

# Laboratory Safety Guidelines

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**Department of Civil Engineering**

**Faculty of Engineering**

**University of Peradeniya**

# Laboratory Safety Guidelines

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## PREFACE

This laboratory safety guidelines/manual was prepared by the Department of Civil Engineering, Faculty of Engineering, University of Peradeniya. The guide includes general safety rules that need to be followed by the students during in-laboratory/field experiments conducted by the respective laboratories. The laboratory-specific safety guidelines are also provided (Appendix V) which, unless stated otherwise, will supersede the general guidelines.

In this document, the ‘Department’ refers to the Department of Civil Engineering, Faculty of Engineering, University of Peradeniya; the laboratory refers to any laboratory belonging to the Department of Civil Engineering; the ‘student’ refers to any undergraduate/postgraduate student registered at the Faculty of Engineering, University of Peradeniya with a specific registration number, a ‘visitor’ refers to any permitted individual not attached to the laboratory of interest and visiting the laboratory for an intended purpose which may involve potential safety concerns. Note that any references to singular imply the plural and *vice versa*.

Students are required to read the entire guidelines and produce the signed and dated acknowledgement form (Appendix I) to the laboratory without which no experiments can be conducted at the laboratory. In addition, the ‘safety audit form’ described herein (Appendix II) needs to be completed *before* starting any experiment. The completed safety audit form, with the respective instructor’s signature, needs to be enclosed with the student’s laboratory report.

Two other important documents, the incident report form and the risk assessment form, are given in Appendix III and IV. Note that important documents are made available in specific colors and please use the correct form and submit the duly completed form to the respective laboratory.

## Quick Safety Guide for Students

- The Department of Civil Engineering consists of 8 laboratories: Computer Aided Design (CAD) Laboratory, Geotechnical Engineering Laboratory, Fluid Mechanics Laboratory, Environmental Engineering Laboratory, Materials Laboratory, Metallurgy Laboratory, Structural Laboratory, and Survey, Transportation and Highway Laboratory.
- Each laboratory (except the CAD laboratory) is demarcated with ‘work zones’ identified by the potential safety hazards involved with the experiments conducted within the zone. Each zone has specific personal protective equipment (PPE) to be used as mentioned in laboratory-specific guidelines (see Appendix V). A ‘safety map’ showing the work zones is displayed at the laboratory entrance.
- Each experiment conducted within a laboratory has a unique experiment code designating the laboratory, the semester in which the experiment is conducted, the work zone, and the experiment number in the given order.

e.g., GEO213

Experiment No.  
Zone  
Semester  
Laboratory

- When entering a laboratory for an experiment, be aware of the zone in which the experiment will be conducted and use the PPEs accordingly. Students are required to come with appropriate attire and shoes for the experiment. No dangling objects (e.g., necklace), loose-fit garments, and slippers are allowed.
- Each laboratory is equipped with a first-aid box and fire extinguishers to be used in an emergency. The safety guides with emergency contact telephone numbers will be made available to all students. A safety telephone directory will also be available near the laboratory telephones for quick access.
- Be cognizant about the emergency exits, fire exits, and assembly areas when you are working in a laboratory.
- In an emergency, seek professional help. Consult the laboratory staff who have been trained to provide professional help. Do not attend to any safety operation if you are not trained.
- If you come across any defective equipment with potential risks, inform the laboratory staff immediately.
- In case of any type of accident and/or if someone is hurt, seek help immediately. Behave as a responsible citizen in case of serious accidents and report to the concerned authorities. Breaching of safety rules during an experiment will not be tolerated.

## 1. Introduction

Laboratory safety awareness is an important mindset that protects people, expensive equipment, and the university resources while conducting laboratory experiments. Individuals working in a Civil Engineering laboratory are always required to exhibit maturity and follow proper operational procedures while operating equipment and conducting laboratory tests. The guidelines given herein are intended to minimize personal accidents and equipment damage. Please be sure to follow the following mandatory rules while conducting the laboratory work.

## 2. Scope

The present safety guide describes the procedures, equipment, personal protective equipment and work practices that are capable of protecting students and all users (including visitors) of the laboratories of the Civil Engineering Department.

This manual is applicable to:

- Students
- Lecturers, instructors, technical and supporting staff
- Visitors
- Any individual entering the spaces with assigned duties in the respective laboratory.

The guide covers activities such as:

- Field work/in-laboratory experiments
- Handling testing equipment/tools
- Taking readings during/after lab sessions
- Storing materials, tools and equipment
- Performaing basic maintenance tasks
- Housekeeping

### **3. Responsibility**

While the students are primarily responsible to have clearly understood and acknowledge in writing the safety guidelines described herein and abide by them, the laboratory technicians, instructors and the academic staff bear the overall responsibility to ensure that the safety precautions are adequately maintained within the laboratory.

- Provide a 15-minute safety briefing prior to each laboratory session and ensure that each student understands, signs and dates the acknowledgement form.
- Under no circumstances should a student be allowed to involve in any laboratory activity associated with potential risks without completing the safety acknowledgement form.
- Misbehavior of any nature and breaching of safety rules during an experiment must not be tolerated.
- Students must not be left unattended for an extended period of time during the experiments.
- The level of supervision must be made on the basis of the maturity of students: the younger the students, the greater the level of supervision should be.
- No defective equipment should be allowed for any reason.

### **4. General**

- If you are not sure about what and why you are doing any task, please ask your instructor.
- While conducting a lab experiment, safety of yourself and that of those around you are paramount – make sure that everyone around you is aware of what is going on.
- Please do not leave any equipment unattended. Equipment should be cleaned and returned to its original condition and position when you leave the instrument.
- Please do not touch anything in the laboratory that is not a part of your experiment.

## 5. Laboratory Dress

While attending a laboratory class, you must be appropriately attired for the particular work related to the lab work.

Some of the simple guidelines include:

- Wear sensible closed-toed shoes or boots; open-toed shoes, sandals, or bare feet are not acceptable laboratory attire
- Wear long pants; shorts are not acceptable laboratory attire.
- Refrain from wearing clothing accessories that may become caught in laboratory equipment.
- Remove loose or dangling objects such as bracelets and necklaces
- Tie back and secure long hair, or contain them properly.
- Wear eyeglasses or contacts, if needed.
- Use ear plugs when necessary.
- Wear gloves, face masks, protective shoes or boots, as appropriate, depending upon the nature of the lab work.

## 6. Laboratory Procedures

A wide variety of equipment and testing apparatus are available in the laboratory. The complexity of many of these devices necessitates specific care and consideration while operating them. If there is any doubt or any question on operating any piece of equipment while performing laboratory work, consult with the instructor or the lab technician.

Guidelines for laboratory safety are necessary to minimize accidents and to ensure that expensive equipment is not damaged by carelessness or negligence.

The following are some of the basic rules pertinent to lab safety:

- Ensure adequate lighting is available at the experimental area. Consult the instructor in case of poor lighting conditions before handling any equipment.
- Do not handle any materials or operate any equipment unrelated to the laboratory experiment to be performed on that particular day.
- Never operate any unfamiliar equipment without a specific approval of the instructor or a lab technician.
- Be sure to clean and dry out the equipment after you have finished the experiment.
- When operating very important equipment, be sure that at least two persons are always present.
- Avoid situations when nobody is available within sight or earshot that could assist in the event of an emergency. This applies to circumstances where, in the event of injury or emergency, immediate assistance is not readily available and the student may not be able to self-rescue or activate emergency services
- Be careful while using and storing sharp edge equipment like knives.
- No food or beverages are allowed in the laboratory.
- Be aware of your surroundings. Keep fingers away from large machinery.
- Wear appropriate clothing and shoes.
- Place all laboratory equipment in their proper storage area after use with the help of the technician.
- Always act in a professional manner.

## 7. Accidents

- In case of any type of accident and/or if someone is hurt, seek help immediately. Behave as a responsible citizen in case of serious accidents and report to the authorities concerned.

- If equipment is damaged, please report the situation to the instructor promptly. This will ensure a proper and quick repair or replacement.
- In the event of major fire, please evacuate the building immediately and seek professional help. In the event of a minor fire, use the nearest fire extinguisher to extinguish the flame if you are trained, if not seek the assistance of the instructor and/or lab technician.

## **8. Electric Hazards**

- Switch off all electrical equipment when not in use.
- Do not attempt to do any electrical repairs or investigations. Consult qualified staff.
- If equipment is to be left on for a specific reason (over an extended period), display a ‘TEST IN PROGRESS’ sign with the time and date.
- All electrical equipment should be regularly checked.
- Report to the lab instructor any problem/malfunctioning of any equipment for appropriate action to be taken.
- Never short circuit the terminal on a power supply, battery, or other voltage source unless instructed to do so.
- Be sure wires leads and patch cords have sufficient insulation when creating electrical circuits.
- Never test battery voltage and capacity using anything other than a voltage sensor or voltmeter.

## **9. Security**

Proper security of the laboratory facilities also ensures a safe working environment. The following are some of the guidelines:

- If you are working late and the last to leave the laboratory inform the lab technician beforehand.
- After you have finished using any equipment, please return it to its proper storage area and cabinet.

- Report any suspicious individuals or unwelcomed visitors not related to the laboratory to the lab technician or faculty security.

## **10. Computing Safety**

Computers in the laboratories are secured using a combination of physical and software-based method to ensure the safety and security of our students, staff and equipment and also the computer network.

- Restricted computer access  
To prevent unauthorized use of computing resources
- Physical security  
Equipment is placed in a manner to limit access to physical ports on the CPU.
- Software based security and prevention of installation of malicious software  
All computers are protected with standard anti-virus and anti-spyware. As a further measure, all computers require a unique, authorized login for authentication before granting network access. Any malicious action against the departmental computer security is an offence.

## **11. Safe Use of Ergonomics**

To escape aching muscles and tiring eyes while working at a desk or a computer, try the following:

- Check your posture
- Take short breaks regularly.
- Adjust chair height so that your arms are approximately parallel with the floor.
- If the front of the chair is causing pressure on your back of thighs or behind your knees, readjust the chair.
- Locate the computer screen approximately one full arms lengths away and position it so that your line of sight to the screen is slightly below horizontal. Relax those muscles.

- A total of 4 hours (not including breaks) of intensive keyboard work is the maximum recommended for a day.

## **12. Risk Control**

This step provides a means by which risk can be systematically evaluated against a set of control options (the hierarchy of controls). The risk control considers ranked risks from the highest to the least weighty.

The hierarchy of controls is as follows:

- Eliminate the hazard
- Substitute with a lesser hazard
- Use engineering controls to reduce hazard
- Administrative controls such as workplace procedures
- Personal protection equipment

## **13. Safe Policy Communications**

Safety instructions, guidelines are communicated through different media:

- Posters
- Signs
- Flyers
- Manuals

Laboratory safety signs and posters are displayed within the laboratory at appropriate locations.

## **14. Signboards**

- Exits
- Fire extinguishers
- Showers
- Eye washes
- Chemical and supply storage areas

- Gas lines
- Special depositories (e.g., biohazardous waste, glass, chemical garbage)
- Emergency plan and phone numbers

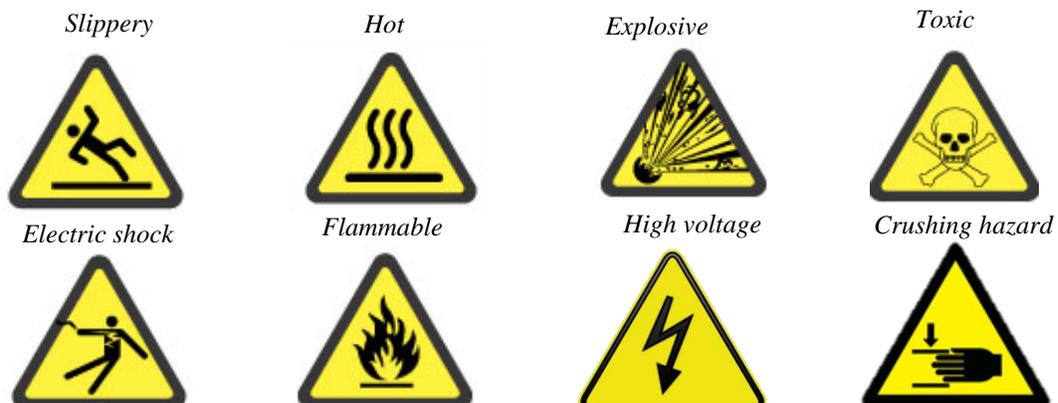
### Prohibiting signs



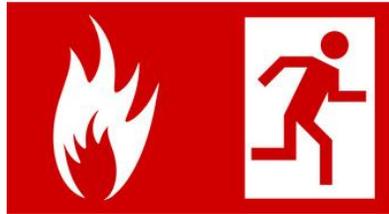
### Mandatory signs



### Triangular signs



## Emergency escape, fire-fighting signs



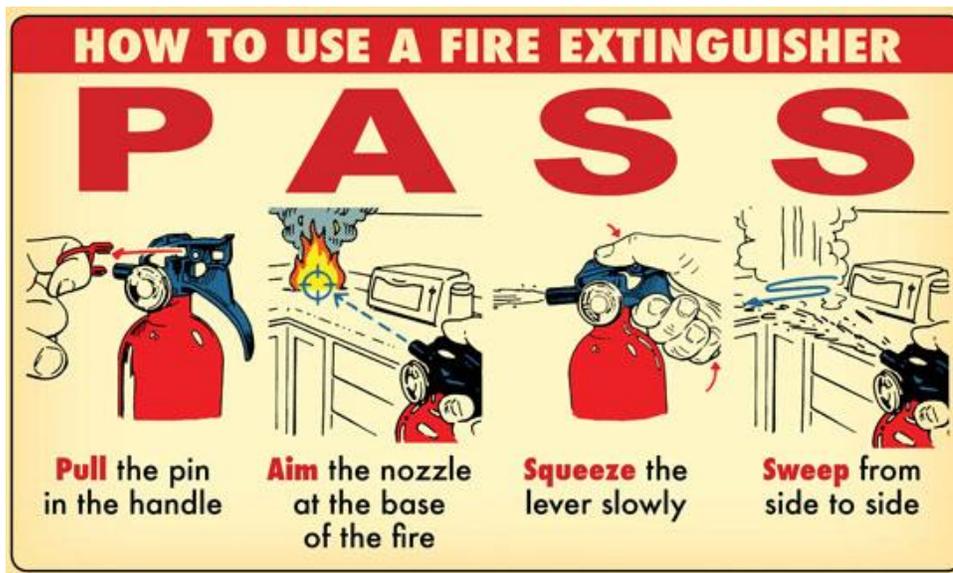
In the event of fire and extinguisher has to be used, keep remember the **P A S S** approach:

**P**ull the pin out on the extinguisher

**A**im the extinguisher at the base of the fire

**S**queeze the nozzle to release extinguishing material

**S**weep: Usa a back-and-forth sweeping motion



# **APPENDICES**



# DEPARTMENT OF CIVIL ENGINEERING

FACULTY OF ENGINEERING,  
UNIVERSITY OF PERADENIYA,  
PERADENIYA, SRI LANKA

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## ACKNOWLEDGEMENT FORM [BLUE FORM]

DEPARTMENT OF CIVIL ENGINEERING

FACULTY OF ENGINEERING

LABORATORY SAFETY GUIDELINES

### **Acknowledgement**

I hereby acknowledge that I have read the entire guidelines mentioned hereunder in relation to the proper procedures and conduct to be followed in the laboratory experiments. As a student at the Dept. of Civil Engineering, Faculty of Engineering, University of Peradeniya, I understand these guidelines and procedures and agree to abide by them.

Course Title:

Year:

Name

Registration number:

Signature:

Date:



## **STUDENT'S SAFETY AUDIT [WHITE FORM]**

Before starting each experiment at the laboratory, students should visit the respective experimental area and study the safety and risks associated with the experiment.

- ✓ Identify the potential risks associated with the experiment that may endanger the safety of you and your colleagues. It may include safety concerns related to fire hazards, excessive heat, electricity hazards, rotating devices, sharp tools, explosive parts, overhead sections with potential to fall, breakable glass-type pieces, chemical spills, overexposure to poisonous gases or any other hazardous potentials you may identify.
  
- ✓ Identify the safety precautions that have been already undertaken to ensure the safety during the experiment.
  
- ✓ Do you feel comfortable with regard to the overall occupational safety of the laboratory during the experiment?
  
- ✓ What are the additional safety measures that you propose to enhance the operational safety associated with this experiment?
  
- ✓ Enclose individually completed 'safety audit form' (see overleaf) with your laboratory report which you submit following the experiment.

## STUDENT'S SAFETY AUDIT FORM

Name:

Registration number:

Course:

Experiment:

<b>Materials</b>	<b>Equipment</b>	<b>Processes</b>
Hazardous chemicals <input type="checkbox"/>	Electrical <input type="checkbox"/>	Excessive heating <input type="checkbox"/>
Biological substances <input type="checkbox"/>	Mechanical <input type="checkbox"/>	Chemical spilling <input type="checkbox"/>
Materials with sharp edges <input type="checkbox"/>	Radioactive <input type="checkbox"/>	Rotational movements <input type="checkbox"/>
Corroded /degraded materials <input type="checkbox"/>	Robotic <input type="checkbox"/>	Exposure to dust/ vapour/fume/ gases <input type="checkbox"/>
Toxic materials <input type="checkbox"/>	Overhead sections with potential to fall <input type="checkbox"/>	Exposure to noise above tolerable limits <input type="checkbox"/>
Explosive materials <input type="checkbox"/>	Sharpe tools <input type="checkbox"/>	Others (specify)
Flammable materials <input type="checkbox"/>	Breakable parts <input type="checkbox"/>	<b>Personal Protective Equipment</b>
Irritant materials <input type="checkbox"/>	Heated elements <input type="checkbox"/>	Labcoat <input type="checkbox"/>
Incompatible materials <input type="checkbox"/>	Malfunctioning sections <input type="checkbox"/>	Reflective jacket <input type="checkbox"/>
Emissions	Others (specify)	Linesman safety belt <input type="checkbox"/>
Dust <input type="checkbox"/>		Safety shoes
Fume <input type="checkbox"/>		With toecap & midplate <input type="checkbox"/>
Vapour <input type="checkbox"/>		Gloves
Gas <input type="checkbox"/>		(Cotton/asbestos/canvas <input type="checkbox"/>
Others (specify) <input type="checkbox"/>		/chemical/surgical)
Other materials with safety concerns (specify)		Goggles (light weight/white vision) <input type="checkbox"/>
		Respiratory Masks <input type="checkbox"/>
		Helmets <input type="checkbox"/>
		Earmuff <input type="checkbox"/>
		Gumboots <input type="checkbox"/>

Are satisfactory post-experiment processes adapted? (e.g., waste disposal, material reuse, cleaning equipment, floor/tables, etc.)	Yes /No
If not, please mention what post-experimental measures you propose.	
What additional safety measures do you propose to improve the safety during the experiment?	
Are you satisfied with the overall occupational safety of the laboratory? (e.g., adequate lighting and ventilation, unobstructed exits, easy access to first aid box, fire extinguishers, availability of trained staff in an emergency etc.)	Yes /No
If not, please mention how to improve the overall occupational safety of the laboratory.	

-----  
Signature of the student

-----  
Date

**Checked by:**

-----  
Instructor's signature

-----  
Date



# DEPARTMENT OF CIVIL ENGINEERING

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PERADENIYA, SRI LANKA

## INCIDENT REPORT FORM [YELLOW FORM]

**This form should be filled out by the person involved with the incident**

Name	Registration No.
Location of the incident	
Date and time of the incident	
Supervisor	
<b>A: Describe how the incident occurred</b>	
Task you were doing (your goal of the activity)	
Describe incident in detail. What happened?	
Describe your response (sequence of events)	
<b>B. did you sustain injuries? What were they? Did you seek medical care? Describe severity of the incident.</b>	
<b>C. Was there any property damage? Elaborate.</b>	
<b>D. Safety rules and procedures.</b> Had necessary PPE been used during operation? Have you received a training?	

-----  
Signature of the person involved  
with the incident (or a responsible  
person on his/her behalf)

-----  
Date

<b>Comments from the Laboratory-in-charge</b>	----- <b>Signature and date (Laboratory-in-charge)</b>
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**(For the Department Office only)**

<b>Received by (Date)</b>	
Action taken by the Head of the Department	----- <b>Signature and date (Head of the Department)</b>



# DEPARTMENT OF CIVIL ENGINEERING

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## RISK ASSESSMENT FORM [PINK FORM] (For research students)

### **PART 1: Personal data and the nature of the project/activity**

Name	Supervisor
Registration No.	Location/Laboratory
Contact information	
Status Technician/Undergrade/Postgrade/Research assistant/other (specify)	
Starting Date	
Proposed finishing date	
Title of the Project/Experiment	
Brief description of the project	
Definitions: <b>Hazard</b> : The potential for harm <b>Risk</b> : The probability of harm actually occurring and the severity of its consequences <b>Risk Assessment</b> : The process of deciding on actions to be taken to reduce risk to an acceptable level by implementing control measures	

## PART 2: Nature of Possible Hazards

<b>Chemicals/Substances</b> <i>Are chemicals/substances hazardous to health to be used?</i> If YES, please describe the hazard.	<b>Yes/No</b>
<b>Biological substances</b> <i>Are biological substances to be used?</i> If YES, please describe the hazard, precautionary measures you follow when you use them, and steps to be taken in an emergency, the means of safe disposal upon use	<b>Yes/No</b>
<b>Electrical</b> <i>Is electrical equipment to be used? Describe...</i>	<b>Yes/No</b>
<b>Radioactive</b> <i>Is radioactive equipment to be used? Describe...</i>	<b>Yes/No</b>
<b>Robotic</b> <i>Is robotic equipment to be used? Describe...</i>	<b>Yes/No</b>
<b>Mechanical</b> <i>Are you using mechanical, pneumatic, hydraulics, motor drives, lifting gear, etc.?</i> <i>Describe...</i>	<b>Yes/No</b>
<b>Other hazards</b> <i>Are there other hazards that may expose you to unusual risks (e.g., working at height)</i>  <i>Please describe the nature of the hazard.</i>	<b>Yes/No</b>

### PART 3: Control Measures

If you answered YES in PART 2 in any of above questions, please provide the control measure to be adopted for these activities. Please describe the post-activity safety measures (e.g., safe disposal of chemical and biological wastes)

How to analyze the risk

**Hazards Identified:** List all potential hazards, e.g. those that may arise from substances, electricity, equipment or machines, and the ways in which people use or misuse those items etc.

**Identify persons at risk:** The risk may be different for the person performing the experiment from someone who knows nothing about it (e.g., cleaners, visitors)

**Control Measures:** Measures that you adopt to reduce risk to their lowest level,

**Likelihood:** 1 = Unlikely; if control measures do not break down  
2 = Likely; if the control measures depend on the individuals using them or adjusting them.  
3 = Certain/imminent; Exposure to hazard is continuous

**Severity :** Assessed on a scale of 1-3 as follows;  
1 = minor injury/illness, 2 = serious injury, 3 = Death/fire /explosion

**Risk:** Likelihood x Severity = Risk rating

**Risk rating :** 1-3 low; 4-6 Moderate; 7-9 High

-----  
Signature of the student

-----  
Date

**Checked by:**

-----  
Supervisor's signature

-----  
Date

## **TELEPHONE NUMBERS**

### **Security Service:**

Faculty security office	3333
University security officer	2133
University chief security officer	2134

### **University Health Centre**

Office	2028
Chief Medical Officer	2024

Peradeniya Hospital	081-2388001-5
Peradeniya Police Station	081- 2388222
Kandy fire brigade	081-2 224444
Kandy Hospital	081- 2222261
Kandy Police Station	081-2 222222

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