COMMENTS OF THE ZERO MERCURY WORKING GROUP ON THE DRAFT GUIDELINES FOR THE INTERIM STORAGE OF MERCURY UNDER ARTICLE 10 OF THE CONVENTION
March 2017

The Zero Mercury Working Group[1] 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.

Introduction

The Minamata Convention on Mercury is a global legally binding instrument with the objective to protect 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 sounds interim storage of mercury and mercury compounds, other than waste mercury, which are set out in article 10 of the Convention.

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 will 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 from the seventh session of the intergovernmental negotiating committee and in consultation with relevant experts.

It is emphasised that guidelines do not establish mandatory requirements, nor attempt to add to, nor subtract from, a Party's obligations under the Convention.~~, in particular article 10 of the Convention.~~ Under Article 10.3, a Party shall take measures to ensure "environmentally sound" storage, "taking into account these guidelines".~~It should also be noted that t~~

The Conference of the Parties may adopt requirements for interim storage in an additional annex to the Convention. Such an annex would be adopted in accordance with the procedures for adopting additional annexes set out in Article 27 of the Convention.

[1] 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. While a member of ZMWG, the Natural Resources Defense Council (NRDC) submitted comments separately due to time constraints. Since NRDC submitted its comments prior to the ZMWG submission, ZMWG takes this opportunity to support the NRDC comments, and notes NRDC could not review the ZMWG comments because of the above-mentioned time constraints.

Overall management of hazardous substances

To address the environmentally sound management of hazardous substances being stored within their territory, Parties should develop and implement chemical management plans (which may include legislation, regulations, policies, agreements with industry, agreed standards, or any combination of these or other management mechanisms). Parties should have specific management plans in place for mercury and mercury compounds that are being "stored" in accordance with article 10. In order for a Party to understand its needs for the interim storage of mercury and mercury compounds, it may be useful for a Party, during the development of its implementation activities, to further work 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 appropriate safety measures and regulatory inspection, as well as assisting with the preparation of emergency response plans.

An important component of such management plans may be acquiring knowledge on the identity of hazardous substances held within the territory, and the quantities of each individual substance. For this purpose, and as part of national management of hazardous substances, inventories are an important tool for identifying, quantifying and characterising substances present. In relation specifically to mercury or mercury compounds, a national mercury inventory can provide useful information for all aspects of 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 its territory. Parties may find it useful also to identify smaller stocks or supplies of mercury as part of overall management. Through the identification of any uses of mercury within its territory, it may estimate approximate quantities of mercury which may require storage. The UNEP inventory toolkit[2] or other national methodologies may provide Parties with additional resources or information for assistance.

As part of the overall management of hazardous substances, establishing baselines for the quantities produced, circulated, traded or in use is valuable. The guidance developed and adopted on a provisional basis by the intergovernmental negotiating committee on the identification of stocks may be utilised as one tool for this purpose. The information may contribute to the establishment of an information registry at the national level, which may serve to assist with safety and regulatory inspection, as well as assisting with the preparation of emergency response plans consistent with national regulations or legislation. There is also potential to track progress at the national level towards phasing out the use of mercury.

Scope of the guidelines;

These guidelines are intended to provide information relating to 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 time (i.e. use in the manufacture of certain mercury-added products after a phase-out date). All uses of mercury not specified in the Convention as being not allowed are considered to be allowed to a Party under the Convention. In the guidelines, there will be no consideration of options for final or permanent storage, nor of options for stabilisation or solidification of mercury. These options are considered to relate to the environmentally sound management of mercury waste, and are covered within the mercury waste guidelines developed under the Basel Convention.

Article 10 covers the storage of mercury and mercury compounds as defined in article 3 of the Convention that are not covered under the definition of mercury waste. On this basis, the article covers the following:

[2] The inventory toolkit is available at http://www.unep.org/chemicalsandwaste/Mercury/ReportsandPublications/MercuryToolkit/tabid/4566/Default.aspx and also through the UNITAR Mercury elearn site at http://mercurylearn.unitar.org

Mercury includes mixtures of mercury with other substances, including alloys of mercury, with a mercury concentration of at least 95 per cent by weight; and

Mercury compounds means mercury(I) chloride (known also as calomel), mercury(II) oxide, mercury(II) sulphate, mercury(II) nitrate, cinnabar and mercury sulphide.

Based on the definitions in article 3, the article does not cover:

Quantities of mercury or mercury compounds to be used for laboratory-scale research or as a reference standard; or

Naturally occurring trace quantities of mercury or mercury compounds present in such products as non-mercury metals, ores, or mineral products, including coal, or products derived from these materials, and unintentional trace quantities in chemical products; or

Mercury-added products.

Additionally, as mercury defined as mercury waste under article 11 of the Convention is not covered by article 10, the article does not cover:

"Substances or objects consisting of mercury or mercury compounds, containing mercury or mercury compounds or 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 harmonised 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 this convention. This definition excludes overburden, waste rock and tailings from mining, except from primary mercury mining, unless they contain mercury or mercury compounds above the thresholds defined by the Conference of the Parties." 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 common English definition of the term interim indicates that it refers to "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, as well as during any transport.

The Basel Convention defines "Environmentally sound management of hazardous wastes or other wastes" as "means 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"

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Extrapolating from this definition, environmentally sound storage of mercury and mercury compounds, other than waste mercury may be considered to be storage in which the mercury is managed in a manner which will protect human health and the environment against the adverse effects which may result from such mercury and mercury compounds. The information presented in the guidelines on interim storage provide certain examples and guiding text in relation to what may be considered appropriate by Parties based on a number of factors.

~~While there is no strict time period set out for 'interim storage', in line with the common English definition of the term 'interim' including provisional or temporary,~~ ~~a~~ A Party may wish to apply a definition at the national level as to the duration of storage which may be considered as part of 'interim' storage[3] ~~in particular to address concerns that the 'interim storage' becomes de facto 'permanent' or 'final' storage~~.

Comment [MB1]: This statement appears inconsistent with the clear distinction made in the Convention between "waste" and "non-waste" Hg. As "interim" only applies to non-waste Hg, any "defacto" or "final storage" issue would then necessarily be a Hg waste issue. In which case, the defacto or permanent storage of Hg would follow the Convention's guidance/requirements for mercury waste.

As the mercury and mercury compounds covered are considered 'commodity mercury' it is considered suitable that the responsibility for the environmentally sound interim storage of the

[3] For example, the United States Quicksilver Caucus 2003 Mercury Stewardship Best Management Practicesmanual assumes that interim storage of elemental mercury is for the next 10-30 years.

mercury should be the responsibility of the owner of the mercury, or the entity which will gain commercial benefit from the use of the mercury. It should be noted that storage facilities may be privately owned or publicly owned, either nationally or potentially on a regional basis. The responsibility for mercury and mercury compounds in transit remains with the entity identified in the national and international regulations, standards or guidance for the transport of dangerous goods (i.e. importer, carrier, handler).

Nevertheless, those entities that are not covered should be encouraged to follow these guidelines.

The Convention does not include any specific quantity limits for the amount of mercury or mercury compounds which may be stored. On this basis, the guidelines for interim storage cover all quantities of mercury which may be stored prior to use. However, it is recognized that the guidelines may need to be applied flexibly within the requirements of site specific issues. Article 3 of the Convention on mercury supply sources and trade specifies that each Party will 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 its territory. Guidance on the identification of such stocks and sources of supply is available in a separate guidance document, which has been adopted on a provisional basis by INC7 and will be considered at the first meeting of the Conference of the Parties (*note – after formal adoption, the reference will be made to the formal version of the guidance document)*.

It is anticipated that the quantity which will be maintained in storage will be commensurate with its intended use and be the mercury considered necessary by the Party to meet the requirements of the domestic activities underway in accordance with the Convention, whether that is producing mercury-added products, undertaking a process using mercury, or the use of mercury in artisanal and small-scale gold mining.

NOTE - The text currently refers to the amount considered necessary by the Party - we may need to consider whether this should be expanded in the guidelines, and would be linked with the quantity of mercury expected to be used in a given period. Input from industry and others would be useful to clarify what is considered a 'reasonable' quantity to store on site.-However, tying this to the Party decision may be considered sufficient.

Good practices for storage

(i) Location of mercury storage sites and site selection criteria

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 and design, in order to avoid any significant risk of mercury release unless unavoidable due to factors such as geographic location, storage facilities should not be built in sensitive locations such as floodplains, wetlands, areas with potential for leaching to groundwater, earthquake zones, Karst terrain, 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.~~

Comment [MB2]: Key to safeguarding public health and the environment is ensuring 'multiple layers of protection' that involve environmentally sound design and site selection as an integral part of the principle of redundancy

In selecting a site for new sites for storage of mercury or mercury compounds, consideration should be given to any requirements under national law including issues such as zoning or restrictions on use. It is suggested that public consultations be held to inform the local community about siting criteria and procedures to mitigate any potential mercury storage risks. Sites should have adequate access to receive and disburse mercury for use. Consideration should be given to factors which 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 within the facility, including consideration of ease of access to mercury or mercury compounds as well as the other factors mentioned. The security of the site should also be considered.

In assessing mercury storage sites, certain criteria may be used as 'exclusion criteria'. The presence of such elements will rule out the possibility of utilising that particular site. Other criteria may be considered as positive or negative factors but not completely exclude the site as an option. The importance of the criteria in selecting a suitable site may be related to the sites effect on the stability of storage, and an individual risk assessment of each potential site to determine suitability would be needed. In such a risk assessment, consideration should include the quantity of mercury or mercury compounds to be stored at the facility, as storage requirements may vary depending on this quantity. The level of control needed to safely manage the mercury may vary with the quantity of mercury stored.

In considering mercury storage sites, consideration could be given as to whether national storage sites are necessary, or whether there would be an opportunity for commodity mercury or mercury compounds to be stored in regional storage facilities prior to use.

Such facilities could be located close to a point of import to limit transportation requirements.

(ii) Construction of storage sites, including provision of barriers

When constructing a new facilty or retrofitting an existing one, consideration should be given to sizing the facility, options for the layout and design, floor strength requirements, surface coatings, plumbing and drains, air flow and ventilation, and acceptable temperature range for storing elemental mercury. Facility sizing will depend on the amount of space needed for present and future storage and the method of storage.[4] Regardless of size, however, storage facilities must meet certain containment characteristics to ensure safe and environmentally sound interim storage of mercury. (QSC 2003)

The storage site shall be provided with engineered or natural barriers that are adequate to protect 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, potentially including separate, self-contained areas for loading operations for shipping and receiving of containers, and for re-packaging operations, as these are operations most vulnerable to accidents or mercury spillage.

To the extent feasible, facilities should be dedicated solely to mercury storage and kept completely segregated, particularly from materials incompatible with mercury~~Storage areas should be designed~~ to ensure that there is no unnecessary chemical or physical reaction to mercury. To reduce the risk of fires, facilities should be constructed of non-combustible materials and using non-combustible materials for pallets, storage racks, and other interior furnishings. (QSC 2003)

The aisles in storage areas should be wide enough to allow for the passage of inspection teams, loading machinery and emergency equipment. Storage facilities should be constructed from non-flammable materials, such as poured concrete, concrete block, etc and should have fire alarm systems and fire suppression systems. Handling areas within 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.

The storage site shall be equipped with a fire protection system. (EU 2011) As part of any emergency response plan, it is important to have procedures in place with the local fire department to ensure that they are sufficiently informed, trained, equipped and prepared to safely handle any fires at the facility. To further prevent the risk of fire, it is suggested that battery-powered electric forklifts be used to transport mercury within the storage facility. (QSC 2003)Where indoor air is vented outside, such venting should be done via activated carbon or other mercury capture systems.

[4] The U.S. Defense Logistics Agency uses the following average storage factors: Volume: 18 net cubic feet per short ton; Square feet: 5.6 gross square feet per short ton

The protection of soil, groundwater and surface water should be achieved through a combination of a geological barrier and a bottom liner system. A drainage and collection system for water discharged from storage sites should be installed within the storage sites to enable mercury monitoring prior to discharge to water systems. Moreover, monitoring procedures should be established for the operation and post-closure phases of the storage sites so that any possible adverse environmental effects of the storage sites can be identified and appropriate corrective measures can be taken. The choice of storage site development should be made in light of the site, geology and other project-specific factors. Appropriate geotechnical engineering principles should be applied to different aspects of storage sites.

(iii) Physical conditions of storage sites

Storage facility floors should be designed to withstand 50% more than the total load from the mercury that is being stored and not be penetrated by any drains or plumbing. (QSC 2003) ~~, although s~~Sloped floors and open flow gutters with rounded-down edges can be used to avoid mercury trapping under gutter covers and to assist in 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. ~~F~~Floors and their coatings should be inspected frequently to ensure that the floors have no cracks and the coatings are intact.

When choosing the materials from which to construct walls, materials that do not readily absorb mercury vapour should be selected. It is important to include redundant systems to prevent releases in the event of an unexpected occurrence, including secondary containment, monitoring for releases, and protection of the workforce and the public from exposure. . ~~-~~(U.S. Department of Energy. 2009; World Chlorine Council. 2004). The temperature in storage areas should be maintained as low as is feasibly possible, preferably at a constant temperature of 21 C. Storage areas should be clearly marked with warning signs (FAO. 1985; US EPA. 1997b; SBC. 2006; US Department of Energy. 2009).[5]

Mercury storage should take place indoors whenever possible. Should mercury be stored in enclosed outdoor facilities, particular care must be taken to ensure that there are protective measures to prevent releases of mercury entering the soil, groundwater or surface water. Sealing of containers to prevent any escape of mercury vapour is important. Stored mercury should be protected from the elements to prevent and damage to containers, and regular checks should be made to confirm the integrity of stored containers.

Storage facilities should be kept secured to avoid theft or unauthorized access.

(iv) Containers for the storage of mercury, including secondary containers

Mercury may be stored either as elemental mercury or as mercury compounds. Elemental (or metallic) mercury is a liquid at room temperature, while most mercury compounds are solids. Different types of storage containers will be appropriate for solid and for liquid storage. The risk of contamination of other materials should be avoided. Containers and packages holding mercury 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 appropriately 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 building ventilation systems with work or public areas and should have their own ventilation systems or be vented directly to the outdoors. Ideally, pollution control devices should be established on any venting systems to capture any mercury vapour or dust release. Guidance developed by UNDP for

[5] These and all other citations in the present annex II are abbreviated citations found in the Basel Convention technical guidelines (UNEP/CHW.12/5/Add.8/Rev.1). The full citations may be found in the bibliography of the technical guidelines.

mercury wastes generated by healthcare facilities[35] provides detailed advice in this regard and may be applicable to many commercial facilities.

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

Those who handle mercury should pay particular attention to the prevention of evaporation and spillage of mercury into the environment. Mercury should be placed in a gas- and liquid-tight containers that bear a distinctive mark indicating that they contain "toxic" mercury. The most appropriate containers to store mercury are especially designed steel containers, as mercury amalgamates with many other metals, including zinc, copper and silver. Some plastics (such as HDPE) [add Bloom reference]are permeable to mercury vapours and should be avoided.

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)

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 leak proof tests as described in Chapters 6.1.5.3 and 6.1.5.4 of the UN Recommendations on the Transport of Dangerous Goods, Manual of Tests and Criteria.(EU 2011) .For smaller quantities, other sizes (e.g., 1-16 pounds) and types (e.g., polyethylene, glass) of containers are often used to transport mercury. (QSC 2003)

When storing mercury in containers, ensure that some "head space" (80% by volume) remains in each container to allow for thermal expansion of mercury.(EU 2011)

Containers should meet the following criteria:

(1) they should not be damaged from any materials previously stored in them or have contained materials that could adversely react with mercury;

(2) their structural integrity should be intact;

(3) they should not be excessively corroded;

(4) they should have a protective coating (paint) to prevent against corrosion and

(5) they should be gas and liquid tight.

Appropriate materials for mercury containers include carbon (minimum ATSM 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

[35] UNDP (GEF Global Healthcare Waste Project), *Guidance on the Clean Up, Temporary or Intermediate Storage, and Transport of Mercury Waste from Healthcare Facilities*. Available from: http://www.gefmedwaste.org/guidanace-documents.

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 container number, gross weight, the date when the mercury was injected, and a "corrosives" label indicating that the container contains corrosive materials, should be affixed to each container (U. S. Department of Energy, 2009) (see example in section vi). In addition, the label should show that the container meets appropriate national or international technical standards regarding tightness, pressure stability, shock resistance, behaviour when exposed to heat, etc.

When storing mercury or mercury compounds, they 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. Where a lower purity level is found (i.e. 95 – 99.9 weight per cent), monitoring the condition of containers to detect any degradation may be required.[6] Consideration should be given to the period of storage of mercury which contains contaminants as prolonged periods of storage may affect the storage containers.

(v) Transport and Acceptance Procedures

All shipments of mercury should be accompanied by a manifest and a chemical analysis report that documents the mercury's level of purity and identifies any contaminants. A copy of such information should be kept by the facility as a record. To minimize the need for reflasking, facility operators may consider requiring that mercury be delivered in storage grade containers. (QSC 2003)

Mercury being transported to the point of use should be properly packaged and labelled, with the following information. permanently marked:

(1) Commodity name
(2) Name of supplier
(3) Government contract/certificate number and lot number
(4) Location of origin (country/state)
(5) Month and year packed
(6) Individual flask number followed by the total number of flasks in the lot
(7) Gross, tare, and net weights shown in pounds, ounces or kilograms under the designation
(8) Hazard warning: Caution-Poisonous-Handle with Care

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)

Acceptance procedures should comply with the following: only metallic mercury which fulfils the minimum criteria set out above should be accepted. (EU 2011) 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 all relevant information kept by the facility. (QSC 2003)

Packaging and labelling for transport is often controlled by national hazardous substances or dangerous goods transportation legislation, which should be consulted first. If such legislation is lacking or does not provide sufficient guidance, reference materials published by national governments, IATA, IMO and UNECE should be consulted. International standards for the proper labelling and identification of chemical substances and mixtures have been developed, including the following reference materials:

[6] Should include no impurities capable of corroding carbon or stainless steel (e.g. nitric acid solution, chloride salts solutions), see : http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2011:328:0049:0052:EN:PDF.

(a) United Nations, 2015. *Globally Harmonized System of Classification and Labelling of Chemicals, 6th revised edition* (revised and improved every two years); and

(a) OECD, 2001. *Harmonised Integrated Classification System for Human Health and Environmental Hazards of Chemical Substances and Mixtures*.

For labelling and packaging, the United Nations Globally Harmonized System of the Classification and Labelling of Chemicals (GHS) should be taken into account, as appropriate

NOTE – appropriate images from the GHS may be inserted in the document here, or may be provided as a link to images on line..

(vi) Logging and tracking of mercury movements

An inventory of the mercury or mercury compounds kept at a storage site should be created and updated as mercury is added to the facility, used or removed from the facility, or disposed of in accordance with Article 11 of the Convention. This inventory sheet should be periodically checked against the containers in storage 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. Maintenance of tracking records is useful to allow auditing of facilities, and also will contribute to reporting under Article 3 in relation to stocks of mercury greater than 50 metric tons. Guidance on the determination of such stocks is available on the mercury website (www.mercuryconvention.org)

Regular inspection of storage areas should be undertaken, focusing particularly 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.1997b).

Facilities should maintain complete records of all quantities of mercury received and shipped for 3 years after closure. Record keeping should include pertinent information on 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. (EU 2011)

(vii) Education and training of staff

Personnel who are engaged in the handling or storage of mercury or mercury compounds should have appropriate and adequate training. ~~.~~ Personnel who are not handling the mercury in the storage area (but who 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 recognition of mercury-specific hazards and handling.

Employee training in effective ESM and workplace health and safety should be provided to, among other things, ensure employee safety against mercury release within the facility, worker exposure and accidental injury.

The basic knowledge that employees need includes:

(a) The chemical properties and adverse effects of mercury;

(b) How to identify mercury and to segregate mercury 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, such as body coverings, eye and face protectors, gloves and respiratory protectors;

(e) Appropriate labelling and storage standards for the facility or facilities, container compatibility and dating requirements, and closed-container requirements;

(f) How to safely handle mercury using the equipment available at the facility in which they work;

(g) How to use engineering controls to minimize exposure;

(h) How to respond in an emergency if mercury is accidentally spilled; and

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

It is important to have worker insurance and employer liability insurance in order to be better prepared for accidents or injuries sustained by workers in the facility, as appropriate under national law.

A mercury awareness-raising package developed by UNEP (UNEP, 2008d) is recommended for use in employee training. All training materials should be translated into local languages and made accessible to employees.

(viii) ~~Timetables for repair, testing and maintenance~~Monitoring and Inspections

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 emission or release of mercury or mercury compounds) caused by the operation.

The information obtained through monitoring programmes should be used to ensure proper management of the stored mercury, to identify potential issues relating to possible mercury releases or exposure to mercury, and to determine 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.

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.

Regular inspections (eg at least one per month) should be undertaken to ensure the facility, including all equipment, is in good condition ~~should be undertaken~~.
This should include inspection of the containers, spill collection areas and floors and walls to ensure there are no mercury releases and the equipment ~~cracks,~~ and ~~that any~~ coatings are intact. To detect leaks and protect workers onsite, a continuous indoor air monitoring system should- be installed, with sensors positioned at ground and head level, to trigger both a visual and acoustic alarm systems. Where leaks are detected, the operator shall immediately take all necessary action to avoid any releases of mercury. (EU 2011) Monitoring equipment should be tested on a regular basis to ensure it is properly calibrated and functioning correctly. Routine maintenance of all equipment, including monitoring equipment, should be carried out.

The inspection schedule may be directed by government ~~national~~ regulations, or instructions defined by the facility manager. A clear plan for the regular monitoring and repair schedule should be in place in advance of commencing operations.

~~-~~Facility operators shall maintain all detailed records of ~~detailing~~ inspections and maintenance. (QSC 2003)

(ix) Emergency practices, including personal protective equipment

In terms of safety for facilities, site-specific plans and procedures, including an- emergency response plan. should be developed for implementing the safety requirements identified for storage of mercury and mercury compounds. 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 within and beyond the building perimeter. The plan should be in place and implemented immediately in case of accidental spillage or other emergencies. (QSC 2003)

-In the event of an emergency, there should be a responsible person who can authorize modifications to the safety procedures when necessary in order to allow emergency response personnel to act. Adequate security siting and access to the affected area should be ensured (Environmental Management Bureau, Republic of the Philippines. 1997; SBC.2006; US Department of Energy. 2009).

Emergency response plans or procedures should ~~be in place.~~ comply with local, state, 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, actions to be taken in emergency situations, including mitigation measures, personnel training plans, communication targets (fire services, police, neighbouring communities, local governments, 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.

Emergency response plans or procedure should cover a number of different scenarios which may include, but not be limited to:

- Damage to storage containers during handling, including distinctions between minor damage and catastrophic damage (e.g., complete failure of the seal on the drum lid or other closure)
- Discovery of container leakage during routine inspections
- Release occurring during re-packaging operations.
- 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.

For each scenario, response guidance should identify:

1. Equipment and procedures needed to address the release,
2. The site official responsible for over-seeing assessment of the situation (i.e., is it a minor or major release) and supervising workers in addressing the release or accident
3. Notification procedures to other workers at the facility (particularly regarding the need to don PPE).
4. When to notify local emergency response personnel for additional support;
5. When to notify the public and actions the public should take
6. When it is appropriate to evacuate non-essential workers from the facility.
7. When it may become necessary to evacuate all workers from the facility.

All equipment necessary to address mercury or mercury compounds spills or releases should be available on-site and in good working order. This may include sorbent materials, chemical reagent products that can be applied to elemental mercury spills to reduce mobility, shovels, etc to pick up spilled materials, and extra drums or other containers in which to place cleaned-up materials. Facilities should also have the capacity to contain and appropriate manage contaminated wash water that may be generated.

When an emergency occurs, the first step is to investigate the site. Wearing suitable 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, an emergency response agency call should be made and, as an immediate precautionary measure, the spill or leak area should be isolated for at least 50 meters in all directions. In case of fire, an extinguishing agent suitable for the type of surrounding fire should be used, whereas water should not. For further information, the "Emergency response guidebook" (US Department of Transportation, Transport Canada, and the Secretariat of Communications and Transportation of Mexico (SCT). 2008) is a helpful resource.

Spillage of elemental mercury, even in small amounts, should be considered hazardous, ~~and should be~~ reported to management and cleaned up with caution. The date, time, inspector, location, and approximate amount of mercury should be documented and records maintained of such incidences. (QSC 2003)

Critical to determining what type of response is appropriate for any mercury spill is evaluating its 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), or on a porous item that can be thrown away (such as a small rug or mat), it can be cleaned up by personnel or workers of a facility and disposed of in an environmentally sound manner. If the spill is large, or on a rug that cannot be discarded, on upholstery or in cracks or crevices, it may be necessary to hire personnel with suitable professional training, should such personnel not already be available at the facility. Large spills involving more than the amount of mercury 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.

If elevated air concentrations of mercury are detected in the faciltiy, the operator should notify management immediately, obtain assistance from a second employee, put on appropriate safety equipment, and attempt to identify the cause. Confirmation can be achieved via visual inspection (for liquid mercury) or using black light testing (for mercury vapor), and vapor monitoring. If the increased air concentration is due to a leak or spill, the corrective action(s) taken should comply with spill clean up protocols. (QSC 2003) 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 (Environment Canada. 2002).

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 both costly to clean up and disruptive. Clean-up procedures for small mercury spills are found in US EPA.2007c.

If a fire were to break out, workers should first put on–personal protective equipment (see below). As part of the emergency plan, fire extinguishing media should be on hand, including regular dry chemicals, carbon dioxide, water, and regular foam. For larger fires, regular foam or flooding with a fine water spray is essential. Equipping the storage facility with a dry-pipe (water supply) fire suppression system, as well as emergency response equipment, is recommended. 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)

Personal Protective Equipment

Personnel who work in the mercury storage areas for extended periods should be equipped with the appropriate safety equipment and clothing, including the following:

- Half facepiece, dual cartridge respirator with NIOSH approval for mercury
- Body Suit: Tychem SL or higher *(or a generic equivalent)
- Impervious type coveralls with hoods
- Gloves: Inner surgical nitrile, silvershield*, and outer nitrile glove

- Feet: Cover shoes with booties
- ANSI approved safety shoes
- Eyes: Safety goggles or glasses with side shields

Facilities should require personnel mercury monitoring to ensure that workers are not exposed to unsafe mercury levels.[7] (QSC 2003)

~~(x) Inspection and monitoring~~

~~Facilities should have adequate monitoring, recording and reporting programmes to ensure that can meet any national requirements to track mercury quantities as well as potential environmental releases.~~

~~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 emission or release of mercury or mercury compounds) caused by the operation. The information obtained through monitoring programmes should be used to ensure proper management of the stored mercury, to identify potential issues relating to possible mercury releases or exposure to mercury and to determine 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.~~

~~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.~~

(X) Closure

Since these storage facilities are intended for interim storage only, all mercury and mercury-contaminated materials should be removed at facility closure. Air, equipment and soil measurements may be undertaken to confirm the proper closure of the site. For private facilities, depending upon the quantities of mercury stored and the estimated cost of closure, a Party may consider requiring some form of financial assurance, such as a bond, to ensure funds will be available to properly close the site and remove mercury-contaminated materials.

Guidance on collection, handling, packaging and transport

Specific technical guidance on the most appropriate handling of mercury is provided in this section, but it is imperative that generators (such as recycling facilities which may be producing commodity mercury for use) as well as storage facilities also consult and adhere to applicable national and local requirements.

Handling: When handling mercury, 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 to minimize the possibility of spillage or excessive evaporation losses.

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 to conform to UN standards for packaging.

[7] For example, in the United States, all personnel should wear a colorimetric badge capable of measuring below the 0.025 mg/m^3 American Council of Government Industrial Hygienists Theshold Limit Value (ACGIH TLV) for four or eight hour averages. Manufacturers' recommendations on use and replacement of the badges should be strictly observed. While in use, monitoring results should be periodically checked against the 0.1 mg/m^3 PEL ceiling.

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

(a) International Maritime Organization, 2014. *International Maritime Dangerous Goods Code*;

(b) International Civil Aviation Organization, 2013. *Technical Instructions for the Safe Transport of Dangerous Goods by Air*;

(c) International Air Transport Association, 2014. *Dangerous Goods Regulations Manual*; and

(d) United Nations, 2013. *United Nations Recommendations on the Transport of Dangerous Goods, Model Regulations*.

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

Companies transporting mercury or mercury compounds within their own countries should be authorized 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.

To ensure that releases from 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. This can be achieved through training activities, such as seminars, that can provide information about new systems and regulations and opportunities for information exchange; the preparation and distribution of leaflets; and the dissemination of information via the Internet.

Health and safety

Two key aspects of an environmentally sound storage of mercury and its compounds are the development and implementation of (1) public health and safety activities and (2) worker health and safety activities which prevent and minimize exposure to mercury and its compounds.

Public Health and Safety

Addressing public safety will be dependent on appropriate reporting of both routine and accidental mercury releases by the facility operators. Timely reporting of this information to local authorities will be necessary, and so both routine and emergency notification procedures, including both civil authorities and local emergency responders, need to be clearly established before the facility begins operation.

People living and working in the vicinity of storage facilities may also be exposed to environmental health and accident risks. These risks relate mainly to emissions and releases from the work undertaken at the facility, as well as and 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 to identify problems and take appropriate measures to remedy them. Such monitoring programmes could include monitoring of any emissions or releases of mercury from the

facility to determine whether there would be any exposure to the local population resulting from the storage facility.

Facility operators may wish to consider hosting community awareness forums to address questions concerning facility siting, operations and emergency response plans.

Worker Health and Safety

Employers should ensure that the health and safety of every employee are protected while they are at work. An exposure assessment should be conducted for all employees and the facility should adopt appropriate monitoring and industrial hygiene practices. 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 should be conducted to 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. (QSC 2003)

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 (compensation) for bodily illness or injury sustained by employees arising out of and in the course of their employment, in accordance with national law. Health and safety plans should be in place at all facilities that handle mercury or mercury compounds to ensure the protection of everyone in and around such facilities. Such plans should be developed for each facility by trained health and safety professionals with experience in managing health risks associated with mercury.

The protection of workers who are engaged in the handling of mercury or mercury compounds and the general public can be achieved through the following ways:

(a) By allowing access to facilities to authorized personnel only;

~~(b)~~ By ensuring that occupational exposure limits for hazardous substances are not exceeded by making sure that all personnel use appropriate protective equipment;

~~(c)~~(b) By ensuring appropriate ventilation of facilities to minimize risk from exposure to volatile substances or substances that can become airborne; and

~~(d)~~(c) By ensuring facility compliance with all national and regional laws on workplace health and safety.

Guideline values for mercury concentrations in drinking water and ambient air established by WHO are 0.006 mg/L for inorganic mercury and 1 µg/m^3 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., 0.025mg/m^3 Hg for inorganic mercury, excluding mercury sulphide, and 0.01mg/m^3 Hg for alkylmercury compounds in Japan); management operations should be conducted so as to satisfy 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.

~~Standards for the identification of stocks~~

~~Guidance on the identification of stocks of mercury and mercury compounds were adopted on a provisional basis at INC7, and should be referenced here.~~

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and the labelling scheme can be found at:
http://www.digitaleurope.org/Services/MecuryFreelogo.aspx

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