



**COMMENTS OF THE ZERO MERCURY WORKING GROUP ON  
THE DRAFT GUIDELINES FOR THE INTERIM STORAGE OF MERCURY UNDER ARTICLE  
10 OF THE CONVENTION  
June 2018**

The Zero Mercury Working Group<sup>1</sup> appreciates the opportunity to submit the following comments, in the form of track changes and margin notes, directly on to a copy of the draft guidelines (circulated by the interim secretariat of the Minamata Convention) below. Our input is intended to clarify, focus and strengthen the draft to better protect people and the environment during the interim storage of mercury and mercury compounds.

**Draft guidelines on the environmentally sound interim storage of mercury, other than waste mercury**

I.	Introduction.....	2
II	Overall management of hazardous substances .....	2
III.	Scope of the guidelines .....	3
IV.	Good practices for storage .....	5
A.	Location.....	5
B.	Construction of storage sites, including provision of barriers .....	5
C.	Physical conditions at storage sites .....	6
D.	Containers for the storage of mercury, including secondary containers .....	6
E.	Logging and tracking of mercury movements .....	8
G.	Education and training of staff .....	8
H.	Timetables for repair, testing and maintenance .....	9
I.	Emergency measures, including personal protective equipment.....	9
J.	Inspection and monitoring .....	11
V.	General guidance on storage of mercury and mercury compounds .....	11
A.	Health and safety .....	11
B.	Public health and safety .....	11
C.	Worker health and safety .....	11
D.	Standards for the identification of stocks.....	12
VI	Information regarding transport of mercury and mercury compounds.....	12
	References and other resources .....	14

<sup>1</sup> The **Zero Mercury Working Group** is an international coalition of over 95 public interest environmental and health non-governmental organizations from more than 50 countries from around the world formed in 2005 by the European Environmental Bureau and the Mercury Policy Project.

## I. Introduction

1. The Minamata Convention on Mercury is a global legally binding instrument with the objective of protecting human health and the environment from anthropogenic emissions and releases of mercury and mercury compounds. The Convention contains obligations relating to mercury emissions and releases resulting from all stages of mercury use, including supply, trade, use, waste and contaminated sites. There are specific obligations relating to the environmentally sound interim storage of mercury and mercury compounds other than waste mercury, which are set out in article 10 of the Convention. These obligations relating to interim storage are different to the requirements for the environmentally sound management of mercury wastes, which are set out in article 11.
2. The Convention stipulates that the Conference of the Parties shall adopt guidelines on the environmentally sound interim storage of mercury and mercury compounds within the scope of article 10. The guidelines shall take into account any relevant guidelines developed under the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and Their Disposal and other relevant guidance. On this basis, the following guidelines have been prepared, in line with the request made by the intergovernmental negotiating committee to prepare a global legally binding instrument on mercury at its seventh session, and in consultation with relevant experts.
3. The guidelines do not establish mandatory requirements or attempt to add to, or subtract from, a party's obligations under the Convention, in particular article 10 of the Convention. However, in taking measures to ensure that the interim storage of mercury and mercury compounds is conducted in an environmentally sound manner, the party is to take into account any guidelines adopted by the Conference of the Parties. The Conference of the Parties may decide to adopt requirements for interim storage in an additional annex to the Convention, in accordance with Article 27.

## II Overall management of hazardous substances

4. To address the environmentally sound management of hazardous substances being stored within their territory, parties may consider developing and implementing chemical management plans (which may include legislation, regulations, policies, agreements with industry, agreed standards, or any combination of these or other management mechanisms). Mercury and mercury compounds that are being "stored", in accordance with article 10, should be included in any such management plan. In order for a party to understand its needs for the interim storage of mercury and mercury compounds, it may be useful for that party, during the development of its implementation activities, to identify the mercury and mercury compounds that are being held in its territory, and to acquire a general understanding of the quantities of mercury and mercury compounds being stored in each location to facilitate safe and appropriate storage. Such information can also contribute to the establishment of appropriate safety measures and regulatory inspection, as well as to the preparation of emergency response plans.
5. In relation specifically to mercury or mercury compounds, a national mercury inventory can provide useful information for all aspects of the implementation of the Minamata Convention. Article 3 of the Convention requires parties to endeavour to identify individual stocks of mercury or mercury compounds exceeding 50 metric tons, as well as sources of mercury supply generating stocks exceeding 10 metric tons per year that are located within their territories. Parties may find it useful also to identify smaller stocks or supplies of mercury as part of their overall management of mercury and include these in their national inventory. Through the identification of any uses of mercury within its territory, a party may be able to estimate the approximate quantities of mercury that may require storage. It should be noted that the intended use of stored mercury may not always be known. The United Nations Environment Programme (UNEP) *Toolkit for Identification and Quantification of Mercury Releases*<sup>2</sup> or other national methodologies may provide parties with additional resources or information that may be of assistance. While the main aim of the toolkit is to assess emissions and releases, it may be a valuable source of information on uses of mercury at the national level.
6. The guidance on the identification of stocks adopted at the first meeting of the Conference of the Parties, may contribute to the establishment of an information registry on mercury at the national level, which may assist with safety and regulatory inspection, as well as with the preparation of

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<sup>2</sup> Available at: <https://wedocs.unep.org/bitstream/handle/20.500.11822/14777/Hg-Toolkit-Guideline-IL1-January2017.pdf?sequence=1&isAllowed=y>.

emergency response plans consistent with national regulations or legislation. At a minimum, a registry of sites approved for the interim storage of mercury may be needed to ensure that storage is undertaken in an environmentally sound manner.

### III. Scope of the guidelines

7. These guidelines are intended to provide guidance for the environmentally sound interim storage of mercury and mercury compounds intended for a use allowed to a party under the Convention. Under the Convention, certain uses of mercury are not allowed after a certain date (e.g. certain mercury-added products after a phase-out date as specified in annex A under article 4 of the Convention). All uses of mercury not specified in the Convention as being not allowed are considered to be allowed to a party under the Convention.

8. These guidelines do not consider options for final or permanent storage, or for stabilization or solidification, of mercury. Those options are considered to relate to the environmentally sound management of mercury waste, and are covered in the technical guidelines for the environmentally sound management of wastes consisting of, containing or contaminated with mercury or mercury compounds developed under the Basel Convention (UNEP, 2015).

9. Article 10 covers the interim storage of mercury and mercury compounds as defined in article 3 of the Convention that are not covered under the definition of mercury wastes as set out in article 11. On the basis of the definitions in article 3, article 10 covers the following:

- (a) Mercury (elemental)
- (b) Mixtures of mercury with other substances, including alloys of mercury, with a mercury concentration of at least 95 per cent by weight;
- (b) Mercury compounds: mercury(I) chloride (known also as calomel), mercury(II) oxide, mercury(II) sulphate, mercury(II) nitrate, cinnabar and mercury sulphide.

10. Additionally, as mercury and mercury compounds falling within the definition of mercury wastes under article 11 of the Convention are not covered by article 10, thus article 10 does not cover:

Substances or objects:

- a) consisting of mercury or mercury compounds,
- b) containing mercury or mercury compounds; or
- c) contaminated with mercury or mercury compounds

in a quantity above the relevant thresholds defined by the Conference of the Parties, in collaboration with the relevant bodies of the Basel Convention in a harmonized manner, that are disposed of or are intended to be disposed of or are required to be disposed of by the provisions of national law or the Minamata Convention. This definition excludes overburden, waste rock and tailings from mining, except from primary mercury mining, unless they contain mercury or mercury compounds above thresholds defined by the Conference of the Parties.

11. Under the Convention, each party shall take measures to ensure that the interim storage of mercury and mercury compounds intended for a use allowed to a party under the Convention is undertaken in an environmentally sound manner, taking into account any guidelines and in accordance with any requirements adopted. The Convention does not include a definition of the term “interim”. The English word “interim” is commonly understood to mean “in or for the intervening period; provisional or temporary”. In the case of the Minamata Convention, it may therefore apply to the period between the mercury being generated or acquired and it being used for a use allowed under the Convention. This guidance also includes for information purposes a section on the transport of mercury and mercury compounds.

12. The Basel Convention defines the “environmentally sound management of hazardous wastes or other wastes” as “taking all practicable steps to ensure that hazardous wastes or other wastes are managed in a manner which will protect human health and the environment against the adverse effects which may result from such wastes”.

13. Extrapolating from this definition, the environmentally sound storage of mercury and mercury compounds, other than waste mercury, may be considered to be storage in which all practicable steps are taken to ensure that the mercury or mercury compounds are managed in a manner that will protect

human health and the environment against the adverse effects which may result from such mercury and mercury compounds.

14. While no strict definition of the maximum storage time is established for “interim storage”, in line with the common use of the English word “interim” to mean “provisional” or “temporary”, a party may wish to establish at the national level the maximum duration of storage that may be considered “interim” storage.

15. Within the provisions of a legally binding instrument, the Party has consented to be bound by the obligations contained within the Convention. However, at a national level, a Party may allocate responsibility for actions in relation to these obligations to entities operating within its territory. As the mercury and mercury compounds covered are considered to be “commodity” substances (as opposed to waste) it may be appropriate for the responsibility for the environmentally sound interim storage of the mercury or mercury compounds to be carried out by the owner or custodian of the mercury or mercury compounds, or the entity that will gain commercial benefit from its use, under controls set out by the Party. A formal agreement between the owner of the mercury or mercury compounds and the management of the storage facility may be required to formally delegate responsibility for the environmentally sound management of the mercury. It should be noted that storage facilities may be privately owned or publicly owned, either nationally or on a regional basis. The authority to operate an interim storage facility may be granted by the relevant national authority, and may specify quantitative limits for the amount of mercury to be stored along with relevant facility requirements. Nevertheless, those entities that are not covered should be encouraged to follow these guidelines.

16. The Convention does not specify the amount of mercury or mercury compounds that may be stored. The guidelines for interim storage therefore cover all quantities of mercury or mercury compounds that may be stored prior to use. In certain jurisdictions, the same controls apply nationally for any quantity of mercury, where for others there may be different rules and standards applying depending on the quantity stored. It is recognized that the guidelines may need to be applied flexibly in accordance with the requirements of specific sites. As is noted above, article 3 of the Convention, on mercury supply sources and trade, specifies that each party is to endeavour to identify individual stocks of mercury or mercury compounds exceeding 50 metric tons, as well as sources of mercury supply generating stocks that exceed 10 metric tons per year, that are located within its territory. Guidance on the identification of such stocks and sources of supply is available in a separate guidance document, which was adopted by the Conference of the Parties at its first meeting. (available at: <http://mercuryconvention.org/Convention/Formsandguidance/tabid/5527/language/en-US/Default.aspx>.)

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16.17. It is anticipated that the quantity maintained in storage will be commensurate with its intended use and will be the amount of mercury or mercury compounds considered necessary by the party to meet the requirements of the domestic activities undertaken in accordance with the Convention, use in allowed mercury-added products or processes using mercury, or using mercury in artisanal and small-scale gold mining (ASGM). In the case of ASGM, the quantities of mercury stored should be commensurate with the baseline inventories, and with reduction activities and targets specified in the article 7 national action plan, where required. The national action plan may also address how the article 10 storage obligation (taking into account these guidelines) is to be applied for ASGM-related activities and sites. The 2008 UNIDO Technical Guidelines on Mercury Management in Artisanal and Small-Scale Gold Mining recommends that metallic mercury should be stored safely at all times when not used; in (a) a secure location that is inaccessible to children; and (b) unbreakable air-tight containers that are covered with a thin layer of water (e.g. 1 centimetre) to prevent mercury evaporation. Mercury should NOT be stored in a domestic residence (UNIDO, 2008). Countries developing their ASGM National Action Plans should reference the UNEP Guidance document for Developing a National Action Plan to Reduce and, Where Feasible, Eliminate Mercury Use in Artisanal and Small-Scale Gold Mining. Where mercury is produced as a byproduct (such as from mining processes), the quantity available may not be directly related to the quantities intended for use, however will be held in interim storage until it is determined whether it is to be used or destined for waste.

17-18. Certain provisions of these guidelines may not be applicable for the interim storage of relatively small quantities of mercury or mercury compounds. As an example, sections IV A and IV B are fully relevant for dedicated storage facilities but not all aspects may be applicable to small storage areas integrated in large industrial plants. Parties should apply the relevant parts of the guidance to such smaller integrated storage activities.

## IV. Good practices for storage

### A. Location

~~18-19.~~ A number of factors should be considered in deciding on the location of storage facilities. A storage facility should have an environmental management system in place. In terms of siting in order to avoid any significant risk of mercury release, where possible storage facilities should not be built in sensitive locations such as floodplains, wetlands, areas with potential for leaching to groundwater, earthquake zones, Karst terrain, complex or unstable terrain or locations with unfavourable weather conditions or incompatible land use. **However, such location limitations may not apply in cases where technical design and legal requirements govern the environmentally sound management of storage facilities.**

~~19-20.~~ In selecting a location for new storage sites, consideration should be given to any requirements under national law, including those pertaining to issues such as zoning or restrictions on use.

~~20-21.~~ It is suggested that public consultations be held to inform the local community about siting criteria and procedures for mitigating any risks associated with storage or mercury or mercury compounds.

~~21-22.~~ Sites should have adequate access for receiving mercury or mercury compounds and discharging them for use. Consideration should be given to factors that may affect site or facility security. At private facilities using mercury or mercury compounds, consideration should be given to the actual location of the mercury storage inside the facility, including ease of access to mercury or mercury compounds. The security of the site should also be considered.

~~22-23.~~ In assessing mercury storage sites, national considerations may lead to certain criteria being used as "exclusion criteria". The presence of such elements would rule out the possibility of using a particular site. Other criteria may be considered, on a national basis, as positive or negative factors but not completely decisive in excluding the site as an option. The assessment of the importance of different criteria may take into account national consideration of circumstances, including a determination of acceptable risks. The importance of the criteria in selecting a suitable site may be related to the site's effect on the stability of storage. Careful consideration should therefore be given to the selections of the location, along with consideration of factors that may impact the siting decision, such as the volume of mercury or mercury compounds expected to be stored at the site, along with the available controls to be able to safely manage the mercury or mercury compounds.

~~23-24.~~ In considering mercury storage sites, consideration could be given to whether national storage sites are necessary or whether commodity mercury or mercury compounds for a number of countries could be stored in centralised storage facilities prior to use. This would be most applicable where there are a number of sited in geographical proximity, but which are in different countries.

~~24-25.~~ Such facilities could be located near a point of import in order to minimize the need for transportation.

### B. Construction of storage sites, including provision of barriers

~~25-26.~~ Storage facilities must meet certain containment characteristics in order to ensure the safe and environmentally sound interim storage of mercury (QSC, 2003). The protection of soil, groundwater and surface water should be carefully considered, particularly in the construction of facilities for the storage of large quantities of mercury. Such protection could be achieved through a combination of a geological barrier and other impermeable barriers.

~~26-27.~~ To the extent feasible, facilities should be dedicated solely to mercury storage and kept completely segregated, particularly from materials incompatible with mercury, to ensure that there is no unnecessary chemical or physical reaction with mercury.

~~27-28.~~ In building a new facility or retrofitting an existing one, consideration should be given to its size, layout and design, floor strength requirements, surface coatings, plumbing and drains, air flow and ventilation, and the acceptable temperature range for storing elemental mercury. The facility's size will depend on the amount of space needed for present and future storage and on the method of storage. Regardless of size, however, storage facilities should meet certain containment characteristics in order to ensure the safe and environmentally sound interim storage of mercury (QSC, 2003).

~~28-29.~~ The storage site should have engineered or natural barriers adequate for protecting the environment against mercury releases and a containment volume adequate for the total quantity of mercury stored (EU, 2011). Facilities should be designed to facilitate the safe handling of containers and might include separate, self-contained areas for loading operations for the shipping and receiving

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**Comment [M1]:** Since the location standards are intended to provide an additional layer of protection should the technology design requirements fail for some reason, the trade-off language in this sentence undermines the principal basis for the location standards, and thus should be deleted. This use of location standards is a basic principle of redundancy built into regulatory frameworks to protect human health.

of containers, and for repackaging operations, as these are the operations most vulnerable to accidents and mercury spillage.

29-30. To reduce the risk of fires, facilities should be constructed of non-combustible materials, and non-combustible materials should be used for pallets, storage racks and other interior furnishings (QSC, 2003).

30-31. The aisles in storage areas should be wide enough to allow for the passage of inspection teams, loading machinery and emergency equipment. Handling areas inside the facility, where mercury or mercury compounds may be transferred between containers, should have negative pressure environments to avoid mercury emissions to the outside of the building. Where indoor air is vented outside, particularly from handling areas, such venting should be done via activated carbon or other mercury capture systems.

31-32. The storage site is best equipped with a fire protection system (EU, 2011). Any emergency response plan should be developed in coordination with the local fire department to ensure that they are sufficiently informed, trained, equipped and otherwise prepared to safely handle any fires at the facility. To further minimize the risk of fire, it is suggested that battery-powered electric forklifts be used to transport the mercury or mercury compounds inside the storage facility (QSC, 2003).

32-33. A drainage and collection system for water discharged from storage sites could be installed within the sites to enable mercury monitoring and ensure mercury is not discharged to water systems. Moreover, monitoring procedures should be established for the operation and post-closure phases of the storage sites so that potential adverse environmental effects of the storage sites can be identified in advance and appropriate corrective measures taken. Storage site development should be guided by the nature of the site, geology and other project-specific factors, as well as appropriate geotechnical engineering principles. Such factors may be less important for sites designed for the storage of small quantities of mercury or mercury compounds.

### **C. Physical conditions at storage sites**

33-34. Storage facility floors should be designed to withstand 50 per cent more than the total load from the mercury or mercury compounds being stored and should not be penetrated by any drains or plumbing. Sloped floors and open-flow gutters with rounded-down edges can be used to avoid trapping mercury or mercury compounds under gutter covers and to facilitate the collection of spills. The floors of storage facilities should be covered with mercury-resistant materials, such as an epoxy coating, and should be light-coloured to allow the detection of mercury droplets. Floors and their coatings should be inspected frequently to ensure that the floors have no cracks and the coatings are intact. Walls should be built of materials that do not readily absorb mercury vapour. It is important to include redundant systems capable of dealing with greater releases of mercury so as to prevent releases in the event of an unexpected occurrence. Such systems include secondary containment, monitoring for releases and protection of the workforce and the public from exposure (US DOE, 2009; World Chlorine Council, 2018). The temperature in storage areas should remain as low as possible, preferably at a constant 21°C (UNEP, 2015). Storage areas should be clearly marked with warning signs (FAO, 1985; US EPA, 1997; US DOE, 2009).

34-35. Mercury storage should take place indoors whenever possible. When mercury or mercury compounds is stored in enclosed outdoor facilities, particular care must be taken to ensure that there are protective measures to prevent releases of mercury into soil, groundwater or surface water. Containers should be sealed to prevent any escape of mercury vapour. Stored mercury or mercury compounds should be protected from external factors to prevent damage to containers, and the integrity of stored containers should be regularly checked.

35-36. Storage facilities should be secured to avoid theft or unauthorized access.

### **D. Containers for the storage of mercury, including secondary containers**

36-37. Storage containers will depend on whether the material to be stored is elemental mercury or as mercury compounds. Elemental (or metallic) mercury is a liquid at room temperature, while most mercury compounds are solids. Solid and liquid storage require different types of storage containers. The risk of contamination of other materials should be avoided. Containers and packages holding mercury or mercury compounds should not be placed together with containers holding other substances. Separate storage areas, even within the same storage facility, should be established. Containers and packages should be marked and stored in a dry and secure place, such as a warehouse or other space that is not usually frequented by people. Such areas should not share ventilation systems with work or public areas. They should have their own ventilation systems or be vented directly to the outdoors. Ideally, ventilation systems should include pollution control devices to capture any mercury

vapour or dust release. Guidance developed by the United Nations Development Programme (UNDP, 2010) for mercury wastes generated by healthcare facilities provides detailed advice in this regard and may be applicable to many commercial facilities.

37-38. Elemental mercury in bulk form should be carefully packaged in appropriate containers, such as those identified in the *United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations*. (United Nations (2015a). Containers for elemental mercury should be stored upright on pallets off the ground, with overpacking (such as shrink wrapping of pallets) to provide protection during handling. Alternatively, the packages could be placed in a protective outer packaging such as a box or crate. The use of wood or other porous materials for pallets should be avoided as such materials are difficult to decontaminate after use. Liquid mercury in containers should be placed in containment trays or in a leak-proof area of the storage facility where the edges of storage areas are curved to limit the potential accumulation of mercury in any corners, and where spills can be contained. The liquid containment volume should be at least 125 per cent of the maximum liquid volume, taking into account the space taken up by items stored in the containment area. Solid mercury compounds should be stored in sealed containers such as barrels or pails with well-fitting lids or in specially constructed containers that do not release mercury vapour.

38-39. Those who handle mercury or mercury compounds should pay particular attention to the prevention of evaporation and spillage of mercury into the environment. Mercury should be placed in labelled gas- and liquid-tight containers. Care should be taken that the labels to be used are in line with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). In addition, the label should show that the container meets appropriate national and international technical standards regarding tightness, pressure stability, shock resistance and behaviour when exposed to heat, among other things. The most appropriate containers for storing mercury are specially designed steel containers, as mercury amalgamates with many other metals, including zinc, copper and silver. Some plastics, such as high-density polyethylene, are permeable to mercury vapours and should be avoided.

39-40. Containers of mercury or mercury compounds should be structurally sound and make possible the environmentally sound storing of such mercury. Seamless flasks and containers are recommended to eliminate the risk of breaches along the seams (QSC, 2003).

40-41. Two main types of internationally approved mercury storage and transport containers exist: 76-lb flasks and one-metric-ton containers (QSC, 2003). The design type of the container should pass the drop test and the leakproof tests as described in chapters 6.1.5.3 and 6.1.5.4 of the *United Nations Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria* (EU, 2011). For transporting smaller quantities of mercury, other sizes (e.g., 1–16 lbs) and types (e.g., polyethylene, glass) of containers are often used (QSC, 2003), however the level of protection such containers provide should be taken into account.

41-42. When storing mercury in containers, it is important to leave some “head space”. The maximum filling ratio by volume is 80 per cent and the “head space” should therefore be at least 20 per cent in each container to allow for thermal expansion of mercury (EU, 2011). Containers should meet the following criteria:

- (a) They should not be damaged from any materials previously stored in them or have contained materials that could adversely react with mercury;
- (b) Their structural integrity should be intact;
- (c) They should not be excessively corroded;
- (d) They should have a protective coating (paint) to prevent corrosion;
- (e) They should be gas- and liquid-tight.

42-43. Appropriate materials for mercury containers include carbon (minimum ASTM A36) and stainless steel (AISI 304 or 316L), which do not react with mercury at ambient temperatures. No protective coating is needed for the inner surface of such containers as long as the mercury to be stored in them meets purity standards for storage as elemental mercury and no water is present inside the container. Protective coatings (e.g., epoxy paint or electroplating) should be applied to all exterior carbon steel surfaces in a manner that does not leave any steel exposed. Coatings should be applied in a manner that minimizes paint blistering, peeling and cracking. Labels including information on the names of the suppliers of the mercury, the origin of the mercury, the level and purity of the mercury, the container number, the gross and net weight, the date when the container was filled with mercury and an appropriate label should be affixed to each container (US DOE, 2009). In addition, the label should show that the container meets appropriate national and international technical standards

regarding tightness, pressure stability, shock resistance and behaviour when exposed to heat, among other things.

43-44. When mercury is stored, it should be as pure as possible in order to avoid chemical reactions and the degradation of containers. A mercury content greater than 99.9 weight per cent is recommended. For lower purity levels (95–99.9 weight per cent), it may be necessary to monitor the condition of containers to detect any degradation over time. Consideration should be given to the period of storage of mercury containing contaminants (e.g. nitric acid, chloride salts), as they may affect the storage containers.

#### **E. Logging and tracking of mercury movements**

44-45. An inventory of the mercury or mercury compounds kept at a storage site should be created and updated as mercury or mercury compounds is added to the facility, used, removed from the facility, or disposed of in accordance with article 11 of the Minamata Convention. The inventory sheet should be checked periodically against the containers stored at the facility to ensure its ongoing accuracy. Shipments of mercury or mercury compounds should be recorded, with consideration given to the requirements of article 3 of the Convention that pertain to the import and export of mercury from the country. The maintenance of tracking records is useful for auditing of facilities, and for reporting under article 3 in relation to stocks of mercury greater than 50 metric tons. Annual or periodic reporting of the quantities of mercury or mercury compounds stored or used may also be considered to obtain the data needed for reporting under article 3. Guidance on the determination of such stocks is available on the Minamata Convention website ([www.mercuryconvention.org](http://www.mercuryconvention.org)).

45-46. Regular inspection of storage areas should be undertaken, focusing especially on damage, spills and deterioration. Clean-up and decontamination should be carried out speedily, but not without alerting the authorities concerned (FAO, 1985; US EPA, 1997).

46-47. All documents containing the required information, including the certificate accompanying the container, as well as records concerning the destocking and dispatch of the metallic mercury after its temporary storage and the destination and intended treatment shall be kept for at least 3 years after the termination of the storage.

#### **G. Education and training of staff**

47-48. Personnel engaged in the handling or storage of mercury or mercury compounds should have appropriate and adequate training. Personnel who are not handling the mercury or mercury compounds in the storage area but could be exposed by an accidental release should also understand the risks and hazards of mercury and be familiar with a facility's emergency response plans (QSC, 2003). Access to the storage area should be restricted to those with adequate training, including in the recognition of mercury-specific hazards and in the handling of mercury.

48-49. Employee training in environmentally sound management and workplace health and safety should be provided to, among other things, ensure that employees are protected against mercury releases within the facility, exposure and accidental injury.

49-50. The basic knowledge that employees should have includes:

- (a) The chemical properties and adverse effects of mercury;
- (b) How to identify mercury and segregate it from other hazardous substances;
- (c) Occupational safety standards relevant to mercury and how to safeguard their health against mercury exposure;
- (d) How to use personal protective equipment provided by the employer, such as body coverings, eye and face protectors, gloves and respiratory protectors;
- (e) Labelling and storage standards considered appropriate for the facility or facilities, container compatibility and dating requirements, and closed-container requirements;
- (f) How to safely handle mercury or mercury compounds using the equipment available at the facility at which they work;
- (g) How to use engineering controls to minimize exposure;
- (h) How to respond if mercury is accidentally spilled;



(i) How to use mercury vapour monitoring devices to identify possible sources of elevated mercury levels in the facility and to provide workers with the information they require to ensure safety (e.g., when respiratory protection may be warranted).

~~50-51~~. It is important to have worker insurance and employer liability insurance as appropriate under national law.

~~54-52~~. A mercury awareness-raising package should be used in employee training. All training materials should be translated into local languages and made accessible to employees.

## **H. Timetables for repair, testing and maintenance**

~~52-53~~. Regular inspections should be undertaken to ensure the facility, including all equipment, is in good condition. Such inspections should include examination of the containers, spill collection areas, floors and walls to ensure there are no mercury releases and the equipment and any coatings are intact. Indoor air monitoring should be considered to check for leaks and protect workers onsite. To detect leaks as early as possible and protect workers on-site, a continuous indoor air monitoring system may be used, with sensors positioned at ground and head levels, and visual and acoustic alarm systems. When leaks are detected, the operator should immediately take all necessary action to avoid any releases of mercury (EU, 2011). Monitoring equipment should be tested regularly to ensure it is properly calibrated and functioning correctly. All equipment, including monitoring equipment, should be subject to routine maintenance.

~~53-54~~. The inspection schedule may be determined by national regulations or instructions, or by the facility manager. A clear plan for a regular monitoring and repair schedule should be in place before the facility starts operating. Records detailing inspections and maintenance should be kept.

## **I. Emergency measures, including personal protective equipment**

~~54-55~~. Site-specific plans and procedures should be developed for implementing the safety requirements identified for the storage of mercury and mercury compounds in line with national standards and with the approval of relevant safety and environmental management authorities. A workable emergency plan should address public evacuation and procedures to be followed in the event of terrorism, fire and other disastrous events that could result in significant mercury releases both inside and outside the facility's perimeter. The plan should be in place and should be implemented immediately in case of accidental spillage or other emergencies (QSC, 2003). A person should be designated who has the responsibility, in emergencies, to authorize any changes to the safety procedures needed to facilitate the work of emergency response personnel. Adequate access to the affected area should be ensured.

~~55-56~~. Emergency response plans or procedures should comply with local, regional and national requirements and include procedures for first responders, including fire department staff, emergency response personnel, ambulance personnel and local hospitals (QSC, 2003). While such plans can vary according to the physical and social conditions of each site, the principal elements of an emergency response plan include the identification of potential hazards; legislation governing emergency response plans; action to be taken in emergency situations, including mitigation measures; personnel training plans; communication targets (fire service, police, neighbouring communities, local government, etc.) and methods in case of emergency; and methods and schedules for the testing of emergency response equipment. Emergency response practice exercises should be conducted.

~~56-57~~. Emergency response plans or procedures should cover a number of different scenarios, which may include but should not be limited to:

- (a) Damage to storage containers during handling, including distinctions between minor damage and catastrophic damage (e.g., complete failure of the seal on a drum lid or other closure);
- (b) Discovery of container leakage during routine inspections;
- (c) Release occurring during repackaging operations;
- (d) Damage to the storage facility itself (e.g., due to flood, fire, severe adverse weather or serious accidents that somehow compromise the physical integrity of the facility).

~~57-58~~. For each scenario, response guidance should identify:

- (a) The equipment and procedures needed to address the release;
- (b) The site official responsible for overseeing the assessment of the situation (i.e., whether it is a minor or major release) and supervising workers in addressing the release or accident;

- (c) Notification procedures to other workers at the facility (particularly regarding the need to don personal protective equipment);
- (d) When to notify local emergency response personnel for additional support;
- (e) When to notify the public, and action the public should take;
- (f) When it is appropriate to evacuate non-essential workers from the facility;
- (g) When it may become necessary to evacuate all workers from the facility.

~~58-59.~~ All equipment necessary to address spills or releases of mercury or mercury compounds should be available on site and in good working order. Such equipment may include sorbent materials, chemical reagent products that can be applied to elemental mercury spills to reduce mobility, shovels and other tools to pick up spilled materials, and extra drums or other containers in which to place cleaned-up materials. Vacuum cleaners (with carbon filters in their exhausts) may be used. Facilities should also have the capacity to contain and manage appropriately any contaminated wash water that may be generated.

~~59-60.~~ When an emergency occurs, the first step is to investigate the site. Wearing suitable personal protective equipment, the person in charge should approach cautiously from upwind, secure the scene and identify the hazard. Placards, container labels, shipping documents, safety data sheets, car identification charts and knowledgeable persons on the scene are valuable information sources. The need to evacuate, the availability of human resources and equipment, and possible immediate actions should then be assessed. In order to ensure public safety, a call to an emergency response agency should be made and, as an immediate precautionary measure, the spill or leak area should be isolated by at least 50 metres in all directions.

~~60-61.~~ In case of fire, workers should first put on personal protective equipment. An extinguishing agent suitable for the type of surrounding fire should be used, whereas water should not. Equipping the storage facility with a dry-pipe (water supply) fire suppression system, as well as emergency response equipment, is recommended. For further information, the "Emergency Response Guidebook" (U.S. Department of Transportation, Transport Canada and the Secretariat of Communications and Transportation of Mexico, 2016) is a helpful resource. If the fire is confined to a given space, the mercury storage containers should be moved away from the fire, using utmost precaution. After the fire is out, the mercury storage containers may need to be treated with a water spray until they are sufficiently cooled. (QSC 2003)

~~61-62.~~ Any spillage of elemental mercury, even in small amounts, should be considered hazardous and should be cleaned up with caution. Spills should be reported to management and the date, time, inspector, location and approximate amount of mercury should be documented and records maintained of such incidences (QSC, 2003). Critical to determining the type of response appropriate for a given mercury spill is evaluating the spill's size and dispersal and whether the necessary clean-up resources and expertise are available. If the spill is small and on a non-porous surface (such as linoleum), it can be cleaned up by the personnel or workers of a facility and disposed of in an environmentally sound manner. If the spill is large or in cracks or crevices, it may be necessary to hire personnel with suitable professional training, should such personnel not be available at the facility. Large spills involving more than the amount of mercury or mercury compounds found in a typical household product should be reported to the local environmental health authorities. If there is any uncertainty as to whether a spill should be classified as "large", the local environmental health authorities should be contacted to be on the safe side. Under certain circumstances outlined in the emergency plan, it may be advisable to obtain the assistance of qualified personnel for professional clean-up or air monitoring, regardless of spill size. Guidance on clean-up of household spills is available (Environment Canada, 2002)<sup>3</sup> and may be adapted for use in other situations. Spills of elemental mercury in the course of commercial activities and in households have the potential to expose workers and the general public to hazardous mercury vapours. In addition, spills are disruptive and costly to clean up. Clean-up procedures for small mercury spills are found in *Spills, Disposal and Site Clean-Up* (US EPA, 2007).

<sup>3</sup> Available at: <https://www.ec.gc.ca/mercure-mercury/default.asp?lang=En&n=D2B2AD47-1>.

## **J. Inspection and monitoring**

62-63. Facilities should have adequate monitoring and recording programmes to track potential environmental releases.

63-64. Monitoring programmes should provide an indication of whether the storage operation is functioning in accordance with its design, and should detect changes in environmental quality (such as any emission or release of mercury or mercury compounds) caused by the operation. The information obtained through monitoring programmes can be used to indicate whether proper management of the stored mercury and mercury compounds is being undertaken, to identify potential issues relating to possible mercury releases or exposure to mercury, and to help assess whether amendments to the management approach might be appropriate. By implementing a monitoring programme, facility managers can identify problems and take appropriate measures to remedy them.

64-65. It should be noted that a number of continuous mercury measurement systems are commercially available for some types of mercury monitoring. Such monitoring may be required under national or local legislation. Alternatively, suitable monitoring may be undertaken through site sampling in the environment.

## **V. General guidance on storage of mercury and mercury compounds**

65-66. While this section provides specific technical guidance on appropriate handling of mercury and mercury compounds, it is imperative that generators (such as recycling facilities which may be producing commodity mercury for use) and storage facilities also consult and adhere to applicable national and local requirements.

66-67. *Handling:* When handling mercury and mercury compounds, it is important to pay particular attention to the prevention of evaporation and spillage of mercury into the environment. Facilities should develop very specific procedures for handling mercury and mercury compounds to minimize the possibility of spillage or excessive evaporation losses.

67-68. *Packaging:* The containers in which mercury and mercury compounds are transported provide the most direct barrier to prevent releases. It is therefore necessary to carefully package mercury and mercury compounds in appropriate containers that have been manufactured in conformity with national and international standards and regulations, including United Nations standards for packaging.

### **A. Health and safety**

68-69. Two key aspects of the environmentally sound storage of mercury and its compounds are the development and implementation of (a) public health and safety activities; and (b) worker health and safety activities that prevent and minimize exposure to mercury and its compounds.

### **B. Public health and safety**

69-70. Addressing public safety is dependent on appropriate reporting of both routine and accidental mercury releases by facility operators. The timely reporting of such information to local authorities requires both routine and emergency procedures for reporting releases, including to civil authorities and local emergency responders, to be clearly established before a facility begins operation. People living and working near storage facilities may also be exposed to environmental health and accident risks. Such risks relate mainly to emissions and releases from the work undertaken at the facility, as well as transport to and from the facility. Adequate measures are necessary to prevent and minimize impacts on human health and the environment. Monitoring programmes may help in identifying problems and taking appropriate measures to remedy them. Such programmes could include the monitoring of any emissions or releases of mercury from the facility to determine whether these could result in any exposure of the local population. Facility operators may wish to host community awareness forums to address questions concerning facility siting, operations and emergency response plans.

### **C. Worker health and safety**

70. Employers should ensure the health and safety of all employees while they are at work. An exposure assessment may be undertaken for all employees and appropriate monitoring and industrial hygiene practices adopted. Colorimetric badges and/or personal monitoring equipment (vapor sampling devices) are needed to undertake a comprehensive exposure assessment and monitoring program. Pre-employment physical examinations would establish a baseline for determining an individual's background mercury level, and help to ensure that the employee has normal body

chemistry for mercury removal. Personnel may have other considerations that should be handled on a case-specific basis. Medical monitoring program should also include periodic physical exams (e.g., every 1-3 years), regular blood tests, and regular urinalysis.

71. Every employer should obtain and maintain insurance, under an approved policy from an authorized insurer, providing a sufficient level of coverage in case of liability (including those that may require compensation) for bodily illness or injury sustained by employees arising out of and in the course of their employment, in accordance with national law. Facility-specific health and safety plans should be in place at all facilities handling mercury or mercury compounds to ensure the protection of everyone in and around such facilities. Such plans should be developed by trained health and safety professionals with experience in managing health risks associated with mercury.

72. The protection of workers who handle mercury or mercury compounds, and of the general public, can be achieved by the following means:

- (a) Restricting access to facilities to authorized personnel;
- (b) Ensuring that occupational exposure limits for hazardous substances are not exceeded by making sure that all personnel use appropriate protective equipment;
- (c) Ensuring appropriate ventilation of facilities to minimize risk from exposure to volatile substances or substances that can become airborne;
- (d) Ensuring that facilities comply with all national and regional laws on workplace health and safety.

73. Guideline values for mercury concentrations in drinking water and ambient air established by WHO are 6 µg/L for inorganic mercury and 1 µg/m<sup>3</sup> for inorganic mercury vapour (WHO, 2006; WHO Regional Office for Europe, 2000). Governments are encouraged to monitor air and water in order to protect human health, especially near sites where activities using mercury take place. Some countries have established permissible levels of mercury in the working environment (e.g., 0.025 mg Hg/m<sup>3</sup> for inorganic mercury, excluding mercury sulphide, and 0.01 mg Hg/m<sup>3</sup> for alkylmercury compounds in Japan). Management operations should be conducted so as to satisfy any applicable requirements regarding permissible levels of mercury in the working environment, and facilities where such operations are conducted should be designed and operated so as to minimize mercury releases to the environment as far as is technically possible.

#### **D. Standards for the identification of stocks**

74. Guidance on the identification of stocks of mercury and mercury compounds was adopted by the first meeting of the Conference of the Parties. The guidance may prove useful as part of managing storage facilities. The guidance is available at <http://mercuryconvention.org/Convention/Formsandguidance/tabid/5527/language/en-US/Default.aspx>.

#### **E. Closure**

75. At the end of life of a facility, all mercury and mercury-contaminated materials should be removed at closure. Air, equipment and soil measurements may be undertaken to confirm the proper closure of the site.

## **VI Information regarding transport of mercury and mercury compounds**

76. For transport and the transboundary movement of mercury, the latest versions of the following documents should be consulted to determine specific requirements:

- (a) International Maritime Organization, *International Maritime Dangerous Goods Code* (updated regularly);
- (b) International Civil Aviation Organization, *Technical Instructions for the Safe Transport of Dangerous Goods by Air*;
- (c) International Air Transport Association (2016), *Dangerous Goods Regulations*;
- (d) United Nations (2017), *United Nations Recommendations on the Transport of Dangerous Goods: Model Regulations Rev. 20*.

77. Mercury and mercury compounds should be transported in a safe and environmentally sound manner in order to avoid accidental spills; they should also be tracked during transport until they have reached their final destination. Prior to transport, contingency plans should be prepared in order to minimize environmental impacts associated with vehicle accidents, spills, fires and other potential emergencies. During transport, mercury and mercury compounds should be identified, packaged and transported in accordance with the relevant national regulations on the transport of dangerous goods, which are generally based on the *United Nations Recommendations on the Transport of Dangerous Goods: Model Regulations* (Orange Book).

78. Companies transporting mercury or mercury compounds within their own countries should hold authorization to transport dangerous goods, and their personnel should be qualified or certified to handle dangerous goods in accordance with applicable national and local rules and regulations. Transporters should manage mercury in a way that prevents breakage, environmental releases and exposure to moisture. National hazardous substances or dangerous goods transportation legislation often control packaging and labelling for transport at the national level. If there is not guidance available at the national level, the materials available for transboundary transport of dangerous goods (listed above) could be consulted. The Globally Harmonized System of Classification and Labelling of Chemicals (UN, 2015) should also be taken into account as appropriate. Detailed transport requirements are not included in this guidance at this stage, as it is considered more appropriate for the relevant primary source to be consulted for such information. The shipping papers should include an emergency response telephone number, and a certification that the shipment is in compliance with all regulations. The shipper is also required to mark the containers with the appropriate diamond labels, proper shipping name, and UN number. For mercury, the label specified is "Corrosive," the proper shipping name is "Mercury," and the UN number is "UN 2809." [QSC 2003]

79. The mercury shipment should be accompanied by a chemical analysis report that demonstrates the mercury's level of purity and identifies any contaminants.

80. Upon arrival, the transport vehicle should be visually inspected for any obvious leaks, spills, droplets, or other pools of free elemental mercury and all suspect mercury sources should be documented and reported to management. On the basis of the inspection, the shipment may be accepted as complying, or rejected as not complying and a written report kept by the facility and should include all relevant information. [QSC 2003]

81. To ensure that releases from the handling and transport of mercury or mercury compounds are kept to a minimum, it is important to raise the awareness of the parties concerned (e.g., transporters, recyclers and treatment operators) about the risks of mercury. Such awareness-raising can be achieved through training activities, such as seminars, that can provide information about new systems and regulations, as well as opportunities for information exchange, the preparation and distribution of leaflets, and the dissemination of information via the Internet.

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<http://www.worldchlorine.org/publications/unep-chlor-alkali-mercury-partnership/mercury-handling-during-normal-plant-operations/>;

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