ACCREDITATION UNIT

SAFETY POLICY FOR LABORATORIES PERFORMING ENVIRONMENTAL AND WATER TESTING

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Purpose

This policy is to describe the requirements and regulation of health and safety, which **shall** be applied at laboratories performing environmental **and** water testing, to assure the safety of**personnel**, and protect them against chemical, **biological**,and radiological hazards. In addition to protect the environment from external and internal exposure to hazardous materials, chemical ionizing radiation, and radioactive materials.

The Accreditation Unit **(JAS-AU)** has set this safety policy to promote safe practices in laboratories, laboratory safety involves chemical safety, electrical safety, **biological,** and other safety issues.

Scope

Health and safety requirements are applied to personnel working at laboratories performing environmental and water testing, who are dealing with calibration andtesting processes.

Authorship

This publication has been written by the Technical Committee, and approved by the Accreditation Director.

Official language

The text may be translated into other languages as required. The English language version remains the definitive version.

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Further information

This policy is mandatory for laboratories, and shall be implemented within four months from its issuance date.

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1 Introduction

This policy aims at setting the main **requirements** for safety to be followed by **employees, visitors, and other personnel working in each laboratory** in the field of environmental and water testing.

The purpose of this safety policy is to protect the life, health and safety of all **personnel** as well as to eliminate the possibility of damage to the property and equipment while carrying out an efficient work schedule. Because laboratories involve numerous chemicals, procedures, and operations, they require extensive safety precauations, laboratory safety involves chemical and **biological** safety, fire safety, electrical safety and other safety issues.

2 Responsibilities

2.1 The Director

- The Director of the Laboratory is responsible for enforcing and regulating all safety policies and regulations, in addition to ensuring that all laboratories activities are conducted in a manner with the least possible hazard **to personnel.**
- **Being aware of the hazards of the materials s/he is working with, and handling those chemical and biological in a safe manner;**

2.2 Health and Safety Officer (or whomever responsible)

2.2.1 The Health and Safety Officer (H&SO) has the duty and the authority to stop any action as being inherently unsafe or immediately dangerous.

2.2.2 The H&SO is responsible to provide instructions and continuous training in the field of their assigned tasks and laboratory operations. Written safety instructions are hanged in each Analytical Section in a way accessible to each person.

2.2.3 The H&SO is responsible to ensure the availability of necessary safety equipment in the laboratory. In addition to audit laboratory activities, and verify records that they comply with safety requirements.

2.2.4 Post the Emergency Response and incident reporting in the lab near the door or main laboratory telephone; and

2.2.5 Ensure appropriate local records are collected and maintained for inspections, inspection follow-up, and lab-specific training.

2.3 Heads of Sections

Head of Sections are responsible for identification of hazards and assessment of the risk associated with operations, in addition to selection of the proper laboratory safety practices, and engineering controls necessary to minimize personnel injury.

2.3.1 Determine if there are chemicals, biological agents, or activities that require prior supervisor approval before conducting experiments and communicate information about these to lab workers;

2.3.2 Ensure all lab workers are trained and follow procedures of the plan;

2.3.3 Perform periodic reviews of their chemical and biological hygiene program and equipment;

2.3.4 Promptly correct problem areas;

2.3.5 Assist and report safety problems to the Department of Health, Safety, and Work Environment as requested;

2.3.6 Maintain a current chemical and biological inventory/list;

2.3.7 Ensure that the lab has methods to secure the hazardous materials used and stored in the lab;

2.4 Individual **Personnel**

2.4.1 **Personnel** are responsible and given the power to stop a work and to stop someone else work if unsafe practice is foreseen.

2.4.2 **Personnel** are responsible to apply safety instructions and policies.

2.4.3 Each **person** at the Laboratory is responsible to comply with all health and safety requirements relevant to the activities they perform mentioned in section 3 of this document, also report unsafe conditions and all accidents resulting in injury.

2.4.4 Understand the function and proper use of all personal protective equipment and wear personal protective equipment when mandated or necessary.

2.4.5 Collecting, labelling and storing chemical and biological hazardous waste properly;

2.4.6 Informing visitors entering their laboratory of the potential hazards and safety rules/precautions

2.5 Maintenance Engineer

The Laboratory Maintenance Engineer/ Department (or however named) is responsible to maintain the different types of extinguishers and **shall** supervise the extinguishers recharge twice a year. In addition to that, he **shall** maintain and inspect the eyewashes, safety showers, and ventilation systems including fume hoods**, biosafety cabinet (BSC)** on regular basis. He is responsible for electrical connections and to ensure that equipment's electrical requirements as specified by the manufacturer are met and ensures the electrical safety.

2.6 Training Coordinator

The Training Coordinator (TC) or however named in consultation with Health and Safety Officer is responsible for ensuring that all laboratory personnel receive training and understand the requirements of this training program. The TC is responsible for maintaining training records for all **personnel**.

2.7 Quality Assurance Officer

The Quality Assurance Officer (QAO) (or quality manager) is responsible to keep records of safety requirements, to ensure adherence to requirements by conducting internal audits.

- **Preparing Lab Specific SOPs for work with potentially hazardous chemicals, biological hazards, equipment or processes when needed;**

3 Safety Requirements:

All **personnel** shall have a proper safety training where this policy is applied for working safely in the lab.

Safe handling of chemicals, biological, radiological and hazardous material that include received items (chemicals or samples) and safe handling of laboratory glassware **shall** be documented and dealt with according to the document control protocol followed by the laboratory.

Internal audits conducted by the Quality Assurance Officer shall ensure adherence to these requirements.

3.1 Chemical and Biological area requirements (Non-Radiological area requirements)

3.1.1 Wear Laboratory coat during performing work and protective safety equipment such as gloves, glasses, respiratory while handling chemicals and processing experiments.

3.1.2 Ensure the suitability and efficiency of ventilation system including fume hoods**, BSC**/ In case of failure, immediately stop working, leave the laboratory, and notify the H&SO.

3.1.3 Apply safe work practices, do not withdraw samples, and chemicals by mouth, do not eat, drink, smoke, and store food in the laboratory.

3.1.4 Deskwork using writing materials must not be done in the laboratory area, where these materials could be contaminated.

3.1.5 Ensure the efficiency of eyewash and showers to be ready if needed. Safety showers should provide strong enough flow to drench the victim for 15 minutes. Eyewashes should give a gentle stream or spray of water which lasts for at least 15 minutes.

3.1.6 Keep **Safety Data Sheet (SDS)** of all chemicals, **biological**, which are used, in the analytical processes.

3.1.7 Place gas cylinders vertically and secure them with a chain or canvas straps.

3.1.8 In case of a chemical spill; use the Spill Clean – Up KIT specified to either acidic, caustic, mercury, or organic solvent spill, and follow the enclosed instructions attached with the kit.

3.1.9 In case of expose of **personnel to** chemicals **and biological agents**, rinse with water for 15 min, and seek a doctor.

3.1.10 Post of hazard warning signs and labels.

3.1.11 Keep the working area in the laboratory clean and good house keeping.

3.1.12 Store the chemicals in good conditions, and according to the storage requirements. Prepare chemical inventory specifying the name of compound, quantity, purity, and health effect.

3.1.13 Do not practice uncontrolled procedures that help the release of contamination.

3.1.14 Prepare an Emergency Safety Plan in case of fire, gas leak, and chemical spill as per section 5 of this policy.

3.1.15 Collect toxic and carcinogenic materials and other chemical wastes in classified containers to prevent environmental contamination. All the laboratory waste are kept in a secure ventilated hazardous waste room until disposed of by the Ministry of Environment in Jordan **if the cab is located in Jordan otherwise it regulations of the Country where the CAB is located** to the assigned hazardous waste landfill.

3.1.16 Report unsafe conditions and all incidents resulting in injury or exposure to hazardous agents to the H&SO.

3.1.17 Arrange medical check for all **personnel** twice a year. In case of emergency cases contact the nearest medical center.

3.1.18 Keep contact details of emergency bodies to contact them promptly if needed.

3.1.19 Keep your head scarf under your coat **when applicable.**

3.1.20 Work from clean to dirty not from dirty to clean.

3.1.21 Never wash or reuse the disposable gloves.

3.1.22 Don't touch your face or adjust PPE with contaminated gloves.

3.1.23 Remove gloves if they become torn.

3.1.24 Perform hand hygiene before donning new gloves.

3.1.25 Never use glassware under pressure or vacuum unless it is designed for the job

3.2 Radiological Area / Radioactive Material Area Requirements:

3.2.1 Wear a laboratory coat or other protective clothing at all times in areas where radioactive materials are used.

3.2.2 Wear disposable gloves at all times while handling radioactive materials.

3.2.3 Wear safety glasses in the laboratory.

3.2.4 Do not eat, drink, smoke, or apply cosmetics in any area where radioactive material is stored or used.

3.2.5 Do not store food in any area where radioactive material is stored or used.

3.2.6 Dispose of radioactive waste only in designated, labeled, and properly shielded receptacles.

3.2.7 Never pipette by mouth.

3.2.8 Place radioactive liquid samples on absorbent – paper – lined trays to contain any spillage.

3.2.9 Label all samples according radio hazard / chemical hazard content.

3.2.10 Use absorbent – lined laboratory carts for moving samples between laboratories.

3.2.11 Wear personnel monitoring devices at all times (e.g., thermo-luminescent dosimeters (TLDs) or pocket dosimeters as specified by the H&SO, and document quarterly TLD Report.

3.2.12 Report any spill to the head of section.

3.3 Health & Safety requirements in Microbiology Section:

3.3.1 Normal Microbiology Laboratory Precautions are required for this procedure. The analyst **shall be** alert to identify any special precautions that may be required for individual samples. The analyst / technician must know and observe normal good laboratory practices and safety procedures required in a microbiology laboratory while preparing, using and disposing of cultures, reagents and materials and while operating sterilizers and other equipment and instrumentation

3.3.2 Mouth - pipetting is strictly forbidden under all circumstances.

3.3.3 In case of Eye Contact, promptly flush eyes with water for a prolonged period (15 min) and seek immediate medical attention.

3.3.4 In case of Ingestion, encourage the victim to drink large amounts of water.

3.3.5 In case of Skin contact, remove any contaminated clothing and immediately wash the affected area with soap and water. Continue to rinse the affected area for 15 minutes. If pain, irritation, rash or any other symptoms of chemical exposure persists, consult a physician.

3.3.6 Do not work alone in a laboratory if the procedures to be conducted are hazardous.

3.3.7 Keep all work areas clean and uncluttered to facilitate clean up.

3.3.8 If an acidic solution is spilled, sprinkle baking soda on the spill and discard the material in accordance with the laboratories waste disposal procedures.

3.3.9 If a caustic solution is spilled, sprinkle sodium bisulphate on the spill and discard the material in accordance with the laboratories waste disposal procedures.

3.3.10 If a solution that is suspected of containing micro-organisms is spilled, apply an equal volume of disinfectant solution to the spill. Wipe the spill up with a disposable wipe. Place the wipe in the appropriate autoclave able waist container. Apply disinfectant to the affected surface area. Dispose of the waste in accordance with the laboratories waste disposal procedures.

3.3.11 Wear face shield while working with hazardous chemicals such Diethyl ether, Acetone or others and all **activities shall be** conducted inside the fume hoods.

3.3.12 Working with the microbial reference culture **shall be** conducted inside the **biosafety cabinet, BSCs must be certified by an accredited and qualified service before they are put into service and at least annually thereafter, also whenever they are moved, repaired and after HEPA filters have been changed,** and all the used microbial culture **shall be** placed into sterilizing bags and sterilized at 121^0C for 30 minutes by autoclaving before their final disposal.

3.3.13 The U.V light is dangerous it can damage eyes, skin, and potentially are carcinogenic. Protect eyes and skin from exposure to U.V light by wearing the safety goggles and gloves.

3.3.14 A list should be on the outside of the door showing what potential hazards are in the lab

3.3.15 Risk group classification shall be used for the laboratory

Classification of infective microorganisms by risk group:

1. **Risk Group 1 (no or low individual and community risk), a microorganism that is unlikely to cause human or animal disease.**
2. **Risk Group 2 (moderate individual risk, low community risk), a pathogen that can cause human or animal disease but is unlikely to be a serious hazard to laboratory workers, the community, livestock or the environment. Laboratory exposures may cause serious infection, but effective treatment and preventive measures are available and the risk of spread of infection is limited.**
3. **Risk Group 3 (high individual risk, low community risk), a pathogen that usually causes serious human or animal disease but does not ordinarily spread from one infected individual to another. Effective treatment and preventive measures are available.**
4. **Risk Group 4 (high individual and community risk), a pathogen that usually causes serious human or animal disease and that can be readily transmitted from one individual to another, directly or indirectly. Effective treatment and preventive measures are not usually available.**

Laboratory facilities are designated as basic – Biosafety Level 1, basic – Biosafety Level 2, containment – Biosafety Level 3, and maximum containment – Biosafety Level

Relation of risk groups to biosafety levels, practices and equipment:

RISK GROUP	BIOSAFETY LEVEL	LABORATORY TYPE	LABORATORY PRACTICES (secondary barrier)	SAFETY EQUIPMENT (primary barrier)
1	Basic Biosafety Level 1	Basic teaching research	GMT	None, open bench work
2	Basic Biosafety Level 2	Primary health services, diagnostic services, research	GMT plus protective clothing, biohazard sign	Open bench plus BSC for potential aerosols
3	Containment Biosafety Level 3	Special diagnostic	As Level 2 plus special clothing,	BSC and/or other primary devices

		services, research	**controlled access, directional airflow**	**for all activities**
4	**Maximum containment Biosafety Level 4**	**Dangerous pathogen units**	**As Level 3 plus airlock entry, shower exit, special waste disposal**	**Class III BSC, or positive pressure suits in conjunction Class II BSCs, double ended autoclave (through the wall) filtered air**

Biological Safety Cabinet Selection:

Type of protectio	BSC Selection
Personnel Protection, microorganisms in Risk Groups 1-3	**Class I, Class II, Class III**
Personnel Protection, microorganisms in Risk Groups 4, glove box laboratory	**Class III**
Personnel Protection, microorganisms in Risk Groups 4, suit laboratory	**Class I, Class II**
Product Protection	**Class II, Class III only if laminar flow included**

3.4 The following table "Personal protective equipment and clothing

Personal Protective Equipment		
EQUIPMENT	**HAZARD CORRECTED**	**SAFETY FEATURES**
Laboratory coats, gowns, coveralls	Contamination of clothing Back opening " Cover street clothing "	- Back opening - Cover street clothing
Plastic aprons	Contamination of clothing Waterproof "	Waterproof
Footwear	Impact and splash	Closed-toe
Goggles	Impact and splash	- Impact-resistant lenses (must be optically correct or worn over corrective eye glasses) - Side shields
Safety spectacles	Impact	- Impact-resistant lenses (must be optically correct) - Side shields

Face shields	Impact and splash	- Shield entire face - Easily removable in case of accident
Respirators	Inhalation of aerosols	Designs available include single-use disposable; full-face or half-face air purifying; full-face or hooded powered air purifying (PAPR); and supplied air respirators
Gloves	Direct contact with chemicals and microorganisms Cuts	Disposable microbiologically approved latex vinyl or nitrile - Hand protection - Mesh

3.5 Policy for General Laboratory Safety Practices during Viral Pandemic

Environmental testing laboratories are considered essential to public health and environmental safety during the virus emergency pandemic and are within the essential activities excepted from the shelter-in-place directives provided by local public health officials.

Environmental Specimen Testing

- Procedures that concentrate viruses, such as precipitation or membrane filtration, shall be performed in a (Bio Safety Levels-2) BSL-2 laboratory with unidirectional airflow and (Bio Safety Levels-3) BSL-3 precautions, including respiratory protection and a designated area for donning and doffing PPE. Work shall be performed in a certified Class II BSC.
- This policy is intended for only those laboratories that perform virus concentration procedures, including wastewater/sewage surveillance testing, and not for public health or clinical diagnostic laboratories that handle virus clinical specimens or laboratories that perform culture and isolation of the virus site- and activity. A specific biosafety risk assessments shall be performed to determine if additional biosafety precautions are warranted based on situational needs, such as high testing volumes or large volumes, and the likelihood to generate infectious droplets and aerosols.

3.5.1 General Policy

This policy is to address the general workflow safety concerns of laboratory personnel during the virus pandemic. All laboratories shall perform site and activity specific risk assessments to determine the most appropriate safety measures to implement for particular circumstances. In addition, facilities shall adhere to local policies and procedures as well as all applicable local regulations and public health guidelines.

3.5.1.1 Risk assessments shall include the following considerations:

- Analyze the number of people that the laboratory space can realistically and safely accommodate while maintaining social distancing.
- Assess the flow of personnel traffic. Where possible, design one-way paths for staff to walk through the laboratory space.
- Assess procedures for cleaning and sanitizing commonly shared equipment and areas—for example, counters, bench tops, and desks to ensure clean surfaces and equipment for all users.
- Review emergency communication and operational plans, including how to protect personnel at higher risk for severe illness from viral spreading

Every institution shall have a health and safety plan to protect personnel from viral pandemic. This plan shall be shared with all staff. Ideally, this plan would:

1. Describe steps to help prevent the spread of virus if a person is sick.
2. Instruct sick personnel to stay home and not return to work until the criteria to discontinue home isolation are met, in consultation with healthcare providers and state and local health departments.
3. Provide information on whom personnel shall contact if they become sick.
4. Implement flexible sick leave and supportive policies and practices. If sick leave is not offered to some or all personnel, the institution shall consider implementing emergency sick leave policies.
5. Personnel shall know who this person is and how to contact this person at all times.
6. Provide personnel with accurate information about the virus, how it spreads, and the risk of exposure.
7. Reinforce training on proper hand washing practices and other routine infection control precautions to help prevent the spread of many diseases.

Ensure that personnel have access to personal protective equipment (PPE), disinfectant and soap, clean running water, and drying materials for hand washing, or alcohol-based hand sanitizers that contain at least 60% ethanol or 70% isopropanol.

4 New Personnel Health and Safety Orientation:

All **personnel**, including those that are permanent, temporary, or part time, as well as Laboratory Janitors and cleaning company workers on annual contracts **shall** receive instruction for the following:

1. Reporting procedures for fire, earthquakes, gas leak, and chemical leak.
2. Evacuation procedures during an emergency.
3. Location of fire alarm pull stations and fire extinguishers, employees using fire extinguishers must have previously received training.
4. Procedures and forms for reporting all accidents and incidents to their supervisors.
5. Procedures for reporting unsafe conditions.

6. Location of first-aid kits.
7. Identification and explanation of all warning signs and labels used in their work area.
8. Use and care of any personnel protective equipment they are required to use.

5 Emergency Evacuation and Operation (E&O) Plan

The laboratory should establish procedures and duties to for fire and other emergency evacuation.

5.1 Fire

In case of fire, all extinguishers **shall be** valid. First Aid Kits **shall be** located within reach to all the personnel at the different laboratory areas.
The following practices should be done if a fire breaks out:

1. Warning all **personnel in** the building.
2. Procedures that may be hazardous should be stopped. If it is in a hood, pull down the sash.
3. Evacuating the area, all employees should exit to the nearest safe area through the evacuation routes and stay at an external assembly point.
4. Attacking/Confining the fire if it is small. Use the suitable type of fire extinguisher designated for flammable liquids, ordinary combustibles, and electrical equipment. Make sure you have an escape route, and proceed as follows:
    a. Never point an extinguisher at person's face.
    b. Never use a fire extinguisher unless you have properly trained.
    c. Pull the pin.
    d. Aim the extinguisher at the base of the fire.
    e. Squeeze the trigger.
    f. Sweep the area with the extinguisher spray.
5. Helping the injured, if someone is on fire, help him by dropping him down to the floor, rolling the victim to extinguish flames.
6. In case of thermal burns caused by burning chemicals, victims may need treatment for chemical exposure, and make sure to inform medical personnel.
7. Pay attention not to shake sensitive materials such as picric acid, and ethyl ether. Shaking the container or unscrewing a cap can develop peroxides over time, and the material becomes unstable and that can result in explosion. Therefore treat any expired containers with extreme caution.
8. Alerting emergency services if the fire is too large and you are unfamiliar with the proper use of fire extinguisher, simply close the door and evacuate.
9. If you are trapped by smoke, stay low and cover your mouth with a wet cloth, stay near a window, open it but do not break it, hang something out of the window to let others know you are there.

5.2 Earthquake

Although earthquakes occur more frequently in tectonically active areas, an earthquake can occur anywhere and without warning.

1. If indoors, watch for falling objects, such as light fixtures, book cases cabinets, shelves, and other furniture that might slide. Stay away from windows if in danger, get under a table or desk into a corner away from windows, or into a structurally strong location such as a hall by a spiller. Do not run outside.
2. Do not dash for exits since they may be damaged and the building exterior brick.
3. When the shaking stops, check for injured persons in your area. Do not attempt to move seriously injured persons unless they are in immediate danger.
4. Check for fires or fire hazards- spills of flammable or combustible liquids, or leak of flammable gases.
5. Turn off ignition and heat sources if it is safe to do so.
6. Shut off all gas sources.
7. Exit the building if possible and go to the assembly point to report on injuries, damages, and potentially hazardous conditions.
8. Once you have exit the building do not reenter until trained emergency personnel have declared the building safe.

5.3 Chemical Spills or Release

5.3.1 Spills that do not endanger workers in the analytical area may be cleaned by laboratory personnel using chemical spill clean-up kits **according to SDS** taking into consideration the following points:

- The hazards of the chemicals involved.
- The amount of the chemicals spilled.
- The possible spills locations.
- Personal protective equipment required for safe clean-up.

There are different types of chemical spill clean-up kits which can be used for the four classes of spills:

- Acid Spill.
- Caustic Spill.
- Flammable Spill.
- Mercury Spill.
- Radiation Spill.

5.3.2 The following equipment should also be provided:

1. Chemical spill kits
2. Protective clothing, e.g. heavy-duty rubber gloves, overshoes or rubber boots, respirators

3. Scoops and dustpans
4. Forceps for picking up broken glass
5. Mops, cloths and paper towels
6. Buckets
7. Soda ash (sodium carbonate, Na2CO3) or sodium bicarbonate (NaHCO3) for neutralizing acids and corrosive chemicals
8. Sand (to cover alkali spills)
9. Non-flammable detergent.

5.3.3 If the spill is large, if the chemical is not easily identified, or if the chemical is extremely hazardous, then:

- Notify everyone in the area.
- Evacuate all personnel from the area.
- If there is a flammability hazard, turn off sources of heat and ignition.
- Confine any vapors (close doors, shut vents).
- Report the incidence.
- Inform the emergency contacts.
- If possible, remain in vicinity, away from danger, to assist emergency responders.
- If someone is injured, call for medical help immediately.

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