



Health, Safety and Environment Standard Operating Procedure

SOP- 04

Hazardous Waste Disposal

Produced by

HSE – Facilities & GS Department

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SOP-04: Hazardous Waste Disposal

1 Overview

1.1 Purpose

The purpose of this Environmental, Health and Safety (HSE) Standard Operating Procedure (SOP) is to provide general guidance for hazardous waste disposal as a result of activities undertaken at Qatar University (QU).

1.2 Hazards and Risks

1.2.1 Hazard Definition

Hazardous waste include elements, compounds, mixtures, solutions, and substances which, when released into the environment may present substantial danger to public health or welfare or the environment. At QU, hazardous waste consist primarily of hazardous chemicals, bio-hazardous materials, and radioactive waste

A hazardous chemical means:

- A chemical for which there is statistically significant evidence (based on at least one study conducted according to established scientific principles), that acute or chronic health effects may occur in exposed individuals; and/or
- A chemical that poses physical hazards such as flammability, corrosion, or reactivity.

Health hazard means:

A chemical which is classified as posing one of the following hazardous effects: acute toxicity (any route of exposure); skin corrosion or irritation; serious eye damage or eye irritation; respiratory or skin sensitization; germ cell mutagenicity; carcinogenicity; reproductive toxicity; specific target organ toxicity (single or repeated exposure); or aspiration hazard.

Physical hazard means:

A chemical that is classified as posing one of the following hazardous effects: explosive; flammable (gases, aerosols, liquids, or solids); oxidizer (liquid, solid or gas); self-reactive; pyrophoric (liquid or solid); self-heating; organic peroxide; corrosive to metal; gas under pressure; or in contact with water emits flammable gas.

Technical Guidelines *TG-01 Chemical Safety*, *TG-02 Biological Safety* and *TG-03 Radiation Safety* present further information regarding specific hazards associated with this SOP

1.2.2 Potential Outcomes

Exposure to or a release of hazardous wastes can result in many outcomes.

Potential Health-related outcomes include:

- Acute toxicity
- Skin corrosion/irritation
- Serious eye damage/eye irritation
- Respiratory or skin sensitization
- Germ cell mutagenicity
- Carcinogenicity
- Reproductive toxicity
- Specific target organ toxicity – single and repeated exposure
- Aspiration hazard
- Asphyxiation

Potential physical outcomes include:

- Explosions
- Fire
- Corrosion

1.3 Key Terminology

Table1. Key Terms

Term	Definition
Chemical	Substance, or mixture of substances
Flammable liquid	Liquids with a flash point not exceeding 61° C
Flammable solid	Solid materials which are readily combustible or may cause or contribute to fire through friction, or when in contact with water can discharge flammable gases.
Flammable gas	When at 20°C and standard pressure at 101.3 kilo Pascal it is: <ul style="list-style-type: none"> • Flammable when mixed with 13% of air or less. • It flammable when exposed to air at 12% point regardless of the minima for explosion.
Corrosive	A chemical that produces destruction of skin tissue or materially damages or destroys metal
Simple asphyxiants	A gas that displaces oxygen and deprive tissues of oxygen
Chemical asphyxiant	A gas that renders the body incapable of maintaining an adequate oxygen supply
Explosive	A solid or liquid substance (or mixture) which is in itself capable by chemical reaction of producing gas at such a temperature and pressure and at such a speed as to cause damage to the surroundings.
Oxidizer	A solid or liquid material, while in it is not necessarily combustible, may cause or contribute to combustion of other material generally by yielding oxygen.
Cryogenic liquid	Cryogenic liquids are pressurized liquids formed by compressing gases to a point where the temperature reaches - 60° C to - 270° C.

2 Scope

The requirements outlined in this SOP are applicable to all QU employees, students, contractors, and visitors who are working for QU, and/or conducting work on QU premises. The following subsections outline some of routine and non-routine activities and locations in which the conditions covered by this SOP may be encountered.

2.1 Routine

Hazardous waste can be encountered in many areas at QU. Most commonly, hazardous waste is found in:

- QU Laboratories
- Facilities maintenance
- Greenhouse
- Medical clinic

2.2 Non-routine

Hazardous waste may also be encountered:

- When hazardous materials are used by on-site contractors
- Accidents
- Delivery vehicles with other materials in them

3 Roles and Responsibilities

Each employee should be on the alert for hazardous conditions and promptly report any to the Health, Safety and Environment Office (HSE).

The department is responsible for the correction of any operational deficiencies that are discovered. Facility deficiencies must be reported to the HSE.

The QU Departments are the primary organization responsible to implement and maintain sound hazardous waste management practices and assure safety compliance in their respective areas.

3.1 Vice Presidents (VPs), Deans, Directors, Managers, Head Sections/Units and Project Managers

VPs, AVPs, Deans, Directors, Managers, Head Sections/Units and Project Managers have the primary responsibility for hazardous waste management and therefore have responsibility for assuring sound safety practices and compliance within their Department/College. They are ultimately responsible for enforcing consequences arising from moderately serious and very serious incidents.

3.2 Employees, Students and Contractors

Employees, contractors and students are responsible for compliance with safety regulations and this technical guidance, as applicable.

3.3 Health, Safety and Environment Office (HSE)

The HSE is responsible for the implementation of this procedure.

3.4 HSE Committee

The HSE Committee shall be responsible for assisting in the implementation, maintenance and review of this procedure, as requested.

4 Risk Prevention

4.1 General Prevention Requirements

The following prevention practices should be followed to minimize the risk from potential hazards associated with hazardous materials:

- Maintain an accurate inventory of the hazardous waste at QU facilities.
- Maintain up to date Material Safety Data Sheets (**MSDS**) for all hazardous waste at QU facilities. These MSDSs must be available to workers.
- Provide appropriate training to workers in areas where hazardous waste is stored, dispensed or handled. Refer to Section 6 of this guidance for specific training requirements.
- Wear appropriate protective gloves/clothing when handling hazardous waste.
- Provide adequate and appropriate storage facilities and ensure hazardous waste is stored in an orderly manner.
- Clearly identify and label hazardous waste containers and storage areas.
- Develop procedures to control and mitigate unauthorized releases of hazardous materials.
- Develop an emergency action plan for response to releases of hazardous waste.
- Establish appropriate disposal methods for hazardous wastes.
- Appropriate spill response and fire suppression materials must be readily accessible.

4.2 Specific Prevention Methods

In addition to the general risk prevention and mitigation measures outlined in section 4.1, the following measures should be applied for specific types of hazardous waste.

4.2.1 Chemical Waste

Chemical waste can be classified into the following classes:

- Irritants
- Asphyxiants
- Toxic substances
- Explosives
- Flammable Materials – Gases, Liquids, Solids
- Oxidizers
- Self-reactive
- Pyrophoric
- Cryogenic Liquids

Please refer to **QU TG-01 Chemical Safety** for the specific prevention methods associated with each class.

4.2.2 Biological Waste

Biological waste includes:

- Materials contaminated or potentially contaminated during the manipulation or cleanup of the material generated during research and/or teaching activities requiring Biosafety Level (BSL) 1, 2, or 3 or animal or plant biosafety level 1, 2, or 3.
- Human tissues and anatomical remains.
- Materials contaminated with human tissue or tissue cultures (primary and established) because these are handled at BSL-2.
- Any liquid blood and body fluids (human or animal).
- Animal carcasses, body parts and bedding from animals infected with BSL2 and BSL3 agents.

Biological waste can be classified into different BSLs. Please refer to **QU TG-02 Biological Safety** for the specific prevention methods associated with each BSL level.

4.2.3 Radioactive Waste

There are seven types of radioactive waste:

- Biological Materials and animal carcasses.
- Dry Solids.
- Liquids.
- Scintillation Vials.
- Source Vials.
- Mixed Wastes
- Lead containing materials.

Please refer to **QU TG-03 Radiation Safety** for the specific prevention methods

4.2.4 Waste Electrical and Electronic Equipment (WEEE)

WEEE is defined as any substance or object including all components, subassemblies and consumables in the prescribed categories thereof that are part of the products, which the holder discards or intends or is required to be discarded.

WEEE is categorized into 10 for reporting purposes, these are:

- Large household appliances (*large cooling appliances, refrigerators and freezers, electric heating appliances and electric radiators, and other fanning, exhaust ventilation and conditioning equipment*).
- Small household appliances (*vacuum cleaners and carpet sweepers, and equipment for opening or sealing containers or packages*).
- IT and telecommunications equipment centralized data processing devices including (*mainframes, minicomputers and printer units, personal computing mean, electrical and electronic typewriters, pocket and desk calculators*).
- Consumer equipment (*radio and television sets, video cameras and recorders, Hi-fi recorders, audio amplifiers and musical instruments*).
- Lighting equipment (*luminaires for fluorescent lamps, and high intensity discharge lamps*).
- Electrical and electronic tools (*drills, saws, sewing machines, tools for riveting, nailing or screwing*).
- Toys, leisure and sports equipment (*sports equipment with electric or electronic components, and coin slot machines*).
- Medical devices (*equipment for radiotherapy, cardiology, dialysis, and pulmonary ventilators, and appliances for detecting, preventing, monitoring, treating, alleviating illness, injury*).
- Monitoring and control instruments (*smoke detectors, heating regulators, thermostats, and appliances for measuring, weighing or adjusting laboratory equipment*).
- Automatic dispensers (*automatic dispensers for hot drinks, bottles or cans, solid products, money, and all appliances which deliver automatically all kinds of products*).

WEEE are classified as hazardous waste the disposal of which is regulated and achieved through the treatment, recovery and recycling of affected equipment.

Modalities of disposal

It shall be the responsibility of HSE to remove WEEE from every primary source (point of generation), by collecting and transporting same through appropriate means for final disposal. These shall be done in accordance with the following steps:

- At the point of generation, WEEE shall be segregated, labelled as such, and kept in a safe condition and site under the control or supervision of individuals directly responsible for the waste stream.
- Thereupon, the responsible person shall fill the WEEE Pickup Request Form in the prescribed manner and submit it to the HSE.
- HSE shall authenticate the Pickup Request Form by conducting safety inspection of the accumulated WEEE.
- Thereafter, an accredited contractor shall be notified for pickup of WEEE from individual primary sources.
- Pickup of WEEE shall be carried out by contractor and coordinated by the HSE.
- HSE shall maintain an inventory of WEEE removed by the contractor for final disposal.
- Means and mode of final disposal of WEEE shall be carried out by contractor in agreement with HSE.
- Relevant information pertaining to final disposal of WEEE shall be made available to HSE by the contractor.

Minimization of WEEE

For the purpose of minimizing the volume of WEEE, QU Information Technology Services (ITS) shall:

1. From time to time, carry out Critical Needs Assessment before the purchase of Electronic and Electrical Equipment (EEE).
2. Request the inclusion of Offer for Take-Back Option and/or detail design process relevant for product Reduce, Reuse, and Recycle (as the case may be) in every contract bids for further procurement of EEE.

5 Safe Work Practices**5.1 General Work Practices**

The following work practices shall be implemented to reduce the risk of injury, illness, or property damage and must be followed by all workers and students.

- Workers shall familiarize themselves with the information provided in the MSDSs and other relevant user instructions provided by the manufacturer.
- Instructions for safe handling and use of the material and equipment, as presented on the MSDS and the user manual, shall be followed and appropriate personal protective equipment (PPE) used by workers handling the material.
- Wash hands immediately after completion.
- Eating, drinking, smoking, chewing gum, applying cosmetics and storing utensils, food and food containers are prohibited in areas where hazardous waste is stored or handled.
- If hazardous waste must be transferred from one container to another, appropriate spill response materials shall be in close proximity to the transfer area such that the worker can quickly control the release and, if safe to do so, clean up the released material.

5.2 Specific Work Practices

Specific safe work practices shall be based on the type and class of hazardous waste and the potential routes of exposure associated with the material. Chemical-specific safe work practices can be found on the MSDS and should be followed. The following presents the minimum safe work practices to be followed, by type and class of the hazardous waste, in addition to those presented in Section 5.1.

5.2.1 Chemical Waste Disposal

Potentially hazardous chemical wastes must be disposed of in accordance with the state's regulations and procedures established by the HSE. Contact your supervisor or HSE before discarding of any potentially hazardous chemical.

The following guidelines will assist chemical hazardous waste collection:

- Unless you have written approval from the HSE, disposal of chemicals by way of the sanitary sewer system is prohibited.

- To determine if the chemical you want to be removed from your laboratory or work area is a regulated hazardous waste, contact HSE, or consult the United States Environmental Protection Administration Regulation 40 CFR 261 - Identification and Listing of Hazardous Waste.
- All lab personnel must be familiar with the location and composition of all wastes produced in the laboratory.
- Waste containers must remain closed except when actually adding waste. Open containers violate state and federal waste regulations.
- For disposal information, call HSE – Environment Section at 4403 6943.

Hazardous Waste Inspection

HSE is responsible for identifying and removing waste from laboratories upon notification, and transporting or shipping to approve treatment, storage, and disposal facilities.

Satellite accumulation areas (laboratories) shall follow the following requirements:

- Keep lids or caps securely in place and tight them except when adding materials. A funnel resting on the mouth of a bottle is not a lid; neither is a Para film.
- Be sure that gas-producing reactions (e.g. organics in acids) have worked to completion before transferring the material to a hazardous waste container.
- Remember: A closed container; when tipped over will not leak.
- Secondary containment is required for all glass containers of liquid hazardous materials stored on the floor.
- Secondary containment is required for all containers of liquid hazardous waste, with capacity of four (4) liters or less, regardless of storage location.
- The word “Hazardous Waste” labels shall be place in the container to identify the contents (e.g. “Acetone Waste”).
- Abbreviations such as H₂SO₄, HCl, EtBr, EtOH, etc. are not acceptable.
- Keep the waste container(s) at or near the point of generation and under control or the supervision of the individuals directly responsible for the waste-generating process. Do not store waste in a separate room or down the hall.
- Do not accumulate more than fifty-five (55) gallons (208) liters of hazardous waste or one (1) quart (0.95 liters) of acutely hazardous waste in the laboratory.

Hazardous Waste Containers

- Hazardous waste containers must be in good condition and chemically compatible with their contents.
- Waste containers must securely fitting lids; do not use corks or stoppers.
- Laboratory beakers, flask, or plastic milk cartons are not acceptable as waste containers.
- Metal containers are not acceptable unless they are the original containers. Glass and plastic reagent bottles are generally the most convenient ones.

- Before discarding materials, allow them to react completely and/or cool to ambient temperature before accumulating as waste, and tightly closing the lid. Until all reactions are completed, the contents of a container are not waste, but are instead the last step of the reaction procedure.
- Store glass waste containers in rubber safety carriers, buckets, or similar containers to protect against breakage and spillage. All holding four (4) liters or less of liquid hazardous waste, and all glass containers of liquid hazardous materials stored on the floor, require secondary containment.
- Liquid waste may be accumulated in glass reagent bottles compatible with the waste. If a large volume of liquid waste is generated, consider a 5-gallon carboys for solvent accumulation. Containers of liquids must have a ten (10) percent headspace to accommodate thermal expansion.
- Solid wastes are to go into a double-lined cardboard box. Liners must be 1.5 mil or greater polypropylene bags. Tie and seal each bag individually.
- Ethidium bromide containing solid and semi-solid waste (e.g. used gels) is also collected in double-lined bags within cardboard boxes. Save liquid ethidium bromide waste in carboys or bottles.
- Reactive chemicals must be disposed of in their original shipping containers.
- Hydrofluoric acid presents a special hazard and must be stored in Teflon containers or original containers.

Chemical Waste Segregation

- **Acids and Bases**

Segregate containers of acids and bases from one another while accumulating for disposal / treatment. Collection of concentrated acids and bases for shipment will be arranged if neutralization in the laboratory is not practicable. Aqueous acid or base solutions with a pH between 5 and 9 can be released to the sanitary sewer without neutralization. Do not discharge acids and bases containing heavy metals to the sewer. Do not mix acids and bases containing heavy metals with other acidic or basic waste. Include neutralization of acids and bases as an end step in the laboratory procedures.

- **Oxidizers**

Package oxidizers separately, and accumulate away from flammable materials.

- **Reactive wastes**

Exercise special care to identify reactive waste. Although the process of using the reactive waste usually eliminates the reactivity characteristics, some have dangerous residual properties. For example, residual metallic sodium, added to a solvent to remove water, could result in a fire or explosion if that solvent mixed with aqueous waste.

Label solutions containing sulfides and/or cyanides to alert personnel not to mix these with acid waste. Mixing could release lethal amounts of toxic gases.

- **Used Solvents**

Collect halogenated and non-halogenated solvent waste in separate containers. Separate those containing heavy metal. Those containing acids or bases are to have the pH adjusted to 6-8 prior to pick up.

Waste Minimization

The Laboratory Supervisors/ In-charge are encouraged to consider ways to reduce the volume of waste or preserve the reuse of materials through the redesign of experiments. Keep recyclable materials separate from other waste. Make every effort in the laboratory to decontaminate, detoxify, neutralize, or neutralize the non-hazardous research materials as the last step in each experiment.

Disposal of the Sewage System

Do not use the sanitary sewer for the disposal of hazardous materials, with the exception of trace quantities associated with cleaning and washing operations, e.g. glassware. The following discharges to the sanitary sewer are prohibited:

- Materials that may create a fire or explosion hazard.
- Corrosive materials with pH less than five (5)
- Solid or viscous materials in amounts to obstruct flow or interfere with operations.
- Discharge of any toxic material in volume or strength to cause interference with waste treatment process.

Disposal to General Waste – Sharps

Place non-contaminated and/or decontaminated glassware and sharp objects in a plastic bag within a cardboard box. This manner of disposal is recommended for all glass items. Housekeeping will pick up these boxes if they are sealed and identified with a label indicating: "CAUTION, GLASS AND SHARPS, and NON-HAZARDOUS MATERIAL ONLY".

5.2.2 Biological Waste

The QU Biological Waste Disposal guideline stipulates proper procedures for the collection, decontamination, and disposal of laboratory-generated biohazard waste. This has been developed in order to minimize the risk of exposure to those who may come into contact with biohazard waste generated in a research laboratory, specifically:

- The laboratory workers generating and collecting biohazardous waste during research,
- support staff retrieving, transferring, and autoclaving the biohazardous waste,
- The housekeeping staff responsible for transporting autoclaved waste in buildings that house research laboratories,
- facilities staff (plumbers, electricians, HVAC, welders, etc.), emergency personnel, and visitors who visit the lab infrequently,
- The contractors' staff responsible for collecting, hauling and final disposal of all waste that is generated in research laboratories.

Biohazardous waste generated and collected in the research laboratories is to be properly autoclaved according to procedures outlined below. This process changes the biological character of the waste to reduce or eliminate its potential for causing disease. Laboratories with biohazardous wastes not specifically addressed by this document (such as waste with multiple hazards, e.g. radioactive biohazardous waste) should consult with HSE – Environment section for alternative treatment and disposal methods.

Defining Laboratory Generated Biohazard Waste

All biohazardous waste generated in the research laboratories will be properly autoclaved and tagged prior to its collection by hazardous waste treatment company. This biohazard waste includes:

- Materials contaminated or potentially contaminated during the manipulation or cleanup of the material generated during research and/or teaching activities requiring biosafety level 1, 2, or 3 or animal or plant biosafety level 1, 2, or 3.
- Human tissues and anatomical remains.
- Materials contaminated with human tissue or tissue cultures (primary and established) because these are handled at BSL-2.
- Any liquid blood and body fluids (human or animal).
- Animal carcasses, body parts and bedding from animals infected with BSL2 and BSL3 agents.

Biohazard Waste Collection Methods

Contaminated Sharps Include items such as:

- razor blades
- scalpels
- lancets
- syringes with/without needles
- slide covers
- specimen tubes

Sharps shall be collected directly into one gallon metal cans. Metal cans used to collect sharps contaminated under the definition of biohazardous waste (above) must bear the biohazard symbol marked with an "x" using autoclave indicator tape. Laboratories should minimize their use of sharps whenever possible and that needles are not recapped, purposely bent, broken, or otherwise manipulated by hand. To avoid accidents related to overfilling the cans, remove the cans for decontamination or disposal when they are 2/3 full. Cans of contaminated sharps are to be autoclaved. After autoclaving, containers of sharps are disposed of in a cardboard box lined with a plastic bag, clearly marked with the "GLASS AND SHARPS" label, figure 1.

Figure 1. Cans of contaminated sharps



While small shards of contaminated broken glass can be placed into the sharps cans identified above, large contaminated broken glass items must be autoclaved separately in a hard walled container (such as a cardboard box) lined with a biohazard bag bearing an autoclave tape indicator "x" , figure 2. The autoclaved glass waste is to be disposed of in a larger cardboard box lined with a plastic bag, clearly marked with the "GLASS AND SHARPS" label.

The metal solvent cans are about 9" long, allowing for a majority of glass pipette disposal when the cans are laid on their side as shown, figure 3, with the opening at the top. Never allow the cans to fill more than 2/3 full and, when removing from a biosafety cabinet, decontaminate the exterior of the can.

Figure 2 - Cardboard Box



Figure 3 - Can laid on side



Pipetting

For large-scale collections of Glass (Pasteur) and plastic pipettes contaminated under the definition of biohazardous waste, line a puncture resistant outer container (such as the package the pipettes came in) bearing the biohazard symbol marked with a heat sensitive autoclave tape “x with an orange autoclave bag. To avoid handling a bag full of pipettes, place the indicator tape “x” over the bag’s biohazardous symbol prior to loading the bag with pipettes. The universal biological hazardous symbol must be displayed on the inner and outer container. The outer container may also be contaminated so it too should be autoclaved to reduce handling of the pipettes which tend to puncture the bag during treatment handling.

For frequently removed small scale collection (such as sterile pipetting in a biological safety cabinet), line a small orange autoclave bag inside a long, thin, hard-walled collection container. Plan to fill this container with appropriate disinfectant upon beginning (may require liquid disposal authorization) or, when finished, loosely close the bag, spray down with proper disinfectant, and transfer it to your larger scale pipette collection container located outside of the cabinet.

Pipette tips are to be collected on the bench top in a small autoclave bag lining a wire stand or other container bearing the biohazardous symbol. Loosely close the bag to allow for steam penetration and place with other solid biohazardous waste.

Figure 4 - Pipette Container



Contaminated Solids

Biohazardous solids consist of:

- Culture dishes, flasks
- Petri dishes
- Solid waste cultures/stocks from the testing and production of biologicals
- Gloves, gowns, masks
- Other solid material potentially contaminated under the definition of biohazardous waste (above). The outer collection container must be durable, leak proof, have a lid and be of such a design so as not to be mistaken by the Housekeeping as regular trash. This container must be labelled with a biohazard sticker. Wire cages cannot be used as the outer container.

Figure 5 - Container for contaminated solids



Line the outer collection container with a red or orange autoclavable biohazard bag. Waste bags with universal biohazard symbols are only to be used for biohazardous waste that will be autoclaved before disposal. Before lining the collection container with the biohazard bag, crisscross the bag's biohazard symbol and/or markings with heat sensitive autoclave tape. The biohazard collection container should be covered with its lid when not in use. Remove bags at 2/3 full and never place glass in these containers.

Liquids

Even though the rules and definitions for liquid biohazardous waste vary somewhat from solid waste procedures, autoclaving is the method of choice for disinfection of the following:

- Liquid human blood
- Animal blood/body fluids
- Human tissue culture, human cell lines (primary or established)
- Human body
- Liquid growth media removed from human tissue cultures

Autoclaved liquid wastes may be discharged directly into the sanitary sewer.

Chemical disinfection may be an acceptable alternative to autoclaving liquid biohazard waste generated in research laboratories such as bleach treatment. When this is done, care must be taken to avoid splash and the drains are to be flushed with copious amounts of water. Chemical disinfection of regulated liquids followed by disposal to the sanitary sewer is not allowed unless approval has been obtained from the Business Operations Department.

Contaminated animal carcasses

Animal carcasses are disposed of through a licensed pathological incinerator. Animal carcasses from transgenic animals or animals inoculated with infectious agents are disposed of by autoclaving (small animals only) or by incineration. These materials are to be placed in boxes and marked for incineration. (No needles or other type of metal and no PVC plastic are to be placed in the collection boxes. Use only non PVC plastic bags.)

Loading and Unloading the Autoclave for Waste Decontamination

Contaminated materials should not be left in hallways or other public spaces prior to the autoclave decontamination. Biohazard bags must be left in the laboratory until they are to be placed in the autoclave. Do not leave them sitting next to the autoclave whether or not it is occupied by another laboratory materials. Biohazard bags may not be left on the floor. Bags that are closed and ready for autoclaving must be placed in secondary containment as shown. Waste materials that are to be decontaminated at a site away from the laboratory are to be transported in closed, hard-walled secondary containers.

Figure 6 - Proper location of contaminated materials



Always minimize contact with biohazardous waste as much as possible. Use a cart to transport the waste from the laboratory to the autoclave. Never crush or push down biohazardous waste; biohazardous waste containers should be removed for autoclaving when they are 2/3 full. Indicator tape should be applied when placing the new autoclave bag into the hard walled outer container; this will reduce handling of the biohazard waste during removal. The heat sensitive autoclave tape should be placed in an "X" pattern over the biohazardous symbol. The heat sensitive tape is to be of the type that changes color,

such as the type that the word "autoclaved" appears after treatment. Once the autoclave disinfection is complete, the tops of the bags may be sealed tightly with lab tape.

After the proper autoclave waste decontamination steps are followed as listed below, the decontaminated waste is then placed in a 44 gallon or 32 gallon (with a drum dolly), lined with black plastic garbage bags, and located in the vicinity of the autoclave. These containers are to be labeled "AUTOCLAVED/ DECONTAMINATED WASTE ONLY". Biohazard bags placed in the containers and marked with the heat sensitive tape which signals that the waste can be removed from the laboratory for disposal.

Figure 7- Autoclaved / Decontaminated Waste Containers



Each department is responsible for providing these containers. Some departments may need several containers depending on the amount of biohazardous waste generated. Overflowing waste or waste in untreated, untagged biohazard bags shall not be picked up.

5.2.3 Radioactive Wastes

It is important to dispose of radioactive wastes in accordance with the radiation protection regulations. This would avoid radioactive exposure to personnel and contamination of the environment. It also avoids regulatory penalties and the possible loss of radioactive material use privileges. Radioactive wastes are not permitted to be disposed of in the sanitary landfill and must not be placed in any container used for the collection of non-radioactive waste, no matter how temporary the use is intended.

Disposal to the Sewer

Only trace quantities of radioactive material associated with glassware cleaning may be discarded to the sewer. Specific authorization from the HSE is required for any exceptions. All authorized releases must occur in a designated, posted drain. Records of each release, including radionuclide, quantity, chemical and/or physical form, date, and time must be documented and maintained.

Segregation and Packaging Radioactive Waste for Pickup

The HSE provides all the radioactive waste containers and removes all radioactive wastes from the laboratories. Each container requires the completion of a Radioactive Waste Disposal Record (Appendix A). Blank records are delivered with empty containers and are also available from HSE. Three standard containers are used; specially marked cardboard

boxes for dry waste, 4 liter glass bottles for liquid waste, and 30-gallon drums for scintillation vials. Specific authorization from the HSE is required for any exceptions.

All waste must be segregated by half-life category:

- Short-lived, half-life \leq 165 days.
- Long-lived, half-life \geq 165 days.

The following packaging requirements must be met for waste removal.

Biological Waste

- Segregate wastes according to half-life category:
 - Short-lived, half-life \leq 165 days.
 - Long-lived, half-life \geq 165 days.
 - H-3, C-14, and I-125 in concentrations less than 0.05 uCi/g.
- Place waste in a clear plastic bag in a freezer.
- Each bag must be labeled with a radioactive materials sticker, listing the Authorized User's name, radionuclide, activity and date.
- The serial number from the Radioactive Waste Disposal Record must be written directly on the plastic bag, using a "permanent" marker.

Dry Waste

- Segregate wastes according to half-life category.
- No free liquids, lead shielding, scintillation vials or organic solvent are allowed.
- Sharps that must be placed in a hard-walled plastic or cardboard container before being placed in the dry waste box.
- Infectious dry wastes must be sterilized by autoclaving before placement in radioactive waste containers. Autoclaving radioactive infectious waste must be specifically approved by the HSE.
- Source vials containing short-lived radionuclides may be placed in the short-lived dry waste box after first removing any lead shielding material. Do not place source vials in the dry waste box if they create unacceptable radiation levels (> 2 mrem/hour at 1 foot from a box).
- Empty source vials for long-lived radionuclides may be placed in the long-lived dry waste. Residual liquids, up to a few milliliters, may be absorbed on a pad or towel and added to the dry waste container. This procedure may be used only for source vials containing less than 10 mCi.
- Minimize the amount of glass and metal by washing these materials and disposing of them as ordinary trash.
- Prior to requesting pickup, the box must be closed by sealing the bag with tape and taping the lid in place. Tape the Radioactive Waste Disposal Record to the top of the box.

Liquid Waste

- The bottle is delivered with a blank yellow tag attached.
- This tag must contain the following before waste is added:

- Authorized User's name.
- Radioactive Waste Disposal Record Serial Number.
- Radionuclide(s),
- When the bottle is full, the tag must also include activity.
- Date of recording the activity Segregate wastes according to half-life category.
- Do not mix biodegradable and non-biodegradable liquids.
- No solids, including filters, pipette tips, stir bars, gels and vials, are allowed.
- Use only the four-liter bottles provided by HSE unless other arrangements have been made with HSE.
- The glass bottles must have secondary containment (rubber safety bucket or plastic container).
- Leave at least a 10% headspace.
- Chemical constituents, including water and scintillation media trade names, and their percentages must be listed on the Radioactive Waste Disposal Record.
- Remove external contamination prior to waste pickup.

Scintillation Vials

- Use only drums provided by HSE.
- Segregate by half-life category.
- Vials must be packed upright in flats or sealed plastic bags containing no more than 100 vials. Place these bags in a lined drum.
- Segregate vials according to the type of scintillation media:
 - Biodegradable or non-hazardous media that do not meet the criteria of a hazardous waste.
 - Non-biodegradable or ignitable which becomes a mixed waste during use.
- Chemical constituents or scintillation trade names must be listed on the Radioactive Waste Disposal Record.
- No dry vials, test tubes, dry wastes or non-scintillation fluids are allowed.
- Vials must have tight, secure tops to prevent leakage during storage and waste handling.

Source Vials

- The source vials containing short-lived radionuclides may be placed in the short-lived dry waste box. Do not place source vials in the dry waste if they emit unacceptable radiation levels (>2 mrem/hr. at 1 foot from the box).
- Empty source vials for long-lived radionuclides may be placed in the long-lived dry waste. Residual liquids, up to a few milliliters, may be absorbed on a pad or towel and added to the dry waste container. This procedure may be used only for source vials containing less than 10 mCi. Otherwise, the residual contents must be emptied into the appropriate liquid waste container.
- Contact HSE for removal of:
 - Long-lived sources with activities greater than 10 mCi.
 - Short-lived sources which yield surveys of > 2 mrem/hour at 1 foot from a vial or source.

Mixed Wastes

Liquids and scintillation vials are subject to Ministry of Environment regulation if they possess characteristics of hazardous waste. These characteristics include ignitability (flashpoint < 140 °F) and corrosivity (pH < 2 or > 12.5).

- All containers of mixed waste must be labeled or marked with the words "Hazardous Waste".
- All containers of mixed waste must remain closed at all times except when waste is being added or removed to the container.

Lead-Containing Materials

Lead-containing materials must not be placed in the radioactive waste containers. The lead will be picked up and recycled. These items must be wipe-tested for removable contamination prior to calling for a pickup. A copy of the survey results, in DPM, must be attached to a Radioactive Waste Disposal Record. While the removable contamination must not exceed 600 DPM.

Radioactive Waste Disposal Records

The terms of the University's Radioactive Materials License would require detailed records of the receipt, use and disposal of radioactive materials. To facilitate maintenance of disposal records, a Radioactive Waste Disposal Record (Appendix A) is provided for use by Authorized Users.

Radioactive Waste Pickup

Call the HSE, to request a pickup of radioactive waste and replacement of containers. Provide the following information:

- Authorized User's name
- Caller's name
- Building name and room number
- Phone number
- Type of waste (biological, dry, liquid, scintillation vials, source vials, lead-containing materials)
- Serial numbers for each waste container to be picked up.
- The number and type of replacement containers needed.

Radioactive Waste Readiness Checklist

Before requesting a pickup of waste, check to ensure the following has been done:

- **Dry Waste**
 - Liner sealed.
 - Lid taped on box.
 - Radioactive Waste Disposal Record is completed.
- **Biological Waste**
 - Sealed in clear plastic bag.
 - Frozen.
 - Labeled with permanent marker.
 - List weight of waste.
 - List activity / weight in uCi/g.
 - Radioactive Waste Disposal Record is completed.
- **Scintillation Vials**
 - Liner sealed.
 - Lid placed on drum.
 - List name of media or chemical constituents.
 - Radioactive Waste Disposal Record is completed.
- **Liquids**
 - Lid in place.
 - 10% head space.
 - Radioactive Waste Disposal Record and yellow tag is completed.

5.3 Request of Hazardous Waste Pickup

Disposal of Hazardous chemical and biological waste generated at Qatar University shall be the responsibility of HSE. Hazardous waste shall be disposed according to the following guidelines:

1. Laboratory In-charge shall properly store hazardous waste at satellite accumulation area.
2. Laboratory In-charge shall prepare the Hazardous Waste Pickup Request Form, http://www.qu.edu.qa/offices/businessop/forms/waste_pickup_request.php and shall be submitted to HSE for processing of waste disposal.
3. HSE shall review the Hazardous Waste Pickup Request Form and conduct safety inspection on waste satellite accumulation area.
4. Upon verification and approval by HSE, the accredited contractor shall be notified for pickup of hazardous waste.
5. Hazardous waste pickup request is process by HSE during office hours, Sunday through Thursday, 8 AM to 2 PM.
6. Hazardous waste pick up is scheduled every Thursday starting at 9:00 AM.
7. In an emergency situation, the accredited contractor shall be asked to commenced packaging, manifesting, pick-up, transport, and final disposal activities within twelve (12) hours after notification by HSE.

Hazardous Waste Container Color Code

- Yellow Bag – Infectious waste contaminated with chemicals
- Orange Bag – Infectious waste (not containing chemicals or Medical contamination)
- Red Bag – Anatomical waste for incineration

Personal Protective Equipment

- Safety Goggles
- Respirator
- Disposable Chemical Suite
- Disposable Gloves

Emergency Equipment

- Chemical Spill Kit
- Biological Spill kit
- Fire Extinguisher
- Self-Contained Breathing Apparatus

6 Training

QU shall ensure that no person handles hazardous waste unless such person has the competency gained from training, technical knowledge and experience of the precautions to be taken against the risk of personal injury or illness, and is under such degree of supervision as may be appropriate having regard to the nature of the work.

Refer to **QU HSEMS Section 11.0 Training and Competency** procedure for additional information regarding training processes.

6.1 General

Training must be provided to workers and students that may be exposed to hazardous waste. The level of training will be dependent upon the degree of exposure. Information and training may be designed to cover categories of hazards (e.g., flammability, carcinogenicity) or specific types. The following general requirements apply to all levels of training.

- Workers should be informed of the hazards associated with hazardous waste at their workplace.
- Workers should be instructed about how to obtain and use the information provided on labels and safety data sheets.
- Workers should be trained in the correct and effective use of the control measures, in particular the engineering control measures and measures for personal protection provided, and should be made aware of their significance.
- Employers should use safety data sheets, along with information specific to the workplace, as a basis for the preparation of instruction to workers, which should be in writing if appropriate.
- Workers should be trained on a continuing basis in the working systems and practices to be followed and their significance for safety in the presence of hazardous waste at work, and in how to deal with emergencies.

6.2 Specific / Retraining

For workers that handle hazardous waste the following additional training should be provided:

- Methods and observations that may be used to detect the presence or release of a hazardous material in the work area (such as monitoring conducted by the employer, continuous monitoring devices, visual appearance or odor of hazardous chemicals when being released, etc.);
- The physical, health, simple asphyxiation, combustible dust, and pyrophoric gas hazards, as well as hazards not otherwise classified, of the chemicals in the work area;
- The measures workers and students can take to protect themselves from these hazards, including specific procedures the employer has implemented to protect employees from exposure to hazardous waste, such as appropriate work practices, emergency procedures, and personal protective equipment to be used

6.3 Training Documentation

QU shall maintain a record of required training and attained competency with respect to hazardous materials for all persons handling or working in the vicinity of hazardous materials.

7 Document Control

This SOP is a controlled document. The controlled version of this Guidance is located on the QU Electronic Documentation Management System.

Any printed copies of this controlled document are reference copies only. It is the responsibility of all of those with printed copies to ensure their copy is kept up to date.

Refer to **QU HSEMS Section 16.0 – Document Control and Record Retention**.

8 References

Globally Harmonized System of Classification and Labelling of Chemicals (GHS), Fifth Edition, United Nations, 2013

NIOSH Pocket Guide to Hazardous Chemicals, <http://www.cdc.gov/niosh/npg>

European Chemicals Agency, <http://echa.europa.eu/en/about-us>

NFPA 400, Hazardous Materials Code, National Fire Protection Association, 2013.

<http://www.ccohs.com/oshanswers/prevention/oxidizing.html> -- Canadian Centre for Occupational Health and Safety

International Labor Organization Encyclopedia of Occupational Health & Safety,

<http://www.ilo.org/iloenc/>

The European Parliament and The Council of the European Union, (2012). DIRECTIVE 2012/19/EU; Waste Electrical and Electronic Equipment (WEEE): Official Journal of The European Union. 24:7:2012.

Appendix A – Radioactive Waste Disposal Form

Radioactive Waste Disposal Form

Serial No. _____

Page ___ of ___

QATAR UNIVERSITY RADIOACTIVE WASTE DISPOSAL RECORD

Survey Results: _____ mrem/hr Estimated weight: _____ kg.

Waste Classification: _____ NON _____

D001 _____ F003 _____ F005 _____ (Other: _____)

I hereby declare that the contents of this consignment are fully and accurately described above by the proper shipping name and are classified, packaged, marked and labeled and are in all respects in proper condition for transport according to applicable international and national governmental regulations.

HSE – Radiation Safety Specialist/officer - Representative

SECTION 1: AUTHORIZED USER (AU)

User Name: _____ Title: _____ Dept. : _____

Contact Details: Email Address: _____ Tel: _____

Location: Building Code: _____ Building Name: _____ Room No: _____

INSTRUCTIONS:

1. Do not mix types of wastes or long-lived and short-lived wastes.
2. Use a separate container for each waste type and half-life category.
3. Use a separate copy of this form for each container.
4. List specific scintillation brand name.

SECTION 2: WASTES TYPES

Dry (Check) <input type="checkbox"/> Paper <input type="checkbox"/> Glass <input type="checkbox"/> Plastics <input type="checkbox"/> Empty source vials)	Liquids _____	Scintillation Vials _____	Carcasses _____	Lead-containing and Shielding contamination test required attach survey results nuclide used _____
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SECTION 3: WASTE INVENTORY

DATE	NUCLIDE	ACTIVITY (mCi)	CHEMICAL CHARACTERISTICS/ COMPOSITION No abbreviations or chemical formulas LIST SPECIFIC SCINTILLATION BRAND NAME

SECTION 4: SUMMARY BY NUCLIDE

		Total activity for each nuclide in mCi. Include sheets (1 mCi = 37 MBq)

SECTION 5: LAB CERTIFICATION

I certify that the WASTE INVENTORY above is correct. Infectious materials have been sterilized. All needles and sharps have been packaged in hard-walled plastic containers.

Authorized User Telephone No. CB#

For waste pickup, call HSE – Environment Section at 4403 6934 or 4403 6940