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Mercury Stewardship
Best Management Practices

October 2003

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DISCLAIMER

This document was developed under Cooperative Agreement No. 83035101 awarded by the U.S. Environmental Protection Agency (US EPA). US EPA was involved in the drafting of this document, including making comments and suggestions intended to improve the document's scientific analysis and technical accuracy. While the document was developed through a joint US EPA/State Workgroup process, the document is a State product. The views expressed in this document do not represent an official US EPA position. US EPA has not made final decisions on any of the issues highlighted in this document. US EPA also does not endorse any products or commercial services mentioned in this document.

Best Management Practices (BMP) Manual
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I. Statement of the Problem

A. Background on Quicksilver Caucus/Environmental Protection Agency (EPA) Stewardship Workgroup

The Quicksilver Caucus is a coalition of state government organizations that was formed to address concerns about mercury pollution. To examine the options which may be appropriate for addressing existing and potential future excess supplies of elemental mercury nationwide, the Quicksilver Caucus and EPA are working together to address two charges:

(1) Develop guidance for mercury storage to ensure safe, interim storage of mercury stock (pending development of viable disposal options at a future date); and

(2) Address surplus mercury management policies and economic/ environmental issues concerning recycled mercury and the export/import of commodity grade mercury.

To undertake these charges, three workgroups were formed: the best management practices workgroup, the storage workgroup, and the markets workgroup.

The Quicksilver Caucus and EPA are also collaborating on determining ways to meet mercury reduction goals for specific water bodies where mercury pollution is caused primarily by air deposition and on providing input on EPA's draft Mercury National Action Plan.

B. Charter for the Best Management Practices Subgroup

The Best Management Practices (BMP) Subgroup was charged with examining the current national storage practices of Federal custodial agencies, commercial entities using significant amounts of mercury for industrial processes, and other entities that store mercury (including States, which temporarily accumulate mercury devices and extremely small amounts of elemental mercury for recycling) and developing a draft BMP Manual. After this BMP manual undergoes review, the subgroup will develop an Implementation Plan.

C. Overview of the BMP Manual

This document is best described as a collection of Best Management Practices (BMPs) assembled by Federal and State agencies to provide suggested practical guidelines for those engaged in interim or longer term storage (i.e., 10 to 30 years) of elemental mercury.

Mercury is a persistent, bioaccumulative, and toxic element that, when discarded, is often classified and regulated as hazardous waste. Mercury that is not regulated as a hazardous waste is, nevertheless, a hazardous material that requires proper management and storage. Most mercury wastes can conceivably be retorted and refined for reuse in mercury-containing devices or manufacturing processes. People who work with mercury

need to avoid exposure to mercury vapors because most of the mercury that is inhaled is absorbed into the body. If enough elemental mercury is absorbed, toxic effects can occur, including tremors, insomnia, headaches, sensory loss, memory loss and impaired cognitive function. It is also very important to ensure that elemental mercury is not released into the environment. Elemental mercury can be converted by certain aquatic bacteria to the very toxic form known as methylmercury, which can accumulate in the tissues of animals, fish, and humans. Some fish species can contain methylmercury levels that are many times higher than the concentrations found in the surrounding water. People who eat contaminated fish can absorb this methylmercury, which, in sufficient quantities, can cause serious neurological problems, as well as birth defects in the children of mothers exposed during pregnancy.

These guidelines do not attempt to determine whether stored elemental mercury should be technically managed as a waste or product. Users of this manual should confer with State and Federal regulatory agencies for advice when deciding how their mercury is regulated. If stored mercury is determined to be a waste, then the applicable State or Federal hazardous waste laws and regulations, including storage requirements, have to be met. In a number of States and localities, storage of a hazardous or potentially hazardous material may be subject to additional regulatory criteria that are not addressed in this manual. Regulatory standards, however, do not currently exist in all cases, particularly if mercury is regarded as a product. Therefore, the drafters of this BMP manual offer these practices, which have been used and field-tested by responsible civil and governmental custodial entities, as a compendium of suggested best management practices that can assist in safely storing elemental mercury for extended periods of time. This manual is not meant to provide any mandatory requirements, but rather provides a compendium of suggested best management practices. State and local authorities may tailor these practices to deal with site-specific conditions and individual regulatory frameworks.

For purposes of this discussion, this manual assumes that interim storage of elemental mercury will likely be needed for the next 10-30 years. It is assumed that it may take 10-30 years to develop and approve disposal treatment options; however, it may take longer. The design and construction of sites that are being newly constructed may want to consider longer term storage periods in the event that alternatives to the storage of mercury are not developed. Other possible management options (e.g., sale, treatment and disposal) are being evaluated and discussed as part of other processes and workgroups and will not be elaborated upon here.

. Also, although the focus of this manual is on a 10-30 year time frame, owners and operators of facilities that are storing for shorter periods of time should find portions of this manual useful because it addresses many common management practices that are independent of the storage time.

D. Use of this BMP Manual

This manual is designed to provide those engaged or interested in the long term storage of elemental mercury with suggested best practices for the management and storage. The recommendations are for 'best practices' in storage management, and represent a collection of successful approaches currently practiced by a number of private and governmental organizations. This manual is not a regulatory document. Once users are sure they have met any existing relevant federal, state and local government regulatory requirement, they should select ideas and procedures from this manual on a voluntary basis for application to their own storage operations. However, before making those selections, we strongly recommend that users consider two important concepts, which were used in the development of this manual-applicability and redundancy.

Applicability: Before best practices can be determined for a specific location or facility, the operator must make a careful analysis of the unique facility operation and layout as those relate to preparation of elemental mercury for storage and the conditions for storage. This should include analysis of airflows, construction features, and external conditions such as security requirements. The user should also have, as far as is practicable, a complete understanding of the conditions that will effect, or could affect, the exposure of the workforce or others to elemental mercury. A thorough understanding of the facility and possible exposure scenarios will be essential in making the appropriate choices of best practices to increase the safety of the storage operation, and allow the operator to put other factors such as cost effectiveness in context. In some cases, this may require the use of technically trained health or engineering professionals, but much of the analysis should be within the expertise of an experienced operator who knows the details of the specific storage operations.

Redundancy: This manual was developed with the principle of increasing the safety of storage of elemental mercury be establishing 'multiple layers of protection'. This means that best practices go beyond merely securing the mercury in properly sealed flasks or other containers, and considers failure scenarios where, despite proper containment, mercury is released to the environment. This protection will involve redundant steps in physical barriers, monitoring for releases, and protection of the workforce and the public from exposure as the result of accidental releases of mercury. Users should consider how they can best build redundant safety systems into their operations and adopt complementary practices that will reinforce their current storage practices and reduce the likelihood and severity of any releases.

Effective use of this manual largely depends on these two key factors. Once the user has analyzed their unique storage situation and accepted the need to develop redundant systems, the identification and adoption of the applicable best practices will be facilitated. The users' feedback from their experience in using this manual will be helpful for future editions.

II. Current Elemental Mercury Custodians

In this section we provide an overview of the entities that are currently storing or

accumulating elemental mercury or mercury devices for recycling and/or resale. Several of the custodians described here have not historically stored mercury long term. This mercury is typically either used or sold within one year. Some, like state and local governments and some private companies, have not stored it at all.

A. Defense Logistics Agency's Defense National Stockpile Center

The Defense National Stockpile program was established by Congress to minimize the U.S. dependence on foreign sources of essential materials in times of national emergency. Since 1988, the Defense Logistics Agency (DLA) has been responsible for the program and established the Defense National Stockpile Center (DNSC) to manage the program and operate storage depots nationwide.

DNSC is responsible for providing safe, secure, and environmentally sound stewardship of all commodities in the inventory. The stockpile includes approximately 65 commodities, including aluminum oxide, cobalt, ferrochrome, lead, rubber, tin, zinc, in addition to mercury.

DNSC currently has 4,890 tons (4,436 metric tons) of mercury stored in enclosed warehouses at three DNSC sites: Somerville, New Jersey; New Haven, Indiana; and Warren, Ohio; and at the U.S. Department of Energy (DOE) Y-12 National Security Complex at Oak Ridge, Tennessee. This inventory has been stored for over 40 years and consists of elemental mercury that ranges in purity from 99.5 to 99.9 percent.

Congress has declared most of the DNSC materials, including mercury, to be in excess of national defense needs and has authorized their disposition, generally by sale. In 1994, mercury sales were stopped because of concerns raised by EPA, congressional, state government, and NGO representatives about the environmental impacts. To evaluate the range of potential management alternatives for elemental mercury and the environmental impacts of these alternatives, DNSC is currently developing an Environmental Impact Statement (EIS). The draft EIS is scheduled to be published for public comment in early 2003.

B. Chlor-Alkali Facilities

Currently in the U.S., nine chlor-alkali facilities use the mercury cell process to produce chlorine and caustic soda. At any given time, each of these facilities has an average of about 300 tons of elemental mercury on-site, either in the production process or in storage for future use of in the production process. The facilities are among the largest users of mercury. The mercury is either purchased or recovered from on-site retorters (a retorter is a treatment process that thermally recovers mercury from waste) and is generally stored for a relatively short time- typically less than one year.

Newer and more efficient mercury-free technologies have been developed. As the facilities age and close, most are switching to non-mercury technologies. As a result, no new mercury cell facilities are being built in the United States.

C. Commercial Mercury Retorters

Currently, there are two main commercial retorting companies operating in the U.S. A typical commercial retorter can process a range of mercury-containing wastes, including chlor-alkali sludges, mercury-containing equipment and devices, and fluorescent lamps. After the retort process, the mercury is usually further refined ("distilled") to increase its purity (the amount of distillation usually depends on the projected end use of the mercury). The elemental mercury is then re-sold domestically and abroad. Prior to re-sale, the mercury is often stored for some period of time.

D. Department of Energy

The Department of Energy (DOE) stores about 860 metric tons (about 25,000 flasks) of elemental mercury at its Y-12 National Security Complex in Oak Ridge, Tennessee. This warehouse also contains the portion of DLA's mercury mentioned above. DOE may have other elemental mercury stored at other locations, but this information is confidential.

III. Best Management Practices

A. Security and Basic Site Procedures

1. Security Requirements

The overall goals of the security requirements are to prevent inadvertent or deliberate unauthorized entry on the active portion of the mercury storage area. The specific recommendations presented are for guidance only. The site specific security requirements unique to a specific facility should be evaluated in consultation with security experts. We recommend the following:

<u>Facility Entry</u>

- An artificial or natural barrier, which completely surrounds the active portion of the mercury storage. An example would be an 8 to 10 foot electrified or barbed wire fence. Additionally, cement barriers should be located in front of the entrance.
- A means to control entry to the storage area, such as: 24-hour attendants, armed security guards, closed circuit television monitors, special staff identification devices and locks, and controlled roadway access to the storage unit or into the facility.

<u>Staff and Vendor Background Checks</u>

- Current and prospective staff requirements should include:
    - A disclosure statement that is signed under penalty of perjury that

gives: full name and address, social security and driver's license numbers, declaration of existence of any arrest for civil or criminal violations.
- Submission to fingerprint ID procedures may be necessary to verify the disclosure statement information.

Recommended Vendor Requirements

With regard to a private company that is under consideration for managing or supplying the facility, transporting materials, or other support, the following information should be acquired:

- A description of any local, state, or federal licenses, permits, or registrations for the generation, transportation, treatment, storage, recycling, disposal, or handling of hazardous waste or hazardous materials applied for, or possessed by the individual or business concern, or by the individual or business concern under any previous name or names, in the five years preceding the filing of the statement, or, by the officers, directors, or partners of the business concern, including the name and address of the issuing agency.

- A listing and explanation of any final orders or license revocations or suspensions, or fines issued or initiated by any local, state, or federal authority, in the five years immediately preceding the filing of the statement, or any civil or criminal prosecutions filed in the five years immediately preceding, or pending at the time of, the filing of the statement, with any remedial actions or resolutions relating to the generation, transportation, treatment, storage, recycling, disposal, or handling of hazardous waste or hazardous materials.

- A listing of any agencies outside of the state that regulate, or had regulated the generation, transportation, treatment, storage, recycling, disposal, or handling of hazardous waste or hazardous materials in the five years preceding the filing of the disclosure statement.

- A listing and explanation of any federal or state conviction, judgment, fine or settlement, in the five years immediately preceding the filing of the statement, with any remedial actions or resolutions if applicable, relating to the generation, transportation, treatment, storage, recycling, disposal, or handling of hazardous waste or hazardous materials.

- A listing of all owners, officers, directors, trustees, and partners of the applicant who have owned, or been an officer, director, trustee, investor, or partner of, any company that generated, transported, treated, stored, recycled, disposed of, or handled hazardous wastes or hazardous materials and which was the subject of any of the actions described in paragraphs above for the five years preceding the filing of the statement.

2. Safety Procedures

At a minimum, a storage facility should develop strict inventory control mechanisms, a site-specific spill plan that covers the employees in the event of a release, and an emergency response plan. The emergency response plan should address public evacuation, remedial response, and procedures to be followed in the event of terrorism, fire, and other disastrous events that could cause significant mercury releases beyond the building perimeter. The plan should comply with local, state, and federal requirements and should include procedures for first responders, including fire department staff, state emergency response personnel, and local hospitals.

Following is some specific information to consider including in an emergency response plan:

- Descriptions of arrangements agreed to by local police departments, fire departments, hospitals, contractors, and State and local emergency response teams to coordinate emergency services;
- Up-to-date lists of names, addresses, and phone numbers (office and home) of all persons qualified to act as emergency coordinator and the chain-of-command of these persons;
- Up-to-date lists of all emergency equipment at the facility (such as fire extinguishing systems, spill control equipment, communications and alarm systems (internal and external), and decontamination equipment), as well as the location and a physical description of each item on the list and a brief outline of its capabilities;
- An evacuation plan for facility personnel, describing signal to be used to begin evacuation, evacuation routes, and alternate evacuation routes;
- Procedures for determining the area to be considered for evacuation; and
- Procedures addressing sensitive receptors, including day care facilities, schools, hospitals, and nursing homes

3. Personnel Training

Personnel who handle or store the mercury flasks should receive classroom or on-the-job training and refresher courses so that they can manage mercury safely and minimize any releases. Personnel who are in the storage area, but who are not actually handling or storing the mercury, should also receive training and refresher courses on the hazards of mercury, spill prevention and response, proper management and housekeeping procedures, and emergency response plan implementation. Relevant personnel should be familiar with the proper operation of emergency equipment and systems.

OSHA's Hazardous Waste Operations and Emergency Response Standard (HAZWOPER) training should be provided to facility employees. First priority for HAZWOPER training should be given to those employees directly involved in any mercury handling and emergency response, but employers should provide necessary training to all employees who could be exposed by an accidental release.

Ideally, the personnel training requirements of 40 CFR 264.16 (Part 264 are the regulations for owners and operators of hazardous waste treatment, storage, and disposal facilities) should be used as guidance for personnel even though these requirements apply to mercury that is a hazardous waste, because they are more conservative requirements.

The facility should have written procedures in place describing appropriate hygiene practices. Such practices should include, but not be limited to, the prohibition of smoking and eating in areas where mercury is stored or handled.

4. Personal Protective Equipment

Each mercury storage facility should conduct an exposure assessment for all potentially exposed employees and adopt appropriate monitoring and industrial hygiene practices. Calorimetric badges and/or personal monitoring equipment (vapor sampling devices) can be of assistance in providing information about individual and group exposure to mercury and are needed to do a comprehensive exposure assessment and monitoring program (See Section G.2.B-Air Monitoring). Such equipment is necessary to determine exposure during routine and non routine jobs. Facilities should consider the use of calorimetric badges capable of measuring below the 0.25mg/m^3 ACGIH TLV for all personnel involved in the handling or mercury, the inspection of warehouses, or other instances when personnel may need to stay in the mercury storage area for short periods of time. Mercury vapor monitoring equipment (personal monitoring equipment) should be employed whenever mercury is being actively handled or there is a question of a mercury release to air.

Personnel who stay in the mercury storage areas for extended periods (especially those involved in reflasking or repackaging activities) should be equipped with the appropriate safety equipment and clothing, including the following (note that 29 CFR can also be consulted for more information on personal protective equipment):

Respirator: Air Purifying Respirator with Mersorb cartridges*

	Half facepiece, dual cartridge respirator with NIOSH approval for mercury
Body Suit:	Tychem SL or higher* 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

*(or a generic equivalent)

5. Personnel Medical Monitoring Program

All personnel should receive physical examinations prior to beginning work in a mercury storage facility. Pre-employment physical examinations establish a baseline for each employee, including determining an individual's background mercury level, and help to ensure that the employee has normal body chemistry for mercury removal (i.e., if a person does not have proper kidney function, he or she should not work around mercury). Personnel may have other considerations (e.g., pregnancy) that should be handled on a case-specific basis.

The medical monitoring program should also include periodic physical exams (e.g., every 1 -3 years), regular blood tests, and regular urinalysis by competent medical authorities to ensure the health and safety of each employee. The frequency of physical exams and tests should be determined using the exposure assessments developed based on each employee's job responsibilities. If an employee has been exposed to mercury, more frequent blood and urine tests, or interventional procedures may be necessary.

As a final suggestion, 29 CFR can be referenced for more information on employee monitoring and records retention requirements for certain types of handling requirements.

6. Facility Siting

In May 1997, EPA issued two publications[1] that discuss issues related to the siting of RCRA hazardous waste management facilities. One addresses the types of environments that pose special challenges to the siting, expansion, and operation of RCRA facilities; the other addresses the social aspects of locating RCRA facilities. Although a storage facility for elemental mercury does not pose the same risks as, say, a hazardous waste incinerator,

[1] Sensitive Environments and the Siting of Hazardous Waste Management Facilities," EPA/530-K-97-003, May 1997; and "Social Aspects of Siting RCRA Hazardous Waste Facilities," EPA/530-K-00-005, April 2000. See http://www.epa.gov/epaoswer/hazwaste/tsds/site/sites.htm for copies of these publications.

and mercury storage may not always require a RCRA permit, these publications provide some general guidelines and practices for choosing an appropriate site for storing mercury. We recommend that potential owners and operators of a mercury storage facility consult these publications as needed.

A brief summary of each publication follows.

"Sensitive Environments and the Siting of Hazardous Waste Facilities": describes the types of areas that, because of their soils, terrain, groundwater, or weather conditions, may pose significant risks of releases and possible exposures to humans and the environment. A sample list of environmentally sensitive locations includes 100 and 500 year floodplains, wetlands, Karst soils, and unstable terrain.

"Social Aspects of Siting RCRA Hazardous Waste Facilities": describes creative mechanisms that help in working effectively with communities. A key point here is to address a community's concerns early, collaboratively, and compassionately. This publication also describes actual experiences in siting a facility and examples of quality of life concerns raised by environmental justice communities when facilities are sited.

B. Warehouse

In this section we address some basic information on what should be considered when building a mercury storage facility or retrofitting an existing building to store mercury, such as the size of the warehouse, 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.

Obviously, the determination of whether a mercury storage facility needs a RCRA or state hazardous waste permit will have a significant impact of all aspects of a facility design. If a permit is required, then the RCRA or state permitting process must be followed. If the storage facility is not subject to RCRA or state requirements, then most of the siting parameters will be in the form of local zoning requirements for the particular class of building and any supplemental requirements federal /state agencies may add. In general, building classes are set forth in the Uniform Building Code, and design parameters for hazardous materials storage facilities are found in the Uniform Fire Code. The design requirements in 40 CFR 264.1100 (Subpart DD-Containment buildings), with the exception of the secondary containment requirements, can also be used as guidance for the design of the mercury storage building.
The following are mercury-specific recommendations to consider.

(1) Size: The size requirements for a warehouse will depend on a number of factors, including the way the mercury will be stored (e.g., size of storage containers, height of stacks) and the amount of space that may be needed for storing future shipments of mercury. In general, the 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

(2) Layout/Design: Mercury flasks should be stored upright on pallets off the ground, with overpacking and secondary containment as described in section F.2. of this manual, and should be stacked no more than two high. Metric ton containers should be stored using overpacking and secondary containment as described in F.2. The aisles in mercury storage areas should be wide enough to allow for the passage of inspection teams, loading machinery, and emergency equipment.

(3) Siting: The mercury storage building should be located away from highly combustible or explosive materials, human or animal food, and other materials, including clothing, that might become contaminated by the mercury. We also recommend that mercury storage buildings not be used to store other liquid wastes or materials. If other solid wastes or materials are stored in a mercury storage building, it is important to ensure that these materials are not combustible, explosive, or incompatible with mercury. The mercury storage activities should be completely segregated from any other wastes or materials.

(4) Flooring/Walls: The floor of the warehouse should be designed to withstand 50% more than the total load from the mercury that is being stored. The floor should be coated with an epoxy coating. The floor and coating should be inspected frequently to ensure that the floor has no cracks and the coating is intact. The floor of the warehouse should not have any drains or plumbing, although sloped floors could be used to assist in the collection of spills. When choosing the materials from which to construct the walls, select materials that do not readily absorb mercury vapor.

(5) Air Flow/Ventilation: While proper storage practices will prevent most releases of mercury vapors, in view of the metal's mobility and toxicity it is prudent to include redundant systems to prevent releases in the event of an unexpected occurrence. Many current facilities where mercury operations are taking place have negative pressure environments. If air is to be ventilated to the outside atmosphere, it should first be filtered through a series of sulfur- or iodine-impregnated, activated carbon filters or another appropriate filtering material. The mercury storage buildings should be designed to minimize exposure to workers and the surrounding community if an accidental release were to occur. The handling of mercury within the mercury storage area can also be minimized to reduce the risk of exposure.(6) Temperature: When mercury leaks or spills, its tendency to volatilize increases with temperature. To minimize volatilization in the event of an accidental release, the temperature in mercury storage areas should be maintained as low as is feasible, preferably at a constant temperature of 70 degrees Fahrenheit. It has been suggested that the temperature should be maintained as low as 40 degrees Fahrenheit since mercury volatizes readily at higher temperatures. Maintaining a temperature at or below 70 digress Fahrenheit, would be very expensive and would not significantly reduce losses of mercury due to vaporization because the mercury will be stored in sealed containers.

(7) Fire Safety: We recommend that a dry sprinkler should be installed, especially if the

building and/or interior furnishings contain combustible components Because containers will rupture and release mercury if exposed to very high temperatures, preference should be given to storage facilities constructed of non-combustible materials and using non-combustible materials for pallets, storage racks, and other interior furnishings to the greatest practical extent. . Current state and local fire codes should be consulted to determine whether the facility is subject to any other requirements.

(8) Signs: A sign should be placed on the entrance of the storage facility that identifies the building as a mercury storage area and states that mercury vapor is highly toxic if inhaled.

(9) Closure: When the building is no longer going to be used for storage of mercury, the mercury should be removed from the storage area and the building, storage containers, secondary containment decontaminated. A determination should be made if there has been any contamination of the flooring, soil, or subsoils. If any contamination exists, see the section on spill cleanup procedures, below, for information on how to manage it. Mercury storage facilities that are permitted to store RCRA or state-only hazardous waste must, as part of the permitting process, develop a closure plan. A RCRA- or state-permitted hazardous waste facility must also have a fiscal mechanism in place to cover closure costs.

C. Storage Containers

Two main types of mercury storage containers exist: 76-lb flasks and one metric ton containers. These containers are typically made of cast iron or carbon stainless steel. Seamless flasks and containers are recommended to eliminate the risk of breaches along the seams. Mercury storage facilities should consider requiring that mercury be transported in storage grade containers to minimize the need for reflasking and its associated risks. If mercury arrives in other types of containers[2], the mercury should be re-packaged into either the 76-lb flasks or the one metric ton containers. See the section on handling, below, for more information on reflasking.

When storing mercury in either type of container, we recommend that some head space remain in each container to allow for thermal expansion of mercury.[3]

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2 Other sizes (e.g., 1-16 pounds) and types (e.g., polyethylene, glass) of containers are often used to transport mercury.

3 Mercury's coefficient of thermal expansion is 1.82 x 10-4/°K. With a density of 13.53 kilograms per liter at 25°C (=298°K), the volume of mercury in a 76 pound flask is approximately 2.548 liters. If the temperature were increased to just below mercury's boiling point (356.9 ° C = 629.9°K), the increased volume of the mercury would be: $(1.82 \times 10^{-4}/°K) \times (629.9 °K - 298 °K) \times (2548 \text{ milliliters}) = 154 \text{ milliliters}$.

This represents an increase of approximately 6.0 percent from the mercury's volume at 25°C. Ten percent additional volume should, therefore, be adequate to contain the mercury in a 76 pound flask. Above its boiling point (where the vapor pressure = 1 Bar or 15 PSI) the pressure of the mercury in a closed flask would increase rapidly with temperature until the flask failed. Any reasonable containers will reach pressures high enough to rupture at the temperatures produced by a fire.

D. Transportation

Elemental mercury is considered a hazardous material under Department of Transportation (DOT) regulations. The following is a summary of DOT requirements:

Shipper Requirements

Packaging - a shipper transporting a hazardous material is required to package the material in accordance with DOT regulations. In the case of mercury, 49 CFR 172.101 requires that the material be packaged in a container meeting the requirements of packaging group III, which is a list of approved container and liner combinations. 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 in 49 CFR 172.101 is "Corrosive," the proper shipping name is "Mercury," and the UN number is "UN 2809." See 49 CFR 172.301 for marking requirements of non-bulk packages

Shipping papers - shipping papers must be accurately prepared. "Less than Load" shipments, which are deliveries by a vehicle that may have shipments to other facilities on board, are usually tendered with a Bill of Lading that is similar to a hazardous waste manifest. (Note that Bills of Lading cannot be accepted for hazardous waste shipments). For mercury, the shipping papers must include, among other things, the total quantity (by net or gross mass, capacity, or as otherwise appropriate) of mercury, an emergency response telephone number, and a certification that the shipment has been properly prepared and is in compliance with all regulations.

E. Receiving

1. Notification Process Prior to Shipping

The owner or operator of a facility that receives mercury from an outside source should inform the source in writing prior to the shipment that he is authorized to accept mercury (for example, by showing the he has the appropriate license or EPA identification number, if one is necessary) and will accept the mercury that is being shipped. The facility owner/operator should keep a copy of this written notice as part of the facility operating record and should inform the outside source of any change that may affect authority to receive the mercury.

2. Manifest/Shipping Paper Verification

All shipments of mercury should be accompanied by a manifest or shipping papers and a Material Safety Data Sheet. All incoming material must conform to packaging/packing requirements, labeling requirements, shipping procedures, methods and regulations contained in applicable parts of the following Codes of Federal Regulations (CFR): 10 CFR (Energy), 29 CFR (Labor), 40 CFR (EPA), 49 CFR (Transportation). In addition, individual mercury containers should have a metal label with the following information

permanently marked, if applicable:

(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

3. Packing Inspection

The term "packing" refers to interior or shipping containers and includes preparation for shipping or storage, blocking, bracing, cushioning, wrapping, weatherproofing, and placement in the exterior containers. "Packaging" refers to exterior packages or liners and related techniques to protect the material from deterioration and prevent material loss or damage

Each lot of mercury should be accepted on the basis of sampling, inspection, and testing completed by the recipient or authorized designee. A Quality Assurance Inspector should be stationed at the storage facility to examine the packaging, marking, and loading for compliance with required specifications. This examination is necessary to minimize the likelihood of damage during handling and deterioration in long-term storage.

The mercury shipment should be accompanied by a chemical analysis report that demonstrates the mercury's level of purity and identifies any contaminants. If such records do not exist, the mercury must be tested on-site to ensure it is of acceptable quality and to verify that the facility is not accepting someone else's hazardous waste.

On the basis of the inspection or testing, or both, the shipment may be accepted as complying, or rejected as not complying, with the facility's requirements. An inspection report should be filed by the storage facility's Quality Assurance Inspector as to whether the shipment is accepted or rejected. The report should include all relevant information, including date of inspection, type of inspection, sampling and analysis performed, whether the analysis was performed by the inspector or producer, type and number of tests, witness, description of packaging, reason for rejection (if applicable), and signature of the inspector.

F. Handling

1. Reflasking operation

As stated above, to minimize the chance of a mercury spill or release associated with reflasking, the mercury storage facility could consider requiring that the mercury be

transported in storage grade containers. As part of this effort, entities that are delivering mercury to a storage facility could be notified of the long-term storage requirements so they can ship the mercury in ready-to-store containers.

If reflasking must take place on site, it should be conducted in a specially designated reflasking area. Relevant staff should be furnished with maximally protective equipment and follow the adopted protocol. If the reflasking operation is to include only minimal planned reflasking, the air flow/ventilation system described below may be scaled back. Some level of air flow/ventilation should be maintained in the event of an accidental release. The following practices should be observed if the facility is to be used for routine reflasking of the incoming mercury:

(1) Replacement flasks and one-ton containers must be available on site prior to the start of any reflasking operation.
(2) Mechanical devices for lifting and pouring the mercury should be on-site.
(3) All reflasking operations should occur in an area with secondary containment.
(4) The area should be monitored for mercury before and after reflasking.
(5) The reflasking area should be ventilated separately from the warehouse with a negative pressure environment.
(6) Any air ventilated outside the building form the reflasking area should first be filtered through a series of iodine impregnated activated carbon filters or another appropriate filtering material. Periodic testing of the outlet air should be undertaken to determine when the filtering material needs to be replaced.

A general reflasking operation can include the following processes:

(1) The mercury containers are transported to the reflasking area by forklift and placed on a pallet (if quantity requires).
(2) Mercury from the old containers is poured down a loading funnel into a large main storage tank and then pumped up into a much smaller head tank. After suspended solids are returned to the storage tank via an overflow line, a series of valves can be opened, allowing the mercury to gravitate from the head tank into the metering tank and a new container.
(3) Newly filled replacement flasks or one-ton containers are placed on a new pallet or a used pallet that has been cleaned and pre-tested for the presence of residual mercury. As an alternative, hard plastic composite pallets could be used to minimize the fire danger, housekeeping needs, and the chance of pallet failure.
(4) A final check is conducted using a mercury vapor detector to ensure that no mercury droplets are present on the exterior storage container.
(5) The container is tightly capped and a forklift transports the container to the storage area.

Wastes that are generated from this reflasking operation must be managed in compliance with applicable hazardous waste regulations and sent to a permitted commercial facility for appropriate treatment and disposal. Empty mercury containers can be transported to an offsite treatment facility for decontamination. Following testing and

certification, the clean flasks could then be sent to a scrap metal recycling facility.

During the reflasking operation, the following spill prevention measures should be used:

(1) Pallet transfer containment pans, which prevent or minimize contamination of floors;
(2) Secondary containment pans;
(3) Containment booms, which would help if a large spill were to occur; and
(4) Mercury monitors, to detect any mercury vapors.

Finally, air emissions must be controlled at reflasking operations. See the section on air monitoring, below, for recommended monitoring during and after mercury handling.

2. Overpacking/Secondary Containment

While we recommend that all of the following extra layers be added around the flasks, site-specific conditions may lead owners and operators of a site to only use some of these measures.

If flasks are used, the following options for additional measures could be employed:[4]

(1) Place the flasks in a thirty-gallon carbon steel (sixteen-gauge) UN-approved drum (6 flasks per drum). A typical drum has a lid with a one-half inch round, sponge rubber O-ring (gasket) around its edge to provide a seal between the drum and its lid. A steel locking ring with a bolt can be used to compress the gasket and maintain the seal. Each lid should also have a bung-hole with a leak-proof lid to permit sampling of the air inside. To separate the flasks in the bottoms of the drum, cardboard dividers can be used. (Using cardboard dividers avoids the use of nails, staples or other metallic objects).
(2) Line the drums with an epoxy-phenolic coating or a poly drum liner or alternatively, place a cushioning material that also functions as an absorbent mat in the bottom of each drum.
(3) Strap the drums together on the pallet to prevent shifting accidents.
(4) Place each pallet on a drip pan.

If one metric ton containers are used, additional containment protection can be provided by placing each container on a square pallet and a drip pan. After overpacking, the mercury should be relocated to storage bays specifically designed and dedicated to mercury storage.

G. Monitoring and Leak Detection

[4] All of these additional containment measures were recently added to the mercury that DLA is storing at the Somerville, NJ; Warren, OH; and New Haven, Indiana depots.

1. Regular monitoring

This section discusses both visual and air monitoring. Elemental mercury air monitoring is a tool to measure exposure and detect leaks during routine and extraordinary events (i.e. spills, upsets, catastrophes). An exposure assessment and industrial hygiene monitoring program needs to be prepared and periodically reviewed by a person qualified to establish such a program (e.g. certified industrial hygienist). Other monitoring programs need to be established by qualified personnel. Auditing to insure compliance with programs needs to be independently undertaken and verified by the facility's management. Management should insure that any deficiencies identified in the auditing process are corrected as quickly as possible.

At a minimum, an industrial hygiene monitoring program should be developed and implemented at the facility. The program should include an exposure assessment for the facility's workers. Occupational exposure limits for mercury are listed below:

Organization	**Value**	**Comment**
Occupational Safety and Health Administration (OSHA)	Permissible Exposure Limit (PEL) = 0.1 mg/m^3	time weighted avg. over 8 hour shift and 40 hour week
American Conference of Governmental Industrial Hygienists (ACGIH)	Threshold Limit Value (TLV) = 0.025 mg/m^3	time weighted avg. over 8 hour shift and 40 hour week
National Institute for Occupational Safety and Health (NIOSH)	Recommended Exposure Limit (REL) = 0.05 mg/m^3	time weighted avg. over 10 hour shift and 40 hour week
The Chlorine Institute5	Recommended Short-term Exposure Limit (STEL) = 0.15 mg/m^3	time weighted average over 15 minute interval

This manual recommends using the most conservative values, ACGIH's 0.025 mg/m^3 TLV and the Chlorine Institute's 0.15 mg/m^3 STEL, as the limits for worker exposure. Any monitoring results above these levels should be verified and documented, the source of the emissions should be investigated, and remedial actions should be taken.

Both active and passive sampling equipment are available to detect personnel exposure to elemental mercury vapor. Active sampling equipment measures the detectable values and renders real-time measurements, whereas passive sampling requires laboratory analysis to determine the exposure levels. Active sampling is recommended and can be achieved through a variety of means including colorimetric badges, colorimetric tubes, dosimeters, and vapor monitors.

Air monitoring for elemental mercury depends on site-specific factors of the particular

5 The Chlorine Institute's STEL is not endorsed by ACGIH or NIOSH.

storage facility, including location, construction, background levels6, storage quantity and degree of processing. The following subsections summarize general recommendations for mercury vapor monitoring. These recommendations are based mostly upon existing DLA and chlor-alkali manufacturing industry procedures. They should not be construed to imply circumvention of any existing regulations or requirements.

Finally, as discussed in the section above on safety procedures, the framework and procedures for equipment operation and calibration, monitoring, leak detection, notification of authorities, containment and cleanup of spills, and associated documentation should be predefined in an emergency response plan.

Recommended Routine Monitoring:

For all of situations described below, if there are obvious leaks, spills, or droplets of mercury, they should be identified and reported to management immediately. The date, time, inspector, location, and proximate amount of mercury should be documented. Corrective action should comply with the section of this manual on spill cleanup protocols.

If there are elevated air concentrations of mercury, then the concentration should first be double checked. Upon confirmation of a higher than background reading, the operator should notify management, obtain assistance from a second employee, don appropriate PPE, and attempt to identify the cause of the elevated reading. 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 the spill cleanup protocols in place at the storage facility.

Continuous monitoring – As a screening measure, all personnel, while working in the storage area (including all receiving, handling, storage, and shipping areas that are connected to an associated air handling system) should, at a minimum, wear a colorimetric badge capable of measuring below the 0.025 mg/m^3 ACGIH TLV. 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 readings close to or above acceptable levels, re-monitor using a color detection tube and associated pump with greater specificity.

Daily monitoring – Visual inspections should be conducted during a daily walkthrough of the storage area. The stored mercury should be examined to ensure the storage containers are still intact. This is a relatively quick way to ensure the containers are not leaking and can be conducted between air monitoring inspections.

While conducting a visual inspection, it is important to ensure that the aisles remain wide enough to allow passage of inspection teams, loading machinery, and emergency equipment.

6 Mercury background levels are anticipated to be less than 20 ng/m^3 (ASTDR 1999)

Weekly monitoring – Weekly vapor monitoring should be conducted using a portable monitoring device with a sensitivity of 1 part per million (ppm), if not 1 part per billion (ppb)[7] [reference: DLA]. Prior to use, ensure monitoring devices are calibrated according to manufacturer's specifications and background mercury vapor level(s) are identified. Details of the calibration (e.g., date, time, operator, zero, span, and background) and monitoring details (e.g., date, time, operator, results, and locations associated with any readings above background) should be recorded. Vapor monitoring should follow OSHA's Method ID-140 (1991).

While doing this monitoring, all drip pans, grease/dirt deposits, cracks, crevices, low-lying areas, and ventilation systems inside the storage facility should be closely examined for mercury accumulation, as mercury is more likely to accumulate in these areas.

Quarterly monitoring – Quarterly monitoring of the air handling system is recommended. If using sulfur- or iodine-impregnated, activated carbon filters (or something comparable), monitor the space between the filters within the air handling system using a portable monitoring device with a sensitivity of 1 ppm, if not 1 ppb. Vapor monitoring should follow OSHA's Method ID-140 (1991).

Quarterly spot-checks should be performed at random locations within the storage facility and should include: surface wiping of drip pans, pallets, door knobs, ventilation ducts, countertops, floors, light switches, PPE, and other highly suspected contaminant locations. Surface wipes should be analyzed for total and elemental mercury and follow OSHA's Method ID-145 (1989).

Monitoring upon mercury receipt – The transport vehicle interior and overpacking integrity should be visually inspected for any obvious leaks, spills, droplets, or other pools of free elemental mercury. Using a vapor monitor with a sensitivity of 1 ppm, if not 1 ppb, monitor grease/dirt deposits, cracks, crevices, low-lying areas, and ventilation system inside the transport vehicle the packaging, and inside the overpacking. All suspect mercury sources should be documented and reported to management.

Monitoring After a Large Spill or Release - Mercury monitoring beyond the frequencies and monitoring degree suggested above may be warranted after an extraordinary event. In such cases, the area should be monitored for both total mercury and mercury vapor, following OSHA Method ID-140 (1991). Ambient monitoring at or near property boundaries should also be instituted [EPA's Compendium Method IO-5 (1999)]. Finally, blood and urine sampling may be warranted after an extraordinary event for employees who may have been exposed to the mercury.

2. Water and other media monitoring

The following procedures can be used to acquire baseline data on potential storage sites, to monitor after a suspected breach of secondary containment, to determine historic

[7] Note that DLA's Somerville Depot, along with the New Jersey Institute of Technology, rely upon the Ohio LUMEX™ and the Tekran™ vapor monitors as being state of the art.

spill and contamination information, to document potential offsite migration, and to assess the site prior to decommissioning.

Water Monitoring (wells, plumbing, drains, downstream water bodies)

Discharges- The discharge of effluents from mercury storage facilities is discouraged. However, if such discharges are possible, a baseline mercury analysis should be performed. Runoff from areas where mercury is handled should also be analyzed for total mercury (per EPA, Method 1631[8], or equivalent) in accordance with federal, state, and local requirements, or at least once per year during typical operation.

Groundwater- Total mercury analysis (using lowest available method detection limits per EPA or an equivalent method) on groundwater use and monitoring wells should be performed as a
baseline and/or once per year for users who have evidence of current or historical spills.

Plumbing/drains- Mercury may remain as a residue contaminant in plumbing/drains and drain traps. Especially important in decommissioning a user facility, analysis for total mercury is useful in determining appropriate disposal options for any residuals.

Soil and Sediment Monitoring

If a site is being considered for interim or long-term mercury storage, a baseline analysis of soils and sediments, if applicable, should be performed. Sampling protocols in EPA's SW-846 should be followed. Biased sampling for soils in low areas should be part of the preliminary set of samples. Further sampling should be conducted periodically. Soils and sediments should also be sampled if there is a breach of secondary containment and prior to facility closure.

3. Emergencies

a. Spill

If a mercury spill occurs, follow the procedures outlined in the facility spill plan.[9] Block off areas where droplets of mercury are visible using a tape or rope and post signs.

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[8] Method 1631: Guidelines Establishing Test Procedures for the Analysis of Pollutants; Measurement of Mercury in Water: This method allows for the determination of mercury at a minimum level of 0.5 parts-per-trillion and supports measurements for mercury published in the National Toxics Rule and in the Final Water Quality Guidance for the Great Lakes System. Note that SW-846, EPA's official compendium of analytical and sampling methods that have been approved for use in complying with RCRA regulations, includes three methods that may be useful: Method 7470A: Mercury in Liquid Waste (Manual Cold-Vapor Technique); Method 7471A: Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique); and Method 7472: Mercury in Aqueous Samples and Extracts by Anodic Stripping Voltammetry (ASV) control provisions, preservation, and storage.

[9] The federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) requires reporting of any release of a hazardous substance to the environment that exceeds a substance-specific

Avoid allowing personnel to walk on or touch mercury contaminated surfaces. Authorized personnel should be notified.

The size of the spill will determine the appropriate clean it up action. A large spill is one pound, or about the equivalent of two tablespoons. A one pound spill must be reported to appropriate state and federal authorities. The following procedures should be incorporated in the facility spill cleanup plan:

(1) When cleaning up a spill staff should use sufficient personal protective equipment (PPE) to protect clothing and skin. Common PPE includes impervious gloves, shoe covers, heavy soled booties, laboratory apron, disposable coveralls, and a respirator. *Never use thin disposable gloves, as they can tear and allow mercury to lodge under the fingernails.*

(2) When respirators are required, the buddy system should be used so employees can watch the color of the end-of-service indicators on the faces each other's cartridges to know when they need to be replaced. If airline respirator hoses are used, they should not be dragged through mercury. The hoses must be checked for mercury contamination before returning them to storage.

(3) Plastic sheets should be spread over surfaces onto which mercury could drop or run and the sides of the sheets should be taped to the floor.

(4) Any dust or oil onto which mercury may have attached during spill cleanup must be removed. Use a compatible detergent or a solvent to remove oil or grime and a specialized mercury vacuum to remove dust.

(5) Rags should only be dipped in cleaning solutions once to avoid contamination of the solution and the container. The amount of mercury-contaminated liquid generated during cleanup should be minimized since contaminated liquid wastes are expensive to dispose.

(6) Mercury kits with hand-powered miniature vacuums or sponges can be used to clean up small spills. The facility should also purchase a specialized mercury vacuum and supplies of mercury indicator powder. To avoid the spread of contamination, mercury-contaminated dirt should never be swept or blown off surfaces with compressed-air nozzles. The specialized mercury vacuum should be used instead.

(7) Flowers of sulfur or "HgX" powder can be used in limited circumstances to seal in place mercury that has entered crevices inside buildings. These materials do not absorb or neutralize mercury, but form hard shells around the droplets that seal in the vapor. Mercury can also be sealed into crevices with sealer or caulk. These techniques should be used only when absolutely necessary (e.g., if removal is prohibitively expensive or the mercury is extremely hard to reach), because trapped

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reportable quantity. The reportable quantity for mercury is 1 pound (454 grams).

mercury can pose a health hazard to those who work on affected surfaces in the future. All locations where mercury has been sealed should be documented; closure plans need include special procedures to address sealed mercury. A sign and permanent label indicating that sealed mercury is present must be used. Mercury spills that occur outside buildings must be completely cleaned up.

(8) A specially designed and dedicated vacuum cleaner must be employed to cleanup large mercury spills. The vacuum's exhaust should be monitored with a mercury sniffer before use. After cleanup, it is important to remove as much mercury as possible from inside the vacuum because too much residual mercury can ruin the mercury absorber. A regular vacuum or HEPA model should never be used to clean up mercury spills because mercury amalgamates with copper in the motor, causing the vacuum to emit high concentrations of mercury vapor. The vacuum itself is contaminated and must be discarded as a hazardous waste.

(9) Resisorb® should be used to eliminate mercury vapors near surfaces, particularly after removing liquid mercury from those surfaces.

(10) Used rags, cleaning materials, protective gear, and mercury contaminated gear should be placed into double, sealable plastic bags. Large tools should be cut up before placing them into the bags. Excess air should be gently squeezed from the bags and the sealed bags should be placed into drums and labeled as hazardous waste. All applicable federal and state hazardous waste requirements must be adhered to when storing and disposing of these materials.

(11) Before removing any access barriers and returning the area to normal use, a clearance survey should be conducted. Air quality of the affected area must be monitored to assure that the cleanup, removal and ventilation resulted in acceptable air quality levels.

(12) If facility personnel become contaminated with elemental mercury, they should immediately use an eyewash station or safety shower to wash the affected area. Any contamination incident should be reported to the appropriate person on site. A mercury vapor sniffer should be used to check for residual traces of mercury under the fingernails or skin. Staff should be examined by a doctor; urine and blood tests should be administered and the results should be documented in a spill report. Follow-up tests or additional medical procedures may be required. Contaminated clothing should be tested with a mercury sniffer, removed, placed in a double, sealable plastic bag, and managed as a hazardous waste.

b. Fire

If a fire were to break out in or near the storage facility, the resulting heat would cause the mercury to expand. If the storage container does not have sufficient surge capacity,

then it might be breached.[10] More importantly, heat causes mercury to vaporize. If inhaled in sufficient concentrations, elemental mercury vapor can induce respiratory shock and death. Proper personal protective equipment can protect firefighters and other emergency response workers from harmful exposure to mercury. Refer to the discussion above of personal protective equipment for workers at mercury storage facilities.

In general, elemental mercury presents little danger of fire or explosion under normal conditions with proper safeguards (note, however, that several mercurial compounds do pose such a threat). Fireproof storage (e.g., in a facility made of non-combustible materials and away from combustible trees and grasses) can significantly reduce likely fire threats in a mercury storage facility.[11] To protect against uncommon contingencies, the storage facility should develop and implement fire management procedures (plans) to address fires due to lightning strikes, severe weather conditions, the presence of potentially combustible materials (e.g., wood storage pallets), possible ignition sources (e.g., electrical control panels, distribution circuits, and fixtures), and terrorist activities. The following include general fire prevention procedures as well as fire management practices.

Fire Prevention Procedures:

(1) Battery-powered electric forklifts should be used to transport mercury within the storage facility.

(2) Caution placards should be placed on all entryways into the Hg storage areas. Each entrance into a mercury storage area should be marked:

"CAUTION - MERCURY, METALLIC-
Highly Toxic by Inhalation."

The sign should also state that, in the event of a fire, special protective gear should be worn and special procedures should be followed.

According to the Material Safety Data Sheet for mercury, recommended extinguishing media for fighting a fire include 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

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[10] As noted above, ten percent additional volume (or approximately 250 milliliters of headspace) should be adequate to accommodate the expansion of the mercury in a 76 pound flask up to its boiling point. At temperatures above 356.9 °C (mercury's boiling point), mercury's vapor pressure exceeds atmospheric pressure; if the pressure causes a tightly sealed mercury flask to be breached, gas phase mercury will be released.

[11] A plane crash could expose a facility to a fire. Locating a storage warehouse away from airports can minimize the risk from accidental crashes.

a water spray until they are sufficiently cooled. It is important to work with the local fire department to ensure that they are sufficiently informed, trained, and equipped to handle such fires.

Fire extinguishing media and other wastes generated in cleaning up after a fire that involves mercury may be contaminated with mercury. Therefore, appropriate personal protective equipment should be used during such cleanups. Any wastes generated from extinguishing such a fire should be presumed to contain hazardous levels of mercury and should be managed accordingly. Alternatively, representative samples of the fire extinguishing wastes can be analyzed by a laboratory to determine if they are, in fact, hazardous. If they are found not to be hazardous, the wastes may be disposed of accordingly.

4. Audits

Periodically, surprise facility audits should be conducted to ensure the established best management practices are being correctly implemented. In addition, the operations at the facility should be reviewed annually to ensure all the BMPs are being followed and to evaluate the need for additional, more stringent practices.

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