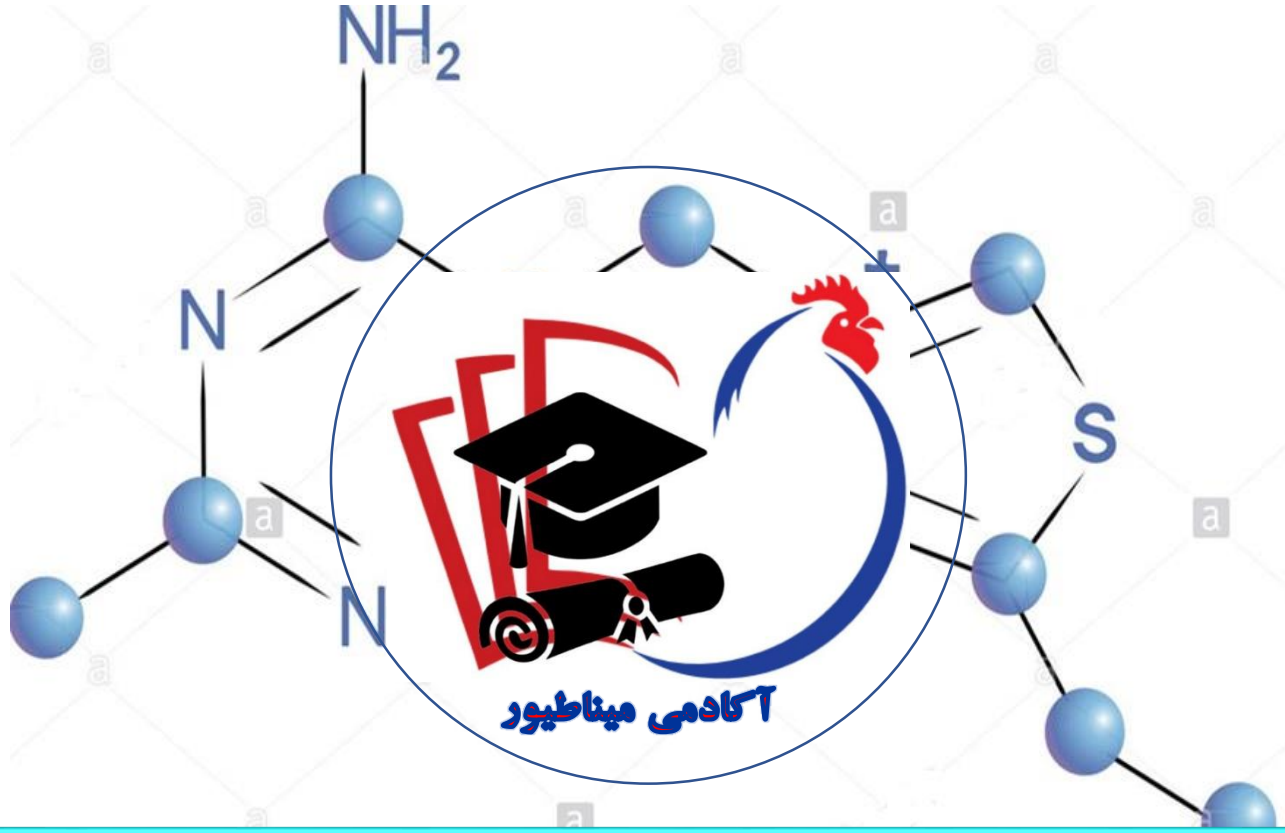


آکادمی میناطیور

Since 2018

بنام خداوند بخشنده مهربان

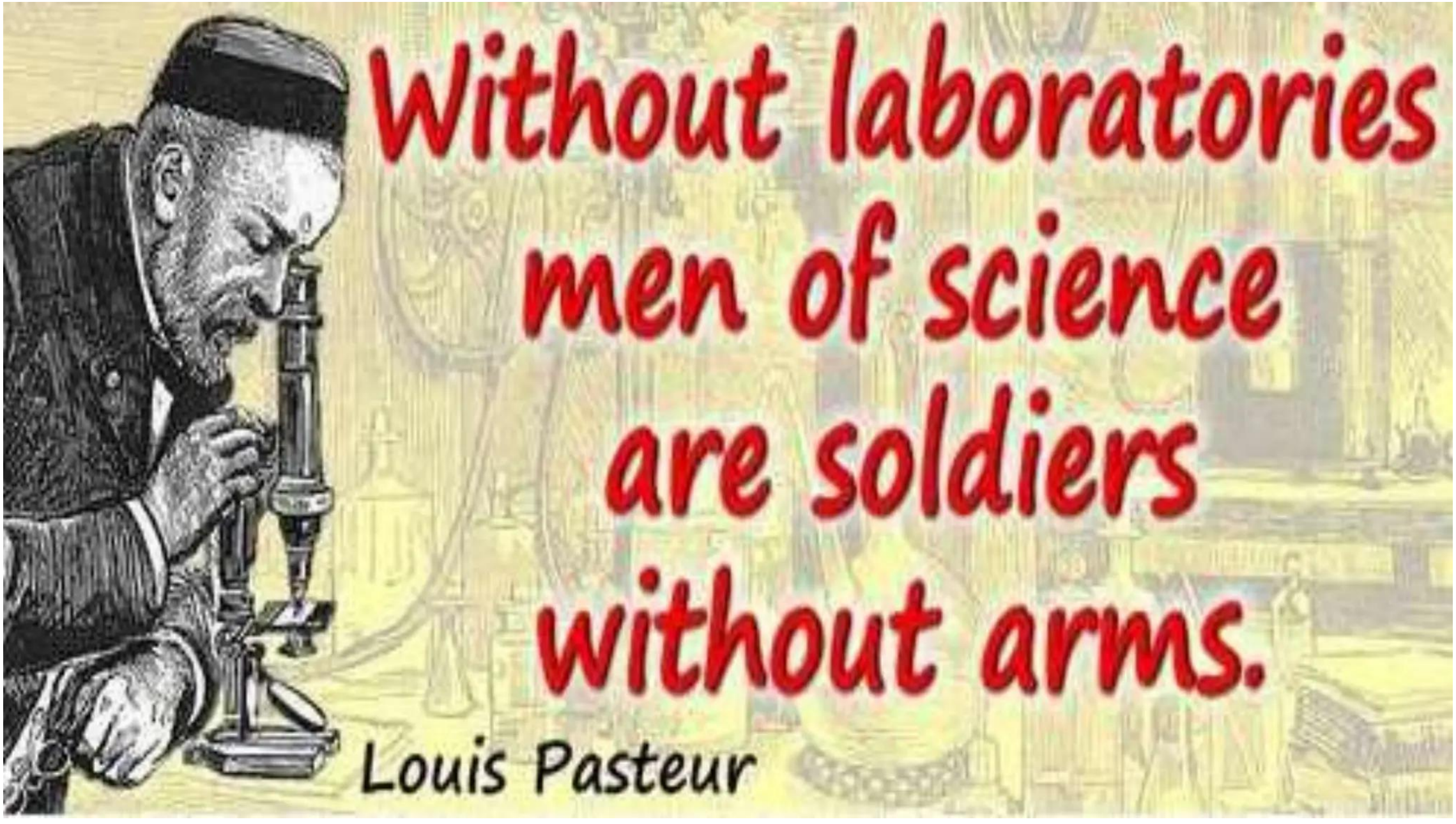
هر آغاز را توشه نام خداست که یادش هدایتگر قلب هاست

خداوند دانایی و علم و نور خردمند و اندیشمند و فکور

لطفی

آکادمی میناطیور

استانداردهای ساختاری و ایمنی در آزمایشگاه

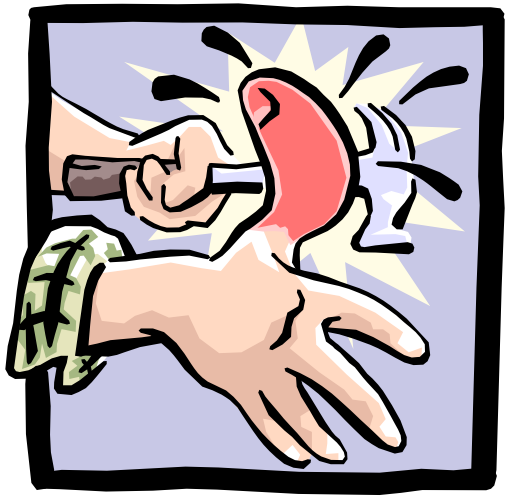


Definition of Science Lab

A room or building with scientific equipment for doing scientific tests or for teaching, researching, doing scientific experiments or place where chemicals or medicines are produced.

Why Training?

Training is by far the most important aspect of safety. Training not only reduces illness/injury but also increases worker efficiency.



Preventing hazards and increasing awareness is the final goal for Laboratory training Courses.

Safety is a culture

Making Safety an Inseparable Part of All Lab Activities

- Laboratory training is the key to reducing injury and illness.
- There are many exposures in the laboratory that pose a hazard to your health and you may have never considered them as a hazard before.
- It is important to have proper training so you, as the employee, are aware of the potential dangers that may threaten your health or life.

Requirements for laboratories

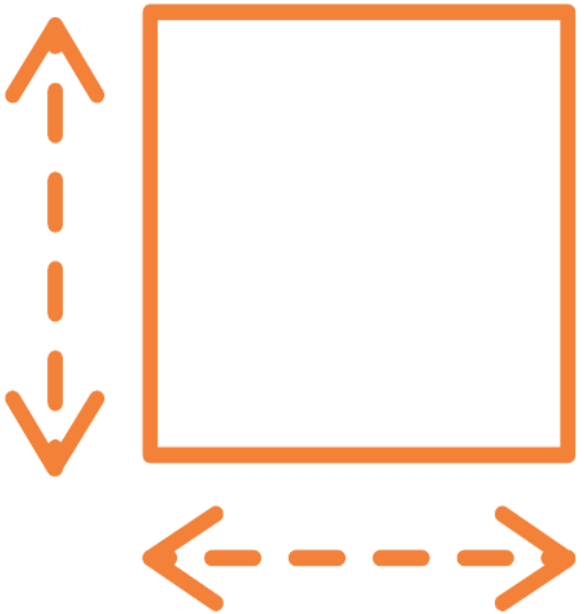
- ✓ General requirements
- ✓ Technical requirements
- ✓ Safety requirements
- ✓ Standards requirements

General requirements

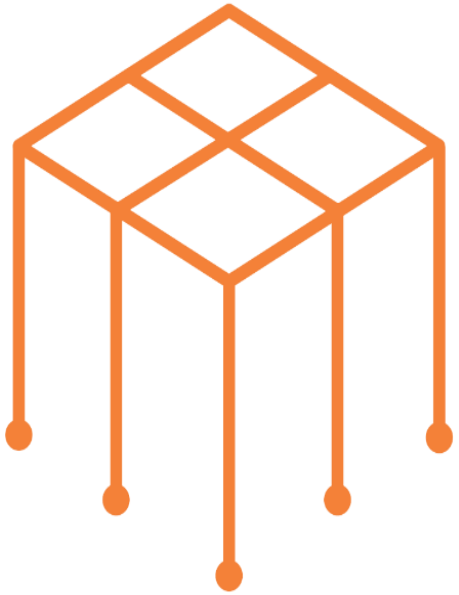
- Location
- Space and dimensions
- Structure & Outline
- Materials

General requirements

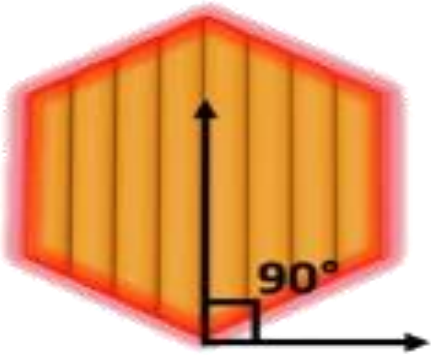
Location



Space &
Dimensions



Structure & Outline



Materials

ⓑ 90° building block
(Red color)

No Damage

Technical requirements


Lighting


Facilities


Flooring


Walls and Ceiling and Doors

Lighting

Having a properly lighted work area is essential to working safely

General laboratory lighting should have an illumination level of 700-1200lux,

Must be required low-glare and shadow-free lighting conditions

The purpose of the emergency light is to illuminate emergency routes and safely evacuate the area when a blackout occurs in Laboratories

Emergency lighting is powered by a rechargeable battery or secondary back-up generator, depending on the model, which is what makes it independent of the main power supply of the building.

LIGHTING

Previous Best Practice	Space Type	New Practice
0.9 watts/sqft	Offices	**0.49** watts/sqft
1.1 watts/sqft	Labs	**0.66** watts/sqft
1 watts/sqft	Overall Conditioned Space	**0.61** watts/sqft

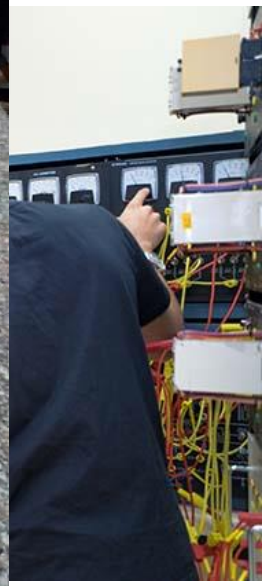
208,561 kWh/year

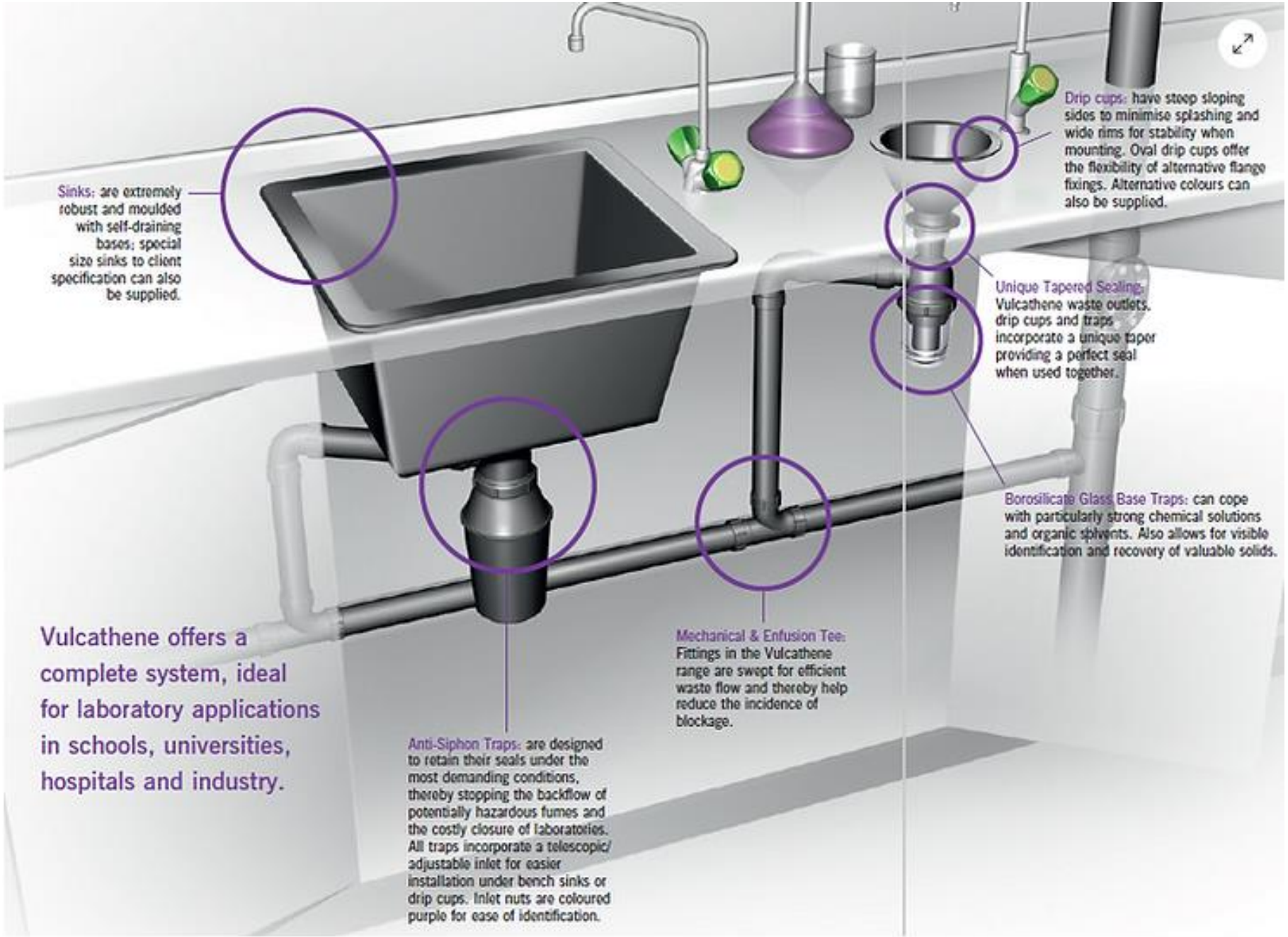
94,753 kWh/year

Results in a savings of $11,897 per year at $0.105 per kWh

Facilities

Hot and Cold water supply

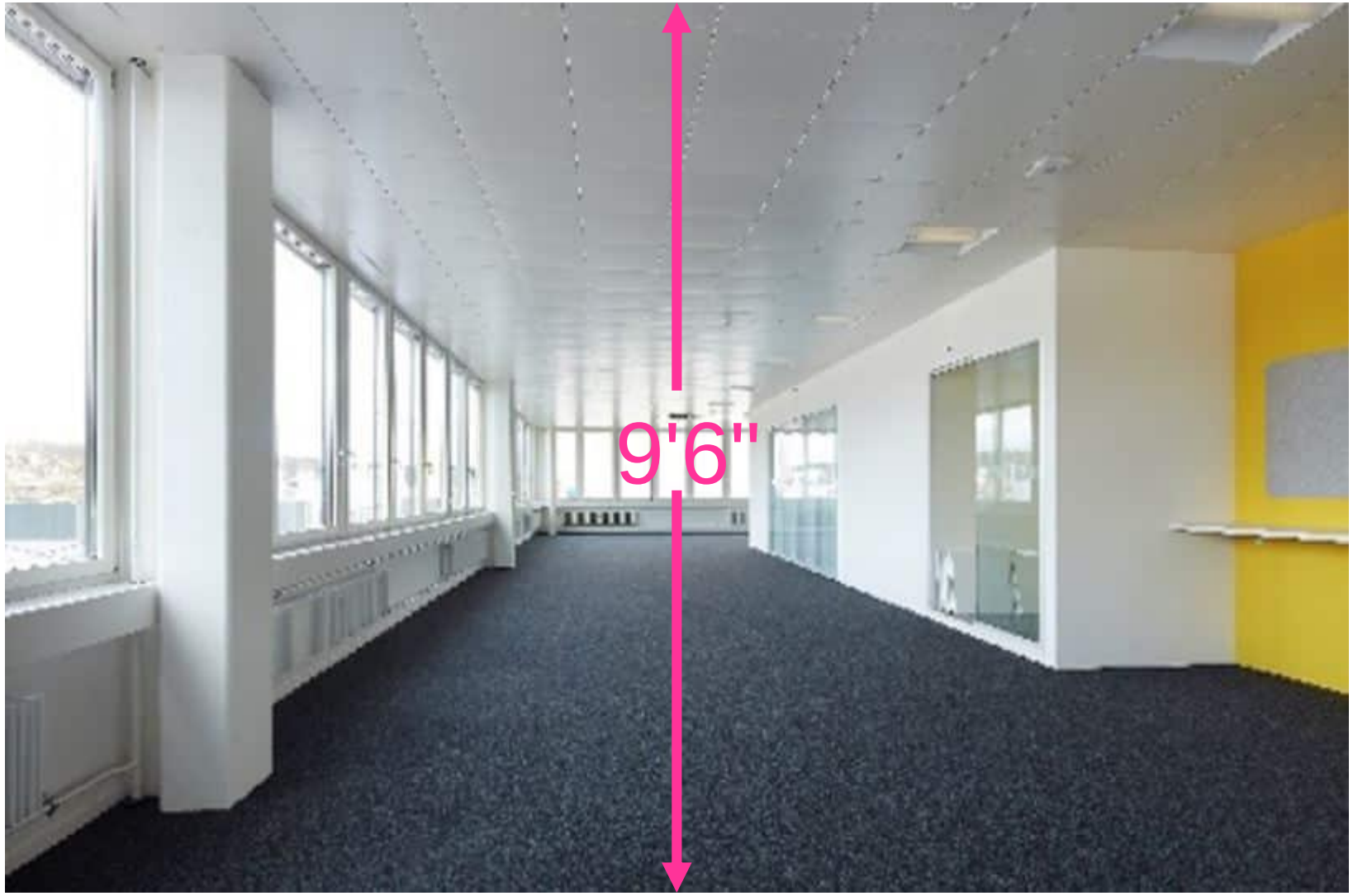



Sinks: are extremely robust and moulded with self-draining bases; special size sinks to client specification can also be supplied.
Drip cups: have steep sloping sides to minimise splashing and wide rims for stability when mounting. Oval drip cups offer the flexibility of alternative flange fixings. Alternative colours can also be supplied.
Unique Tapered Sealing: Vulcathene waste outlets, drip cups and traps incorporate a unique taper providing a perfect seal when used together.
Borosilicate Glass Base Traps: can cope with particularly strong chemical solutions and organic solvents. Also allows for visible identification and recovery of valuable solids.
Vulcathene offers a complete system, ideal for laboratory applications in schools, universities, hospitals and industry.
Mechanical & Enfusion Tee: Fittings in the Vulcathene range are swept for efficient waste flow and thereby help reduce the incidence of blockage.
Anti-Siphon Traps: are designed to retain their seals under the most demanding conditions, thereby stopping the backflow of potentially hazardous fumes and the costly closure of laboratories. All traps incorporate a telescopic/adjustable inlet for easier installation under bench sinks or drip cups. Inlet nuts are coloured purple for ease of identification.

Laboratory sewage should be separated from other types of sewage

Drainpipes with appropriate chemical resistance inner coating should be used as stack pipes to withstand exposure to potentially hazardous chemicals and materials.

Standard Ceiling Height




Latex or polyurethane paints
Easy to clean
Smooth
Resistant to chemicals used in the laboratory
Impervious

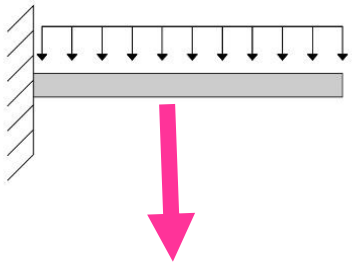
Laboratory floor must be non-pervious, one piece, and with coverings to the wall

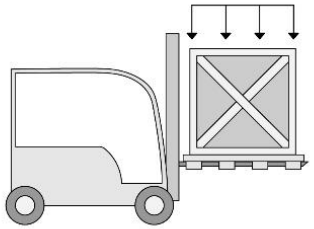
Why Coving Is Important?

Coving is the technique of installing small barriers lining the edges of a floor where it meets the wall (referred to as coves).

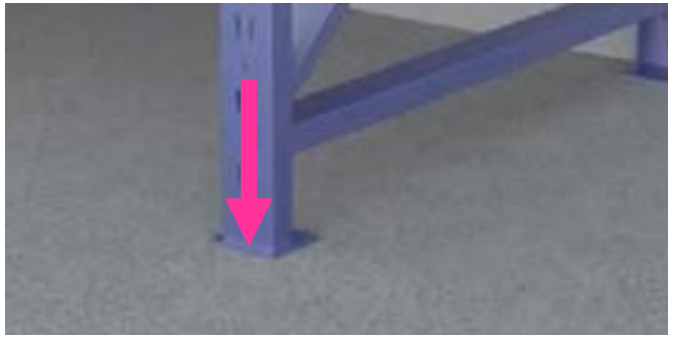
Coves are generally rounded 45-degree angles which slope upwards, preventing a hard 90-degree angle where floor and wall meet.

Floor loading





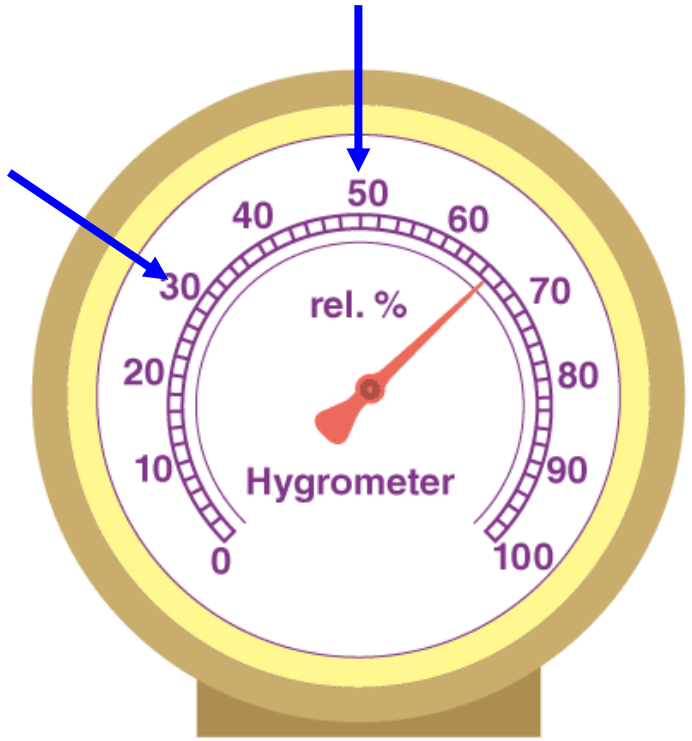
5 kPa/25 sq.mm

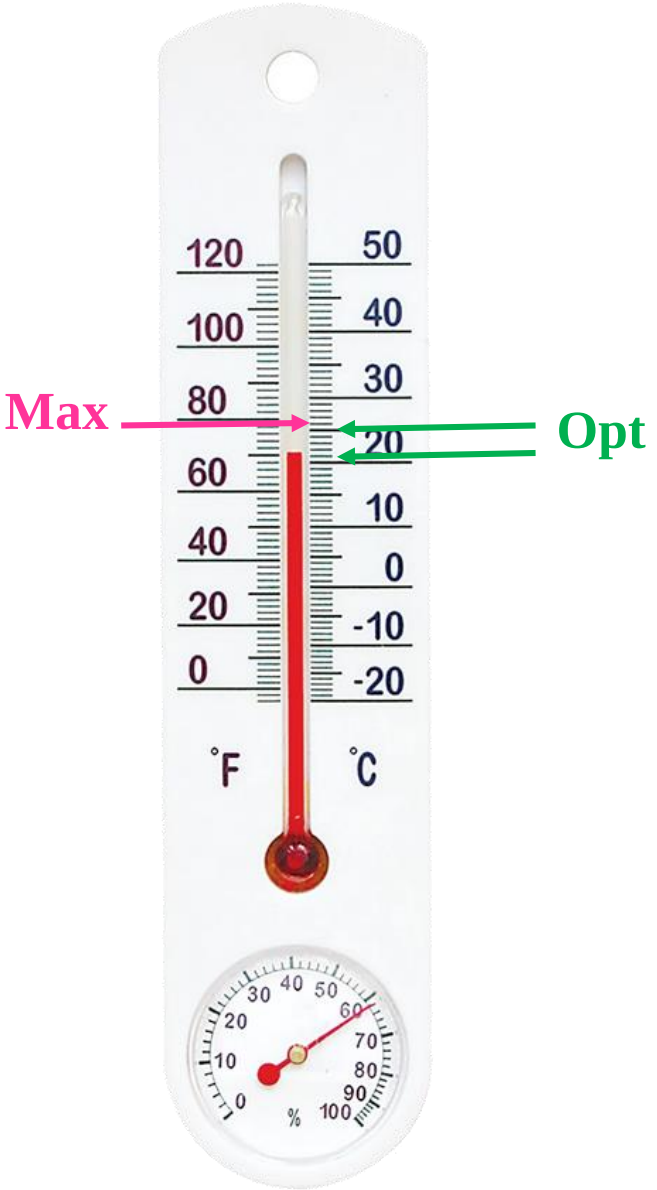


3 kPa/25 sq. mm

- Laboratory doors should swing into egress pathways whenever feasible should be recessed
- Glass doors or panels should be made of tempered/ toughened glass for safety
- Door access control should be installed to prevent unauthorized access

Room Pressure, Humidity and Temperature





Safety requirements

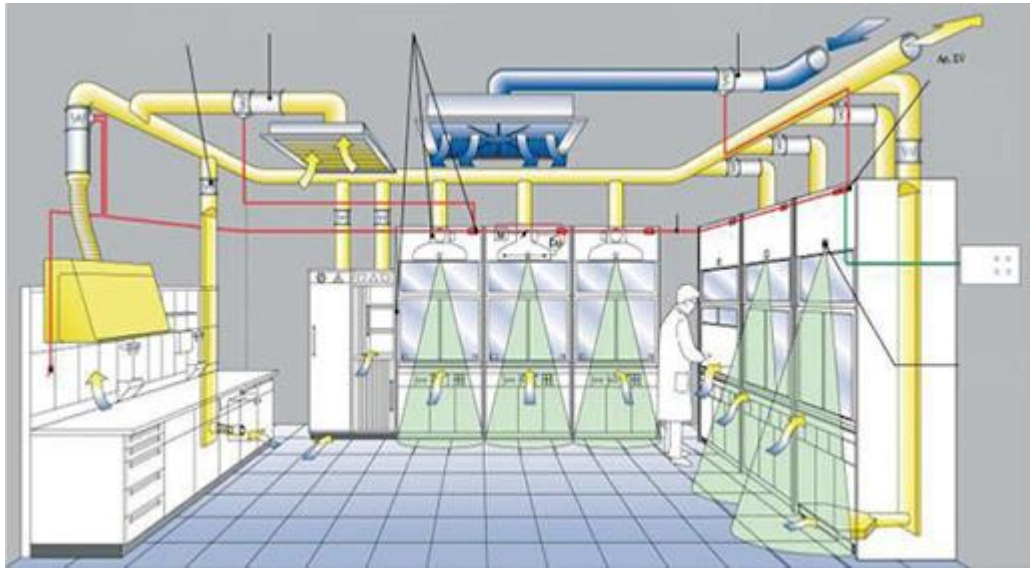
Ventilation system

Electrical system

Fire suppression technology

Safety equipment

Laboratory Ventilation System



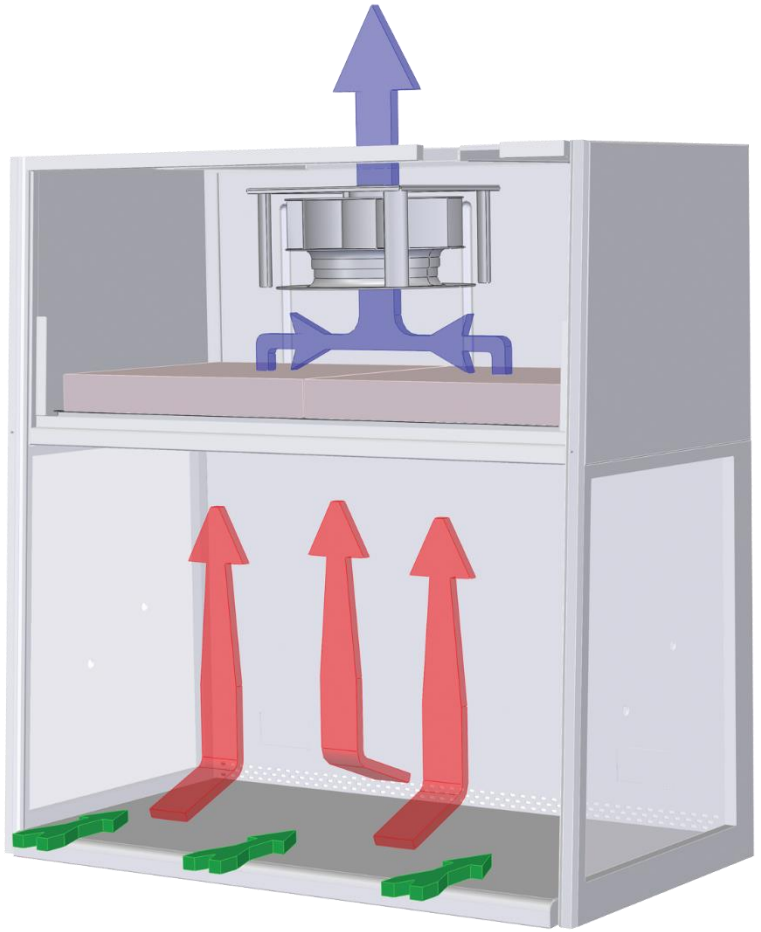
It ensures that hazardous materials and chemicals are removed from the laboratory and that fresh air is brought in

exchanges air at least twice per hour

clean air enters and old air is completely expelled

Air must flow through cleaner areas and remove from more contaminated areas, such as bacteriology, by a suitable hood

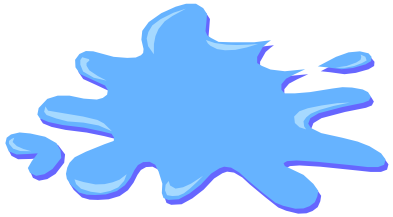
The exhaust air from the laboratory should not flow elsewhere, and the exhaust air from the ventilators should be installed in a way that does not pose a danger to the building's occupants



•GOALS OF VENTILATION:

•Ventilation may be designed to protect the worker from potentially hazardous inhalation hazards
•- toxic or volatile chemicals
•- particles or dusts
•- vapors or aerosols
•- infectious microorganisms
•- other inhalation hazards
• temperature control
•Ventilation may be designed to protect the product from contamination
•Ventilation may be designed with filters to clean the air being exhausted from the unit, thereby protecting the environment

- When using the hood you first need to make sure the exhaust blower is operating and air is entering the hood
- Remember, do not put your face inside the hood!
- Minimize storage of chemicals in the hood
- Clean spills immediately



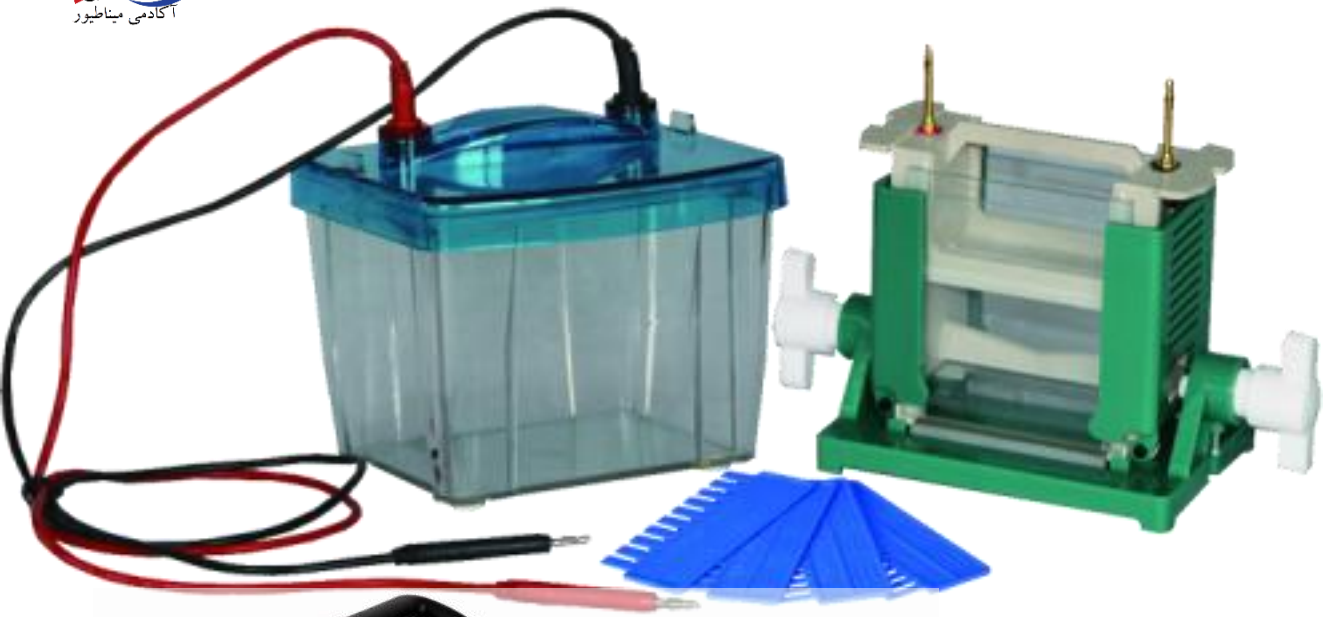
- Work with the sash at the proper operating level as indicated by the arrows

Electrical Safety in the Laboratory


POWER
OFF
ON
TOUCH
Vortex-2


32.0 V 20.0 A
C.V.
C.C.
REAR CONTROL
VOLTAGE
CURRENT
PUSH FINE / COARSE
PUSH FINE / COARSE
PeakTech®
1575
LABORATORY SWITCHING MODE POWER SUPPLY
DC 1 ~ 32V / 0 ~ 20A
I
O
POWER
−
+
FRONT OUTPUT :
5A MAX.

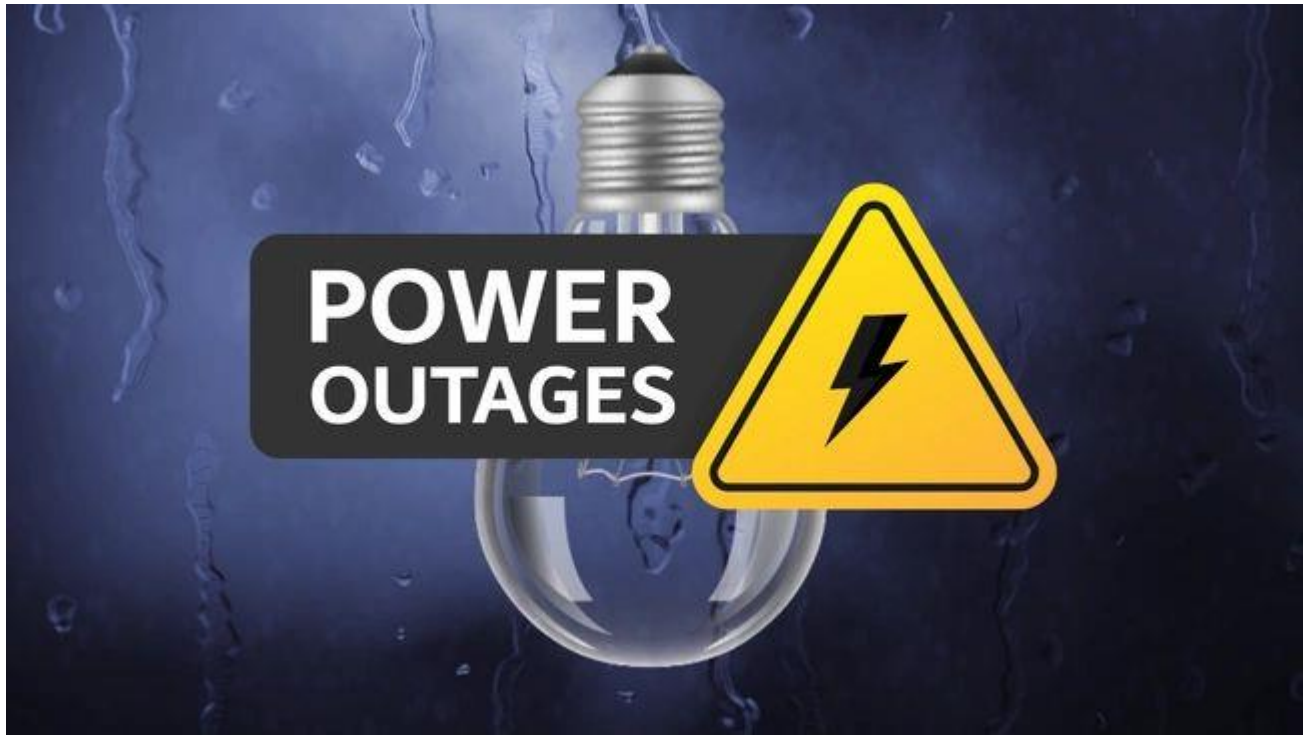

superlek
HOT PLATE MAGNETIC STIRRER
PLATE
PROBE
TEMP
R.P.M

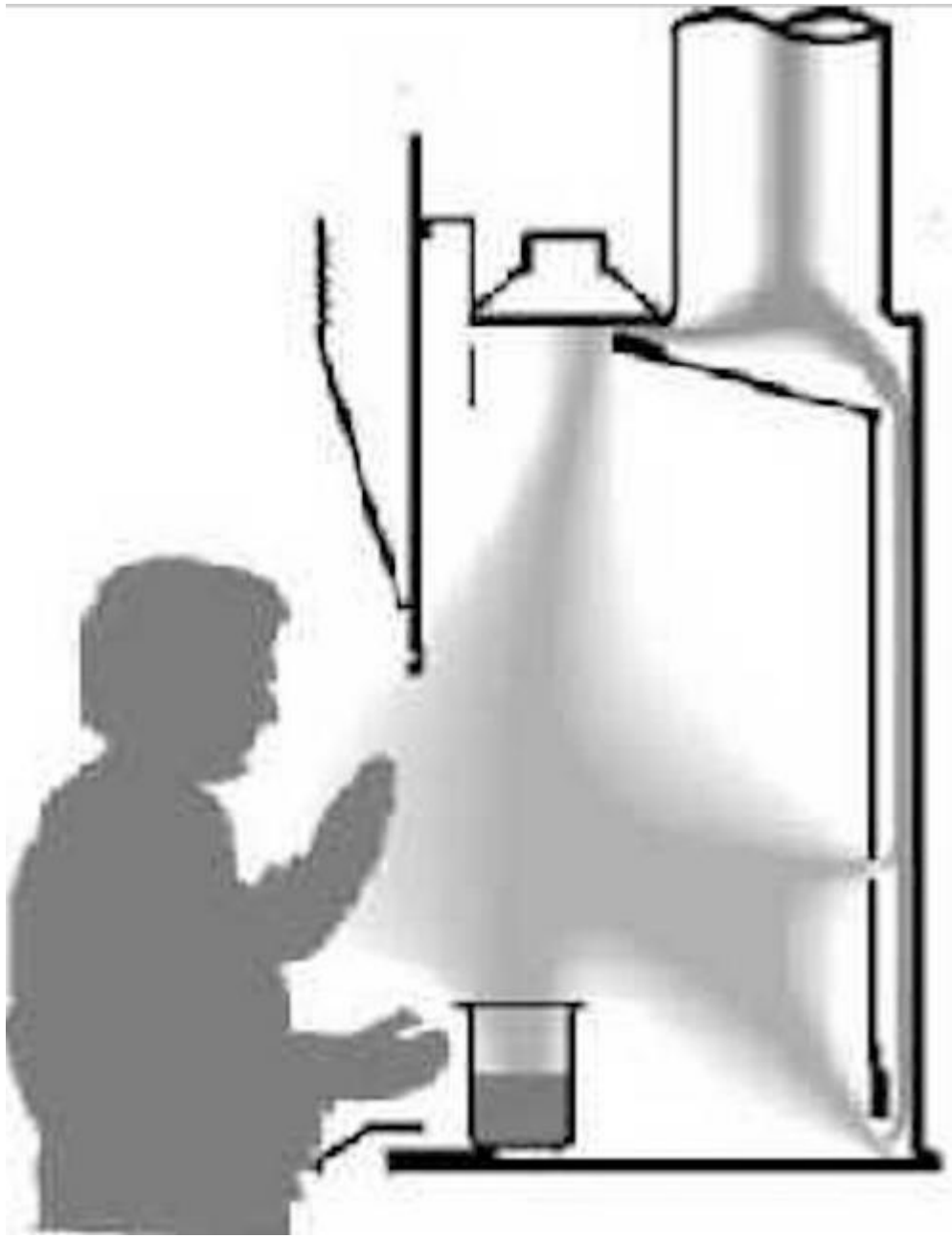



ROCKER 300
HIGH TEMPERATURE
DO NOT TOUCH


stuart
orbital shaker
300


415V~
50/60Hz
I-ON
I-ON


POWER
OUTAGES



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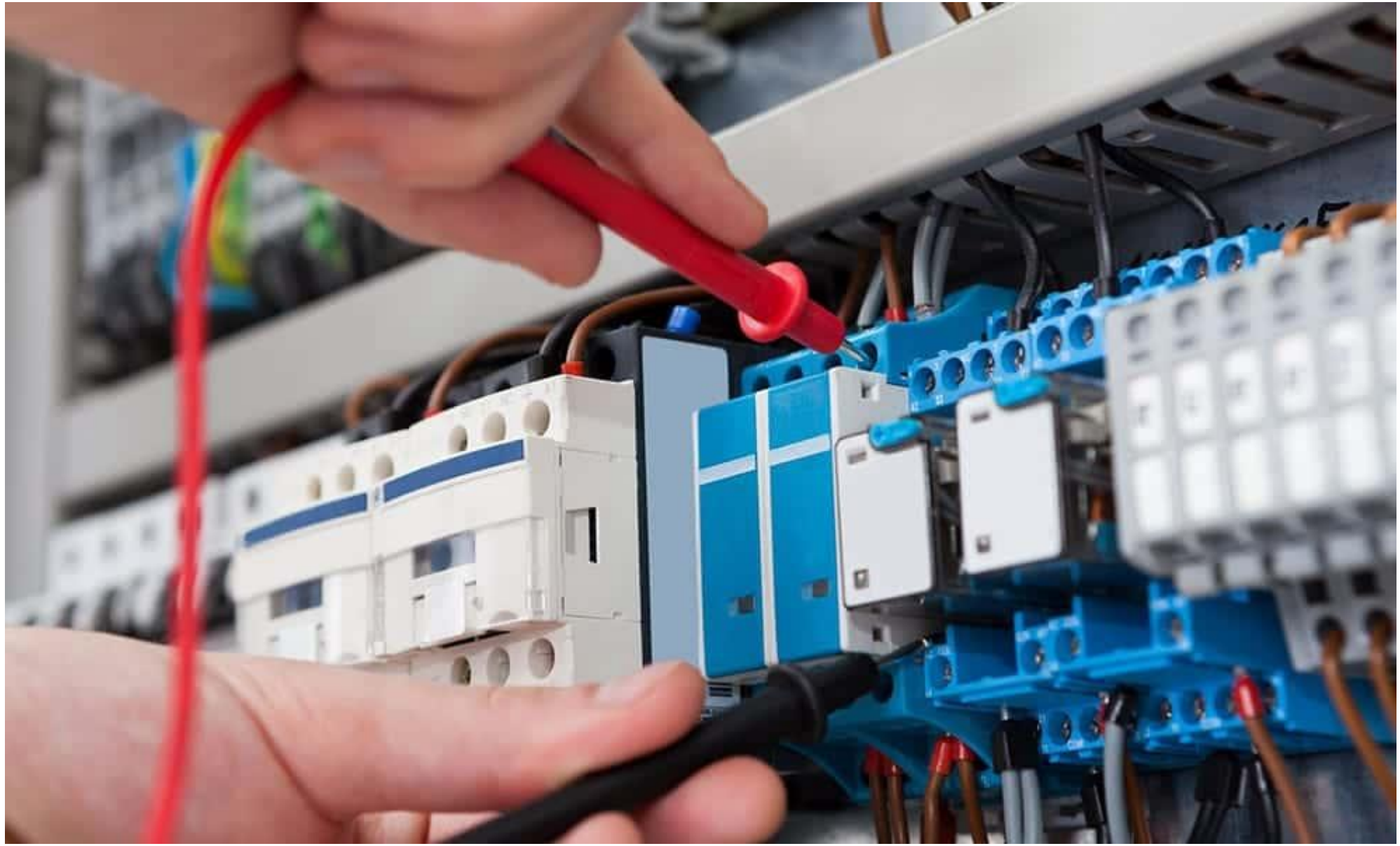
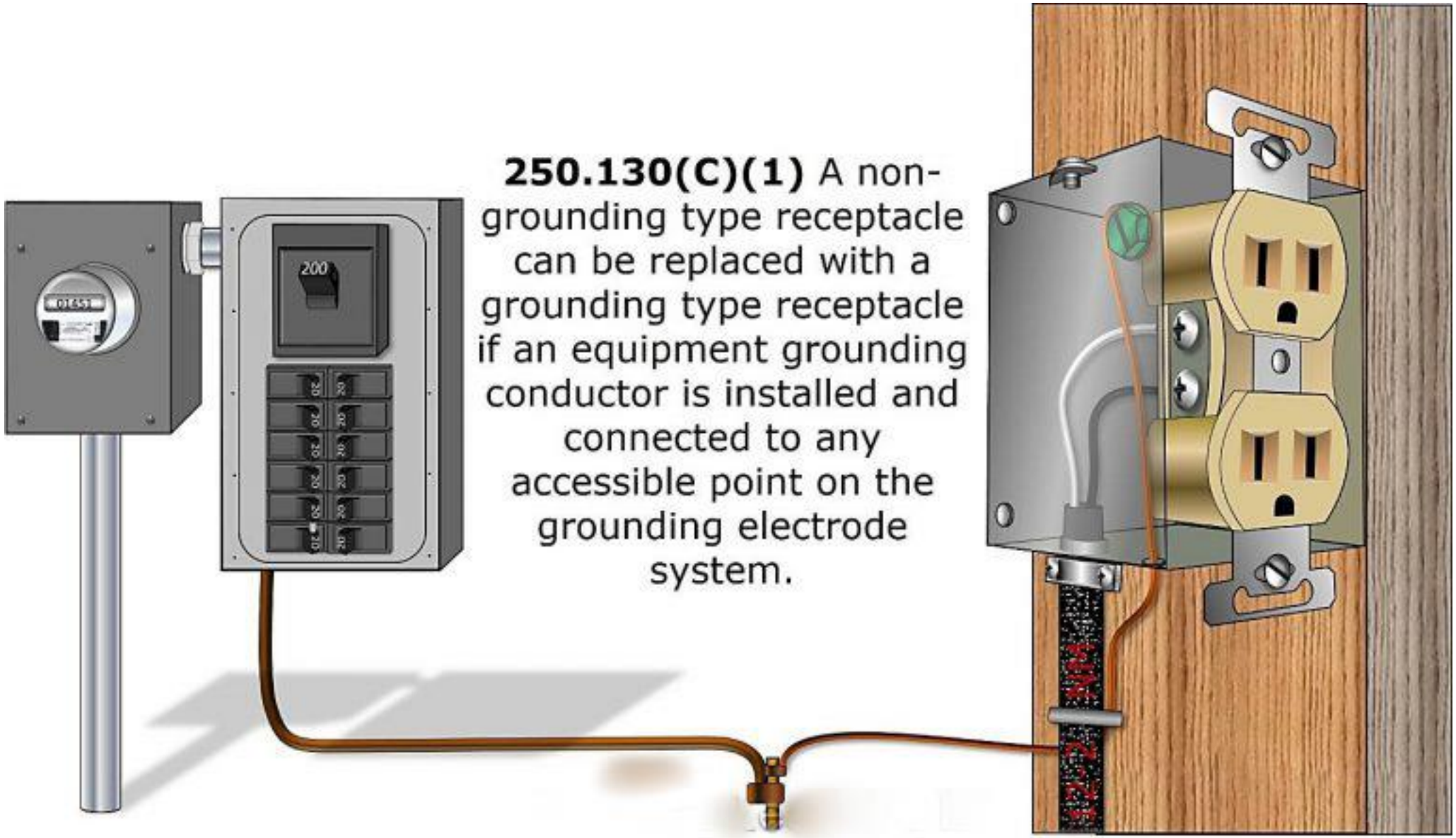


250.130(C)(1) A non-grounding type receptacle can be replaced with a grounding type receptacle if an equipment grounding conductor is installed and connected to any accessible point on the grounding electrode system.

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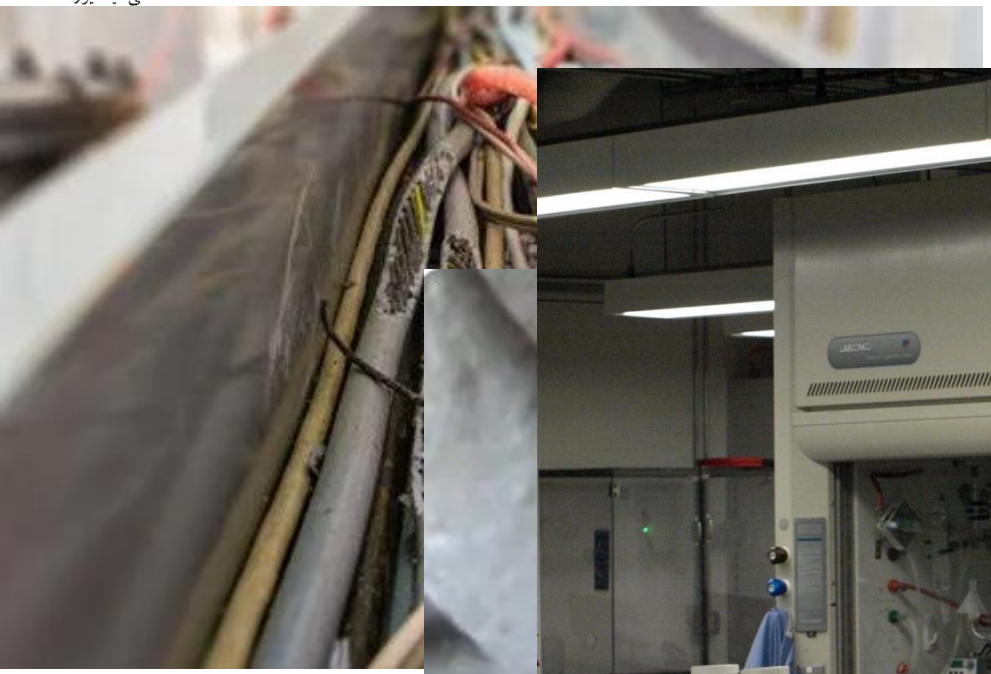
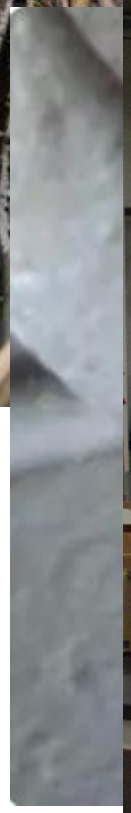
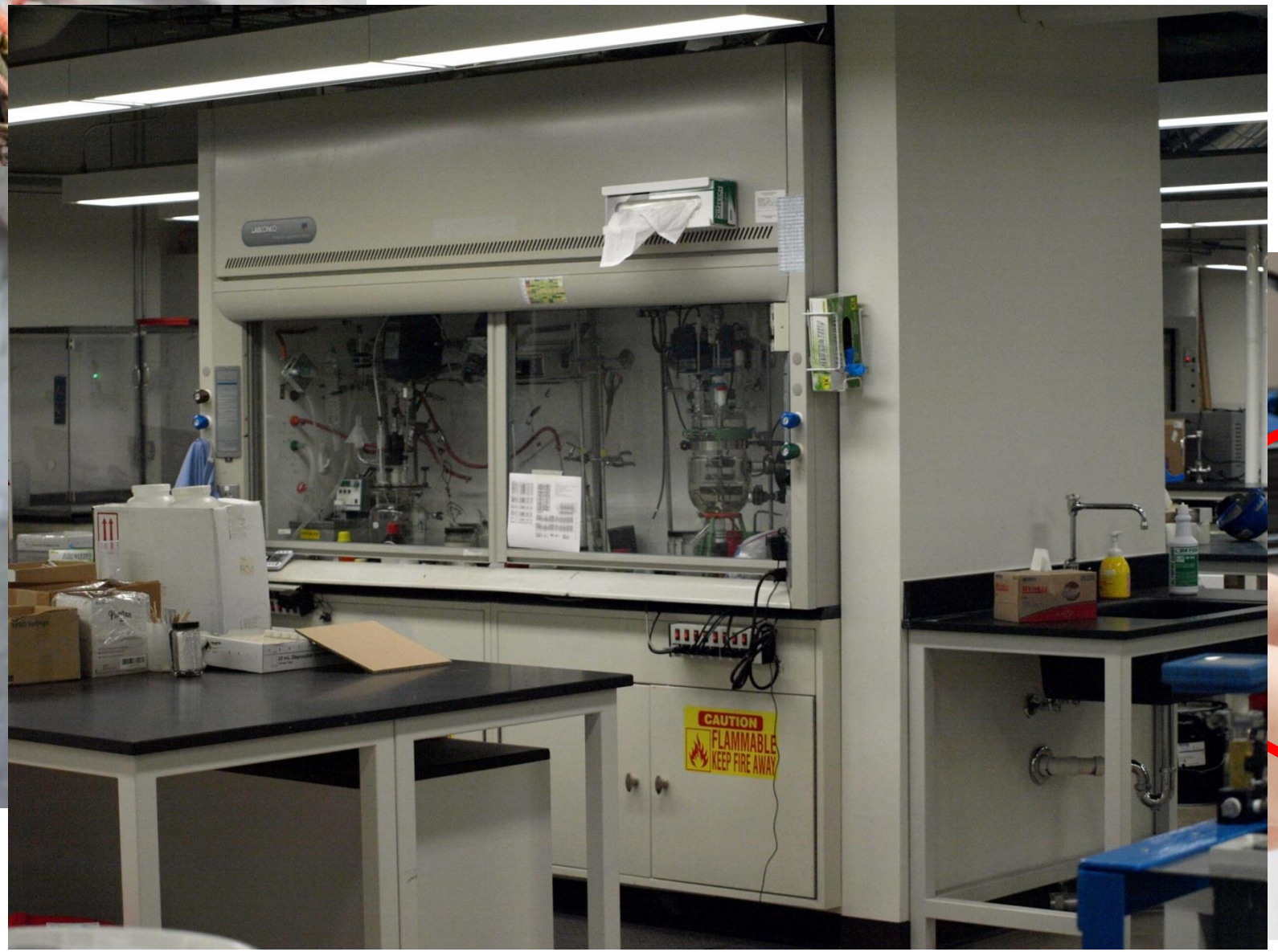
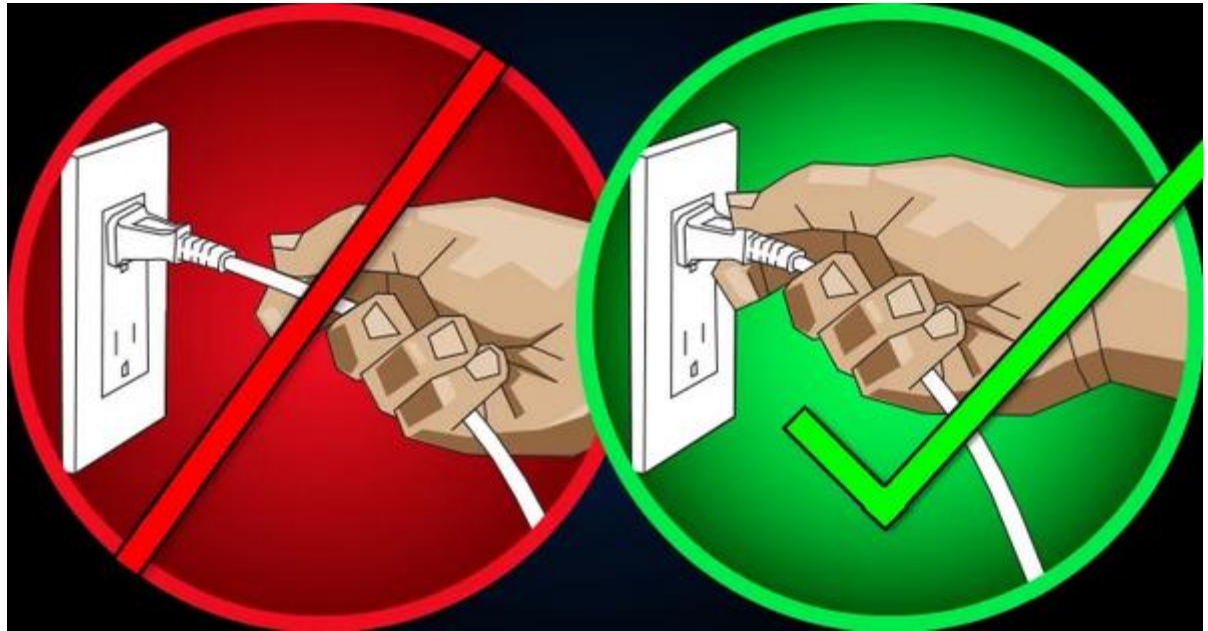
آکادمی میناطیور



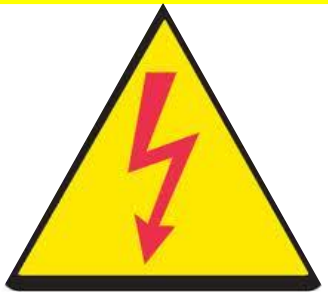





inspect



Physical hazards: Electrical equipment



- Always inspect electrical cords prior to use. Do not use if they are cracked or have exposed wiring.
- Never use electrical appliances near water.
  - Make sure hands are dry when unplugging a cord.
- Do not overload outlets.
- Avoid excessive use or “daisy chaining” (several cords strung together) of extension cords.
- Never override the safety features on electrical equipment.

Electricity and Flammable Materials

Electrical Safety

- Do not place a cord where someone can trip over it.
- Unplug all equipment before leaving the room.

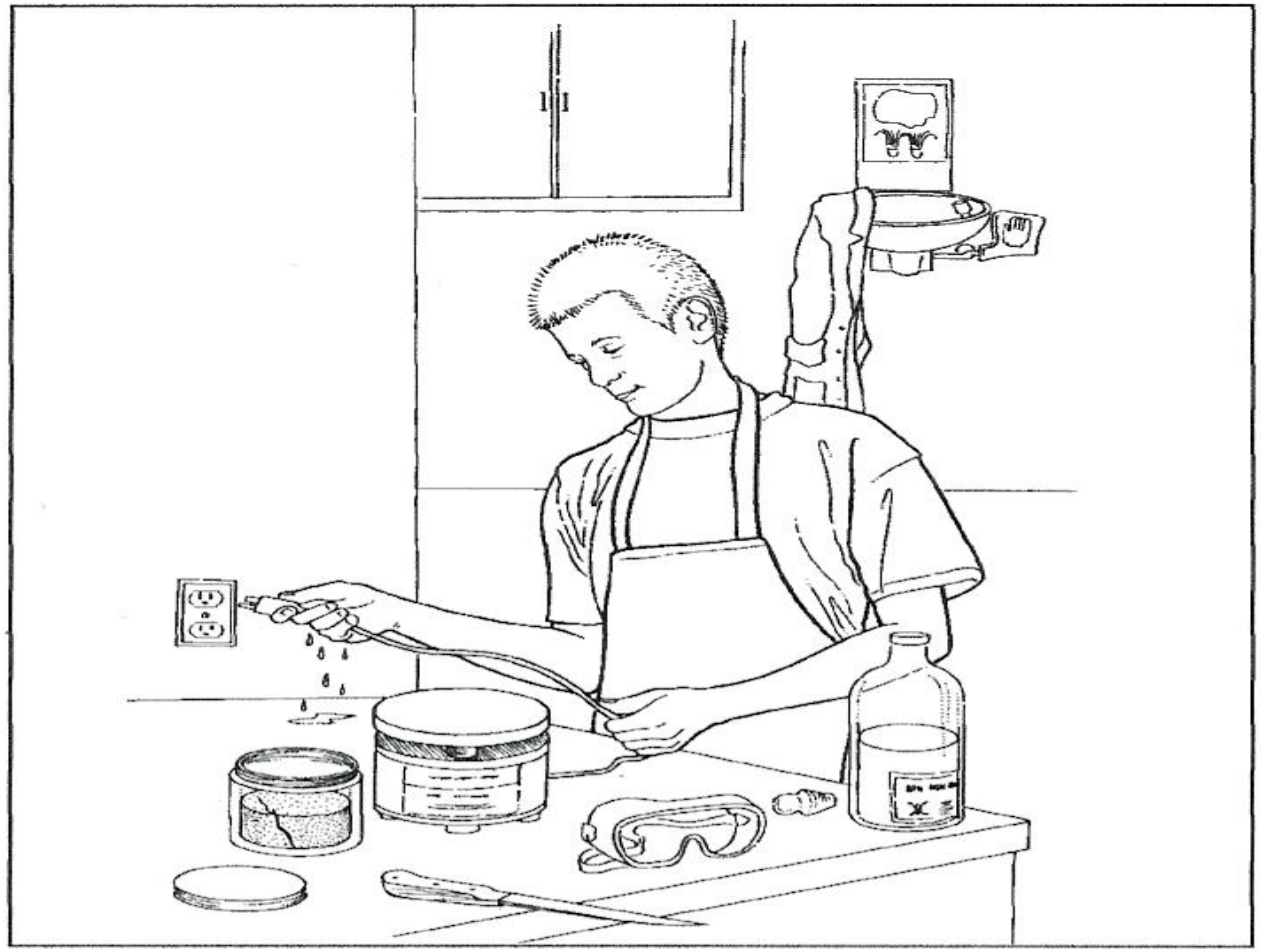

KÄRCHER
Professional


ESCO


CAUTION
FLAMMABLE
KEEP FIRE AWAY

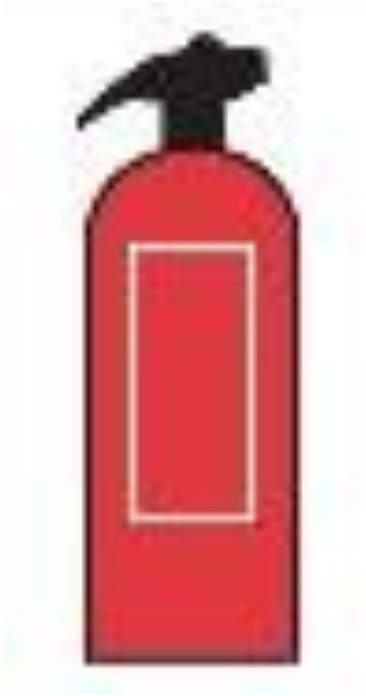

Large openings
EP18 25
EP18 29

What’s Wrong With This Picture?



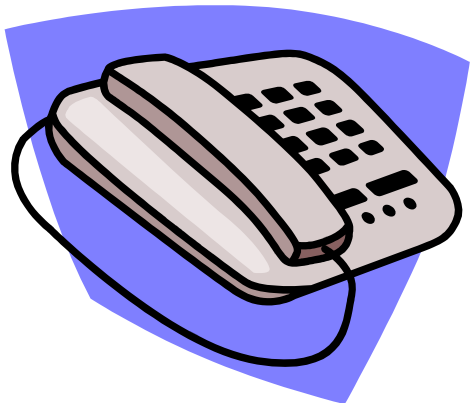
از تماس با مدارهای الکتریکی پرانرژی خودداری کنید.
فقط کارگران برق واجد شرایط می توانند تجهیزات برقی را نصب، سرویس یا تعمیر کنند.

Fire suppression technology




FIRE


EXIT
iStock
Credit: sabelskaya
1491164358



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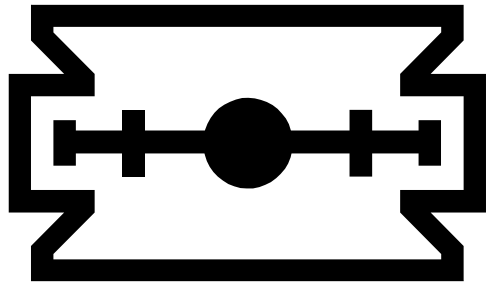
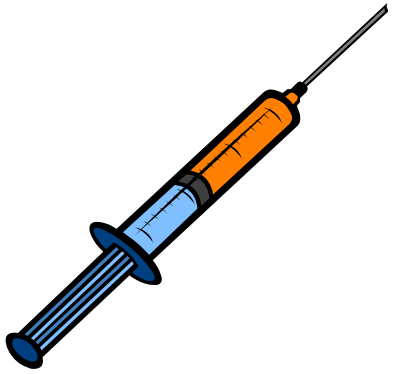
Do not wait any longer than necessary to call,

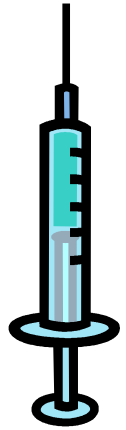
Time is of essence!

Training



What is a Sharp?





Safety Symbols

Sharp Objects

- When using knifes or other sharp objects always walk with the points facing down.
- Cut away from fingers and body.

All sharps must be placed into a rigid, puncture and leak-resistant container that is also impervious to moisture.

The sharps container must be labeled either with “Biohazard” or “Infectious Waste”. Do not over fill the sharps container

Personal hygiene

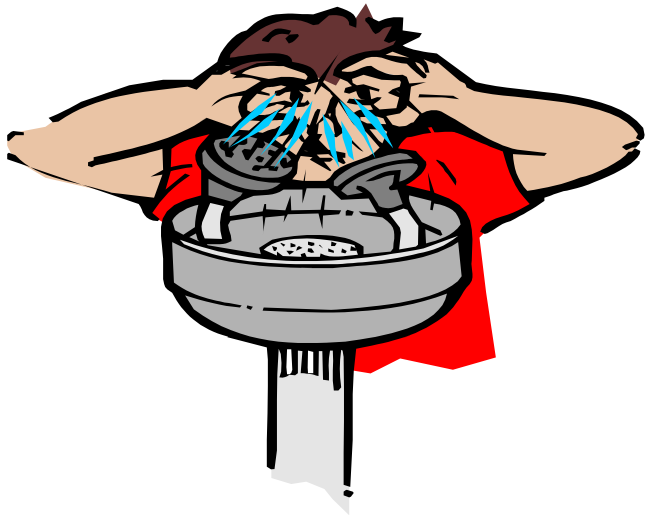
- Always remove gloves before leaving the lab.
- Wash well before leaving the lab, even if it’s only for a short break.
  - Use soap and water, not solvents (which may enhance absorption of the chemical by the skin, may be toxic, and/or may remove protective oils).
  - Wash with mild soap and water immediately whenever any chemical comes in contact with your skin. Flush for at least 15 minutes.
- Avoid inhalation of chemicals.
  - Do not sniff a chemical in order to identify it.

Personal hygiene (cont.)

- No food or drink is allowed in the lab or in chemical storage areas.
  - This includes gum and candy.
- Application of cosmetic products in the lab is not permitted.
- Use of tobacco products is not permitted in the lab. Smoking is prohibited in all UAF facilities.
- Never pipet any chemical by mouth.
- Tie long hair back.
- Remove jewelry.

Know Your Surroundings

- When physical hazards and health hazards exist, it is very important to know where the eye wash/safety shower is located. Unexpected accidents do occur and knowing where to go at the time of an emergency can reduce injury/illness.



Safety Symbols

Eye Protection

- Wear safety goggles when working with chemicals, flames, or heating devices.
- If a chemical gets in your eye, flush in water for 15 minutes and notify the teacher.

Safety Symbols

Heating Safety

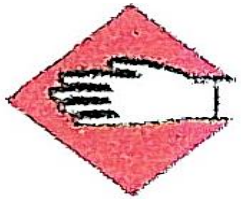
- Tie back hair and loose clothes when working with open flames.
- Never look into a container as you are heating it.
- Heated metal and glass looks cool, use tongs or gloves before handling.
- Never leave a heat source unattended.

Safety Symbols

Chemical Safety

- Read all labels twice before removing a chemical from the container.
- Never touch, taste, or smell a chemical unless instructed by the teacher.
- Transfer chemicals carefully!

Hand Safety



- If a chemical spills on your skin, notify the teacher and rinse with water for 15 minutes.
- Carry glassware carefully.

Plant Safety

- Do not eat any plants in lab.
- Wash your hands after handling plants.

If Overexposed to a Hazardous Substance

- Get medical help immediately!
- Inform your lab supervisor
- Check MSDS for first-aid instructions.
- Some general guidelines are
    - Eyes: Flush with water for 15 minutes
    - Ingestion: Follow label and MSDS instructions
    - Skin Contact: Stand under emergency shower and remove contaminated clothing immediately
    - Inhalation: Get to fresh air and get prompt medical attention

- Immediately flush eye(s) with water for at least fifteen minutes. The eyes must be forcibly held open to wash, and the eyeballs must be rotated so all surface area is rinsed. The use of an eye wash fountain is desirable so hands are free to hold the eyes open. If an eyewash is not available, pour water on the eye, rinsing from the nose outward to avoid contamination of the unaffected eye.
- Remove contact lenses while rinsing. **Do not lose time removing contact lenses before rinsing.** Do not attempt to rinse and reinsert contact lenses.
- Seek medical attention regardless of the severity or apparent lack of severity. Explain carefully what chemicals were involved. If easily accessible, bring an SDS.
- Fill out an Incident Report!

Housekeeping

- Keep access to emergency shower and eye wash clear at all times.
- Test emergency shower and eye wash weekly to make sure they deliver continuous, clean, lukewarm water.
  - Document the weekly tests.
- Keep work areas free of clutter.

Housekeeping

- Keep all aisles, stairs, corridors, and stairwells free of equipment, boxes, chemicals, and debris
- Food and drink should never be brought into a lab
- To reduce the chance of breakage (and a contaminated oven), never use a mercury thermometer in an oven or incubator

Housekeeping

- Chemical storage areas should be frequently monitored.
  - Inspect for broken, deteriorating, or leaking containers.
  - Ensure that all containers are clearly labeled with the full name and hazard of the chemical (e.g. “Hydrochloric acid, corrosive” or “Ethanol, flammable”).
- Chemicals must be put back into their proper storage location at the end of the day.
  - At the end of a work day, any chemical in an unlabeled container should be considered a waste and disposed of appropriately.

Housekeeping

- Disposal of empty chemical containers
  - Water soluble non-regulated chemicals
    - Examples: sodium chloride, magnesium sulfate
    - Triple rinse with water, deface label, mark as “Empty”, discard in regular trash
  - Water soluble regulated chemicals:
    - Examples: ethanol, formalin, methanol
    - Triple rinse with water (collect rinses in waste container)
    - Deface label, mark with “Empty”, discard in regular trash

Housekeeping

- Disposal of empty chemical containers
  - Non-water soluble chemicals:
    - Examples: phenol, oils, some alcohols
    - Triple rinse with a solvent that will remove the chemical, collecting all rinses in a hazardous waste collection container
    - Deface label, label as “Empty”, and dispose in normal trash

Proses of Constructing a Laboratory

- Planning
- Design
- Construction
- Activity

References

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- Prudent Practices in the Laboratory – Handling and Disposal of Chemicals, National Research Council, National Academy Press, Washington, D.C., 1995.

با سپاس

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ای آن که به یاری تو این فصل سرآمد
آن لحظه ببینیم که این وصل سرآمد

دیریست که از جام تو بس جرعه کشیدیم
جز مهر از آن حضرت درگاه ندیدیم

در حال امانیم که هر ایمنی از توست
هر علم همه ظاهری و باطنی از توست

ناچیز، کمی از عدد علم تو گفتیم
لیکن نه به اندازه ی یک در که بسفتیم

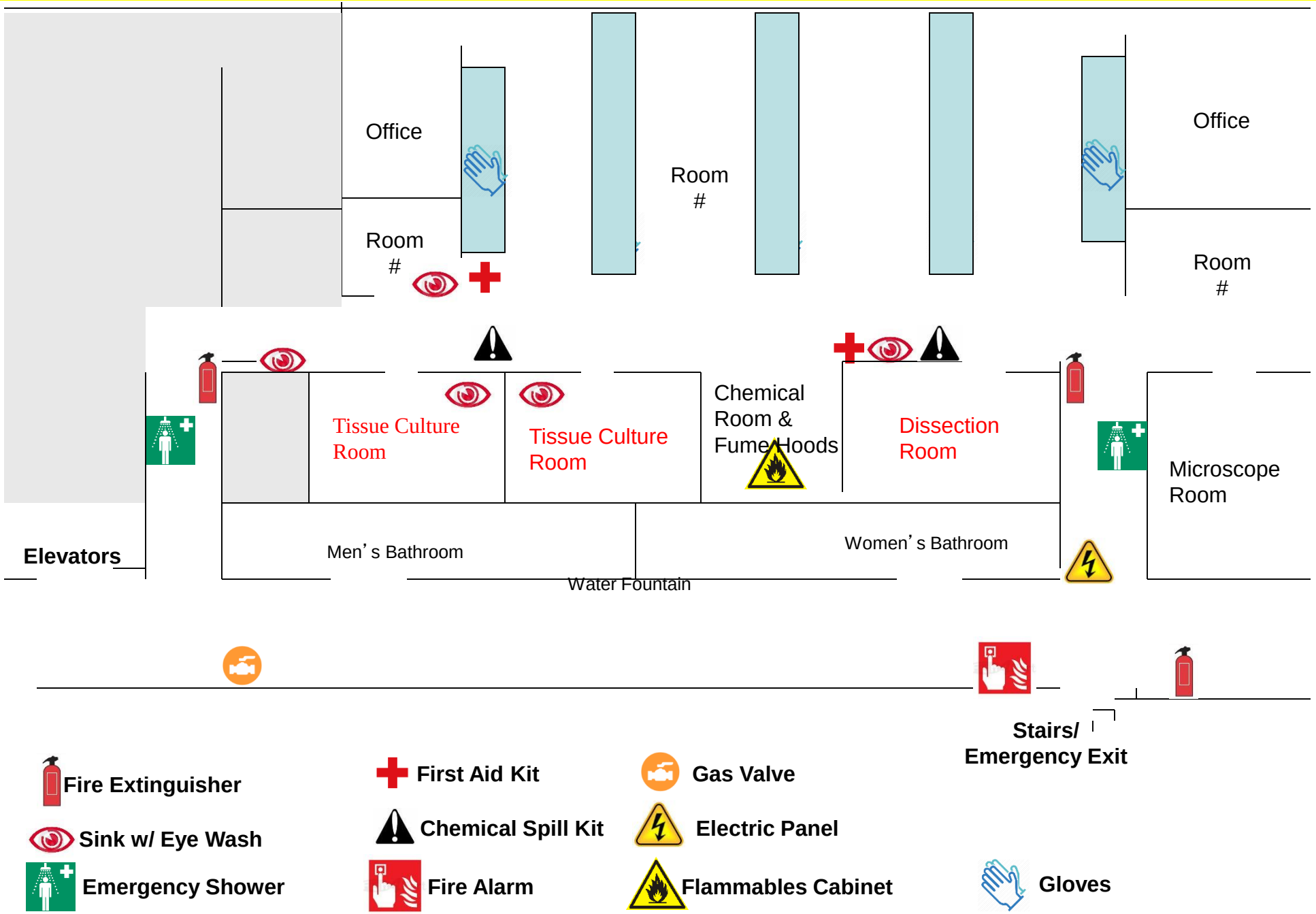
بی لطف تو ما زادره و توشه نداریم
جز بندگیت هیچ در این گوشه نداریم

لطفی که تو را در دل هر ذره بجوید
دایم به تو از کنه دل خویش بگوید:

ما را به دمی با خودمان وا تو بگذار
ای یارترین، یارترین، یارترین یار

لطفی

“Name” Lab Floor Plan



Physical hazards: Thermal hazards

- Thermal hazards include both hot and cold objects.
- Hot items:
  - Use heat-resistant gloves when handling hot items.
  - Use caution when heating liquids on hot plates.
    - Use a stir bar or Boil-Eezers to ensure even heating of the liquids (to prevent superheating and boil-overs)
    - Never leave hot plates unattended.
- Bunsen burners
  - Inspect tubing prior to using the burner. It should not have cracks, and should fit tightly to the burner and to the gas spigot.
    - Be alert to gas leaks along the tubing—these can ignite.
  - Stand back from the burner when lighting the gas.

Physical hazards: Thermal hazards

- Hot (cont.)
  - Autoclaves
    - Wear heat-resistant gloves when loading an autoclave. The inner surfaces of the machine are hot.
    - Wear face shield, rubber apron, and heat-resistant gloves when unloading an autoclave. Liquids can be superheated, and bottles can explode if jostled.
    - Beware of hot water in the bottom of autoclave trays.
      - Use deep tubs rather than shallow trays.
    - Do not stand in front of the autoclave door while opening it—stand behind the door to avoid getting blasted with steam.
    - Autoclave safety training is available. Contact your Chemical Hygiene Officer/Safety coordinator or EHSRM (474-6771).

Physical hazards: Thermal hazards (cont.)

- Cold
  - Ultra cold freezers
    - Wear insulated gloves when accessing ultra cold (-60 to -80 °C) freezers.
    - Bare skin can stick to cold surfaces, especially if fingers are damp.

Physical hazards: Thermal hazards

- Cold (cont.)
  - Liquid Nitrogen (LN2)
    - Wear insulated or cryoprotective gloves when accessing LN2.
      - Note: cotton gloves are NOT sufficient. Splashes of LN2 can easily penetrate the gloves, causing frostbite and serious injury.
    - Wear face shield or splash goggles to protect face and/or eyes from splashes
    - Use caution when adding items to LN2. Rapid addition of items can result in splashes and burns to the face and hands.
    - Tubes that have been stored in LN2 should be thawed behind a shield.
      - Sometimes LN2 leaks into the tube during storage. The nitrogen will rapidly expand upon warming, causing the tube to shatter.
    - Liquid Nitrogen training is available (474-6771).

Ventilation

- Types of ventilation found in labs:
  - Laminar flow hood
    - Protects samples/operation
      - Useful for working with bacterial or cell cultures (helps prevent contamination)
    - Does NOT protect the user!
  - Biosafety cabinet
    - Useful for working with infectious agents
    - Depending on type of cabinet, may protect only the samples
    - Biosafety Cabinet training is available
      - Contact Office of Research Integrity (474-7832) or EHSRM (474-6771) to enroll in online training.

Ventilation (cont.)

- Types of ventilation found in labs (cont.):
  - Chemical fume hood

    - Keep sash at or below “maximum sash height” posted on fume hood.
    - Fume hoods are tested annually at UAF. If your fume hood does not have a current sticker, or if your fume hood does not seem to be working properly, contact EHSRM (474-6771) or your department chemical hygiene officer.

Ventilation (cont.)

- Types of ventilation found in labs (cont.):
  - Chemical fume hood (cont.)
    - Conduct all work at least 6” inside fume hood.
      - This reduces the chance that vapors will backwash out of the hood due to air movement.
    - Do NOT store chemicals in a fume hood.
    - Do NOT block the vents at the back of the fume hood.
    - If a large object must be placed inside the hood (e.g. a water or acid bath), elevate it slightly so that air can flow under the object

Ventilation (cont.)

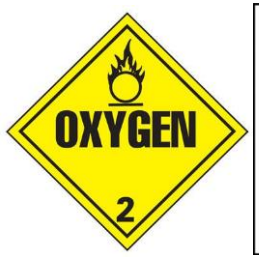
- Types of ventilation found in labs (cont.):
  - Canopy and Snorkel
    - These types of ventilation use the physical properties of the chemical or process to capture the exhaust (e.g. heat, lighter-than-air vapors).
      - Note: the snorkel face must be within ½ the duct diameter to the chemical or process being exhausted to work properly.

Canopy

Snorkel

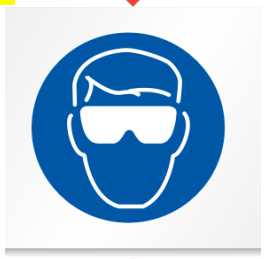

CORROSIVE
8



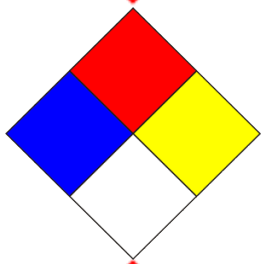

OXYGEN
2



ELECTRIC SHOCK

RADIOACTIVITY HAZARD

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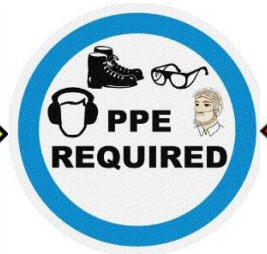
PPE
REQUIRED

COMBUSTIBLE
3

FLAMMABILITY
HEALTH
REACTIVITY
SPECIAL
WARNINGS


BIOLOGICAL HAZARD