

# Basic Guidelines

## for Interim Storage, Handling, and Transportation of Mercury

Peru 2022



PERÚ

Ministerio  
del Ambiente



# Basic Guidelines

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**for Interim Storage,  
Handling, and  
Transportation  
of Mercury in Peru**

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Version 1.0



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## About the authors

This document was produced by the Artisanal Gold Council under contract to the United States Department of State for the project, "Increased Control and Transparency of Mercury in Peru." The AGC is a highly respected thought leader, and innovator working to improve the artisanal and small-scale gold mining sector globally. Its deep field experience and technical expertise permit the AGC to forge strong and meaningful relationships with artisanal miners and their communities. These connections are crucial to developing and implementing concrete technical and systems improvements in the field – where it counts – including environmental, social, and governance systems to ensure that jobs are stable, safe, equitable, and long-lasting. Learn more about the Artisanal Gold Council's work at [www.artisanalgold.org](http://www.artisanalgold.org).

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# Abbreviations

<b>ASGM</b>	Artisanal and Small-scale Gold Mining
<b>DGASA</b>	General Directorate of Socio-environmental Affairs
<b>DGFM</b>	General Directorate of Mining Formalization
<b>DICAPI</b>	General Directorate of Captaincies and -Coast Guard
<b>DIRMEAMB</b>	Directorate of Environment – PNP
<b>DS</b>	Official Decree
<b>EPA</b>	Environmental Protection Agency
<b>EVOH</b>	Ethylene-vinyl alcohol (a flexible thermoplastic copolymer)
<b>FEMA</b>	Special Prosecutor for Environmental Matters
<b>GEF</b>	Global Environment Facility
<b>HDPE</b>	High-density polyethylene
<b>Hg</b>	Mercury
<b>MINAM</b>	Ministry of the Environment
<b>MINEM</b>	Ministry of Energy and Mines
<b>MTC</b>	Ministry of Transport and Communications
<b>NIOSH</b>	National Institute for Occupational Safety and Health
<b>OSHA</b>	Occupational Safety and Health Administration
<b>PNP</b>	National Police of Peru
<b>PPE</b>	Personal Protective Equipment
<b>RCBF</b>	Register for the Control of Auditable Assets
<b>SEIA</b>	Environmental Impact Assessment
<b>SUNAT</b>	National Superintendency of Customs and Tax Administration
<b>UNDP</b>	United Nations Development Programme
<b>UNEP</b>	United Nations Environment Programme
<b>WHO</b>	World Health Organization

# Definitions

**The Minamata Convention:** A multilateral environmental agreement designed to protect human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds (ref. Minamata Convention on Mercury, Art. 1).

**Interim storage facility:** A facility designed to house objects or substances for a predetermined temporary period until they are transferred to another location for final treatment or disposal (ref. Minamata Convention on Mercury).

**Mercury:** Elemental mercury Hg<sup>0</sup>, which is a silver liquid of high toxicity whose use and distribution is regulated internationally by the Minamata Convention (ref. Minamata Convention on Mercury).

**Artisanal and small-scale gold mining:** Gold mining conducted by individual miners or small enterprises with limited capital investment and production (ref. Minamata Convention on Mercury, Art. 2).

# Introduction

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## Purpose of this Guidance

This document has been prepared by the Artisanal Gold Council to provide basic practical guidance for the environmentally sound storage, handling, and transport of liquid mercury and mercury wastes in Peru, particularly wastes consisting of used elemental mercury and mercury contaminated materials. This guidance is adapted to the needs of Peru, which aims to progressively eliminate mercury use in artisanal and small-scale mining, and has committed to manage mercury wastes in compliance with the Minamata and Basel conventions. As needed, a more comprehensive version of this guidance document is also available.

## Users

This document has been designed to provide government agencies and others with detailed practical guidance on the environmentally sound management of elemental mercury and mercury wastes (PPE, vessels, and other contaminated solids, liquid mercury waste such as seized or reused mercury, mercury in plastic bags, and other liquid waste such as mercury mixed with water in plastic bottles). It is intended to supplement the guidelines developed under the Basel and Minamata Conventions, the Peruvian regulations and other guidance documents that stop short of giving specific recommendations for protocols and products that are needed to ensure environmentally sound transport, handling and storage of mercury waste throughout Peru. It is expected that this guidance will also be useful or adapted for other countries dealing with similar challenges such as the countries of the Latin American and Caribbean Group (GRULAC).

## General Content

This guidance document is divided into three main sections. The first deals with **storage of mercury** and mercury contaminated waste, and covers storage containers and facilities, emergency planning, personnel training, documentation and reporting. The second section focuses on **mercury handling**, including worker protection, spill response and mercury transfers. The third section deals with the **transport of mercury** and mercury contaminated waste, including certification, planning, emergency management, tracking and transport protocol.

# Storage

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Mercury must be stored in a dark, stable and secure location far from kitchens and dining areas, sleeping quarters, and indoor places of work. Though it may not be possible to observe all of these precautions, every effort must be made to choose a storage location that is as far as possible from threats such as flooding, fire, and earthquake. In addition, it is critical that mercury be stored in robust containers to prevent and contain any leaks, emissions or threats to humans and the environment. The following section provides more detail about a basic mercury storage facility.

## Storage Facility Specifications

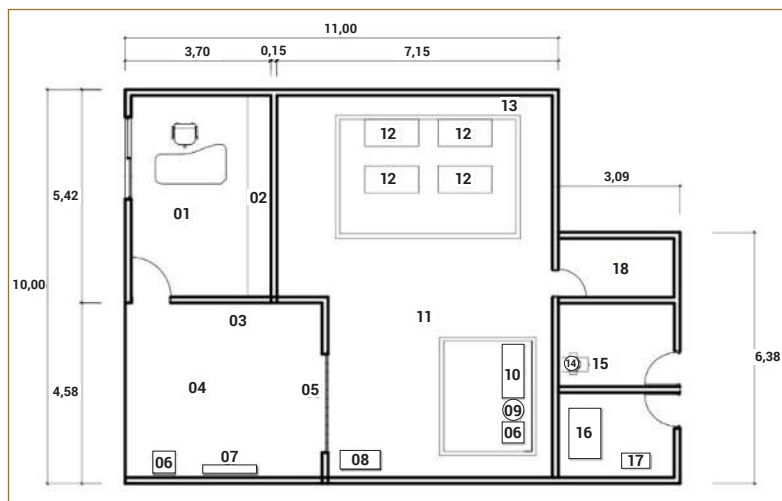
General overview and design criteria for a basic interim mercury storage facility:

- An interim mercury storage facility is intended for short to medium-term storage of no more than 5 tonnes of mercury. If the quantity of mercury stored at any time exceeds 5 tonnes, then some or all of the mercury must be transferred to a separate facility.
- The facility is only for storage of liquid mercury, mercury mixed with other liquids, and small volumes of materials that are heavily contaminated with mercury, such as personal protective equipment (PPE).
- Mercury should be able to both enter and exit the facility, and any mercury entering the facility should not remain for more than five years.
- At a minimum, the facility must be secured with physical locks, and be fire-resistant, for example constructed from non-combustible materials. Any windows should be blacked out or shaded permanently, and the facility should be vented to the outside to allow cool air to enter at night and prevent buildup of mercury vapors.
- The storage area must have PPE available for all staff at the facility.



*Figure 1. Epoxy floor covering and containment.*

The following diagram shows the layout of a relatively comprehensive interim mercury storage facility.



*Figure 2. Sample floor plan for a temporary mercury storage facility (01. Administration office; 02. File and storage; 03. Equipment storage; 04. Driveway covered; 05. Roll-up security / garage door; 06. Spill Kit, 07. Fire Hose Coil; 08. EPP Cabinet; 09. Overpack Barrel; 10. Workbench with Fume Hood; 11. Floor Containment Barrier Enclosures to Limit Spills; 12. Hg storage chest coolers; 13. Ground level ventilation fan; 14. Chimney; 15. Centrifugal fan with Hg filters for extractor hood; 16. Backup generator; 17. Electrical box and 18. Sanitary Facilities).*

If the budget is limited, the storage facility could be set up in a single secure room, or it could be fabricated from a used shipping container, for example (see image below). At a minimum, the facility should include a closet to secure documents, basic equipment and PPE; a spill kit; overpacking containers; a work table; ventilation; an electrical outlet and lighting; and a small but secure outdoor area where PPE can be decontaminated in the sun.



*Figure 3a. A second-hand 10-ft container can be made by cutting a 40-ft container into four parts and adding a back wall or doors as necessary.*



*Figure 3b. Mercury storage unit design discussed at the Simposio del Oro 2020, La Paz, Bolivia.*

If such secure storage is not possible, mercury and contaminated materials may be stored temporarily in airtight containers, as described later in this document.

## Emergency Planning And Response

The mercury storage facility should have an Emergency Response Plan, which identifies procedures and actions to take in the event of an emergency. The objective is to prevent or minimize risks to people, mercury releases to the environment and damage to the mercury storage facility and surrounding structures. In Peru, the emergency response plan is part of the contingency plan, established in the Environmental Management Instrument, according to Law N° 28551.

The main elements of an emergency response plan include the definition of an emergency; the identification of potential hazards; actions to be taken in emergency situations, including mitigation measures; personnel training plans; communication priorities and methods (fire service, police, neighboring communities, local government, etc.); and schedules for the testing of emergency response equipment.

It is the responsibility of the storage facility management to decide when it is necessary to activate the emergency response plan, but in general the plan should be activated in the event of any incident (flood, earthquake, fire, etc.) that could lead to a significant mercury leak or significant damage to the storage facility, and especially any incident that is beyond the ability of the facility workers to handle without external assistance. In the event of an emergency, site staff must:

- Notify the relevant authorities (PNP, firefighters, FEMA) and keep the site secured until the appropriate official has deemed the area safe for investigation or continued operation.
- Put on PPE such as old clothes, aprons or coveralls, shoe covers, rubber or nitrile gloves, eye protection and respiratory protection.
- Record the incident and note the circumstantial details.

Emergency response plans or procedures should cover a number of different scenarios, such as:

- Minor leakage of a mercury storage container;
- Serious damage to a mercury storage container (e.g., complete failure of the seal on a container);
- Mercury spill, such as during repackaging operations; and
- Damage to the storage facility itself (e.g., owing to flood, fire, earthquake, vandalism, theft, etc.) that compromises the physical integrity of the facility.

## Fire and other risks

The storage site should be equipped with basic equipment to deal with a fire, such as a fire extinguisher, PPE, smoke alarms, etc. The Emergency Response Plan should be developed in coordination with local agencies responsible for fires, earthquakes, etc., to ensure that personnel are sufficiently informed, trained, equipped and otherwise prepared to safely handle such emergencies. To reduce the risk of fire, storage racks and other interior equipment – as well as the facilities themselves – should preferably be constructed of non-combustible materials.

In case of fire, workers should first put on personal protective equipment before extinguishing the fire. Carefully move the mercury and waste storage containers away from the fire. After the fire is extinguished, the containers may need to be cooled, for example with a water spray.

## Worker Training

Access to the mercury handling and storage area should be restricted to those with adequate training. Yearly refresher training is recommended. Basic training should include the following basic training objectives:

- Learn about the adverse health and environmental effects of mercury, especially health effects on women and children. For example, there are different possible routes of mercury exposure, including through the skin by absorption, the stomach by ingestion, and the lungs by inhalation. Mercury uptake is high for lungs (>80%), and lower for the skin (<3%) and the stomach (<1%).
- Learn how to safely handle mercury and mercury wastes (including identification, collection, handling, labelling, storage, disposal, etc.) using the equipment available.
- Know how to use personal protective equipment, such as body coverings, eye and face protectors, gloves and respiratory protectors, including how to properly handle and dispose of such equipment.
- Understand the possible mercury exposure from typical situations, and how to protect workers by limiting exposure time and wearing personal protective equipment.
- Be familiar with the facility's Emergency Response Plan, and particularly the information on the emergency management of mercury spills and waste.
- Know how to use the spill kit and how to determine what sort of incident comprises an emergency.

- Learn why the mercury storage facility should not be used to store any substances other than mercury and mercury wastes.
- Appreciate why smoking or eating is not permitted in the storage facility.

A personal mercury exposure monitoring device, such as a colorimetric badge or equivalent (described further in the section on PPE), should be worn by workers in the facility to let them know if and when they should be concerned about their mercury exposure. Workers who are pregnant or who are breastfeeding should avoid mercury handling and storage areas, if at all possible. The mercury storage facility should have worker insurance as required under national law.

Useful training materials include the Artisanal Gold Council's "Chemical hazards in the artisanal gold sector: Impacts of mercury, cyanide and silica dust on human health and the environment:"

[https://www.artisanalgold.org/wordpress/wp-content/uploads/2020/07/AGC\\_Health-brochure\\_Chemical-hazards-in-ASGM.pdf](https://www.artisanalgold.org/wordpress/wp-content/uploads/2020/07/AGC_Health-brochure_Chemical-hazards-in-ASGM.pdf).

UNEP has also posted a range of useful information on the Minamata Convention website:

<https://www.mercuryconvention.org/en/publications>

## Mercury Storage Containers

Elemental mercury and mercury wastes should be stored separately and comply with the provisions of DL 1278 and DS N° 014-2017-MINAM. Different types of wastes should also be stored separately: non-liquid contaminated materials (PPE, containers, rags and others), contaminated liquids (water + mercury and others), and bulk elemental mercury waste (reused mercury and mercury in plastic bags) should each be stored in separate containers.

Waste elemental mercury and contaminated liquids should be stored in appropriate containers. There are two main types of internationally approved steel storage and transport containers for liquid mercury: 34.5 kg (approximately 2.5 liters) flasks and one-metric-ton containers (see Figure 4). Recommendations for steel storage flasks include the following:

- Carbon steel (ASTM A36 minimum) or stainless steel (AISI 304 or 316L) is preferred.
- Metal flasks should have as few welds as possible.
- Teflon® tape provides excellent and low cost sealing for metal screw top seals.
- Epoxy paint on the outside of the flask will prevent corrosion and increase flask life.



*Figure 4. 34.5 kg and 1 tonne steel containers or flasks of mercury.*

Where steel flasks are not available, other types and sizes of container may be used. HDPE plastic is best, ideally with 2mm or greater wall thickness, which is commonly used for storage containers and paint cans (see below). However, elemental mercury should be stored only in durable containers that are:

- Strong enough to resist damage if dropped from a small height or during transport on rough roads;
- Strong enough to support the mass of mercury contained
- Constructed of a material that does not react with mercury (e.g., no aluminum);
- Not already damaged by any materials previously stored in them;
- Clean, dry and structurally sound;
- If made of metal, not corroded to the point where leaks may occur if the corroded area is struck with a hammer;
- Air-tight.

When storing elemental mercury in containers, it is important to leave some “head space” to allow for thermal expansion of the mercury. The maximum filling ratio of a container is 80 percent by volume, and the head space should therefore be at least 20 percent (References: 4,8,9).

Non-liquid mercury-contaminated materials should be stored in containers such as barrels or pails with air-tight lids (see Figure 5), ideally sealed with Teflon tape or rubber gaskets, that will prevent the release of mercury vapor.

## Temporary storage containers

Mercury seized or surrendered in the field may not be contained in vessels appropriate for transport or storage. To avoid spills, smaller quantities of mercury and other liquid wastes should not be removed from the containers in which they are found. Instead they should be placed inside two sealable plastic bags (ideally clean sealable plastic bags further sealed with packing tape or packing wrap), one inside the other, and then placed in airtight containers that are filled with enough sorbent material to pad and absorb all of the mercury stored in the container in the event of a leak.



*Figure 5. Examples of containers for storage and transport purposes (a) 60-liter container and (b) 4.5-liter container.*

Other items that can be used instead of sorbent granules or pads include rags, old cotton or wool clothing, sawdust, etc.

In the event of a mercury spill at the storage facility or elsewhere, contaminated wastewater or solid wastes may be generated during cleanup that will need to be stored securely.

As described further below, the contents (generally a number of smaller containers or packets) of all temporary storage containers at the facility should be recorded in a ledger so as to keep a basic record of all mercury waste in storage, including storage container number, packet number, basic contents and weight of each packet, the date the packet was placed in the temporary storage container, and the name of the person responsible. The ledger should be kept in a secure place and updated when any of the containers or wastes are transferred or removed from the storage facility.

Smaller containers of mercury waste should be placed in larger spill-proof storage vessels. Some facilities use chest refrigerators for this purpose, as they are widely available and fairly well air-sealed. If connected to a power source, a lower temperature can help to minimize any vaporization of mercury from a leaky container. However, if other precautions have been taken to prevent mercury leaks from containers, and the sealing strip under the lid of the chest refrigerator is intact, the appliance does not necessarily have to be turned on. Furthermore, if the chest refrigerator has a durable stainless steel liner, this is ideal for mercury storage, but not obligatory. In any case, the refrigerator box should be lined inside with sorbent pads as an extra layer of spill protection.



*Figure 6. Chest refrigerator.*

## Longer term storage containers

When mercury is stored for longer periods in facilities that have sufficient capacity (and forklifts available to move heavy containers), it is common to provide secondary containment for standard 34.5 kg flasks by using UN-approved steel 200-litre drums sealed with rubber gaskets. Each drum should be clearly labeled, as indicated in a later section, and stored in groups of four drums on pallets. The proposed overpacking procedure is as follows:

- Place a UN-approved drum on a pallet.
- Put a plastic bag inner liner into the drum.
- Place cushioning material, which also functions as an absorbent mat, at the bottom of the plastic bag.
- Put the 34.5 kg mercury flasks into the drum. One drum should not hold more than six flasks, giving a gross drum weight of approximately 220 kg.
- Tightly insert sponge rubber or cardboard dividers between the flasks, as well as between the flasks and the inner side of the drum.
- Seal the inner plastic bag and place the drum lid on top.
- Place the rubber gasket and sealing ring around the drum lid and tighten.

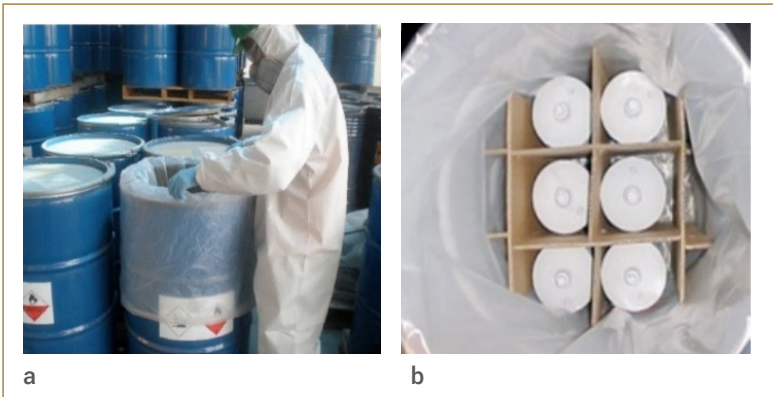


Figure 7. (a) 200-liter drums in each of which six 34.5 kg Hg flasks are stored, as shown in (b).

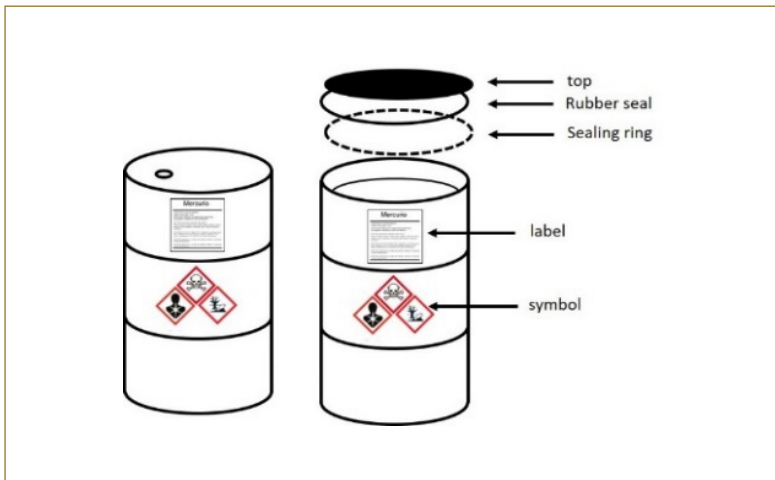


Figure 8. Typical parts and markings on 200-liter storage drums.

## Storage Areas

Metal flasks containing elemental mercury should be stored upright on pallets, if available. If not on a pallet, the flasks could be placed in protective outer packaging such as a box or drum. If small airtight containers of mercury waste are not stored in a refrigerator chest, they may be stored on steel shelves capable of withstanding the load. If there is any corrosion or rust on any metal surfaces that may be used for storage, the shelf surfaces should be epoxy coated to facilitate any later decontamination that may be necessary.

Likewise, all floor surfaces should have cracks sealed and be epoxy coated to facilitate decontamination.



*Figure 9. Metal shelving for storage of mercury wastes.*

## Labeling

It is necessary to differentiate between labeling and documentation. The purpose of labeling is simply to indicate that a container holds hazardous materials and poses a potential risk to human health and the environment during storage, handling, and transport. Documentation, on the other hand, refers to a more comprehensive record-keeping system, as described in a separate section below.

Accurate and durable labeling of materials in storage is absolutely essential. Labeling should be done as soon as possible after materials are secured, since unlabeled containers present a serious potential hazard.

At the very least, each flask or other container should indicate that it contains mercury and warn of its toxicity. Moreover, each flask or other container should indicate whether it contains bulk mercury, mixed mercury liquids, or mercury-contaminated solid waste, as these three categories of mercury waste should be kept in separate storage containers.

If available, international standard hazardous materials labelling (see Figure 10) should also be affixed to all containers holding mercury and mercury wastes. If printed labels are not available, these images may be drawn by hand, preferably in black and red.



Figure 10. Danger symbols and mercury risks on typical labeling.

## Monitoring and Inspection

Monitoring of mercury exposures to both the workers and the storage facility should be carried out regularly.

For relatively small storage facilities with a limited budget, workers can wear colorimetric dosimeter badges as discussed below in the section on PPE. When workers are not on duty, they should store their dosimeter badges in a separate building along with a “control” badge that remains in the place where the active duty badges are stored when not in use. Management should take care that the workers’ mercury exposure never exceeds occupational health standards.

If the appropriate equipment is available and properly calibrated, indoor air monitoring at mercury storage facilities should be done regularly to check for mercury vapors and protect workers on site, especially before and after handling mercury. If such monitoring equipment is not available, colorimetric badges or similar dosimeters may be placed at different locations in the facility and checked periodically in order to determine the general level of safety. If the results show that safe limits have been exceeded, remedial measures should be taken.

In addition to monitoring of worker health and storage facility air quality, visual inspections should be carried out regularly, preferably every month, and a record kept of the results. Inspections should include a test of the site security system, checking for leaks, corroded or broken containers, improper methods of storage, ventilation, the condition of the PPE and

wash area, spill kit contents, and to ensure that records are up to date. Inspections should also include examination of the mercury handling area, floors and walls to ensure that the equipment and any coatings are in good condition. A clear plan and budget for regular monitoring and maintenance should be in place before the facility starts operating.

As described below, documentation should be kept on routine monitoring and inspection of storage areas, focusing especially on damages, spills and any deterioration of containers or equipment. Clean-up and decontamination records should also be kept, including any alerts to the relevant authorities. (References: 1,4,8)

## Documentation

In order to ensure safety and chain-of-custody responsibility, it is important to document all mercury and mercury wastes stored in the facility. As mentioned above, the three main types of mercury waste – bulk mercury, liquids mixed with mercury, and mercury-contaminated solid waste – should be stored in separate containers, and this should be clear in the documentation.

Basic documentation should consist of a ledger that describes all mercury and wastes in storage, including the storage container number, the type of material in the container, the source and weight of the material, the date the material was placed in the container, and the name of the last person handling the material. In the case of mercury-contaminated solid waste (e.g. contaminated PPE) that may consist of various packets placed in a storage container, each packet number should be recorded in the ledger as well. The ledger should be kept in a secure place and updated when any of the contents of the containers are transferred within the storage facility, or when containers come in or out of the storage facility.

When mercury and wastes are transferred out of the storage facility, the container closures should be taped in such a way that opening the container will break the tape. Moreover, the responsible handler must sign the tape over any breaking points and also over the ends of the tape so that the signature is written across both tape and container. In addition, each container should be labelled with the type of mercury or material contents, the weight of the sealed container and contents, the date when the container was sealed, and any other key identification and chain-of-custody information.

It is essential that hard copies be kept of all manifests, custody and transfer records, etc., for at least three years. (References: 1,4,7).

## Inventory

According to Peruvian law, every mercury user (natural or legal person) must be enrolled in the Register for the Control of Auditable Assets (RCBF) of SUNAT. Currently there is no regulation covering mercury in storage, but in Perú SUNAT and FEMA have official responsibility for and custody of any seized mercury. The ledger described above comprises the mercury inventory of the storage facility, and should be checked periodically against the containers stored at the facility to ensure its accuracy. In line with the Minamata Convention, each year the total inventory of liquid mercury and wastes held at the storage site should be reported to the appropriate government agency.

## Facility Closure

When a storage facility is no longer needed and has been emptied of all mercury, wastes and mercury-contaminated materials, the area should also be emptied of all removable objects and thoroughly inspected for any spilled mercury, following the spill cleanup protocols. Removable objects should be left outside, in the sun if possible, for one week to decontaminate them. Once any visible mercury has been removed, all windows and doors should be propped open and large drying fans should be operated for at least a week to help disperse residual mercury vapors, ideally during warm weather. If possible, air, equipment and soil measurements should be taken to confirm that the site has not been contaminated. If contamination is present, the site should be remediated according to relevant regulations. All building surfaces should then be sealed with two coats of paint before recommissioning the space for new uses. For extra precaution, even after remediation, the site should never be used for sleeping, cooking, or dining purposes.

# Handling

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It is critical that mercury is handled safely and in a manner that ensures traceability and security. The first layer of security is the storage facility itself, as presented in the previous section. This section describes procedures to protect workers and prevent releases during collection, reception, and transfer of mercury to appropriate containers.



## Personal Protective Equipment

The mercury storage facility should have a closet for personal protective equipment (PPE). This should include:

- Impermeable gloves of natural rubber, neoprene rubber, nitrile rubber or PVC. Thick rubber is best. If only thin gloves (0.3 mm or less) are available, they should be used in two or three layers.
- Safety goggles or other protective eyewear in case of splashing mercury.
- Disposable shoe covers or rubber boots, ideally with a reinforced or steel toe.
- Coveralls, aprons, and other protective clothing that can be disposed of if contaminated, or hung in the sun after use. The coveralls, suit, or apron should cover the boot tops so that any liquid cannot enter the boot. Normal street clothes or a uniform should never be worn when working with mercury.
- Respiratory protection. At a minimum, surgical masks or multi-layered cloth masks should be worn at all times when handling mercury, whether or not it is properly contained. In any case, it is important to minimize the time any person is potentially exposed to mercury vapor. Ideally, an air purifying respirator (with a mercury cartridge) should be used when handling mercury that is not in a sealed container, and in the following situations:
  - a) During emergencies, and during entry into areas of unknown mercury concentration.
  - b) During evaluation or installation of other mercury control equipment.
  - c) In work situations where workers have previously exceeded the recommended mercury exposure limits.
  - d) During cleaning, maintenance, repair and other work where existing controls may not be effective.

Some common PPE materials and brands for mercury handling and ease of cleaning include butyl rubber, natural rubber, neoprene rubber, nitrile rubber, polyvinyl chloride (PVC), Viton®, Viton®/butyl rubber, Silver Shield® PE/EVOH, Tychem® BR/LV, Tychem® Responder® CSM, Tychem® TK and rubber "Wellington" boots.

Contaminated PPE should be isolated by sealing it in a plastic bag until it can be placed in an airtight steel drum or other container. Employees must not take mercury-contaminated materials, clothing, or equipment home,

nor are such materials permitted in vehicles unless they are secured in an appropriate airtight container.

Rubber or synthetic gloves should be tested for pin-holes or other leaks by inflating them (see Figure 11) before putting them on.

Workers at a mercury storage facility should wear a clip-on Mercury Vapor Badge (also known as a personal air monitor or dosimeter) while in the storage facility. The most practical for this type of work is a badge that changes color according to the cumulative mercury exposure (e.g., Morphix Technologies ChromAir® Chemical Detection Badges) during the time a worker is exposed.<sup>1</sup> A different type of badge needs to be sent to a lab for analysis in order to determine the cumulative exposure (e.g., Advanced Chemical Sensors).

For reference, occupational mercury vapor exposure limits recognized in many countries include:

- **NIOSH** (National Institute for Occupational Safety and Health) REL (Recommended exposure limit) = TWA (Time-weighted average measured or calculated in relation to a reference period of 8 hours) 50 micrograms/m<sup>3</sup>
- **OSHA** (Occupational Safety and Health Administration) PEL (Permissible exposure limit) = TWA 100 micrograms/m<sup>3</sup>
- **European Union IOELV** (indicative occupational exposure limit value)<sup>2</sup> = TWA 20 micrograms/m<sup>3</sup>

In comparison, the mercury vapor level considered to comprise an “Immediate danger to life or health” (IDLH) is 100 times greater than the OSHA PEL at 10,000 micrograms/m<sup>3</sup>.

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1 Once the worker has left the storage facility, in order to determine the average mercury concentration during the period of exposure, the worker identifies on the badge the highest cell with a color change and divides the corresponding dose level (exposure level multiplied by hours of exposure) by the number of hours the worker was exposed. This gives the average mercury exposure in micrograms per cubic meter. For more detail, see <<https://www.morphitec.com/file/document/chromair/380018%20mercury-080919.pdf>>

2 COMMISSION DIRECTIVE 2009/161/EU of 17 December 2009 establishing a third list of indicative occupational exposure limit values in implementation of Council Directive 98/24/EC and amending Commission Directive 2000/39/EC.

## Procedure for Donning PPE

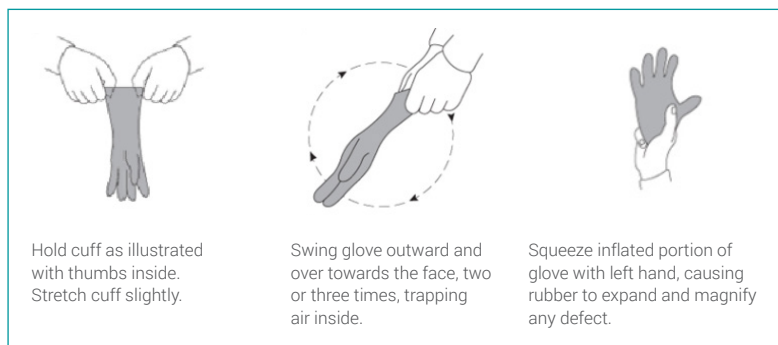
Inspect all PPE for damage and replace if the protection is compromised. If possible, don and inspect equipment with a partner so that each person can check the proper use and fit of the other person's equipment.

1. Remove any jewelry, watch, mobile phone and other metallic items that could chemically interact with mercury; also cover any metal frames on eyeglasses with plastic wrap or tape before putting on PPE.
2. Put on protective suit, placing feet carefully in the leg/foot part of suit so as not to rupture the suit.
3. Put on boots and pull suit legs down over the tops of the boots.
4. Put on the appropriate respiratory protection, ensuring an adequate fit over nose and mouth.
5. Put on safety glasses.
6. Put on gloves, ensuring that the gloves are pulled up over the sleeves of the suit.
7. Inspect PPE to ensure integrity and proper fit of the equipment.

## Procedure for Doffing PPE

Inspect all PPE for damage or contamination. If possible, remove equipment with a partner to permit a more thorough inspection, and to ensure that proper removal procedures are observed.

1. Remove apron (if applicable).
2. Remove safety glasses.
3. Remove respirator.
4. Remove boots.
5. Remove gloves.



**Figure 11. Testing rubber or synthetic gloves for pin holes or other leaks.**

6. Remove suit or coveralls by carefully grabbing them by the inside surfaces so as to avoid touching the outer (possibly contaminated) surfaces with hands.
7. Wash hands thoroughly.
8. Inspect PPE again and discard or decontaminate any equipment that is compromised.



*Figure 12. Main personal protective equipment (PPE) for mercury.*

## Mercury Spill Kit

Any spillage of mercury or mercury contaminated waste, even small droplets, should be considered hazardous and cleaned up with caution. Workers should prepare for clean-up by getting the mercury spill kit (see below) and putting on the necessary PPE.

Equipment needed to deal with spills or releases of elemental mercury or mercury contaminated waste should be kept in a readily accessible location and in good working order. The spill kit, PPE and wash area should be near (but, if possible, not in) the storage area. The type of equipment on hand should be appropriate to the size of the facility and the quantity of mercury in storage. Such equipment may include sorbent materials, chemical reagent products that can be applied to elemental mercury spills to reduce its liquidity or mobility, shovels and other tools for picking up spilled materials, and containers in which to place cleaned-up materials. Never use a vacuum cleaner or broom to clean up a mercury spill.<sup>3</sup>



*Figure 13. Some spill cleanup materials.*

The basic mercury spill kit should include the following items, to the extent possible:

- Step-by-step clean-up procedure in the form of a guide
- Flashlight
- Small plastic scoop and dustpan
- 2 silicone spatulas
- Tweezers
- Eyedropper or syringe (without the needle)
- Duct tape or sticky tape
- “DANGER: MERCURY WASTE” labels to put on waste containers
- Air-tight, sealable plastic bags (small and large sizes with thickness of 2 to 6 mils (50 to 150 microns), such as heavy-duty sealable freezer bags)

<sup>3</sup> A vacuum cleaner will not only be difficult to decontaminate, but it will also heat and diffuse more mercury vapor into the air. A broom will break the mercury into smaller droplets, increase the spread of mercury in the area and also increase the level of mercury vapor in the air.

- Air-tight, puncture-resistant, rigid plastic or steel (not aluminum) jar or other container with a wide opening
- Empty 2.5-liter steel mercury storage flask
- Regular plastic waste bags with thickness 2 to 6 mils (50 to 150 microns)
- Plastic tray or wash basin with round corners and edges
- Spill and vapor suppression agents such as sulfur powder, zinc or copper flakes, commercial absorbent pads or mercury vapor suppressants
- Brush to gather powder or flakes
- Alcohol, vinegar, or peroxide-soaked swabs
- A signed sheet indicating when materials were used and replenished



*Figure 14. Spill and vapor suppression materials: (a) copper flakes; (b) sulfur powder; (c) sealable plastic bags.*

## Mercury Spill Response

Every mercury spill should be documented and, if more than a few milliliters of mercury, reported to government authorities if required by relevant regulations. If there is any uncertainty as to whether a spill should be reported to the authorities, it would be advisable to report it. Documentation of any mercury spill should include the type of mercury or mercury wastes spilled, the location, dispersal and approximate amount of mercury or mercury wastes spilled, the date, time, names of the persons who observed and documented the spill, the proximity of the spill to human habitations and environmentally sensitive areas, and the cleanup procedure employed.

Familiarity with the necessary cleanup resources and available cleanup materials is critical to properly responding to a mercury or mercury waste spill. If the spill is small and on a non-porous surface (such as linoleum or an epoxy painted floor), it can be readily cleaned up by facility workers and disposed of in an environmentally sound manner. If the spill is larger or goes into cracks or crevices, it may be necessary to hire someone with suitable professional training if special expertise is not available at the storage facility. Under certain circumstances that should be outlined in the emergency response plan, it may be advisable to obtain the assistance of qualified professional clean-up or air monitoring personnel regardless of the spill size.

General spill response guidelines are outlined below.

Meanwhile, there are a number of things that should NOT be done in response to a mercury spill:

- Do NOT use a vacuum cleaner or broom to clean up spilled mercury – they will simply spread the mercury farther and increase the mercury concentration in the air.
- Do NOT wash contaminated clothing or fabrics in a washing machine – they will contaminate the machine and wastewater.
- Do NOT pour mercury down the drain – it will contaminate the plumbing system and septic or sewage treatment system for years to come.
- Do NOT get mercury on the bottom of your shoes, which will spread the mercury to other areas – use disposable shoe covers or decontaminate your shoes.

## Mercury Spill Protocol

If a mercury spill is minor (e.g., a few drops, broken thermometer, etc.) and can be easily and properly cleaned up by workers at the scene, management should be informed and the spill should be documented, but there is no need to carry out every detail of the following procedure, which may be used simply for guidance. If a mercury spill is more significant, however, this procedure should be followed to the extent possible.

1. Keep the facility secured until management has been informed and authorizes a response.
2. Ensure that all persons who were near the spill are safe and receive any needed medical treatment.
3. Remove watches and jewelry to avoid mercury reacting with any metals.
4. Put on appropriate PPE –apron or coveralls, shoe covers, rubber or nitrile gloves, eye protection and respiratory protection.
5. Turn on fume hoods, fans or other ventilation, as available.
6. Make sure the facility is secure and identify the extent and distribution of the spill.
7. Determine the appropriate response including the possible need to evacuate, the availability of trained personnel and equipment, and possible immediate actions.
8. If the clean-up is within the capabilities of the on-site team, then proceed to clean up the spill as below. If not, follow the emergency management plan.
9. Bring the spill kit to the edge of the affected area.
10. Place a wide-mouth container on the plastic tray.
11. Begin at the outer edge of the spill and clean inward towards the center of the spill.
12. Use the tweezers to pick up broken glass or contaminated loose material and place in sealable plastic bags.
13. Remove visible balls and pools of mercury using spatulas to slide mercury into the dustpan and then into the container.
14. Use the eye-dropper or syringe to suck up small mercury beads and eject them carefully into the container.
15. Shine the flashlight at a low angle to see reflections of tiny mercury droplets.
16. Use sticky tape to pick up tiny droplets and place the tape with the mercury in a sealable plastic bag.
17. Sprinkle sulfur powder, zinc or copper flakes on cracks, floor crevices and hard surfaces that have come in contact with mercury.

18. Use a brush to collect the powder or flakes and put them in a sealable plastic bag.
19. Wipe the affected area with vinegar-soaked or peroxide-soaked swabs.
20. Remove contaminated soft material, if any – use a knife to cut out contaminated carpets, rugs, etc. – and put in a sealable plastic bag or container.
21. Clean out any drains that may have received contaminated wastewater – carefully collect any mercury in the drain trap, transfer it to an air-tight container and then replace the trap.
22. Place all contaminated material in leak-proof, sealable plastic bags to be stored or disposed of as mercury waste.
23. Label and seal all contaminated material put in storage.
24. Wash hands and all exposed skin with soap and water.
25. Ventilate the spill area with fans to volatilize residual mercury and to blow contaminated air to the outside for at least 48 hours.
26. For facilities with central ventilation, increase air exchange rates for several days.
27. Conduct medical monitoring for any workers or others who were exposed to high levels of mercury vapor.
28. Write a report on the spill incident and recommend improvements to prevent future spills.
29. After a spill has been cleaned up, replace spill kit contents that have been used.

A very useful video in Spanish (Limpieza y almacenamiento temporario de residuos de mercurio) on mercury spill preparedness and response may be seen at:  
<https://www.youtube.com/watch?v=Ry5SbkKv96o>

## Mercury Collection Protocol in the Field

As described in the section on “temporary storage containers”, it is recommended to repackage inadequate or substandard containers in the field in double sealable plastic bags inside a sealable plastic or metal container filled with sorbent material. This should prevent spills during transport from the field to the storage facility, and would also be appropriate for interim storage of the received material and would avoid the need to transfer liquid mercury to other containers. The following protocol details the process for safely collecting mercury in the field and bringing it to a storage facility.

1. Upon arrival at a mercury collection site in the field, a mercury receiving area should be prepared in a well ventilated, covered area by placing a thick plastic liner with taped seams on the ground. Sandbags under the outer edges of the plastic will create low walls over which mercury droplets cannot escape. The receiving area should be marked with caution tape and signs stating that only authorized personnel are permitted in the area. Ideally, personnel entering the receiving area should wear full PPE (masks, tyvek suits, boots, safety glasses, etc.); however, if this equipment is not available, personnel must be extremely careful to minimize mercury exposure.
2. The receiving area should have a sturdy plastic covered table in the middle, with a plastic wash basin (with round corners and smooth bottom with no scratches or grooves) in which seized mercury containers are placed. Adjacent to this, clean and empty wide-mouth containers should be placed, as well as sealable plastic bags.
3. Collection should be done in teams of at least two persons so that one can document the process and serve as a monitor for any actions that might warrant subsequent cleanup.
4. Absorbent pads should be placed at the bottom and along the inner sides of the wide-mouth containers as padding and added spill prevention.
5. All containers should be labelled with a unique identifying number and empty weight.
6. The mercury should be photographed in the plastic wash basin in the containers in which it was found or confiscated. The photographs should be part of the dossier, along with a photo of the documents, and should be sent, to the next recipient of the mercury.
7. The mercury should be weighed on a dedicated scale placed inside the plastic wash basin.
8. Mercury should be kept in the vessels in which it is found, whether they are sealable plastic bags or plastic bottles or otherwise. The

vessels should be placed inside two sealable plastic bags, one inside the other, which are then placed this into the absorbent-pad-lined container. Many items can be put into the same container, as long as it is not filled more than 80% full.

9. Items in the container should be separated with absorbent pads, and other absorbent materials or granules may be placed around them to fill all voids. This will keep them from moving around during transport and will contain any possible spills.
10. The containers should be tightly closed and sealed. The containers should be taped where they are sealed, and then signed and dated in a way to indicate whether the containers have been opened before reaching their destination.
11. Workers involved in the transfer must sign the documentation or transport manifest to guarantee the accuracy of its contents. The manifest must state the weight of mercury in each container and the identifying code of each container. The manifest must also include the location, date and time of the transfer, as well as the date and identifying code of the collection or seizure operation. The manifest must be made in duplicate so that one copy remains with the authorized personnel (PNP, DICAPI) or FEMA (seizing organization) and the other copy (showing chain of custody) will remain with the mercury until its final disposal.
12. the containers should be placed in a crate that is securely fastened to the transport vehicle. The sides and bottom of the crate should be covered with absorbent pads which may also be used to fill voids between the containers to stop them from moving during transport.

## Mercury Vessel Transfer Protocol

This protocol is to guide personnel in situations where a more substantial quantity of mercury in substandard containers may have to be dealt with. If one follows the guidelines in the section on “temporary storage containers,” repackaging of a large number of substandard mercury containers could take up a large amount of storage space, so it may be advisable to transfer the mercury into standard steel mercury flasks.

For example, if the authorities were to come into possession of a significant quantity of mercury during a seizure operation, and if there is no locally available mercury storage facility, a special mercury transfer site could be set up using the following protocol, which outlines a process for safely transferring mercury from substandard containers to steel flasks at an interim storage facility or in the field:

1. The mercury transfer site should be established in a well ventilated, covered area by placing a thick plastic liner with taped seams on the ground. Sandbags under the outer edge of the plastic will create low walls over which mercury droplets cannot escape.
2. The mercury transfer area should be marked with caution tape and signs stating that only authorized personnel are permitted in the area.
3. All personnel entering the area should wear full PPE (masks, Tyvek suits, boots, safety glasses, etc.).
4. The mercury transfer area should have a sturdy plastic covered table in the middle, with a plastic wash basin (with round corners and smooth bottom with no scratches or grooves) in which seized mercury containers are placed. Adjacent to this, clean and empty 2.5-liter mercury flasks should be placed. These flasks should be labeled with a unique identifying number and empty weight.
5. The mercury should be photographed in the plastic wash basin in the containers in which it was found or confiscated. The photographs should be part of the dossier, along with a photo of all documentation, and should be sent to the next recipient of the mercury.
6. The mercury in the containers in which it was found or confiscated should be weighed on a dedicated scale placed inside the plastic wash basin. Then the empty containers must be weighed in order to determine the net weight of the mercury.
7. A dedicated stainless steel funnel, to be always stored in the plastic wash basin, should be used to transfer the mercury from the standard containers into the mercury flasks.
8. Careful transfer of the liquid mercury should be done in teams of at least two persons so that one can document the process and serve as a monitor for any actions that might warrant subsequent cleanup.
9. Empty plastic bags, bottles, and other containers in which the mercury was found should be placed in a sealed garbage bag, labeled as toxic waste and shipped along with the mercury.
10. Once the mercury has been transferred to secure flasks, the flasks should be sealed with tamper-proof security tags such as those used to secure mercury flasks in the formal gold mining industry.
11. All weights of mercury and containers should be logged on the transport manifest forms, as well as the names and signatures of all parties involved in the transfer operation.
12. The mercury flasks should then be crated for transport and the crate(s) marked with the number and identifying codes of all contents. The manifests should be placed in the crate(s) with the mercury and sealed with tamper-proof tags that must be intact at the time of delivery.

## Traceability and mass balance

A mass balance of the mercury wastes held, transferred, transported, and received must be performed and recorded at each change of custody (taking into account any emissions or losses, with justifications when significant). This involves weighing each container and ensuring that it matches the weight when shipped. Weighing should take place in a well ventilated area on a workbench and ideally under a fume hood. Tamper-proof seals should be inspected to ensure that the container was not opened nor the contents disturbed. The tracking records are kept by each of the involved actors to allow the local and/or national authorities to inspect the chain of custody from the initial holder to the final destination.

Standard transport manifests list all the important information required for tracking shipments. When mercury is packaged for storage at the same site, the contents of the package should be recorded and copies kept with the package itself as well as in the administrative files of the facility. If there is no standard recordkeeping method specified, the following shows the minimum records that should be kept.

Date	Collection location	Name of collector and organization
11 December 2020	Puerto Maldonado	Alvaro Sánchez

Comments:

Security tag number	Total weight	Description
90304456	24 kg	Three small bottles of mercury.
90304457	15 kg	Plastic bags of mercury, mercury contaminated objects.

*Table 1. Basic records for tracking a shipment of mercury*

Mercury is often transported in small packages due to its density, and standard paper manifest forms have a limited number of rows on which to list each package. Therefore, multiple manifest forms may have to be used, in which case the total number of manifest forms in the shipment should be listed on each form, for example, “Form 1 of 4.”

# Transport

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It is critical that mercury is managed safely and in a manner that ensures traceability and security. Mercury storage and handling operations have been covered in the previous sections. This section describes procedures to protect workers and prevent releases during mercury transport and related operations.



# Regulations and Registrations

According to the regulatory framework in Peru, mercury is on the list of hazardous materials and is a controlled product; therefore, any company that transports mercury or mercury wastes must adhere to a number of regulations and conditions regarding the transport of hazardous materials:

In accordance with Peru's Law No. 28256, mercury and mercury waste must be handled in accordance with regulation DS 021-2008-MTC (Aprueban Reglamento Nacional de Transporte de materiales y residuos peligrosos), 4 which imposes the following restrictions:

- All companies transporting mercury must be enrolled in the Register for the Control of Auditable Assets (RCBF) that is administered by the National Superintendency of Customs and Tax Administration (SUNAT).
- All companies transporting mercury must hold a Special Operating Permit to Provide Land Transport Service of Hazardous Materials and/or Wastes by Road, granted by the General Directorate of Land Transport (DGTT); each mercury transport vehicle must be re-registered every 5 years.
- Each mercury transport vehicle must be closed and equipped with a GPS tracking system to indicate its location at any given time.
- All companies transporting mercury must have a Contingency Plan approved by the Ministry of Transport and Communications (MTC), as further described below.
- Vehicles transporting mercury must display on all four sides of the vehicle the appropriate risk labels and safety panels indicating the transport of hazardous material and/or waste.
- Any company sending mercury to another destination must provide the transport company in advance with a Reference Guide prepared in accordance with the standards issued by the SUNAT, as well as the mercury Material Safety Data Sheet (MSDS), in Spanish.
- Before starting the journey, any vehicle carrying mercury to another destination must have a transport plan, as further described below.
- Each mercury transport company must have insurance to cover potential personal, material and environmental incidents during transport.

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4 DS 021-2008-MTC is based on the UN Model Regulation for Road and Rail Transport of Dangerous Goods (UN # 2809 Class 8, Subsidiary risk 6.1, Packing group III).

The UN Model Regulation for Road and Rail Transport of Dangerous Goods suggests the following labelling for the transport of mercury:

- Pictograms GHS06, GHS08 and GHS09 should all be affixed to containers used for transporting mercury.
- As further detailed below, labels indicating Corrosive Class 8 and Class 6.1 Toxic (as well as the “fish and tree” pictogram recommended by the UN Model Regulation) should be affixed to the transport vehicle.



*Figure 15. Examples of dangerous goods marking and labeling: GHS06, GHS08, GHS09, Corrosive Class 8, Class 6.1 Toxic, “fish and tree” pictogram.*

## Contingency Plan

Before starting operations, any company transporting mercury must have a contingency plan. The contingency plan must be approved by the General Directorate of Socio-Environmental Affairs (DGASA) of the MTC. The contingency plan details all of the procedures required to transport mercury, and includes an emergency management plan that describes measures that will be taken to minimize the environmental impacts associated with vehicle accidents, spills, fires and other possible incidents.

## Vehicle Specifications

Any vehicle used for the transport of mercury must meet all requirements indicated in the National Vehicle Regulations, including amendments. Vehicles used for transport of mercury must also be equipped with basic elements for emergency response, such as a fire extinguisher, protective clothing, flashlight, first-aid kit, spill kit, collection and cleaning equipment, and absorbent material. Moreover, special provisions under Peruvian law regarding transport of hazardous substances require that one fire extinguisher must be located in the cab, and a second fire extinguisher should be placed near the mercury cargo. General requirements for the transport vehicle include:

- Proper registration.
- Valid inspection or equivalent periodic control.
- Closed design, correct size for the intended load.
- Bulkhead between driver cabin and vehicle body.
- System to keep load secure during transport.
- Spill kit, first-aid kit, fire extinguishers.
- Appropriate hazardous material transport signs.
- Route plan, contingency plan, emergency phone, etc.
- GPS equipment for permanent monitoring of the vehicle from origin to destination, and effective communication with the carrier base.
- Tamper-proof measures to ensure that the contents of the transport vehicle were not opened or disturbed.

## Transport Plan

Before starting the journey, the driver of the vehicle must have a transport plan that includes the following:

- Time of departure.
- Expected arrival time at the final destination.
- Route plan authorized by the MTC.
- Material safety information for mercury, in Spanish.
- List of emergency phone numbers of the recipient as well as regional committees and / or local emergency care, located along the transport route.
- List of checkpoints along the authorized route, where SUNAT and other agencies check documentation.

The driver must comply with the schedules established for the transport of dangerous cargo, and speeds will also be controlled in high-risk places. The vehicle and load should be inspected at mandatory stops indicated on the route plan, as well as the driver's fitness (especially to ensure lack of fatigue). The progress of the transport vehicle should be reported periodically with supporting images, in addition to any incidents or events occurring in route. In case of an incident or emergency, the situation must be evaluated and actions taken according to the contingency plan. The provincial authorities should identify alternate routes in urban areas, as well as places for parking on the municipal road network.

## Emergency Management Plan

The Contingency Plan mentioned above, and required by government regulations, includes a matrix for the identification of potential hazards and risks during transport, and describes how such risks will be managed. Within the Contingency Plan the transport company needs to develop an emergency management plan, which includes more detailed predictive, preventive and reactive measures to deal with any foreseeable incident during mercury transport, including vehicle loading and unloading, and to mitigate the impact of any such incident on the population and the environment. If an incident occurs during transport, the carrier and, where appropriate, the sender of the hazardous materials are responsible to:

- a) Execute the emergency management plan.
- b) Report the event to the DGAAM of the MTC, who will coordinate the response with the relevant authorities.
- c) Within 2 days of the event, present a written report of the event and of the response measures taken.
- d) Within 7 business days of the event, send the DGASA of the MTC a report on the measures taken to remedy any damage, using an official pre-established form. Depending on the nature and severity of the event, it will be formally classified as either an incident, an emergency or a crisis.

As a valuable resource, the (online) Emergency Response Guidebook<sup>5</sup> is widely used by firefighters, police and other emergency services who are usually the first to arrive at the scene of a hazardous materials transportation incident.

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<sup>5</sup> The PHMSA (U.S. Department of Transportation Pipeline and Hazardous Materials Safety Administration) 2020 Emergency Response Guidebook provides first responders with a go-to resource to help deal with hazmat accidents during the critical first 30 minutes.

## Vehicle Labeling

The basic vehicle pictograms for mercury are Corrosive Class 8 and Class 6.1 Toxic, and the UN also recommends the “fish and tree” pictogram. The panels must be made with reflective material, black and white, 25 cm by 25 cm minimum, and must be installed in a visible location on all four sides of the transport vehicle:

- Class 8: Two test tubes dripping onto a metal plate and a hand, including the word CORROSIVE and the number 8 corresponding to the hazard class.
- Class 6: Skull and crossbones, the word TOXICO and number 6 at the bottom.



Figure 16. Panels to be displayed on a Class 8 (6.1) vehicle: Corrosive Class 8, Class 6.1 Toxic, “fish and tree” pictogram.

The other label required is an identifier of the UN corresponding to mercury, i.e., number 2809 in reflective paint, with orange background, black numbers and black borders. This label must be installed on the front and back of the vehicle.

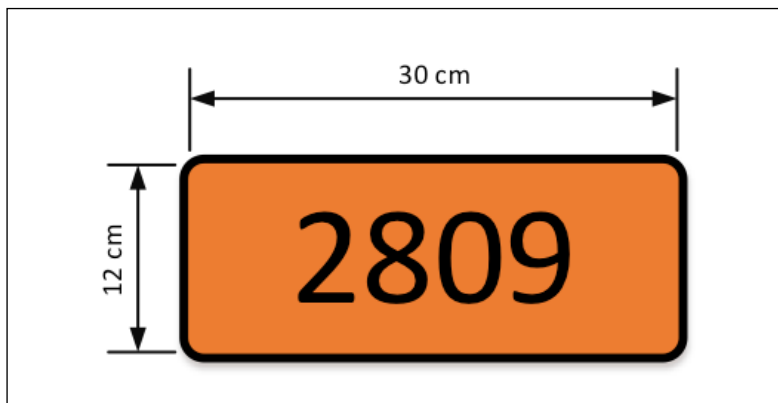


Figure 17. Vehicle class identification label.

# Tracking

## Check-list

Before setting out, all vehicles must be inspected by the safety or emergency teams to ensure that vehicles are in adequate working condition and that personnel have sufficient PPE and other resources to address possible incidents. A checklist should be used and the inspection team should document the inspection results according to the checklist. There must also be an inspection and maintenance schedule for emergency equipment. Generally, the PPE in transport vehicles should be inspected every 30 days to ensure that there is sufficient and appropriate equipment available.

## Records

All containers being shipped should be tamper-proof and marked with unique identifying codes that are recorded in an official manifest to enable verification and prevent tampering. At the very least, the container lid should be taped across the seal, and signed and dated on the cover edge and the edges of the tape in a way that part of the signature is written on the container itself.

Transport of mercury requires detailed documentation from departure to final destination. Storage facility or field records should show the weight of mercury and/or mercury waste prior to transport. A manifest or consignment note then accompanies the movement of the mercury and shows the chain of custody. The chain of custody shows the signatures of the individuals who handled the mercury and/or waste from the shipper to the destination facility, as well as the names of the managers representing the shipper, carrier and destination facility. Copies of the manifest or shipping note, among other documents, should be kept by the shipper, carrier, and destination facility, including:

- Vehicle: vehicle registration, vehicle type and body, vehicle ownership.
- Load: materials carried, UN number, quantity, weight, name of the shipping party, municipality of origin, municipality at destination, certification that the shipment is in compliance with all regulations.
- Incidents and emergencies: emergency response telephone number, and a record of any incidents during the transport.

As part of the chain of custody, a mass balance of the mercury wastes transported must be carried out at each change of custody, justifying any changes or variations in the weight, security, etc., of the shipment. This involves weighing each container and ensuring that it matches the weight when shipped. Tamper-proof or other seals should be inspected to ensure that the vessel was not opened and the contents disturbed. Tracking records, as shown previously, are kept by each of the involved parties to allow the local and/or national authorities, if they wish, to trace the shipment from the initial shipper to the final destination.

Upon arrival at the final destination, the transport vehicle should be visually inspected for any obvious leaks or other signs of elemental mercury, and any suspected mercury leaks should be documented and reported in line with relevant procedures.

## Transportation Protocol

Consistent with the above guidance, the basic protocol for initiating mercury transport may be summarized as follows:

1. Verify that the mercury and mercury waste to be transported meet the requirements for acceptance at the destination facility.
2. Verify the quantity (mass) of elemental mercury and wastes to be transported.
3. Verify the type and number of packages to be shipped.
4. Ensure all national regulations for the shipment and type of packaging are met. These include, but are not limited to, mass requirements, container filling level requirements and closure requirements.
5. Mark and label the loaded containers as follows:
  - Indicate the contents and weight.
  - Indicate UN mercury identifying number 2809.
  - Provide shipper and receiver names and addresses.
  - For liquid mercury, the “Corrosive” label should be affixed near these markings, if container dimensions are large enough.
  - If mercury waste is being shipped, the following label must be applied, and should remain visible at all times during transport:

<p style="text-align: center;">HAZARDOUS WASTE NATIONAL LAW PROHIBITS IMPROPER DISPOSAL If found, contact the nearest police or public safety authority</p>
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6. Place marked/labeled containers on appropriate pallets.
7. Verify that the information on the manifest and all other administrative forms are complete and copies kept by all parties.
8. Notify the destination facility of impending shipment.
9. Ensure that the carrier is aware of and qualified to transport hazardous waste, and complies with all relevant regulations.
10. Ship the mercury and/or mercury wastes to the destination facility specified in the manifest, and ensure that the route and the final destination do not change EXCEPT after prior communication and approval from the SUNAT.

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