

# **LABORATORY SAFETY MANUAL**

**Environmental Engineering Laboratory**



**BANGLADESH UNIVERSITY OF  
ENGINEERING  
AND TECHNOLOGY**

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**Disclaimer:**

The safety measures mention in this manual are applicable for general activities in the laboratory. Students and lab stuffs are asked to follow additional safety measures if it's necessary for any specific experiment.

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## Safety manual

This safety manual is applicable for Environmental Engineering Laboratory. This will help both students and laboratory instructors to know about the safety features and safe work practices inside the laboratory.

### 1. Emergency

#### 1.1 What is an Emergency? (Definitions)

Sudden, unexpected, or impending situation that may cause injury, loss of life, damage to the property, and/or interference with the normal activities of a person or group and which, therefore, requires immediate attention and remedial action.

Following situations may be regarded as emergency:

- 1) A sudden, urgent, usually unexpected occurrence or occasion requiring immediate action
- 2) A state, especially of need for help or relief, created by some unexpected event

#### Emergency Contact List

Designation	Name	Phone No.
Head of the Department	Dr. Ahsanul Kabir	01711673982

Designation	Phone No.	BUET Office
BUET telephone operator(PABX)	55167100	0

#### Medical Centre:

Emergency ambulance service/Medical officer	6666
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Designation	Name	Phone No.	BUET Office
Chief Medical officer	Dr. Md. A. K.Masud	01916740809	7344
Senior medical officer	Dr. Mohammad Mashuk Elahi	01552416578	7393
Medical officers	Dr. Md. Hasib iskandar	01720960997	7893
Medical officers	Dr. Md. Mubashwirul islam	01679222750	7817

#### Fire service and civil defense:

Fire Brigade Emergency/Enquiry	199
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Place	Mobile	Phone
Polashi	01716354370	02-8628688
Mirpur Road	01730002229	02-9001055
Mohammadpur	01712970093	02-9112078

#### Police & Security:

Designation	Phone
Emergency Call	999
DMP Police Emergency	01713398311,9551188

**Directorate of Students' Welfare (DSW):**

Designation	Name	Phone No.	BUET Office
DSW	Dr. Md. Mizanur Rahman	01911346993	6135,7143
Assistant DSW	Dr. Md. Raquibul Hossain	01819557960	7224
Associate Directors	Dr. Mohammad Faisal	01794692601, 01926714764	7713, 6168

**Residential Halls: (Updated at 03/08/2019)**

Hall Name	Designation	Name	Phone No.	BUET Office
Ahsan Ullah Hall	Assistant Provosts	Dr. Md. Iqbal Hossain	01927885215	7430
Kazi Nazrul islam Hall	Assistant Provosts	Dr. Mahbub Hasan	01820291811	7833
Titumir Hall	Assistant Provosts	Dr. Md. Muktadir Billah	01840702279	7718
Sher-e-Bangla Hall	Assistant Provosts	Dr. Md. Shahinoor islam	01922544639	7933
Suhrawardy Hall	Assistant Provosts	Dr. Mohammad Khurshed Alam	01712526059	6390
Shahid Smrity Hall	Assistant Provosts	Dr. Rupak Mutsuddy	01839848062	7224
Chattri Hall	Assistant Provosts	Nishat Sultana	01757786310	7735
Dr.M.A.Rashid Hall	Assistant Provosts	Dr. Md. Shafiul Azam	01535495622	7470

**University security & others:**

Designation	BUET Office
Security Emergency Call	7777
Security officer	7482
Electricity & Plumbing	7323
Machine Room	7589
Shaheed Minar Gate(Main Gate)	7812
West Palashi ( Main Gate)	6592
Bakshi Bazar R/A Gate	7825
Dhakeswari R/A Gate	7759
Palashi R/A Gate	7692
Azad R/A Gate	7760
71,72 No. Building Gate	6330

**1.2 What to do in Case of an Emergency?*****In the event of an emergency,***

- Get out of immediate danger!
- Report situation to the instructor
- Explain the nature of the emergency.
- Provide your name and location.
- Provide the phone number from which you are calling.
- Answer all questions and do not hang up the phone until the operator is finished.

***If the emergency has cause injury to a person,***

- Provided it is safe for you, stay with the victim!
- If the victim is conscious, ask what the problem is.
- If the victim is unconscious, check for breathing and bleeding. Do not move the individual until trained personnel arrive or an immediate threat to life exists. Only trained individuals should administer first aid and CPR.
- Keep the victim still, comfortable, and ventilated.
- Protect the victim from any disturbances.
- Search for any emergency identification (i.e. ID)
- Wait for emergency help to arrive. Never leave the victim alone if possible.
- Once the emergency responders have arrived, stay out of the way of emergency personnel and emergency vehicles!

***What to do in case of a fire or smoke?***

All situations related to fire should be taken seriously. If you hear or see anything uncertain, evacuate the building!

***If fire or smoke is discovered anywhere on or about the campus:***

- Leave the area where the fire is located, isolating it as well as possible by closing doors and windows around it.
- Activate the fire alarm switch.
- Do not attempt to retrieve valuables.
- Do not use Elevators /lifts .
- Never attempt to fight a fire larger than wastebasket size. Even a small fire can generate enough smoke to cause serious injury. Never attempt to fight a fire by yourself. Call for help. Always stay between the fire and the exit.

***If you can't evacuate:***

- Find a safe location and call emergency.
- Crawl to the door on hands and knees, so you can breathe the fresher air near the floor.
- Seal your room against entering smoke.
- If it's still smoky in your room, breathe through a wet towel that covers your nose and mouth. Breathe only through your nose.
- Clear flammable debris from the window.

**1.3 FIRE EXTINGUISHER INSTRUCTIONS (PASS)**

- P \* PULL** safety pin from the handle
- A \* AIM** at the base of the fire
- S \* SQUEEZE** the trigger handle
- S \* SWEEP** foam side to side



## 1.4 What if you or people are trapped in a burning building?

- The universal sign for a person trapped in a burning building is to hang clothing or a sheet out of the window of the room where you are trapped. The firefighters then will know where you are trapped.
- If you are aware that someone is trapped in a burning structure, inform the firefighters immediately.
- Do not re-enter the building alone.
- If you are trapped, stay low to the ground as you try to exit. Do not open any doors that feel hot. Use wet towels or clothes to protect you from flames and smoke.
- If your clothes catch fire, STOP, DROP, AND ROLL!!!

## 2. General Conduct

### 2.1 General Instruction

- 1 Conduct yourself in a responsible manner at all times in the laboratory.
- 2 Follow all written and verbal instructions carefully. If you do not understand a direction or part of a procedure, ask the instructor before proceeding.
- 3 Never work alone. No student may work in the laboratory without an instructor or attendant present.
- 4 When first entering a laboratory room, do not touch any equipment, chemicals, or other materials in the laboratory until you are instructed to do so.
- 5 Do not eat food, drink beverages, or chew gum in the laboratory. Do not use laboratory glassware as containers for food or beverages.
- 6 Perform only those experiments authorized by the instructor. Never do anything in the laboratory that is not called for in the laboratory procedures or by your instructor. Carefully follow all instructions, both written and oral. Unauthorized experiments are prohibited.
- 7 Be prepared for your work in the laboratory. Read all procedures thoroughly before entering the laboratory. Horseplay, practical jokes, and pranks are dangerous and prohibited.
- 8 Observe good housekeeping practices. Work areas should be kept clean and tidy at all times. Bring only your laboratory instructions, worksheets, and/or reports to the work area. Other materials (books, purses, bags, cell phone etc.) should be stored in the confined area.
- 9 Keep walkway clear. Push your chair under the desk when not in use.
- 10 Know the locations and operating procedures of all safety equipment including the first aid kit, eyewash stations, safety shower and fire extinguisher. Know where the exits are located.
- 11 Report all accidents, injuries, and breakage of glass or equipment to instructor immediately
- 12 Always work in a well-ventilated area. Use the fume hood when working with volatile substances or poisonous vapors. Never place your head into the fume hood.
- 13 Be alert and proceed with caution at all times in the laboratory. Notify the instructor immediately of any unsafe conditions you observe.
- 14 Dispose of all chemical waste properly.

- 15 Labels and equipment instructions must be read carefully before use. Set up and use the prescribed apparatus as directed in the laboratory instructions or by your instructor.
- 16 Keep hands away from face, eyes, mouth, and body while using chemicals or preserved specimens. Wash your hands with soap and water after performing all experiments. Clean (with detergent), rinse, and wipe dry all work surfaces, (including the sink) and apparatus at the end of the experiment. Return all equipment clean and in working order to the proper storage area.
- 17 Experiments must be personally monitored at all times. You will be assigned a laboratory station at which to work.
- 18 Students are never permitted in the chemicals storage rooms or preparation areas unless given specific permission by their instructor.
- 19 All chemicals in the laboratory are to be considered dangerous. Do not touch, taste, or smell any chemical unless specifically instructed to do so.
- 20 Check the label on chemical bottles twice before removing any of the contents. Take only as much chemical as you need.
- 21 Acids must be handled with extreme care. You will be shown the proper method for diluting strong acids. Always add acid to water, swirl or stir the solution and be careful of the heat produced, particularly with sulfuric acid.
- 22 Never remove chemicals or other materials from the laboratory area.
- 23 Take great care when transferring acids and other chemicals from one part of the laboratory to another. Hold them securely and walk carefully.
- 24 Never handle broken glass with your bare hands. Use a brush and dustpan to clean up broken glass. Place broken or waste glassware in the designated glass disposal container.
- 25 Clean all the apparatus used with distilled water before and after the experiment.

### **3. Working with Chemicals**

Before working with chemicals, read the MSDS sheet in order to make yourself familiar with the nature of the chemical, its hazard level and emergency response recommendations.

#### **3.1 What to Do if Your Body has Gotten in Contact With a Chemical?**

- If you are not sure how dangerous the chemical contact is, tell the laboratory supervisor, course instructor or teaching assistant
- The treatment of a chemical exposure takes precedent over spill cleanup, spill containment, or property damage including water damage from the use of an eyewash or safety shower.
- In the event of chemical contact with skin or eye, flush the affected area for a minimum of 15 minutes using the eyewash station or sink in your lab. If possible, obtain assistance to remove contaminated clothing after flushing has begun.
- If contact is made through inhalation, immediately move to an area away from the exposure.
- After immediate treatment for the exposure has been completed, pay a visit to the doctor.

### 3.2 Chemical Storage

Proper chemical storage requires that chemicals are stored to meet the following criteria:

- Chemicals are stored only with other chemicals they are compatible with.
- Some chemicals must be stored in special cabinets that provide proper ventilation or flammability protection.
- Some chemical require storage at certain heights.
- Chemicals are best stored in their original containers.
- Some liquid chemicals must be stored with appropriate secondary containers.
- Never store any chemical in a container that is incompatible or does not properly label its actual content.

In order to ensure proper chemical storage, return chemicals to their original place of storage at the end of the lab session.

### 3.3 Chemical Labeling

An unlabeled chemical can create substantial problems due to uncertainty about how to safely handle, store or dispose of it.

Therefore, all chemicals, including those stored in temporary storage or process containers, must be properly labeled. Never use any chemical or substance that is not clearly labeled or identified!

### 3.4 Definition of Chemical Waste

A variety of solid and liquid wastes can be generated in the laboratory. All lab workers that work with chemicals are required to understand how to safely handle, store, and dispose of these materials.

Once you determine a material:

- cannot be reused,
- cannot be used for its intended purpose,
- has exceeded its shelf life,
- has no known owner or generator,
- is no longer wanted or needed, or
- is an end product of a process or experiment that cannot be used as feedstock in an existing process, IT IS A WASTE!

Please remember that maintenance fluids must, in most cases, be disposed of as waste.

#### 4. Physical safety symbols

	<p><b>Symbol for Gloves</b> Gloves must be worn while working in the laboratory. It is important to choose the appropriate type of glove.</p>
	<p><b>Symbol for Boots</b> Closed toe shoe that cover the entire feet must be worn all time while working in the laboratory.</p>
	<p><b>Symbol for Protective Clothing</b> Apron must be worn while working in the laboratory.</p>
	<p><b>Symbol for Safety Glasses</b> Safety glass must be worn while working with chemicals.</p>
	<p><b>Symbol for Breathing Masks</b> Use breathing mask while working in an area with potentially contaminated air.</p>
	<p><b>Symbol for Face shields</b> Face shields must be worn when executing experiments that carry the potential of causing an explosion inside of the hood.</p>
	<p><b>Symbol for Hearing Protection</b> There is a wide variety of hearing protection devices available. Use one according to your need in the laboratory</p>
	<p><b>Symbol for Wash Hands</b> Hand washing is a primary safeguard against inadvertent exposure to toxic chemicals or biological agents. The wash hands safety sign lets lab personnel know to wash their hands.</p>
	<p><b>Symbol for Food &amp; Drink Prohibited</b> No food and drink is allowed inside the laboratory. Especially during class hours.</p>

	<p><b>Symbol for Fire Extinguisher</b> it's important that every lab be prepared with the correct fire extinguisher, inspection requirements, and training.</p>
	<p><b>Symbol for No Open Flames</b> Open flame devices carry with them the risk of unintentional fire and serious consequences when not used appropriately. So be careful about open flame.</p>
	<p><b>Symbol for Poison/Toxic Material</b> The toxic material symbol indicates the presence of substances that may harm an individual if they enter the body.</p>
	<p><b>Symbol for Explosive Hazard</b> The exploding bomb symbol will appear on chemicals in the lab that have explosive properties</p>
	<p><b>Symbol for Flammable &amp; Combustible Substances</b> The flammable and combustible symbol signifies substances that will ignite and continue to burn in air.</p>
	<p><b>Symbol for recycling storage</b> The recycling sign is used in labs to indicate where recyclable items are gathered and sorted.</p>

**Some tools and machines:**



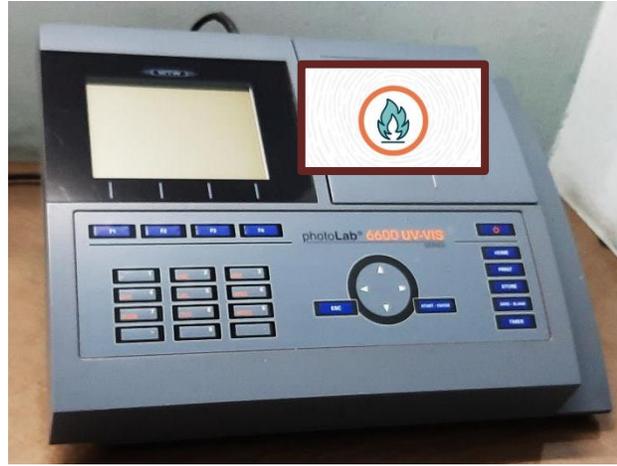
**Atomic Absorption Spectrophotometer**



**Incubator**



**Turbidity Meter**



**Spectrophotometer**



**pH Meter**



**Balance**



**Centrifuge Machine**



**Flocculator Machine**



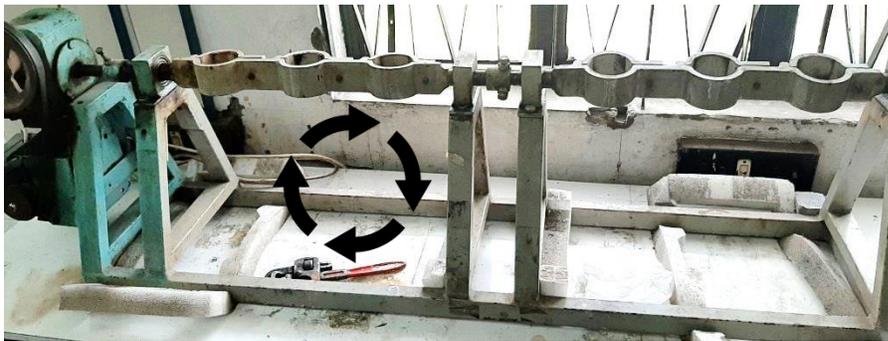
**Water Bath**



**Reactor**



**Cod Reactor with Hot Plate**



**Rotating Leaching Machine**



**Furnace**



**Water Distillation Machine**



**Total Extraction machine**



**TOC analyzer**



**Bacteriological suction unit for bacteriological analysis**



**UV spectrophotometer**



**RO-water Purifier**

## 5. Reference

1. <https://www.labmanager.com/lab-health-and-safety/2017/09/science-laboratory-safety-and-hazard-signs-meanings>
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