U.S. Department of Energy Interim Guidance on Packaging, Transportation, Receipt, Management, and Long-Term Storage of Elemental Mercury

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LIST OF ABBREVIATED TERMS

The following is a list of abbreviated terms used in this document. Additional terms are included in sections of this guidance that cover specific standards and procedures.

ACGIH	American Conference of Government Industrial Hygienists
AK	acceptable knowledge
ASHRAE	American Society of Heating, Refrigerating, and Air-Conditioning Engineers
AWS	American Welding Society
BEI	biological exposure indices
BMP	best management practice
CCTV	closed-circuit television
CDW	Computer District Warehouse
CEQ	Council on Environmental Quality
CESQG	Conditionally Exempt Small-Quantity Generator
CFR	U.S. Code of Federal Regulations
CWI	certified welding inspector
DNSC	Defense National Stockpile Center
DOE	U.S. Department of Energy
DOE/LM	U.S. Department of Energy, Office of Legacy Management
DOT	U.S. Department of Transportation
ECOS	Environmental Council of the States
EM	Office of Environmental Management
EMS	environmental management system
EMSF	Elemental Mercury Storage Facility
EPA	U.S. Environmental Protection Agency
ES&H	environment, safety, and health
FOIA	Freedom of Information Act
FP	fire protection
H&S	health and safety
Hazmat	hazardous materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
Hg	mercury (chemical symbol)
HMIS	Hazardous Materials Identification System
HPR	Highly Protected Risk
HVAC	heating, ventilation, and air conditioning
IATA	International Air Transportation Association
IBC	International Building Code
ID	identification number
IDS	intrusion detection system
IFC	International Fire Code
IMDG	International Maritime Dangerous Goods

ISMS	Integrated Safety Management System
ISO	International Organization for Standardization
LDR	Land Disposal Restriction
LEED	Leadership in Energy and Environmental Design
LQG	Large Quantity Generator
LSC	Life Safety Code
MEBA	Mercury Export Ban Act (of 2008)
MR	modulus rupture
MSDS	Material Safety Data Sheet
NARA	National Archives and Records Administration
NDE	nondestructive examination
NFPA	National Fire Protection Association
NIMP	National Incident Management Plan
NIOSH	National Institute for Occupational Safety and Health
NPT	National Pipe Thread
OC	operating contractor
ORNL	Oak Ridge National Laboratory, Oak Ridge, Tennessee
OSHA	Occupational Safety and Health Administration
PK	process knowledge
PPA	property protection area
PPE	personal protective equipment
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
QSC	Quicksilver Caucus
RC	Records Custodian
RCRA	Resource Conservation and Recovery Act
S&Ps	standards and procedures
SCBA	self-contained breathing apparatus
SF	safety factor
SQG	Small Quantity Generator
SSP	Site Security Plan
SWMU	solid waste management unit
TBD	to be determined
TCLP	Toxicity Characteristic Leaching Procedure
TLV	threshold limit value
TRI	toxic release inventory
TSD	treatment, storage, and disposal
TSDF	treatment, storage, and disposal facility
TWA	time-weighted average

UBC	Uniform Building Code
UPS	uninterruptible power supply
USB	Universal Serial Bus
USC	U.S. Code
USGBC	U.S. Green Building Council
VOC	volatile organic compound
WAC	waste acceptance criteria
WAP	waste analysis plan

UNITS OF MEASURE

Length, Area, and Volume:

cfm	cubic feet per minute (i.e., typically for air flow)
cm	centimeter(s)
cm^2	square centimeter(s)
cm^3	cubic centimeter(s)
fpm	feet per minute (i.e., typically for lineal air velocity)
ft	feet
ft^2	square feet
ft^3	cubic feet
gal	gallon(s)
gpm	gallons per minute (i.e., typically for water flow)
m	meter(s)
m^2	square meter(s)
m^3	cubic meter(s)
L	liter(s)
mL	milli(10^{-3})liter(s)
psi(g)	pounds per square inch (i.e., typically for fluid pressure, or material stress)
psf	pounds per square foot (i.e., typically for floor loading)

Mass/Density:

g	gram(s)
mg	milli(10^{-3})gram
µg	micro(10^{-6})gram
ng	nano(10^{-9})gram
kg	kilo(10^3)gram(s)
MT (or t)	metric ton(s) (1000 kg)
g/cm^3	gram(s) per cubic centimeter
kg/m^3	kilo(10^3)grams per cubic meter
lb/ft^3	pounds per cubic feet

Time:

d	day(s)
h	hour(s)
min	minute(s)
s	second(s)
y	year(s)

Material Concentration:

ppb	part(s) per billion
ppm	part(s) per million
mg/m^3	milligrams per cubic meter
$µg/m^3$	micrograms per cubic meter
ng/m^3	nanograms per cubic meter

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1. INTRODUCTION

1.1 BACKGROUND

The U.S. Department of Energy's (DOE) Office of Environmental Management (EM), in consultation with the U.S. Environmental Protection Agency (EPA) and all appropriate State agencies in potentially affected States, has prepared this guidance on packaging, transportation, receipt, management, and long-term storage of elemental mercury at a DOE facility or facilities as mandated by the *Mercury Export Ban Act of 2008* (MEBA), Public Law No. 110-414 (the Act). This guidance document establishes basic standards and procedures for the receipt, management, and long-term storage of elemental mercury at a DOE facility or facilities as mandated by the Act.

The Act, enacted October 14, 2008, prohibits the sale, distribution, and transfer of elemental mercury by Federal agencies (with certain exceptions); prohibits the export of elemental mercury (subject to potential essential use exemptions) effective January 1, 2013; requires DOE to designate and manage a facility for long-term storage of elemental mercury; and requires that various reports be submitted to Congress.

In the preparation of this guidance, DOE provided an overview of the Elemental Mercury Long-term Management and Storage Project to the EPA and potentially affected States to identify key assumptions associated with the guidance for long-term elemental mercury[*] management and storage, outline preliminary topics proposed to be addressed in the guidance, and facilitate consultations in the guidance development as required by the Act.

The Act establishes the following key milestones for the DOE indicated in Figure 1.1:

10/01/09: ***Procedures and Standards***. DOE, after consultation with EPA and all appropriate State agencies in affected States, shall issue guidance to potential users of the long-term mercury management and storage program. The guidance establishes standards and procedures for the receipt, management, and long-term storage of elemental mercury at the designated facility (including requirements to ensure use of suitable shipping/storage containers).

01/01/10: ***Designation of a DOE Elemental Mercury Storage Facility***. The Secretary of Energy shall designate a DOE facility or facilities (which shall not include any portion of the Oak Ridge Reservation, Tennessee) for the purpose of long-term management and storage of elemental mercury generated within the United States.

10/01/12: ***Fees***. DOE shall publically announce the fee system for long-term management and storage of elemental mercury by this date. The fee system, however, can be modified annually by DOE.

01/01/13: ***Operation of Elemental Mercury Storage Facility***. The facility designated by DOE shall be operational and shall accept custody (for the purpose of long-term management and storage) of elemental mercury generated within the United States by this date. DOE will begin collecting fees at the time of delivery. A designated elemental mercury storage facility in existence on or before 01/01/13 is authorized to open and operate under Resource Conservation and Recovery Act (RCRA) interim status until the State or EPA issues a final decision on the permit application. The mercury export ban also becomes effective on this date.

[*]Please note that this guidance sometimes uses the term "mercury" as a shorthand to refer to "elemental mercury."

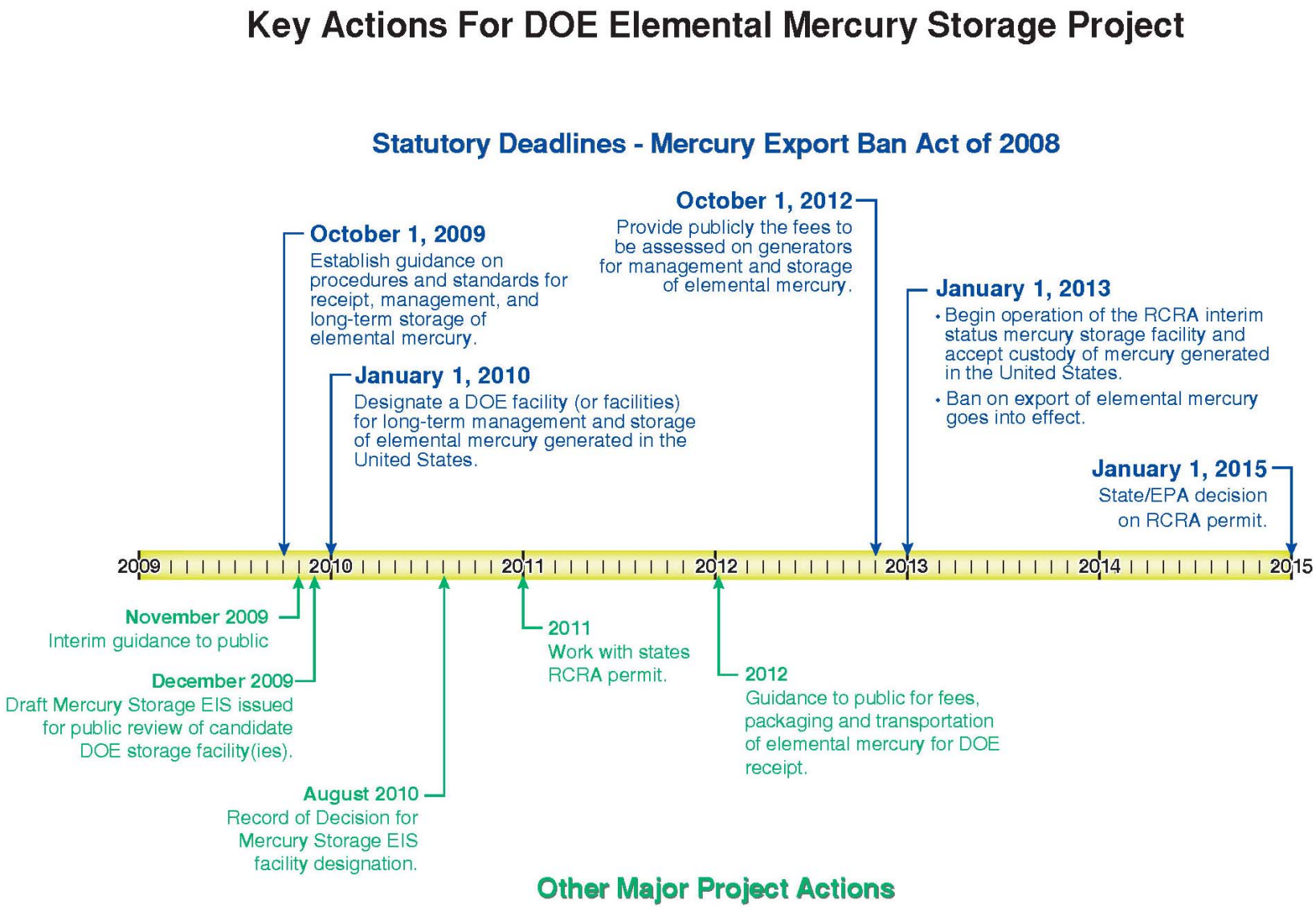

Figure 1.1. Timeline and key actions of the DOE Elemental Mercury Storage Project.

07/01/14: ***Mercury Recycling Study***. DOE shall transmit to Congress the results of a study, conducted in consultation with EPA, that (1) determines the impact of the long-term mercury storage program on mercury recycling and (2) includes proposals (if necessary) to mitigate any negative impacts identified relative to mercury recycling.

01/01/15: ***State/EPA RCRA Permit Application Decision***. State/EPA shall issue a final decision regarding a RCRA permit application for the elemental mercury storage facility (or facilities).

Annually: ***Annual Cost Reports***. Not later than 60 days after the end of each Federal fiscal year, DOE shall transmit a report of all of the costs incurred in the previous fiscal year associated with the long-term management and storage of elemental mercury.

1.2 PURPOSE

This document is intended to provide general guidance on standards and illustrative procedures that are current, consistent, and best suited for supporting the DOE program for the receipt, management, and long-term storage of mercury generated in the United States. As such, this interim guidance provides a framework for the standards and procedures associated with a DOE-designated elemental mercury storage facility with a focus on the RCRA permitting of such a facility and planning for that storage facility's needs. In the future, this interim guidance may be supplemented and, as appropriate replaced (superseded) by the storage facility's site-specific standards and procedures after the DOE-site designation is made. That facility-specific guidance could include stricter standards imposed by their state's regulations and/or conditions imposed by their RCRA permit. The facility-specific guidance could also include their fee structure for receipt and long-term storage of elemental mercury. Refer to Figure 1.1 for additional information on the timeline and key elements of the DOE Elemental Mercury Storage Project.

This guidance refers to Federal regulations [RCRA, Department of Transportation (DOT), etc.], the Act, and DOE Orders as requirements, whereas best management practices (BMPs) are referred to as "criteria" within the Standards portion of each section. This guidance document is not meant to modify or replace regulations which undergo periodic revisions. In the event of a conflict between this guidance and promulgated regulations, the regulations govern.

It should be noted that, in addition to Federal regulations, States may have additional hazardous waste and other regulations with which generators, transporters, and the DOE Operating Contractor (OC) must comply.

The BMPs reviewed as part of this guidance include the 2003 Environmental Council of the States (ECOS) *Mercury Stewardship Best Management Practices* (ECOS, October 2003) as well as the Basel Convention draft technical guidelines (Basel Convention, April 2009).

Container specifications and material acceptance criteria reflect the Act's requirement "to ensure that the elemental mercury is stored in a safe, secure, and effective manner" during transport and throughout long-term storage.

DOE Order (O) 450.1A (*Environmental Protection Program*) requires each DOE site to develop and implement an environmental management system (EMS), which shall reflect elements found in the International Organization for Standardization (ISO) 14001:2004 (E) International Standard or equivalent. Such elements include policies, procedures, and training to do the following:

- Identify operations and activities with significant environmental impacts;

- Manage, control, and mitigate the impacts of these operations and activities; and
- Assess performance and implement corrective actions where needed to ensure continual improvement.

This document includes not only requirements but also discussions of available options. This guidance includes the following major objectives:

1. Provide RCRA requirements for use in complying with relevant standards and developing procedures for an elemental mercury storage facility;
2. Facilitate the RCRA permitting process by summarizing the applicable RCRA requirements prior to DOE's submittal of a RCRA permit application for an elemental mercury storage facility; and
3. Assist both DOE and future DOE OCs in preparing for the long-term management and storage of elemental mercury.

This guidance document is intended to be a reference for a wide variety of individual users, industries, and regulatory organizations impacted by the Act. Specifically, potential users of this guidance document may include the following:

- Past generators, current owners, and custodians of elemental mercury;
- Recyclers of mercury-bearing materials, wastes, and products (e.g., companies that recover dental amalgam);
- Major industrial generators of mercury, including the minerals mining industry (especially gold), chlor-alkali (chlorine and caustic soda production) industry, and electrical lighting (e.g., fluorescent lamp) industry;
- Private and government contractors managing stockpiled mercury;
- Shippers of elemental mercury;
- State and Federal regulatory agencies (e.g., EPA); and
- Future operators of an elemental mercury storage facility for DOE.

Major users of this guidance should be the generators of elemental mercury as well as the potential OCs of the DOE-designated elemental mercury storage facilities. Specific sections in this guidance of use to generators and OCs of the elemental mercury storage facilities are indicated in Section 1.3.

This guidance provides general direction to (1) generators who will ensure the purity of the mercury and the integrity of the containers; (2) transporters who will load, secure, and transfer the mercury to the storage facility; and (3) the operators of the storage facility who will be responsible for unloading the mercury from the transport vehicle, verifying that waste acceptance requirements have been met, and operating the elemental mercury storage facility.

1.3 SCOPE, MAJOR ASSUMPTIONS, AND CONTENT

As required by the MEBA, this document outlines existing requirements and standards and applicable procedures for the receipt (including acceptance criteria and transfer/transport requirements), management, and long-term storage of elemental mercury by the DOE. In addition to this Introduction, this guidance covers the following major topics:

- Section 2: Standards and Procedures Applicable to Generators,
- Section 3: Standards and Procedures for Transportation of Elemental Mercury,
- Section 4: Standards and Procedures for Receipt/Verification of Elemental Mercury and Mercury Containers, and
- Section 5: Standards and Procedures for Operating the Elemental Mercury Storage Facility.

Various subtopics are included under Sections 4 and 5. Section 4 includes detailed guidance on verification and acceptance criteria for elemental mercury and its containers. Sections 2, 3, and 4 are of major interest to generators of elemental mercury, whereas Sections 4 and 5 primarily would be useful to a prospective OC of a DOE-designated elemental mercury storage facility.

The DOE elemental mercury storage facility requirements of Section 5 include guidance for the following topics in the subsections indicated:

5.1 RCRA facility design;
5.2 Personnel safety;
5.3 Workspace air monitoring;
5.4 Recordkeeping;
5.5 Facility security;
5.6 Inspections of mercury containers, storage facility, and facility equipment and materials;
5.7 Emergency response (to elemental mercury spills, fires, and emergency events);
5.8 Waste management requirements; and
5.9 Training.

Appendices A–H are used to provide supplementary information and are referred to in the body of the report. A list of references cited in each section is provided at the end of the relevant section.

Major assumptions include the following:

1. Elemental mercury storage acceptance purity is defined as 99.5% (by volume) or better, and composition data for elemental mercury and impurities are reported by weight and are supplied to DOE prior to shipment.
2. The DOE facility shall not accept elemental mercury contained in environmental media or consumer products (fluorescent lamps, batteries, etc.) or elemental mercury in manufactured items (manometers, thermometers, switches, etc.) (see Section H.4 of Appendix H for more information).
3. The elemental mercury to be shipped to the storage facility is a waste (since it is being discarded), and generally will be characterized as a hazardous waste under RCRA.
4. The DOE OC shall approve all elemental mercury storage containers, including 3-liter (L) and 1-metric ton (MT) containers as well as other types of containers to be agreed upon between the generator and the OC in accordance with specified acceptance requirements.
5. The DOE elemental mercury storage facility shall be an existing or new storage facility, adaptable to a modular design. DOE may designate more than one facility for the storage of elemental mercury.
6. The DOE elemental mercury storage facility shall be a RCRA-regulated/permitted facility, storing discarded elemental mercury commercial chemical product (U151) or used elemental mercury (D009) generated in the U.S.

1.4 RCRA REGULATIONS

The MEBA requires that the elemental mercury managed and stored at a DOE-designated elemental mercury storage facility shall be subject to the requirements of the *Solid Waste Disposal Act* (as amended), commonly known as the *Resource Conservation and Recovery Act* or RCRA. These requirements include RCRA Subtitle C (hazardous waste standards). However, the Act [see Sect. 5(g)(2)] contains a specific exception from the RCRA prohibitions on storage of hazardous wastes restricted from land disposal (which prohibit hazardous waste storage unless it is being stored to accumulate quantities necessary to facilitate proper recycling, treatment, or disposal). RCRA Subtitle C contains a “cradle-to-grave” system of requirements that requires solid waste and hazardous waste identification and management standards, as well as tracking the transfer/shipment

of hazardous wastes from their point of generation, their transport, and their storage, treatment and/or disposal.

The Act does not affect the sale, recovery, or other use of mercury by persons (other than Federal agencies) in the United States, and it does not prohibit continued storage of commodity elemental mercury by persons (owners, recyclers, or Federal agencies). The DOE-designated elemental mercury storage facility shall accept and store elemental mercury which persons have decided to discard and ship to DOE for long-term storage. The Act allows DOE to establish terms, conditions, and procedures necessary to facilitate long-term storage of elemental mercury that will be delivered to DOE per the Act. The elemental mercury received by DOE will essentially be in storage pending EPA's development of a treatment standard addressing high-purity elemental mercury wastes destined for land disposal. The Act supports a position that the mercury is a solid waste and a hazardous waste. It states that the "... elemental mercury managed and stored…shall be subject to the requirements of the *Solid Waste Disposal Act*, including requirements of subtitle C of that Act [which regulates hazardous wastes]… ."

Under RCRA, a solid waste is any discarded material. A discarded material includes, among others, any material that is abandoned [40 CFR 261.2(a)(2)]. Abandoned materials include, but are not limited to, materials that are stored before or in lieu of being abandoned by being disposed of, burned or incinerated [40 CFR 261.2(b)]. Hence, the mercury stored by DOE will meet the EPA definition of "abandoned or being stored in lieu of being abandoned" by the persons who initiate a shipment to DOE. In short, persons shipping elemental mercury to DOE will be shipping a discarded material (waste elemental mercury).

Elemental mercury, when discarded, is either a listed or characteristic hazardous waste, depending on its origin. Unused mercury (either as a commercial chemical product or off-specification commercial chemical product) that is discarded/abandoned is a "listed hazardous waste" with the waste code U151. Used/spent elemental mercury when discarded/abandoned, is classified as a "characteristic waste" with the waste code D009 if it exhibits the toxicity characteristic.

The DOE-designated facility will be a RCRA-regulated/permitted facility, receiving discarded elemental mercury (U151 or D009) generated in the U.S. The DOE-designated elemental mercury storage facility, if in existence on or before 01/01/2013, will operate under RCRA interim status until EPA or the state issue a decision on the facility's RCRA permit application, which is required by 2015. This guidance document is not intended to be a complete representation of EPA's regulations addressing interim status or for the preparation or submittal of a RCRA permit application. Some of the information required in a permit application for a container storage facility is included where relevant to the design and/or operation of the DOE elemental mercury storage facility. In general, the elemental mercury storage facility must submit a comprehensive permit application covering all aspects of design, operation, and maintenance. The content of the permit application is designed to ensure the elemental mercury storage facility will be designed, operated and maintained in compliance with Subtitle C regulations. The permit application consists of two parts, Part A and Part B. The Part A of the permit application is submitted on a designated form, Form 8700-23 (refer to 40 CFR 270.13 for more information). The Part B information is submitted in narrative form. The Part B information requirements are addressed in 40 CFR 270.14 through 270.27.

It is the generator's responsibility to determine whether the elemental mercury to be shipped to a DOE-designated elemental mercury storage facility for storage under MEBA is a solid waste[*] or a listed or characteristic hazardous waste (U151 for new, unused elemental mercury or D009 for characteristic, used elemental mercury) and to document that determination [40 CFR 261.2,

[*]For example, elemental mercury generated by a conditionally exempt small quantity generator.

40 CFR 262.11, and 40 CFR 262.40(c)]. It is also the generator's responsibility to meet the Waste Acceptance Criteria (WAC) issued by the DOE OC and to conduct any required sampling and analysis per the facility's Waste Analysis Plan (WAP). During the waste acceptance/review process (see Sections 4 and 5.8), the DOE elemental mercury storage facility shall confirm and accept or reject the generator's waste determination that is documented on the generator's Waste Profile form and then approve the waste for transfer/shipment to the facility. If a generator's waste determination is rejected, the DOE OC shall work with the generator to resolve issues. The WAC and the WAP are discussed in this guidance in Sections 4 ("Standards and Procedures for Receipt/Verification of Elemental Mercury and Mercury Containers") and 5.8 ("Waste Management Requirements").

Figure 1.2 is a waste process flowchart showing the key steps for generators (waste characterization, waste profile documentation, and approvals needed prior to shipment), transport, and receipt/acceptance at the storage facility. Key RCRA elements associated with each of these major components are indicated.

1.5 QUALITY ASSURANCE/QUALITY CONTROL (QA/QC) REQUIREMENTS

DOE elemental mercury storage facility requirements associated with QA/QC are found in DOE Order 414.1C, *Quality Assurance* (issued June 17, 2005). Each contractor for an elemental mercury storage facility shall develop and implement a quality assurance project plan (QAPP) that satisfies the requirements of DOE Order 414.1C. The QAPP should use a graded approach to meet the quality objectives, which are identified by the 10 major criteria identified in that Order.

These QA criteria indicate that the QAPP for a DOE mercury storage facility must address management, performance, and assessment requirements in the following major areas:

1. Program organization and management process,
2. Personnel training and qualification,
3. Quality improvement,
4. Documents and records,
5. Work performance,
6. Design performance,
7. Procurement performance,
8. Inspection and acceptance testing,
9. Performance of management assessments, and
10. Performance of independent assessments.

Detailed requirements associated with each one of these 10 criteria are listed in Appendix B.

A recognized national or international consensus standard may also be utilized to meet the requirements for the elemental mercury storage facility QAPP.

1.6 LEED CRITERIA

For buildings with costs of $5 million or greater, DOE develops facilities that reflect Leadership in Energy and Environmental Design (LEED). A green building rating system, LEED was developed in the 1990s by the U.S. Green Building Council to provide a suite of standards of environmentally sustainable construction. LEED promotes a whole-building approach to sustainability by recognizing building performance in six key areas of human and environmental health for sustainable site development, water and energy use efficiencies, and other quality features.

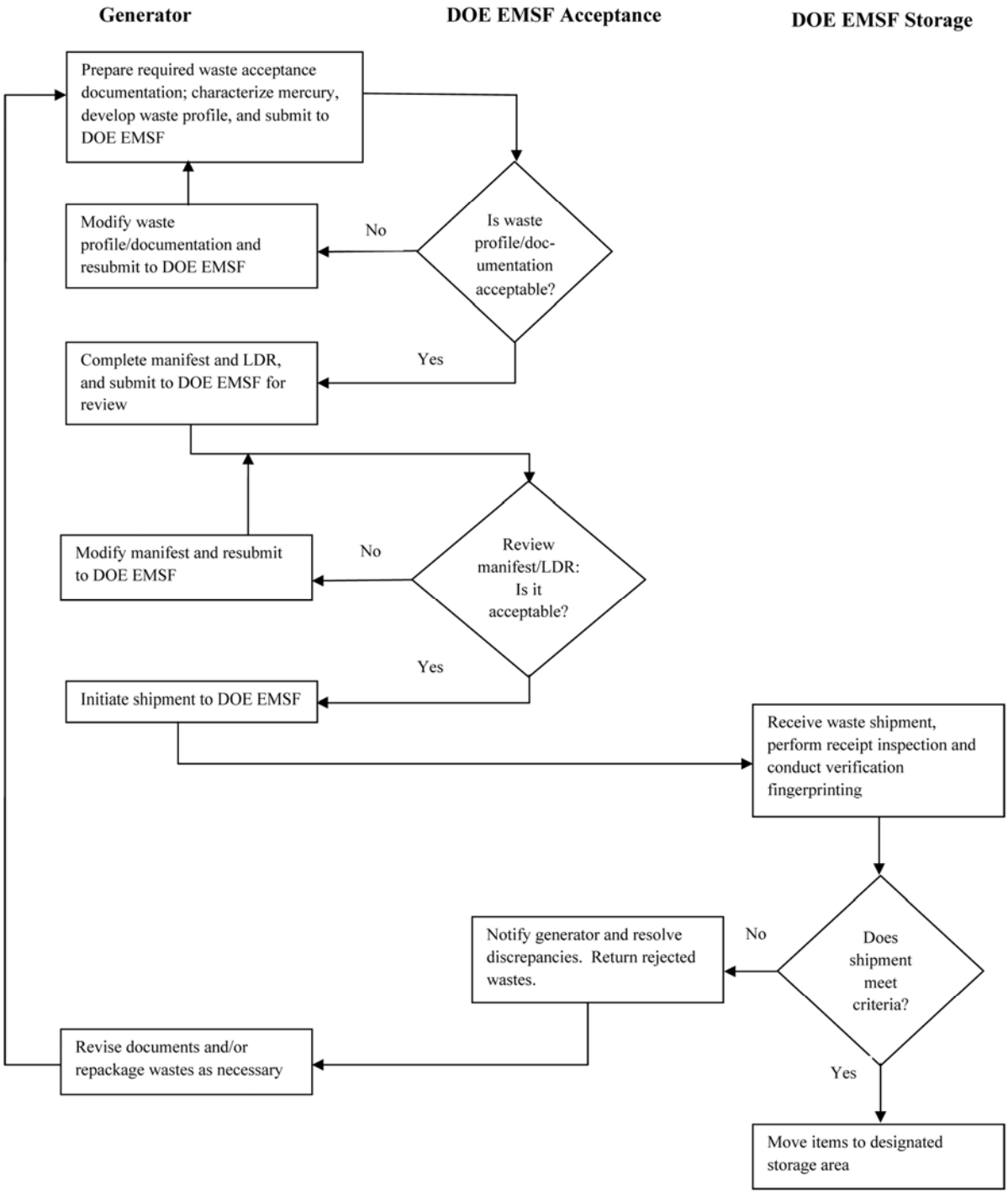

Figure 1.2. DOE elemental mercury storage facility (EMSF) waste process flowchart.

1.7 GUIDANCE ON STANDARDS AND PROCEDURES

A. Standards describe and establish measurable controls and requirements to achieve policy objectives. They also contain acceptable methods for implementing requirements. In this guidance, standards indicate a degree or level of excellence or attainment required in certain areas such as the RCRA, health and safety (H&S), and QA/QC.

In this guidance, both standards and procedures focus mainly on RCRA and other federal requirements, followed by DOE Orders, and then BMPs.

In this guidance, requirements for standards include applicable requirements for the following:

- *Protection of the Environment*, which identify the applicable requirements for compliance with RCRA. Specific applicable citations from Title 40 of the *Code of Federal Regulations* (CFRs) are identified in this guidance for required implementation related to execution of MEBA.
- *Transportation*, which identify applicable requirements for compliance with DOT regulations regarding transportation of hazardous materials. Specific applicable citations from Title 49 of the CFR are identified for required implementation related to execution of MEBA.
- *Labor*, which identify applicable requirements for compliance with DOE regulations as well as those of the Department of Labor, Occupational Safety and Health Administration (OSHA). The DOE regulations include those of 10 CFR Part 851 (Worker Safety and Health Program) for contractors and DOE Order [DOE Order 440.1B, *Worker Protection Program for DOE (Including the National Nuclear Security Administration) Federal Employees*].

Specific applicable citations from 29 CFR Part 1910 ("Occupational Safety and Health Standards") are identified for required implementation related to execution of MEBA.

Other applicable standards cited in this guidance include, but are not limited to, requirements from the following sources:

- National Fire Protection Association (NFPA),
- Uniform Building Code (UBC),
- International Building Code (IBC),
- U.S. Green Building Council (USGBC)—Leadership in Energy and Environmental Design (LEED), and
- Other Department of Energy Orders (e.g., DOE Order 430.2B, which addresses LEED).

B. Procedures describe suggested processes used to meet the requirements of standards. The DOE OC shall develop written procedures for critical operations at an elemental mercury storage facility designated by DOE. Procedures include action steps and types of records generated or received, establish accountability and responsibility, provide specific controls for risk management, define expectations for work processes and products, and serve as training tools. Because of the value that procedures provide to these areas, the DOE OC shall update and review written procedures regularly. Updating written procedures is particularly important when processes, hardware, software, or configurations change.

As a general guidance, revisions made to each issued standard and procedure for the DOE-designated elemental mercury storage facility have a change notice that includes a revision log containing the following items of information:

- Revision number,
- Description of changes,
- Effective date, and
- Specific sections of the standard or procedure affected.

In general, an annual review should be performed of BMPs, standards, and procedures critical to elemental mercury storage facility operations to ensure compliance with Federal regulations and DOE audit requirements. The importance of such a review is that different types of procedure adjustments, for example, can have strikingly different implications on various aspects of facility operations. For this reason, it is important to document the characteristics of a procedure (or standard) change and the reasons why it is necessary.

1.8 STORAGE FACILITY OVERVIEW

Section 5 covers standards and procedures (S&Ps) guidance directly associated with the DOE-designated elemental mercury storage facility. This guidance includes a conceptual layout of the elemental mercury storage facility as well as the S&Ps needed for certain essential functions performed in the facility, including the following:

- Section 5.1 provides a description and basic layout of an elemental mercury storage facility, along with discussion of the basic features of each of the four major facility areas (Office Administration, Receiving and Shipping, Storage, and Handling). Other essential facility features covered in Appendix F include building equipment and utilities, fire protection, special ventilated areas, and workforce staffing.
- Section 5.2 covers facility worker health and safety (H&S), H&S reporting, industrial hygiene limits, and the use of personal protective equipment (PPE).
- Section 5.3 provides S&P guidance for airborne monitoring at the elemental mercury storage facility.
- Section 5.4 provides S&P guidance for general recordkeeping at the facility.
- Section 5.5 discusses S&P guidance for facility security features.
- Section 5.6 covers S&Ps associated with inspections of mercury containers, the storage facility, facility equipment, and materials.
- Section 5.7 covers S&Ps for emergency responses to mercury spills, fires (including fire protection), and natural disasters.
- Section 5.8 discusses S&P guidance for waste management activities at the elemental mercury storage facility.
- Section 5.9 discusses S&P guidance for storage facility training and includes training associated with mercury container handling and management, H&S, and RCRA requirements.

The RCRA regulations for permitted (and/or interim status) facilities include general facility standards as well as unit-specific (e.g., operation) design and operating criteria. The general facility standards consist of good housekeeping provisions for any facility that handles hazardous waste. The technical requirements for the specific facility operations are designed to prevent the release of hazardous waste into the environment. The regulations for containers in 40 CFR Part 264/265, Subpart I, include design and operating requirements, inspections, and closure. These requirements are designed to ensure that the integrity of the container is not breached while in storage.

1.9 REFERENCES

DOE (U.S. Department of Energy). June 17, 2005. DOE Order 414.1C, *Quality Assurance*, Washington, D.C. Accessed (May 13, 2009) on the Web at URL: http://www.directives.doe.gov/pdfs/doe/doetext/neword/414/o4141c.pdf

DOE/NSO (U.S. Department of Energy, Nevada Site Office). May 2009. *Nevada Test Site Waste Acceptance Criteria*, DOE/NV-325-Rev. 7-01, DOE Nevada Site Office, Waste Management Project, Las Vegas, Nevada. Accessed (July 1, 2009) on the Web at URL: http://www.nv.doe.gov/library/publications/emrwap/DOENV_325_Rev7-01.pdf

DOE (U.S. Department of Energy). May 17, 2007. DOE Order 440.1B, *Worker Protection Program for DOE (including the National Nuclear Security Administration) Federal Employees*, Washington, D.C. Accessed (July 2, 2009) on the Web at URL: http://www.directives.doe.gov/pdfs/doe/ doetext/neword/440/o4401b.pdf

DOE (U.S. Department of Energy). February 27, 2008. DOE Order 430.2B, *Departmental Energy, Renewable Energy, and Transportation Management*, Washington, D.C. Accessed (June 3, 2009) on the Web at URL: http://www.directives.doe.gov/pdfs/doe/doetext/neword/ 430/o4302b.pdf

DOE (U.S. Department of Energy). June 4, 2008. DOE Order 450.1A, *Environmental Protection Program*, Washington, D.C. Accessed (June 22, 2009) on the Web at URL: http://www.directives.doe.gov/pdfs/doe/doetext/neword/450/o4501a.pdf

ECOS (Environmental Council of the States). October 2003. *Mercury Stewardship Best Management Practices*, Quicksilver Caucus and U.S. Environmental Protection Agency, Washington, D.C.

Basel Convention. April 2009. *Draft Technical Guidelines on the Environmentally Sound Management of Mercury Wastes*, Draft 4, Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, Geneva, Switzerland. Accessed (09-14-09) on the website for the Basel Convention at the URL: http://www.basel.int/techmatters/index.html

ISO (International Organization for Standardization). 2004. Environmental Management Systems—Requirements with Guidance for Use, ISO 14001: 2004, Geneva, Switzerland

Solid Waste Disposal Act, as amended (often referred to as the *Resource Conservation and Recovery Act*), 42 U.S.C. 6901 et seq.

Mercury Export Ban Act of 2008, Public Law 110-414 (October 14, 2008)

10 CFR Part 851—Worker Safety and Health Program

29 CFR Part 1910—Occupational Safety and Health Standards

40 CFR 261.2—Definition of solid waste

40 CFR 261.2(a)(2)—Definition of solid waste (discarded material)

40 CFR 261.2(b)—Definition of solid waste (burned or incinerated material)

40 CFR 262.11—Hazardous waste determination

40 CFR 262.40(c)—Recordkeeping (test results, waste analyses, or other determinations)

40 CFR Part 264—Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities [Subpart I (Use and Management of Containers)]

40 CFR Part 265—Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities [Subpart I (Use and Management of Containers)]

40 CFR Part 270—EPA Administered Permit Programs: The Hazardous Waste Permit Program, Subpart B—Permit Application

40 CFR 270.13—Contents of part A of the permit application

40 CFR 270.14—Contents of part B: General requirements
40 CFR 270.15–.27 (Specific part B information requirements for various items and components including containers)

40 CFR Part 268—Land Disposal Restrictions

40 CFR Part 268.50—Prohibitions on storage of restricted wastes

2. STANDARDS AND PROCEDURES APPLICABLE TO GENERATORS

STANDARD (S)

S2.1 INTRODUCTION

This section identifies regulatory requirements (RCRA and DOT) and DOE Orders, BMPs, and other criteria applicable to persons (i.e., generators) that would like to transfer/ship elemental mercury to a DOE-designated elemental mercury storage facility per MEBA. The generator requirements under RCRA that could apply are based on the facility's generator status. It is the generator's responsibility to determine whether the mercury being shipped is a listed (U151) or characteristic (D009) hazardous waste.[*] Documentation that the generator should complete and obtain approval from the DOE OC prior to shipment is described. That generator documentation should demonstrate that the waste (elemental mercury) to be shipped meets the elemental mercury storage facility's Waste Acceptance Criteria for purity, absence of prohibited constituents, and no radioactive constituents or contamination (refer to Sections 4 and 5.8). The generator is responsible for the cost of any required analyses, the cost for repackaging to meet the acceptance criteria,[†] the preparation of the Waste Profile, the shipment to the DOE elemental mercury storage facility, as well as the fee imposed for long-term storage and management.[‡]

To facilitate safe and effective storage, mercury shall be shipped in closed containers in good condition to meet DOT and RCRA requirements. Three liter and/or 1-MT containers are preferred, but the DOE OC may accept the use of other sizes of containers. Any containers (other than 3-L and 1-MT) would require pre-acceptance by the receiving facility prior to shipment. The DOE OC shall approve all elemental mercury storage containers, including 3-liter (L) and 1-metric ton (MT) containers as well as other types of containers to be agreed upon between the generator and the OC in accordance with specified acceptance requirements. As a BMP, all containers should be palletized with a spill tray to facilitate subsequent handling and storage operations at the DOE facility. These containers and pallets should have proven structural integrity by meeting criteria defined in Section 4 and Appendix G.

The receiving DOE elemental mercury storage facility shall implement a waste acceptance process that screens the generator's documentation on mercury, the containers, and/or the pallets prior to shipment to ensure all requirements/acceptance criteria are met. Mercury purity, container integrity, and the absence of mercury contamination on exposed surfaces are critical elements of the WAC. If a received container or pallet does not meet the storage facility's acceptance criteria, either the containers or pallets may be returned to the generator or the mercury may be repackaged at the generator's expense. (Note: The pallets/containers should only be returned to generator after a determination that they are safe and DOT compliant. If damaged they will be replaced by new pallets or containers at the generator's expense.) If a leak is identified upon receipt inspection, recontainerization may be done per emergency response action as defined in Section 5.7.

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[*] One exception could be a conditionally exempt small quantity generators whose elemental mercury could be shipped as a solid waste.

[†] The DOE storage facility would not accept elemental mercury contained in batteries or elemental mercury in elemental mercury-containing equipment (e.g., thermometers, thermostats, barometers, manometers, valves, switches, barometers, gauges, relays, etc.). Both elemental mercury in batteries and elemental mercury in elemental mercury containing equipment may be managed by generators as hazardous waste or they may be managed as universal waste (40 CFR Part 273). For more information on universal waste requirements see Appendix H (Section H.5) and 40 CFR Part 273 and applicable state regulations.

[‡] DOE will make the fee system publically available by October 2012.

It should be noted that, in addition to Federal regulations, States may have additional hazardous waste and other regulations with which generators, transporters, and the DOE OC must comply.

S2.2 SPECIFIC REQUIREMENTS OR CRITERIA (OR GUIDELINES)

S2.2.1 RCRA Requirements*

RCRA requires generators to determine if their solid wastes are hazardous wastes. 40 CFR 262.11 defines a three-step hazardous waste determination process that any person who generates a solid waste, as defined in 40 CFR 261.2, is required to follow. First, the generator is required to determine if the solid waste is excluded from RCRA regulation in 40 CFR 261.4. Second, if the waste is not excluded, the generator is required to determine if it is listed in Subpart D of Part 261. Third, for compliance with the land disposal restrictions or if the waste is not listed in Subpart D of Part 261, the generator is required to identify all relevant hazardous waste characteristics in Subpart C of Part 261.

Under RCRA, unused elemental mercury (either the commercial chemical product or an off-specification commercial chemical product) that is discarded is a "listed hazardous waste" with the waste code U151 [see 40 CFR 261.33(f)]. Used/spent elemental mercury when discarded would be classified as a "characteristic waste" with the waste code D009 if it exhibits the toxicity characteristic (see 40 CFR 261.24). However, for purposes of compliance with the Land Disposal Restrictions (LDRs) or if the waste is not listed in Subpart D of Part 261, the generator must identify all relevant hazardous waste characteristics in Subpart C of Part 261.

40 CFR Part 262 defines the "Standards Applicable to the Generators of Hazardous Waste." A hazardous waste generator is any person or site whose processes and actions create hazardous waste (see 40 CFR 260.10). Generators are divided into three categories based upon the quantity of waste they produce:

1. Large Quantity Generators [LQG, see 40 CFR Part 262 and 40 CFR 261.5(e)] generate 1000 kilograms per month or more of hazardous waste, more than 1 kilogram per month of acutely hazardous waste, or more than 100 kilograms per month of acute spill residue or soil.
2. Small Quantity Generators [SQG, see 40 CFR 262.34(d)] generate more than 100 kilograms but less than 1000 kilograms of hazardous waste per month.
3. Conditionally Exempt Small-Quantity Generators (CESQG, see 40 CFR 261.5) generate 100 kilograms or less per month of hazardous waste, 1 kilogram or less per month of acutely hazardous waste, or less than 100 kilograms per month of acute spill residue or soil.

Each class of generator is required to comply with its own set of requirements (see Table 2.1). All generators, except CESQGs, are also required to do the following:

- Obtain an EPA identification number (ID) (available from State environmental offices (see 40 CFR 262.12).
- Comply with the manifest system [see Appendix H (Sections H.2 and H.3), Section 3, and 40 CFR 262.40].
- Handle wastes properly before shipment—packaging, labeling, marking, placarding, accumulation time, etc. (see 40 CFR 262.30–262.34).
- Comply with recordkeeping and reporting requirements (see 40 CFR 262.40–262.44) including waste minimization planning and reporting.

*The information in this document is not intended to be a complete representation of EPA's regulations for generators. It is intended as a summary for generator informational use only and does not cover more stringent State requirements for generators.

Table 2.1. Supplementary information on requirements for LQGs, SQGs, and CESQGs

Criteria/activity/ documentation	LQGs	SQGs	CESQGs
Quantity limits	≥1,000 kg/month >1 kg/month of acute hazardous waste >100 kg/month of acute spill residue or soil Part 262 and 40 CFR 261.5(e)	Between 100–1000 kg/month 40 CFR 262.34(d)	≤100 kg/month ≤1 kg/month of acute hazardous waste ≤100 kg/month of acute spill residue or soil 40 CFR 261.5(a) and 40 CFR 261.5(e)
EPA ID number	Required 40 CFR 262.12	Required 40 CFR 262.12	Not required 40 CFR 261.5
Manifest	Required 40 CFR 262.20	Required 40 CFR 262.20	Not required 40 CFR 261.5
DOT transport requirements	Yes 40 CFR 262.30–262.33	Yes 40 CFR 262.30–262.33	Yes

All generators are required to comply with any State regulations for generators (contact your State environmental office for more information).

Under RCRA, generators are required to accurately characterize their wastes. They may make a hazardous waste determination by testing or applying their knowledge of the waste's chemical and physical properties as specified in 40 CFR 262.11. For shipment of elemental mercury to the DOE storage facility, waste characterization may be based on sampling and analysis, acceptable knowledge, or a combination of both. Acceptable knowledge is broadly defined to include acceptable knowledge and the facility's records of analysis performed before the effective date of RCRA regulations or actual chemical analysis of the waste. Acceptable knowledge includes detailed information about the waste obtained from existing published or documented waste analysis data or studies conducted on wastes generated by processes similar to that which generated the waste. Acceptable knowledge may include~~s~~ manufacturing material inputs and specifications, mass balance calculations, documented living memory of generators, process logs and records, etc. Generator knowledge is required to be accurate and verified routinely by the generator via sampling and analysis. Additionally, RCRA requires that TSD facilities obtain a detailed analysis of wastes to be received; the analysis is required to be sufficient to allow safe and compliant storage, treatment, or disposal. As a result, TSD facilities like a DOE storage facility issue specific waste analysis/characterization requirements for generators to meet for waste acceptance and conduct fingerprinting analyses for verification of wastes received.

Generators are required to keep copies of manifests for a minimum of 3 years from the date the waste was accepted by the initial transporter. (The generator/transporter signed copy need not be retained after the TSD facility returns a signed copy acknowledging receipt.) The generator is required to also keep any exception reports for a minimum of 3 years from the due date of the report. Records of waste analyses and other determinations (e.g., acceptable knowledge) are required to be retained for a minimum of 3 years from the date of shipment for TSD.

CESQGs do not have specific recordkeeping requirements under RCRA, but it is advisable that they retain waste analyses/waste characterization records to prove their exempt status. It is also advisable

for CESQGs to maintain records regarding their on-site waste accumulation totals to document their exempt status. CESQGs are not required under RCRA to use manifests or retain manifests, but the DOT requirements would still apply to the shipment; therefore, CESQGs would need to issue a shipping paper and meet DOT requirements for recordkeeping.

S2.2.2 QA/QC Criteria/Guidelines

If DOE is the generator of elemental mercury, DOE (including DOE contractors and subcontractors) should develop and implement a Quality Assurance Project Plan (QAPP). Particular emphasis should be given to the work performance, records, and assessments of DOE Order 414.1C.

Quality assurance records required under DOE Order 414.1C for DOE contractors and subcontractors and that are typically issued/maintained under a DOE site's waste generator program include:

- Quality Assurance Project Plan (QAPP),
- Sampling and Analysis Plan,
- Qualifications for personnel conducting sampling,
- Copy of the analytical laboratory's QAPP,*
- Copies of the analytical procedures used to characterize the elemental mercury,*
- Qualifications for personnel completing the analytical data,*
- Validation of the analytical data,
- Validation procedures, and
- Qualifications of validation personnel.

While the RCRA regulations do not impose specific QA/QC standards per se on waste generators, a generator's waste characterization is required to be accurate. Therefore, it is a recommended BMP for non-DOE generators of elemental mercury to have QA/QC documentation that supports their RCRA waste determination and their subsequent waste characterization that is later documented on the Waste Profile, manifest and LDR form.

S2.3 ELEMENTAL MERCURY WASTE APPROVAL PROCESS AND DOCUMENTATION

The DOE OC for elemental mercury storage facility shall establish a waste approval process and define documentation that the generator must submit. The basic generator steps and the facility's review/approval process are shown in Figure 1.2. Elemental mercury would not be shipped until the receiving facility accepts the generator's documentation. The requirements for generators outlined below are driven by the RCRA requirements (above), DOT, the Act, and QA/QC criteria (above).

S2.3.1 Generator Requirements before Shipment

Generators must demonstrate that the waste mercury to be shipped meets the facility WAC (refer to Section S5.8.3.10). At a minimum, the generator must submit the following required documentation to the DOE OC of the elemental mercury storage facility and obtain the facility's approval to transport the waste to the facility prior to shipment (see Appendix D for more information on RCRA recordkeeping requirements and the waste process flowchart of Figure 1.2 in Section 1):

*Items may be skipped if the DOE generator uses a DOE-approved analytical laboratory. Under the DOE Consolidated Audit program, DOE audits and approves analytical laboratories for use by DOE and its operating contractors for waste characterization.

1. A Waste Profile form for each separate elemental mercury waste stream
2. A copy of the draft manifest and LDR form* for the initial shipment

Information in the Waste Profile includes, but is not limited to, generator information and waste characterization (applicable RCRA waste codes, sampling and analyses results, and/or documented acceptable knowledge). The Waste Profile documents (1) the mercury's purity and whether any other hazardous constituents [including RCRA organics regulated under Subpart CC Air Emissions (40 CFR 264.1080/265.1080)] are present, (2) that there are no radioactive constituents or contamination in the mercury, (3) the absence of prohibited materials (water, chloride salts solutions, nitric acid solutions, or other possible corrosion agents), (4) the U.S. point of generation of the mercury, and (5) that the containers and pallets (possibly excluding small 3-L container shipments) used are suitable for long-term storage of elemental mercury. The Waste Profile identifies the minimum informational requirements that must be supplied for the DOE OC to properly evaluate the waste stream and approve the Waste Profile. However, the DOE OC may request additional information not included on the Waste Profile. This may include quality assurance documentation in support of the generator's waste characterization and sampling and analysis and/or lists and images of the containers or pallets before shipment. The OC of the receiving elemental mercury storage facility may reserve the right to conduct a visit/audit of the generator site and their documentation where waste characterization is solely by acceptable knowledge.

As a BMP, all documentation is to be submitted to the DOE OC of the elemental mercury storage facility according to the schedule set by the DOE OC to allow for a complete review and approval by the storage facility.

A pre-shipment record of all containers being shipped should be submitted in a table similar to what is shown in Table 2.2 below. The pallet number and container number should be pre-assigned by the personnel at the storage facility. The container type should be identified by the generator and include the manufacturer (if known) and basic information. The weight [specify units (lb, kg)] of each filled container to a single decimal place should be included along with any special information of note.

Table 2.2. Example list of container information sent with shipment documentation

Pallet number	Container number	Container type	Filled weight (lb)	Special note
0001	01			N/A[a]
0001	02			Paint chipped
0001	03			N/A
0001	04			Dent in container side

[a]N/A = not applicable.

S2.3.1.1 Mercury analysis documentation

As part of the Waste Profile, the generator provides a detailed analysis of the purity of the elemental mercury preparing to be shipped. The purity analysis shall confirm a minimum purity of 99.5% (per volume) and list all impurities and their weight percent of content. The total liquid shipment per container is on a volume basis, and the percent impurities are on a weight basis. The impurities shall not be capable of corroding carbon or stainless steel. To prevent degradation of the container, nitric acid solutions, chloride salts solutions, water, and other possible corrosion agents are prohibited. The mercury shall be free of any added radiological components. The elemental mercury storage facility's

*CESQGs may use shipping papers or manifests depending on agreement with the receiving storage facility.

waste analysis plan (WAP) (Section S5.8.3.10) provides the generator with the specific analyses required and the number of samples requiring analysis.

S2.3.1.2 Mercury containers

The elemental mercury should arrive at the designated DOE elemental mercury storage facility in DOT-approved and RCRA-compliant metal (steel) containers (see Section 3), with 3-L or 1-MT sizes being preferred to facilitate safe and efficient storage operations; other material and size options are acceptable at the discretion of the facility operators. Mercury storage container guidelines are provided in detail in Appendix G. The guidelines are intended to create maximum flexibility while maintaining appropriate safety requirements and complying with 49 CFR 173.24. The acceptable containers include both (1) existing containers—containers no longer produced by industry, and (2) industry containers—containers currently manufactured for containing elemental mercury. The DOE facility operator may utilize available technical references such as those recently developed by Oak Ridge National Laboratory (ORNL) in making decisions for existing container acceptance. These references include the following:

1. Hylton, T. D., et al. April 2009. *Drum Characterization for the DNSC Mercury Stockpile* (ORNL/TM-2009/002).
2. Mattus, C. H., et al. July 2009. *Flask Characterization for the DNSC Mercury Stockpile* (ORNL/TM-2009/003).
3. Pawel, S. J. and H. F. Longmire. April 2009. *Evaluation of Steel Flasks for Long-Term Storage of Elemental Mercury: Chemical Compatibility and Metallographic Assessment* (ORNL/TM-2009/004).
4. Terry, J. W., et al. February 2009. *DNSC Mercury Stockpile Inventory Definition Report* (ORNL/TM-2009/001).

Two recent investigations (2001–2002 and 2007–2008) of the condition of the 128,600+ 3-L containers in its inventory were conducted by the Defense National Stockpile Center (DNSC) (Terry et al., February 2009). From 1999 through the present, DNSC identified three 3-L containers that leaked a relatively large amount of mercury, one pound or more (≥33 mL). The 3-L containers typically hold 76 lb (34.5 kg) of mercury.

Information made available by DNSC shows (1) the most recent purchase of large quantities of mercury was done in 1977 (~2000 3-L containers); and (2) about 54,000 3-L containers of mercury were purchased in 1964. No large purchases of mercury were made between 1964 and 1977, and there was no sale of mercury during that period. The DNSC inventory contained about 200,000 containers after the purchase in 1964; sales between 1977 and 1995 reduced the inventory to the present level of 128,600+ containers. Consequently, the containers in the DNSC inventory have been in static storage for at least 30 years, some for substantially longer.

ORNL examined 3-L containers removed from the DNSC inventory (Mattus et al., July 2009). Mercury is known to not react with steel containers at ambient temperatures and this was confirmed for 3-L flasks from the DNSC inventory by metallurgical analysis (Pawel and Longmire, April 2009). The very small number of failures found since 1999 and the results of the metallurgical analysis suggest that containers in static storage in a well maintained facility should have a long lifetime.

S2.3.1.3 Container labeling

A container of elemental mercury should arrive at the storage facility properly labeled with the correct information. The preferred location for the label on a 3-L container is the shoulder. For a

1-MT container there are two preferred label locations—one on the top near the plug and one on the side, as shown in Figure 2.1. The preferred orientation of the side label is perpendicular to the "C" channels; this orientation causes the label to be facing the correct direction in the spill tray. The preferred label locations will ensure the labels are readily visible and, thereby, facilitate the inspection of the container labels at receipt and throughout long-term storage. Alternative label positions are acceptable if container design does not suit the suggested locations.

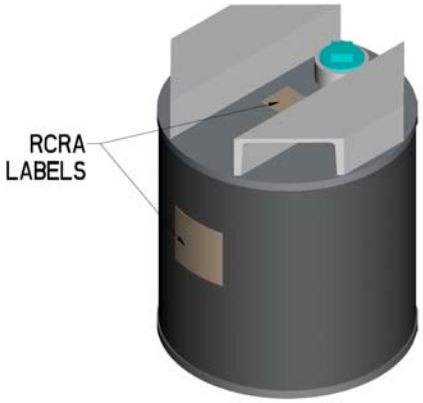


Figure 2.1. RCRA labels on a 1-MT container.

S2.3.1.4 Container documentation

The generator should provide all available documentation about the manufacturing and history of the containers in the Waste Profile. In addition several images and approximate dimensions are expected for each type of container. Additional information and images are required for containers with corrosion, dents, cracks, or other structural concerns, as they may not meet DOT requirements. If a container arrives at the storage facility with undocumented damage, the container may be sent back to the generator. (This does not imply that documentation of a container's damage would make that container acceptable.) It is recommended that the generator photographically document the condition of the containers prior to shipping for their own records.

To ensure the structural integrity of the container, the containers sent to the storage facility are preferred to have only been used for storage of elemental mercury. In the Waste Profile, as applicable, the generator shall document that the containers have not been damaged from any previously contained materials and that those materials would not adversely react with mercury.

S2.3.1.5 Pallets

The 3-L containers are preferred to be sent in box pallets that comply with the following: (1) Contain 49 3-L containers, with all containers in an upright position. Use of a smaller box pallet is acceptable for shipment of less than 49 3-L containers. All generator shipments require OC approval of the pallet configuration prior to shipment. (2) Box pallets have at least two directional lower fork lift access. (3) A spill tray capable of containing at least 10% of the mercury held on the pallet while the pallet is sloped three degrees (as when pallet is stored on racks in the facility). The 10% leak containment requirement is a result of RCRA 40 CFR 264.175(b). The spill tray should be formed from a material that does not corrode or degrade in strength in the expected storage environment (for example, painted carbon steel). (4) The pallet may be constructed of painted steel, untreated hardwood with fire protective paint applied, treated hardwood, or other materials that have equivalent load capacity, fire resistance, degradation rate (e.g., expected life), and would not require disposal as hazardous waste.

(5) Pallets should be free of contaminants [no radioactive constituents or contamination and no hazardous constituents that would cause the pallet to be regulated under RCRA or the Toxic Substances Control Act (e.g., polychlorinated biphenyls)]. (6) The pallet should be structurally sound with members in good condition upon visual inspection. (7) The pallet specification document with load rating should be provided to the OC for concurrence.

The 1-MT containers should be sent on pallets, with one container per pallet. As a BMP, two metal bands should be used to secure the 1-MT container to the pallet. The pallet specification document with load rating should be provided as part of the Waste Profile.

DOT requirements for shipping the mercury containers are discussed in Section 3.

S2.4 REFERENCES

EPA (U.S. Environmental Protection Agency) 40 CFR Part 261, "Identification and Listing of Hazardous Waste")

EPA (U.S. Environmental Protection Agency) 40 CFR Part 262, "Standards Applicable to the Generators of Hazardous Waste")

Hylton, T. D., et al. April 2009. *Drum Characterization for the DNSC Mercury Stockpile*, ORNL/TM-2009/002, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Mattus, C. H., et al. July 2009. *Flask Characterization for the DNSC Mercury Stockpile*, ORNL/TM-2009/003, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Pawel, S. J. and H. F. Longmire. April 2009. *Evaluation of Steel Flasks for Long-Term Storage of Elemental Mercury: Chemical Compatibility and Metallographic Assessment*, ORNL/TM-2009/004, Oak Ridge National Laboratory, Oak Ridge, Tennessee

Mercury Export Ban Act of 2008, Public Law 110-414 (October 14, 2008)

Terry, J. W., et al. February 2009. *DNSC Mercury Stockpile Inventory Definition Report*, ORNL/TM-2009/001, Oak Ridge National Laboratory, Oak Ridge, Tennessee

40 CFR Part 260—Hazardous Waste Management System: General

40 CFR 260.10—Definitions (associated with hazardous waste management systems)

40 CFR Part 261—Identification and Listing of Hazardous Waste

- Subpart C—Characteristics of Hazardous Waste
- Subpart D—Lists of Hazardous Wastes

40 CFR 261.2—Definition of solid waste

40 CFR 261.4—Exclusions

40 CFR 261.5—Special requirements for hazardous waste generated by conditionally exempt small-quantity generators

40 CFR 261.5(a)—(Definition of a CESQG)

40 CFR 261.5(e)—(Regulation of acute hazardous waste generators)

40 CFR 261.24—Toxicity characteristic

40 CFR 261.33—Discarded commercial chemical products, off-specification species, container residues, and spill residues thereof

40 CFR Part 262—Standards Applicable to Generators of Hazardous Waste

40 CFR 262.11—Hazardous waste determination

40 CFR 262.12—EPA identification numbers

40 CFR 262.20—General requirements (for manifests)

40 CFR 262.30–262.34 (Pre-transport Requirements: packaging, labeling, marking, placarding, and accumulation time)
40 CFR 262.34(d)—(Hazardous waste accumulation time without a needed permit)
40 CFR 262.40–262.44 (Recordkeeping and reporting)

40 CFR 264.1080/265.1080—Applicability
40 CFR 264.175(b)—Containment (design and operation)
40 CFR Part 273—Standards for Universal Waste Management

49 CFR 173.24—General requirements for packagings and packages

DOE Order 414.1C (*Quality Assurance*)

PROCEDURE (P)

WASTE ACCEPTANCE PROCESS FOR GENERATORS FOR TRANSFER OF ELEMENTAL MERCURY FOR LONG-TERM STORAGE AND MANAGEMENT AT A DOE STORAGE FACILITY

P2.1 INTRODUCTION

This procedure outlines the steps associated with the process of obtaining DOE approval for transfer of elemental mercury from a generator to a DOE storage facility. DOT and RCRA requirements, DOE Orders, and QA/QC standards serve as the basis for the waste acceptance approval process.

P2.2 PRECAUTIONS/LIMITATIONS

This procedure is limited to the generator actions for obtaining DOE approval to conduct transfers of elemental mercury for long-term storage. DOT and RCRA requirements should be consulted prior to shipment to ensure no change in regulations has occurred. Following this procedure does not guarantee compliance with DOT or RCRA regulations.

P2.3 REQUIREMENTS

- 49 CFR, *Transportation Regulations*
  - 49 CFR Part 171, General Information, Regulations, and Definitions
  - 49 CFR Part 172, Hazardous Materials Table, Special Provisions, Hazardous Material Communication, Emergency Response Communication, and Training Requirements
  - 49 CFR Part 173, Shippers—General Requirements for Shipments and Packaging
  - 49 CFR Part 174, Carriage by Rail
  - 49 CFR Part 175, Carriage by Aircraft
  - 49 CFR Part 176, Carriage by Vessel
  - 49 CFR Part 177, Carriage By Public Highway
  - 49 CFR Part 178, Specification for Packaging
  - 49 CFR Part 179, Specification for Tank Cars
- 40 CFR Part 261, “Identification and Listing of Hazardous Waste”
- 40 CFR Part 262, “Standards Applicable to Generators of Hazardous Waste”
- 40 CFR Part 263, “Standards Applicable to Transporters of Hazardous Waste”

P2.4 PREREQUISITES

Generators and the DOE OC personnel are RCRA and DOT trained per their involvement in the shipment.

P2.5 ACTION STEPS

This procedure lists the steps involved in the process flow to obtain approval to transfer elemental mercury to DOE for storage (see Figure 1.2). The first step would be the generator making inquiry to the DOE storage facility for acceptance requirements. Generators issue and maintain programmatic documentation that is designed to ensure the elemental mercury is accurately characterized and that it will meet the facility's defined WAC.

At a minimum, the generator completes the Waste Profile and issues a draft manifest and LDR form. The DOE storage facility may request additional information not included on the Waste Profile. This may include quality assurance documentation in support of the generator's waste characterization and the generator's sampling and analysis and/or lists and images of the containers or pallets before shipment.

The Waste Profile would include, but is not limited to, generator information and waste characterization information (e.g., applicable RCRA waste codes, sampling and analyses results, and/or documented acceptable knowledge). The Waste Profile should document the following: (1) the elemental mercury's purity and whether any other hazardous constituents [including RCRA organics regulated under Subpart CC Air Emissions (40 CFR 264.1080/265.1080)] are present, (2) that there are no radioactive constituents or contamination in the mercury, (3) the absence of prohibited materials (water, chloride salts solutions, nitric acid solutions, or other possible corrosion agents), and (4) that the containers and pallets used are suitable for long-term storage of elemental mercury.

The DOE storage facility reserves the right to request supporting information including QA/QC documentation from generators if it is necessary to support the generator's waste determination and/or waste characterization.

The generator's documentation (at a minimum Waste Profile, draft manifest, and LDR form) should be submitted to the DOE storage facility for approval prior to shipment. The Waste Acceptance staff at the DOE elemental mercury storage facility would review and comment on the generator's documentation, and the generator would revise and resubmit the documentation as necessary. The receiving storage facility may reserve the right to conduct audits of the generator site and their documentation to ensure the generator's waste meets the DOE WAC. Operating Contractor (OC) approval would be granted after the generator has satisfactorily met the DOE standards for shipment. OC may suspend a generator's approval to ship if, at any time, OC believes the generator's waste characterization is deficient. Causes for suspension could include waste characterization errors or omissions, container integrity deficiencies, etc. The generator would implement corrective actions and/or provide copies of corrective actions taken for OC review and concurrence in order to re-activate shipments that have been suspended.

P2.6 RECORDS

- Generator QA/QC which may-include Waste Sampling and Analysis Plan, associated supporting documents and/or Self-Assessment Report
- Generator's completed Waste Profile(s)

- Manifest/LDR Form
- DOE approval to ship elemental mercury
- DOE notification to the off-site generator of the permits in place to accept the waste
- DOE rejection/suspension to ship elemental mercury
- Generator corrective action documentation

P2.7 REFERENCES

40 CFR Part 261, "Identification and Listing of Hazardous Waste"
40 CFR Part 262, "Standards Applicable to the Generators of Hazardous Waste"
40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities"

40 CFR 264.1080—Applicability

40 CFR 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities"

40 CFR 265.1080—Applicability

49 CFR, *Transportation Regulations*

49 CFR Part 171, General Information, Regulations, and Definitions
49 CFR Part 172, Hazardous Materials Table, Special Provisions, Hazardous Material Communication, Emergency Response Communication, and Training Requirements
49 CFR Part 173, Shippers—General Requirements for Shipments and Packaging
49 CFR Part 174, Carriage by Rail
49 CFR Part 175, Carriage by Aircraft
49 CFR Part 176, Carriage by Vessel
49 CFR Part 177, Carriage By Public Highway
49 CFR Part 178, Specification for Packaging
49 CFR Part 179, Specification for Tank Cars

DOE Order 414.1C, Quality Assurance

3. STANDARDS AND PROCEDURES FOR TRANSPORTATION OF ELEMENTAL MERCURY

STANDARD (S)

S3.1 INTRODUCTION

This standard provides information associated with the packaging and movement of mercury, including the RCRA, DOT, IATA, and IMDG requirements that are applicable.* This standard provides the information necessary to ship elemental mercury from generator sites to a DOE-designated elemental mercury storage facility via ground, water, or air transport in non-bulk packaging. Shipments are only initiated after the DOE storage facility has approved the generator's waste documentation outlined in Section 2.

Under 49 CFR (*Transportation Regulations*) non-bulk packaging for mercury means a packaging that has a maximum capacity of 450 L (119 gal) or less as a receptacle for a liquid.

It should be noted that, in addition to Federal regulations, States may have additional hazardous waste and other regulations with which generators, transporters, and the DOE OC must comply.

S3.2 SPECIFIC CRITERIA

Both RCRA and the Hazardous Materials Transportation Act (implemented by DOT) regulate the transport of hazardous wastes. Under these statutes, specific pretransport regulatory requirements must be met before shipment of hazardous wastes and specific transport requirements must be met during shipment. The pre-transport requirements under RCRA and DOT are designed to help reduce the risk of loss, leakage, or exposure during shipment of hazardous materials and to communicate information on potential hazards posed by the hazardous material in transport. The specific requirements for the transport of mercury in the United States by truck, rail, vessel and air are provided by the DOT air shipment requirements, which are also found in the International Civil Aviation Organization regulations and in the air carrier's requirements of the International Air Transportation Association (IATA) regulations. For purposes of this guidance, the IATA regulations will be referred to, unless there is a difference between the two. Specific stipulations for water transport are found in the International Maritime Dangerous Goods (IMDG) regulations. All of these are discussed below. Finally, waste acceptance/receiving requirements at the DOE-designated elemental mercury storage facility must also be taken into account. These regulations affect both the generator (as the shipper) and the transporter (or carrier); each has their own responsibilities, but the shipper is held ultimately responsible for the shipment.

S3.2.1 RCRA Requirements

Generators and transporters are subject to RCRA regulations governing the shipment of hazardous wastes.

Generators comply with the manifest system (see 40 CFR 262.40). A generator can only offer hazardous wastes for off-site shipment to a transporter that has an EPA Identification Number [40 CFR 262.12(c)]. Before a hazardous waste may be shipped off-site, the generator must determine:

*The information in this document is not intended to be a complete representation of the regulations covering transport of hazardous wastes. It is intended as a summary for generator informational use only.

- the proper identification of the hazardous waste (40 CFR 262.11);
- the proper packaging for the hazardous waste (40 CFR 262.30);
- the necessary RCRA and DOT labeling, marking, and placarding requirements (40 CFR 262.30–262.33); and
- the information necessary to complete and sign the hazardous waste manifest for the waste shipment (40 CFR 262.20–262.23).

Generators comply with the manifest system (see 40 CFR 262.20–.27). The pre-shipment review of the manifest (and the associated land disposal restriction form) by the DOE OC is intended to ensure that the manifest accurately represents the waste defined in the generator's Waste Profile.

Hazardous waste transporters are individuals or entities that move hazardous waste from one site to another by highway, rail, water, or air (see 40 CFR 260.10). The RCRA regulations addressing transporter requirements are found in 40 CFR Part 263. Regulated activities include transporting hazardous waste from a generator's site to a facility that can recycle, treat, store, or dispose of the waste. The regulations do not apply to on-site transportation of hazardous waste at either the generator site or a TSD facility (see 40 CFR 263.10). Transporters who store manifested hazardous wastes for 10 days or less during shipments (e.g., at a transfer facility) are not required to obtain a RCRA permit for that storage (40 CFR 263.12). Some states impose specific notification and operating requirements for transfer facilities.

Requirements for transporters include the following (see 40 CFR Part 263):

- Obtaining an EPA identification number (available from your state environmental office) (40 CFR 263.11),
- Complying with the manifest system and recordkeeping (40 CFR 263.20–263.22),
- Responding appropriately to hazardous waste discharges (40 CFR 263.30–263.31), and
- Complying with all applicable DOT regulations as described above (see 49 CFR Parts 171–179 and DOT's hazardous materials safety web site).

S3.2.2 DOT Requirements

In the United States, the packaging and transport of all hazardous materials, including hazardous wastes, are regulated by the DOT, and the regulations are found in 49 CFR (*Transportation*). Mercury is classified as a corrosive (Hazard Class 8 material). As such, there are specific requirements for the ground, water, and air shipments of mercury.

Listed below is a summary of the major responsibilities of shippers of hazardous materials, including hazardous wastes. General shipper responsibilities are contained in 49 CFR Part 173.

• Determine whether a material meets the definition of a "hazardous material" • Proper shipping name • Class/division • Identification number • Hazard warning label • Packaging • Marking • Employee training	• Shipping papers • Emergency response information • Emergency response telephone number • Certification • Compatibility • Blocking and bracing • Placarding • Security plan • Incident reporting

The list below contains some of the major responsibilities of carriers of hazardous materials. Carrier and offeror (shipper) responsibilities frequently overlap. When a motor carrier performs a shipper function, the carrier is responsible for performing that function in accordance with 49 CFR. The cargo space of the vehicle should be suitable for the material being shipped. The vehicle itself must be in sound mechanical condition. The carrier must check to insure that the material offered by the shipper is properly described and packaged. In addition to the provisions of 49 CFR Parts 100–180, interstate motor carriers of placarded loads must comply with the hazardous materials requirements in 49 CFR Part 397.

- Shipping paper
- Placarding and marking vehicle
- Loading and unloading
- Ensuring compatibility
- Blocking and bracing
- Incident reporting
- Security plan
- Employee training

S3.2.2.1 General DOT requirements for transport of hazardous materials

a. **Packaging**. A shipper transporting a hazardous material is required to package the material in accordance with DOT regulations. Per 49 CFR 173.22, "Shipper's Responsibility," a "Shipper is required to determine that the selected packaging is authorized per the applicable regulations, including Part 173 requirements." This means that the shipper (and no one else) is responsible for making sure that all applicable regulations are met. The shipper is lawfully responsible should damage occur due to the use of improper packagings. Even if no damage is done or no spill results, shippers can be cited for the improper transport of hazardous materials. DOT requires that shippers be trained to ensure compliance with DOT.

   General requirements for packagings and packages are found in 49 CFR 173.24. These requirements apply to all types of packages including bulk, non-bulk, new, used, specification, and non-specification packages and packagings.

   Authorized packagings. In general this section indicates that only authorized packagings may be used and that those packagings are described in Column 8 of the Section 172.101 table or the packaging is permitted or conforms to provisions in Subparts B or C of Part 171 of this subchapter or Sections 173.3, 173.4, 173.5, 173.5a, 173.6, 173.7, 173.8, 173.27, or 176.11. For mercury, the specific types of packagings that are acceptable for transport and storage are discussed below in Section S3.2.2.2 of this section.

   Subsection 173.24(d) describes specification packagings and UN (United Nations) standard packagings manufactured outside the United States. This subsection refers to Parts 178 and 179 of 49 CFR (*Transportation*). 49 CFR Part 179 is not germane, as this part discusses specifications for tank cars. Part 178 is germane, and any specification package used for the shipment of mercury must meet the requirements of this section. This subsection also describes the requirements for use of UN standard packages not manufactured in the United States.

b. **Shipment**. Portions of 49 CFR 173.24 that are especially germane to the shipment of mercury include the following.

173.24(b)(1)—"...there will be no identifiable (without the use of instruments) release of hazardous materials to the environment."

173.24(b)(2)—"The effectiveness…will not be substantially reduced…[by] minimum and maximum temperatures, changes in humidity and pressure, and shocks, loadings, and vibrations, normally encountered during transportation."

173.24(b)(3)—"There will be no mixture of gases or vapors in the package which could through any credible spontaneous increase of heat or pressure, significantly reduce effectiveness of the packaging."

173.24(b)(4)—"There will be no hazardous material residue adhering to the outside of the package during transport."

While only 173.24(b)(1) specifically states "without the use of instruments," it has generally been interpreted that each of these requirements is met through un-aided visual or other un-aided indications or observations that no issue exists that could create an unsafe condition.

c. **Compatibility issues**. 173.24(c) states that there should be no "corrosivity, permeability, softening, premature aging, or embrittlement" issues created by pairing the hazardous material with the packaging. Since mercury is classified by DOT as a corrosive material, this subsection is particularly germane. The use of any aluminum-based packaging must be avoided as well as any other packaging material that is attacked by, or reactive with, mercury.

d. **Closure requirements**. 173.24(f) requires that the closure must be designed such that "there is no identifiable release of hazardous materials" (including when the effects of temperature, pressure, and vibration are considered) during use and that the "closure is leakproof and secured against loosening." A closure that is part of a specification package must conform to all of the specifications for the packaging. During air transport, stoppers, corks, or other such friction devices must be held in place by positive means.

e. **Venting issues**. 173.24(g) addresses venting of packages to reduce internal pressure. At all temperatures normally incident to shipping, the vapor pressure of elemental mercury is significantly less than 1 psig, so venting issues are not relevant and are therefore not further addressed.

f. **Outage (headspace) and filling limits**. 173.24(h) refers to Section 173.24a. This section addresses *Additional general requirements for non-bulk packaging and packages*. The primary areas of concern for mercury transport are

- (a)(5)—vibration, "each non-bulk package must be capable of withstanding, without rupture or leakage, the vibration test procedure specified in Section 178.608 of this subchapter."

  The vibration test procedure simulates a vibration incident during transport under relatively severe conditions by placing the package on a vibration table, finding the vibration frequency that causes the package to just lift off the ground, and then allowing the package to be subjected to this frequency for a continuous hour.

- (b) non-bulk packaging filling limits.

  Section 173.24a(b) is generally not applicable as long as specification packaging is not used. Should specification packaging be used, then packagings designed and marked for use with high-density liquids such as mercury must be used.

- (d) liquid filling requirements.

  Subsection 173.24a(d) states, "liquids must not completely fill a receptacle at a temperature of 55°C (131°F) or less." Therefore, consideration of expansion of mercury at this elevated temperature (131°F) must be taken into account when shipping packagings are being filled.

S3.2.2.2 Specific DOT requirements for transport of mercury

49 CFR 173.164 addresses the specific requirements for transporting mercury. Subsection 173.164(a) addresses air transport, Subsection 173.164(d) addresses transport other than by aircraft, and subsection 173.164(e) discusses exempt quantities. These sections are described in greater detail below. Subsections 173.164(b) and (c) address manufactured articles; as such these sections are not germane to this standard and are not discussed further. It is anticipated that the primary form of mercury transport will be ground. As such, these requirements are covered in 173.164(d). For transportation by other than aircraft, mercury must be packaged

(1) in any packaging which meets the requirements of Part 178 of this subchapter at the Packing Group III performance level or
(2) in non-specification reusable metal packagings.

Item (2) above is particularly important in the transport of mercury. Virtually all non-air transport of elemental mercury is performed in non-specification reusable metal packagings. When these packagings are used, it is very important to ensure that all of the general requirements for hazardous materials packaging described above are met. These typically come in two sizes: an approximately 0.75-gal (3-L) size that holds ~76 lb of elemental mercury and an approximately 19.5-gal size that holds ~2200 lb (1 MT) of elemental mercury. Specification packagings may also be used. As stated above, specification packagings must meet the Packing Group III performance level. The acceptable containers will comply with DOT ground transport specifications and the guidelines of Appendix G.

Stricter limitations apply to transport by air as stipulated in Subsection 173.164(a), which requires that Packing Group I performance level be used for packages but also includes additional requirements and specific maximum payloads as shown in Table 3.1 below. Additionally, these inner packagings (including containers) "…must be packed in steel drums (1A2), steel jerricans (3A2), wooden boxes (4C1), (4C2), plywood boxes (4D), reconstituted wood boxes (4F), fiberboard boxes (4G), plastic boxes (4H2), plywood drums (1D) or fiber drums (1G)" outer packagings.

Subsection 173.164(e) states that, except for air transport, packages containing less than 0.45 kg (1.0 lb) net weight of mercury are exempt from the hazardous materials transport regulations.

Table 3.1. Relevant stipulations and maximum payloads for air transport packages

Inner packaging	Applicable stipulations	Maximum payload
Iron or steel quicksilver flasks	B	35 kg (77 lb)
Stipulations		
B—Either the inner packagings or the outer packagings must have inner linings or bags of strong leakproof and puncture-resistant material impervious to mercury completely surrounding the contents, so that the escape of mercury will be prevented irrespective of the position of the package.		

S3.2.2.3 DOT training requirements

DOT (49 CFR 172.702) requires that each employer whose employees work with hazardous materials (hazmat) must train these employees. “Hazmat employees” include those who prepare the packages for shipping, prepare, sign or review the paperwork, load trucks, drive the vehicles, or unload or receive the hazardous materials.

A hazmat employee who performs any of these functions may not perform the function unless he or she has been trained in the requirements of hazardous materials (generally, identification, classification, labeling, marking, placarding, packaging, etc.) that apply to that function. It is the duty of each hazmat employer to comply with the applicable requirements of this subchapter and to ensure that each hazmat employee is thoroughly instructed. In addition, hazmat employers must ensure that each hazmat employee is tested by appropriate means on the training subjects covered in 49 CFR 172.704.

S3.2.3 Applicable International Requirements

Applicable international requirements include the following:

a. IATA contains Packing Instruction 803, which applies to “UN 2809, Mercury, on passenger and cargo aircraft.” In general this packing instruction is in agreement with the DOT requirements. One added requirement is that the packaging must be capable of meeting IATA General Packing Requirement 5.0.2. The primary stipulation is IATA 5.0.2.9, which states that the package must be capable of withstanding, without leaking, a pressure differential of 95 kPa (13.8 psi). Other stipulations in IATA 5.0.2 have been discussed above in Section S3.2. IATA Packing Instruction 803 also allows for the use of single packaging only if the packages are “welded steel bottles with inner vaulted bottoms,” and the “closures must be a steel bolt with a conical thread and the opening must not exceed 20 mm (0.8 in.).”

b. The International Maritime Dangerous Goods (IMDG) Code stipulates that for water transport, stowage of the mercury must be “clear of living quarters.”

S3.3 REFERENCES

40 CFR Part 260—Hazardous Waste Management System: General

40 CFR 260.10—Definitions (associated with hazardous waste management system)

40 CFR Part 262—Standards Applicable to Generators of Hazardous Waste

40 CFR 262.11—Hazardous waste determination
40 CFR 262.12(c)—EPA identification numbers (restrictions)
40 CFR 262.20–262.23 (Manifest requirements)
40 CFR 262.20–.27 (Subpart B—The Manifest)
40 CFR 262.30–262.33 (Pre-transport Requirements: packaging, labeling, marking, and placarding)
40 CFR 262.40–262.44 (Recordkeeping and reporting)

40 CFR Part 263—Standards Applicable to Transporters of Hazardous Waste

40 CFR 263.10—Scope (associated with hazardous waste management system)
40 CFR 263.11—EPA identification number
40 CFR 263.12—Transfer facility requirements

40 CFR 263.20–.22 (Manifest system and recordkeeping)
40 CFR 263.30–.33 (Response to hazardous waste discharges)

49 CFR 173.22—Shipper's responsibility
49 CFR 173.24—General requirements for packagings and packages
49 CFR Part 171—General Information, Regulations, and Definitions
49 CFR Part 171, and Sections 172.101, 173.3–173.8, 173.27, and 176.11—Authorized packagings

49 CFR Part 172—Hazardous Materials Table, Special Provisions, Hazardous Material Communication, Emergency Response Communication, and Training Requirements

49 CFR 172.702—Applicability and responsibility for training and testing
49 CFR 172.704—Training requirements

49 CFR Part 173—Shippers: General Requirements for Shipments and Packaging

49 CFR 173.24—General requirements for packagings and packages
49 CFR 173.164—Requirements for transporting mercury

49 CFR Part 174—Carriage by Rail
49 CFR Part 175—Carriage by Aircraft

49 CFR Part 176—Carriage by Vessel

49 CFR 176.11—Exceptions

49 CFR Part 177—Carriage by Public Highway
49 CFR Part 178—Specification for Packaging
49 CFR Part 179—Specification for Tank Cars
49 CFR Parts 100–180 [Other Regulations Relating to Transportation (of Hazardous Materials)]
49 CFR Part 397—Transportation of Hazardous Materials; Driving and Parking Rules

IATA Packing Instruction 803
IMDG (International Maritime Dangerous Goods) Code

PROCEDURE (P)

GENERATOR'S PREPARATIONS FOR TRANSPORTATION

P3.1 INTRODUCTION

This procedure provides the recommended steps for generators to follow when initiating a shipment of elemental mercury to a DOE-designated storage facility via ground transfers including the DOT and RCRA requirements that are applicable. See also discussion of the generator waste acceptance procedure (beginning in P2.1 of Section 2), which should be completed prior to or in concert with this procedure.

P3.2 PRECAUTIONS/LIMITATIONS

This procedure outlines generator actions for a shipment of elemental mercury (as hazardous waste) by truck. This procedure does not cover the actions of the transporter during the transport of the mercury.

NOTE: DOT and RCRA regulations should be consulted prior to shipment to ensure no change in regulations has occurred. As a result, following this procedure does not guarantee compliance with DOT or RCRA regulations.

P3.3 REQUIREMENTS

- 49 CFR, *Transportation Regulations*
- 40 CFR Part 262, "Standards Applicable to Generators of Hazardous Waste"
- 40 CFR Part 263, "Standards Applicable to Transporters of Hazardous Waste"

P3.4 PREREQUISITES

Generator's staff are to be DOT trained per their involvement in the shipment. Generator-required documentation (Waste Profile, manifest, etc.) has been approved by the receiving DOE elemental mercury storage facility. The DOE storage facility has notified the generator of the permits their facility has in place to receive the elemental mercury.

P3.5 ACTION STEPS

For generator staff:

1. Verify elemental mercury to be transported.
2. Verify that the elemental mercury to be transported meets the requirements for acceptance at the DOE-designated elemental mercury storage facility (see Sections 2 and 4 of this document).
3. Verify the quantity (mass) of elemental mercury to be transported.
4. Verify the type and number of packagings to be used for shipment. The most likely choice of packaging would be either ~76 lb (3 L) or ~2200 lb (1 MT) of non-specification reusable metal packagings. Alternatively, any specification packaging that meets Packaging Group III requirements can be used if approved by the DOE elemental mercury storage facility.
5. Ensure all DOT requirements for the type of package selected are met. This includes, but is not limited to, mass requirements, filling level requirements, and closure requirements.
6. Mark and label the loaded package as appropriate. The appropriate package markings would be as follows.
    - RQ (reportable quantity)
    - UN2809
    - Waste Mercury (D009 or U151)
    - Shipper/receiver name and address
    - The DOT "Corrosive" label would be applied near these markings, if package dimensions are adequate.
    - Additionally, for hazardous waste the following label must be applied and should be at a location visible after the waste is palletized:
        - HAZARDOUS WASTE—Federal Law Prohibits Improper Disposal. If found, contact the nearest police or public safety authority or the U.S. Environmental Protection Agency.
7. Place marked/labeled containers in appropriate pallets.
8. Verify information on manifest and LDR form are complete.
9. Notify the DOE elemental mercury storage facility of impending shipment per facility's schedule.

10. To minimize corporate liability for the shipment, ensure carrier is aware of hazardous waste nature of material to be shipped, is qualified for such transport operations (has EPA ID no.), and is prepared (has the appropriate placards) to placard the vehicle.

    [Note: DOE generator facilities should consult DOE Order 460.1B before shipping elemental mercury off-site and conduct and document a carrier review prior to shipping the mercury off-site.]

11. Contact carrier for pickup.
12. Ship mercury to the DOE-designated elemental mercury storage facility.

P3.6 RECORDS

- Manifests (shipping papers for CESQG only)
- LDR form
- Carrier review (required for DOE contractors and subcontractors)
- DOT training records
- DOE notification to the off-site generator of the permits in place to accept the waste

P3.7 REFERENCES

40 CFR Part 262—Standards Applicable to Generators of Hazardous Waste
40 CFR Part 263—Standards Applicable to Transporters of Hazardous Waste

DOE Order 460.1B, *Packaging and Transportation Safety*

4. STANDARDS AND PROCEDURES FOR RECEIPT/VERIFICATION OF ELEMENTAL MERCURY AND MERCURY CONTAINERS

STANDARD (S)

S4.1 INTRODUCTION

This section discusses standards and procedures needed for a DOE-designated elemental mercury storage facility for receipt and acceptance of elemental mercury, mercury containers, and/or pallets, and inventory tracking. The purpose is to address receiving, handling, inspecting and testing activities conducted by the facility prior to transferring the waste into long-term storage. This section addresses the physical receipt inspection of the shipped containers of elemental mercury and associated pallets into the storage facility after the storage facility management has approved the generator's waste characterization and packaging via a completed Waste Profile form (see Sections 2 and 5.8). The DOE OC shall, in essence, verify that the shipped waste, containers, and/or pallets meet the established Waste Acceptance Criteria, which in part reflects the Waste Analysis Plan. The verification steps (fingerprinting) for the elemental mercury confirm the purity of the mercury (99.5 vol % or greater); confirm the absence of prohibited constituents (such as nitric acid solutions, chloride salts solutions, water, or other possible corrosion agents); confirm whether any other hazardous constituents (e.g., heavy metals, including silver) are present; and/or confirm the absence of radioactive constituents or contamination.

It should be noted that, in addition to Federal regulations, States may have additional hazardous waste and other regulations with which generators, transporters, and DOE OC must comply.

The mercury should arrive at the designated DOE storage facility in DOT-approved and RCRA-compliant containers (see Sections 2 and 3). A two-stage visual inspection shall be used to ensure the containers and pallets meet the facility's Waste Acceptance Criteria. The next step involves the collection of the required number of mercury samples for fingerprint checks per the facility's Waste Analysis Plan (refer to Section S5.8.3.10). After the waste and containers are accepted the containers are marked to show their date of receipt and are separated in the facility by size.

The verification and acceptance criteria are largely based on RCRA's requirements for container storage operations (40 CFR 264.170–.179 and 40 CFR 265.170–.178), generator pre-transport requirements (40 CFR 262.30–.34), and BMPs to ensure safe/efficient storage. Movements/transfers of intact containers between the Receiving area, Handling area, or Storage area would not require further waste analysis as long as container tracking is sufficient to tie waste characterization back to the generator and/or fingerprinting results.

There are certain other requirements that will apply to the DOE storage facility to allow receipt of elemental mercury from off-site generators. For example, facilities that receive hazardous waste from an off-site source (except where the owner/operator of the facility is also the generator) must inform the generator in writing that the facility has the appropriate permit(s) for accepting the waste [40 CFR 264/265.12(b)]. This notification is part of the storage facility operating record and shall be addressed in the waste acceptance review process (refer to Sections 2 and 3) and in the storage facility procedures for waste acceptance and recordkeeping.

S4.2 SPECIFIC CRITERIA (OR GUIDELINES)

S4.2.1 RCRA Requirements

Under RCRA, TSDFs must verify the composition (i.e., hazardous constituents and characteristics) of incoming waste in order to treat, store, or dispose of the waste properly. The facility's waste analysis plan (WAP, see Section 5.8) outlines the verification procedures, including specific sampling methods, necessary to ensure proper treatment, storage, or disposal (40 CFR 264/265.13). Implementation of the fingerprinting checks is a key element of that verification of incoming wastes.

DOE OC staff at the storage facility shall ensure that the containers are properly labeled with the required information (see Section 3). At the time of waste acceptance into the Storage area, the staff shall mark each container with the date and track receipt in their operating records. The staff shall ensure that the labels/markings are visible for inspection (40 CFR 264/265.174). The 3-L container should be labeled on the shoulder. The 1-MT container should be labeled in two places—one on the top near the plug and one on the side as shown in Section 2, Figure 2.1. Place the side label perpendicular to the "C" channels to cause the label to be facing the correct direction in the spill tray. The preferred label locations will ensure the labels are readily visible and, thereby, facilitate the inspection of the container labels at receipt and throughout long-term storage. Alternative label placements may be considered if container design is not compatible with the suggested label arrangements.

DOE OC staff shall retain documentation pertaining to waste receipt and acceptance in the facility operating record (40 CFR 264/265.73). Such records include, but are not limited to: unmanifested hazardous wastes, manifest discrepancies, container inspections and fingerprinting checks (including results and chain of custody) (refer to Section 5.8 for more information).

S4.2.2 QA/QC Criteria/Guidelines

The storage facility Operating Contractor (OC) should develop and implement a Quality Assurance Project Plan (QAPP). Particular emphasis is encouraged to be given to the work performance and inspection and acceptance elements of DOE Order 414.1C.

As part of the QAPP, the OC should establish acceptance procedures and inspection plans to ensure and verify the generator provided documentation meets the elemental mercury and container receiving criteria as specified in Section S4.3. These procedures and plans include methods for verifying and validating that the documentation received is correct.

Inspector(s) with qualifications for performing Level 2 nondestructive examination (NDE) and American Welding Society (AWS) certification may be available as needed.

S4.3 RECEIPT OF MERCURY AT STORAGE FACILITY

Concentrations of mercury vapor in the trucks shall be measured as a first step. After the mercury vapor concentration is verified to be below the action level, the pallets and the containers shall be visually inspected while on the truck. The visual inspection focuses on looking for spilled mercury or obvious mercury contamination on container surfaces, validating and completing the RCRA manifest, and judging the structural integrity of the box pallets. If a spill is found, cleanup procedures shall be implemented. If the number of containers or type of waste does not match the manifest, the generator shall be notified and a discrepancy report filed within 15 days of receipt of the waste (40 CFR 264/265.70 to .72). If the manifest information is correct, then the facility staff shall sign the

manifest and return the original signed copy to the generator; the storage facility shall retain a completed copy.

Containers that have corrosion, structural damage, or are a different type from that presented in the generator documentation may be returned to the generator at the generator's expense. (Note. The pallets/containers should only be returned to generator after a determination that they are safe and DOT compliant. If damaged they will be replaced by new pallets or containers at the generator's expense.) See Table 4.1 for facility options.

The 3-L containers are expected to arrive at the facility in box pallets with a built-in spill tray, similar to the example shown in Figure 4.1. Each pallet could contain 49 3-L containers, and be safely transported using a forklift rated for at least 5000 lb. The use of untreated lumber with fire protective paint is preferred. Overpacking the 3-L containers in drums for shipment to the storage facility is not recommended. The containers sent to the storage facility should be of sufficient quality not to require an overpack and removing 3-L containers from the overpack drums may pose a safety risk if the container's plug is not a safe lifting point. If the shipment has less than 49 total 3-L containers, then the DOE OC determines on the packaging requirement for the shipment and any required adjustments to the inspection process. The 3-L containers, from the shipment of less than 49 containers after passing inspection, will be consolidated with other small-quantity shipments into a full-size 49 3-L container box pallet with a spill tray.

Figure 4.1. Example box pallet with 3-L containers.

The storage facility OC is responsible for further defining the inspection requirements. The mercury vapor concentration reading shall be taken in the Receiving area to monitor the personnel breathing zone, particularly near the containers. Section 5.3 provides American Conference of Government Industrial Hygienists (ACGIH) guidelines. After the containers and pallets pass the initial inspection on the vehicle, the pallets will be transported into the Receiving area for further inspection. In the Receiving area, the containers will be visually inspected for the following: (1) any mercury leak not discovered during the prior inspection on the truck, (2) obvious structural damage to the integrity of the containers or pallets (substantial dents or cracks), (3) mercury contamination (e.g., beads) on the exterior surface of the containers or the pallets (inspection completed using the unaided eye), (4) extensive container corrosion, especially on or near welds and the plug, and (5) identification of

container types to ensure the information and images provided by the generator matches what is received. Any containers that fail the visual inspection will receive further review to decide if the container may be placed into storage, sent back to the generator, or if the mercury will be transferred to a new container. (Upon placement of any such container into storage, continuing evaluations of that container's condition are recommended.) Leaking containers shall have mercury transferred into new containers, and similar container types in such shipment may be further scrutinized before being accepted into the storage facility. The new containers are recommended to be industry produced, meet the function requirements listed in Appendix G, and selected by the facility's operating contractor. The plug in the new container will be sealed with Teflon® tape or equivalent. Containers with visible mercury contamination (e.g., beads) may be transported to the mercury Handling area to be cleaned. If the contamination (e.g., beads) cannot be successfully removed, the container may be sent back to the generator with an outer barrier incorporated or repackaged at the generator's expense. If the mercury is repackaged, the new containers are recommended to be industry produced, meet the function requirements listed in Appendix G, and selected by the facility's OC. As noted above, the plug in the new container will be sealed with Teflon® tape or equivalent. Any mercury containers that are returned to the generator will follow the RCRA requirements under 40 CFR 264/265.72 for that return shipment. (See Section S5.8.3.5 for information on the status of residues in empty containers.)

The next step involves the collection of the required number of mercury samples for fingerprint checks per the facility's Waste Analysis Plan (refer to Section S5.8.3.10). Containers randomly selected for fingerprinting shall be held in the Handling area so that the containers can be opened. Recommended fingerprinting checks could include mercury purity;[*] specific gravity; color;[†] percent or presence of water;[‡] chloride salts solutions, nitric acid solutions, other possible corrosion agents, silver, or other heavy metals; pH;[§] and verification of no radioactive constituents or contamination. Opened containers shall be closed after samples are taken. Containers awaiting the results of fingerprinting may be held in the Handling area or moved to the Receiving or Storage area pending the confirmation of acceptance based on those results. After the waste and containers are accepted the containers will be marked to show their date of receipt and separated in the facility by size. The 3-L containers will be in box pallets and will be placed onto seismically rated storage racks. Shipments discovered not meeting minimum WAC requirements may be returned to the generator at generator's expense.

The containers and pallets that pass the acceptance/verification process shall be placed into the storage facility and their placement location recorded.

The acceptance/verification steps for 1-MT containers parallels the steps for 3-L containers with a few exceptions noted here. The 1-MT containers may be transported on pallets, with one container per pallet. As a BMP, the 1-MT container transported on a pallet should be secured to the pallet using at least two metal bands.

The 1-MT containers are separated from the pallets. Cut the band ties safely and remove the 1-MT containers from the pallet using a forklift. The pallets are reusable and may be returned to the generator at the generator's expense. The visual inspection of the container is continued after the container is separated from the pallet. The 1-MT containers that pass the acceptance/verification process shall be placed into the storage facility in spill trays on the floor of the facility and their placement location recorded.

[*]By total metals analysis or hand-held X-ray fluorescence analyzer if detection limits are sufficiently accurate.
[†]By visual inspection.
[‡]By visual inspection and/or analyses.
[§]If two phases are observed.

Alternatively, as part of the waste management planning process the facility shall have outlined steps for the handling of rejected wastes, including their return to the generator (refer to Section 5.8). Because this should be a rare occurrence, those steps are not outlined here.

It should be noted that the receipt acceptance and verification activities would generate wastes, such as spill cleanup residues, contaminated personal protective equipment, contaminated sampling equipment/debris, etc. These wastes will be subject to a solid verses hazardous waste determination and must be managed appropriately at the point of generation.

S4.3.1 Manifest Issues

Manifest discrepancies include significant differences between the quantity or type of hazardous waste designated on the manifest and the quantity or type of hazardous waste that a facility actually receives; rejected wastes; and container residues. More specifically, significant differences are any discrepancies in weight (for bulk waste, over 10% weight difference), piece count (for batch or containerized waste shipments, one container per truckload), or waste type. Upon discovering a significant difference in quantity or type, the DOE OC must try to reconcile the discrepancy with the generator or transporter. Any discrepancies not resolved within 15 days of waste receipt must be reported to the EPA Regional Administrator with an explanatory letter and a copy of the manifest (40 CFR 264/265.72).

Rejected wastes may be a full or partial shipment of hazardous waste that the TSDF cannot accept. Container residues are residues that exceed the quantity limits for empty containers in 40 CFR 261.7. Upon rejecting waste or identifying a container residue, the DOE OC must contact the generator before forwarding the waste to an alternative facility. If it is impossible to find an alternative facility that can receive the waste, the waste can be returned to the generator. The DOE OC must send the waste to an alternative facility or to the generator within 60 days and must prepare a new manifest for the shipment (40 CFR 264/265.72).

If a TSDF accepts waste from off-site without a manifest, an unmanifested waste report must be prepared in accordance with 40 CFR 264/265.76. The report must be submitted to the EPA Regional Administrator within 15 days of receiving the waste (40 CFR 264/265.76).

After the initial inspection, random containers shall be selected for RCRA fingerprinting (see Section 5.8). 40 CFR 264/265.13 requires the storage facility to obtain a detailed chemical and physical analysis of a representative sample of the waste per the facility's Waste Analysis Plan (WAP). Fingerprinting is typically done for a portion of the wastes received (see Section 5.8).

A container currently in storage that has been damaged but is not leaking mercury may be visually inspected to determine whether the container is structurally sound for continued storage or if the mercury needs to be transferred to a new container. As a BMP, the container inspection will be completed while wearing appropriate personal protective equipment. Overpacking the container is not recommended.

S4.4 STORAGE LAYOUTS AND CONFIGURATIONS

The mercury containers will be segregated by container size for long-term storage. Additional separation by container type could be used to simplify the inspection process (e.g., placing similar container types together).

The 3-L containers may be stored in box pallets with spill trays on seismically rated racks or on a sloped floor. The RCRA labels must be visible for inspection purposes. The racks may have a 3° slope towards the aisle to cause leaked mercury to flow towards the edge of the spill tray to assist in quickly identifying spills. The spill tray on the pallet will have walls with sufficient height to contain at least 10% of the mercury contents on the pallet with the pallet at the indicated angle. The 10% spill tray containment is a requirement of RCRA 40 CFR 264.175(b). The 3-L containers may be stored double or triple stacked, depending on storage facility safety requirements as well as conditions contained in a State-issued RCRA facility permit. As a BMP, the top of the containers on the highest level will be below a 12-ft elevation from the ground; above that height, additional fire suppression equipment would be required. An example of a double-stacked configuration is shown in Figure 4.2.

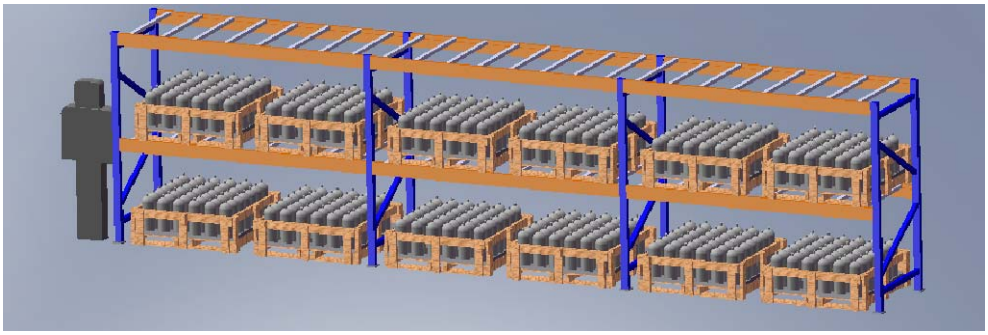


Figure 4.2. Example of 3-L containers in pallets on a seismic-rated rack.

The 1-MT containers will be stored single stacked on the floor in spill trays, as shown in Figure 4.3. Each spill tray should hold eight containers. The spill tray will be designed to contain the full contents of one 1-MT container. If the containers meet all the safety requirements, including seismic, then double stacking the containers could be considered. To double stack the 1-MT containers, the following at a minimum would be needed. (1) Adaptors joining the lower container and upper container must positively secure the two containers; this is critical for protection from seismic events. Several designs would be needed to accommodate the various containers received. (2) The bottom tier 1-MT container must be capable of safely supporting the upper tier container.

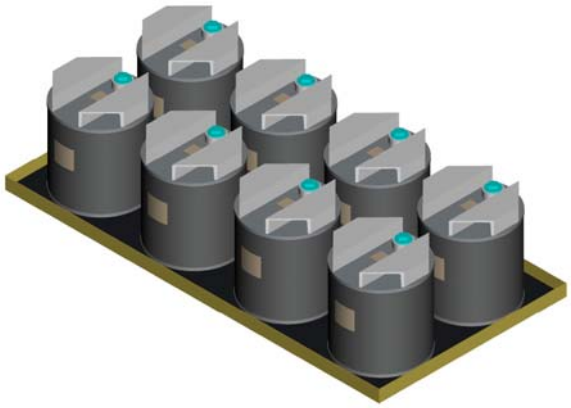


Figure 4.3. Example of 1-MT containers in a spill tray.

S4.5 UNPACKAGING

The 3-L containers are expected to arrive at the storage facility in box pallets suitable for long-term storage. However, shipments of less than 49 3-L containers may be approved. These containers are expected to be repackaged into a full-size box pallet to maximize the spacing efficiencies of the

storage racks. The 3-L containers may be transported using a gantry crane in the mercury Handling area into the new pallet. The containers may be transported one at a time, and a partially filled pallet may remain in the mercury Handling area until it is completely filled.

S4.6 REFERENCES

40 CFR Part 261—Identification and Listing of Hazardous Waste

40 CFR 261.7—Residues of hazardous waste in empty containers

40 CFR Part 262—(RCRA) Standards Applicable to Generators of Hazardous Waste

40 CFR 262.30–262.34—Pre-Transport Requirements

40 CFR Part 264—(RCRA) Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 264.12(b)—Required notices
40 CFR 264.13—General waste analysis
40 CFR 264.70–264.72—Manifest system (applicability, use, and discrepancies)
40 CFR 264.73—Operating record
40 CFR 264.76—Unmanifested waste report
40 CFR 264.170–264.178—Use and management of containers
40 CFR 264.174—Inspections
40 CFR 264.175(b)—Containment (system design and operation)

40 CFR Part 265—(RCRA) Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 265.12(b)—Required notices
40 CFR 265.13—General waste analysis
40 CFR 265.70–265.72—Manifest system (applicability, use, and discrepancies)
40 CFR 265.73—Operating record
40 CFR 265.76—Unmanifested waste report
40 CFR 265.170–265.179—Use and management of containers
40 CFR 265.174—Inspections

DOE Order (O) 414.1C, *Quality Assurance*

PROCEDURE (P)

MERCURY/CONTAINER/PALLET VERIFICATION AND ACCEPTANCE

P4.1 INTRODUCTION

Procedures for accepting elemental mercury, containers, and pallets into the storage facility shall include at least the following: (1) steps for visual inspection/acceptance of containers and box pallets, (2) steps for managing containers or pallets that fail inspection, and (3) steps for retrieving and processing random mercury fingerprinting samples taken from containers (see Section 5.8).

P4.2 FREQUENCY

As a BMP, the procedures are expected to be reviewed at least once a year, adding images and information about containers and pallets to a database. This practice enables the personnel responsible for visual inspection to focus on particular aspects of the containers or pallets that have been shown in the past to be a concern.

P4.3 PRECAUTIONS/LIMITATIONS

The containers and pallets sent to the storage facility are judged only from exterior appearance. The quality of the containers heavily depends on the mercury generator.

P4.4 REQUIREMENTS

40 CFR 264/265.13 require the storage facility to obtain a detailed chemical and physical analysis of a representative sample of the waste. The analysis can include the information supplied by the generator but also includes fingerprinting a percentage of the containers received as defined in the WAP for the elemental mercury storage facility (see Section 5.8).

P4.5 ACTION STEPS

These action steps cover acceptance and verification for the following:

Fingerprint sampling of the elemental mercury will include at least the following steps:

1. Proper technique for randomly selecting containers,
2. Removing and transporting the container to the mercury Handling area,
3. Securely removing the plug from the container,
4. Retrieving the appropriate mercury sample without contaminating the outer surface of the container or the elemental mercury with impurities,
5. Installing the plug and storing the container,
6. Constructing the chain of custody requirements for the sample and/or conduct of visual checks, and
7. Comparing the fingerprinting results to the generator's supplied information and performing any corrective actions based on the results.

Visual inspection and acceptance of the containers and pallets are more extensive than for the elemental mercury. The containers arriving at the facility will be visually inspected using a detailed procedure that follows these basic steps:

1. Open the truck and measure the mercury vapor concentration, to ensure it is below the acceptable facility mercury concentration action level for entry;
2. Identify the types of containers in the truck;
3. Visually inspect the containers and pallets looking for mercury leaks or surface contamination, discrepancies with the manifest, excessive corrosion, structural damage, and areas of concern indicated by the database;
4. If all the containers are acceptable after the inspection, the containers may be transported into the facility and their location in the facility recorded. If a container fails the visual inspection, then further analysis of that container is required. The questionable container will be transported to the mercury Handling area for further visual inspection, and upon additional review, the container could be accepted into the facility or rejected and the mercury container returned to the generator. See Table 4.1 for suggested review and disposition.

Table 4.1. Summary table for container acceptance

Item	Inspection outcome	General action steps
A	Out-of-specification container received • Stopper • Construction • Welds • Corrosion	• May overpack or re-flask on site • May return to generator at generator's cost • May review and accept container in current condition
B	Visible mercury contamination (e.g., beads) observed[a]	• Bag container as appropriate and transfer to special facility • Apply wiping procedure to remove visible contamination prior to storage • May overpack and return to generator at generator's cost
C	Definitive evidence of liquid mercury and/or flowable mercury observed	• Notify spill response • Bag or confine container as appropriate and transfer to special facility • Apply facility spill clean-up/waste management • Utilize approved new vessel(s) and handling area • Special handling, waste management, containers at generator's cost

[a]Section S4.3 states that containers with visible mercury contamination (e.g., beads) are to be transported to the mercury Handling area to be cleaned. If the contamination cannot be successfully removed, the container may be sent back to the generator with an outer barrier incorporated or repackaged at the generator's expense.

P4.6 EXAMPLE CHECKLIST FOR VISUAL INSPECTION OF CONTAINERS AND PALLETS

The inspection completed inside the transport vehicle focuses on assessing the general structural integrity of the pallets and looking for mercury leaks or obvious surface contamination. The following checklist should be completed before transferring pallets into the Receiving area or mercury Handling area. All types of acceptable containers require DOE approval with information supplied below used as examples.

3-L mercury containers checklist

1. Judge the structural integrity of the pallet. Check for boards separating, missing fasteners, and substantial dents or cracks in the wood. Damaged pallets that are judged unsafe upon arrival will be reinforced before transporting with a forklift. If a pallet is judged to be damaged beyond repair, the containers will be transferred to another pallet using a portable gantry crane after the visual inspection for mercury is completed and passed. If a mercury leak is found, then wipe the container, or overpack, and transfer it to the mercury Handling area.

   □ Pass or successfully repaired
   □ Unrepairable damage (transfer containers if Pass for Question 2)

2. Visually inspect the edges of each spill tray (if applicable) and the gaps between the containers for mercury; any amount of mercury visible to the unaided eye is a failure.

   □ Pass (transfer pallet into Receiving area)
   □ Fail (continue to Question 3)

3. A mercury leak has been discovered; cleanup procedures are to be implemented based on the estimated amount of mercury leaked. If a small quantity (less than 33 mL) is found in the spill tray, it would be safer to transport the pallet to the mercury Handling area for cleanup. For a larger quantity of mercury (greater than 33 mL), assume a gross container leak; further review of the situation should be conducted by the operating facility management. Leaks will be reviewed on a case-by-case basis to determine the appropriate course of action.

   □ Less than 33 mL of mercury
   □ More than 33 mL of mercury

1-MT mercury containers checklist

1. Visually inspect the pallet and exterior of the container for mercury; any amount of mercury viewable by the unaided eye is a failure. If mercury is viewable, operating facility management will review the situation to determine the appropriate course of action.

   □ Pass
   □ Fail

2. Judge the structural integrity of the pallet. Check for boards separating, missing fasteners, and substantial dents or cracks in the wood. Damaged pallets that are judged to be unsafe upon arrival will be reinforced before transporting with a forklift. If a pallet is judged damaged beyond repair, the containers will be separated from the pallet and transported with a forklift.

   □ Pass or successfully repaired
   □ Unrepairable damage

3. Visually inspect the spill tray and exterior of the container for mercury; any amount of mercury visible to the unaided eye is a failure. If mercury is visible, operating facility management should review the situation to determine the appropriate course of action.

   □ Pass
   □ Fail

Detailed visual inspection in Receiving area

Additional visual inspection of the 3-L and 1-MT containers is required before acceptance into the facility. The containers are to be inspected for mercury contamination (e.g., beads), structural damage, and excessive corrosion, and to ensure the container type matches what was expected from the generator.

A failure in any of the following inspections could result in the containers being sent back to the generator at the generator's expense.

1. Visually inspect with an unaided eye for mercury contamination (e.g., beads) on the exterior of each container or in the spill tray. If contamination is found, transfer the pallet to the mercury Handling area for decontamination.

   □ Pass
   □ Fail

2. Visually inspect the exterior of each container for obvious damage to the structural integrity of the container (substantial dents or cracks).

   □ Pass
   □ Fail

3. Visually inspect the exterior of each container for excessive material corrosion that could impact the structural integrity of the container.

   □ Pass
   □ Fail

4. Identify the container type(s) and cross check with type(s) expected from the generator.

   □ Pass
   □ Fail

P4.7 RECORDS

Extensive records are expected to be kept for all mercury containers in the storage facility. The following information shall be recorded for each container:

- Date of acceptance to storage,
- Vehicle monitoring records and acceptance checklist,
- Generator/sender of the elemental mercury,
- Mercury fingerprinting results,
- Container type, number, and pallet number received,
- Manifest records including discrepancy reports or returned shipments, and
- Image of the container if unique or has possible structural deficiency.

P4.8 REFERENCES

The American Conference of Governmental Industrial Hygienists (ACGIH) has assigned mercury vapor a threshold limit value (TLV) of 0.025 mg/m^3 as a time-weighted average (TWA) for a normal 8-h workday and a 40-h workweek and considers mercury vapor an A4 substance (not classifiable as a human carcinogen).

40 CFR Part 264—Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

40 CFR 264.13—General waste analyses
40 CFR 264.15(c, d)—General Inspection Requirements
40 CFR 264.73(b)(5)—Operating Record
40 CFR 264.171—Condition of Containers
40 CFR 264.172—Compatibility of Waste with Containers
40 CFR 264.173—Management of Containers
40 CFR 264.174—Inspections

40 CFR Part 265—Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 265.13—General waste analyses
40 CFR 265.15(c, d)—General Inspection Requirements
40 CFR 265.73(b)(5)—Operating Record
40 CFR 265.171—Condition of Containers
40 CFR 265.172—Compatibility of Waste with Containers
40 CFR 265.173—Management of Containers
40 CFR 265.174—Inspections

5. STANDARDS AND PROCEDURES FOR THE OPERATING ELEMENTAL MERCURY STORAGE FACILITY

This section discusses the standards and procedures needed for the following functions at a DOE-designated elemental mercury storage facility. The separate sections discuss the requirements of standards and procedures for each of these functions.

5.1 **RCRA facility design**—Describes the design for DOE elemental mercury storage facility being a RCRA-permitted facility.

5.2 **Personnel safety**—Describes safety measures to be taken during elemental mercury storage facility operations.

5.3 **Workspace air monitoring**—Includes industrial hygiene, monitoring equipment, monitoring frequency, and monitoring locations.

5.4 **Recordkeeping**—Includes the management of documents and records generated, received, disseminated, and stored in the process of shipping, receiving, and storing elemental mercury.

5.5 **Facility security**—Covers the requirements for ensuring the physical security of the elemental mercury stored in the storage facility.

5.6 **Inspections of mercury containers, storage facility, and facility equipment and materials**—Includes inspection of mercury containers, storage facility systems and components (e.g., roof and floor), and facility equipment and materials.

5.7 **Emergency response**—Covers emergency responses to mercury spills, fires (and fire protection), and other emergencies.

5.8 **Waste management requirements**—Focuses on the waste management requirements defined under RCRA that apply to hazardous waste container storage operations.

5.9 **Training**—Covers training for the DOE elemental mercury storage facility including mercury container handling and management.

It should be noted that, in addition to Federal regulations, States may have additional hazardous waste and other regulations with which generators, transporters, and DOE must comply.

5.1 RCRA FACILITY DESIGN

STANDARD (S)

S5.1.1 Introduction

This section provides guidance on RCRA facility design requirements. The guidance is aimed at supporting site selection and upgrades to facilitate safe and efficient storage operations as governed by law, regulations, and good management and engineering practice. This section provides RCRA-based guidance for the DOE elemental mercury storage facility. The major functions within the storage facility include waste receipt and/or shipping, waste repackaging and/or verification, and long-term waste storage. A secondary function includes personnel work areas to support the day-to-day work as well as recordkeeping and equipment storage. All these functions facilitate overall RCRA compliance, but RCRA facility design requirements are either general or are specific to the container storage operations. The RCRA design standards are addressed following a discussion of the four conceptual (functional) areas.

The design requirements for interim status and permitted facilities differ in some cases. Where there are differences, the permitted facility must meet a higher, more stringent standard. Basically, a permitted facility must be designed, constructed, maintained, and operated to prevent releases of hazardous waste or hazardous constituents to air, soil, or surface water (40 CFR 264.31)—this general requirement would apply to all areas (Receiving, Handling, and/or Storage). An interim status facility (a facility that may undergo renovations during the interim status period in order to meet the higher permitted conditions) must be maintained and operated to minimize such releases (40 CFR 265.31). While an interim status facility may need to undergo renovations to meet the RCRA standards for a permitted facility, RCRA defines the process to do so and sets limits (refer to S5.1.6 for more information). The RCRA requirements for a container Storage area are intended to minimize releases.

S5.1.2 Conceptual Facility Areas

The conceptual DOE elemental mercury storage facility has four major physical areas to correspond to the above functional areas: Receiving and Shipping, Handling, Storage, and Office Administration. These are described as follows:

1. The *Receiving and Shipping* area is the operational interface area to and from the facility. This area supports trucker docking, offloading, and determination of status on receipt by inspection and subsequent transfer to either the Handling or Storage areas. It also allows for inspection, packaging, marking, manifesting, and trucker docking and loading for off-site shipments of elemental mercury containers or samples. As a good engineering practice, it should be an enclosed area, adjacent to both the Handling and Storage areas, with truck offload ports, equipment for offload and inspection, and bare chairs and desks for employees conducting field inspection and manifest review.
2. The *Handling* area provides an enclosed, separate, dedicated location for potentially contaminated work. Emergency transfer of the contents of a leaking container, bulking operations, and/or limited storage of containers, as well as normal sampling for laboratory sample preparation, should be performed in this area. As a BMP, the area has filtered ventilation draw and a stockpile of personal protective equipment (PPE).
3. The *Storage* area is the core of operations and comprises the bulk of the facility. This enclosed area has ample storage and aisle space for careful, tracked placement and retrieval of all containers (e.g., 3 L and 1 MT). Walls, roof, and a base underlying the containers must minimize releases (40 CFR 264/265.31). The area has appropriate ventilation and fire protection measures. This area (or the office area below) also includes space for storage of

emergency response (spill cleanup) supplies. The area and placement of containers allow for easy and accessible placement, inspection, and retrieval of the mercury containers.

4. The *Office Administration* area is conceptualized as a single, locally situated building dedicated to management, operations, recordkeeping, training, and all other Office Administration functions supporting the overall mercury program. However, due to many factors, such as a preference for multiple Storage areas or simple building availability, it may be much less physically distinct. As a conventional office space, it is not targeted for detailed discussion. However, a key consideration is that, as a staff occupancy area, it is not in a hazardous area and so should be physically separate from the other three facility areas.

S5.1.3 General RCRA Considerations

The elemental mercury storage facility must be operated in accordance with either RCRA interim status standards or the conditions in a RCRA hazardous waste facility permit. A RCRA-permitted facility must be designed, constructed, maintained and operated to prevent releases of hazardous waste or hazardous constituents to air, soil, or surface water. It is expected that some containers will have trace mercury contamination (e.g., beads) on the outside and that there will be some trace mercury contamination (e.g., beads) on pallets. As a result, in the event of fire, the firewater discharged from sprinklers in the Storage or Handling area could entrain trace mercury contamination. Therefore, containment of firewater is a consideration in the design of the permitted facility. Note for the conceptual facility, the RCRA containment design standards [40 CFR 264.175(a)] for the stored mercury are met by the use of the specified pallets rather than the firewater containment system.

An elemental mercury storage facility is unlikely to require groundwater monitoring. However, the site may have to install groundwater monitoring wells as a result of the investigation of past releases of hazardous constituents from solid waste management units (SWMUs) in the area. The identification and investigation of SWMUs is a consequence of obtaining a RCRA permit and is driven by 40 CFR 264.101 ("Corrective action for solid waste management units").

While it is anticipated that fingerprint sampling will be conducted in the Handling area, this process only requires a simple extraction of the necessary aliquots. Further, it is expected that the sample will be sealed, packaged, labeled, and shipped to an off-site laboratory for analysis, and that waste from the analytical laboratory will not be returned to the storage facility. The same is essentially true for sampling of containers of wastes generated during facility operations. As a result, the conceptual facility design does not address space, equipment, or safety considerations for an analytical laboratory.

S5.1.4 RCRA Containment Storage System

Per 40 CFR 264.175 (a), permitted facilities storing wastes containing free liquids[*] must have a containment system, explicitly addressed as follows:

[*]The paint filter test is used to determine the presence of free liquids. Mercury, due to its surface tension, normally passes the paint filter test and is not considered a free liquid. However, because elemental mercury is liquid and spreads easily when spilled, this guidance document is written to require containment based on the definition of free liquid under 40 CFR 260.10: "free liquids means liquids which readily separate from the solid portion of a waste under ambient temperature and pressure."

40 CFR 264.175(b)(1) requires a base free of cracks and gaps and sufficiently impervious to contain leaks, spills, and accumulated precipitation until the collected material is detected and removed.

The spill trays (see Section 4) and epoxy-based floor coatings will both be impervious to mercury leaks and spills and fire protection water. Primarily, the spill trays are targeted to collect container leaks and spills, while the floor coating is intended mainly for sprinkler water but also backup containment and protection for leaks and spills and for accumulation of droplets from volatilized mercury that could potentially occur over time.

40 CFR 264.175(b)(2) requires containers to be elevated or otherwise protected (e.g., floors sloped) from contact with accumulated liquids.

Section 4 of this document suggests sloped storage racks, though a spacer placed under the containers can be considered as an alternative. Joint health and safety and operational review may allow sloped floors. However, in particular cases [e.g., on loading dock ramps, as in Fig. F.1(c)], sloping of the facility floor is not generally recommended, as (1) this may pose a traffic hazard and (2) rework of existing facilities may be impractical. Instead, the intent of 40 CFR 264.175(b)(2) is that containers are "protected from contact with accumulated liquids." The intent can be met by elevating the containers above the floor.

According to 40 CFR 264.175(b)(3), containment capacity must be sufficient for 10% of the volume of the containers or the volume of the largest container, whichever is greater.

The pallets with spill trays meet this requirement by having free volume space sufficient for the greater of the maximum container volume or 10% of the total stored mercury volume within the pallet.

Per 40 CFR 264.175(b)(4), run-on (from precipitation) must be prevented unless there is excess capacity of the system to contain it.

The facility will have a foundation, roof and walls that should prevent run-on from entering the facility.

Per 40 CFR 264.175(b)(5), spilled or leaked waste and accumulated precipitation must be removed in a manner to prevent overflow.

In essence, the facility operator must promptly respond to leaks and spills to prevent overflow of the required containment system.

40 CFR 264.175(c) and (d) subsections are not applicable as the mercury storage containers will contain liquid mercury and will not contain F020, F021, F023, F026, or F027 listed wastes.

S5.1.5 RCRA Air Emission Requirements

For a DOE elemental mercury storage facility, Subparts AA and BB are not expected to apply because (1) regulated processes or regulated equipment would not be in use and (2) the elemental mercury is not expected to contain organics at 10 ppm by weight or higher. Subpart CC could apply to a limited extent, and the facility would provide its determination in its permit application. Refer to Section H.1 of Appendix H (RCRA Supplementary Information) for more information.

S5.1.6 Equivalency and Exceptions

The storage facility may request exemptions from RCRA requirements if the exemption can be sufficiently justified. For instance, prior to submittal of the Part A Permit Applications, the facility may consider requesting an exemption from 40 CFR 270.13(l) (inclusion of a topographic map extending one mile beyond the property boundaries of the source). For a large site, the required topographic map can be too large to reasonably handle and produce. If an existing facility is selected by DOE, the facility may need to request exemptions from submittal of certain design/engineering documents signed by Professional Engineers [40 CFR 270.14(a)]. When the facility was originally designed, built or modified, such prior drawings may not have been certified by a Professional Engineer, even though good engineering practices were used at the time.

S5.1.7 References

40 CFR Part 260—(RCRA) Hazardous Waste Management System

40 CFR 260.10—Definitions (hazardous waste management system)
40 CFR 260.20—Rulemaking petitions (general requirements)

40 CFR Part 264—(RCRA) Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 264.13—General waste analysis
40 CFR 264.18—Location standards
40 CFR 264.31—Design and operation of a facility
40 CFR 264.101—Corrective action for solid waste management units
40 CFR 264.175—Containment (in Subpart I: Use and Management of Containers)

40 CFR Part 265—Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 265.13—General waste analysis
40 CFR 265.18—Location standards
40 CFR 265.31—Maintenance and operation of a facility

40 CFR Part 270—EPA Administered Permit Programs: The Hazardous Waste Permit Program
40 CFR 270.13—Contents of part A of the permit application
40 CFR 270.14(a)—Contents of part B: General requirements

Perry, R. H. and D. W. Green (eds.). 1997. *Perry's Chemical Engineer's Handbook*, 7th edition, McGraw-Hill, New York, New York.

Lide, D. R. (ed.). 2009. *CRC Handbook of Chemistry and Physics*, 89th edition, CRC Press/Taylor and Francis, Boca Raton, Florida.

5.2 PERSONNEL SAFETY

STANDARD (S)

S5.2.1 Introduction

DOE requires its contractors to "ensure that management of environment, safety and health (ES&H) functions and activities becomes an integral but visible part of the contractor's work planning and execution process" [48 CFR 970.5204-2(b)]. DOE is committed to conducting work efficiently and in a manner that protects the workers, the public, and the environment. An Integrated Safety Management System (ISMS) is used to meet this objective. This section will identify some of the safety requirements that apply to a DOE facility for long-term storage of elemental mercury.

Governmental safety requirements may be imposed at the Federal, State, Tribal, or local level. This section will discuss Federal requirements. State, Tribal, and local requirements are usually consistent with the Federal regulations, but there may be additional criteria unique to the State or locality in which the facility is located. If the location chosen is on an existing DOE site, the new facility can be incorporated into the ISMS for the site.

S5.2.2 Specific Criteria/Guidelines

DOE's safety management philosophy is expressed in the contracting requirements of 48 CFR Part 970, in "Safety Management System Policy" (DOE Policy 450.4), and 10 CFR Part 851 (Worker Safety and Health Program). The *Integrated Safety Management System Manual* (DOE Manual 450.4-1) (2 volumes) provides more details on establishing an ISMS. The ISMS has five functions which repeat in a continuous improvement process. These five steps are (1) define the scope of work, (2) analyze hazards, (3) develop/implement controls, (4) perform work, and (5) feedback/improvement.

More guidance is found in a two-volume document, DOE Guide 450.4-1B, *Integrated Safety Management System Guide for use with Safety Management System Policies (DOE P 450.4, DOE P 450.5, and DOE P 450.6); The Functions, Responsibilities, and Authorities Manual; and the Department of Energy Acquisition Regulation*. General guidelines are included in DOE Order 5480.19, Change 2, *Conduct of Operations Requirements for DOE Facilities*. Current versions of all DOE policies, orders, manuals, and guides can be found at http://www.directives.doe.gov.

S5.2.2.1 RCRA criteria

The relevant material in the RCRA regulations generally reinforces DOE guidance. For instance, in 40 CFR 264/265.14 through 40 CFR 264/265.16, regulations impacting safety include the following:

- The owner or operator must prevent the unknowing entry, and minimize the possibility for the unauthorized entry, of persons or livestock onto the active portion of his facility (40 CFR 264/265.14).
- The owner or operator must inspect his facility for malfunctions and deterioration, operator errors, and discharges which may be causing or may lead to (1) release of hazardous waste constituents to the environment or (2) a threat to human health. The owner or operator must conduct these inspections often enough to identify problems in time to correct them before they harm human health or the environment [40 CFR 264/265.15(a)].

- The owner or operator must develop and follow a written schedule for inspecting and monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment (such as dikes and sump pumps) that are important to preventing, detecting, or responding to environmental or human health hazards [40 CFR 264/265.15(b)(1)].
- Facility personnel must successfully complete a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures the facility's compliance with the requirements of this part. The training program must be designed to ensure that facility personnel are able to respond effectively to emergencies by familiarizing them with emergency procedures, emergency equipment, and emergency systems. Training topics include (1) procedures for using, inspecting, repairing, and replacing facility emergency and monitoring equipment, (2) key parameters for automatic waste feed cut-off systems, (3) communications or alarm systems, (4) response to fires or explosion, (5) response to groundwater contamination incidents, and (6) shutdown of operations [40 CFR 264/265.16(a)].
- Initial training must be completed within 6 months of employment, documented, and reviewed annually [40 CFR 264/265.16(b)–(d)].

The RCRA requirements that impact safety are generally covered by other requirements discussed under security, training, and emergency response.

S5.2.2.2 QA/QC criteria

The ISMS is defined to include applicable integration with the Environmental Management System and the QAPP as defined in DOE Order 414.1C, *Quality Assurance*.

S5.2.3 Requirements for the DOE Worker Health and Safety at Elemental Mercury Storage Facility

DOE's Worker Safety and Health Program is described in 10 CFR Part 851. In 10 CFR 851.10(1), the DOE OC is required to (1) provide a place of employment that is free from recognized hazards that are causing or have the potential to cause death or serious physical harm to workers and (2) ensure that work is performed in accordance with all applicable requirements of this part and with an approved worker safety and health program for that workplace. DOE has several guides, including the following, which provide acceptable ways of meeting the requirements of this program:

- DOE Guide 440.1-4, *Contractor Occupational Medical Program Guide for use with DOE Order 440.1*
- DOE Guide 440.1-1A, *Worker Protection Program for DOE (including the National Nuclear Security Administration) Federal Employees Guide for use with DOE O 440.1B*
- DOE Guide 440.1-2, *Construction Safety Management Guide for use with DOE Order 440.1*
- DOE Guide 440.1-3, *Occupational Exposure Assessment*
- DOE Guide 440.1-8, *Implementation Guide for use with 10 CFR Part 851, Worker Safety and Health Programs*

DOE Guide 440.1-8, *Implementation Guide for Use with 10 CFR Part 851 Worker Safety and Health Program*, provides an example (Example B) of a Worker Safety and Health Program for a DOE non-nuclear site in Attachment 2.

Contractors must also comply with the safety and health standards that are applicable to the hazards at their workplace. At an elemental mercury storage operation, the following standards from 10 CFR 851.23 may apply:

- 29 CFR 1904.4 through 1904.11, 1904.29 through 1904.33; 1904.44, and 1904.46, "Recording and Reporting Occupational Injuries and Illnesses"
- 29 CFR, Part 1910, "Occupational Safety and Health Standards"
- 29 CFR, Part 1926, "Safety and Health Regulations for Construction"
- American Conference of Governmental Industrial Hygienists (ACGIH), "Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices," (2005) (incorporated by reference, see 10 CFR 851.27) when the ACGIH TLVs are lower (more protective) than permissible exposure limits in 29 CFR Part 1910. When the ACGIH TLVs are used as exposure limits, contractors must nonetheless comply with the other provisions of any applicable expanded health standard found in 29 CFR Part 1910.
- American National Standards Institute (ANSI) Z88.2, *American National Standard for Respiratory Protection*, 1992
- ANSI Z49.1, *Safety in Welding, Cutting and Allied Processes*, Sections 4.3 and E4.3, 1999
- National Fire Protection Association (NFPA) 70, *National Electrical Code*, 2005
- NFPA 70E, *Standard for Electrical Safety in the Workplace*, 2004

Compliance with these standards does not relieve a DOE OC from complying with any additional specific safety and health requirement that it determines to be necessary to protect the safety and health of workers.

The Federal mandatory requirements for applicable functional areas are given in 10 CFR 851.24. Functional areas listed that may apply to the elemental mercury storage facility are (1) construction safety, (2) fire protection, (3) firearms safety (e.g., protective force), (4) industrial hygiene, (5) occupational medicine, (6) motor vehicle safety, and (7) electrical safety. Other standards that may be applicable are listed below.

Working standards are covered in detail in the OSHA regulations under 29 CFR Part 1910. Subparts which may be applicable to parts of the operation include the following:

- Subpart A (General)
- Subpart B (Adoption and Extension of Established Federal Standards)
- Subpart D (Walking-Working Surfaces)
- Subpart E (Means of Egress)
- Subpart F (Powered Platforms, Manlifts, and Vehicle-Mounted Work Platforms)
- Subpart G (Occupational Health and Environmental Control)
- Subpart H (Hazardous Materials)
- Subpart I (Personal Protective Equipment)
- Subpart J (General Environmental Controls)
- Subpart K (Medical and First Aid)
- Subpart L (Fire Protection)
- Subpart M (Compressed Gas and Compressed Air Equipment)
- Subpart N (Materials Handling and Storage)
- Subpart O (Machine and Machine Guarding)

- Subpart P (Hand and Portable Powered Tools and Other Hand-Held Equipment)
- Subpart Q (Welding, Cutting, and Brazing)
- Subpart S (Electrical)
- Subpart Z (Toxic and Hazardous Substances)

S5.2.4 Reporting on Health and Safety

Health and safety records must be kept up to date and reported to regulatory agencies and employees in a timely manner. OSHA reporting requirements are covered in 29 CFR Part 1904, "Recording and Reporting Occupational Injuries and Illnesses." DOE also has reporting requirements. DOE appoints an accident investigation board to conduct formal investigations of serious accidents, classified as either Type A or Type B. Accidents not meeting these criteria are categorized, investigated, and reported as required by DOE Order 231.1, *Environment, Safety, and Health Reporting*, or DOE Order 232.1, *Occurrence Reporting and Processing of Operations Information*. These reports initiate a process of accident analysis, identification of corrective actions, and tracking and documentation of those actions.

Medical and exposure monitoring records shall be maintained and communicated to employees per OSHA requirements. Regular biological monitoring of workers can document mercury exposure. Although no biological monitoring test acceptable for routine use has yet been developed for mercury vapor, total inorganic mercury can be measured in the urine or blood.

S5.2.5 Use of Personal Protective Equipment

Worker safety rules place personal protective equipment (PPE) at the end of the following list of preferred controls [10 CFR 851.22(b)]:

- Elimination or substitution,
- Engineering controls,
- Work practices and administrative controls that limit worker exposure, and
- Personal protective equipment.

After the preferred measures have been applied, PPE may be required for some parts of the operation. OSHA and other industry standards shall be applied in selecting and using protective equipment, and workers must be trained and qualified to use this equipment. Some of the applicable standards are listed as follows:

- DOE Order (O) 450.1A, *Environmental Protection Program*
- 29 CFR 1910.132, "Personal Protective Equipment"
- 29 CFR 1910.133, "Eye and Face Protection"
- 29 CFR 1910.134, "Respiratory Protection"
- 29 CFR 1910.135, "Head Protection"
- 29 CFR 1910.138, "Hand Protection"
- ANSI Z41, Personal Protection—Protective Footwear
- ANSI Z87.1, Occupational and Educational Eye and Face Protection
- ANSI/AIHA Z88.2, Practices for Respiratory Protection
- ANSI/AIHA Z88.6, Respirator—Physical Qualifications for Personnel
- ANSI/AIHA Z88.7, Color Coding of Air-Purifying Respirator Canisters, Cartridges and Filters
- ANSI/AIHA Z88.10, Respirator Fit Testing Methods
- ANSI Z89.1, Industrial Head Protection

S5.2.6 References

40 CFR Part 264—(RCRA) Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

- 40 CFR 264.14—Facility security
- 40 CFR 264.15—General facility inspection requirements
- 40 CFR 264.16—Personnel training
- 40 CFR 264.17—General requirements for ignitable, reactive, or incompatible wastes

40 CFR Part 265—(RCRA) Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

- 40 CFR 265.14—Facility security
- 40 CFR 265.15—General facility inspection requirements
- 40 CFR 265.16—Personnel training
- 40 CFR 265.17—General requirements for ignitable, reactive, or incompatible wastes

10 CFR Part 851, Appendix A—Worker Safety and Health Functional Areas

- 10 CFR 851.10—General requirements
- 10 CFR 851.22(b)—Hazard prevention and abatement
- 10 CFR 851.23—Safety and health standards
- 10 CFR 851.24—Functional areas
- 10 CFR 851.27—Reference sources

29 CFR Part 1904—Recording and Reporting Occupational Injuries and Illnesses
29 CFR Part 1910—Occupational Safety and Health Administration
29 CFR Part 1926—Safety and Health Regulations for Construction

48 CFR Part 970—DOE Management and Operating Contracts

- 48 CFR 970.2303-2(a)—Contract Clauses
- 48 CFR 970.5204-2(b)—Laws, regulations, and DOE directives
- 48 CFR 970.5223-1—Integration of Environment, Safety, and Health into Work Planning and Execution

DOE Guide (G) 440.1-1A, *Worker Protection Program for DOE (including the National Nuclear Security Administration) Federal Employees Guide for Use with DOE O 440.1B*
DOE Guide (G) 440.1-2, *Construction Safety Management Guide for Use With DOE Order 440.1*
DOE Guide (G) 440.1-3, *Occupational Exposure Assessment*
DOE Guide (G) 440.1-4, *Contractor Occupational Medical Program Guide for Use with DOE Order 440.1*
DOE Guide (G) 440.1-8, *Implementation Guide for Use with 10 CFR Part 851 Worker Safety and Health Program*
DOE Guide (G) 450.4-1B, *Integrated Safety Management System Guide for Use with Safety Management System Policies (DOE P 450.4, DOE P 450.5, and DOE P 450.6); The Functions, Responsibilities, and Authorities Manual; and the Department of Energy Acquisition Regulation*, Vol. 1 Guidance and Vol. 2 Appendices.

DOE Manual (M) 450.4-1, *Integrated Safety Management System Manual*

DOE Order (O) 225.1A-1, *Implementation Guide for Use with DOE Order 225.1A, Accident Investigations*
DOE Order (O) 231.1, *Environment, Safety, and Health Reporting*
DOE Order (O) 231.1-1, *Occurrence Reporting and Performance Analysis Guide*
DOE Order (O) 232.1, *Occurrence Reporting and Processing of Operations Information*
DOE Order (O) 414.1C, *Quality Assurance*
DOE Order (O) 450.1A, *Environmental Protection Program*
DOE Order (O) 5480.19, Change 2, *Conduct of Operations Requirements for DOE Facilities*

DOE Policy (P) 450.4, "Safety Management System Policy"
"Integrated Safety Management (ISM): ISM Champions Web Site," May 5, 2009, http://www.hss.energy.gov/healthsafety/ism/ (accessed July 10, 2009)

Standards

ANSI (American National Standards Institute) Z41, Personal Protection—Protective Footwear.
ANSI Z49.1, Safety in Welding, Cutting and Allied Processes, 1999.
ANSI Z87.1, Occupational and Educational Eye and Face Protection, 1999.
ANSI Z89.1, Industrial Head Protection.
ANSI/AIHA (American National Standards Institute/American International Health Alliance) Z88.2, Practices for Respiratory Protection.
ANSI/AIHA Z88.6, Respirator—Physical Qualifications for Personnel.
ANSI/AIHA Z88.7, Color Coding of Air-Purifying Respirator Canisters, Cartridges, and Filters.
ANSI/AIHA Z88.10, Respirator Fit Testing Methods.
ISO (International Systems for Standards) 9001, Quality Management Systems—Requirements, 2004.
ISO 14001, Environmental Management Systems—Requirements, 2008
NFPA (National Fire Protection Association) 70, National Electrical Code, 2005.
NFPA 70E, Standard for Electrical Safety in the Workplace, 2004.

ACGIH (American Conference of Governmental Industrial Hygienists). 2005. *Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices, Cincinnati, Ohio.*

PROCEDURE (P)

P5.2.1 Introduction

It is not feasible to list all the procedures that would be needed for safe operation of the facility. Many procedures are expected to be developed to implement the numerous regulations that could apply during construction and operations. Only procedures specific to handling and storing the mercury are likely to be different from any well-managed DOE or other industrial operation. This section outlines the types of procedures that must be in place to facilitate safe operation of the DOE mercury storage facility.

P5.2.2 Requirements

Procedures provide instructions for operating within the standards and requirements applicable to the facility. *Conduct of Operations Requirements for DOE Facilities* places requirements for having

procedures on the management of their facilities (DOE Order 5480.19, Sect. 4) to cover the following:

- Operations at DOE facilities be conducted in a manner to ensure an acceptable level of safety.
- Operators at facilities have procedures in place to control the conduct of their operations.
- Line organizations review existing and planned programs important to safe and reliable facility operations.
- Line organizations assess the effectiveness of corporate directives, plans, or procedures at facilities under their cognizance.

P5.2.2.1 QA/QC requirements

QA and QC are discussed in more detail elsewhere in this document. QA/QC is an integral part of ISMS. Guidelines for implementing QA/QC in a safety program are expected to include QA/QC procedures for materials and equipment used, safety equipment and software used, and assessment procedures to verify that the work is being performed properly. DOE has provided guidance in DOE Guide 414.1-1B (entitled: *Management and Independent Assessments Guide for Use with 10 CFR, Part 830, Subpart A, and DOE Order 414.1C, Quality Assurance; DOE M 450.4-1, Integrated Safety Management System Manual; and DOE O 226.1A, Implementation of Department of Energy Oversight Policy*). The frequency of assessments should take into account the need to keep up with changes occurring in the program, system, or process without distracting the organization from focusing on working safely and accomplishing their mission.

P5.2.2.2 RCRA requirements

Because the RCRA requirements for safety overlap with other requirements for security of the facility, training requirements, and emergency response, the applicable procedures will most likely be developed under the other topic areas. The training requirements and procedures must train the employees to perform their work in a safe manner.

P5.2.3 Safety Procedures

The following are examples of some of the types of procedures that may be developed to implement the safety requirements for the mercury facility. Some of these areas are covered by site-wide procedures if the facility is located at an existing DOE or other site.

- Construction procedures
- Management procedures
- Training and qualification program procedures
- Employee safety manual
- Hazard identification and assessment procedures
- Industrial hygiene procedures to reduce mercury exposure
- Engineering and technical support procedures
- Maintenance procedures affecting safety systems or equipment
- Receiving and forklift procedures for storage
- Transportation and packaging procedures
- Recordkeeping and management procedures
- Monitoring and venting procedures before entry to Storage area
- Investigation and reporting procedures
- Corrective action procedures
- Self-assessment procedures

- Configuration management procedures.
- Occupational medicine procedures
- Material control and accountability for mercury
- Operating procedures
- Emergency actions procedures
- Procedures for selection and use of personal protective equipment.
- Procedure on developing, approving, and managing safety procedures

Another list of suggested procedures is included in the sample safety and health program in DOE Guide 440.1-8, *Implementation Guide for Use with 10 CFR Part 851 Worker Safety and Health Program*, Attachment 2.

- Accident/incident investigation
- Combustible and flammable materials
- Electrical safety
- Ergonomics
- Hand/portable power tools
- Hoisting and Rigging
- Ladder safety
- Lockout/tagout
- Noise control and hearing conservation
- Pesticides/toxic substances
- Respiratory protection
- Sanitation and health
- Vehicles
- Affirmative procurement
- Chemical carcinogen control
- Confined spaces
- Emergency management
- Safety and health command media
- Fall protection
- Hazard abatement
- Job hazard analysis
- Machine guarding/tagging
- Occupational medicine
- Risk management pre-planning
- Service contractor safety
- Ventilation
- Workers' compensation
- Occupational exposure
- Emergency wash station
- Equipment safety
- Safety and health committees
- Fire protection
- Hazard communications
- Laboratory safety
- Lessons learned
- Personal protective equipment
- Pressure safety

- Safety tags
- Temperature extremes

P5.2.4 Recordkeeping and Reporting

Procedures should be developed to ensure the appropriate information is captured and recorded. The required OSHA, RCRA, and DOE reports must be prepared and transmitted (through the site organization if possible) as required. The corrective actions identified as the result of events and assessment should be tracked to completion and incorporated in the procedures.

P5.2.5 References

DOE Guide 414.1-1B, *Management and Independent Assessments Guide for use with 10 CFR, Part 830, Subpart A, and DOE Order 414.1C, Quality Assurance; DOE M 450.4-1, Integrated Safety Management System Manual; and DOE O 226.1A, Implementation of Department of Energy Oversight Policy*
DOE Guide 414.1-4, *Safety Software Guide for Use with 10 CFR 830, Subpart A, Quality Assurance Requirements, and DOE O 414.1C, Quality Assurance*
DOE Guide 414.1-5, *Corrective Action Program Guide*
DOE Guide 440.1-8, *Implementation Guide for Use with 10 CFR Part 851 Worker Safety and Health Program*

DOE Order 226.1A, *Implementation of Department of Energy Oversight Policy*
DOE Order 450.1 Chg. 3, *Environmental Protection Program*
DOE Order 5480.19, *Conduct of Operations Requirements for DOE Facilities*

5.3 WORKSPACE AIR MONITORING

STANDARD (S)

S5.3.1 Introduction

This guidance provides the criteria for using mercury vapor analyzers to monitor the breathing air in the work space to ensure that workers' exposures to mercury vapors stay within the specified allowable concentration. Appendix E contains a copy of the OSHA/EPA Occupational Chemical Database for elemental mercury. It also contains a copy of the Pocket Guide data sheet for metallic mercury prepared by the National Institute for Occupational Safety and Health (NIOSH). There are no RCRA requirements for this objective. This guidance applies to all DOE organizations and their contractors associated with performing long-term management and storage of elemental mercury and as defined in their contracts.

S5.3.2 Specific Requirements

Mercury vapor analyzers that are used for protection of human health must be capable of accurately measuring concentrations of mercury vapor in breathing air in excess of the specified allowable concentration. OSHA limits the concentration of mercury vapor exposure to personnel to 0.1 mg/m^3 (see Appendix E). The American Conference of Governmental Industrial Hygienists (ACGIH) has assigned mercury vapor a threshold limit value (TLV) of 0.025 mg/m^3 as a time-weighted average (TWA) for a normal 8-h workday and a 40-h workweek and considers mercury vapor an A4 substance (not classifiable as a human carcinogen). When the ACGIH values are lower than the OSHA values, 10 CFR 851.23 requires that the ACGIH values be used for the protection of personnel.

S5.3.2.1 Laws and regulations

10 CFR Part 851—Worker Safety and Health Program

10 CFR 851.23—Safety and Health Standards

29 CFR Part 1910—Occupational Safety and Health Standards

29 CFR 1910.134—Respiratory Protection
29 CFR 1910.1000—Air Contaminants

OSHA Compliance Directive 02-02-006—Inorganic Mercury and its Compounds

S5.3.2.2 QA/QC requirements

Mercury vapor analyzers shall be calibrated at least as frequently as specified by the manufacturer of the instrument.

Mercury vapor analyzers that are used for protecting human health shall be removed from service upon reaching the calibration due date or when a situation occurs that could affect analyzer calibration. Analyzers that are to be calibrated shall be conspicuously labeled, tagged, or otherwise marked to ensure removal from service and to prevent inadvertent use. After the instrument has been recalibrated and certification has been received, it may be placed back into service.

For additional QA/QC details, see Section 1.5 and Appendix B.

S5.3.3 Required Elemental Mercury Storage Facility Features

When conducting inspections of containers, the concentration of mercury vapor in breathing air shall be ≤ 0.025 mg/m^3 on an 8-h TWA unless personnel wear appropriate respiratory protection. Inspection personnel shall wear appropriate personal protective clothing. Contaminated PPE or other wastes may be generated as a result of air monitoring activities. These wastes would be collected and managed appropriately at the point of generation.

S5.3.4 References

10 CFR Part 851—Worker Safety and Health Program

10 CFR 851.23—Safety and Health Standards

29 CFR Part 1910—Occupational Safety and Health Standards

29 CFR 1910.134—Respiratory Protection
29 CFR 1910.1000—Air Contaminants

OSHA Compliance Directive 02-02-006—Inorganic Mercury and its Compounds

ACGIH (American Conference of Governmental Industrial Hygienists). 2008. *TLVs and BEIs Based on the Documentation of Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*, Cincinnati, Ohio.

PROCEDURE (P)

MONITORING WORKSPACE AIR FOR MERCURY VAPOR CONCENTRATION

P5.3.1 Introduction

Personnel shall periodically perform analysis of the breathing air in the mercury Storage area to ensure that the concentration of mercury in the area does not exceed the permissible concentration.

This procedure applies to DOE OC personnel who are responsible for ensuring that the breathing air concentration remains within the permissible range. Personnel shall be trained to operate the instruments to properly perform the necessary analyses. This procedure also applies to DOE OC personnel who are responsible for operating the instruments and interpreting the results.

The procedure shall be revised as changes are incorporated into the facility and/or container inspection process. The procedure is expected to be reviewed every 3 years, whenever regulations or the facility's permit conditions regarding waste management change, or whenever the facility management determines that their waste management process is not meeting their needs.

P5.3.2 Precautions/Limitations

Liquid mercury and mercury vapor pose a health hazard if sufficient quantities are inhaled, ingested, or absorbed through the skin. After absorption into the bloodstream, the mercury can attack the central nervous system. See Appendix E for additional information.

P5.3.3 Requirements

The elemental mercury storage facility requirements would include the following.

- As a Best Management Practice, there shall be no eating, drinking, smoking, or chewing in the mercury Storage area. Upon leaving the mercury Storage area, personnel are expected to wash their hands with water and soap. Clothing must be changed if it has become contaminated.
- Material Safety Data Sheets (MSDS) for elemental mercury and other chemicals that are stored and/or used in the facility shall be readily available at the site.
- Unless personnel are wearing appropriate respiratory protection, the concentration of mercury vapor in the breathing air shall be ≤ 0.025 mg/m^3 on an 8-h TWA (ACGIH guidance).

P5.3.4 Prerequisites

Major prerequisites for the DOE elemental mercury storage facility include the following.

- Personnel shall be dressed in the appropriate personal protective equipment.
- The mercury vapor analyzer shall be in calibration and within its calibration due date.
- Personnel shall be trained on the manufacturer's operating instructions (e.g., warm-up time, time required for regenerating an instrument).

P5.3.5 Action Steps

P5.3.5.1 Mercury vapor analyzer method

When a mercury vapor analysis is needed, personnel will obtain a mercury vapor analyzer.

Personnel shall verify that the instrument is still within the calibration due date. If the instrument has passed the due date, it shall be removed from service until it has been recalibrated by a qualified calibration service.

On a daily basis (i.e., when work is being performed that requires mercury vapor measurements), personnel should qualitatively test the instrument with a known source of mercury vapor to verify that the instrument responds to the mercury vapor and that the instrument responds appropriately when it is moved away from the source of mercury vapor.

Personnel shall take the instrument to the desired area and operate the instrument in accordance with the manufacturer's operating manual to measure the concentration of mercury vapor in the air.

Portable mercury vapor analyzers typically contain rechargeable batteries. When not being used, the mercury vapor instrument is to be returned to the charging station to keep the battery charged and to make the instrument available for other measurements. At the end of the day, all of the mercury vapor analyzers are to be returned to the charging station so that they are fully charged for the next day's work.

P5.3.5.2 Passive dosimeter method for individuals

OSHA has evaluated a solid sorbent passive dosimeter for collecting mercury vapor exposure data (OSHA Method ID-140). Passive dosimeters do not require a pump. The dosimeters can be analyzed at any laboratory that is equipped with a cold-vapor atomic absorption spectrophotometer. The results

are not available immediately, so these dosimeters may be used in conjunction with the mercury vapor analyzer method as described in Section P5.3.5.1.

If used, the passive dosimeter is assigned to an individual and the start time is recorded.

The individual attaches the dosimeter on his/her clothing near the breathing zone (e.g., collar of lab coat) and wears it for the period of time (e.g., 8-h workday) designated by the appropriate authority (e.g., industrial hygienist).

At the end of the period, the dosimeter is removed from the individual and the stop time is recorded.

The dosimeter is packaged and shipped to an analytical laboratory for analysis.

The laboratory results are analyzed to determine the exposure measured by the dosimeter.

P5.3.5.3 Passive dosimeter method for locations

This section follows the steps listed in Section P5.3.5.2 except the dosimeter is assigned and placed in a strategically selected area that is to be monitored for mercury vapor (e.g., mercury Storage area, mercury transfer station, office area).

P5.3.5.4 Active dosimeter method

An active dosimeter is one that uses a pump to draw an air sample through the dosimeter, and the volume of air is measured.

When the qualified person (e.g., industrial hygienist) determines that an active dosimeter measurement is required, a dosimeter/pump is assigned to the person or strategic location. When the pump is turned on, the start time is recorded.

The unit collects a sample for the time designated by the qualified person (e.g., industrial hygienist).

At the end of the collection period, the pump is turned off, and the stop time is recorded.

The dosimeter is removed, packaged, and shipped to an analytical laboratory for analysis.

The laboratory results are analyzed to determine the mercury vapor exposure to the person or at the strategic location.

P5.3.6 Waste Handling

Contaminated personal protective equipment or other wastes may be generated as a result of air monitoring activities. These wastes would be collected and managed appropriately at the point of generation based on the waste determination (solid verses hazardous waste).

P5.3.7 Records

Records mainly include analytical results from dosimeter measurements and calibration records for the mercury vapor instrumentation.

P5.3.8 References

ACGIH (American Conference of Governmental Industrial Hygienists). 2008. *TLVs and BEIs Based on the Documentation of Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices*, Cincinnati, Ohio.

ECOS (Environmental Council of the States). October 2003. *Mercury Stewardship Best Management Practices*, Quicksilver Caucus and U.S. Environmental Protection Agency, Washington, D.C. Accessed (07-28-09) on the Web at URL: http://www.ecos.org/files/720_file_QSC_BMP_Oct_03.pdf

OSHA (Occupational Safety and Health Administration). June 1991. "Mercury Vapor in Workplace Atmospheres," OSHA Method ID-140, OSHA Technical Center, Sandy, Utah. Accessed (July 25, 2009) on the Web at URL: http://www.osha.gov/dts/sltc/methods/inorganic/id140/id140.html

5.4 RECORDKEEPING

STANDARD (S)

S5.4.1 Introduction

Records management is the planning, controlling, directing, organizing, training, promoting, and other managerial activities involving the life cycle of information, including creation, maintenance (use, storage, retrieval), and disposal of records, regardless of media. The Federal Records Act (44 USC 31) and other statutes require the DOE and its contractors to create records that document their activities, file records for safe storage and efficient retrieval, and dispose of records according to DOE record schedules. Records may be in many formats: paper, electronic, audio-visual, maps, etc. Records document the organization, functions, policies, decisions, procedures, operations, and other activities of the agency.

There are rules governing the use and destruction of all Federal records. DOE facilities must protect their Federal records. Following good records management practices can benefit DOE in many ways, such as improving access to information and saving time, space, and money.

Both DOE Orders and other federal regulations, including RCRA, impose recordkeeping requirements that would apply to the DOE-designated mercury storage facility. The requirements in the DOE orders are based on both regulatory requirements and BMPs. The recordkeeping required by RCRA is designed to track hazardous waste from its generation (cradle) to final disposition (grave). The manifest system tracks each shipment of hazardous waste, while the operating record and other required reports summarize facility activity over time. The facility operating record and reports provide a set of records designed to document compliance with RCRA requirements. All required RCRA records must be available for inspection by regulators.

S5.4.2 Specific Requirements

This section is not intended to provide an exhaustive list of the regulatory requirements for recordkeeping that may apply to the facility. Instead it is addressing those that are key to a DOE facility storing hazardous waste (elemental mercury) under RCRA. [See Appendix D (Section D.4.3) for applicable federal statutory requirements other than RCRA.] Similarly, this Section does not include an exhaustive list of the records that would be kept. However, key records are addressed here or in the relevant Standards and/or Procedures.

S5.4.2.1 RCRA requirements

The RCRA requirements for recordkeeping are designed to ensure that regulated parties maintain sufficient records to demonstrate that hazardous wastes were properly characterized and managed from the point of generation (by the generator) until final disposition (via treatment or disposal). Recordkeeping (e.g., waste tracking) is critical to the cradle-to-grave management system that RCRA imposes for hazardous wastes. All parties that manage a hazardous waste (generators, transporters, and treatment, storage, and disposal facilities) have responsibilities for issuing or maintaining records. This section focuses primarily on the TSD recordkeeping requirements. In general, RCRA records pertaining to TSD operations are the facility's operating record (40 CFR 264/265.73); however, additional recordkeeping requirements can also be imposed, depending on the facility's operations.

The storage/maintenance of RCRA required records must, at a minimum,* comply with RCRA requirements, whether the records are maintained on paper or in electronic systems. For example, generators may keep manifests in a central location (either onsite or at a corporate or agency main office that is not onsite) [40 CFR 262.40(a)] (for more information on generator records, refer to Section 2 and 3). TSD facilities must retain copies of manifests onsite (anywhere at the TSD site, but not necessarily at the TSD facility itself) (40 CFR 264/265.71) (refer to Sections 4 and 5.8).

Regardless of where the records are stored, most RCRA records must be maintained for a minimum of 3 years (with some exceptions), and those records must be accessible to regulators for inspections. Electronic recordkeeping systems may be used, per EPA guidance; however, such systems must store and print out high-quality images including handwritten signatures (when applicable); must ensure the record accuracy, integrity, and security of the data; and provide features that allow reasonable access by inspectors. Facility or container inspection records are typically maintained at the TSD facility (see Section S5.6.2). Records associated with generator waste acceptance (waste analyses, acceptable knowledge documentation, waste profiles, etc.), manifests/notifications, waste fingerprinting results, and/or permitting of the facility are typically stored in waste management office file systems (see Section 5.8). Training records (see Section 5.9) may be kept in central training files. Records would also include correspondence to or from regulators such as reports, notifications, permit applications, etc. Some reports/submittals including permit applications require certification of the accuracy of the document and must be signed by an authorized representative of the facility.

Waste receipt and waste generation records shall include sufficient information to meet biennial reporting† requirements for TSDFs. Examples of log sheets for waste receipt are included in Appendix D.

State requirements and RCRA hazardous waste facility permits may be more restrictive and may implement additional recordkeeping requirements. RCRA recordkeeping requirements for the DOE elemental mercury storage facility focus on manifesting (wastes received and stored versus wastes shipped), wastes generated by the facility, waste minimization efforts, the facility operating record, required reports and plans (closure plan and contingency plan), notifications and permit applications, and personnel training records.

The majority of RCRA records must be maintained for a minimum of 3 years. Retention time is automatically extended in cases of unresolved enforcement action. Some RCRA records must be maintained for longer periods of time. An example is training records (refer to Section S5.9.2.1 for more information). As a best management practice, it is expected that TSDF waste tracking, inspection, and/or spill records be kept for the life of the facility. Retention of waste treatment/ disposal records may be useful in averting liability under Comprehensive Environmental Response, Compensation and Liability Act investigations of off-site treatment/disposal facilities. It is recommended that the TSDF assign accountability for RCRA recordkeeping requirements within their organization to ensure the requirements will be met.

S5.4.2.2 DOE requirements

DOE facilities are required to implement a records management system that begins with identifying applicable recordkeeping requirements and then implementing a system to ensure those records are accessible for the required retention period.

*In some cases, DOE recordkeeping requirements are more stringent.
†Some States require annual reporting on specific forms.

S5.4.3 Equivalency and Exceptions

Facilities may request modifications or exceptions to RCRA provisions. For instance, EPA guidance allows for the use of computerized record systems (eliminating all or most paper records). However, it may be desirable for the DOE elemental mercury storage facility to specifically request the approval and design of computer-based records to include any/all operating records, including but not limited to, inspection logs where electronic signatures and date/time stamping could be beneficial.

S5.4.4 References

DOE Orders

DOE Order 243.1, *Records Management Program*
DOE Order 243.2, *Vital Records*
DOE Order 414.1C, *Quality Assurance* (Management/Criterion 4—Documents and Records)

Other Federal Agency Regulations

29 CFR 1910.1020—Access to employee exposure and medical records
36 CFR Chapter XII, Subchapter B—Records Management
- Part 1220—Federal Records; General
- Part 1222—Creation and Maintenance of Records; Adequate and Proper Documentation
- Part 1228—Disposition of Federal Records
- Part 1230—Micrographics
- Part 1232—Audiovisual Records Management
- Part 1234—Electronic Records Management
- Part 1236—Management of Vital Records
- Part 1238—Program Assistance

40 CFR Parts 260, 262, 264, 265, 268, and 270—Hazardous Waste Regulations
- 40 CFR 260.20—Rulemaking petitions (general requirements)
- 40 CFR 260.21—Petitions for equivalent testing or analytical methods
- 40 CFR 262.40(a)—Recordkeeping
- 40 CFR 264.71/265.71—Use of manifest system
- 40 CFR 264.73/265.73—Operating record

44 USC 31—Records Management by Federal Agencies (Federal Records Act)
44 USC 33—Disposal of Records
44 USC 35—Coordination of Federal Information Policy

PROCEDURE (P)

RECORDS MANAGEMENT

P5.4.1 Introduction

This procedure is intended to help individuals to learn to properly identify, use, maintain, and dispose of Federal records necessary to track information concerning the generation, shipment, treatment, and disposal of hazardous wastes. Records may include information from generators, transporters, and TSD facilities on the amounts and kinds of hazardous waste being generated, transported, and stored at a DOE-designated elemental mercury storage facility.

As creators of Federal records, all elemental mercury storage facility employees should strive to ensure that end users have the information they need, when they need it, and in the format they need.

P5.4.2 Applicability

This procedure applies to all individuals engaged in the long-term storage of elemental mercury. This procedure does not specify what each type of record should contain or the records that are generated and/or received as a result of performing any other procedure. The Records subsection of each procedure is expected to contain information regarding the records that are generated and/or received as a result of performing its action steps.

P5.4.3 Responsibilities

The storage facility OC is responsible for

a. Ensuring that employees are trained in the adequate creation, maintenance and use, and disposition of records,
b. Implementing this standard procedure within the managed areas, and
c. Identifying the facility Records Manager.

The Facility Records Manager is responsible for establishing a records management program in accordance with Federal laws and regulations to include managing records in all formats, including the following:

a. Implementing the recordkeeping requirements in this standard procedure
b. Assisting managers and staff in identifying and managing records
c. Providing awareness that records management is a part of the job of every DOE and contractor employee
d. Enabling staff to know what data to collect and how to maintain it throughout its life cycle
e. Ensuring accurate evidence of facility activities, organization, functions, policies, decisions, procedures, and operations
f. Generating a facility-specific records retention schedule in accordance with the DOE records disposition schedules
g. Identifying unscheduled and new types of records that will need disposition authorities
h. Assisting staff in determining records from non-records

The Records Custodian (RC) is responsible for

a. Controlling, maintaining, protecting, and ensuring proper disposition of records and
b. Ensuring records are legible and reproducible.

The Information Technology (IT) representative is responsible for

a. Ensuring that electronic systems are appropriately maintained and backed up and
b. Safeguarding electronic documentary materials stored in DOE electronic recordkeeping systems to prevent the intentional or negligent misuse of, unauthorized access to, or destruction of records.

All elemental mercury storage facility staff members are responsible for the following:

a. Identifying documentary materials that meet the definition of Federal records
b. Maintaining records in accordance with the DOE Records Disposition Schedules

c. Safeguarding sensitive records such as those containing personally identifiable information, classified information, vital information, and information protected under the Freedom of Information Act (FOIA) and Privacy Act
d. Destroying eligible documentary materials at the end of the applicable retention period, including materials that do not meet the definition of record, that is, non-record, personal files, and/or qualifying transitory records

P5.4.4 Definitions

Please see Appendix D, Section D.1 ("Record Management Definitions").

P5.4.5 Requirements

State and local requirements may also apply.

- 29 CFR 1910.1020, Access to employee exposure and medical records
- 36 CFR Part 1220, Federal records, General
- 36 CFR Part 1222, Creation and maintenance of Federal records
- 36 CFR Part 1228, Disposition of Federal records
- 40 CFR 260.20—Rulemaking Petitions
- 40 CFR Part 262—Standards Applicable to Generators of Hazardous Waste
- 40 CFR Part 263—Standards Applicable to Transporters of Hazardous Waste
- 40 CFR Part 264/265 Subpart B—General Facility Standards
- 40 CFR Part 264/265 Subpart C—Preparedness and Prevention
- 40 CFR Part 264/265 Subpart D—Contingency Plan and Emergency Procedures
- 40 CFR Part 264/265 Subpart E—Manifest System, Recordkeeping and Reporting
- 40 CFR Part 264/265 Subpart F—Releases from Solid Waste Management Units
- 40 CFR Part 264/265 Subpart G—Closure and Post-Closure
- 40 CFR Part 264/265 Subpart I—Use and Management of Containers
- 40 CFR Part 264/265 Subpart CC—Air Emission Standards (Containers)
- Appendix I to Title 40 CFR Part 264/265—Recordkeeping instructions
- 40 CFR Part 270 Subpart B—Permit Application
- 40 CFR Part 270 Subpart C—Permit Conditions
- 40 CFR Part 270 Subpart D—Changes to Permits
- 40 CFR 268.7—Testing, tracking and recordkeeping requirements for generators, treaters, and disposal facilities
- 40 CFR 268.9—Special rules regarding wastes that exhibit a characteristic
- DOE Order 243.1, *Records Management Program*
- DOE Order 243.2, *Vital Records*
- DOE Order 414.1C, *Quality Assurance Management*/Criterion 4—Documents and Records
- DOE Order 440.1B, *Worker Protection program for DOE (Including National Nuclear Security Administration) Federal Employees*

P5.4.6 Action Steps

All elemental mercury storage facility staff create and/or receive records necessary to document activities of the DOE elemental mercury storage facility because of the administrative, legal, or historic value of the information contained in them. As identifiers of Federal records, all elemental mercury storage facility staff are bound by Federal statutes to guarantee the adequacy, preservation, and disposition of Agency records.

To ensure that complete and accurate records are created and retained in the DOE System of Records, it is essential that elemental mercury storage facility staff distinguish between records and nonrecord materials by the appropriate application of the definition of records:

> *Records* include all books, papers, maps, photographs, machine readable materials, or other documentary materials, regardless of physical form or characteristics, made or received by an agency of the United States Government under Federal law or in connection with the transaction of public business and preserved or appropriate for preservation by that agency or its legitimate successor as evidence of the organization, functions, policies, decisions, procedures, operations or other activities of the Government or because of the informational value of the data in them (44 USC 3301—Definition of records).

Identifying all records and keeping them in a central file location* makes it easier to establish a recordkeeping system, organize, use, maintain, and retrieve the records when needed, and dispose of them when they are no longer needed for the conduct of the regular current business. A central file maintains the official record copy of facility records, which may be the original documentation.

An example of the types of data to collect for safekeeping in the elemental mercury storage facility system of records, please see Appendix D, Section D.3 ("Examples of Facility Records").

An example of detailed procedure guidance for the proper management of facility records can be found in Appendix D, Section D.4 ("Records Management Procedures"), which contains Figure D.1, Criteria to determine record status.

P5.4.7 Records

Records generated and or received in accordance with work performance of this procedure may include, but are not limited to the following:

- Air emission control records for tanks, surface impoundments, and containers
- Annual, Biennial or Other Reports
- Arrangements with Local Authorities (for emergency support)
- Biennial Report
- Carbon adsorption systems log
- Closure Plans
- Contingency Plan and distribution records for the Plan
- Confirmation of delivery of hazardous waste from consignee
- Controlled Documents
- Document Transmittals
- Documentation of RCRA compliance
- DOE Authorization for Destruction of Records Forms
- Electronic Records System
- Emergency Reports
- Environmental and Personal Exposure Monitoring Records
- EPA Acknowledgment of Consent
- Equipment identification number and hazardous waste management unit identification
- Exception Report

*See above RCRA guidance on location requirements for certain RCRA records (S5.4.3).

- Facility closure records
- Facility implementation schedule
- Facility plot plan
- Freedom of Information Act (FOIA) Request/Response Records
- Ground-water monitoring records
- Ground-water analyses
- Inspection Logs and Reports
- Inventory Logs and Reports
- Land Disposal Restriction Notifications/Certifications
- Leak detection records and report
- Log sheets of persons entering/exiting mercury storage areas
- Logs of personnel requesting mercury records
- Manifests
- Material Safety Data Sheets (MSDS)
- Monitoring Equipment Lists and Reports
- Monitoring Logs of Unsafe Systems
- Notification of Intent to Export
- Required Notifications Prior to Shipping
- Notifications to off-site waste generators of permits and waste acceptance
- Operating record
- Performance test plans (not related to RCRA)
- Permit applications and supporting documents
- Personnel Medical Examination records
- Petitions for variances/exceptions
- Privacy Act Records List
- Quality Assurance Plan
- Records Holding records
- Records Inventory reports
- Records Management Plan
- Records of waste disposal locations and quantities
- Records of waste received and stored at the facility
- Records of waste disposal locations and quantities records
- Records Retentions and Disposition Schedule
- Release Reports
- Reports of releases, fires, and explosions
- Safety Plan
- Schedule of valve monitoring
- Shipping Papers
- Storage facility waste acceptance review and approval forms
- Tank repair documentation
- Tracking documentation of transporters
- Training records
- Unmanifested Waste Reports
- Vital Records Lists
- Volatile organic compound (VOC) emissions reports
- Waste Acceptance Criteria document
- Waste Analysis Plan
- Waste characterization/acceptance forms

- Waste discrepancy records and reports
- Waste Disposal records
- Waste generation/handling records for hazardous wastes generated at the storage facility
- Waste Minimization Program Plan
- Weld inspection reports

P5.4.8 Appendix

Appendix D, Guidance for Records Management, identifies additional guidance documents, figures, and exhibits that may be helpful training for all project personnel as it is essential that all parties involved in the long-term storage of elemental mercury learn to distinguish between records and nonrecord materials for the facility to meet Federal regulations. These additional guidance documents, figures, and exhibits are included in the four sections of this appendix:

- Section D.1, Records Management Definitions,
- Section D.2, RCRA Requirements for Recordkeeping,
- Section D.3, Examples of Facility Records, and
- Section D.4, Records Management Procedures.

5.5 FACILITY SECURITY

STANDARD (S)

S5.5.1 Introduction

The purpose of this standard is to enumerate elements necessary for ensuring the physical security of the elemental mercury stored in the DOE-designated storage facility. The security provided for the facility must prevent inadvertent or deliberate unauthorized access to the facility and the Storage area. This standard enumerates the minimum design and operation requirements to secure the elemental mercury storage facility. Accountability systems for individual containers are not considered part of physical security.

S5.5.2 Specific Requirements/Criteria

Regulatory requirements for storage facility security will, at a minimum, include requirements from RCRA, applicable state and local regulations, and DOE directives. In addition, certain site-specific security provisions may be applicable. Certain security measures from the ECOS (October 2003) are considered BMPs. The security-related BMPs from ECOS are included in Section P5.5.3.

S5.5.2.1 RCRA Requirements

The elemental mercury storage facility shall meet the standards for a hazardous waste TSDF under the requirements of RCRA, 40 CFR Part 264 (facilities) and 40 CFR Part 265 (interim status facilities). Sections 264.14 and 265.14 list these security requirements.

- The owner or operator must prevent the unknowing entry, and minimize the possibility for the unauthorized entry, of persons or livestock onto the active portion of the facility, unless he/she can demonstrate to the EPA Regional Administrator that (1) physical contact with the waste, structures, or equipment within the active portion of the facility will not injure unknowing or unauthorized persons or livestock which may enter the active portion of a facility and (2) disturbance of the waste or equipment, by the unknowing or unauthorized entry of persons or livestock onto the active portion of a facility, will not cause a violation of the requirements of this part. [This demonstration must be included in the Part B of the permit application required under 40 CFR Part 270 (“EPA Administered Permit Programs: the Hazardous Waste Permit Program”).]
- Unless the owner or operator has made a successful demonstration as described above, a facility must have (1) a 24-h surveillance system (e.g., television monitoring or surveillance by guards or facility personnel) which continuously monitors and controls entry onto the active portion of the facility or (2) (i) an artificial or natural barrier (e.g., a fence in good repair or a fence combined with a cliff), which completely surrounds the active portion of the facility; and (ii) means to control entry, at all times, through the gates or other entrances to the active portion of the facility (e.g., an attendant, television monitors, locked entrance, or controlled roadway access to the facility).
- Unless the owner or operator has made a successful demonstration under the first bullet, a sign with the legend, “Danger—Unauthorized Personnel Keep Out,” must be posted at each entrance to the active portion of a facility, and at other locations, in sufficient numbers to be seen from any approach to this active portion. The legend must be written in English and in any other language predominant in the area surrounding the facility and must be legible from a distance of at least 25 ft. Existing signs with a legend other than “Danger—Unauthorized

Personnel Keep Out" may be used if the legend on the sign indicates that only authorized personnel are allowed to enter the active portion, and that entry onto the active portion can be dangerous.

Under RCRA (40 CFR 264.15 and 40 CFR 265.15), the physical protection systems (barriers, signs, etc.) must be checked/inspected according to the schedule set in the facility's inspection plan (refer to Section 5.6 for more information).

S5.5.2.2 Department of Energy Requirements

Security at the DOE elemental mercury storage facility will be subject to DOE Order (O) 470.4A, *Safeguards and Security Program*, DOE Policy (P) 470.1, *Integrated Safeguards and Security Management (ISSM) Policy*, DOE Order (O) 414.1C, *Quality Assurance*, and DOE Manual (M) 470.4-2A, *Physical Protection*.

Physical security requirements shall at least meet those for a DOE Property Protection Area (PPA). Some of the DOE requirements are parallel to the RCRA requirements outlined above; while other DOE requirements are more restrictive. The DOE guidelines are listed in DOE Manual 470.4-2A, *Physical Protection* (approved 7/23/09). The more restrictive DOE requirements are noted in Chapter II ("Security Areas") of this manual and summarized here.

- Protection may include physical barriers, access control systems, biometric systems, protective personnel or persons assigned administrative or other authorized security duties, intrusion detection systems, locks and keys, etc. The cognizant security authority must designate, describe, and document PPA protection measures within their site security plan.
- Warning signs and/or notices must be posted around the perimeter and at entrances to a PPA.
- An inspection program shall deter prohibited and controlled articles being brought into PPA facilities. All personnel, vehicles, packages, and hand-carried articles are subject to inspection before entry into a security area. Likewise, such programs must ensure that safeguards and security (S&S) interests are not removed.

Physical security shall also comply with DOE Order 414.1C, in particular for performance, work processes and design. See Appendix B for more information.

S5.5.3 DOE Implementation Philosophy and Approach to Security

DOE endorses the concept of graded physical protection, based on DOE Order 470.3B, *Graded Security Protection (GSP) Policy*, and DOE Manual 470.4-1, *Safeguards and Security Program Planning and Measurement*. When there is limited safeguards interest, a Site Security Plan (SSP) must be developed.

DOE assets must be protected against malevolent acts (theft, diversion, sabotage) and natural disasters and civil disorders, considering the site and regional threats, protection planning strategies, and protection measures. DOE can impose requirements it deems necessary for the safety of employees and the public and to minimize threats to life, chemical materials, government property, the public, and the environment. Sites upgrading security measures must do an analysis of the life-cycle costs of security technology to traditional manpower-based approaches.

Physical protection systems, including components, must be tested to ensure systems effectiveness. Effectiveness must be tested at least annually as required by performance assessment programs, and

there shall be a program of testing and maintenance. Physical surveillance equipment must be used for the purpose described in the SSP, and signs must be posted that surveillance equipment is in operation.

S5.5.4 Elemental Mercury Storage Facility Security Features

To meet DOE Order (O) 413.3A (*Program and Project Management for the Acquisition of Capital Assets*), an assessment shall take place as part of the design review to identify security requirements. The following suggested features would meet the DOE and/or RCRA requirements[*] outlined above and consider the specific facility. However, implementation of the security requirements may vary, depending on whether the elemental mercury storage facility is located within a DOE or other installation or is freestanding. In the first case, many security functions are expected to be integrated with the existing site security. If the installation is freestanding, special arrangements must be made for security checks and a coordinated response from local law enforcement. Additional guidance is available in DOE Manual 470.4-2A (*Physical Protection*).

- The storage facility shall meet local building codes, be constructed of building materials that offer penetration resistance to, and evidence of, unauthorized entry into the area and be surrounded by a fence with secured gates.[†] The Storage area, the Handling area, and the Receiving and Shipping area shall be inside the fence. It is desirable, but not essential, for the Office Administration area to be inside the fence.
- The fence shall be located at least 20 ft from any building, and entry control points shall have a barrier resistant to bypass. The fence shall be 8–10 ft high, with barbed wire at the top or be electrified. The fence line shall be kept clear of vegetation, trash, equipment, or anything that impedes observation or would aid someone in penetrating or getting over the fence. (The cleared area is also an advantage for safety and fire control.)
- If motorized gates are used at entry control points, the gate controls must be located within a protective force post and gates must be operable during power outages. Alarms and communications systems must connect entry control points to control points and communications centers.
- Barriers or alarms must be located on all unattended openings that are larger than 96 $in.^2$ in area or larger than 6 in. in the smallest dimension or within 18 ft of the ground, roof, or ledge of a lower security area. Alarms are expected to sound at a central control point and alert security personnel.
- Doors, door frames, and door jambs must provide needed delay when part of a barrier. Any transparent glazing must be penetration resistant. Doors that are solely emergency exits must not be accessible from outside the secure area, comply with NFPA 101, *Life Safety Code*, and not open into areas of greater security. An astragal/mullion must be used where doors in pairs meet, be reinforced, and unmovable from the outside.
- Entry into the Storage area is expected to be logged, with pertinent information, including mercury vapor levels detected before entering the area.

[*]Note: the majority of the design features outlined here are driven by DOE requirements. RCRA security requirements focus on the use of security systems to restrict/control entry and the posting of warning signs.

[†]Either walls/locked doors or fence/locked gates will meet the RCRA requirement for a barrier to prevent unauthorized intrusion. Alternatively, a 24-h surveillance system (e.g., television monitoring or surveillance by guards or facility personnel) can be use to deter unauthorized entry to meet RCRA requirements.

- Lighting systems shall allow detection and assessment of unauthorized persons, including people, items, and vehicles at control points, but not hinder or reveal other protective force activities. Lights shall be maintained and tested according to approved procedures, and compensatory measures shall be implemented when the lighting systems fails.
- Signage on the fence shall indicate that the facility is a DOE facility and trespassing is not allowed. Signage shall also comply with RCRA requirements outlined in Section S5.5.2.1.
- Access to the fence and structures shall be regulated by a controlled key system or automated access control system. A second key or access level may further limit the number of people who can open the Storage area. These employees can escort other workers inside the Storage area.
- Electrical service and utilities for the building shall enter the building underground or be protected from accidents and tampering. Uninterruptible power supply (UPS) systems shall protect sensors, card readers, and all other critical parts of the protection system from disruptions in public service. Wiring for alarm and security systems shall be protected to keep systems from being disabled.
- Best cyber security practices are expected to be followed. The database with the inventory of the elemental mercury storage facility must be protected against modifications through the internet and backed up off-site.
- Vehicle access shall be controlled. Government vehicles or delivery vehicles are admitted to the fenced area only when on official business, validated, and operated by properly DOE-badged employees or escorted by authorized persons.
- All delivery vehicles bringing in materials or supplies shall be inspected for security purposes before they enter the fenced area. The vehicle can then be moved inside the fence to decontaminate any containers or surfaces.
- The site protective force and local law enforcement shall be briefed and allowed to tour to become familiar with the facility.
- Redundant communication systems must be available to alert installation security forces or local law enforcement officials.
- There must be an emergency plan (which may also cover RCRA and DOE requirements) for a security event and the facility response to that event.

A Security Vulnerability Assessment Report is required by DOE Order 413.3A Chg. 1 as part of the Critical Decision Requirements for acquisition of capital assets. Additional security measures (access control, monitoring, etc.) are called for in DOE Manual 470.4-2A and can be customized to the specific facility.

S5.5.5 Equivalency and Exceptions

A waiver from the security requirements can be requested. The RCRA regulations in Section S5.5.2.1 and 40 CFR 260.20 provide ways to obtain exceptions. As an example, if an existing facility is selected by DOE, that facility may have existing signs that provide adequate warning of the mercury hazards. Per 40 CFR 270.14(b)(4) the facility could request continued use of those warning signs rather than post the signs required under 40 CFR 264/265.14(c).

DOE officials must approve the SSP and can be helpful in applying for an exception to the requirements of a DOE order when the intent of the order can be met in another way.

S5.5.6 References

40 CFR Part 260—Hazardous Waste Management System: General

40 CFR Part 260.20—General

40 CFR Part 264—(RCRA) Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 264.14—Security
40 CFR 264.15—General inspection requirements

40 CFR Part 265—(RCRA) Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 265.14—Security
40 CFR 265.15—General inspection requirements

40 CFR Part 270—(RCRA) EPA Administered Permit Programs: The Hazardous Waste Permit Program

40 CFR 270.14(b)(4)—A description of the security procedures and equipment required by 40 CFR 264.14, or a justification demonstrating the reasons for requesting a waiver of this requirement

DOE Order (O) 205.1A, *Department of Energy Cyber Security Management*, 12/4/06
DOE Guide (G) 470.4-1, *Asset Protection Analysis Guide*, 08/21/08
DOE Manual (M) 231.1-2, *Occurrence Reporting and Processing of Operations Information*, 08/19/05
DOE Manual (M) 470.4-1 Chg. 1, *Safeguards and Security Program Planning and Management*, 03/07/06
DOE Manual 470.4-2A, *Physical Protection* (approved 07/23/09)
DOE Manual (M) 470.4-3A, *Contractor Protective Force*, 11/05/08
DOE Manual (M) 470.4-4A, *Information Security Manual*, 01/16/09
DOE Manual (M) 470.4-7, *Safeguards and Security Program References*, 08/26/05

DOE Order (O) 151.1C, *Comprehensive Emergency Management System*, 11/02/05
DOE Order (O) 413.3A, Chg. 1, *Program and Project Management for the Acquisition of Capital Assets*, 11/17/08
DOE Order (O) 414.1C, *Quality Assurance*, 06/17/05
DOE Order (O) 470.3B, *Graded Security Protection (GSP) Policy*, 08/12/08
DOE Order (O) 470.4A, *Safeguards and Security Program*, 05/25/07

DOE Policy (P) 470.1, *Integrated Safeguards and Security Management (ISSM) Policy*, 05/08/01

NFPA 101, *Life Safety Code*, 2009 Edition

ECOS (Environmental Council of the States). October 2003. *Mercury Stewardship Best Management Practices*, Quicksilver Caucus and U.S. Environmental Protection Agency, Washington, D.C.

PROCEDURE (P)

FACILITY SECURITY

P5.5.1 Introduction

Site-specific procedures must be developed to implement the security requirements identified for the elemental mercury storage facility and to help ensure that DOE OC employees perform their tasks safely and successfully. Because the procedures must be site specific, the outlines below will need to be supplemented. The elemental mercury storage facility may identify the need for additional procedures. Some procedures may address other concerns in addition to security, and these topics may be incorporated in a more general procedure.

P5.5.2 Precautions/Limitations

The protection of human life and the environment are paramount. In the event of an emergency, there shall be a responsible person who can authorize modifications to the security procedures when necessary to allow emergency response personnel to function.

P5.5.3 Requirements

Multiple procedures will probably need to be developed. The following list includes some of the items that may be included in the procedures. If the storage facility is placed at an existing installation, many of these items can be incorporated into the existing installation facilities. Some of these items can also be combined. All procedures are to be reviewed annually and revised if necessary. More frequent review and revision is needed if some of the security features are changed, the operation of the facility changes, the security system does not perform as expected, or the perceived threat to the facility changes.

- Posted orders for protective forces describing security rounds and checks, frequency, actions, alarm checks, and documentation of routine checks
- Procedures for verifying the origin, carrier, driver, etc., on shipments of elemental mercury and supplies arriving from outside vendors
- Procedures for admitting government vehicles or delivery vehicles through the facility security fence
- Background checks on all staff including name, address, social security number, driver's license numbers, civil or criminal violations, and fingerprints, if necessary. (This could also be accomplished through the investigation involved with obtaining a DOE badge.)*
- Cement barriers in front of the entrance.*
- A logging and recordkeeping system for entries into Storage area
- Procedures for controlled access to fenced area, building, and Storage area
- Systems for verifying and controlling the access devices (a secure pass system, an efficient key control system, tags)
- Regular maintenance and testing procedures on security hardware and software [alarms, locks, gates, and closed-circuit television (CCTV) system] and verification that the fences are clear and signage is legible
- Policies for maintenance of CCTV system (if present), what is monitored, recordings, and access to recorded images

*Suggested attribute inclusion from ECOS (Environmental Council of the States). October 2003. Mercury Stewardship Best Management Practices, Quicksilver Caucus and U.S. Environmental Protection Agency, Washington, D.C. Accessed (07-28-09) on the web at URL: http://www.ecos.org/files/720_file_QSC_BMP_Oct_03.pdf

- Procedure for response to an alarm at the storage facility or notification from CCTV monitoring station
- Procedure for notifying local law enforcement for assistance or to respond
- Arrangements for having a knowledgeable person available if protective force must enter Storage area or work around mercury
- Notification procedures, including periodic tests of notification systems
- Training and certification procedures for staff, protective force, and others with security responsibilities
- Procedures for familiarizing local law enforcement with the facility and coordinating a response
- Procedures for post-event reports after an incident (see DOE Order 151.1C, DOE Manual 231.1-2, and 40 CFR 264/265.56)
- Procedures and schedules for security drills and tests
- Procedures and schedules for security self-assessments and outside audits
- A corrective action program to correct weaknesses and deficiencies
- A cyber security program to prevent tampering with security control systems and records

P5.5.4 Prerequisites

Except for access by emergency personnel, all access shall be directed and supervised by an authorized responsible person and approved in advance by the facility manager.

P5.5.5 Action Steps

Not applicable.

P5.5.6 Records

Records of security activities at the facility shall be maintained for a determined time. At a minimum, each time the Storage area is opened and resecured shall be documented.

A list of people responding to an incident is to be kept for investigation and follow-up.

All security training and qualification records are to be kept on file as part of a training program.

For each entry, the responsible person shall prepare and record a thorough description of the activities performed, the names of the persons involved, and the times and date of the activity.

Critical electronic databases, including the inventory of the elemental mercury storage facility, must be protected against unauthorized modifications and have backup copies stored in a separate location.

Records of facility security activities shall be maintained.

P5.5.7 References

40 CFR Part 264—(RCRA) Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 264.56—Emergency Procedures

40 CFR Part 265—(RCRA) Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 265.56—Emergency Procedures

DOE Manual (M) 231.1-2, *Occurrence Reporting and Processing of Operations Information*, 8/19/05

DOE Order (O) 151.1C, *Comprehensive Emergency Management System*, 11/2/05

5.6 INSPECTIONS OF MERCURY CONTAINERS, STORAGE FACILITY, AND FACILITY EQUIPMENT AND MATERIALS

STANDARD (S)

S5.6.1 Introduction

This standard is written to address RCRA inspection requirements for storage of hazardous waste [40 CFR 264/265.15, 40 CFR 264/265.171–.174, 264/265.73(b)(5), 270.14(b)(5)]. Under RCRA, the inspection program is designed to ensure that TSDFs are properly maintained and that hazardous wastes are handled compliantly. The facility (including equipment) and wastes must be inspected for malfunction, deterioration, operator errors, and discharges (40 CFR 264/265.15). The inspection provisions are carried out according to a written inspection schedule that is kept at the facility. The schedule identifies the types of problems to be looked for and sets the frequency of inspection, which may vary. Some frequencies are set by the regulations; certain frequencies may be specified as conditions within the RCRA facility permit (when issued); others may be set by the facility based on the anticipated rate of deterioration of the equipment and the probability of an incident. Specific records must be maintained.

Inspections shall be carried out by trained inspectors. Inspection requirements defined under the RCRA hazardous waste facility permit, when issued, may be more stringent and must be followed. Inspection records must be maintained in a log or summary for at least 3 years, and the record must contain the required information per 40 CFR 264/265.15(c,d). Any observed deterioration or malfunction of equipment or structures found during inspections shall be remedied. Where hazards are imminent or have already occurred, remedial action must be taken immediately.

Additional inspection and equipment calibration requirements may be defined in the Operating Contractor's (OC) QAPP.

S5.6.2 Specific Requirements/Criteria

RCRA

RCRA regulations require periodic inspections of the storage facility and equipment (40 CFR 264/ 265.15). The facility inspections are performed in order to identify any potential problems related to malfunctions and deterioration of equipment or structures, operator errors, and discharges which may lead to the release of hazardous waste constituents to the environment or pose a threat to human health. A written schedule must be developed, followed, and kept at the facility for inspecting all monitoring equipment, safety and emergency equipment, security devices, and operating and structural equipment. Inspections must be conducted often enough to identify problems before they become harmful to human health or the environment. The schedule (or plan) identifies the types of problems that might be encountered and the frequency of inspection. Frequency is based on the rate of deterioration of equipment and the probability of an incident unless a frequency is set by Federal/State regulations or in the facility permit conditions. As a result, inspection frequencies (and their respective logs) can vary from daily, weekly, monthly, to even annually.

Areas subject to spills, such as loading and unloading areas, must be inspected daily when in use [40 CFR 264/265.15(b)(4)].

At least once a week, container Storage areas must be visually inspected for leaking containers and for deterioration of containers and the containment system (40 CFR 264/265.174). Additional

inspection criteria may be derived from other RCRA requirements, such as labeling (40 CFR 262.31), closed containers (40 CFR 264/265.173), aisle space (40 CFR 264/265.35), and/or the facility's written inspection schedule [40 CFR 264/265.15(b)]. That schedule should also cover required equipment, such as telephones, alarms, fire extinguishers, spill response materials, security, signage, and access controls (refer to Section 5.1 for facility design requirements).

Inspections shall be carried out by inspectors who have been trained in the conduct of inspections and the associated recordkeeping requirements [40 CFR 264/265.16(a)(1)].

Recordkeeping requirements for inspections are detailed in 40 CFR 264/265.15(d). The owner or operator must record inspections in a log, including the date and time of the inspection, the name of the inspector, observations made, and the date and nature of any repairs. These records must be kept for a minimum of 3 years from the date of inspection. Any observed deterioration or malfunction of equipment or structures found during inspections must be remedied. Where hazards are imminent or have already occurred, remedial action must be taken immediately. Inspection requirements defined under the RCRA hazardous waste facility permit, when issued, may be more stringent and must be followed.

OSHA

The Occupational Safety and Health Administration's requirements are found in 29 CFR Part 1910. In particular, requirements for hazardous waste operations and emergency response (1910.120), respiratory protection (1910.134), and air contaminants (1910.1000) must be applied as necessary. The ACGIH has assigned mercury vapor a TLV of 0.025 mg/m^3 as a TWA for a normal 8-h workday and a 40 h workweek and considers mercury vapor an A4 substance (not classifiable as a human carcinogen. When the ACGIH values are lower than the OSHA values, 10 CFR 851.23 requires that the ACGIH values be used for the protection of personnel.

DOE Orders

DOE Order 450.1A (*Environmental Protection Program*) requires compliance with RCRA regulations and defines expectations of quality assurances in environmental programs.

QA/QC requirements

Criterion 8 of DOE Order 414.1C (*Quality Assurance*) covers performance/inspection and acceptance testing of items, services, and processes. It also mandates standards for calibration and maintenance of equipment used for inspections and tests. See Section 1.5, QA/QC Guidance Criteria, for more information. Procedure 2 of this section provides procedures guidance for this type of QA/QC inspection.

S5.6.3 Required Elemental Mercury Storage Facility Features

The written inspection schedule must be developed, followed, and kept at the facility. The records of inspections (logs) must also be maintained at the facility. The Office Administration area is ideal for the storage of these required records. The mercury storage facility must provide protection of the containers from weather conditions. The facility must also have engineered spill-control features to prevent mercury spills from exiting the facility. The arrangement of containers and the placement of labels/markings on containers should be designed to facilitate inspections during long-term storage. Facility lighting, aisle space, stacking, etc., also should be designed to facilitate inspections. The use of tracked container/pallet numbers (e.g., barcodes) facilitates the recording of deficiencies and their

corrective action. The use of a sloped storage rack for the 3-L containers facilitates the discovery of leaks.

When conducting inspections of containers, the concentration of mercury vapor in the breathing air must be ≤ 0.025 mg/m^3 on an 8-h TWA unless personnel wear appropriate respiratory protection. Inspection personnel shall wear appropriate personal protective clothing.

S5.6.4 Equivalency and Exceptions

The storage facility can request exemptions from RCRA requirements if the exemption can be sufficiently justified (see 40 CFR 260.20). As an example, the DOE storage facility could request an exemption from the weekly container inspection requirements under 40 CFR Parts 264/265.174 (for leaking containers, deterioration of containers and the containment system caused by corrosion or other factors). The exception could be based on several factors: (1) container integrity conditions imposed by the WAC; (2) existing evidence at similar facilities for the low frequency of leaks, deterioration, etc.; and (3) the negligible amount of internal corrosion caused by mercury in the specified containers. Given the large number of containers that could eventually be stored, the facility could suggest an alternate frequency, such as inspecting one/quarter of the inventory each week and therefore, the total inventory would be checked every 28 days.

S5.6.5 References

40 CFR Part 260 Subpart C—Rulemaking Petitions

40 CFR 260.20—General

40 CFR Part 262—Standards Applicable to Generators of Hazardous Waste

40 CFR 262.31—Labeling

40 CFR Part 264—Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

40 CFR 264.15—General Inspection Requirements
40 CFR 264.16(a)(1)—Personnel Training
40 CFR 264.35—Required Aisle Space
40 CFR 264.73(b)(5)—Operating Record
40 CFR 264.171—Condition of Containers
40 CFR 264.172—Compatibility of Waste with Containers
40 CFR 264.173—Management of Containers
40 CFR 264.174—Inspections
40 CFR 264.175—Containment

40 CFR Part 265—(RCRA) Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 265.15—General Inspection Requirements
40 CFR 265.16(a)(1)—Personnel Training
40 CFR 265.35—Required Aisle Space
40 CFR 265.73(b)(5)—Operating Record
40 CFR 265.171—Condition of Containers
40 CFR 265.172—Compatibility of Waste with Containers

40 CFR 265.173—Management of Containers
40 CFR 265.174—Inspections

40 CFR Part 270—EPA Administered Permit Programs

40 CFR 270.14(b)(5)—Contents of Part B: General Requirements

10 CFR Part 851—Worker Safety and Health Program

10 CFR 851.23—Safety and Health Standards

29 CFR Part 1910—Occupational Safety and Health Standards

29 CFR 1910.120—Hazardous Waste Operations and Emergency Response
29 CFR 1910.134—Respiratory Protection
29 CFR 1910.1000—Air Contaminants

OSHA Compliance Directive 02-02-006—Inorganic Mercury and its Compounds

DOE Order (O) 414.1C—*Quality Assurance*
DOE Order (O) 450.1A—*Environmental Protection Program*

ACGIH (American Conference of Governmental Industrial Hygienists). 2008. *TLVs and BEIs Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices*, Cincinnati, Ohio.

PROCEDURE (P)

NO. 1. INSPECTIONS OF CONTAINERS AND STORAGE FACILITY

P5.6.1 Introduction

Personnel shall periodically perform visual inspections of the mercury containers and facility areas and equipment to ensure that all necessary steps are being taken to maintain the facility and reduce the potential release of mercury. The results of the inspection shall be documented and the documentation retained for at least three years.

Inspection personnel shall be trained to perform the necessary inspections. This procedure applies to the personnel who are responsible for conducting the facility and container inspections.

The procedure is to be revised as changes are incorporated into the facility and/or container inspection process.

The procedure should be reviewed every year, whenever regulations or the facility's permit conditions regarding waste management change, or whenever the facility management determines that their waste management process is not meeting their needs.

P5.6.2 Precautions/Limitations

Liquid mercury and mercury vapor pose a health hazard if sufficient quantities are inhaled, ingested, or absorbed through the skin. After absorption into the bloodstream, the mercury can attack the central nervous system.

P5.6.3 Requirements

Inspection requirements for the elemental mercury storage facility include the following.

- There shall be no eating, drinking, smoking, or chewing in the mercury Storage area. Upon leaving the mercury Storage area, personnel are expected to wash their hands with water and soap. Clothing must be changed if it becomes contaminated.
- Material Safety Data Sheets (MSDSs) for elemental mercury and other chemicals that are stored and/or used in the facility shall be available to personnel upon request.
- Unless personnel are wearing appropriate respiratory protection, the internal building and/or container inspections shall be performed when the concentration of mercury vapor in the breathing air is ≤ 0.025 mg/m^3 on an 8-h TWA (ACGIH guidance).

P5.6.4 Prerequisites

Major prerequisites for the DOE elemental mercury storage facility include the following:

- Personnel shall be dressed in the appropriate personal protective equipment for the area that is being inspected.
- Personnel shall have the appropriate inspection equipment (e.g., portable lighting).
- Personnel who are inspecting the container Storage area shall have a portable mercury vapor instrument that is direct reading and in calibration.
- Facility staff members are trained in operating/inspection procedures, OSHA's Hazardous Waste Operations and Emergency Response (HAZWOPER) standard, and spill/emergency response per the Facility Training Plan.

P5.6.5 Container Inspections

Inspection Frequency: At least weekly inspections are required by 40 CFR 264.174/265.174 ("Inspections") for all containers holding hazardous wastes. Inspection requirements defined under the RCRA hazardous waste facility permit, when issued, may be more stringent and must be followed.

Personnel will travel through the mercury storage aisleways and visually look for elemental mercury on and around the storage containers, in the containment (pallets with spill trays), and on the floor. The use of bright lighting enhances the detection of potential mercury spills. Per 40 CFR 264.174, personnel will also be looking for any deterioration of containers and the containment systems.

During the inspection, personnel shall periodically measure the mercury vapor in the breathing air with a portable mercury vapor instrument.

If the mercury vapor concentration is >0.025 mg/m^3 on an 8-h TWA, personnel shall suspend the inspection and exit into an area in which the breathing air does not require respiratory protection.

To continue the inspection and meet the required schedule for inspection of the containers, either the mercury vapor concentration of the breathing air shall be reduced to ≤ 0.025 mg/m^3 or the inspection personnel shall wear the appropriate respiratory protection equipment.

If elemental mercury is found on the outside of a container during the inspection, personnel shall determine the concentration of mercury vapor in the breathing air and respond as indicated above.

When safe to do so, trained personnel clean up the liquid mercury and determine the source from which it originated. Consideration is to be given to whether the event triggers the activation of the RCRA Contingency Plan and any external notifications.

Personnel shall implement steps to control the leakage of the mercury from the leaking container [e.g., transport it to the Handling area (without spreading mercury contamination) and then transfer the elemental mercury into a new container]. If the mercury is transferred to a new container, the new container shall be marked and labeled such that the traceability of the mercury's origin is maintained. Upon completion of the transfer, the new container is returned to the Storage area.

The container Storage area shall be inspected per the facility's inspection schedule and included in the inspections (e.g., curbing, peeling coatings, required signage, adequacy of aisle space, and availability/operability of required equipment including spill response).

Each container shall be inspected for leaks, container and containment system deterioration at least weekly. Inspections checking for illegible/missing labels and container closure would be conducted at a frequency defined by the facility schedule.

The inspector shall record the results of the inspection in the appropriate log.

Occurrence reporting shall be done in compliance with DOE standards and procedures.

P5.6.6 Facility Inspections

RCRA inspection requirements are detailed in 40 CFR 265.15(a–d). Regulations are written generally and stress inspection of features impacting the environment and human health, corrections, and maintenance of a 3-year log. Since few examples (e.g., dikes and pumps) are given in the regulations, the intent of this text is to suggest certain environmental and human health-related items and equipment that warrant regular inspection, to spur development of a facility-specific inspection procedure.

This section provides guidance on periodic and event-driven facility inspections. Inspectors are to be cognizant of ongoing work, so as not to interfere, and make reasonable allowances for work in progress, which often may require that material, tools, and equipment are deployed from normal Storage areas. Immediately following inspection, findings are to be reviewed to determine if the subject physical area or material should be tagged out and/or removed from service, pending repair. However, inspection findings shall not only be corrected, but steps shall be taken to eliminate, or at least minimize, recurrence. Such steps may include trend tracking, individual assignments of responsibility, and back briefings to staff on inspection finding progress. Occurrence reporting shall be done in compliance with DOE standards and procedures.

P5.6.6.1 General storage facility inspections

Inspection Frequency: As defined in the facility's inspection schedule.

1. Check the outer security fence.
    a. Look for signs of degradation to exterior fence, turnstile, gate, signage, or locks/bands.
    b. On fence, look for human/animal/elemental damage or barrier degradation including cut or detached fencing, access attempts under or over fence, loss of strength in posts, fasteners or fencing due to rust or foreign object load bearing.

c. On inspecting turnstiles, look for free rotation that would enable human exit without reentry and without excessive effort.
d. On gate, look for free hinge rotation and proper closure without excessive gaps.
e. On signage, look for legibility, currently approved message, and current approval authority (e.g., signature and title).

2. Check the storage facility exterior.

   a. Check that the exterior facility slab is above grade, with no signs of separation or base erosion from under slab.
   b. In the apron area, between facility and fence, look for development of soil erosion or loss of landscaping plants.
   c. Check facility exterior and roof for holes, dents, damage, or wear.
   d. Check that signs, doors, and walk paths are serviceable.

3. Perform general equipment checks.

   a. Detectors (e.g., a Jerome instrument for measuring mercury vapor concentration) are of the correct type and are checked periodically for calibration.
   b. Forklift and lift fixtures receive an initial load test (e.g., at recommended 125% of rated load) and are retested after any load-path repairs, or after any event that may make the integrity of the device suspect.
   c. Forklift condition is checked regularly with daily (prior to use) inspection that includes fork actuation, lights, backup alarm and horn, tires, and steering mechanism.

4. Check signage.

   a. Postings, tags and markings are present, intact, up to date, and legible.
   b. RCRA signage is required at all entrances to the active (e.g., waste operations) portions of the facility.
   c. They must be in sufficient numbers to be seen from any approach.
   d. They must show the required legend [40 CFR 264/265.14(c)].

5. Check the doors.

   a. From a security perspective, check that the doors close and lock easily and fully with intact weather stripping.
   b. Hinges and rollup door runners work easily.
   c. Doors lock and close easily and fully.
   d. On locks or security bands, look to see that they are locked as issued, are serviceable, and show no evidence of tampering.
   e. Stored material and equipment is to be inventoried periodically for accountability, with special attention to elemental mercury containers, as well as high-street-value items and/or items that can be easily removed.

6. Check that the secondary floor barrier shows no debris accumulation.

   a. Seal on curb is visibly intact, and without gaps or cracks.
   b. Floor slab shows no lateral or stepped (out of plane) dislocations suggestive of mechanical failure or of safety hazard to foot or forklift traffic.
   c. Floor paint condition is serviceable, without cracks, bubbling, or excessive wear.
   d. Truck portal barrier is intact.

7. Check the backup emergency power (e.g., generator) system, and its operation.
    a. Check for fuel level, battery condition, leaks, belts, wiring, and overall condition based on manufacturer specifications.
    b. Check that generator starts easily, without excessive smoke, vibration, and overheating, and that the generator provides voltage and amperage to a test load over a reasonable test period (e.g., for ~30 min).
    c. Ensure that a mechanical review of system condition is performed periodically.

8. Ensure that good housekeeping is observed.
    a. Waste is only placed in designated containers, and containers are regularly cleared with waste appropriately characterized, labeled, and handled.
    b. Tools and equipment are stored in assigned Storage areas.
    c. General dirt and debris are swept, vacuumed, or mopped up.
    d. Floor, racks, and containers are clear of debris, waste, and tripping hazards. Although microscopic mercury droplets are expected, especially on elemental mercury containers, no bare elemental mercury is visible.
    e. There shall be no eating, drinking, smoking, or chewing in the Receiving and Shipping, Handling, or Storage areas.
    f. The Handling area may have an air conditioner (AC), but it shall not be used by individuals for breaks.
    g. No insects, birds, vermin (e.g., rodents), pets, or other animals are in any of the Storage facility areas.
    h. Minimize the residence time and the risk of ignition of combustibles and flammables in all areas.

9. In the inspection of electrical systems operability, check that energy consumption is minimized.
    a. Fans and lights are off when not in use.
    b. Forklift is off, and ideally, on-charge when not in use.
    c. General lighting is adequate for the activities and fully bulbed.
    d. Emergency lights are serviceable and unobstructed from area view.
    e. No electrical defects are evident.

10. Fire Protection Systems
    a. Check the fire protection systems for water (and gas) pressure.
    b. Periodically flush headers to remove potential scale accumulation (see Section F.3 of Appendix F).
    c. Check that fire extinguishers are in date.
    d. Check that alarms, panel displays, and electronic (e.g., automated telephone-based) notification systems are functional.
    e. Where possible, involve fire protection professionals in checks for their expertise and to foster familiarity in the event of an emergency.

P5.6.6.2 Receiving and Shipping area

Inspection Frequency: Areas that are subject to spills, such as loading and unloading areas must be inspected daily when in use.

1. Check truck ports for rollup door actuation, elastomeric weather seal, lubrication, wire condition, controls, spilled wastes, and cleanliness.
2. Check that clerical forms are present and current.
   a. Check that necessary clerical supplies (stapler, tape, paper, pens, etc.) are available.
   b. Check that inspection tools [e.g., lights, light sets, extension cords with a ***ground fault circuit interrupter*** (GFCI), vapor detectors, and other nondestructive evaluation (NDE) devices] are available.
3. Check that the clerical area is clear of debris and reasonably orderly.

P5.6.6.3 Handling area

Inspection Frequency: As defined in the facility's inspection schedule. Note: numbering of the listing below has no implication regarding the importance of the particular actions described.

1. Check that the fan runs without excessive noise, vibration, overheating, or current draw. Check fan belts and visible wiring for fraying. Ensure that the fan draws at longest snout length with a centerline velocity of at least 100 fpm.
2. Check that elemental mercury-contaminated waste is in containers. Check that RCRA waste is stored in accordance with applicable storage requirements (e.g., labeling, volume limits, and/or time limits).
3. Perform periodic aerosol check and/or changeout on Handling area filter.
   a. Add calibrated amounts of aerosolized mercury vapors at snout and sample the vapor after the filter.
   b. Check the results for required vapor reduction and track the results for trends in filter usage.
   c. Introduce the aerosol over 10 snout diameters ahead of the filter, and perform sampling over 10 duct diameters downstream of the filter to ensure an even vapor mixing before reading.
   d. Note that a centerline through-wall sampling port (with valve and cap) may be added to the stack inside the exterior-entry housing to facilitate periodic sampling, though it must be valved off and capped between uses.
   e. Stickers showing manufacture, installation, and periodic test information are to be located in the Handling area by the fan housing.
4. Conduct container storage inspections (see above container inspection discussion) for any containers, such as 1-MT containers being used in bulking operations, managed in this area as required [see example checklist at the end of this procedure (Table 5.1)].
5. Check for availability and suitability of spill response equipment required under the RCRA Contingency Plan.

P5.6.6.4 Storage area

Inspection Frequency: As defined in the facility's inspection schedule.

1. Check for availability and suitability of spill response equipment required under the RCRA Contingency Plan.
2. If applicable, check that any dehumidifiers are off during cold months (approximately <50°F) and on during summer months (approximately >70°F).
3. Check that wall louvers and screens (e.g., for fans) are intact and cleared of debris. Check that louvers actuate easily.

4. Check that fans run without excessive noise, vibration, overheating, or current draw. Check fan belts and visible wiring for fraying. Ensure that air draw is within manufacturer specifications.

P5.6.6.5 Office Administration area

1. Ensure that no elemental mercury is stored in this area. (Note: Sealed and marked samples may be allowed.)
2. Ensure that no used personal protective equipment (PPE) or hazardous waste is in this area.
3. Perform occasional vapor and/or smear checks to ensure that no elemental mercury is tracked or otherwise transferred from the three operational areas.
4. Conduct periodic check of required records to ensure records are complete (signed, dated, problems noted) and that required corrective actions were completed.

P5.6.7 Records

- Inspection schedule
- Inspection logs
- Corrective action records (spill cleanup records or maintenance information)
- Equipment calibration records
- Notifications/reports per the RCRA Contingency Plan

P5.6.8 References

40 CFR Part 264—Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

40 CFR 264.14(c)—Security
40 CFR 264.15—General Inspection Requirements
40 CFR 264.16(a)(1)—Personnel Training
40 CFR 264.73(b)(5)—Operating Record
40 CFR 264.171—Condition of Containers
40 CFR 264.172—Compatibility of Waste with Containers
40 CFR 264.173—Management of Containers
40 CFR 264.174—Inspections

40 CFR Part 265—Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

40 CFR 265.14(c)—Security
40 CFR 265.15—General Inspection Requirements
40 CFR 265.16(a)(1)—Personnel Training
40 CFR 265.73(b)(5)—Operating Record
40 CFR 265.171—Condition of Containers
40 CFR 265.172—Compatibility of Waste with Containers
40 CFR 265.173—Management of Containers
40 CFR 265.174—Inspections

40 CFR Part 270—EPA Administered Permit Programs

40 CFR 270.14(b)(5)—Contents of Part B: General Requirements

10 CFR Part 851—Worker Safety and Health Program

10 CFR 851.23—Safety and Health Standards

29 CFR Part 1910—Occupational Safety and Health Standards

29 CFR 1910.120—Hazardous Waste Operations and Emergency Response
29 CFR 1910.134—Respiratory Protection
29 CFR 1910.1000—Air Contaminants

OSHA Compliance Directive 02-02-006—Inorganic Mercury and its Compounds

DOE Order 450.1A—Environmental Protection Program

ACGIH (American Conference of Governmental Industrial Hygienists). 2008. *TLVs and BEIs Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices,* Cincinnati, Ohio.

Table 5.1. Example container inspection checklist

Inspector's name: **Date:** **Time:**

Activity inspected	Potential problems	Check if acceptable	Deficiency to be remedied[a]	Date deficiency remedied
Container placement and aisle space	Inadequate aisle space; container labels not visible for inspection			
Container labeling	Label missing, information incomplete/wrong, date/waste code missing			
Container condition	Severe corrosion, leaks, structural defects, lid open/missing			
Pallets with spill trays	Defect/corrosion, signs of leaking container(s)			
Diking	Cracks or deterioration of dike wall to base, joints			
Base, foundation, ramps	Cracks, uneven settlement, wet spots, erosion of and/or damaged surface coating			
Building integrity	Significant damage, roof leaking, precipitation run-on entering building			
Telephone	Present and working condition			
Loading/unloading areas/ramps	Spills, leaks, no unnecessary equipment present			

[a]Provide sufficient detail such that the problem can be located by others. For container issues, list aisle/row/pallet no., container no. Use back of page or additional sheets if necessary.

PROCEDURE (P)

NO. 2. RECEIPT INSPECTIONS AND CALIBRATIONS OF FACILITY EQUIPMENT AND MATERIALS

P5.6.9 Introduction

The storage facility OC shall develop and implement a procedure for receipt inspection of certain procured equipment and calibration of ES&H measuring and test equipment. This procedure provides guidance and qualifications for personnel conducting inspections of equipment and material to ensure that equipment and material used in support of the long-term management and storage of elemental mercury are calibrated and current for use. A documented review of this procedure is expected to be completed annually or when opportunities for process improvement are identified.

P5.6.10 Precautions/Limitations

When working around liquid mercury or mercury vapor, appropriate measures must be taken to ensure that health hazards are minimized. Based on guidance provided by the American Conference of Government Industrial Hygienists (ACGIH), PPE is necessary when the concentration of mercury vapor in the breathing air reaches a level of >0.025 mg/m^3 on an 8-h time-weighted average.

P5.6.11 Criteria

Industry and manufacturer standards for the inspection of equipment and materials supporting long-term management and storage of elemental mercury are to be used to determine the type of inspections and equipment maintenance to be performed.

Instruments that are utilized for maintaining ES&H standards and receipt inspection requiring periodic calibration are to be calibrated to a national approved standard and traceable to a specific recognized national standard (e.g., National Institute of Standards and Technology—NIST). These calibrations may be completed on the site or by an approved contractor at their facility.

Examples of this classification of equipment include

- Mercury vapor monitoring equipment,
- Pressure gauges used in the measurement of ES&H attributes, and
- Mercury sampling equipment.

P5.6.12 Prerequisites

All personnel performing calibrations shall be trained to complete these tasks. This training shall be documented as required by the Project Training Plan (see Section P5.9.3).

P5.6.13 Action Steps

A project equipment inspection plan shall be developed. This plan shall include the following attributes:

- A listing of equipment items to be inspected/calibrated,
- Inspection/calibration frequency, and
- Standards used for calibration.

Calibrated equipment shall include a decal with a unique equipment number to include calibration date, due date, and identification of the person or company that completed the calibration. The decal must be attached to the calibrated equipment.

Calibration can be called for

- With a new instrument,
- When a specified time period is elapsed,
- When a specified usage (operating hours) has elapsed,
- When an instrument has had a shock or vibration which potentially may have put it out of calibration, and/or
- Whenever observations appear questionable.

P5.6.14 Records

Records generated by the procedure include

- Completed receipt inspection plans and records,
- Calibration records—including traceability documentation to a national standard,
- Calibration vendor approvals,
- Inspector qualifications, and
- Other documentation as deemed necessary.

P5.6.15 Reference

DOE Order (O) 414.1C, *Quality Assurance*. Accessed (05-28-09) on the Web at the URL: http://www.directives.doe.gov/pdfs/doe/doetext/neword/414/o4141c.pdf

5.7 EMERGENCY RESPONSE

5.7.1 Introduction

This section discusses standards and procedures needed for specific emergency responses to incidents that could occur at an elemental mercury storage facility. DOE Order 151.1C, *Comprehensive Emergency Management System*, and RCRA (40 CFR 264/265.30–.37 and 264/265.50–.56) establish requirements for the design and implementation of emergency response programs in order to minimize the impacts to human health or the environment from releases of hazardous constituents or wastes from DOE facilities. The general DOE and RCRA requirements for emergency response are addressed here. More detailed guidance is provided in two Standards and Procedures subsections. The first addresses isolated spills from leaking containers of elemental mercury, and the second addresses emergencies resulting from fires, natural disasters, and/or external events. In the discussion of isolated elemental mercury leaks, descriptions are provided of options available to the DOE OC for transferring elemental mercury into suitable non-leaking containers.

The RCRA preparedness and prevention standards are intended to minimize and prevent emergency situations at TSDFs. Under RCRA, a TSDF must be prepared to respond to unavoidable emergencies. Contingency plans and emergency procedures provide the owner and operator with mechanisms to respond effectively to emergencies. The goal of these requirements is to minimize hazards resulting from fires, explosions, or any unplanned release of hazardous waste or constituents to air, soil, or surface water. To help guide these activities, the owner and operator must maintain a written contingency plan at the facility and must carry out that plan immediately in the event of an emergency. These regulations require maintenance and routine testing of emergency equipment, alarms, minimum aisle space (to accommodate movement of personnel and equipment during emergencies), and provisions for contacting local authorities (police, fire department, hospitals, and emergency response teams) involved in emergency responses at the facility. The local authorities must be familiar with the facility and properties of the hazardous waste(s) handled at the facility (40 CFR 264/265.37). If more than one local authority is involved, a lead authority must be designated. At DOE facilities, the DOE OC is typically the lead authority. If state or local authorities decline to enter into such arrangements, the owner and operator must document the refusal in the facility operating record [40 CFR 264/265.37(b)].

40 CFR 264/265.18 define the location standards set for RCRA TSDFs and reflect a basic requirement to locate TSDFs on sites that minimize catastrophic events caused by flooding or earthquakes. The flood and seismic standards of 40 CFR 264.18 do not apply to interim status facilities but would apply if the facility seeks a RCRA hazardous waste facility permit (refer to Section F.5 of Appendix F for more information). In addition, RCRA facilities must be operated and maintained in a manner that minimizes the possibility of a fire, explosion, or any unplanned release of hazardous waste or hazardous waste constituents to air, soil, or surface water. Specifically, 40 CFR 264/265.32 mandates that a facility must have an internal communication or alarm system, a phone or radio capable of summoning emergency assistance, firefighting equipment, and adequate water supply. Further, 40 CFR 264/265.33 and 264/265.34 require that this equipment be maintained and tested regularly, and that all personnel have access to an alarm system or emergency communication device. In addition, the facility must have aisle space that is sufficient to ensure easy movement of personnel and equipment unless the owner/operator demonstrates that it is unnecessary based on the nature of the hazardous waste stored (40 CFR 264/265.35). Lastly, TSDF staff must be trained to respond to emergencies (see Section 5.9).

TSDFs must issue and maintain contingency plans onsite at all times and carry out these plans in the event of an actual emergency. The plan describes arrangements with local authorities and lists names,

home addresses, and telephone numbers of all personnel qualified to act as emergency coordinators. If more than one emergency coordinator is listed, a primary contact must be designated. The plan must include a list of all emergency equipment and evacuation plans, where applicable. If the facility has already prepared an emergency or contingency plan in accordance with other regulations [e.g., Spill Prevention, Control, and Countermeasures (SPCC) Plan or DOE Order 151.1C], amending the existing plan to incorporate hazardous waste management provisions is sufficient to fulfill the RCRA requirements (40 CFR 264/265.52). EPA recommends that a combined emergency plan be based on the *Integrated Contingency Plan (One Plan) Guidance* (http://www.epa.gov/emergencies/docs/chem/one-plan.pdf).

A copy of the contingency plan (and any revisions) must be maintained at the facility and provided to all local authorities that may have to respond to emergencies (40 CFR 264/265.53). The contingency plan must be reviewed and amended when the applicable regulations or facility permits are revised, the plan fails in an emergency, or there are changes to the facility, the list of emergency coordinators, or the list of emergency equipment (40 CFR 264/265.54). DOE Order 151.1C and some states require an annual review of plans.

The emergency coordinator (40 CFR 264/265.55) is responsible for assessing emergency situations and making decisions to respond. There must be at least one employee either on the facility premises or on call to fill this role. This person must have the authority to commit the resources needed to carry out the contingency plan.

In the event of an imminent or actual emergency situation, the emergency coordinator must immediately activate internal facility alarms or communication systems and notify appropriate state and local authorities. In cases where there is a release, fire, or explosion, the emergency coordinator must immediately identify the character, exact source, amount, and extent of any released materials. At the same time, the coordinator must assess possible hazards to human health or the environment. If the coordinator determines that the emergency threatens human health or the environment outside of the facility and finds that evacuation of local areas may be advisable, the coordinator must notify appropriate authorities and either the designated government official for the area or the National Response Center (phone: 1-800-424-8802). During an emergency, measures must be taken to ensure that fires, explosions, and releases do not occur, recur, or spread. If the facility stops operation, the coordinator must monitor for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment [40 CFR 264/265.56(a)–(f)].

After an emergency, any residue from the release, fire, or other event must be treated, stored, or disposed of according to all applicable RCRA regulations. The coordinator must ensure that all emergency equipment is cleaned and fit for use before operation is resumed. The owner or operator must document in the facility operating record events that required the implementation of the contingency plan. Within 15 days of the accident, the owner or operator must submit a written report describing the incident to the EPA Regional Administrator [40 CFR 264/265.56(g)–(j)].

The facility's Part B Permit Application (40 CFR Part 270) and the subsequent permit will address emergency preparedness and prevention plans and procedures and will include a copy of the facility's Contingency Plan.

ECOS recommendations for emergency response preparation and planning (ECOS, October 2003) parallel that of DOE and RCRA.

The RCRA requirements related to facility design and day-to-day operations that support emergency preparedness and prevention have been addressed in Sections 5.1 and 5.6.

STANDARD (S)

RESPONSE TO SPILLS OF ELEMENTAL MERCURY

S5.7.2 Introduction

Spills of mercury do not present serious short-term hazards to people or the environment except when exposed to high heat (e.g., fire) or significant mechanical energy (e.g., high winds or powerful flows of water). The first priority in a spill situation is to stabilize the environment around the spill so that energy sources or human activities do not disperse the spilled mercury. Once the situation is stabilized, emergency responders can proceed with deliberation to recover spilled mercury and then to decontaminate the area.

The purpose of this section is to describe the minimum standards and procedures for responding to spills of elemental mercury. This section addresses spills of mercury that occur at the facility during (a) passive storage, (b) movement of mercury containers within the facility, and (c) receipt of mercury from off-site suppliers. Spills that might occur during repackaging (transfer of mercury from one container to another) are addressed in Appendix C.

S5.7.3 Specific Criteria and Best Management Practices

S5.7.3.1 RCRA requirements

RCRA requires that spills of hazardous waste in TSD facilities must be cleaned up in a timely manner [40 CFR 264.175(b)(5)].

The emergency coordinator determines when to implement the RCRA contingency plan. It must be implemented in the event of fires, explosions, or unplanned releases of hazardous waste which could threaten human health or the environment. The facility contingency plan identifies specific criteria which trigger implementation of the plan and/or trigger outside notifications to regulators or DOE. Spills inside RCRA containment systems (pallets with spill trays or berms) are not expected to force the implementation of the RCRA contingency plan. All employees performing their duties around stored mercury are to be trained in what to do in the event of a suspected spill. Personnel responsible for responding to a spill are to be trained in the procedures for containing and remediating a mercury spill safely.

Spill response supplies are inspected monthly (or at a frequency defined by their RCRA permit) to ensure that an adequate inventory is available at all times. The results of the inspection are documented on a log sheet and placed in the facility operating record (see Section 5.4).

The most likely cause of a spill is a container that develops a leak. When the source of the spill is identified, the mercury contents in the container may be transferred immediately to another container (Handling area) or the container and mercury contents may be temporarily placed in an overpack to prevent additional spills. Draft guidance on transferring mercury from a container is provided in Appendix C. After a leaking container is emptied, the new container is labeled, packaged, and stored properly. The empty container is evaluated to determine whether it may be handled as non-RCRA material.

After cleanup of a spill, the residual contamination on building surfaces is evaluated to ensure that regulatory requirements are met. Incident reports shall comply with facility requirements, RCRA requirements (40 CFR 264/265.56), and those for DOE occurrence reports (DOE Manual 231.1-2).

S5.7.3.2 OSHA requirements

Employees assigned to respond to emergencies shall be trained and certified as specified in 10 CFR Part 851 and 29 CFR 1910.120(p)(8)(iii) to the hazardous materials technician level [29 CFR 1910.120(q)(6)(iii)]. All other staff shall have sufficient awareness training to recognize that a response situation exists, summon a fully trained employee, and not attempt to handle the situation themselves [i.e., first responder awareness level, 29 CFR 1910.120(q)(6)(i)].

S5.7.3.3 DOE requirements

Incident reports comply with the requirements for DOE occurrence reports (DOE Manual 231.1-2).

S5.7.3.4 Best management practices

Except during and immediately after cleaning up a spill, sufficient supplies, tools, and personal protective equipment (PPE) are on hand to treat two successive spills without restocking. If, at any time, the inventory of tools and supplies falls below the level needed to respond to a single spill, all movement of mercury at the facility ceases.

The facility management determines the minimum number of spill response personnel who must be deployed before beginning a spill cleanup. This number is published in the spill response plan, and no spill cleanup is to be started or performed with fewer trained spill response personnel in attendance.

Visible pools or drops of mercury are to be recovered by mechanical means to the extent feasible. Small drops of mercury are to be recovered by hand-powered miniature vacuums or sponges, as appropriate. Larger spills of mercury are to be recovered by a specialized mercury vacuum. Regular vacuum cleaners and high-efficiency particulate air-filtered vacuum cleaners are not to be used because the mercury vapor will amalgamate with the copper wiring in the motor and eject mercury vapor into the air. When all practical mercury recovery has been completed, mercury decontamination is to begin.

Under no circumstances shall energetic jets, streams of fluids, or heat be applied to areas contaminated with spilled mercury.

S5.7.4 Required Elemental Mercury Storage Facility Emergency Response Equipment Features

A caution sign is to be installed at all entrances to the elemental mercury Storage area, stating the following:

> CAUTION—MERCURY, METALLIC—Highly toxic by skin absorption and inhalation of fume or vapor.

As noted above, suitable types and amounts of emergency response equipment must be available at the facility. The type and amounts of emergency response equipment are defined in the facility's RCRA contingency plan and reflect the types and amounts of hazardous wastes stored. Typical emergency response equipment includes: fire extinguishers, protective clothing, gloves, shoe covers/boots, safety goggles, respirators, tools (nonsparking if needed), unused containers and/or overpacks. Spill cleanup equipment/materials typically include suitable absorbents (vermiculite, clay, sulfur powder, zinc or copper flakes, pads and/or booms), wipes, eye droppers, stiff cards or cardboard, tape, suitable cleaning solvents, and specialized mercury vacuum. Consideration should be given toward eye washes and/or self-contained breathing apparatus. Spill kits may be suitable for use

in the Receiving area and Handling area; whereas more substantial supplies/equipment are to be stored and used within the Storage area. Some sites have HAZMAT vehicles and/or supply storage buildings to supplement that maintained at the TSD facility that maintain basic supplies but also specialty equipment, such as an emergency generator, exhaust fan, and floodlights.

S5.7.5 Equivalency and Exceptions

The storage facility can request exemptions from RCRA requirements if the exemption can be sufficiently justified [see 40 CFR 270.14(b)(6)]. As an example, the DOE storage facility may request an exemption from the requirement to store some spill control and decontamination equipment at the facility [40 CFR 264/265.52(e)]. The exception may be based on the need to ensure the equipment stays clean/useable between spill response events. It may be best to store containers of sulfur and/or the specialized mercury vacuum near the facility rather than in it to avoid possible inadvertent contamination between spill events.

S5.7.6 References

40 CFR Part 264—(RCRA) Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 264.18—Location standards

40 CFR 264.30 through 264.37 (Subpart C—Preparedness and Prevention). Includes:
- 40 CFR 264.30—Applicability
- 40 CFR 264.31—Design and operation of facility
- 40 CFR 264.32—Required equipment
- 40 CFR 264.33—Testing and maintenance of equipment
- 40 CFR 264.34—Access to communications or alarm system
- 40 CFR 264.35—Required aisle space
- 40 CFR 264.37—Arrangements with local authorities

40 CFR 264.50 through 264.57 (Subpart D—Contingency Plan and Emergency Procedures). Includes:
- 40 CFR 264.50—Applicability
- 40 CFR 264.51—Purpose and implementation of contingency plan
- 40 CFR 264.52—Content of contingency plan
- 40 CFR 264.53—Copies of contingency plan
- 40 CFR 264.54—Amendment of contingency plan.
- 40 CFR 264.55—Emergency coordinator
- 40 CFR 264.56—Emergency procedures

40 CFR 264.175(b)(5)—Design and operation of a containment system/removal of spilled or leaked waste from containment system

40 CFR Part 265—(RCRA) Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 265.18—Location standards

40 CFR 265.30 through 265.37 (Subpart C—Preparedness and Prevention). Includes same regulatory items as above for 40 CFR 264.30 through 264.37

40 CFR 265.50 through 265.56 (Subpart D—Contingency Plan and Emergency Procedures). Includes same regulatory items as above for 40 CFR 264.50 through 264.56

40 CFR Part 270—(RCRA) EPA Administered Permit Programs: The Hazardous Waste Permit Program

40 CFR Part 270.14—General requirements of Part B of the hazardous waste permit application

EPA (U.S. Environmental Protection Agency). April 1998. *Integrated Contingency Plan ("One Plan") Guidance*, 550-F-98-015, Office of Solid Waste and Emergency Response, Washington, D.C. A summary of this guidance was accessed (07-31-09) on the Web at the URL: http://www.epa.gov/emergencies/docs/chem/one-plan.pdf

DOE Manual (M) 231.1-2, *Occurrence Reporting and Processing of Operations Information*

DOE Order (O) 151.1C, *Comprehensive Emergency Management System*

29 CFR Part 1910—(OSHA) Occupational Safety and Health Standards

29 CFR 1910.120—Hazardous waste operations and emergency response

29 CFR 1910.120(p)(8)(iii)—Certain operations conducted under RCRA/emergency response program

29 CFR 1910.120(q)(6)(i)—Emergency response to hazardous substance releases/training/first responder awareness level

29 CFR 1910.120(q)(6)(iii)—Emergency response to hazardous substance releases/training/hazardous materials technician

ECOS (Environmental Council of the States). October 2003. Mercury Stewardship Best Management Practices, Quicksilver Caucus and U.S. Environmental Protection Agency, Washington, D.C. Accessed (07-28-09) on the Web at URL: http://www.ecos.org/files/720_file_QSC_BMP_Oct_03.pdf

PROCEDURE (P)

RESPONSE TO SPILLS OF ELEMENTAL MERCURY

P5.7.1 Introduction

This procedure outlines (1) the general response actions that are followed in the event of a mercury spill and is limited to spills that do not require activation of the RCRA contingency plan[*] and (2) the preparations that are to be made to ensure that the facility can respond to such an event. This section describes the general procedures for managing small spills of elemental mercury that might be found during inspections. Because the selected facility or facilities are not known, details will need to be added to these procedures at a later time.

Emergency response procedures for spills and hazardous material releases are covered in the RCRA-required contingency plan or other similar plans. The requirements of RCRA plans may also be incorporated into other required response plans.

[*]The next procedure addressing emergency-triggered events provides an example of a response that could involve activation of the RCRA Contingency Plan.

P5.7.2 Precautions/Limitations

Any time a vehicle or building containing mercury is entered, the first action shall be to measure the mercury vapor concentration with a calibrated mercury vapor analyzer. If the mercury vapor concentration is equal to or above 0.025 mg/m^3, the American Conference of Government Industrial Hygienists (ACGIH) threshold limit value (TLV), respiratory protection shall be used.

P5.7.3 Requirements

EPA requires that all spills of hazardous waste be addressed promptly to minimize hazards to human health and the environment. EPA guidance suggests that prompt or immediate response is within 1 consecutive workday for operational facilities and within 72 h of the occurrence if the facility is not in operation during the spillage event (see 57 FR 61494, *Drippage in Storage Yards and Contingency Plans*, December 24, 1992).

After completing the cleanup, decontamination, or at the end of the work shift, whichever comes first, all mercury waste, such as disposable personal protective clothing, respirator cartridges, and other contaminated debris, shall be placed in a covered, lined container and properly labeled and managed as a hazardous waste.

P5.7.4 Prerequisites

A site-specific spill response plan is to be prepared and updated annually or whenever salient conditions change.

The adequacy of the spill response supplies and tools are to be evaluated monthly (or at a frequency defined by the facility's RCRA permit); orders for inadequate supplies are to be placed within 24 h of discovery of the deficiency. The minimum level of emergency response supplies must never go below that dictated by the RCRA Contingency Plan.

All facility personnel shall be trained on their responsibilities with regard to mercury spills. Personnel who work around mercury shall be trained annually to recognize a spill and to know what to do in the event that a spill is suspected. Personnel who have the additional responsibility to respond to spills shall be trained annually on the procedures and use of cleanup equipment. All other personnel shall be trained annually on whom to notify in the event that they are told of a suspected spill.

P5.7.5 Action Steps

The spill response procedures for the DOE elemental mercury storage facility are to include the following action steps.

- Determine the size, location, and source of the spill.
- Develop a spill cleanup plan enumerating the tools and materials needed, the specific PPE to be employed, the persons who will undertake the cleanup, and contingency plans.
- Assemble needed materials, including any materials needed to deal with contingencies.
- Perform the cleanup.
- Properly characterize, label, store, and/or dispose of the accumulated mercury-contaminated material and spent mercury cleanup solutions in a manner and at a location approved by the EPA or authorized State and according to DOE policy.

P5.7.6 Records

All measurements and actions are to be documented. RCRA requirements include noting the time, date, and details of any incident that requires implementing the contingency plan in the facility operating records. Records are to include the following.

- Documentation of cleanup efforts and results.
- Lessons learned and recommended procedure changes, as appropriate, in a letter report.
- A letter to file documenting actions to be taken as a result of the spill experience as part of the operating record issued by the storage facility manager. The letter specifically explains reasons for not implementing procedure changes recommended by the cleanup team, if any.

The records are expected to include emergency response procedures, the RCRA contingency plan, and agreements with emergency responders.

P5.7.7 References

40 CFR Part 264—(RCRA) Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR Part 264 Subpart D—Contingency Plan and Emergency Procedures

40 CFR Part 265—(RCRA) Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR Part 265 Subpart D—Contingency Plan and Emergency Procedures

57 FR (*Federal Register*) 61494—"Drippage in Storage Yards and Contingency Plans," Vol. 57, page 61494, December 24, 1992

STANDARD (S)

FOR EMERGENCIES IMPACTING A STORAGE FACILITY

S5.7.8 Introduction

The elemental mercury storage facility may be threatened by externally triggered events, such as severe weather, earthquake, accidents, explosions, fire, malevolent actions, etc. The response to these larger events will involve more responders, including some from the local community, and greater coordination with local groups.

Emergency management requirements for DOE facilities are defined by DOE Order 151.1C and explained further in the following four emergency management guides.

- DOE G 151.1-1A, *Emergency Management Fundamentals and the Operational Emergency Base Program*
- DOE G 151.1-2, *Technical Planning Basis*
- DOE G 151.1-3, *Programmatic Elements*
- DOE G 151.1-4, *Response Elements*

There is a fifth guidance on biosafety that is not relevant to an elemental mercury storage facility.

The standard components of a DOE emergency management program are

- Planning (determining in advance what will be done in response to particular emergencies),
- Preparedness (having procedures, equipment, personnel in place to respond),
- Readiness assurance (ongoing process of verifying and demonstrating readiness to respond),
- Response (the actual mobilization of people, equipment, and resource during an emergency), and
- Recovery (planning for and actions after the response to return the facility to normal operations).

A hazard survey determines whether the elemental mercury storage facility is required to have a Hazardous Materials Program or whether an Operational Emergency Base Program is adequate. Although an elemental mercury storage facility may have enough hazardous material onsite to be screened in by the hazard survey, a Base Program may still be sufficient if further analysis cannot find an event that will cause dangerous levels of the materials outside the facility. The elemental mercury storage facility can fall under this exemption, as a sustained fire in the facility with rupturing of containers and vaporization of the mercury is unlikely, especially if the facility is designed with minimal combustibles, a fire suppression system, and cleared areas within and around the fence.

The programmatic requirements of a Base Program are program administration, training and drills, exercises, and readiness assurance (self-assessment and audits). The following 10 response elements must be addressed.

1. Emergency response organization—One individual is assigned to control the aspects of the facility response. If the initial response units come from the local authorities or outside sources, the coordinator works with the responding Incident Commander following the National Incident Management System or local incident command system. An expert in dealing with mercury may be assigned to be part of the response.
2. Off-site response interfaces—Coordination with Tribal, State, and local organizations responsible for off-site emergency response. These are essentially the same requirements as those for a non-DOE facility and those defined by RCRA [40 CFR 264.52(c), 40 CFR 265.52(c)].
3. Emergency facilities and equipment—Material to support the response, notify employees, and evacuate people safely. Similar requirements exist under OSHA (29 CFR 1910.38 and Appendix to Subpart E), RCRA (40 CFR 264/265.32, .35, .37) and NFPA 101-2000.
4. Emergency categorization—Existing criteria for designating an Operational Emergency within 15 min after event recognition.
5. Notifications and communications—Capability to notify workers, emergency response personnel, and response organizations and/or regulators. These requirements are similar to those for non-DOE facilities, with the addition of notification of DOE elements.
6. Consequence assessment—For a Base Program facility, required consequence assessment capabilities are determined by other DOE orders and Federal, State, and local ordinances.
7. Protective actions and reentry—Plans for evacuation or sheltering and accountability for employees, as may be required for other plans. Also includes planning for reentry and protection of reentry personnel (also required by 29 CFR 1910.120).
8. Emergency medical support—Requirements for site medical programs are determined by 10 CFR 851.210, 29 CFR 1910.151, and NFPA 99-2005. The planning defines the interface between the medical plan and emergency plan; some guidance may be found in DOE Guidance 151.1-4, Chapter 8.

9. Emergency public information—All emergencies require some public information response and are to have plans to establish a media center when needed.
10. Termination and recovery—Termination of an emergency must be coordinated with all the off-site agencies responsible for off-site emergency response and establish the criteria to resume operation. Termination is to be followed by an investigation of the event, preparation of any required reports (DOE or RCRA), and development of corrective actions when appropriate.

Additional considerations

All off-site responders, including medical response, must be given the opportunity to become familiar with the arrangement and hazards of the facility (as part of the coordination). Because mercury is a toxic metal, firefighting personnel and others who may have occasion to enter a mercury Storage area under fire conditions shall be cautioned that highly toxic mercury vapor may be present. There should be a caution sign on all entrances to the elemental mercury Storage area stating the following:

> CAUTION—MERCURY, METALLIC—Highly toxic by skin absorption and inhalation of fume or vapor.

Employees and responders must train on the emergency response plan. Employees are to receive training on the response plan when they begin to work at the storage facility or if the plan changes. Refresher training is to be provided annually for those with some response role (DOE Order 151.1C, III.4.a and 40 CFR 264/265.16). If there is a site or qualified local hazardous material response team, the facility employees may only be responsible for reporting the emergency and evacuating the facility. OSHA has emergency response training requirements under hazardous waste operations (includes training on the Incident Command System) and egress [29 CFR 1910.120(p)(8)(iii), 29 CFR 1910.120(q)(6), 29 CFR 1910.120, Sections C.2 and C.6 of Appendix C, and 29 CFR 1910.38(e)]. Facility responders also are to be trained on the National Incident Management System (NIMS) so that they can coordinate the response with the off-site response groups.

DOE uses the term “drill” to describe a predominately training activity and the term “exercise” for response tests that are evaluated. At a minimum, there must be an annual building evacuation exercise consistent with 41 CFR 102-74.360, NFPA standards and local regulations, and at least annual tests of the communications systems used to contact DOE headquarters, DOE elements, and local authorities (DOE Order 151.1C, III.4.b).

S5.7.9 Equivalency and Exceptions

If the elemental mercury storage facility is located within another DOE installation, it may be incorporated as a Base Program facility within the installation’s emergency management plan. The facility may also be incorporated into a non-DOE installation plan, as long as all the requirements of the Base Plan are met by that plan. Emergency plans required under RCRA (40 CFR 264/265, Subpart D) and OSHA (29 CFR 1910.38) may be incorporated into the DOE plan, or the DOE plan requirements may be part of these plans.

S5.7.10 References

40 CFR Part 264—(RCRA) Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR 264.16—Personnel training
40 CFR 264.18—Location Standards

40 CFR 264 Subpart C—Preparedness and Prevention, which includes:

40 CFR 264.32—Required equipment
40 CFR 264.35—Required aisle space
40 CFR 264.37—Arrangements with local authorities

40 CFR Part 264 Subpart D—Contingency Plan and Emergency Procedures
40 CFR 264.52—Content of contingency plan

40 CFR Part 265—(RCRA) Interim Status Treatment, Storage, and Disposal Facility Standards

40 CFR 265.16—Personnel training
40 CFR 265.18—Location Standards
40 CFR 265 Subpart C—Preparedness and Prevention, which includes:

40 CFR 265.32—Required equipment
40 CFR 265.35—Required aisle space
40 CFR 265.37—Arrangements with local authorities

40 CFR 265 Subpart D—Contingency Plan and Emergency Procedures
40 CFR 265.52—Content of contingency plan

40 CFR Part 270—EPA Administered Permit Programs: The Hazardous Waste Permit Program

270.14(b)(11)—Permit application/general requirements

41 CFR Part 102—Facility Management/Accident and Fire Prevention

41 CFR 102-74.360—Specific Accident and Fire Prevention Responsibilities of Occupant Agencies

10 CFR Part 851—Worker Safety and Health Program

10 CFR 851.210—Occupational medicine

DOE Guide (G) 151.1-1A, *Emergency Management Fundamentals and the Operational Emergency Base Program*, 07/11/2007. Accessed (09/16/09) on the web at URL: http://www.directives.doe.gov/pdfs/doe/doetext/neword/151/g1511-1a.pdf
DOE Guide (G) 151.1-2, *Technical Planning Basis*, 07/11/2007. Accessed (09/16/09) on the web at URL: http://www.directives.doe.gov/pdfs/doe/doetext/neword/151/g1511-2.pdf
DOE Guide (G) 151.1-3, *Programmatic Elements*, 07/11/2007. Accessed (09/16/09) on the web at URL: http://www.directives.doe.gov/pdfs/doe/doetext/neword/151/g1511-3.pdf
DOE Guide (G) 151.1-4, *Response Elements*, 07/11/2007. Accessed (09/16/09) on the web at URL: http://www.directives.doe.gov/pdfs/doe/doetext/neword/151/g1511-4
DOE Order (O) 151.1C, *Comprehensive Emergency Management Sy*stem, 11/02/2005

29 CFR Part 1910 Subpart E Appendix—Means of Egress/Exit Routes, Emergency Action Plans, and Fire Prevention
29 CFR 1910.38—Emergency Action Plans

29 CFR 1910.120—Hazardous waste operations and emergency response

29 CFR 1910.120(p)(8)(iii)—Certain operations conducted under RCRA/emergency response program
29 CFR 1910.120(q)(6)(i)—Emergency response to hazardous substance releases/training/first responder awareness level

29 CFR 1910.120(q)(6)(iii)—Emergency response to hazardous substance releases/training/hazardous materials technician
Appendix C—Compliance Guidelines

29 CFR 1910.151—Medical services and first aid

DHS (U.S. Department of Homeland Security). December 2008. *National Incident Management System*, Washington, D.C. Available on the Web at the URL http://www.fema.gov/pdf/emergency/nims/NIMS_core.pdf (accessed July 8, 2009).

ECOS (Environmental Council of the States). October 2003. *Mercury Stewardship Best Management Practices*, p. 15, Quicksilver Caucus and U.S. Environmental Protection Agency, Washington, D.C. Accessed (07-28-09) on the Web at URL: http://www.ecos.org/files/720_file_QSC_BMP_Oct_03.pdf

Newby, J. (editor). November 1989. *ASM Handbook, Mechanical Testing and Evaluation*, Vol. 8, "Hot Tension and Compression Testing," Fig. 1 ("Effects of Temperature on Strength and Ductility of Various Materials"), 9th edition, ASM International, Materials Park, Ohio.

NFPA (National Fire Protection Association), *Healthcare Facilities handbook*, 99-2005

NFPA, *Life Safety Code*, 101-2000

PROCEDURE (P)

FOR EMERGENCIES IMPACTING A STORAGE FACILITY

DOE Order 151.1C requires that emergency response procedures be developed to implement the required emergency response plans for the spectrum of operational emergencies. Fires and explosions are covered in RCRA-required contingency plans. The Occupational Safety and Health Administration (OSHA) also specifies a number of procedures to implement its required emergency plan.

P5.7.11 General Requirements

The RCRA Contingency Plan requirements imply required procedures such as the following.

- Actions facility personnel will take to comply with 40 CFR 264/265 Subparts C and D in response to fires, explosions, or any unplanned sudden or non-sudden release of hazardous waste or hazardous waste constituents to air, soil, or surface water at the facility.
- Agreed-upon procedures under 40 CFR 264/265 Subpart C for coordinating emergency services with police departments, fire departments, hospitals, contractors, and state and local emergency response teams.
- Lists of names, addresses, and phone numbers (office and home) of all persons qualified to act as emergency coordinator (see 40 CFR 264.55/265.55), and procedures for keeping the list up to date. (Where more than one person is listed, one must be named as primary emergency coordinator and others must be listed in the order in which they will assume responsibility as alternates.)
- A list of all required emergency equipment at the facility, a physical description, where the equipment is required, where it is stored, and a brief outline of its capabilities.
- Evacuation procedures, including a description of the signal(s) to be used to begin evacuation, evacuation routes, and alternative evacuation routes (in cases where the primary routes could be blocked by releases of hazardous waste or fires).
- Notification and reporting procedures for when the RCRA Contingency Plan is activated.

The emergency coordinator also has required procedures (40 CFR 264.56/265.56).

- Procedures for activating the facility alarm or communications systems to notify all personnel and notifying the appropriate State, Tribal, and local agencies which have designated response roles.
- A process for immediately identifying the character, exact source, amount, and areal extent of any released materials and assessing the possible hazards to human health or the environment that may result from the release, fire, or explosion.
- If there is a possible hazard outside the facility, the coordinator must immediately (1) notify local authorities and help them determine whether an evacuation is needed and (2) notify either the government on-scene coordinator for that geographical area or the National Response Center (phone: 1-800-424-8802) and provide specified information about the incident.
- Procedures for all reasonable measures necessary to ensure that fires, explosions, and releases do not occur, recur, or spread to other hazardous waste at the facility. These measures must include, where applicable, stopping processes and operations, collecting and containing released waste, and removing or isolating containers.
- Procedures for monitoring for leaks, pressure buildup, gas generation, or ruptures in valves, pipes, or other equipment, when appropriate, if the facility ceases operation.
- Procedures for treating, storing, or disposing of recovered waste, contaminated soil or surface water, or any other material that results from a release, fire, or explosion at the facility.
- Ensuring that no incompatible waste is treated, stored, or disposed of at the facility until cleanup procedures are completed.
- Measures to ensure all emergency equipment listed in the contingency plan is cleaned and fit for its intended use before operations are resumed.

10 CFR Part 851 and OSHA require that employers develop emergency action plans which include the following procedures [29 CFR 1910.38(c)]:

(1) Procedures for reporting a fire or other emergency;
(2) Procedures for emergency evacuation, including type of evacuation and exit route assignments;
(3) Procedures to be followed by employees who remain to operate critical plant operations before they evacuate;
(4) Procedures to account for all employees after evacuation;
(5) Procedures to be followed by employees performing rescue or medical duties; and
(6) The name or job title of every employee who may be contacted by employees who need more information about the plan or an explanation of their duties under the plan.

Some of the procedures implicit in the DOE orders can be inferred from the components of the Base Plan, listed earlier. These procedures include the following items.

- Procedures for determining the Emergency Manager and implementing NIMS with the local authorities and outside sources.
- Requirements for coordination with Tribal, State, and local organizations responsible for off-site emergency response.
- Procedures for maintaining facilities and equipment to support the response, notify employees, and evacuate people safely.
- Criteria and process for designating an Operational Emergency within 15 min after event recognition.
- Procedures for notifying workers, emergency response personnel, and response organizations.
- Process for consequence assessment using capabilities appropriate to the facility.

- Procedures for evacuation or sheltering and accountability for employees, as well as preliminary procedures for reentry and protection of reentry personnel.
- Procedures for coordinating with emergency medical response.
- Procedures for emergency public information and establishing a media center when needed.
- Coordination procedures for terminating an emergency and establishing criteria to resume operations.
- Process for investigating the event, preparing required reports, and developing corrective actions where appropriate.

P5.7.12 Records

The owner or operator must document in the facility operating record events that required the implementation of the RCRA Contingency Plan. Within 15 days of the accident, the owner or operator must submit a written report describing the incident to the EPA Regional Administrator [40 CFR 264.56(g)–(j)/265.56(g)–(j)].

All measurements and actions are to be documented. RCRA requirements include noting the time, date, and details of any incident that requires implementing the Contingency Plan in the facility operating records. Records are to include the following.

- Document cleanup efforts and results.
- Lessons learned and recommended procedure changes, as appropriate, in a letter report.
- A letter to file documenting actions to be taken as a result of the spill experience as part of the operating record issued by the storage facility manager. The letter specifically explains reasons for not implementing procedure changes recommended by the cleanup team, if any.

Other records include emergency response procedures, RCRA contingency plan, RCRA contingency plan implementation notifications and reports, and agreements with emergency responders.

P5.7.13 References

40 CFR 264—(RCRA) Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR Part 264 Subpart C—Preparedness and Prevention
40 CFR Part 264 Subpart D—Contingency Plan and Emergency Procedures

40 CFR 264.55—Emergency coordinator
40 CFR 264.56—Emergency procedures

40 CFR Part 265—(RCRA) Interim Status Treatment, Storage, and Disposal Facility Standards

40 CFR Part 264 Subpart C—Preparedness and Prevention
40 CFR Part 264 Subpart D—Contingency Plan and Emergency Procedures

40 CFR 265.55—Emergency coordinator
40 CFR 265.56—Emergency procedures

OSHA (Occupational Safety and Health Administration) Regulations:

29 CFR Part 1910 Subpart E Appendix—Means of Egress/Exit Routes, Emergency Action Plans, and Fire Prevention

29 CFR 1910.38—Emergency Action Plans
29 CFR 1910.120—Hazardous waste operations and emergency response

DOE Order (O) 151.1C, *Comprehensive Emergency Management Sy*stem, 11/02/2005
DOE Guide (G) 151.1-1A, *Emergency Management Fundamentals and the Operational Emergency Base Program*, 07/11/2007

5.8 WASTE MANAGEMENT REQUIREMENTS

STANDARD (S)

S5.8.1 Introduction

Only a few RCRA TSDFs are required to have a formalized waste management plan.* Container storage facilities are not required to have a formalized waste management plan. However, generators and TSDFs must have a waste minimization program [40 CFR 262.41(a)(6), (7), and (8); 40 CFR 264.73(b)(9); 40 CFR 264/265.75(h), (i), and (j)]. All TSDFs must also have a waste analysis plan (WAP), which is included in the Part B permit application and then subsequently in the RCRA facility permit. They must also have corresponding waste acceptance requirements (referred to as Waste Acceptance Criteria or WAC) that are defined by their Part B permit application and subsequently in the RCRA facility permit. Information pertaining to the wastes (waste description, container/waste compatibility information, WAP, special requirements for wastes generated off-site, and LDR information) that will be stored in the facility is addressed in the Waste Characteristics section of the permit application and corresponding permit. Similarly, a facility must summarize its container management practices in the Part B permit application (40 CFR 264/265.171–174, 270.15) as part of the facility's Process Information. Container management practices include the steps to empty containers, the handling of empty containers (40 CFR 261.7), identification of waste discrepancies on the manifest or shipping paper (40 CFR 264/265.72), and unmanifested wastes (40 CFR 264/265.76). The handling of reactive, ignitable, and incompatible wastes is covered in the section entitled "Procedures to Prevent Hazards" of the permit application.

This section of the guidance focuses on the waste management requirements defined under RCRA that are applicable to an elemental mercury storage facility (permitted or interim status). The basic requirements for a waste minimization program, the WAP, and container management practices are outlined. The information contained in this section outlines the various waste management elements that apply to container storage operations as a permitted storage facility but also as a waste generator. Waste acceptance requirements are summarized in Section 4. The WAC is broader than the WAP. The WAC is written to inform the generator what is required to obtain approval from the OC to ship wastes there. The WAC includes generator documentation (forms and/or instructions and sequencing/timing of submittals) that must be submitted to the facility for waste acceptance, defines packaging and labeling requirements, as well as waste analysis, QA/QC requirements and/or waste restrictions. The WAC can outline the process to obtain variances from any of the facility requirements, can address the process for the facility's handling of nonconforming wastes, and can also include the fee structure. The facility may issue a waste acceptance procedure (see the procedure in Section 2) that implements the WAC.

Minor differences exist between the waste management requirements for permitted and interim status units. Those differences are noted. State requirements may be more stringent than the Federal requirements. State requirements are not addressed herein.

S5.8.2 Specific Criteria (or Guidelines)

Specific waste management criteria associated with a DOE elemental mercury storage facility will include the following RCRA requirements.

*Waste management plans are only required for surface impoundments, waste piles, land treatment units, or landfills managing dioxin, furan, or phenol wastes (40 CFR 270.17, .18, .20, or .21).

- 40 CFR 261.7—Residues of Hazardous Waste in Empty Containers
- 40 CFR Part 262—Standards Applicable to Generators of Hazardous Waste
- 40 CFR 264/265.12—Required Notices
- 40 CFR 264/265.13—General Waste Analysis
- 40 CFR 264/265.17—General Requirements for Ignitable, Reactive, or Incompatible Wastes
- 40 CFR 264/265.72—Manifest Discrepancies
- 40 CFR 264/265.73—Operating Record
- 40 CFR 264/265.75—Biennial Report
- 40 CFR 264/265.76—Unmanifested Waste Report
- 40 CFR 264/265.77—Additional Reports
- 40 CFR 264/265.171–.174—Condition of Containers; and Compatibility of Waste with Container, Management of Containers, and Inspections
- 40 CFR 264/265.177—Special requirements for incompatible wastes
- 40 CFR 270.14—General Requirements of Part B of the Hazardous Waste Permit Application

Per the Act, DOE is to provide long-term management and storage of elemental mercury generated within the United States [Section 5(a)(2)].

DOE Order 450.1A (*Environmental Protection Program*) requires that DOE facilities comply with RCRA regulations and defines expectations of quality assurances in environmental programs.

S5.8.3 Required Waste Management Features

Proper hazardous waste management is the goal of RCRA, and therefore, planning for waste generation, waste acceptance, and waste handling are critical elements toward ensuring compliance with the requirements. The information in this section outlines the requirements for container storage operations as a permitted storage facility but also as a waste generator for wastes generated during day-to-day operations.

At present, DOE Orders do not require the elemental mercury storage facility to operate under a formal waste management plan. However, DOE Order 450.1A (*Environmental Protection Program*)[*] mandates compliance with environmental requirements at DOE facilities.

S5.8.3.1 RCRA description of waste minimization program requirements

RCRA requirements for a waste minimization program are included in 40 CFR 262.41(a)(6-8), 264.73(b)(9), 264/265.75(h), (i), and (j).

One of the mandates of RCRA is to reduce or eliminate the generation of hazardous waste as expeditiously as possible [RCRA Section 1003(b)]. When preparing a manifest, hazardous waste generators (which include TSDFs that generate hazardous wastes as part of their operations) are required to certify that they have taken steps to minimize the amount of hazardous waste that they generate. LQGs must certify on each manifest that they have "a program in place" to reduce the volume and toxicity of the hazardous waste they generate; SQGs must certify that they have made a good faith effort to minimize their waste generation. Generators must also submit a biennial report indicating their efforts to reduce the volume and toxicity of wastes. TSDFs describe their waste

[*]The objective of this Order is to implement sound stewardship practices that are protective of the air, water, land, and other natural and cultural resources impacted by DOE operations, and meet or exceed compliance with applicable environmental, public health, and resource protection requirements cost effectively.

reduction program in their permit application. Regulators can inspect a facility at any time to determine whether a program is actually in place.

S5.8.3.2 RCRA required waste management elements

RCRA requirements for container management practices conducted at the storage facility include 40 CFR 261.7; Part 262; 264/265.13; 264/265.17; 264/265.35; 264/265.72, .73, and .76; 264/265.171–.174; and 40 CFR 270.14(b)(2), (3), (5), and (8).

Permitted and interim status TSDFs must manage the hazardous wastes they generate or receive in a manner which complies with the regulations. As such, a TSDF is required to describe its container management practices in its Part B permit application, and those practices can become a condition of the permit when issued. Interim status and permitted facilities typically issue and maintain, at a minimum, internal procedures that outline compliant hazardous-waste-handling steps to facilitate overall compliance.

S5.8.3.3 RCRA permitted or interim status storage practices

Storage facilities must meet RCRA standards for the handling of containers of hazardous wastes (40 CFR 264/265.171–.174, 264/265.35). Container storage practices are outlined in the Part B permit application as part of the facility's Process Information [40 CFR 264.171–.174, 264.35, 270.14(b)(5) and (8)]. The information to be provided includes the following.

- A complete description of the containers that will be used for storing hazardous waste. The primary focus is to document compatibility of the waste with the containers to be used for storage. Information can include testing, literature, or past operating experience that will reinforce the selection of containers.
- Movement and handling of containers is described and is intended to demonstrate how handling practices will minimize events that would compromise the integrity of a container or the containment system (refer to Section 4 for recommended pallet design and Section 5.1 for RCRA facility design requirements). The types of equipment to be used must be provided. This section describes exactly how containers will be placed in the unit [e.g., containers are stacked on pallets (two pallets high, with 49 3-L containers per pallet)] and how they are moved (e.g., containers are moved by forklift). Containers must not be handled, opened, or stored in a manner that may cause them to leak.
- Information on the maximum number of containers, stack height, storage arrangement, and container volumes must be provided. This section should indicate that adequate aisle space will be maintained to permit inspections and to implement emergency response actions.
- The container inspection process and corrective actions taken in response to inspections are summarized. Relevant inspection parameters must be defined and typically include signs of deterioration from corrosion, leaking containers, and illegible or missing labels/markings.
- Information with regard to opening and closing of containers of wastes must also be provided. In general, containers should enter the storage unit closed and remain closed unless it is necessary to sample the container or to transfer the container contents into another container.
- Labeling and marking practices must be described. A brief description of the container identification, tracking, and recordkeeping process should be provided. [Note: The waste tracking systems should be designed to facilitate preparation of the required reports under RCRA, including waste minimization efforts and biennial reports (see Section 5.4).]

S5.8.3.4 RCRA requirements for incompatible wastes

RCRA requirements for incompatible wastes are included in 40 CFR 264/265.17; 264/265.177; and 270.14(b)(9). Special care must be taken in handling ignitable, reactive, or incompatible wastes (40 CFR 264/265.17).

Ignitable and reactive wastes must be protected from ignition sources (e.g., requires the use of non-sparking equipment). "No Smoking" signs must be placed where ignitable and reactive wastes are stored and separate smoking areas must be designated [40 CFR 264/265.17(a)]. TSDFs must also take precautions to prevent waste reactions [40 CFR 264/265.17(b)]. Owners and operators for whom 40 CFR 264.17(a) and (b) are applicable must document their compliance with those sections [40 CFR 264.17(c)].

TSDFs must describe the precautions taken at the facility when managing ignitable, reactive, or incompatible wastes in their RCRA Part B permit application [40 CFR 270.14(b)(9)] as part of their Process Information. Alternatively, if the facility will not manage ignitable, reactive, or incompatible wastes, then this should be stated in the permit application and in facility procedures.

S5.8.3.5 RCRA residues of hazardous waste in empty containers

The regulations regarding the management of empty containers and residues remaining in empty containers are found in 40 CFR 261.7. These regulations set out procedures for establishing when a container or inner liner that held a hazardous waste is "empty." Since empty containers no longer contain hazardous waste, these regulations are also used to determine when containers are no longer subject to the RCRA requirements. So when properly emptied, the container is no longer hazardous waste. To distinguish between the usual meaning of the word "empty" and the strict regulatory definition, the phrase "RCRA empty" is sometimes used. Any hazardous waste remaining in either a "RCRA empty" container or inner liner (see below for the specific criteria) is not regulated as a hazardous waste. Therefore, these regulations allow containers or inner liners meeting the provisions in 40 CFR 261.7 to be reused for other purposes, recycled, or discarded as solid waste, since the container is no longer considered to hold hazardous waste. Separate standards are set for acute, gaseous, and non-acute hazardous wastes. If "RCRA empty" containers will be reused at a TSDF, then the TSDF must address their procedures with regard to steps to be taken to prevent reactions, fires, or other releases in their permit application as part of the Procedures to Prevent Hazards [40 CFR 270.14(b)(9)] and in facility procedures. Under RCRA, a container or an inner liner removed from a container holding non-acute hazardous waste, such as elemental mercury, is empty under the following conditions.

- All wastes have been removed using practices commonly employed industry-wide to remove wastes from containers or liners, such as pouring, pumping, aspirating, and draining [40 CFR 261.7(b)(1)(i)] and
- No more than 2.5 cm (1 in.) of material remains in the container or liner [40 CFR 261.7(b)(1)(ii)], or
- No more than 3 percent by weight of the container remains for containers with a capacity of 119 gal or less, and no more than 0.3 percent by weight remains for containers with a capacity greater than 119 gal [40 CFR 261.7(b)(1)(iii)]

Residues removed from a container that is not RCRA empty or that result from rendering a container empty are fully subject to the RCRA Subtitle C hazardous waste requirements. The above RCRA standards would apply to mercury transfer operations conducted at the storage facility (see Sections 4

and 5.6). When responding to leaks, staff at the facility would transfer the mercury from a leaking container into a new, unused container and label and store the new waste container, and manage the container that leaked appropriately. If that container meets the "RCRA empty" standard,* the container could be recycled for its metal content or managed as solid waste. Those containers that previously leaked would not be suitable for reuse as containers.

S5.8.3.6 RCRA manifest discrepancies

RCRA regulations for handling discrepancies in waste manifests are included in 40 CFR 264/265.72. The handling of manifest discrepancies are typically covered in TSDF waste management planning and/or an internal procedure regarding waste acceptance (see Section 4) and are addressed in the Part B permit application.

S5.8.3.7 RCRA unmanifested hazardous waste reports

If a TSDF accepts waste from off-site without a manifest, an unmanifested waste report must be prepared in accordance with 40 CFR 264/265.76. The facility's process for responding to the receipt of unmanifested hazardous wastes should be covered in their waste management procedures.

S5.8.3.8 RCRA reports to EPA Regional Administrator

Other reports that must be made to the EPA Regional Administrator include, but are not limited to, reports of releases, fires and explosions, groundwater contamination and monitoring data, and facility closure (40 CFR 264/265.77). Releases may also trigger Comprehensive Environmental Response, Compensation, and Liability Act and Emergency Planning and Community Right-to-Know Act reporting (see Section 5.4).

S5.8.3.9 RCRA secondary (newly generated) facility wastes

If the storage facility initiates a waste shipment involving its stored hazardous wastes, a new manifest must be prepared to comply with Part 262 generator standards [40 CFR 264/265.71(c)]. Additionally, if the storage facility generates hazardous wastes as part of its operations (e.g., waste-flammable paint, waste solvents, spill cleanup residues, mercury-contaminated PPE, etc.), then the storage facility would be considered a RCRA generator per Part 262. Compliance with the Part 262 regulations can include satellite and 90-day accumulation areas under 40 CFR 262.34 that are exempt from permitting. The use of generator accumulation areas would only be available to the hazardous wastes that are generated by the TSDF onsite.

S5.8.3.10 RCRA waste analysis plan (WAP) requirements

The general requirements for conducting waste analysis are included in

- 40 CFR 262.11, for generators that do not treat, store, or dispose of hazardous waste;
- 40 CFR 264.13, for permitted TSDFs, including 40 CFR 264.13(a)(4) and (c) for all off-site TSDFs (generators who treat prohibited wastes in tanks, containers, and/or containment buildings to meet LDR treatment requirements should also follow the general waste analysis provisions in 40 CFR 264.13/265.13); and
- 40 CFR 265.13, for TSDFs operating under interim status.

*The facility may have a stricter standard for empting containers that includes repeated empting of mercury residues from "RCRA empty" containers after periods of accumulation. Additional contamination (e.g., beads) of mercury may coalesce over time and may then be collected and managed as hazardous waste.

A WAP is required for all TSDFs, as well as generators treating hazardous waste in tanks, containers, or containment buildings to meet LDR standards. The WAP must be written and kept on site. The facility's WAP (or elements thereof) must be included in its Part B permit application [40 CFR 270.14(b)(2) and (3)]. Documentation of waste analysis procedures in a WAP should help ensure compliance with RCRA waste identification requirements. TSDFs need to verify the composition (i.e., hazardous constituents and characteristics) of incoming waste in order to treat, store, or dispose of the waste properly. A WAP outlines the verification procedures, including specific sampling methods, necessary to ensure proper treatment, storage, or disposal (40 CFR 264/265.13). The facility's WAC can be used to guide the development of the WAP. Key elements of the WAC for the elemental mercury storage facility that could guide the WAP include mercury purity; presence of constituents that could foster corrosion of containers such as water, nitric acid solutions, chloride salts solutions, other possible corrosion agents, other heavy metals (including silver), and no radioactive constituents or contamination (regulatory driven) (see Table 5.2). However, the WAP should also include analyses for wastes generated by the facility as a result of its operations; those analyses are not specifically addressed in Table 5.2. Those newly generated wastes would be subject to a waste determination at the point of generation and should be segregated, at least until characterization is complete, from the wastes in permitted storage. The facility should ensure that the newly generated wastes are not incompatible with the stored wastes and that the facility permit addresses management of these volumes and types of solid or hazardous waste. Compliance with the Part 262 regulations (see Section 2 for more information) can include satellite and 90-day accumulation areas under 40 CFR 262.34 that are exempt from permitting.

Table 5.2. Suggested elemental mercury test methods

Analyte or group	Sample preparation method	Analytical method
Mercury TCLP	1311[a]	7040A, 7473, 7471
Heavy metals TCLP	1311 (or alternate approved methods)	1311 (or alternate approved methods ICP 6010 or ICPMS 6020)
Mercury (total; purity)	Following Karadjova paper[b]	7473; ICPMS 6020
Other metals (total; impurities)	Following Karadjova paper	ICPMS 6020
Gross radiation scan		9310, gamma scan
Total chloride	ASTM D808-81	325.3
Specific gravity		ASTM D891-09
Percent/presence of water		9000/visual
Average volatile organic concentration[c]		25D (40 CFR Part 60, Appendix A)

[a]Test Method 1311 in EPA SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods."
[b]Karadjova, I., et al. "ET-AAS in the Analysis of High-Purity Mercury," *Mikrochim. Acta* **127**, 225–228 (1997), Springer.
[c]For Subpart CC status if not determined by acceptable knowledge.

Before a facility treats, stores, or disposes of any hazardous waste, the facility must obtain a detailed chemical and physical analysis of a representative sample of the waste [40 CFR 264/265.13(a)]. This information may be supplied either through sampling and laboratory analysis or through acceptable knowledge. Acceptable knowledge includes process knowledge (obtaining data from existing published or documented waste analysis or studies), waste analysis data (obtained from the generator), or studies conducted on hazardous wastes generated by processes similar to that which generated the waste.

The WAP must, at a minimum, contain the following basic elements [40 CFR 264/265.13(b)]:

- Parameters to be analyzed,
- Testing and analytical methods,
- Sampling methods used to obtain representative samples,
- Frequency of waste re-evaluation,
- For off-site TSDFs, the waste analyses that generators have agreed to supply, and
- Procedures to ensure that the waste received at the off-site TSDF matches the identity of the waste designated on the accompanying manifest.

The waste analysis must be repeated periodically to ensure that the information on a given waste is accurate and up to date [40 CFR 264/265.13(a)(3)]. At a minimum, the waste analysis must be repeated (1) when the TSDF is notified or has reason to believe that the process or operation generating the hazardous wastes has changed or (2) when inspection indicates that the hazardous waste received does not match the information on the accompanying manifest (e.g., manifest discrepancy).

A WAP documents the procedures that the facility uses to obtain a representative sample of the waste and to conduct a detailed chemical and physical analysis of this representative sample. The WAP also can describe special handling procedures for proper transportation, treatment, storage, or disposal of the wastes. Sampling procedures would outline the chain-of-custody and recordkeeping requirements for sampling to ensure sample results can be tied back to a specific container.

Formal documentation of waste analysis procedures in a WAP offers many advantages, including the following:

- Allowing for planning and analyzing several waste analysis options before making a selection;
- Establishing a reliable and consistent internal management mechanism for properly identifying wastes on site;
- Ensuring that all participants in waste analysis have identical information (e.g., a hands-on operating manual), thereby promoting consistency and decreasing the likelihood that errors will be made;
- Ensuring that facility personnel changes or absences do not lead to lost information;
- Reducing the facility's liabilities by decreasing the instances of improper handling or management of wastes;
- Assisting in demonstrating to regulators that the facility is in compliance with all regulations applicable to proper waste identification, thereby ensuring a safe operating environment and protection of human health and the environment.

Because RCRA is a self-implementing program, the burden is on the TSDF to demonstrate that it is operating in compliance with all applicable regulations. Any violations that occur at the facility, regardless of any good faith effort the facility made to obtain information, are the facility's sole responsibility. For example, if a TSDF, accepts waste from an off-site facility, and relies on the information provided by the generator or TSDF sending the waste, the receiving facility is still responsible for accurately identifying/classifying the waste. As a result, TSDFs commonly implement a system of corroborative testing for the hazardous wastes they receive.

Abbreviated waste analysis, often referred to as "fingerprint analysis," is conducted generally for key parameters. For elemental mercury, fingerprinting checks could include mercury purity;[*] specific gravity; color;[†] percent or presence of water;[‡] presence of chloride salts solutions, nitric acid solutions, other possible corrosion agents, silver, or other heavy metals; pH;[§] and verification of no radioactive constituents or contamination. Those parameters should give information that can be used to help verify that the waste matches the expected characteristics for that waste. For example, at an off-site TSDF, fingerprint analysis can be used to indicate that the waste received matches the description on the manifest, and that the waste matches the waste type that the facility has agreed to accept. Because the TSDF already knows the detailed chemical and physical properties of a waste, the appropriate fingerprint parameters can be chosen easily, since the purpose of the fingerprint or spot check is only to verify that each waste arriving at the TSDF is the actual waste expected.

Choosing the appropriate fingerprint analysis parameters requires facility-specific determinations. Choosing the appropriate sampling method should reflect the nature of the elemental mercury to be received. Biased surface sampling for some of the fingerprint checks, such as prohibited constituents, might be warranted. Fingerprint analysis is not a substitute for conducting a complete waste analysis and, therefore, may not be defensible if a waste is misidentified by the generator but still passed the fingerprint test. The decision to conduct abbreviated corroborative testing using fingerprint analysis on a few select parameters or to conduct a complete analysis to verify the profile would ultimately be decided by the TSDF.

Selecting WAP parameters

An accurate representation of a waste's physical and chemical properties is critical in determining viable waste management options. Accordingly, facility WAPs must specify waste parameters that provide sufficient information to ensure the following:

- Compliance with applicable regulatory requirements (e.g., LDR regulations, newly identified or listed hazardous wastes),
- Conformance with permit conditions (i.e., ensure that wastes accepted for management fall within the scope of the facility permit, and process performance standards can be met), and
- Safe and effective waste management operations (i.e., ensure that no wastes are accepted that are incompatible or inappropriate given the type of management practices used by the facility).

WAPs include provisions to ensure that waste management units meet the special requirements for ignitable, reactive, and incompatible wastes (40 CFR 264/265.17). Incompatible wastes, if brought together, may result in heat generation, toxic gas generation, and/or explosions. Therefore, a WAP must address measures to identify potentially ignitable, reactive, and incompatible wastes. The information provided by the waste manifest and fingerprint testing can be supplemented with other testing to identify incompatible wastes.

Sampling strategies

The development and application of a sampling strategy is a prerequisite to obtaining a representative sample capable of producing scientifically viable data. These strategies should be selected or prepared prior to actual sampling to organize and coordinate sampling activities, to maximize data accuracy,

[*]By total metals analysis or hand-held X-ray fluorescence analyzer if detection limits are sufficiently accurate.
[†]By visual inspection.
[‡]By visual inspection and/or analyses.
[§]If two phases are observed.

and to minimize errors attributable to incorrectly selected sampling procedures. At a minimum, a sampling strategy should address the following:

- Objectives of collecting the samples
- Types of samples needed (e.g., grab or composite)
- Selection of sampling locations
- Number of samples
- Sampling frequency
- Sample collection and handling techniques to be used

In addition, the following factors should also be taken into consideration since they can influence the sampling development process:

- Physical properties of the wastes to be sampled
- Chemical properties of the wastes to be sampled
- Special circumstances or considerations (e.g., complex multi-phasic waste streams, highly corrosive liquids)

Two major sampling approaches may be employed to collect representative samples. These approaches are summarized as follows:

- *Authoritative Sampling*—Where sufficient historical, site, and process information is available to accurately assess the chemical and physical properties of a waste, authoritative sampling (also known as judgment sampling) can be used to obtain representative samples. This type of sampling involves the selection of sample locations based on knowledge of waste distribution and waste properties (e.g., homogeneous process streams) as well as management unit considerations. Accordingly, the validity of the sampling is dependent upon the accuracy of the information used. The rationale for the selection of sampling locations is critical and should be well documented.
- *Random Sampling*—Due to the difficulty of determining the exact chemical and physical properties of hazardous waste streams that are necessary for using authoritative sampling, the most commonly used sampling strategies are random (not to be confused with haphazard) sampling techniques. Generally, three specific techniques—simple, stratified, and systematic random—are employed.

By applying these procedures, which are based upon mathematical and statistical theories, representative samples can be obtained from nearly every waste sampling scenario. Given the expected overall homogeneity of the elemental mercury to be received at the DOE storage facility, authoritative sampling could be utilized when defining sampling requirements for waste analyses by the generator and the storage facility itself. For any newly generated waste at the DOE facility, random sampling may be needed to ensure results are representative.

In general, the RCRA regulations do not specify when to sample or how many samples should be taken. EPA-approved procedures are typically used when determining how many samples to take, but other statistically based procedures can be approved. The higher number of samples taken increases the accuracy of the results; hence, some TSDFs sample 10% of the containers they receive, with some wastes/containers specifically excepted from sampling. The DOE elemental mercury storage facility may use its knowledge (e.g., homogeneity) of the mercury (either U151 or D009) to be accepted when determining the protocol for fingerprinting. As an example using the cube root procedure, Method D 140-70 (American Society for Testing and Materials), the minimum number of containers

that would be randomly sampled/fingerprinted from each shipment of a generator's waste would be calculated as follows:

Number of containers received	Number of containers sampled
1	1
2–8	2
9–27	3
28–64	4
65–125	5

Use of waste profiles and pre-acceptance reviews

It is common practice for TSDFs that receive wastes from an off-site generator (or other facility) to require the submittal of a Waste Profile (or comparable document) to the TSDF as a pre-acceptance condition. A Waste Profile provides a comprehensive description of each waste stream (see Section 2).

The level of pre-acceptance reviews can vary based on the variety of wastes typically managed. The level of screening required for an off-site storage facility receiving only elemental mercury could be less than that required for a TSDF accepting all RCRA wastes. Off-site facilities may require that the generator provide detailed information regarding

- The process that generates the waste,
- The physical and chemical description of the waste,
- The analytical procedures and results used to characterize the waste or acceptable knowledge documentation, including information on Subpart CC (air emissions) status,
- Whether any prohibited constituents are present,
- EPA hazardous waste codes, and
- Certifications and notifications as applicable to LDR wastes.

Off-site hazardous waste management facilities are required to comply with additional regulations [40 CFR 264/265.13(c)] relating to procedures that help minimize the potential for the facility to accept incorrectly identified or unacceptable waste shipments. For off-site facilities, the waste analysis plan must define the procedures which will be used to inspect and, if necessary, analyze each movement* of hazardous waste received at the facility to ensure that it matches the identity of the waste designated on the accompanying manifest or shipping paper.

The off-site facility's WAP specifies the waste analysis data that the generator of the waste provides to substantiate its waste determination. It is important that the WAP include descriptions of the procedures to be taken by the TSDF to determine how well the generator's data represents the wastes to be managed. The TSDF should determine whether recharacterization of the waste is necessary if a shipment of a particular waste is determined, through pre-acceptance screening, to be significantly different from the waste as characterized and identified from the pre-shipment sample and/or waste manifest. These procedures and waste recharacterization procedures should be specified in the WAP. Alternatively, the facility may reject the entire shipment of waste and return the waste to the

*Movement within the areas of the DOE storage facility does not require additional analysis. However, the use of container tracking numbers and tamper indicating devices from receipt and throughout storage should ensure that the waste characterization can be tied back to the generator.

generator. An off-site facility should, at a minimum, visually inspect and compare the contents of each shipment to the accompanying manifest to identify the wastes (see Section 4). The shipment received on site should be sampled and analyzed to the extent necessary to verify that it meets permit specifications and regulatory requirements.

S5.8.4 References

40 CFR Part 60—Standards of performance for New Stationary Sources (Appendix A)
40 CFR Part 260—Hazardous Waste Management System: General
40 CFR Part 261—Identification and Listing of Hazardous Waste

40 CFR 261.7—Residues of Hazardous Waste in Empty Containers

40 CFR Part 262—Standards Applicable to Generators of Hazardous Waste

40 CFR 262.11—Hazardous waste determination
40 CFR 262.34—Accumulation time
40 CFR 262.41(a)(6), (7), and (8)—Biennial report/waste minimization program

40 CFR Part 264—Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

40 CFR 264.12—Required notices
40 CFR 264.13—General waste analysis
40 CFR 264.17—General requirements for ignitable, reactive, or incompatible wastes
40 CFR 264.35—Required aisle space
40 CFR 264.71(c)—Use of manifest system
40 CFR 264.72—Manifest discrepancies
40 CFR 264.73(b)(9)—Operating record
40 CFR 264.75—Biennial Report
40 CFR 264.76—Unmanifested waste report
40 CFR 264.77—Additional reports
40 CFR 264.171–.174—Condition of containers, compatibility of waste containers, management of waste containers, and inspections
40 CFR 264.177—Special requirements for incompatible wastes

40 CFR Part 265—Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

40 CFR 265.12—Required notices
40 CFR 265.13—General waste analysis
40 CFR 265.17—General requirements for ignitable, reactive, or incompatible wastes
40 CFR 265.35—Required aisle space
40 CFR 265.71(c)—Use of manifest system
40 CFR 265.72—Manifest discrepancies
40 CFR 265.73—Operating record
40 CFR 265.75(h), (i), and (j)—Biennial Report
40 CFR 265.76—Unmanifested waste report
40 CFR 265.77—Additional reports
40 CFR 265.171–.174—Condition of containers, compatibility of waste containers, management of waste containers, and inspections
40 CFR 265.177—Special requirements for incompatible wastes

40 CFR Part 270—EPA Administered Permit Programs

40 CFR 270.14(b)(2), (3), (5), (8), and (9)—Permit application/general requirements
40 CFR 270.15—Permit application information for containers

DOE Order (O) 450.1A, Environmental Protection Program

EPA (U.S. Environmental Protection Agency). April 1994. Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes: A Guidance Manual, OSWER 9938.4-03, Washington, D.C.

EPA SW-846, "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods."

Karadjova, I., L. Jordanova, and S. Arpadjan. 1997. "ET-AAS in the Analysis of High-Purity Mercury," pp. 225–228, in *Microchimica Acta*, Vol. 127, Nos. 3–4, Springer Wein, New York, New York.

Mercury Export Ban Act of 2008, Public Law 110-414 (October 14, 2008).

Solid Waste Disposal Act, as amended (often referred to as the *Resource Conservation and Recovery Act*), 42 USC 6901 et seq.

S5.8.5 Links to Supplementary Information

Links for the following resources are available on the Web.

U.S. (Environmental Protection Agency). April 1994. *Waste Analysis at Facilities that Generate, Treat, Store, and Dispose of Hazardous Wastes: A Guidance Manual*, OSWER 9938.4-03, Washington, D.C. Accessed (05-28-09) on the Web at the URLs:
http://www.epa.gov/osw/hazard/tsd/ldr/wap330.pdf and
http://www.epa.gov/Compliance/resources/policies/civil/rcra/wasteanalygman-rpt.pdf

PROCEDURE (P)

NO. 1. FACILITY WASTE ACCEPTANCE/REJECTION PROCESS

This procedure guidance focuses mainly on requirements for waste container management (including empty containers and special requirements for ignitable, reactive, or incompatibles) and for a WAP.

P5.8.1 Introduction

The DOE elemental mercury storage facility shall have a WAC document for generators to use as their reference. The facility shall have a procedure that describes the data and information required for all wastes to be received before the waste is accepted for storage. The procedure (or separate guidance documents) outlines the parameters, analyses, and/or acceptable knowledge that must be documented, including specific forms for the generator to complete, if the facility is to accept the waste. The procedure outlines (1) internal steps to be taken in the event that discrepancies are found upon receipt of the waste or in the event that unmanifested hazardous wastes are received, (2) required notifications to off-site generators, and (3) required regulatory reports. Separate procedures must address waste sampling procedures, including the packaging and transfer of samples to the analytical laboratory and receipt/handling of any excess or returned samples and are not addressed here. Separate procedures shall address the actual storage, tracking and management of the hazardous wastes after acceptance and the associated recordkeeping.

The scope shall cover the internal pre-waste shipment (paperwork) review process through waste acceptance or waste rejection by the elemental mercury storage facility.

P5.8.2 Frequency

The procedure is to be reviewed every 3 years or whenever RCRA regulations or the facility's permit conditions regarding waste acceptance change or whenever the facility determines that their waste acceptance process is not meeting their needs.

P5.8.3 Precautions/Limitations

The procedure shall indicate that if at any time an individual believes that work cannot continue safely, or that the training provided is inadequate to allow the work to be performed safely, that individual has the responsibility and authority to suspend or stop work.

For the most part, this procedure covers work activities to be performed in an office environment. The facility's Work Control process may cover the Integrated Safety Management philosophy for office environments and provides suggested office environment guidelines. The facility may also have Work Controls in place for any field activities. Hence, the facility indicates what Work Controls govern the work/actions covered by the procedure.

P5.8.4 Specific Requirements

P5.8.4.1 RCRA requirements

40 CFR 261.7, Residues of hazardous waste in empty containers
40 CFR 262.11—Hazardous waste determination
40 CFR 264/265.13, Waste Analysis Plan
40 CFR 264/265.17, General requirements for ignitable, reactive, or incompatible wastes
40 CFR 264/265.72, Manifest discrepancies
40 CFR 264/265.76, Unmanifested waste report
40 CFR 264/265.77, Reports to the EPA Regional Administrator
40 CFR 264/265.177, Special requirements for incompatible wastes

P5.8.4.2 DOE requirements

DOE Order 450.1A, *Environmental Protection Program*

P5.8.4.3 Other requirements

Mercury Export Ban Act of 2008, Public Law 110-414 (October 14, 2008).

P5.8.5 Prerequisites

The generator conducts the required sampling and analysis of the hazardous waste to meet the facilities WAP or WAC before preparing the waste characterization paperwork for review/acceptance by the facility.

Facility staff are trained in WAP and WAC requirements and manifesting/DOT requirements.

P5.8.6 Action Steps

Action steps indicate the actions the facility staff would complete to ensure the hazardous waste is appropriate for shipment to and storage at the facility. Staff performs a detailed review of paperwork submitted by the generator to support proper characterization and classification of waste. The steps for document flow between the generator and the facility are detailed (see also Section 2). Paperwork is to be reviewed for completeness and accuracy. The review may include verification of DOT classification and packaging as well as RCRA characterization. The review may also include verification that all available characterization information related to this waste stream is included and considered.

P5.8.7 Records

Waste management records that should be maintained at a DOE elemental mercury storage facility include the following:

- WAP and WAC document(s),
- Waste characterization/acceptance forms (completed by generator),
- Storage facility waste acceptance review and approval forms,
- Manifests and associated paperwork (LDR notifications/certifications),
- Unmanifested waste reports,
- Notifications to off-site waste generators of permits and waste acceptance,
- Waste discrepancy records and reports, and
- Other reports submitted to regulators.

P5.8.8 References

40 CFR Part 261—Identification and Listing of Hazardous Waste

40 CFR 261.7—Residues of Hazardous Waste in Empty Containers

40 CFR Part 262—Standards Applicable to Generators of Hazardous Waste

40 CFR 262.11—Hazardous waste determination

40 CFR Part 264—Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

40 CFR 264.13—General waste analysis
40 CFR 264.17—General requirements for ignitable, reactive, or incompatible wastes
40 CFR 264.72—Manifest discrepancies
40 CFR 264.76—Unmanifested waste report
40 CFR 264.77—Additional reports
40 CFR 264.177—Special requirements for incompatible wastes

40 CFR Part 265—Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

40 CFR 265.13—General waste analysis
40 CFR 265.17—General requirements for ignitable, reactive, or incompatible wastes
40 CFR 265.72—Manifest discrepancies
40 CFR 265.76—Unmanifested waste report
40 CFR 265.77—Additional reports

40 CFR 265.177—Special requirements for incompatible wastes

Mercury Export Ban Act of 2008, Public Law 110-414 (October 14, 2008)
DOE Order 450.1, *Environmental Protection Program*, approved 01-15-03

PROCEDURE (P)

NO. 2. CONTAINER MANAGEMENT

This procedure guidance addresses container storage requirements.

P5.8.9 Introduction

The DOE elemental mercury storage facility shall have procedures that address container management practices (those practices required by RCRA regulations and/or their permit), and it shall address the tracking and management of the hazardous wastes after acceptance (see Section 4) and the associated recordkeeping. Separate procedures would be needed if the elemental mercury storage facility were to begin shipping the elemental mercury to an off-site facility for treatment and disposal. The purpose of the container management procedures is to ensure that the elemental mercury storage facility is operated in compliance with RCRA and any conditions imposed by the hazardous waste permit for the elemental mercury storage facility. The tracking of hazardous waste received, stored, removed [either recharacterized, treated, or disposed (shipped off-site)] is needed for biennial reporting (see Section 5.4, Recordkeeping).

The scope covers the handling of hazardous wastes received from off-site generators. For the purpose of this procedure, receipt begins at the point the waste arrived at the facility. (*Note: the management of newly generated wastes may be covered in separate procedures written for the site/facility as a whole rather than the elemental mercury storage facility alone.*)

This procedure may include instructions, general operations of the facilities and equipment, routine handling and storage operations, and routine maintenance.

P5.8.10 Frequency

The procedure is to be reviewed every 3 years or whenever RCRA regulations or the facility's permit conditions regarding waste management change or whenever the facility management determines that their waste management process is not meeting their needs.

P5.8.11 Precautions/Limitations

The procedure shall indicate that if at any time an individual believes that work cannot continue safely, or that the training provided is inadequate to allow the work to be performed safely, that individual has the responsibility and authority to suspend or stop work.

During hazardous waste-handling operations, personnel performing the activities shall maintain communication with a coworker, either directly or through visual or voice contact.

The procedure shall indicate that if at any time a safety work permit (e.g., Confined Space) is deemed necessary to perform these activities, safety equipment defined within the work permit shall be used in conjunction with those described in this section.

P5.8.12 Requirements

P5.8.12.1 RCRA requirements

40 CFR 261.7 (Residues of hazardous waste in empty containers)
40 CFR 264.170–.179 and 40 CFR 265.170–.178 (Container management)
40 CFR 264/265.14 (Security/access controls)
40 CFR 264/265.15 (Inspections)
40 CFR 264/265.31–.35 (Maintenance and operation of facility/equipment)
40 CFR 264/265.70–.77 (Manifesting, recordkeeping, and reporting)
40 CFR 264/265.17 and 40 CFR 264/265.177 (Requirements for ignitable, reactive, and incompatible wastes)

P5.8.12.2 DOE requirements

DOE Order 450.1A, *Environmental Protection Program.*
DOE Order 5000.3A, *Occurrence Reporting and Processing of Operations Information*.

P5.8.13 Prerequisites

The generator has shipped the elemental mercury under a hazardous waste manifest.[*] Waste acceptance (paperwork for characterization) requirements have been met.

Facility staff members are trained in operating procedures, WAP and WAC requirements, and manifesting/DOT requirements.

Wastes stored are to be limited to those meeting the WAC (acceptable waste codes, approved containers, acceptable container condition, and nonradioactive waste).

Eating, chewing gum, drinking, storing food, smoking, chewing tobacco, and applying cosmetics shall be prohibited in waste Receiving/Storage/Handling areas of the facility. “No Smoking” signs shall be conspicuously placed if there is a hazard from ignitable or reactive waste.

If the waste storage operations involve corrosive or high-irritation materials, then the facility shall provide emergency eyewashes or showers and the procedure may indicate where these are located.

P5.8.14 Tools and Materials

The procedure indicates what tools and materials will be used for activities covered by the procedure. Examples include

- Container handling equipment;
- Fire prevention equipment and system;
- Nonsparking tools (for ignitable or reactive waste operations);
- Spare containers for spill cleanup materials (i.e., fiber/poly and metal containers and packing material) and spare elemental mercury containers for repackaging leaking containers;
- Spill response equipment (see the RCRA Contingency Plan or permit for specifics to list); and
- Safety glasses, gloves, and personal protective equipment.

[*]Or under a shipping paper, if the mercury has been approved by the facility for shipment as a solid waste, such as from a CESQG.

P5.8.15 Action Steps

The procedure is expected to:

- require staff to use the proper PPE for the type of work being conducted. At the minimum, the following safety equipment may be considered: safety glasses with side shields, safety shoes, company clothes or lab coats, and leather and/or nitrile gloves.
- note when and how the RCRA Contingency Plan is implemented and where a copy can be found (e.g., storage facility office).
- indicate how access is controlled: The gate and doors shall be locked at all times when the facility is left unattended.
- indicate who is authorized for routine access: Only those trained persons approved by the Facility Management shall be authorized to perform hands-on waste activities. Personnel conducting maintenance are to be escorted by trained personnel.
- indicate what communication equipment is in place: two-way radios, pagers and phones, or other alarm systems.
- indicate where the Training requirements for personnel working in the facility may be found.
- ensure that hazardous waste is managed in accordance with RCRA requirements and any specific permit conditions. The procedure states how containers are to be managed at the facility. It indicates that containers are to be stored according to the facility layout plan and RCRA permit (providing adequate spacing to allow for container inspections and ensuring minimum required aisle space is maintained). The maximum storage quantity as defined by the permit is stated [e.g., any combination of the following, the total of which shall not exceed XXX* gallons or kilograms (including container weights)]. The facility inventory is to be routinely updated and monitored to prevent exceeding the permitted limit.
- if applicable, the procedure requires separated storage of reactive, ignitable, or incompatible waste, allowing either sufficient space and/or barriers.
- ensure containers holding hazardous waste are always closed during storage, except when necessary. Closures are to be visually checked as part of the facility-approved inspection process. Containers holding hazardous waste shall not be opened, handled, or stored in a manner which may rupture the container or cause it to leak.
- indicate stacking arrangements allowed in the permit (e.g., 3-L containers are to be placed on pallets with spill trays with pallets placed between each level). Pallets are arranged in rows to provide adequate aisle space for unobstructed movement of emergency personnel and equipment, and such that container labels shall be visible.
- outline the tracking system used if containers are repackaged or bulked after receipt and tracking of waste between Handling and Storage areas. Also cover the handling of empty containers and the wastes generated from repackaging efforts or bulking efforts.
- address what reporting requirements must be met, including biennial waste reports and other applicable reports.
- cover any specific conditions imposed by the hazardous waste permit for the elemental mercury storage facility.

P5.8.16 Records

Waste receiving/container records that are to be maintained at a DOE elemental mercury storage facility include the following.

*The approved storage limit.

- Documentation of maintenance activities
- Occurrence reports as required by DOE Order 5000.3A (*Occurrence Reporting and Processing of Operations Information*)
- Manifests and associated paperwork (LDR notifications/certifications)
- Unmanifested waste reports
- Notifications to off-site waste generators of permits and waste acceptance
- Waste generation/handling records for hazardous wastes generated at the facility
- Waste discrepancy records and reports
- Waste inventory and tracking information (including container storage, bulking, recontainerization)
- Required reports (biennial, waste minimization efforts, etc.)
- Other reports submitted to regulators (including report of other noncompliances required by a RCRA permit)

P5.8.17 References

40 CFR Part 261—Identification and Listing of Hazardous Waste

40 CFR 261.7—Residues of Hazardous Waste in Empty Containers

40 CFR Part 264—Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

40 CFR 264.14—Security/access controls
40 CFR 264.15—Inspections
40 CFR 264.17—General requirements for ignitable, reactive, or incompatible wastes
40 CFR 264.31 through 264.35—Maintenance and operation of facility/equipment
40 CFR 264.70 through 264.77—Waste manifesting
40 CFR 264.170 through 264.179—Container management
40 CFR 264.177—Special requirements for incompatible wastes

40 CFR Part 265—Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

40 CFR 265.14—Security/access controls
40 CFR 265.15—Inspections
40 CFR 265.17—General requirements for ignitable, reactive, or incompatible wastes
40 CFR 265.31 through 265.35—Maintenance and operation of facility/equipment
40 CFR 265.70 through 265.77—Manifesting, recordkeeping, and reporting
40 CFR 265.170 through 265.178—Container management
40 CFR 265.177—Special requirements for incompatible wastes

DOE Order (O) 450.1A, *Environmental Protection Program*, approved 01-15-03.
DOE Order 5000.3A, *Occurrence Reporting and Processing of Operations Information*, approved 05-30-90.

5.9 TRAINING

This section discusses standards (S) and procedure (P) requirements of training for elemental mercury container storage and management.

STANDARD (S)

TRAINING REQUIREMENTS FOR STORAGE OF ELEMENTAL MERCURY

S5.9.1 Introduction

The OC shall be responsible for training personnel for all tasks involved with the elemental mercury storage facility. To address this responsibility, a Training Plan is to be developed. This plan shall identify positions, training requirements for those positions (modules, frequency and duration), and required records generated from the training activities. Training regarding RCRA, QA/QC, and ES&H requirements make up the major elements of training. Training may be implemented via classroom, on-the-job, self-study, or web-based modules depending on the audience, content, and whether the module is the initial one or a refresher. For example, initial RCRA training may be classroom or on the job; refresher training may be self study or Web based.

The purpose of a Training Plan is to provide guidance to ensure project personnel are trained to critical project disciplines. Training modules, frequency, and duration are to be designed to ensure the facility is operated in compliance with requirements.

This standard is applicable to personnel who are assigned to work at the facility. Training may include RCRA, QA/QC, ES&H, and mercury container/facility inspections/operations, including emergency response. The exception would be for maintenance workers who conduct repair work at the facility under escort or under the control of trained personnel.

S5.9.2 Specific Criteria (or Guidelines)

S5.9.2.1 RCRA requirements

RCRA requires that facility personnel must successfully complete a program of classroom instruction or on-the-job training that teaches them to perform their duties in a way that ensures facility compliance with RCRA [40 CFR 264/265.16(a)]. That training program must also include training for emergency response. Training must be directed by a person trained in hazardous waste management procedures and include instructions that teach facility personnel hazardous waste management procedures and contingency plans relative to the positions in which they are employed. In addition, RCRA training also requires the following.

- Facility personnel successfully complete the appropriate RCRA training within 6 months after the date of their employment, assignment to the facility, or to a new position at a facility, whichever is later. Employees who have not completed this training must not work unsupervised.
- Facility personnel take part in an annual review of their initial RCRA training.

The OC must maintain the following documents and records at the elemental mercury storage facility:

- The job title for each position at the facility related to hazardous waste management, and the name of that employee filling each job;

- A written job description for each position in the above bullet; and
- A written description of the type and amount of both introductory and continuing training for assigned RCRA positions.

Training records of current personnel must be kept until closure of the elemental mercury storage facility; for former personnel, training records must be kept for 3 years from the date last worked.

To ensure RCRA compliance, at a minimum, the following RCRA (40 CFR) sections are to be included in the Training Plan. This Plan identifies positions that are required to complete specific training modules related to the following.

40 CFR Part 264—Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

- 40 CFR 264.15(c,d), General Inspection Requirements
- 40 CFR 264.16, Personnel Training
- 40 CFR 264.171, Condition of Containers
- 40 CFR 264.172, Compatibility of Waste with Containers
- 40 CFR 264.173, Management of Containers
- 40 CFR 264.174, Inspections
- 40 CFR 264.73(b)(5), Operating Record

40 CFR Part 265—Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

- 40 CFR 265.15(c,d), General Inspection Requirements
- 40 CFR 265.16, Personnel Training
- 40 CFR 265.171, Condition of Containers
- 40 CFR 265.172, Compatibility of Waste with Containers
- 40 CFR 265.173, Management of Containers
- 40 CFR 265.174, Inspections
- 40 CFR 265.73(b)(5), Operating Record

40 CFR Part 270—EPA Administered Permit Programs: The Hazardous Waste Permit Program

- 40 CFR 270.14(b)(5), Contents of Part B: General Requirements

The RCRA Part B Permit Application would describe the RCRA training program for facility personnel. The RCRA hazardous waste facility permit when issued may have more stringent requirements that must be followed. Personnel assigned to review/accept/sign generator waste determinations, manifests, or shipping papers must also have extensive training in RCRA waste identification/characterization, LDR, and DOT.

For emergency response, the training shall ensure that facility personnel can respond effectively to emergencies that might occur at the facility. Hence, familiarization with facility-specific emergency response procedures (for spills, fires, explosions), emergency equipment (including spill control equipment, fire control, etc.), and emergency systems (facility communications or alarm systems) is critical. Facility staff who are trained for emergency response training per OSHA [29 CFR 1910.120(p)(8) and 1910.120(q)—HAZWOPER] need not have separate RCRA emergency response training, provided the training per OSHA meets the requirements of RCRA.

The plan must address the frequency of training, including the annual review of initial RCRA training required under 40 CFR 264/265.16.

S5.9.2.2 DOT requirements

DOT (49 CFR 172.702) requires that each employer whose employees work with hazardous materials must train each of its hazmat employees. “Hazmat employees” include those who prepare the packages for shipping; prepare, sign, or review the paperwork; load trucks; drive the vehicles; or unload or receive the hazardous materials.

A hazmat employee may not perform a DOT function unless he or she has been trained in the requirements of hazardous materials (generally identification, classification, labeling, marking, placarding, packaging, etc.) that apply to that function. The DOE elemental mercury storage facility ensures that each hazmat employee is thoroughly instructed and is tested by appropriate means on the training subjects covered in 49 CFR 172.704.

Since DOT training is designed to be job specific, some employees may only require a basic knowledge of DOT whereas others may require extensive (basic and 40 h) training.

S5.9.2.3 QA/QC requirements

Like RCRA and DOT, per DOE Order 414.1C(a), the elemental mercury storage facility must train and qualify personnel to be capable of performing assigned work and provide continuing training to personnel to maintain job proficiency. The Training Plan and associated Needs Analysis shall be submitted to DOE for approval.

Per the Order above, QA/QC requirements are to be identified in the Quality Assurance Project Plan. All personnel are to be trained to this document. The QA/QC requirements are identified in Section 1.5 and Appendix B.

S5.9.2.4 ES&H requirements

Section 5(d)(2) of the MEBA requires DOE to conduct operational training and emergency training for all staff who have responsibilities related to elemental mercury management, transfer, storage, monitoring, or response.

10 CFR Part 851, the Worker Safety and Health Program, addresses requirements for a worker safety and health program that reduces or prevents occupational injuries, illnesses, and accidental losses by providing DOE contractors and their workers with safe and healthful workplaces at DOE sites. Specifically 10 CFR 851.25, requires the following.

- Development and implementation of a worker safety and health training and information program to ensure that all workers exposed or potentially exposed to hazards are provided with training and information on that hazard in order to perform their duties in a safe and healthful manner.
- The program provides
  - Training and information for new workers, before or at the time of initial assignment to a job involving exposure to a hazard;
  - Periodic training as often as necessary to ensure that workers are adequately trained and informed; and

— Additional training when safety and health information or a change in workplace conditions indicates that a new or increased hazard exists.

- Training and information is provided to workers who have worker safety and health program responsibilities to enable them to carry out those responsibilities.

29 CFR Part 1910 **(**known as the "Hazard Communications" or "Right-to-Know" standards) requires hazard communication (HAZCOM) information and training for employees such as

- The physical and health hazards associated with hazardous chemicals, including those contained in unlabeled pipes, in the work area;
- Methods and observations used to detect the presence or release of hazardous chemicals (e.g., monitors, alarms, odors, appearance);
- Measures employees may take to protect themselves from exposure to hazardous chemicals, such as appropriate work practices, emergency procedures, and personal protective equipment;
- Information on operations in the work area where hazardous chemicals are present (an explanation of the labeling system and the material safety data sheets (MSDSs)]
- How to access a list(s) of hazardous chemicals present in the work area and associated MSDSs; and
- The location of the facility's written Hazard Communication Program.

This training may be accomplished through completion of General HAZCOM training and job-specific ES&H training.

The Training Plan provides guidance for the critical Project ES&H requirements. Emphasis shall be given to health and safety requirements during the receipt, handling, and sampling of elemental mercury and associated waste.

S5.9.3 References

RCRA regulations associated with training:

40 CFR Part 264—Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities. Training for:

40 CFR 264.15(c,d)—General Inspection Requirements
40 CFR 264.16—Personnel Training
40 CFR 264.73(b)(5)—Operating Record
40 CFR 264.171—Condition of Containers
40 CFR 264.172—Compatibility of Waste with Containers
40 CFR 264.173—Management of Containers
40 CFR 264.174—Inspections

40 CFR Part 265—Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities. Training for:

40 CFR 265.15(c,d)—General Inspection Requirements
40 CFR 265.16—Personnel Training
40 CFR 265.73(b)(5)—Operating Record
40 CFR 265.171—Condition of Containers
40 CFR 265.172—Compatibility of Waste with Containers

40 CFR 265.173—Management of Containers
40 CFR 265.174—Inspections

40 CFR Part 270—EPA Administered Permit Programs: The Hazardous Waste Permit Program. Training for:

40 CFR 270.14(b)(5)—Contents of Part B (Permit Application): General Requirements

DOE regulations associated with training:

10 CFR Part 851—Worker Safety and Health Program

10 CFR 851.25—Training and information

DOE Order (O) 414.1C(a), *Quality Assurance*

DOT regulations associated with training:

49 CFR 172.702—Applicability and responsibility for training and testing.
49 CFR 172.704—Training requirements

OSHA regulations associated with training:

29 CFR 1910.120—Hazardous waste operations and emergency response (HAZWOPER)

29 CFR 1910.120(p)(8)—RCRA/emergency response program/training
29 CFR 1910.120(q)—Emergency response to hazardous substance releases/training

PROCEDURE (P)

TRAINING REQUIREMENTS FOR A DOE ELEMENTAL MERCURY STORAGE FACILITY

P5.9.1 Introduction

This procedure provides training guidance in support of long-term storage of elemental mercury. These requirements may be captured in the OC's Training Plan that will be approved by DOE. The OC's training program must ensure that project personnel have been provided the training needed to complete their designated tasks and that personnel are aware of management expectations related to job performance.

This procedure includes training for key disciplines to ensure compliant operations at the elemental mercury storage facility. These disciplines include RCRA, DOT, ES&H, and QA/QC.

This procedure is to be reviewed for possible revision either annually, when there is a change in the training requirements, or whenever any of the disciplines has experienced a problem that suggests the procedure and associated training is deficient (i.e., internal deficiencies noted, or Notice of Violation or Notice of Deficiency issued by regulators).

P5.9.2 Precautions/Limitations

Prior to conducting work assignments, personnel must complete the training as designated by the Training Plan and the corresponding needs analysis. When on-the-job training is being conducted, the

trainee is accompanied by a trained person. These precautions/limitations are to be discussed in the Training Plan.

P5.9.3 Requirements

The Project Training Plan shall provide details as to the training modules and methods the contractor uses to ensure personnel are adequately trained to complete their assigned tasks in accordance with the following.

- DOE (U.S. Department of Energy). June 17, 2005. DOE Order 414.1C, Quality Assurance, Washington, D.C. Accessed (May 13, 2009) on the Web at URL http://www.directives.doe.gov/pdfs/doe/doetext/neword/414/o4141c.pdf
- U.S. EPA (Environmental Protection Agency), 40 CFR Part 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities"
- U.S. EPA (Environmental Protection Agency), 40 CFR Part 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities"
- U.S. EPA (Environmental Protection Agency), 40 CFR Part 270, "EPA Administered Permit Programs: The Hazardous Waste Permit Program"
- U.S. DOT (Department of Transportation) 49 CFR 172.702, "Training"
- *Mercury Export Ban Act of 2008*, Section 5(d)(2), "Training," Public Law 110-414 (October 14, 2008)
- 29 CFR Part 1910, Hazard Communications
- 10 CFR Part 851, Worker Safety and Health

Once the storage facility has a RCRA hazardous waste facility permit, the permit may have additional training requirements/conditions that must be met and incorporated into the training plan/program and associated procedures.

P5.9.4 Prerequisites

Personnel completing RCRA activities to include critical facility and container management operations are expected to have the experience necessary to be certified within 6 months of hire date or possess the following certifications:

- RCRA TSD training (in accordance with the RCRA training plan for the storage facility), and
- DOT training.

P5.9.5 Action Steps (RCRA Training)

- Facility personnel successfully complete RCRA training within 6 months after the date of their employment, assignment to the facility, or transfer to a new position at a facility, whichever is later. Employees who have not completed this training shall not work unsupervised.
- Facility personnel take part in an annual review of RCRA training.
- A RCRA Training Program Director is appointed for the elemental mercury storage facility.
- Training program director, in consultation with the elemental mercury storage facility manager, defines training requirements for facility personnel and develops the following:
  - The job title for each position at the facility related to hazardous waste management, and the name of that employee filling each job;
  - A written job description for each position in the above dashed item; and

- — A written description of the type and amount of both introductory and continuing training for assigned positions.

- Classroom, on-the-job, and/or Web-based training module(s) are developed and implemented to ensure that facility personnel are fully trained to complete their job and comply with RCRA and other discipline requirements.

P5.9.6 Records

Training records are to be specified in the Training Plan.

Records relevant to this procedure include, but are not limited, to the following.

- Training records on current personnel must be maintained until closure of the facility.
- Training records for former employees must be maintained for 3 years from the last date the employee worked at the facility.
- Personnel training records may accompany personnel transferred within the same company.
- Training records are to include the following:
  - — The job title for each position at the facility related to hazardous waste management, and the name of that employee filling each job
  - — A written job description for each position in the above bullet
  - — A written description of the type and amount of both introductory and continuing training for the assigned positions
  - — Employee training records as specified in the Training Plan
  - — Inspector Certification Records
  - — Program Training Modules

P5.9.7 References

The following documents are recommended for use in developing this training procedure:

RCRA training requirements:

40 CFR Part 264—Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

40 CFR 264.16—Personnel Training

40 CFR Part 265—Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities

40 CFR 265.16—Personnel Training

40 CFR Part 270—EPA Administered Permit Programs: The Hazardous Waste Permit Program

DOE training requirements:

DOE Order (O) 414.1C, *Quality Assurance*
10 CFR Part 851—Worker Safety and Health

DOT training requirements:

DOT 49 CFR 172.702—Training

OSHA training requirements:

29 CFR 1910.120—HAZWOPER Training

Mercury Export Ban Act of 2008, Section 5(d)(2), "Training," Public Law 110-414 (October 14, 2008).

ECOS (Environmental Council of the States). October 2003. *Mercury Stewardship Best Management Practices*, Quicksilver Caucus and U.S. Environmental Protection Agency, Washington, D.C. Accessed (07-28-09) on the Web at URL: http://www.ecos.org/files/720_file_QSC_BMP_Oct_03.pdf

AWS (American Welding Society) QC1:2007, *Standard for AWS Certification of Welding Inspectors*, 2007.

P5.9.8 Links to Supplementary Information per Procedure

DOE Order 414.1C (*Quality Assurance*), accessed (05-28-09) on the Web at the URL http://www.directives.doe.gov/pdfs/doe/doetext/neword/414/o4141c.pdf

U.S. EPA RCRA training web site: http://www.epa.gov/epawaste/inforesources/pubs/hotline/rmods.htm

U.S. EPA RCRA generator training module web site: http://www.epa.gov/epawaste/inforesources/pubs/hotline/training/gen05.pdf

U.S. EPA RCRA Air Emission Training for TSDFs and Generators web site: http://www.epa.gov/epawaste/hazard/tsd/td/ldu/pdf/subcc.pdf

Appendix A
MERCURY EXPORT BAN ACT OF 2008

Appendix A. MERCURY EXPORT BAN ACT OF 2008

A.1 DISCUSSION

This appendix provides the *Mercury Export Ban Act of 2008* (Public Law No. 110-414), which was signed into law on October 14, 2008.

A.2 REFERENCE

Mercury Export Ban Act of 2008, Public Law 110-414 (October 14, 2008).

AUTHENTICATED
U.S. GOVERNMENT
INFORMATION
GPO

Public Law 110–414
110th Congress

An Act

To prohibit the sale, distribution, transfer, and export of elemental mercury, and for other purposes.

Oct. 14, 2008
[S. 906]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled,

Mercury Export Ban Act of 2008.
15 USC 2601 note.

SECTION 1. SHORT TITLE.

This Act may be cited as the "Mercury Export Ban Act of 2008".

15 USC 2611 note.

SEC. 2. FINDINGS.

Congress finds that—

(1) mercury is highly toxic to humans, ecosystems, and wildlife;

(2) as many as 10 percent of women in the United States of childbearing age have mercury in the blood at a level that could put a baby at risk;

(3) as many as 630,000 children born annually in the United States are at risk of neurological problems related to mercury;

(4) the most significant source of mercury exposure to people in the United States is ingestion of mercury-contaminated fish;

(5) the Environmental Protection Agency reports that, as of 2004—

(A) 44 States have fish advisories covering over 13,000,000 lake acres and over 750,000 river miles;

(B) in 21 States the freshwater advisories are statewide; and

(C) in 12 States the coastal advisories are statewide;

(6) the long-term solution to mercury pollution is to minimize global mercury use and releases to eventually achieve reduced contamination levels in the environment, rather than reducing fish consumption since uncontaminated fish represents a critical and healthy source of nutrition worldwide;

(7) mercury pollution is a transboundary pollutant, depositing locally, regionally, and globally, and affecting water bodies near industrial sources (including the Great Lakes) and remote areas (including the Arctic Circle);

(8) the free trade of elemental mercury on the world market, at relatively low prices and in ready supply, encourages the continued use of elemental mercury outside of the United States, often involving highly dispersive activities such as artisinal gold mining;

(9) the intentional use of mercury is declining in the United States as a consequence of process changes to manufactured products (including batteries, paints, switches, and measuring devices), but those uses remain substantial in the developing world where releases from the products are extremely likely due to the limited pollution control and waste management infrastructures in those countries;

(10) the member countries of the European Union collectively are the largest source of elemental mercury exports globally;

(11) the European Commission has proposed to the European Parliament and to the Council of the European Union a regulation to ban exports of elemental mercury from the European Union by 2011;

(12) the United States is a net exporter of elemental mercury and, according to the United States Geological Survey, exported 506 metric tons of elemental mercury more than the United States imported during the period of 2000 through 2004; and

(13) banning exports of elemental mercury from the United States will have a notable effect on the market availability of elemental mercury and switching to affordable mercury alternatives in the developing world.

SEC. 3. PROHIBITION ON SALE, DISTRIBUTION, OR TRANSFER OF ELEMENTAL MERCURY.

Section 6 of the Toxic Substances Control Act (15 U.S.C. 2605) is amended by adding at the end the following:

"(f) MERCURY.—

Effective date.

"(1) PROHIBITION ON SALE, DISTRIBUTION, OR TRANSFER OF ELEMENTAL MERCURY BY FEDERAL AGENCIES.—Except as provided in paragraph (2), effective beginning on the date of enactment of this subsection, no Federal agency shall convey, sell, or distribute to any other Federal agency, any State or local government agency, or any private individual or entity any elemental mercury under the control or jurisdiction of the Federal agency.

"(2) EXCEPTIONS.—Paragraph (1) shall not apply to—

"(A) a transfer between Federal agencies of elemental mercury for the sole purpose of facilitating storage of mercury to carry out this Act; or

"(B) a conveyance, sale, distribution, or transfer of coal.

"(3) LEASES OF FEDERAL COAL.—Nothing in this subsection prohibits the leasing of coal.".

SEC. 4. PROHIBITION ON EXPORT OF ELEMENTAL MERCURY.

Section 12 of the Toxic Substances Control Act (15 U.S.C. 2611) is amended—

(1) in subsection (a) by striking "subsection (b)" and inserting "subsections (b) and (c)"; and

(2) by adding at the end the following:

"(c) PROHIBITION ON EXPORT OF ELEMENTAL MERCURY.—

Effective date.

"(1) PROHIBITION.—Effective January 1, 2013, the export of elemental mercury from the United States is prohibited.

"(2) INAPPLICABILITY OF SUBSECTION (a).—Subsection (a) shall not apply to this subsection.

"(3) REPORT TO CONGRESS ON MERCURY COMPOUNDS.—

"(A) REPORT.—Not later than one year after the date of enactment of the Mercury Export Ban Act of 2008, the Administrator shall publish and submit to Congress a report on mercuric chloride, mercurous chloride or calomel, mercuric oxide, and other mercury compounds, if any, that may currently be used in significant quantities in products or processes. Such report shall include an analysis of— Publication.

"(i) the sources and amounts of each of the mercury compounds imported into the United States or manufactured in the United States annually;

"(ii) the purposes for which each of these compounds are used domestically, the amount of these compounds currently consumed annually for each purpose, and the estimated amounts to be consumed for each purpose in 2010 and beyond;

"(iii) the sources and amounts of each mercury compound exported from the United States annually in each of the last three years;

"(iv) the potential for these compounds to be processed into elemental mercury after export from the United States; and

"(v) other relevant information that Congress should consider in determining whether to extend the export prohibition to include one or more of these mercury compounds.

"(B) PROCEDURE.—For the purpose of preparing the report under this paragraph, the Administrator may utilize the information gathering authorities of this title, including sections 10 and 11.

"(4) ESSENTIAL USE EXEMPTION.—(A) Any person residing in the United States may petition the Administrator for an exemption from the prohibition in paragraph (1), and the Administrator may grant by rule, after notice and opportunity for comment, an exemption for a specified use at an identified foreign facility if the Administrator finds that—

"(i) nonmercury alternatives for the specified use are not available in the country where the facility is located;

"(ii) there is no other source of elemental mercury available from domestic supplies (not including new mercury mines) in the country where the elemental mercury will be used;

"(iii) the country where the elemental mercury will be used certifies its support for the exemption;

"(iv) the export will be conducted in such a manner as to ensure the elemental mercury will be used at the identified facility as described in the petition, and not otherwise diverted for other uses for any reason;

"(v) the elemental mercury will be used in a manner that will protect human health and the environment, taking into account local, regional, and global human health and environmental impacts;

"(vi) the elemental mercury will be handled and managed in a manner that will protect human health and the environment, taking into account local, regional, and global human health and environmental impacts; and

"(vii) the export of elemental mercury for the specified use is consistent with international obligations of the United States intended to reduce global mercury supply, use, and pollution.

"(B) Each exemption issued by the Administrator pursuant to this paragraph shall contain such terms and conditions as are necessary to minimize the export of elemental mercury and ensure that the conditions for granting the exemption will be fully met, and shall contain such other terms and conditions as the Administrator may prescribe. No exemption granted pursuant to this paragraph shall exceed three years in duration and no such exemption shall exceed 10 metric tons of elemental mercury.

"(C) The Administrator may by order suspend or cancel an exemption under this paragraph in the case of a violation described in subparagraph (D).

"(D) A violation of this subsection or the terms and conditions of an exemption, or the submission of false information in connection therewith, shall be considered a prohibited act under section 15, and shall be subject to penalties under section 16, injunctive relief under section 17, and citizen suits under section 20.

"(5) CONSISTENCY WITH TRADE OBLIGATIONS.—Nothing in this subsection affects, replaces, or amends prior law relating to the need for consistency with international trade obligations.

"(6) EXPORT OF COAL.—Nothing in this subsection shall be construed to prohibit the export of coal.".

Deadline.
42 USC 6939f.

SEC. 5. LONG-TERM STORAGE.

(a) DESIGNATION OF FACILITY.—

(1) IN GENERAL.—Not later than January 1, 2010, the Secretary of Energy (referred to in this section as the "Secretary") shall designate a facility or facilities of the Department of Energy, which shall not include the Y–12 National Security Complex or any other portion or facility of the Oak Ridge Reservation of the Department of Energy, for the purpose of long-term management and storage of elemental mercury generated within the United States.

(2) OPERATION OF FACILITY.—Not later than January 1, 2013, the facility designated in paragraph (1) shall be operational and shall accept custody, for the purpose of long-term management and storage, of elemental mercury generated within the United States and delivered to such facility.

(b) FEES.—

(1) IN GENERAL.—After consultation with persons who are likely to deliver elemental mercury to a designated facility for long-term management and storage under the program prescribed in subsection (a), and with other interested persons, the Secretary shall assess and collect a fee at the time of delivery for providing such management and storage, based on the pro rata cost of long-term management and storage of elemental mercury delivered to the facility. The amount of such fees—

Public information.

(A) shall be made publically available not later than October 1, 2012;

(B) may be adjusted annually; and

(C) shall be set in an amount sufficient to cover the costs described in paragraph (2).

(2) COSTS.—The costs referred to in paragraph (1)(C) are the costs to the Department of Energy of providing such management and storage, including facility operation and maintenance, security, monitoring, reporting, personnel, administration, inspections, training, fire suppression, closure, and other costs required for compliance with applicable law. Such costs shall not include costs associated with land acquisition or permitting of a designated facility under the Solid Waste Disposal Act or other applicable law. Building design and building construction costs shall only be included to the extent that the Secretary finds that the management and storage of elemental mercury accepted under the program under this section cannot be accomplished without construction of a new building or buildings.

(c) REPORT.—Not later than 60 days after the end of each Federal fiscal year, the Secretary shall transmit to the Committee on Energy and Commerce of the House of Representatives and the Committee on Environment and Public Works of the Senate a report on all of the costs incurred in the previous fiscal year associated with the long-term management and storage of elemental mercury. Such report shall set forth separately the costs associated with activities taken under this section.

(d) MANAGEMENT STANDARDS FOR A FACILITY.—

(1) GUIDANCE.—Not later than October 1, 2009, the Secretary, after consultation with the Administrator of the Environmental Protection Agency and all appropriate State agencies in affected States, shall make available, including to potential users of the long-term management and storage program established under subsection (a), guidance that establishes procedures and standards for the receipt, management, and long-term storage of elemental mercury at a designated facility or facilities, including requirements to ensure appropriate use of flasks or other suitable shipping containers. Such procedures and standards shall be protective of human health and the environment and shall ensure that the elemental mercury is stored in a safe, secure, and effective manner. In addition to such procedures and standards, elemental mercury managed and stored under this section at a designated facility shall be subject to the requirements of the Solid Waste Disposal Act, including the requirements of subtitle C of that Act, except as provided in subsection (g)(2) of this section. A designated facility in existence on or before January 1, 2013, is authorized to operate under interim status pursuant to section 3005(e) of the Solid Waste Disposal Act until a final decision on a permit application is made pursuant to section 3005(c) of the Solid Waste Disposal Act. Not later than January 1, 2015, the Administrator of the Environmental Protection Agency (or an authorized State) shall issue a final decision on the permit application.

Procedures. Standards.

Deadline.

(2) TRAINING.—The Secretary shall conduct operational training and emergency training for all staff that have responsibilities related to elemental mercury management, transfer, storage, monitoring, or response.

(3) EQUIPMENT.—The Secretary shall ensure that each designated facility has all equipment necessary for routine operations, emergencies, monitoring, checking inventory, loading, and storing elemental mercury at the facility.

(4) FIRE DETECTION AND SUPPRESSION SYSTEMS.—The Secretary shall—

(A) ensure the installation of fire detection systems at each designated facility, including smoke detectors and heat detectors; and

(B) ensure the installation of a permanent fire suppression system, unless the Secretary determines that a permanent fire suppression system is not necessary to protect human health and the environment.

(e) INDEMNIFICATION OF PERSONS DELIVERING ELEMENTAL MERCURY.—

(1) IN GENERAL.—(A) Except as provided in subparagraph (B) and subject to paragraph (2), the Secretary shall hold harmless, defend, and indemnify in full any person who delivers elemental mercury to a designated facility under the program established under subsection (a) from and against any suit, claim, demand or action, liability, judgment, cost, or other fee arising out of any claim for personal injury or property damage (including death, illness, or loss of or damage to property or economic loss) that results from, or is in any manner predicated upon, the release or threatened release of elemental mercury as a result of acts or omissions occurring after such mercury is delivered to a designated facility described in subsection (a).

(B) To the extent that a person described in subparagraph (A) contributed to any such release or threatened release, subparagraph (A) shall not apply.

Records.

(2) CONDITIONS.—No indemnification may be afforded under this subsection unless the person seeking indemnification—

Notification.
Deadline.

(A) notifies the Secretary in writing within 30 days after receiving written notice of the claim for which indemnification is sought;

(B) furnishes to the Secretary copies of pertinent papers the person receives;

(C) furnishes evidence or proof of any claim, loss, or damage covered by this subsection; and

(D) provides, upon request by the Secretary, access to the records and personnel of the person for purposes of defending or settling the claim or action.

(3) AUTHORITY OF SECRETARY.—(A) In any case in which the Secretary determines that the Department of Energy may be required to make indemnification payments to a person under this subsection for any suit, claim, demand or action, liability, judgment, cost, or other fee arising out of any claim for personal injury or property damage referred to in paragraph (1)(A), the Secretary may settle or defend, on behalf of that person, the claim for personal injury or property damage.

(B) In any case described in subparagraph (A), if the person to whom the Department of Energy may be required to make indemnification payments does not allow the Secretary to settle or defend the claim, the person may not be afforded indemnification with respect to that claim under this subsection.

(f) TERMS, CONDITIONS, AND PROCEDURES.—The Secretary is authorized to establish such terms, conditions, and procedures as are necessary to carry out this section.

(g) EFFECT ON OTHER LAW.—

(1) IN GENERAL.—Except as provided in paragraph (2), nothing in this section changes or affects any Federal, State, or local law or the obligation of any person to comply with such law.

(2) EXCEPTION.—(A) Elemental mercury that the Secretary is storing on a long-term basis shall not be subject to the storage prohibition of section 3004(j) of the Solid Waste Disposal Act (42 U.S.C. 6924(j)). For the purposes of section 3004(j) of the Solid Waste Disposal Act, a generator accumulating elemental mercury destined for a facility designated by the Secretary under subsection (a) for 90 days or less shall be deemed to be accumulating the mercury to facilitate proper treatment, recovery, or disposal.

Certification.

(B) Elemental mercury may be stored at a facility with respect to which any permit has been issued under section 3005(c) of the Solid Waste Disposal Act (42 U.S.C. 6925(c)), and shall not be subject to the storage prohibition of section 3004(j) of the Solid Waste Disposal Act (42 U.S.C. 6924(j)) if—

(i) the Secretary is unable to accept the mercury at a facility designated by the Secretary under subsection (a) for reasons beyond the control of the owner or operator of the permitted facility;

(ii) the owner or operator of the permitted facility certifies in writing to the Secretary that it will ship the mercury to the designated facility when the Secretary is able to accept the mercury; and

(iii) the owner or operator of the permitted facility certifies in writing to the Secretary that it will not sell, or otherwise place into commerce, the mercury.

This subparagraph shall not apply to mercury with respect to which the owner or operator of the permitted facility fails to comply with a certification provided under clause (ii) or (iii).

Deadline.

(h) STUDY.—Not later than July 1, 2014, the Secretary shall transmit to the Congress the results of a study, conducted in consultation with the Administrator of the Environmental Protection Agency, that—

(1) determines the impact of the long-term storage program under this section on mercury recycling; and

(2) includes proposals, if necessary, to mitigate any negative impact identified under paragraph (1).

SEC. 6. REPORT TO CONGRESS.

At least 3 years after the effective date of the prohibition on export of elemental mercury under section 12(c) of the Toxic Substances Control Act (15 U.S.C. 2611(c)), as added by section 4 of this Act, but not later than January 1, 2017, the Administrator of the Environmental Protection Agency shall transmit to the Committee on Energy and Commerce of the House of Representatives and the Committee on Environment and Public Works of the Senate a report on the global supply and trade of elemental mercury, including but not limited to the amount of elemental mercury

traded globally that originates from primary mining, where such primary mining is conducted, and whether additional primary mining has occurred as a consequence of this Act.

Approved October 14, 2008.

LEGISLATIVE HISTORY—S. 906:

SENATE REPORTS: No. 110–477 (Comm. on Environment and Public Works).
CONGRESSIONAL RECORD, Vol. 154 (2008):
Sept. 26, considered and passed Senate.
Sept. 27, 29, considered and passed House.

Appendix B
QUALITY ASSURANCE PROJECT PLAN CRITERIA

Appendix B. QUALITY ASSURANCE PROJECT PLAN CRITERIA

B.1 DISCUSSION

This appendix summarizes, in Table B.1, detailed requirements in DOE Order 414.1C, *Quality Assurance* (DOE June 17, 2005), which are associated with criteria that may be specified in a quality assurance project plan (QAPP) for a DOE elemental mercury storage facility. As a Best Management Practice, the QAPP for such a facility would address the management, performance, and assessment criteria and requirements listed in this table.

B.2 REFERENCE

DOE (U.S. Department of Energy). June 17, 2005. DOE Order 414.1C, *Quality Assurance*, Washington, D.C. Accessed (May 13, 2009) on the Web at URL: http://www.directives.doe.gov/pdfs/doe/doetext/neword/414/o4141c.pdf

Table B.1. Summary of quality assurance project plan requirements in DOE Order 414.1C for a DOE elemental mercury storage facility

Criterion No.	Category/type	Requirement(s)
1	Management/program	(a) Establish an organizational structure, functional responsibilities, levels of authority, and interfaces for those managing, performing, and assessing work. (b) Establish management processes, including planning, scheduling, and providing resources for work.
2	Management/personnel training and qualification	(a) Train and qualify personnel to be capable of performing assigned work. (b) Provide continuing training to personnel to maintain job proficiency.
3	Management/quality improvement	(a) Establish and implement processes to detect and prevent quality problems. (b) Identify, control, and correct items, services, and processes that do not meet established requirements. (c) Identify the causes of problems, and include prevention of recurrence as a part of corrective action planning. (d) Review item characteristics, process implementation, and other quality-related information to identify items, services, and processes needing improvement.
4	Management/documents and records	(a) Prepare, review, approve, issue, use, and revise documents to prescribe processes, specify requirements, or establish design. (b) Specify, prepare, review, approve, and maintain records.
5	Performance/work processes	(a) Perform work consistent with technical standards, administrative controls, and hazard controls adopted to meet regulatory or contract requirements using approved instructions, procedures, etc. (b) Identify and control items to ensure their proper use. (c) Maintain items to prevent their damage, loss, or deterioration. (d) Calibrate and maintain equipment used for process monitoring or data collection.

Table B.1. (continued)

Criterion No.	Category/type	Requirement(s)
6	Performance/design	(a) Design items and processes using sound engineering/scientific principles and appropriate standards. (b) Incorporate applicable requirements and design bases in design work and design changes. (c) Identify and control design interfaces. (d) Verify/validate the adequacy of design products using individuals or groups other than those who performed the work. (e) Verify/validate work before approval and implementation of the design.
7	Performance/procurement	(a) Procure items and services that meet established requirements and perform as specified. (b) Evaluate and select prospective suppliers on the basis of specified criteria. (c) Establish and implement processes to ensure that approved suppliers continue to provide acceptable items and services.
8	Performance/inspection and acceptance testing	(a) Inspect and test specified items, services, and processes using established acceptance and performance criteria. (b) Calibrate and maintain equipment used for inspections and tests.
9	Assessment/management	Ensure that managers assess their management processes and identify and correct problems that hinder the organization from achieving its objectives.
10	Assessment/independent	(a) Plan and conduct independent assessments to measure item and service quality and the adequacy of work performance and to promote improvement. (b) Establish sufficient authority and freedom from line management for independent assessment teams. (c) Ensure that persons conducting independent assessments are technically qualified and knowledgeable in the areas to be assessed.

Appendix C
DRAFT GUIDANCE FOR MERCURY TRANSFER

Appendix C. DRAFT GUIDANCE FOR MERCURY TRANSFER

These operations and equipment described herein are not intended to be definitive requirements but rather Guidance for consideration. Based on incorporating expert guidance in container acceptance methodology, the risk of receiving a container that has leaked liquid is very, very low. The handling and controlled ventilation/hood area is primarily used for sampling verification, and very infrequent cleanup of external mercury contamination (e.g., beads) on containers.

Assume that the container will have been placed in an overpack at the inspection/acceptance station, or include equivalent leak confinement during intra-site transport.

For a fixed facility, a stand-up filtered and permitted hood, with material-handling equipment integrated in a logical manner, is recommended. In this example note that the snorkel must be proximal to the transfer operations whenever a container is open, and breathing-zone monitoring must be done often using an appropriate vapor monitor (e.g., Jerome or VM-3000) to verify safe levels for workers handling the containers.

1. The following equipment may be needed for setup and/or available before starting transfer operations:
    a. Vacuum hand pump [aspirator pump for collecting traces of mercury contamination (e.g., small beads)]
    b. Large vacuum cleaner fitted with sulfide-impregnated filter and high-efficiency particulate air filter
    c. Flexible berm material to contain a spill outside of the pan, at least 10 ft in length
    d. Impact wrench to remove container plug
    e. Teflon tape to rewrap the "old" plugs
    f. Customized slotted-socket tool for the impact wrench (Figure C.1)
    g. Snorkel connected to a vacuum with a sulfide-impregnated filter [e.g., Airfiltronix® equipment has been successfully used by ORNL (Figure C.2)]. Note: It may require more than one unit to provide adequate personnel protection
    h. New 3-L or 1-MT containers that are qualified for mercury storage and transport
    i. Weigh-scale, large-mouth funnel
    j. Table under fume hood with liner material; Herculite® and rubberized waffle material have been successfully used (Figure C.3)
    k. Peristaltic pump fitted with tygon tubing (approximately 60 in. will be needed; 3/8-in. I.D. tubing size, for case of 3-L container)
    l. Dip tubes—two (3/8-in.-diameter tubes, approximately 13 in. long, for case of 3-L container)
    m. Box with tight-sealing lid to store empty containers; may also use large sealable plastic bags prior to placing containers in the box
    n. Spill cleanup kit containing mercury absorbent materials, gauze
    o. Eye-wash station
    p. Mercury vapor monitoring instrumentation
    q. Plastic bags for covering equipment (Figure C.3)
    r. Personal protective equipment (PPE), that is, safety glasses, nitrile gloves, lab coat, safety shoes (Figure C.4)

Figure C.1. Impact wrench. Note the slotted socket tool.

Figure C.2. Snorkel.

Figure C.3. The peristaltic pump is shown contained in a separate plastic-lined pan. Vacuum transfers could also be applied. (The clear plastic bottle shown above was used as an intermediate container for this transfer operation as a way to visually inspect the mercury.)

Figure C.4. Transfer operations in a large floor pan. Transfer operations should be performed on a table under a fume hood.

2. Visually inspect the containers and remove any visible mercury contamination (e.g., beads) using the hand vacuum (aspirator) pump and/or wipes soaked with Merc-X solution, or equivalent.

3. Obtain the weight of the empty new container (including plug). Record the weight on the container. (Alternatively, the contents of the leaking container could be transferred to a 1-MT container that has been designated to accumulate mercury from several 3-L container. If a 1-MT container is used, weigh it before and after the transfer and record the results on the container. Note that RCRA requirements for container inspections apply in this case.)

4. Place a container onto the work table. The table may need to have a lip large enough to contain a full-container inventory of mercury in the event of a major spill; the table also contains the (new) empty container and the peristaltic pump/tubing and/or vacuum-assisted transfer assembly, if used as the transfer mode. (If leaking container is transferred into a 1-MT container, the container and tubing must have a suitable pan beneath them that could contain the contents of a full 1-MT container, and vacuum transfer could be employed.) Evaluate and implement actions to prevent microdroplets of mercury from being spread during transfer operations.

5. Using the peristaltic pump, transfer mercury from the old container into the new container; wipe the transfer tube with gauze whenever the tube is extracted from a container to remove the mercury contamination (e.g., microbeads) that always "cling" to a stainless steel tube when it is immersed in mercury. The small quantity of mercury that remains in the old container after the peristaltic pump loses its vacuum must be poured from the old container into the new container using a wide mouth funnel. Care must be taken to avoid bead splatter on the funnel wall, so pour slowly into a gauze cloth or equivalent (Figure C.4).

6. Install a Teflon-wrapped plug into the new container, and mark the container with the identification number of the original container. (If a 1-MT container is used to accumulate mercury from leaking containers, record the added mass and source container on the container after each addition.)

7. Weigh the newly filled container. Record the weight on the container. (If a 1-MT container is used, reweigh the container and record its weight and the date weighed on the container. A record of additions by date, mass, and source should be permanently marked on the container.)

8. Follow up by installing a metal-stamped steel tag on the container.

9. After the plug has been installed into the old container, inspect the container for visible mercury and check its exterior for mercury vapor levels using the appropriate vapor monitor.

10. Pack empty containers according to their disposition, and store them appropriately or send them for disposal.

11. Mark the newly filled container appropriately and place it into the Storage area.

Appendix D
GUIDANCE FOR RECORDS MANAGEMENT

Appendix D. GUIDANCE FOR RECORDS MANAGEMENT

These documents are included as it is essential that all facility staff learn to distinguish between records and nonrecord materials for the facility to meet Federal regulations.

D.1 RECORDS MANAGEMENT DEFINITIONS

Adequate and proper documentation means a record of the conduct of Government business that is complete and accurate to the extent required to document the organization, functions, policies, decisions, procedures, and essential transactions of DOE and that is designed to furnish the information necessary to protect the legal and financial rights of the Government and of persons directly affected by the DOE's activities.

Appraisal is the process by which the National Archives and Records Administration (NARA) determines the value and thus the final disposition of Federal records, making them either temporary or permanent.

Controlled Document means any document regardless of format (paper, electronic) or delivery method for which distribution and status are to be kept current by the issuer to ensure that authorized holders or users have available the most up-to-date version.

Disposition means those actions taken regarding records no longer needed for the conduct of the regular current business of the agency.

Documentary materials is a collective term for records and nonrecord materials that refers to all media on which information is recorded, regardless of the nature of the medium or the method or circumstances of recording.

Electronic Records means information recorded in a form that only a computer can process that satisfies the definition of a record. Electronic records are preferably kept in recordkeeping systems but may be created, stored, and managed in any form of electronic information system or application program.

File means an arrangement of records. The term is used to denote papers, photographs, photographic copies, maps, machine-readable information, or other recorded information regardless of physical form or characteristics, accumulated or maintained in filing equipment, boxes, or machine-readable media, or on shelves, and occupying office or storage space.

National Archives of the United States means the Agency responsible for appraising, accessioning, preserving, and making available permanent Federal records.

Nonrecord materials are those Federally owned informational materials that do not meet the statutory definition of "records" or that have been excluded from coverage by the definition. Extra copies of documents kept only for reference, stocks of publications and processed documents, and library or museum materials intended solely for reference or exhibit are excluded materials.

Permanent record means any Federal record that has been determined by NARA to have sufficient value to warrant its preservation in the National Archives of the United States.

Recordkeeping requirements mean all statements in statutes, regulations, and agency directives or authoritative issuances that provide general and specific requirements for DOE or contractor personnel on particular records to be created and maintained by the agency.

Recordkeeping system is a manual or automated system in which records are collected, organized, and categorized to facilitate their preservation, retrieval, use, and disposition.

Records include all books, papers, maps, photographs, machine-readable materials, or other documentary materials, regardless of physical form or characteristics, made or received by DOE under Federal law or in connection with the transaction of public business and preserved or appropriate for preservation by that agency or its legitimate successor as evidence of the organization, functions, policies, decisions, procedures, operations, or other activities of the Government or because of the informational value of the data in them [44 USC 3301 (Disposal of Records, Definition of Records)].

Records center is defined in 44 USC 2901(6) (Records Management by the Archivist of the United States and by the Administration of General Services, Definitions) as an establishment maintained and operated by DOE primarily for the storage, servicing, security, and processing of records which need to be preserved for varying periods of time and need not be retained in office equipment or space.

Records maintenance and use means any activity involving location of records of DOE: the storage, retrieval, and handling of records kept at office file locations by or for the Agency.

Records management means the planning, controlling, directing, organizing, training, promoting, and other managerial activities involved with respect to records creation, records maintenance and use, and records disposition in order to achieve adequate and proper documentation of the policies and transactions of DOE and effective and economical management of agency operations.

Records schedule means the printed DOE manual or directive containing the records descriptions and disposition instructions approved by the National Archives and Records Administration (NARA).

Series means file units or documents arranged according to a filing system or kept together because they relate to a particular subject or function, result from the same activity, document a specific kind of transaction, take a particular physical form, or have some other relationship arising out of their creation, receipt, or use, such as restrictions on access and use (also called a records series).

Temporary records are any records which have been determined by the Archivist of the United States to have insufficient value (on the basis of current standards) to warrant its preservation by NARA. This determination may take the form of a DOE records disposition schedule approved by NARA (SF 115, “Request for Records Disposition Authority”) or a general records schedule issued by NARA.

Vital Records means those records that are essential to the continued functioning or reconstitution of an organization during and after an emergency including those records essential to protecting the rights and interests of that organization and of the individuals directly affected by its activities. Vital records are sometimes called essential records. Vital records considerations are part of DOE’s continuation of operations program.

D.2 RCRA REQUIREMENTS FOR RECORDKEEPING

D.2.1 Purpose

RCRA requirements for recordkeeping are designed to ensure that regulated parties maintain sufficient records to demonstrate that hazardous wastes were properly characterized and managed from the point of generation (by the generator) until final disposition (via treatment or disposal). Recordkeeping (e.g., waste tracking) is critical to the cradle-to-grave management system that RCRA imposes for hazardous wastes.

D.2.2 Responsibilities

All parties that manage a hazardous waste [generators, transporters, and treatment, storage, and disposal facilities (TSD)] have some responsibilities for issuing or maintaining records.

D.2.3 Requirements

RCRA is the principal Federal law in the United States governing commercial businesses as well as Federal, State and local government facilities that generate, transport, treat, store, or dispose of hazardous waste. The information below—derived from various links under "Wastes" from EPA's Quick Finder[*]—provides a summary of requirements, followed by a detailed listing of the Federal regulations governing the processes involved in the long-term storage of elemental mercury.

a. **Generators:** Hazardous waste generators are divided into categories based on the amount of waste they produce each month. Different regulations apply to each generator category. Under RCRA, hazardous waste generators are the first link in the cradle-to-grave hazardous waste management system. All generators must determine if their waste is hazardous and must oversee the ultimate fate of the waste. RCRA Subtitle C requires generators to ensure and fully document that the hazardous waste they produce is properly identified, managed, and treated prior to recycling or disposal, including the following:

- Each biennial report and any exception reports
- All manifests for 3 years from the date on which the hazardous waste was accepted by the initial transporter, or until a signed and dated copy of the manifest is received from the designated facility
- Records of waste analyses and determinations performed by the generator

Note: There are no specific federal requirements for keeping records of the amount of hazardous waste generated by a Conditionally Exempt Small-Quantity Generator (CESQG). However, it is highly recommended. This documentation provides a basis for determining generator status each calendar month and is proof to any regulatory agency that may question monthly generation rates. Hazardous waste that is sent to a treatment, storage, and disposal facility (TSDF) is generally listed on a Uniform Hazardous Waste Manifest or a State manifest. The manifest provides the proper documentation for monthly generation of hazardous waste. If at any time, the monthly generation for the facility exceeds 220 lb, EPA must be notified of the change of generator status (from http://www.ehso.com/Generatr_CESQGl.htm).

b. **Transporters:** Hazardous waste transporters move waste from one site to another by highway, rail, water, or air (see 40 CFR 260.10). This includes transporting hazardous waste from a generator's site to a facility that can recycle, treat, store, or dispose of the waste. It can also include transporting treated hazardous waste to a site for further treatment or disposal. Federal and, in some cases, State regulations govern hazardous waste transportation,

[*]Accessed (09-21-09) on the web at URL http://www.epa.gov/epahome/quickfinder.htm#w

including the Manifest System, a set of forms, reports, and procedures that track hazardous waste from the time it leaves the generator facility until it reaches the waste management facility.

c. **Treatment, Storage, and Disposal:** Requirements for TSDFs govern the treatment, storage, and disposal of hazardous waste, including land disposal, the permitting process, and requirements for TSDFs. The records of hazardous waste activities that owners and operators of TSDFs are required to keep and regularly submit to EPA include the following:

- EPA Identification Number (Form 8700-12)—All facilities that generate, transport, recycle, treat, store, or dispose of hazardous waste are required to notify EPA (or their State agency) of their hazardous waste activities. An EPA Identification Number must be obtained unless the solid waste has been excluded from regulation or their hazardous waste has been exempted.
- Part A (Form 8700-23)—Part A of the permit application is submitted on a designated form, Form 8700-23. The basic Part A information requirements are presented in 40 CFR 270.13.
- Part B—Part B information is submitted in narrative form. It includes general information requirements for all hazardous waste management facilities, as well as unit-specific information. The Part B information requirements presented in 40 CFR 270.14 through 40 CFR 270.27 reflect the standards promulgated in Parts 264 and 266. Section 270.14(b) lists the general information requirements that all hazardous waste management facilities must submit in Part B of the permit application. Owners and operators are required to provide information regarding the placement of hazardous waste and any resultant releases [40 CFR 270.14(c) and (d)].

  Owners and operators must also submit unit-specific information for each hazardous waste management unit at the facility. Sections 270.15 through 270.27 correspond to Part 264, Subparts I through X, AA, BB, CC, and DD, as well as Part 266, Subpart H. For example, if a TSDF manages hazardous waste in containers, the owner and operator must provide a description of the container storage containment design and sketches to demonstrate compliance with the 50-foot buffer zone requirement for ignitable and reactive wastes (40 CFR 264.176). Owners and operators may be required to submit additional information pursuant to 40 CFR 270.10(k) for the purpose of establishing permit conditions under the omnibus provision in RCRA Section 3005(c)(3) [40 CFR 270.32(b)(2) and 270.50(d)]. The omnibus provision allows the Agency to establish conditions not specified in Part 264 or 266 in a permit that are necessary to protect human health and the environment.
- National Biennial RCRA Hazardous Waste Reports—Sections 3002 and 3004 of RCRA require that EPA collect information pertaining to hazardous waste management from hazardous waste generators and hazardous waste TSDFs on a 2-year cycle.
- Hazardous Waste Manifest System—The system includes a set of forms, reports, and procedures designed to seamlessly track hazardous waste from the time it leaves the generator facility where it was produced, until it reaches the off-site waste management facility that will store, treat, or dispose of the hazardous waste.

The recordkeeping requirements under RCRA can be found in the following:

- 40 CFR 260.20—Rulemaking
- 40 CFR Part 262—Standards Applicable to Generators of Hazardous Waste
- 40 CFR Part 263—Standards Applicable to Transporters

- 40 CFR Part 264/265 Subpart B—General Facility Standards
- 40 CFR Part 264/265 Subpart C—Arrangements with Local Authorities
- 40 CFR Part 264/265 Subpart D—Contingency Plan and Emergency Procedures
- 40 CFR Part 264/265 Subpart E—Manifest System, Recordkeeping and Reporting
- 40 CFR Part 264/265 Subpart F—Releases from Solid Waste Management Units
- 40 CFR Part 264/265 Subpart G—Closure and Post-Closure
- 40 CFR Part 264/265 Subpart I—Use and Management of Containers
- 40 CFR Part 264/265 Subpart CC—Air Emission Standards (Containers) Recordkeeping requirements
- Appendix I to Title 40 CFR Part 264/265—Recordkeeping instructions
- 40 CFR Part 270 Subpart B—Permit Application
- 40 CFR 270.31—Requirements for recording and reporting of monitoring results
- 40 CFR Part 270 Subpart D—Changes to Permits
- 40 CFR 268.7—Testing, tracking and recordkeeping requirements for generators, treaters, and disposal facilities
- 40 CFR 268.9—Special rules regarding wastes that exhibit a characteristic

D.2.4 Example Log Sheets for Receipt or Generation of Hazardous Wastes

Keeping and maintaining a log is a good way to comply with the RCRA recordkeeping requirements for waste receipt and waste generation. Waste receipt and waste generation records should include sufficient information to meet biennial reporting* requirements for TSDFs. Examples of a waste receipt log sheet (Table D.1) and a waste generation log sheet (Table D.2) follow.

D.3 EXAMPLES OF FACILITY RECORDS

The list below is not intended to be exhaustive but rather to provide example categories of facility records likely to be generated and/or received by a DOE-designated elemental mercury storage facility.

Administrative

Electronic
EPA Required

Facility Operations/Process
Finance

Inspection/Equipment

Materials Control and Accountability
Medical
Motor Vehicle Maintenance & Operations

Personnel
Procurement/Supply
Property

*Some States require annual reporting on specific forms.

Table D.1. Example waste receipt log sheet										
Date elemental mercury received/stored	**Quantity of elemental mercury shipped/received (lb)**	**No. containers received**	**Manifest no.**	**DOE assigned container tracking numbers**	**Waste code(s)**	**Sender's contact information**	**Generator EPA ID. no.**	**Transporter EPA ID. no.**	**Transporter information**	**DOE storage location**
4-15-2013	76	1	XXXXXXX	090001	D009	John Doe John's Auto Salvage 5678 Something Rd. Anytown, CA 98765	CAXXXXXXXXX	TNXXXXXXXXXX	Shipping R Us 1 Anywhere Rd. Anywhere, TN 3XXXX	Building no. 1 (receiving)
4-22-2013	456	6		090006-090011	U151	John Doe John's Auto Salvage 5678 Something Rd. Anytown, CA 98765	CAXXXXXXXXX	TNXXXXXXXXXX	Shipping R Us 1 Anywhere Rd. Anywhere, TN 3XXXX	Building no. 2. (storage)

Table D.2. Example waste generation log sheet (for TSDF generated wastes)												
Date generated	**Quantity (lb)**	**Container no.**	**Source/generator information**	**Waste characterization information**	**Generator's contact information**	**Date to permitted storage**	**Generator EPA ID no.**	**Transporter EPA ID no.**	**Transporter information**	**DOE storage location**	**Date shipped off-site**	**TSDF handling code**
4-15-2013	6	1	Spill cleanup, Pallet 0001, 4/15/2013 Waste Generation Codes	Form codes, waste codes, analytical reference no.; acceptable knowledge information, etc.	Jack Doe Badge No. Phone No.	6/1/2013	XXXXXXXXXXX	TNXXXXXXXXXX	Shipping R Us 1 Anywhere Rd. Anywhere, TN 3XXXX	Building no. 1 (receiving)	1/5/2014	SO1
4-22-2013	5	2	Spill cleanup, Pallet 0001, 4/15/2013 Waste Generation Codes	Form codes, waste codes, analytical reference no.; acceptable knowledge information, etc.	Jack Doe Badge No. Phone No	7/1/2013	XXXXXXXXXXX	TNXXXXXXXXXX	Shipping R Us 1 Anywhere Rd. Anywhere, TN 3XXXX	Building no. 2 (storage)	1/5/2014	SO1

Quality Assurance

RCRA Required
Records Management
Routine Facility Work

Safety, Security, and Emergency Planning
Shipping

Training
Travel and Transportation

Waste Acceptance
Worker Protection

D.4 RECORDS MANAGEMENT PROCEDURES

D.4.1 Introduction

To ensure that complete and accurate records are made and retained in the DOE System of Records, it is essential that facility staff distinguish between records and nonrecord materials by the appropriate application of the definition of records:

- *Records* include all books, papers, maps, photographs, machine-readable materials, or other documentary materials, regardless of physical form or characteristics, made or received by an agency of the United States Government under Federal law or in connection with the transaction of public business and preserved or appropriate for preservation by that agency or its legitimate successor as evidence of the organization, functions, policies, decisions, procedures, operations or other activities of the Government or because of the informational value of the data in them (44 USC 3301).
- *Nonrecord materials* are those Federally owned informational materials that do not meet the statutory definition of records or that have been excluded from coverage by the definition. Excluded materials are extra copies of documents kept only for reference, stocks of publications and processed documents, and library or museum materials intended solely for reference or exhibit [36 CFR 1220.14 (Federal Records; General definitions)].

D.4.2 Procedures

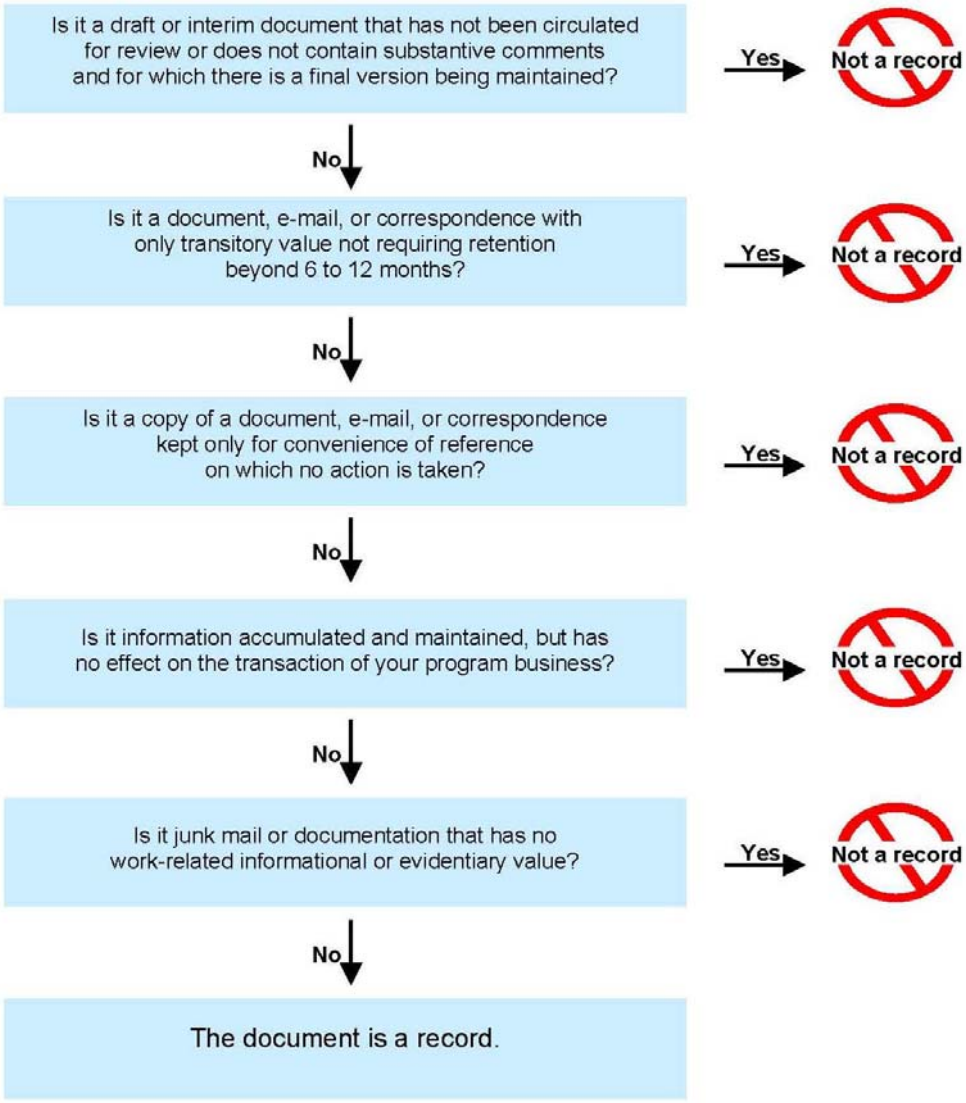
D.4.2.1 Identifying Federal records

1. The document creator or identifier employs Figure D.1, Criteria to Determine Record Status, to determine record status of documentary material. If the answer is "Yes" to any question, material status is Nonrecord and the material is to be maintained for its approved retention period. Otherwise, material status is Record.

   Note 1: See NARA Bulletin 96-06 ("Disposition of Federal Records and Personal Documentary Materials"). Item 7A (Removal of Nonrecord Materials from Agency Custody) regards the retention of nonrecord materials of security-classified information or other restricted information. Such nonrecord materials must remain under the control of DOE.

Criteria to Determine Record Status

If the answer is "Yes" to any of the following questions, the document is not a record.



(June 2009)

Figure D.1. Criteria to determine record status.

2. The Record Owner ensures the adequacy of the documentation and determines if the materials contain information that qualifies it as

   - Vital Records,
   - Privacy Act Records,
   - Official Use Only Information, or
   - Classified Information.

   Note 2: A record can be of more than one type.

3. The Facility Records Manager designates a Records Custodian (RC) to ensure that the documentary material is legible and reproducible, controlled, protected, filed, and properly maintained throughout its life cycle.

4. The Records Manager works with staff to identify and document specific categories of records to be systematically created or received, regardless of how transmitted (in person or by messenger, mail, electronic means, or by any other method).

   Note 3: For more information on identifying records, see 36 CFR 1222.34, "Identifying Federal records."

D.4.2.2 Using Federal records

Information contained in the facility system of records may routinely be disclosed to staff performing work on a contract, service, grant, cooperative agreement, job, or other activity for DOE and who have a need to have access to the information for use in the performance of their duties or activities for the facility.

1. The Records Manager

   - Provides guidance over the use and dissemination of information wherever records are located and
   - Ensures that all records, regardless of the medium (e.g., paper, electronic, or other), are organized, classified, and described to promote their accessibility, and make them available for use by all staff during their life cycle.

2. The Record Owner limits use of fragile or unusually valuable documentary materials. When possible, provides suitable reproductions in lieu of the originals.

3. The Record Owner limits copies of records prepared to those specifically required or requested or which serve a valid purpose.

4. The Record Owner complies with appropriate applicable requirements regarding the use and disclosure of information.

5. When appropriate, the Record Owner and record recipient(s) complies with the requirements of the following:

   - DOE Order 243.2, *Vital Records*
   - 5 USC 552a(m), The Privacy Act of 1974
   - 10 CFR Part 1004, "Freedom of Information Act"
   - DOE Order 475.2, *Identifying Classified Information*
   - DOE Order 471.3, *Identifying and Protecting Official Use Only Information*

D.4.2.3 Maintaining records efficiently

This procedure applies to all facility staff and managers responsible for maintaining records that provide evidence necessary to document activities of the DOE-designated elemental mercury storage facility.

1. The Records Manager identifies, develops and issues recordkeeping requirements for records in all media (paper, microform, audiovisual, cartographic, and electronic) of the transaction of business that are sufficient to

   - document the persons, places, things, or matters dealt with by facility management and staff;
   - facilitate action by facility officials and their successors;
   - make possible a searching investigation, examination, surveillance, or audit;
   - protect the financial, legal, and other rights of DOE and of persons directly affected by DOE actions;
   - document the formulation and execution of basic policies and decisions and necessary actions taken; and
   - document important board, committee, or staff meetings.

2. The Records Manager ensures

   - adequate records storage facilities,
   - records are available to all authorized personnel,
   - official file locations are specified for records in all media,
   - maintenance of records at unauthorized locations is prohibited,
   - adequate training for all personnel on the management of Federal records, including records created by individuals using electronic mail, and
   - permanent and temporary records are physically segregated or, for electronic records, which can be segregated.

3. The Records Manager grants or limits the ability of individuals to examine records or record groupings.

4. The Record Custodian (RC)

   - Collects and processes records;
   - Ensures records are legible and reproducible;
   - Controls, protects, and ensures proper disposition of records;
   - Develops, updates, and maintains records disposition schedules;
   - Applies approved record disposition schedules to records;
   - Indexes records for ease of retrieval;
   - Protects the integrity of records in their custody against unauthorized alteration or destruction;
   - Maintains effective recordkeeping throughout the life cycle of the records;
   - Maintains permanent records in a format that will permit transfer to the U.S. National Archives and Records Administration (NARA);
   - Examines records periodically to ensure the physical state of records so they remain usable; and
   - Upgrades electronic records storage media, as necessary to retain viewable records through their life cycle.

5. The Records Manager

   - Creates and maintains records that document the destruction of temporary records and the transfer of permanent records to DOE Records Management;
   - Ensures that official records are not removed from DOE custody without appropriate authorization;
   - Reviews the records maintenance program periodically to (1) determine its adequacy, and (2) audits a representative sample of records in paper, audiovisual, electronic, cartographic, and architectural files for duplication, misclassification, or misfiles; and
   - Changes legal custody of eligible permanent records to DOE.

D.4.2.4 Transferring and disposing of Federal records

An effective records disposition program ensures that DOE has the recorded information necessary to conduct Government business, avoid waste, and preserve the United State's documentary heritage.

1. The Records Custodian (RC) determines and notifies the Records Owners of records that can be cut off and either transferred to an inactive records storage area or approved off-site facility or destroyed according to applicable disposition schedules.

2. The Records Owner

   - Packs records not needed for current day-to-day reference in designated storage boxes;
   - Transfers inactive records to the approved records storage area;
   - Maintains adequate information about the records being moved;
   - Creates and maintains records that document the destruction of temporary records and the transfer of permanent records; and
   - Disposes of temporary records in compliance with the appropriate records retention schedule so that they cannot be accessed, retrieved, or recovered when they reach the end of their retention period.

D.4.2.5 Managing vital records

1. The Records Owner determines if a record meets either definition of a vital record, or both:

   - Emergency operating records and/or
   - Legal and financial rights records.

   Note 4: If a record has the properties of both categories, the Record Owner stores it with emergency operating records.

2. The Record Owner captures and maintains vital records "in a medium that is most viable for readability under emergency operating conditions."

   Note 5: Since vital records must be immediately accessible, they should be in paper format on-site for immediate retrieval in the event computer systems go down, or immediately available electronically off-site.

3. The Records Manager compiles, maintains, updates, and protects the vital records by

   - Ensuring records are retrievable requiring only a routine effort to locate needed information, especially since individuals unfamiliar with the records may need to use them during an emergency or disaster;

- Ensuring that all equipment needed to read vital records or copies of vital records will be available in case of emergency or disaster;
- Coordinating vital records storage issues with the emergency management personnel.
- Developing and updating a vital records inventory;
- Maintaining duplicate current copies of the vital records and associated inventory at separate locations to ensure immediate access in any situation;
- Providing training to staff assigned responsibilities in the Vital Records Program and making training records available for inspection;
- Including vital records identification and management data in records program assessments; and
- Reviewing the vital records inventory annually.

4. The Records Owner

    - Contacts the Records Manager for instructions on labeling, handling, storage, etc., of vital records;
    - Controls distribution of vital records to copyholders identified as essential for continued operations or for preserving legal rights and interests; and
    - Maintains vital records by removing obsolete vital records and replacing them with copies of current vital records.

D.4.2.6 Coordinating records recovery

1. The Records Manager establishes and maintains the security of records by ensuring the availability of vital records and preventing unauthorized access to, additions to, changes to, removal of, and destruction of Federal records.

2. The Records Manager performs a risk assessment regarding possible damage or loss of records and develops and maintains a records mitigation and recovery plan to prevent damage to records.

3. The Records Manager trains all Vital Records Owners on how to identify, protect, and make readily available the emergency operating records needed to support the resumption of critical operations and business functions during or after a disaster.

4. The Vital Records Owner

    - Supports the Records Manager in planning ways to avoid, where possible, the occurrence of an emergency and
    - Supports the Records Manager and other facility managers providing critical activities during or after an emergency or disaster by providing critical activities and access to vital records, if possible. This is done to facilitate execution of the organization's essential functions from alternate locations and to reconstitute normal operations.

5. The Records Manager, Vital Records Owners, and/or other designated staff

    - Suit up in appropriate personal protective equipment (PPE) before entering a damaged space;
    - Perform a damage assessment of vital records and the areas where the records are stored, after a damaged space has been determined safe to enter;
    - Separate damaged records from undamaged records as soon as possible to speed up repair and recovery; and

- Perform recovery procedures to restore, recover, or replace the damaged records, documenting the date and time of recovery step completion and the name of the staff member who completed it.

D.4.3 Specific Criteria

- 29 CFR 1910.1020—Access to employee exposure and medical records
- 36 CFR Part 1220—Federal records, General
- 36 CFR Part 1222—Creation and maintenance of Federal records
- 36 CFR Part 1228—Disposition of Federal records
- 40 CFR 260.21—Petitions for equivalent testing or analytical methods
- 40 CFR Part 262—Standards Applicable to Generators of Hazardous Waste
- 40 CFR Part 264—General Facility Standards
- 40 CFR 264.37—Arrangements with Local Authorities
- 40 CFR Part 264 Subpart D—Contingency Plan and Emergency Procedures
- 40 CFR Part 264 Subpart E—Manifest System, Recordkeeping and Reporting
- 40 CFR Part 264 Subpart B—General Facility Standards
- 40 CFR 264.174—Inspections (Container)
- 40 CFR 264.279—Recordkeeping
- 40 CFR Part 264—Subpart CC—Air Emission Standards for Tanks, Surface Impoundments, and Containers
- Appendix I to Title 40 CFR Part 264—Recordkeeping instructions
- 40 CFR Part 265 Subpart B—General Facility Standards
- 40 CFR 265.37—Arrangements with Local Authorities
- 40 CFR Part 265 Subpart D—Contingency Plan and Emergency Procedures
- 40 CFR Part 265 Subpart E—Manifest System, Recordkeeping, and Reporting
- 40 CFR 265.174—Inspections (Container)
- 40 CFR 265.94—Reporting and recordkeeping
- 40 CFR 265.279—Recordkeeping
- 40 CFR Part 265—Subpart CC—Air Emission Standards for Tanks, Surface Impoundments, and Containers
- Appendix I to Part 265—Recordkeeping instructions
- 40 CFR Part 270 Subpart B—Permit Application
- 40 CFR 270.31—Requirements for recording and reporting of monitoring results
- 40 CFR Part 270 Subpart D—Changes to Permits
- 40 CFR 268.7—Testing, tracking and recordkeeping requirements for generators, treaters, and disposal facilities
- 40 CFR 268.9—Special rules regarding wastes that exhibit a characteristic
- DOE Order 243.1, *Records Management Program*
- DOE Order 243.2, *Vital Records*
- DOE Order 414.1C Criterion #4, *Quality Assurance, Management/documents and records*
- DOE Order 440.1B, *Worker Protection program for DOE (Including National Nuclear Security Administration) Federal Employees 44 U.S.C. 31*
- 44 USC 31, Federal Records Act

D.4.4 References

- 10 CFR Part 1004, Freedom of Information Act
- 36 CFR Part 1220, Federal Records; General
- 36 CFR Part 1222, Creation and Maintenance of Federal Records
- 36 CFR Part 1236, Management of Vital Records
- 41 CFR 102–193, Federal Management Regulation (Creation, Maintenance, and Use of Records)
- 5 USC 552a(m), *The Privacy Act of 1974*
- 44 USC 3310, Disposal of Records Constituting Menace to Health, Life, or Property
- DOE Notice (N) 150.1, "Continuity of Operations"
- DOE Order (O) 151.1C, *Comprehensive Emergency Management System*
- DOE Order (O) 471.3, *Identifying and Protecting Official Use Only Information*
- DOE Order (O) 475.2, *Identifying Classified Information*
- DOE Form (F) 1324.8, "Records Transfer"
- DOE Guide (G) 1324.5B, *Records Maintenance and Disposition, Chapter III, Files Maintenance Procedures*
- *Agency Recordkeeping Requirements: a Management Guide*, "Adequate and Proper Documentation"
- *Agency Recordkeeping Requirements: A Management Guide* series, 1995
- Checklist for Self-Assessment
- DOE Records Disposition Schedules
- DOE Office of Science Quality Assurance Program, *Life Cycle Asset Management—Good Practice Guide*, dated March 1996
- DOE Procedure for Conducting a Records Inventory
- DOE Records Management Handbook RM 06-45, "Issuance of the Records Management Handbook," dated 09/21/2006
- DOE Roadmap II: The Next Generation 2000–2006, Strategic Plan, dated January 2000
- DOE Roadmap II: The Next Generation 2000–2006, Tactical Plan, dated January 2000
- DOE Roadmap to the Year 2000, dated August 1995
- EPA (U.S. Environmental Protection Agency). Weblink to EPA "Quick Finder for Most Popular Topics," Section "Waste," accessed (09-21-09) on the web at URL http://www.epa.gov/epahome/quickfinder.htm#w
- Documenting Your Public Service
- Frequently Asked Questions about Records Scheduling and Disposition
- Identify and Protect Your Vital Records
- NARA Bulletin 2006-02, "NARA Guidance for Implementing Section 207(e) of the E-Government Act of 2002"
- NARA Bulletin 96-6, "Disposition of Federal Records and Personal Documentary Materials"
- NARA Form 14097, "Technical Description for Transfer of Electronic Records to the U.S. National Archives"
- National Archives Privacy Act Resources
- Packing, Boxing, and Labeling Records
- Procedure for Preparing a Records Inventory and Disposition Schedule (RIDS)
- Records Emergency Assessment Checklist/Katrina Emergency Records Recovery/Disposal Form
- SF 135, "Records Transmittal and Receipt"
- SF 135, "General Instructions for Preparing the Standard Form 135"

- “Toolkit for Managing Electronic Records“
- U.S. EPA Privacy Act, *General Routine Uses of EPA Systems of Records*
- Vital Records and Records Disaster Mitigation and Recovery: An Instructional Guide
- Vital Records Management, A Briefing for Federal Agencies, *National Archives*
- What Are Federal Records?
- Your Records Management Responsibilities Pamphlet

Appendix E

ELEMENTAL MERCURY INFORMATION/DATA FROM HEALTH AND SAFETY DATABASES AND BULLETIN

Appendix E. ELEMENTAL MERCURY INFORMATION/DATA FROM HEALTH AND SAFETY DATABASES AND BULLETIN

E.1 DISCUSSION

This appendix provides information and data on elemental mercury found in certain health and safety (H&S) databases, and in an issue of the *Safety* & *Health Bulletin* published by the DOE Office of the Assistant Secretary for Environment, Safety & Health.

- U.S. Department of Labor [Occupational Safety and Health Administration (OSHA)], U.S. Environmental Protection Agency (EPA), "OSHA/EPA Occupational Chemical Database," and
- National Institute for Occupational Safety and Health (NIOSH), *NIOSH Pocket Guide to Chemical Hazards* (NIOSH September 2005).
- U.S. Department of Energy, *Safety & Health Bulletin*, Issue No. 2005-08, "Safe Management of Mercury (Hg)."

It should be noted that the mercury compound data is not applicable to the MEBA.

Elemental mercury information and data provided in these resources (and on the pages that follow) include physical properties, exposure limits, respirator recommendations, personal protection measures, and target human organs from exposure.

Copies of the OSHA and NIOSH databases for elemental mercury are provided as a convenience to the readers, but users of the information in these databases should access the OSHA and NIOSH websites, as applicable, to ensure that they are using the most current database information.

The DOE *Safety & Health Bulletin* indicates that all mercury spills should be cleaned immediately using a vacuum cleaner especially designed for cleaning mercury. Note. The size of the collection container in the mercury vacuum should be considered for applicability prior to use. For addressing small mercury spills use of a small hand pump followed by a finished surface cleaning that uses mercury absorbent may be preferable.

E.2 REFERENCES

NIOSH (National Institute for Occupational Safety and Health). September 2005. *NIOSH Pocket Guide to Chemical Hazards*, "Mercury compounds [except (organo) alkyls](as Hg)," NIOSH Publication 2005-149, accessed (6/29/2009) on the Web at URL: http://www.cdc.gov/niosh/npg/npgd0383.html

OSHA (Occupational Safety and Health Administration) and EPA (U.S. Environmental Protection Agency). Not dated. "OSHA/EPA Occupational Chemical Database," accessed (6/29/2009) on the Web at URL: http://www.osha.gov/web/dep/chemicaldata/ChemicalResult.asp?RecNo=418

DOE/ESH (U.S. Department of Energy, Office of the Assistant Secretary for Environment, Safety & Health). June 2005. "Safe Management of Mercury (Hg)," in *Safety & Health Bulletin*, Issue No. 2005-08, DOE/EH-0697, Washington, D.C.

U.S. Department of Labor
Occupational Safety & Health Administration
www.osha.gov
Search GO Advanced Search | A-Z Index

OSHA/EPA Occupational Chemical Database

Chemical Identification

Chemical Name: MERCURY, ELEMENTAL AND INORGANIC COMPOUNDS, as Hg
CAS #: 7439-97-6 **UN No:** 2809 **Formula:** Hg
Synonyms: Mercury metal: Colloidal mercury; Metallic mercury; Quicksilver Synonyms of "other" Hg compounds vary depending upon the specific compound.

Physical Properties

Physical Description: [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except

BP: 674ºF	**MW:** 200.6	**LEL:** NA	**NFPA Fire Rating:** NA
FRZ/MLT: FRZ: -38ºF	**VP:** 0.0012 mmHg	**UEL:** NA	**NFPA Health Rating:** NA
FP: NA	**VD:** NA		**NFPA Reactivity Rating:** NA
Sp. GR: 13.6 (metal)	**IP:** NA		**NFPA Sp. Inst.:** NA

Exposure Limits

OSHA	NIOSH	Related Information
PEL-TWA ppm: NA	**REL-TWA ppm:** NA	**AIHA Emergency Response Planning Guidelines - ERPG-1/ERPG-2/ERPG-3:** NA/0.25 ppm/0.5 ppm (VAPOR ONLY)
PEL-TWA mg/m3: NA	**REL-TWA mg/m3:** 0.05	
PEL-STEL ppm: NA	**REL-STEL ppm:** NA	
PEL-STEL mg/m3: NA	**REL-STEL mg/m3:** NA	
PEL-C ppm: NA	**REL-C ppm:** NA	
PEL-C mg/m3: 0.1	**REL-C mg/m3:** 0.1	**Carcinogen Classifications:** IARC-3, TLV-A4
Skin Notation: No	**Skin Notation:** Yes	
Notes: NA	**Notes:** TWA IS FOR Hg VAPOR	
	IDLH ppm: NA	
	IDLH mg/m3: 10	
	IDLH Notes: NA	

NIOSH Pocket Guide to Chemical Hazards (Current through June 2006)

Mercury compounds [except (organo) alkyls] (as Hg)			CAS: 7439-97-6
Formula: Hg (metal)			RTECS: OV4550000 (metal)
Synonyms & Trade Names: Mercury metal: Colloidal mercury, Metallic mercury, Quicksilver Synonyms of other"Hgcompoundsvarydependinguponthespecificcompound."			DOT ID & Guide: 2809 172
Exposure Limits			
NIOSH REL: Hg Vapor: TWA 0.05 mg/m3 [skin] Other: C 0.1 mg/m3 [skin]		OSHA PEL : C 0.1 mg/m3	
IDLH: 10 mg/m3 (as Hg)		Conversion: NA	
Physical Description			
Metal: Silver-white, heavy, odorless liquid. [Note: Other"Hgcompoundsincludeallinorganic&arylHgcompoundsexcept (organo)alkyls.]"			
MW: 200.6	BP: 674F	FRZ: -38F	Sol: Insoluble

VP: 0.0012 mmHg	IP: ?	RGasD: NA	Sp.Gr: 13.6 (metal)
Fl.P: NA	UEL: NA	LEL: NA	MEC: NA

Metal: Noncombustible Liquid (See flammable and combustible liquid classes)

Incompatibilities & Reactivities

Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper

Measurement Methods

NIOSH 6009; OSHA ID140

Personal Protection & Sanitation	First Aid
Skin: Prevent skin contact Eyes: N.R. Wash skin: When contam Remove: When wet or contam Change: Daily	Eye: Irr immed Skin: Soap wash prompt Breath: Resp support Swallow: Medical attention immed (See procedures)

NIOSH Respirator Recommendations

See Appendix E for Respirator Recommendations for Mercury compounds [except (organo) alkyls]. Mercury vapor: NIOSH/OSHA 0.5 mg/m3: CCRS /SA 1.25 mg/m3: SA:CF/PAPRS (canister) 2.5 mg/m3: CCRFS /GMFS /SAT:CF/PAPRTS (canister)/SCBAF/SAF 28 mg/m3: SA:PD,PP :
(See symbols and codes)

Exposure Routes

Inh Abs Ing Con

Symptoms

Irrit eyes, skin; cough, chest pain, dysp, bron pneuitis; tremor, insom, irrity, indecision, head, ftg, weak; stomatitis, salv; GI dist, anor, low-wgt; prot
(See abbreviations)

Target Organs

Eyes, skin, resp sys, CNS, kidneys
(See abbreviations)

DOT Emergency Response Guidebook (ERG 2004)

Guide Number: 172

172 Gallium and Mercury
POTENTIAL HAZARDS
HEALTH
* Inhalation of vapors or contact with substance will result in contamination and potential harmful effects.
* Fire will produce irritating, corrosive and/or toxic gases.

FIRE OR EXPLOSION
* Non-combustible, substance itself does not burn but may react upon heating to produce corrosive and/or toxic fumes.
* Runoff may pollute waterways.

PUBLIC SAFETY
* CALL Emergency Response Telephone Number on Shipping Paper first. If Shipping Paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
* Isolate spill or leak area immediately for at least 10 to 25 meters (30 to 80 feet) in all directions.
* Stay upwind.
* Keep unauthorized personnel away.

PROTECTIVE CLOTHING
* Wear positive pressure self-contained breathing apparatus (SCBA).
* Structural firefighters' protective clothing will only provide limited protection.

EVACUATION
Large Spill
* Consider initial downwind evacuation for at least 100 meters (330 feet).

Fire
* When any large container is involved in a fire, consider initial

evacuation for 500 meters (1/3 mile) in all directions.

EMERGENCY RESPONSE

FIRE

* Use extinguishing agent suitable for type of surrounding fire.
* Do not direct water at the heated metal.

SPILL OR LEAK

* Do not touch or walk through spilled material.
* Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
* Stop leak if you can do it without risk.
* Prevent entry into waterways, sewers, basements or confined areas.
* Do not use steel or aluminum tools or equipment.
* Cover with earth, sand, or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain.
* For mercury, use a mercury spill kit.
* Mercury spill areas may be subsequently treated with calcium sulphide/calcium sulfide or with sodium thiosulphate/sodium thiosulfate wash to neutralize any residual mercury.

FIRST AID

* Move victim to fresh air.
* Call 911 or emergency medical service.
* Apply artificial respiration if victim is not breathing.
* Administer oxygen if breathing is difficult.
* Remove and isolate contaminated clothing and shoes.
* In case of contact with substance, immediately flush skin or eyes with running water for at least 20 minutes.
* Keep victim warm and quiet.
* Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

Additional Emergency Response Information (CAMEO Data)

Non-fire Spill Response: Keep material out of water sources and sewers. Build dikes to contain flow as necessary. Attempt to stop leak if without undue personnel hazard. (AAR, 1999)

Firefighting: Cool all affected containers with flooding quantities of water. Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Use water in flooding quantities as fog. Keep run-off water out of sewers and water sources. (AAR, 1999)

Reactivity: CHEMICAL PROFILE: Insoluble, explosive acelylide is formed by mixing acetylene and mercury. Ammonia and mercury can form explosive compounds. A residue resulting from such a reaction exploded when an attempt was made to clean it off a steel rod (Chem. Eng. News 25:2138. 1947). Chlorine dioxide and mercury explode when mixed (Mellor 2, Supp. 1:381. 1956). Methyl azide in the presence of mercury was shown to be potentially explosive (Can. J. Chem. 41:1048. 1963). Ground mixtures of sodium carbide and mercury, aluminum, lead, or iron can react vigorously (Mellor 5:848. 1946-47). (REACTIVITY, 1999)

First Aid: Eye: If this chemical contacts the eyes, immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately. Contact lenses should not be worn when working with this chemical. Skin: If this chemical contacts the skin, promptly wash the contaminated skin with soap and water. If this chemical penetrates the clothing promptly remove the clothing and wash the skin with soap and water. Get medical attention promptly. Breathing: If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform mouth-to-mouth resuscitation. Keep the affected person warm and at rest. Get medical attention as soon as possible. Swallow: If this chemical has been swallowed, get medical attention immediately. (NIOSH, 1997)

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Occupational Safety & Health Administration
200 Constitution Avenue, NW
Washington, DC 20210

NIOSH Publication 2005-149 **September 2005**

NIOSH Pocket Guide to Chemical Hazards

NPG Home | Introduction | Synonyms & Trade Names | Chemical Names | CAS Numbers | RTECS Numbers | Appendices | Search

Mercury compounds [except (organo) alkyls] (as Hg)

CAS 7439-97-6 (metal)

Hg (metal)

RTECS QV4550000 (metal)

Synonyms & Trade Names
Mercury metal: Colloidal mercury, Metallic mercury, Quicksilver
Synonyms of "other" Hg compounds vary depending upon the specific compound.

DOT ID & Guide
2809 172 (metal)

Exposure Limits

NIOSH REL:
Hg Vapor: TWA 0.05 mg/m^3 [skin]
Other: C 0.1 mg/m^3 [skin]

OSHA PEL†:
TWA 0.1 mg/m^3

IDLH 10 mg/m^3 (as Hg) See: 7439976

Conversion

Physical Description
Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.]

MW: 200.6	BP: 674°F	FRZ: -38°F	Sol: Insoluble
VP: 0.0012 mmHg	IP: ?		Sp.Gr: 13.6 (metal)
Fl.P: NA	UEL: NA	LEL: NA	

Metal: Noncombustible Liquid

Incompatibilities & Reactivities
Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper

Measurement Methods
NIOSH 6009; OSHA ID140
See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)
Skin: Prevent skin contact
Eyes: No recommendation
Wash skin: When contaminated
Remove: When wet or contaminated
Change: Daily

First Aid (See procedures)
Eye: Irrigate immediately
Skin: Soap wash promptly
Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations
Mercury vapor: NIOSH
Up to 0.5 mg/m^3:
(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern†

(APF = 10) Any supplied-air respirator
Up to 1.25 mg/m^3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)
Up to 2.5 mg/m^3:
(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode/PAPRTS(canister)
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece
Up to 10 mg/m^3:
(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure- demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

Other mercury compounds: NIOSH/OSHA
Up to 1 mg/m^3:
(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern†
(APF = 10) Any supplied-air respirator
Up to 2.5 mg/m^3:
(APF = 25) Any supplied-air respirator operated in a continuous-flow mode
(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)
Up to 5 mg/m^3:
(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†
(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode/PAPRTS(canister)
(APF = 50) Any self-contained breathing apparatus with a full facepiece
(APF = 50) Any supplied-air respirator with a full facepiece
Up to 10 mg/m^3:
(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode
Emergency or planned entry into unknown concentrations or IDLH conditions:
(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria

Target Organs Eyes, skin, respiratory system, central nervous system, kidneys

See also: INTRODUCTION See ICSC CARD: 0056 See MEDICAL TESTS: 0136

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ENVIRONMENT, SAFETY & HEALTH

SAFETY & HEALTH BULLETIN

Assistant Secretary for Environment, Safety & Health • U.S. Department of Energy • Washington, DC 20585

Safe Management of Mercury (Hg)

DOE/EH-0697 Issue No. 2005-08 June 2005

***Special Operations Reports** are issued to initiate management actions in response to events whose subject matter represents significant departmental safety concerns.*

***Environment, Safety and Health Alerts** are issued to initiate immediate action on potentially significant safety issues.*

***Environment, Safety and Health Bulletins** are issued to share information and recommend actions on potential safety issues.*

***Operating Experience Summaries** are issued to share lessons learned information, operating experience information, and best practices from significant events or important individual DOE activities.*

PURPOSE

This Bulletin provides information on a safety concern that may impact operations at Department of Energy (DOE) facilities. Specifically, the concern is the safe handling of mercury and mercury compounds.

BACKGROUND

Mercury is found in small amounts in thermometers, manometers, and barometers and in larger quantities at DOE facilities – ranging from amounts found in scientific equipment to tons in remediation waste at burial sites and hundreds of tons at the DOE stockpile storage facility in Oak Ridge.

DOE records show that there have been about 30 safety incidents involving mercury over the past 5 years. Half of those occurrences were leaks, discharges, and spills in quantities ranging from milliliters to over 100 pounds. Improper cleanup of one spill led to the contamination of four workers. Another 30 percent of those incidents involved the unexpected discovery of mercury with quantities exceeding 200 pounds in one situation or mercury and dimethyl mercury levels above permissible levels.

WHAT ARE THE HAZARDS?

Mercury (Hg) is a heavy, silver-white odorless metal which is a liquid at room temperature. Due to its vapor pressure, liquid mercury can volatilize at room temperature. Inhalation of mercury vapors is the main cause of toxicity because mercury is well-absorbed by the lungs. Short-term exposure to high levels of mercury vapors may cause lung damage, nausea, vomiting, diarrhea, increased blood pressure or heart rate, skin rashes, and eye irritation. Symptoms of chronic poisoning include inflammation of the mouth and gums, weakness, increased saliva production, loss of appetite and weight, and impaired digestive and kidney functions. Effects of mercury on the central nervous system often show up as tremors, particularly in the hands. Irritability, temper outbursts, excitability, shyness, and indecision are other symptoms of mercury poisoning.

Mercury can combine with other elements to form toxic inorganic and organic mercury compounds that can seriously affect the nervous system, lungs, kidneys, and developing fetus. One of the most dangerous mercury compounds is dimethyl mercury. A single drop on the skin can cause serious injury or death.

CONTROLLING THE HAZARDS

Ensure that all users and bystanders are properly trained in the hazards of mercury and observe the following good practices:

- Use enclosed systems that isolate mercury processes.
- Post appropriate warning signs and limit access to mercury operations.
- Floors and work surfaces should be nonporous and free of joints and cracks.
- Ventilate areas where mercury or mercury compounds are handled.
- Maintain equipment containing mercury to prevent release of mercury liquid.
- Immediately clean all mercury spills using a vacuum cleaner especially designed for cleaning mercury.
- Avoid sweeping; it breaks the mercury into smaller particles that volatilize quickly.
- DO NOT use compressed air to clean clothing or equipment.
- Place mercury wastes in vapor-tight containers.
- Wear a respirator designed for use with mercury vapors when necessary.

ADDITIONAL SOURCES OF INFORMATION

- Your Safety and Health Office
- Information on the web:
  - http://www.atsdr.cdc.gov/MHMI/mmg46.html
  - http://en.wikipedia.org/wiki/Mercury_(element)
  - http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB

SUMMARY

- Mercury is found at all DOE sites.
- Exposure to mercury and mercury compounds can lead to serious health problems.
- Take proper precautions when handling mercury and cleaning up spills.

If you have any questions, please call Dr. Bill McArthur at 301-903-9674 or e-mail bill.mcarthur@eh.doe.gov.

John Spitaleri Shaw
Assistant Secretary for
Environment, Safety and Health

Appendix F

CONCEPTUAL ELEMENTAL MERCURY STORAGE FACILITY FEATURES

Appendix F. CONCEPTUAL ELEMENTAL MERCURY STORAGE FACILITY FEATURES

F.1 ELEMENTAL MERCURY STORAGE FACILITY FEATURES

NOTICE: *The nominal facility layout, discussed below and shown in the referenced figures, is conceptual and notional. It is presented as a potentially feasible example and illustrates the application of facility selection and upgrade recommendations in the text. However, a wide range of layouts is possible, based on such presently unsettled factors as the quantity of mercury for storage and availability of existing facilities.*

It should be noted that, in addition to Federal regulations, States may have additional hazardous waste and other regulations with which generators, transporters, and the DOE operating contractor (OC) must comply.

F.1.1 Building Layout Example

Figures F.1(a) and (b) provide conceptual plan views of the three operational facility areas: Receiving and Shipping, Handling, and Storage. Figure F.1(a) gives a conceptual scale view of the overall operational area needed for the nominally expected 10,000 MT of elemental mercury storage, based on a rough assessment of known inventories, of a 60:40% breakdown by 1-MT and 3-L containers, respectively, with 3-L containers on pallets and racks, as described in Section 4. Figures F.1(a) and (b) also provide captioned notes with information that reinforces and identifies the specific locations of suggested upgrades that are described in this section. Figures F.1(c) and (d) provide specific guidance on suggested ventilation, barrier, and utility nuance. Note that these figures show an example layout of ~150,000 ft^2, which is a comfortably sized layout for the nominally expected 10,000 MT elemental mercury storage facility capacity. A bare-minimum facility footprint area of approximately 90,000 ft^2 should be sufficient, although operational difficulties in building and container inspection, maintenance, gantry-assisted container placement and retrieval, and a cramped Receiving and Shipping area would be expected.

F.1.2 Building Equipment and Utilities

Per the MEBA [Section 5(d)(3)], the designated facility shall have all equipment necessary for routine operations, emergencies, monitoring, checking inventory, loading, and storing elemental mercury.

The International Fire Code (IFC) 2704.6, 40 CFR 264/265.56, and 40 CFR 270.14(b)(8)(iv) require standby (or emergency) power for exhaust ventilation and emergency alarm systems on Group H-4 (corrosive liquids) storage. The authors of this document interpret this requirement as only binding on the required Handling area ventilation and not binding on that for the Storage area. The nature of the standby power is not prescribed, but as the power for the fire alarm systems must be available at all times, it is recommended that a diesel generator, sized for all local facility fire actuation/alarm (Handling and Storage areas), ventilation, and lighting, needs be placed, maintained, and periodically tested. Also, rather than providing emergency power for small islands of critical computer or communication within the Office Administration area, an uninterruptable power supply (UPS) backup [e.g., Computer District Warehouse (CDW) Part No. APC Smart-UPS 1500 Universal Serial Bus (USB)] is suggested.

It is recommended that power controls for an elemental mercury storage facility be mounted in an enclosure mounted to the facility exterior. A lockable enclosure prevents unauthorized access, keeps

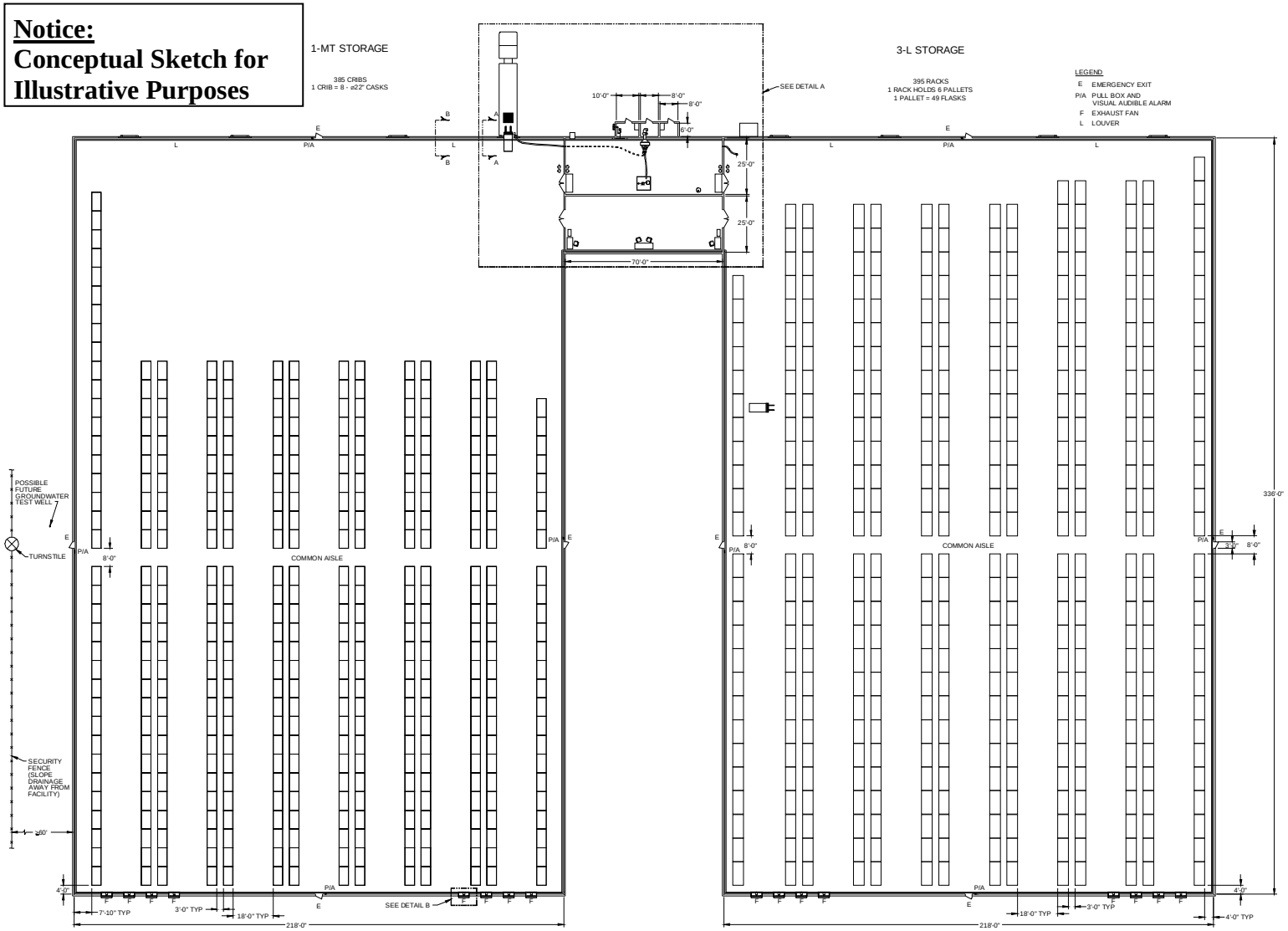


Figure F.1(a). Conceptual DOE elemental mercury storage facility plan view.

Notice:
Conceptual Sketch for Illustrative Purposes

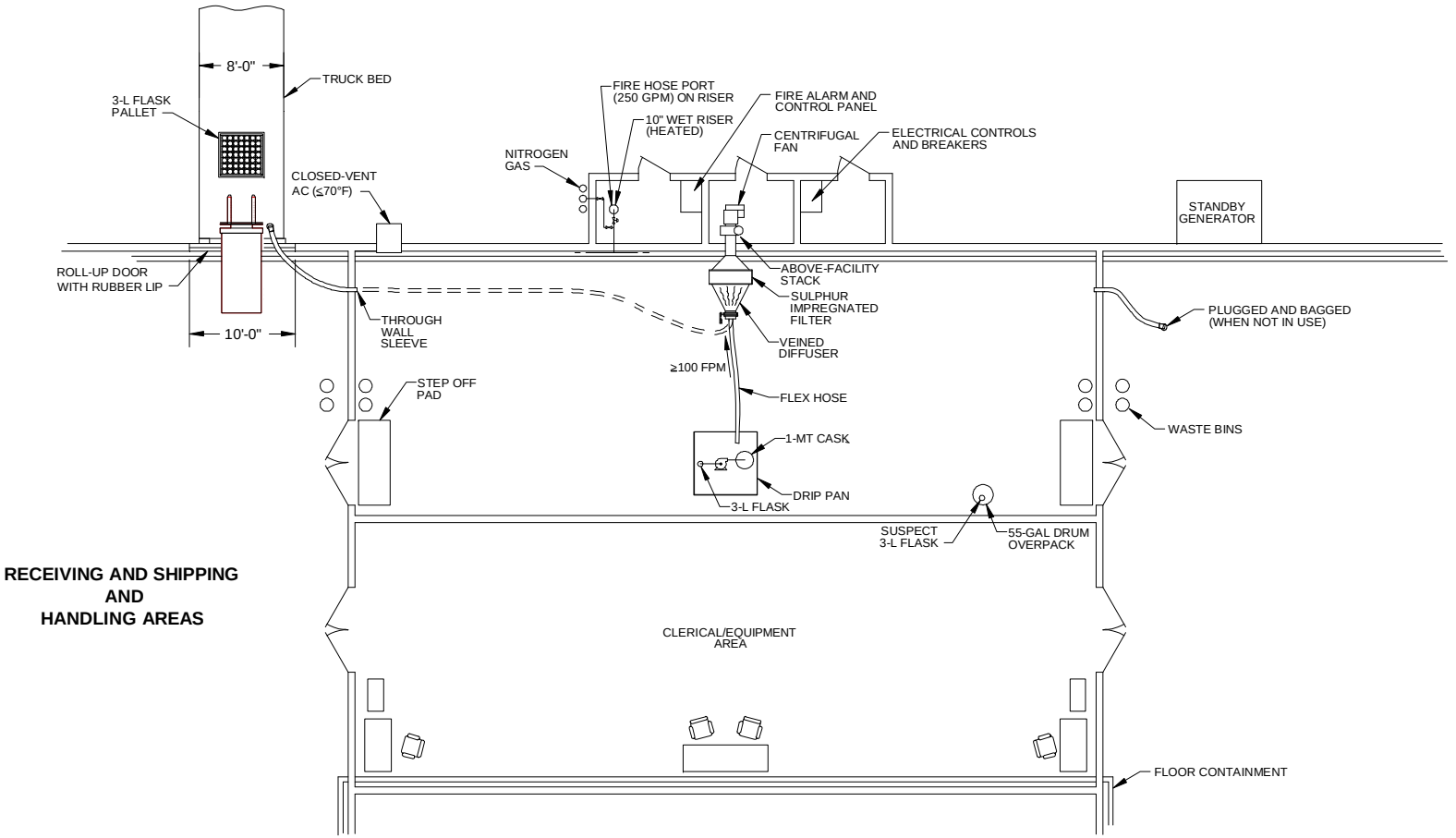


Figure F.1(b). Conceptual elemental mercury storage facility Receiving and Shipping and Handling areas [Detail-A in Figure F.1(a)].

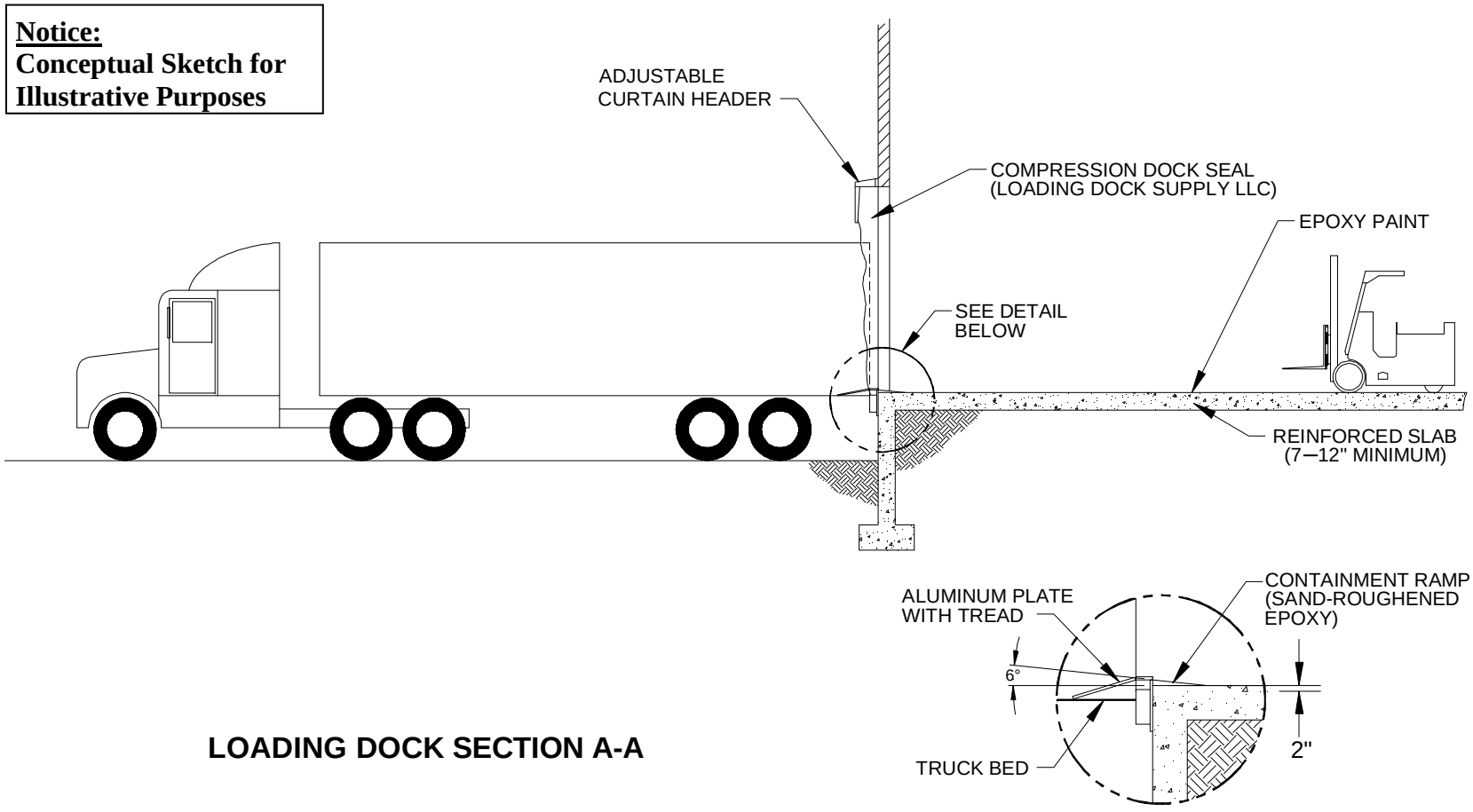
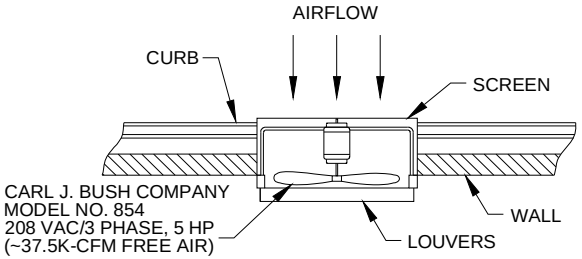
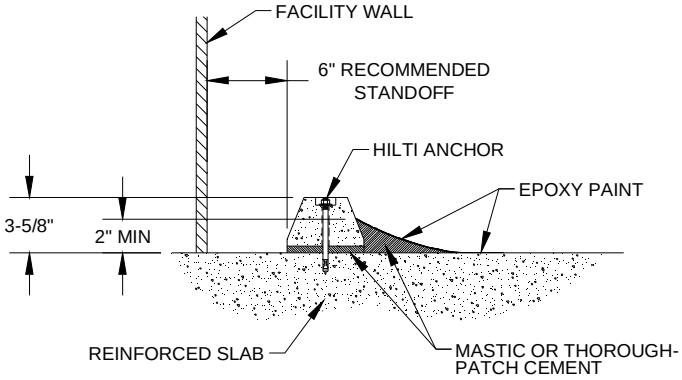


Figure F.1(c). Conceptual elemental mercury storage facility loading dock [Section A-A in Figure F.1(a)].

Notice:
Conceptual Sketch for Illustrative Purposes



STORAGE AREA AXIAL FAN PLAN



CURB DETAIL

FACILITY FLOOR CONTAINMENT SECTION B-B

Figure F.1(d). Conceptual elemental mercury facility Storage area axial fan and facility floor details [Detail-B and Section B-B in Figure F.1(a)].

the weather out, and allows for emergency access without entry to the main hazardous material areas. Ideally, the power control enclosure may be separate from but near a similarly constructed fire alarm/control enclosure. Multiple power draws will be seen including Handling area and Storage area ventilation, fire alarm and suppression systems, recharge for electric forklift, area lights, and normal 110-V ac outlets for sundry equipment. Note that many of the loads are 110-V ac/single-phase and minor, but availability of 208-V ac/three-phase sufficient for sixteen 5-hp fan motors is recommended, if the optional Storage area fans are emplaced.

Firewater supply for sprinklers can be roughly designed at a minimum of 0.2 gpm/ft^2 for a 2000-ft^2 design area. Therefore, a sprinkler system is suggested that provides a minimum of 400 gpm (60 psig) at the heads most hydraulically-remote from the riser. Figure F.1(b) shows an exterior 250 gpm hose tie for use in fire department response, which is based on NFPA ordinary-2 hazard hydraulic design and assumes only one design area and one riser hose is active at a time.

Dehumidifier use in the Storage area is optional. This humidity control can provide benefits in reduced rust on carbon steel surfaces such as containers, metal pallets or racks, and fasteners. Depending on facility type, this may also reduce interior condensation and mildew, while improving performance of mercury vapor detection systems, such as those based on gold-foil (e.g., Jerome).

Allowable reinforced floor slab thickness is driven by combined loads of forklift, pallet, containers, and mercury. An electric Yale ERC-055-VG is suggested as a nominal commercial forklift for consideration. It has power steering, a high-visibility mast liftable to the 12-ft recommended maximum height of stacks, and cushioned tires (~4 in. × 10 in. wetted floor area on load). It has a 5500-lb capacity (at 24 in. center), which is acceptable for our suggested 56 in. × 56 in. 3-L pallet since the forklift downrates to 4715 lb (at our 28-in. pallet center). It weighs ~10,850 lb (with 3900-lb battery) and has a wetted wheelbase footprint of 54.2 in. × 42.1 in. In 2009 U.S. dollars, it costs ~$32K for the suggested orthogonal 15-ft aisles (or ~$38K with rotating mast and potential aisle reduction). These factors are key in dynamic load estimation.

For occupancy, four floor load cases are considered: static vs dynamic and 3-L container pallets vs the 1-MT containers. For 1-MT containers, the static load comes from a single stack of eight 1-MT containers [~2750 lb, ~20-in. outer diameter (OD) each] to a drip pan. For 3-L containers, the static load comes from a rack (~120 in. × 60 in.) consisting of three stacked rows of two pallets each (with 49 ~80-lb 3-L containers in each pallet). Worst-case distributed loads are for the 1-MT containers at approximately 715 psf. The dynamic load comes from forklift carry of a pallet of 49 3-L containers or of a single 1-MT container. Worst-case distributed loads are, of course, for the (heavier) 3-L container pallet at approximately 1185 psf, when a 1.25 dynamic scaling factor is applied for forklift motion (U.S. Army FM 5-742, 1985). Without detail, we will note that plunging shear loads are dominated by distributed loads (i.e., distributed loads determine acceptable slab thickness). Therefore, the 1185-psf worst-case dynamic distributed load dictates to acceptable (reinforced) slab thickness and, referring to “Concrete Floor Slabs on Grade Subject to Heavy Loads” (USACE TM 5-809-1, 1987), we suggest the following:

1. A minimum 7-in. slab is sufficient, if well-documented, high flexural strength is expected (i.e., “modulus rupture,” MR > 700 psi); and
2. A minimum 12-in. slab is sufficient, if a low flexural strength is expected (i.e., MR ~ 550 psi), or if quality appears good but is undocumented.

Prudence suggests that a low MR should be assumed if it cannot be documented. Original documentation may come from QA/QC and testing during slab installation. For a pre-existing facility, it may also come with careful testing of flexural 3- or 4-point bend tests (ASTM, 2008) or, more

practically, with correlation of MR to compressive strength [e.g., by ACI 330R (2008)]. Lastly, before final facility acceptance, and before additional epoxy floor paint is applied which may mask cracking, field load tests of the slab are recommended. A representative forklift with test weight may be placed in the facility, and coordinated with visual or acoustic crack checks.

The estimates above are preliminary, based on the nominal case of Fig. F.1(a), and should be vetted for the specific storage site and equipment. Reasonable alternative engineering review methods may, of course, be applied. These estimates assume single-stacked 1-MT containers. Preliminary review of commercial 1-MT containers (i.e., both Barrick and Newmont) shows that double-stack would likely require an intermediate sleeve and careful review for seismic stability. In addition, there may be concerns with availability of facilities with a slab thickness sufficient to carry concentrated loads. Dead load from double-stacked 1-MT containers (or a single-stacked 2-MT container) would dominate dynamic (i.e., forklifted) loads, and the resulting ~1424 psf would drive allowable slab thicknesses to 10 in., if well documented and of high flexural strength, or 16 in. otherwise. There may be fewer such thick-slab facilities available.

F.2 FACILITY SECONDARY CONTAINMENT BARRIER

Containment standards (40 CFR 264.175) apply and attribute three corresponding barriers: (1) primary (the container), (2) liquid collection (spill tray), and (3) secondary (building floor). Section 4 of this guide (which covers acceptance criteria for elemental mercury containers) addresses primary and liquid collection barriers as well as secondary barriers, including the facility roof and walls, but with focus on the impermeable floor barrier. Under RCRA, a containment system for a container storage area must be able to contain leaks and spills from containers, and must have sufficient capacity to contain 10% of the volume of containers or the volume of the largest container, whichever is greater. Since significantly more than 1000 gal of Group-H4 liquids (elemental mercury) are anticipated for facility storage, IFC Section 2704.2 requires secondary containment and spill control. IFC Section 2704.2 uses the term “secondary containment” and refers to hazardous liquid and solid sequester. Also, since mercury is a corrosive, IFC Section 3104.1.1 requires liquid-tight floor construction.

The Handling area and Storage area are expected to be completely enclosed. 40 CFR Part 264 Subpart B (General Facility Standards) requires “livestock” exclusion. Close observation of these directives suggests that openings such as fan apertures and louvers should be screened against wildlife. Hinged and balanced louvers will provide ventilation support while helping to control dust. Further, roof and walls must be closed and maintained intact against the elements including dust, debris, and precipitation. Lastly, gaps on roll-up door must be eliminated, with special attention to the typically rubberized lower lip which effects a near-seal by the floor when the door is shut.

In addition, it is suggested that the impermeable floor coating be “feathered” up on a curb inside the perimeter of the facility to provide for collection of microdroplet mercury entrained in firewater, in the event of a sprinkler release. A minimum of 2-in. feathering is suggested. Note that simple feathering to an exterior wall is not advised, since circadian weather may cause cyclic differential thermal expansion between facility walls and pad, which may cause cracks. Liquid mercury is roughly 13.5 times heavier than and virtually insoluble in water (Perry, Green, and Maloney, 1997). A minimum lip of 1 in. will provide just over 1 gal of water retention for every 2 ft^2 of floor space and retention of liquid mercury which may be moved along the floor by the flow of discharged firewater. Still, the testing of retained firewater, as described in Section S5.1.3, should be observed.

Slab seal must also be maintained at existing or new floor interfaces, lest potential mercury spill or microdroplets dislodged during sprinkler discharge find their way into the slab. An impermeable seal

must be effected. As racks may be bolted to an existing concrete slab by means of conventional (e.g., Hilti-type) anchors, a hard neoprene washer seal or a simple touch-up application of durable (e.g., epoxy) sealant may be applied. Slab expansion joints within the perimeter curbed area may be reset with fresh mastic to flush, and also sealed over with epoxy paint. If DOE elects for the construction of a new elemental mercury storage facility, then inclusion of water stops in concrete joints should be considered. If DOE considers conversion of an existing facility for elemental mercury storage, such a facility may be found to have pre-existing floor penetrations, such as floor drains. These should be sealed, ideally with a high-quality (e.g., Thaxton-type) plug; where possible, a sealed curb to minimum height equal to that on the facility's interior-perimeter curb should be considered. The seal of all such curbs to the floor slab may best be accomplished by tightening an anchor bolt in the curb placed on durable compressible seal (e.g., neoprene sheet or mastic) [see Fig. F.1(a)]. As such an interior curb may be a hazard to foot and forklift traffic. Such curbs should be reviewed on a case-by-case basis and, where appropriate, trip hazard markings should be used. Such curbing and marking by exit doors should be carefully engineered. Lastly, stepped curbing may not be appropriate near the roll-up doors used in the Receiving and Shipping area; forklift access may be maintained by a scabble and concrete resurface with a gently sloped curb, whether by pour or metal insert.[*]

Figures F.1(c) and (d) give examples of barrier implementation. However, the overall intent in this discussion is not to prescribe a particular solution but to reinforce careful planning of the operational layout of prospective areas, and action per plan to upgrade floor areas before occupancy of the elemental mercury storage facility.

F.3 FIRE PROTECTION REQUIREMENTS

Public Law No. 110-414, Section 5(d)(4) (MEBA, see page A-9) addresses fire detection and permanent suppression systems. The fire suppression system must be permanent unless the DOE Secretary determines that a permanent system is not necessary to protect human health and the environment. The fire detection system includes smoke and heat detectors. For DOE facilities, DOE Order 420.1B (*Facility Safety*) drives fire protection, but the cited and central reference is the International Building Code (IBC-2006). The IBC-2006 cites NFPA's Life Safety Code (LSC), and the International Fire Code (IFC), as needed.

For Fire Protection (FP) purposes, Occupancy Type appears as Group H-4 (corrosive liquids), based on combined considerations of building construction and contents and use. Though the Hazardous Materials Identification System (HMIS) refers to mercury as a simple "corrosive liquid," FP characterization is bound by the IBC-2006, which describes mercury as hazardous (Group H-4). Because single-facility elemental mercury storage will likely be well over 500 gal, IBC-2006 will prescribe Type II-B building construction, with containment and negative-powered ventilation required for the "use" areas (i.e., the Handling area) and natural ventilation for the Office Administration, Receiving and Shipping, and Storage areas.

[*] Another possible means of addressing the problem of run-on from discharged firewater, as presented in S5.1.4 in response to 40 CFR 264.175(b)(4), could be to provide removable, noncombustible (metal) cowlings, to be placed over mercury containers. Cowling lips would extend in the manner of a "cake cover" (i.e., to a larger diameter and extending below the drip pan lips). This could be designed to prevent firewater accumulation in drip pans and, therefore, to essentially eliminate mercury entrainment in runoff from containers in the event of sprinkler discharge. However, this is complicated by (1) the difficulty posed to weekly container inspections, (2) the need for close Fire Protection review in cowling design (e.g., NFPA-13 requires no sprinkler obstruction with any dimension over 4 ft), and (3) the confounding possibility of pre-fire mercury contamination beyond the containers, or its condensation outside the cowling in the event of a large fire. Due to these complications, reliance on a building floor and curb containment system is recommended instead of container cowlings.

Fire suppression based on carbon dioxide is not allowed by DOE, due to asphyxiation concerns. Gaseous systems may be considered, but initial and maintenance costs will be high. Modern mist systems could reduce concerns of falling water impact on, and "splattered" dissociation of, pooled mercury. However, because little mercury release is likely and mist systems still experience maintenance problems, a conventional sprinkler system is recommended. This may make the selection from among existing facilities easier and may be "wet" or "dry" (i.e., with filled or empty sprinkler piping until fire activation) but with care given to potential for winter freeze. If a winter-freeze locale is chosen, then a dry system with an insulated or heated riser supply should be considered. It is expected that a particular sprinkler system will be designed or reviewed by fire protection engineers, per NFPA-25. Factors such as water and piping type will affect periodicity of inspection and flush with potable water in galvanized pipe (with painted exterior) that have fewer scale and microbial issues. Per NFPA-25, wet systems flush test at least yearly; dry systems full flow trip test at least every three years, and all sprinkler systems have obstruction inspection at least every five years.

The maximum rack height is 12 ft, or difficulty of sprinkler construction within racks will be encountered. Sprinkler heads must be a minimum of 18 in. above the top of the racks to allow for water dispersion. Conducting a sprinkler review for water supply relative to combustible pile density is a best management practice.

Life Safety Code (LSC) typically requires a minimum aisle width of 36 in. for emergency egress. RCRA is not specific; but 3 ft secondary aisles and 5 ft primary aisles are common in RCRA storage facilities. Note that the worst-case equipment placement may block aisle egress, so consideration of orthogonal forklift plus 36 in. in aisle layout may avoid the need for additional exit(s). Both LSC and IBC address maximum travel to exits, but the IBC is the more restrictive constraint. IBC-2006 (Table 1016.1) limits exit travel distance to maximum of 175 ft to common path, and then a maximum of 75 ft common path travel to exit.

IBC-2006 (Table 503) reports allowable building areas. For Group H-4/II-B, noncombustible construction is required, with a maximum single-facility area of 17,500 ft^2, without sprinkler protection. However, if sprinkler protection is provided, then this area can be increased by three times; if 60 ft of dead space is provided around each single-facility, then its allowed area can be increased again by twice as much. Therefore, for the ~150,000-ft^2 nominal case shown in Figure F.1(a) (and comprised of two wings of ~75,000 ft^2 each), sprinkler protection would be acceptable. Further, 40 CFR 264.14 (Security) suggests a natural (e.g., cliff) or artificial (e.g., fence) barrier be placed around the 60-ft dead space. Finally, note that there is no easy way to avoid the complications of a sprinkler-protected facility by maintaining a floor area under 17,500 ft^2; DOE Guidance 420.1-3, Section 4.2, describes a graded-approach compliance with a Highly Protected Risk (HPR) rating aimed at a DOE "best protected" insurance rating. A small footprint facility containing H-4 material must still comply with HPR.

Assuming typical pallet construction of non-RCRA materials, neither RCRA nor IBC-2006 speak to pallet design. So, while as a general aim combustibles should be minimized, strictly speaking both non-combustible (e.g. metal) and combustible [e.g., fire resistant (FR) and bare wood] pallets are permissible. Regardless of pallet material choice, automatic fire sprinklers are required for this type of occupancy (Group 4), and pallet choices affect an elemental mercury storage facility's fire protective risk status, mainly through combustible load. However, choices in metal and wooden pallet construction may have effects in other areas, including spill cleanup, industrial hygiene (IH), pallet life, waste determination, and cost. A discussion of pallet construction options follows.

Option 1: Choice of metal pallet construction

Metal construction will generally be inherently fire resistive and non-combustible. Welded and ground seams will generally be easier to clean in the event of spills. Anticorrosive coating can lengthen pallet life, and care in coating choice may improve cleanup by avoiding amalgamation issues, such as may exist with zinc or galvanized coatings. Such coatings are expected to have little impact on facility combustible load, and generally present few IH or waste issues during application or in the event of fire. However, these aspects should be checked with data sources such as a specification sheet, a materials safety data sheet (MSDS), or vendor representatives.

Option 2: Choice of FR wood pallet construction

Wood may be encapsulated by FR coating or paint, or it may be impregnated with an FR material (e.g., a boron compound) before construction. Heated cure of FR-coated cut lumber before assembly is generally preferred, but a slightly reduced benefit is still seen when FR coating is applied to the complete assembly and no heat cure is applied.

FR lumber is typically treated at a dedicated pressure and kiln facility before purchase. Note that many other pressure treated lumber variants exist which are not only non-FR but which are particularly noxious if burned and can complicate eventual waste disposal. Regarding the use of pressure treated lumber, only FR class-rated lumber should be considered for mercury storage pallets.

The FR performance of these two methods differs. FR-coating encapsulation will tend to reflect some radiant heat and inhibit combustible vapor emission from the pallet at elevated temperatures, while impregnation tends to stall flame progression. Some IH or waste considerations may exist with either method (especially impregnation), and the characteristics of candidate compound should be evaluated on a case-by-case basis. Also, while FR coated wood should retain its manufacturer- or handbook-rated structural characteristics, FR impregnation may reduce wood strength somewhat. By either method, FR wood will generally still be considered a combustible, since it will burn albeit in a less vigorous char-type manner. Both FR encapsulation and impregnation only provide a time period of protection, ideally matched to the time needed for site fire response. Impregnation (with typical borates) provides superior protection against rot, decay and pests, while encapsulation is superior in moisture rejection. Finally, both FR methods are of higher cost than non-FR wood construction, with impregnation cost likely higher.

Option 3: Choice of non-FR wood construction

Conventional non-FR wood construction is viewed as permissible for mercury storage pallets, even though it adds to combustible load and provides a logical site for fire initiation. ORNL FP specialists advise that a credible vision of an operating elemental mercury storage facility will likely have significant wood, paper-, plastic- or rubber-based combustibles, such that the wood-driven basis for key reviews should be unaffected by the choice of either a combustible or noncombustible pallet. Fire suppression will be required and the maximum expected fire temperature will be based on a wood fire. Still, ORNL FP expects that noncombustible or FR pallet design, where reasonably applicable, should be favored as a best management practice over non-FR wood construction.

Conventional, untreated lumber has some advantages in use. It is common and pallets should be cheaper to construct. Unusual additives are not present to create harmful vapors in the event of fire and, if uncontaminated, it should be easier to dispose than either metal or FR wood. However, it may have a relatively short life due to decay or infestation, and since it (as well as FR impregnated wood) is relatively porous, liquid spill cleanup may be rather difficult.

IFC Section 2704.9 requires an emergency fire alarm system but does not specify design. Audible (e.g., horn), visual (e.g., strobe), and pull box are recommended at each normal or emergency exit. MEBA-required protection may also be met by the use of high-mounted smoke and heat detectors. Key data, including alarm location and control valve position, should be electronically transmitted to a local alarm/control panel, which should be mounted outside the facility for easy first-responder access [e.g., as shown in Figures F.1(a) and (b)]. Given the intermittency of operations for a long-term storage facility, hiring of a private control-receiving firm is advised, if none is available within the facilities staff. The alarm data would then be sent by phone line to a continuous-service firm that is experienced in monitoring and action, is well briefed on the hazardous storage issues, and can initiate the response. A parallel alarm line may also be sent to facility operations manager for joint awareness. The site management/staff, control-receiving firm, and local fire station should all be involved in planning (e.g., certificate of occupancy, permits, and pre-fire plan), training, periodic exercises, and fire system maintenance.

Early in a fire, the local temperatures will pass above 400°F, the temperature at which the common logarithmic vapor pressure curve bends upward, and vaporization of any open or exposed mercury will increase (Butts, 1943). Mercury microdroplets on the exterior of containers will then be quickly vaporized, and facility vapor levels will rise. However, above 950°F, with container breaches, a significant surge in mercury vapor will be expected in the facility. Areas above TLV located downwind of the facility should be evacuated, and the weather should be monitored for wind shift. Mercury microdroplet condensation may be expected on surfaces exposed to high concentration vapors. The firefighters should use skin-protecting PPE and self-contained breathing apparatus (SCBA) for protection from the vapors.

F.4 SPECIAL VENTILATED AREAS

The main requirement driving ventilation is the American Conference of Governmental Industrial Hygienists' (ACGIH's) Time-Weighted-Average/Threshold Limit Value (TWA/TLV) limit of 0.025 mg/m^3 mercury vapor. Readings above this TLV should be viewed as a presumptive indicator of a "source" of exposed mercury, whether from a leak or spillage at a prior time of liquid transfer. A spot of elevated mercury vapor reading above TLV suggests a nearby spot of mercury liquid (or amalgam) since mercury vapors are relatively heavy and, if undisturbed, will lie low. However, relatively minor movement may broadly stir up mercury vapors above a 6-ft elevation and into the breathing zone. This underpins area ventilation guidance.

When the subject area is in use, negative pressure is required in each of two facility areas:

1. <u>In the Handling area, as filtered high-negative draw close to the vapor source</u>:
   The purpose of this required ventilation draw is to remove and capture relatively small volumes of high concentration vapors from a mercury vapor source. Such a source can be at a spill, from smeared microdroplets, or from a port on an open container with significant volume or residue of mercury from prior use. A source may also be a new container which, on fill, has its air volume displaced by in-rushing liquid mercury. The displaced air may be rich in mercury vapors. A negative draw snorkel should be placed in close proximity (within 2 to 3 in.) of a source with a minimum centerline air velocity 100-fpm at the source to entrain elemental mercury vapors. Typically, a centrifugal-type radial fan should be overdesigned to allow for a minimum 100-fpm reading, even with a maximally extended snorkel (i.e., as for truck cargo area needs, described below) and with a maximally expected loading of the filter. The 100-fpm measure should be confirmed periodically by calibrated meter (e.g., VelociCalc).

Connect the duct to a mercury vapor (e.g., sulfur) filter, low-maintenance fan, and discharge outside the building to a stack. Construct and check the entire system for leak-tightness, and perform periodic checks to ensure that the positive pressure side of the system (from discharge side of the fan to stack exit) is sealed against leaks. In addition, good practice is to mount this positive-pressure side of the system outside the building as an added safeguard against leaks (and noise) in the facility. The stack should be one-third to one full height of the building above the full height of the building to effect proper dilution of any unfiltered materials passing into the exhaust. Design the upstream diffuser aspect ratio or veins to force even mercury vapor loading across the filter face and prevent channeling which may cause premature filter changeout. Placement of the filter before the fan removes mercury vapor which could condense or amalgam to inner surfaces, thereby minimizing hazards and cleanup in fan maintenance or decommissioning. However, mercury may still condense on suction side of the filter, specifically inside the flexible ventilation duct. Therefore, seal the end of the snorkel, by plug and taped bag, when the directed ventilation system is not in use; a taped bag alone is discouraged as accidental start-up of the fan before bag removal may drag the bag onto the filter media.

As the binding chemical in the filter (e.g., sulfur) may become inactive with time and/or use, developing a reasonable plan for test and changeout is BMP. Testing could be invoked when a continuous (and frequently recalibrated) post-filter exhaust monitor shows elevated mercury vapor levels, with changeout if confirmed by checks with snorkel introduction of a known mercury vapor source concentration. Alternatively, filter changeout could simply be scheduled periodically, with the period shorter than that needed to overwhelm the filter under the worst expected source concentration. A wall-mounted AC unit is suggested for the Handling area. While this may have salutary benefit for comfort for workers in hot personal protective coats and gear during summer months, it is primarily intended to reduce mercury vapor emissions by keeping the temperature below 70°F. However, ensure that (1) the suspect-contaminated Handling area is not used as a cool-off or break area, (2) the AC unit is only used during hot-month Handling area work (to observe LEED energy concerns), and (3) the vent remains closed to promote a closed Handling area atmosphere.

2. <u>In the Storage area, as unfiltered low-mounted low-negative draw for the general area</u>:
The purpose of this optional-but-recommended ventilation draw is to remove low-concentration mercury vapors (below TLV) which may reside in the Storage area before work begins. It is good practice to continue this draw throughout the work (unless work is disrupted, as may occur in vapor monitor checks) and turn it off at the end of the work session. The draw is intended to be low mounted to capture heavy vapors with the least disruption or elevation and should be grilled, guarded, and (if possible) exterior mounted against accidental hand injury and noise. It is suggested that louvers be added at the corners of the building, with automatic-counterbalanced or exterior-manual louver actuation to minimize building entry until the Storage area first air change-out is complete.

   This is intended to be a low-vacuum, high-volume flow system typically suited to a conventional axial industrial fan. The vacuum pressure is not prescribed but must be much less than that in the Handling area, so as not to redirect flow if both fans are accidently turned on at the same time. A high-volume flow system is recommended; the ORNL Health and Safety Field Support subject matter expert (SME) recommends 10 building volume air changes per hour, based on mercury vapor hazard and American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE) guidance, with suggested draw from the rear of the Storage area to promote discharge away from and minimize noise at entry. In operation, at least one full Storage area air change (i.e., minimally 6 minutes) of fan

operation is recommended before entry for start of work. No (sulfur) filter or stack is required for the Storage area draw, as only low (sub-TLV) levels are expected. Indeed, while an optional stack may be considered, a filter will likely load up with area dust and cause operational problems. Also, the 10 changes per hour are ASHRAE *guidance*, and may be viewed as a rule-of-thumb recommendation subject to HVAC specialist review for a particular site. Other factors, notably the dimensions of the particular facility and distance from air inlets to exhaust, will be known during facility selection (or design) and will affect the air velocity that moves mercury vapors from the Storage area.

This fan system will likely be more expensive than that for the Handling area. Using the nominal case shown in Fig. F.1(a) of this appendix (two wings, each of 218 ft × 336 ft × 20 ft high) for the 1-MT container storage, approximately 3 million ft^3 for the total 2-wing area should be evacuated 10 times per hour. The aggregate ~500,000 cfm could be supplied by 16 axial, belt-driven, corrosion-resistant, wall-mounted exhaust fans. Nominal fan choice and arrangement are in Figs. F.1(a) and (d), with sizing allowance for louver and screen debris pressure drop (~1/4 in. water gauge), and with protective inlet screens and louver assemblies shown. While the wall-AC and single snorkeled fan in the Handling area may be dual rated, these Storage area fans, when in operation, will have a significant power draw and are expected to require 208-V ac/three-phase service.

Receiving and Shipping is expected to be an interior location, near a trucking port and near the Handling area. This minimizes transport before inspection, and into the Handling area (in the uncommon case where inspection requires it). To maintain ventilation control, an exterior loading dock is not recommended, as uninspected and potentially leaky or mercury-contaminated containers may expose personnel and the environment to spills or mercury vapor. A preferred arrangement is to have a conventional aperture-type roll-up door directly to the facility. Typically, such arrangements have a rubberized collapsible bumper, which can be upgraded to effect a near-seal and promote ventilation draw to the facility's fan in the Handling area. Such an arrangement also minimizes loading dock accidents.

Before truck unloading, a vapor check of the receiving truck area should be conducted. If high vapor levels (over TLV) are found, then a standard plan should be briefed and followed before truck entry. Depending on vapor levels and observed condition of cargo, the plan may involve extended Handling area snorkel use to bring vapors to below TLV level, as shown in Figure F.1(b). Actions may also include appropriate respiratory protection and PPE use, direct movement of cargo to the Handling area, and/or quarantine of the truck until additional information and resources are received from the shipper.

The Handling (but not Storage) area draw is recommended to be in effect during receiving and inspection as draw from a through-wall snorkel (optional, but recommended) from the nearby Handling area fan which will pull mercury vapors through filtered exhaust. Once receiving and inspection are complete, and the area is determined to be clean of mercury, the Handling area fan may be turned off and the (unfiltered) Storage area fan may be started, in normal preparation for Storage area work.

ORNL empirical experience (to 130°F with 3-L containers) and analytic modeling [on 3-L and 1-MT containers, to 400°F, 13 G; assuming a 90% fill and showing a safety factor (SF) of SF > 3 on yield] suggest that temperature control is not needed to ensure container integrity in the Storage area. However, vapors from external microdroplets will be reduced if temperatures are kept low (nominally, <70°F). This is recommended in the small Handling

area, which may deal with open or leaky containers. However, due to higher costs and lower vapor risk, air conditioning is not recommended for the Storage area.

Although the Office Administration area is not involved in the direct handling of mercury, ventilation must be maintained consistent with expected support for office occupancy and long term storage of key paper-based permanent Federal records and, if prevailing wind direction is discernible, located upwind of the Receiving, Storage, and Handling areas. ANSI/ASHRAE Standard 55-1992 Figure 2 gives acceptable ranges of operative temperature and humidity for people in typical summer and winter clothing during light, primarily sedentary activity, consistent with normal office work. While the exact ranges of the figure should be referenced, rough ranges of 25-to-60% relative humidity and 68-to-80°F should be observed. In addition, while volumetric air changes are not described, ASHRAE 62.6.1 Table 2 ("Outdoor Air Requirements for Ventilation Offices") prescribes 20 cfm for each Office Administration area resident. Except during a vapor release, or other 'shelter in place' event, this air is recommended to be fresh air from outside the facility. Finally, federal records storage must comply with 36 CFR 1222.50(b)(9)(c)(1), which prescribes similar ventilation as for office space. However, while other Office Administration area ventilation (e.g., air flow) may be reduced during periods of low occupancy, storage ventilation must be continuous.

F.5 LOCATION-SPECIFIC CRITERIA

40 CFR 264/265.18 define the location standards set for RCRA TSDFs and reflect a basic requirement to locate TSDFs on sites that minimize catastrophic events caused by flooding or earthquakes. The flood and seismic standards of 40 CFR 264.18 do not apply to interim status facilities but would apply if the facility seeks a RCRA hazardous waste facility permit. Both permitted and interim status facilities cannot involve placement of hazardous waste in a salt dome, salt bed formation, underground mine, or cave (except for the Waste Isolation Pilot Plant in New Mexico).

F.5.1 Flood

40 CFR 270.14(b)(11) also refers to the seismic/floodplain requirements. An elemental mercury storage facility should not, if possible, be located in a listed 100-year floodplain. If the chosen facility site is within a 100-year floodplain, then it must be shown that there is either no impoundment area "washout," or the effect of "washout" is acceptable. The site should be examined and graded to avoid flooding. The upper lip of the facility's slab should be well above grade, and the 60-ft apron area should be contoured and landscaped so runoff will move away from the facility with minimal erosion [see also 40 CFR 264.175(b)(4) for design requirements for run-on prevention]. Further, runoff from neighboring upland areas should be intercepted (e.g., by ditching) before the 60-ft apron and directed away from the facility.

F.5.2 Seismic

40 CFR 270.14(b)(11) also refers to the seismic requirements. Per RCRA, the storage facility site should not be located in any area listed as within 200 ft of an active (i.e., Holocene-era) fault.

Per DOE O 420.1, DOE takes a graded approach to natural phenomenon hazard assessment of multiple events including earthquakes, floods, and violent weather. While strict formulas or numeric G-loading are not prescribed, guidance is given in subordinate standards (DOE-STD-1020 through -1024) and applicable building codes (e.g., UBC, IBC). The graded approach employs three key

concepts: life safety, continuity of essential missions, and hazardous material safety. A probability and consequence evaluation is performed as part of a utilitarian natural phenomena hazards (NPH) assessment. Generally, DOE O 420.1 applies to DOE personnel and contractors and (with a cost-benefit emphasis) to new and existing facilities.

Seismic review will be performed with attention not only to basic facility structure but also interior structure, notably the 3-L racks. Limiting the shelf height to 12 ft, as recommended in the Fire Protection Section to minimize sprinkler complications, will also provide improved resistance to moments during a potential seismic event. Anchor the racks to the floor, and place cross-ties between high-mounted racks to maximize the combined inertial moment against lateral G loading. Design the cross-ties carefully and train the forklift operators to avoid forklift mast entanglement.

Reinforcing bars in the floor slabs are recommended against seismic separation. Each slab is comprised of a well-compacted base material, free from excessive moisture accumulation, to prevent slab failure by liquefaction of base material in a seismic event.

F.5.3 Fire

ECOS (October 2003) BMP (page 15) indicates that, in a sustained fire, both A36-equivalent carbon steel and 300 series SS containers will likely crack and leak. During normal storage including forklift handling, and assuming a maximum 90% volumetric fill, acceptable safety factors (SFs) are expected [that is, SF > 3 on yield for a 300 series stainless steel (SS) (or A36-equivalent) typical 3-L flask or 1-MT container construction with a temperature (T) <120°F]. For a non-space-conditioned Storage area, a nominal sprinkler link setting of <250°F is suggested, subject to detailed fire protection review at a chosen site. A simple irreversible 400°F crayon (e.g., McMaster-Carr 3261K91) scribing on each pallet is also suggested as a means of any post fire-event determination of the extent of areas in which containers may have experienced excessive temperatures requiring individual inspection and/or transfer of the contents. Supplementary information for fire protection consideration are included elsewhere in Appendix F.

F.6 REFERENCES

36 CFR 1222.50—Records and maintenance storage

40 CFR Part 264—Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR Part 264 Subpart B—General Facility Standards
40 CFR 264.14—Security
40 CFR 264.18—Location standards

40 CFR Part 264 Subpart C—Preparedness and Prevention
40 CFR 264.31 to 264.33—Covers facility design and operation, required equipment, and testing and maintenance of equipment

40 CFR Part 264 Subpart F—Releases from Solid Waste Management Units
40 CFR 264.101—Corrective action for solid waste management units

40 CFR Part 264 Subpart I—Use and Management of Containers
40 CFR 264.175—Containment

40 CFR Part 265—Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

40 CFR Part 265 Subpart B—General Facility Standards
40 CFR 265.18—Location standards

40 CFR Part 265 Subpart C—Preparedness and Prevention
40 CFR 265.31 to 265.33—Covers facility design and operation, required equipment, and testing and maintenance of equipment

40 CFR Part 270—EPA Administered Permit Programs: The Hazardous Waste Permit Program

40 CFR Part 270 Subpart B—Permit Application
40 CFR 270.14—Contents of Part B: General requirements

DOE Guide (G) 420.1-3, *Implementation Guide for DOE Fire Protection and Emergency Services Programs for Use with DOE O 420.1B, Facility Safety.*
DOE Order (O) 420.1B, *Facility Safety*

ACI (American Concrete Institute). 2008. *Guide for the Design of Concrete and Construction of Concrete Parking Lots*, ACI 330R, Section 2.5 (“Concrete Properties”)
ANSI/ASHRAE (American National Standards Institute/ American Society of Heating, Refrigerating, and Air Conditioning Engineers) Standard 55-1992, *Thermal Environmental Conditions for Human Occupancy*
ASHRAE (American Society of Heating, Refrigerating, and Air Conditioning Engineers) Standard 62, *Ventilation for Acceptable Indoor Air Quality*
ASTM (American Society for Testing and Materials). 2008. *Masonry Standards*, ASTM C73/293 (“Center Point Loading”)
Boiler Pressure Vessel Code 2008, Section II, Table 1A
IBC (International Building Code) 2006, IBC-2006
IFC (International Fire Code), Section 2704.2 (“Storage—Spill Control and Secondary Containment for Liquid and Solid Hazardous materials”)
IFC Section 2704.6 (“Explosion Control”)
IFC Section 2704.9 (“Emergency alarm”)
IFC Section 3104.1.1 (“Liquid-tight floor”)
NFPA, *Standard for the Installation of Sprinkler Systems*, NFPA-13
NFPA, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*, NFPA-25
NFPA (National Fire Protection Association), *Life Safety Code*, NFPA-101, 2000
NFPA, *Guide for Fire and Explosion Investigations*, NFPA-921, Table 5.3.1.1
NFPA, *Healthcare Facilities handbook*, NFPA 99-2005

Butts, A. 1943. *Metallurgical Problems*, pp. 345 (Table XXII) and 399, McGraw-Hill Book Company, New York, New York.
ECOS (Environmental Council of the States). October 2003. *Mercury Stewardship Best Management Practices*, Quicksilver Caucus and U.S. Environmental Protection Agency, Washington, D.C.
Linde, D. R. (ed.). 1999. *CRC Handbook of Chemistry and Physics, 80th edition, 1999–2000*, CRC Press, Inc., Boca Raton, Florida.
Perry, Robert H., Don W. Green, and James O. Maloney. 1997. *Perry’s Chemical Engineers’ Handbook*, 7th ed., McGraw-Hill, New York, New York.
USACE (U.S. Departments of the Army and the Air Force). August 1987. TM 5-809-1/AFM-88-3, Chapter 15, “Concrete Floor Slabs on Grade Subject to Heavy Loads,” Washington, D.C.
U.S. Army. March 14, 1985. “Concrete and Masonry,” Field Manual FM 5-742.

Appendix G
MERCURY STORAGE CONTAINER GUIDELINES

Appendix G. MERCURY STORAGE CONTAINER GUIDELINES

G.1 INTRODUCTION

The mercury storage container guidelines are intended to create maximum flexibility while maintaining appropriate safety requirements and complying with 49 CFR 173.24. All acceptable containers fall into two main categories: (1) existing containers—containers no longer produced by industry—and (2) industry containers—containers currently manufactured for containing elemental mercury. These guidelines only discuss 3-L and 1-MT containers. However, other sizes may be allowable at the discretion of the facility operators.

It should be noted that, in addition to Federal regulations, States may have additional hazardous waste and other regulations with which generators, transporters, and the DOE operating contractor must comply.

G.2 EXISTING CONTAINERS

An existing container is defined as any 3-L or 1-MT container meant for the storage of mercury that is no longer produced and may not have been manufactured to current industry standards. Some of these containers may be acceptable for long-term storage of elemental mercury. The containers should meet the following requirements: (1) no damage from any previously contained materials and those materials should not adversely react with mercury; (2) no damage to the structural integrity of the container; (3) no excessive corrosion; and (4) should have a protective coating (paint) to protect against corrosion. Existing 3-L and 1-MT containers should be reviewed before shipment with several images and documentation. The facility operator may consult with technical experts to assess container integrity prior to accepting existing containers.

Examples of acceptable existing 3-L containers are provided below.

G.2.1 Example 1

Example 1 is made of a central cylinder to which are welded upper and lower sections. The neck of the container is attached to the upper section by an internal weld. Example 1 is approximately 12 cm in diameter and about 35 cm tall to the top of the neck (not including the height of the threaded plug). Example 1 has a mass of about 3.4 kg.

G.2.2 Example 2

Example 2 is made of a central cylinder that was shaped with a curved upper shoulder and a concave bottom. The neck of the container is formed as part of the body. The bottom of the container is sealed by welding. Example 2 is about 13 cm in diameter and approximately 36 cm tall to the top of the flared neck (not including the height of the threaded plug). Example 2 has a mass of about 5.1 kg.

G.2.3 Example 3

Example 3 is made of a single piece of metal that was formed into a central cylinder with a curved upper shoulder and a concave bottom. The neck of the container is formed as part of the body. Example 3 is about 13 cm in diameter and approximately 31 cm tall to the top of the neck (not including the height of the threaded plug). Example 3 has a mass of about 3.7 kg.

G.2.4 Example 4

Example 4 is made from a single piece of metal that was formed into a central cylinder with a curved upper shoulder, a slightly concaved bottom, and a neck. The container is made without externally visible welds. Example 4 is about 13 cm in diameter and about 36 cm tall to the top of the neck (not including the height of the threaded plug). Example 4 has a mass of about 6.3 kg.

G.2.5 Example 5

Example 5 is made from a single piece of metal that is formed into a central cylinder with a convex upper shoulder and a concave bottom. The neck of the container is formed as part of body. Example 5 is similar to containers for compressed gases. Example 5 container is about 13 cm in diameter and about 33 cm tall to the top of the neck (not including the height of the threaded plug). Example 5 has a mass of about 4.1 kg.

G.2.6 Example 6

Example 6 is made from a single piece of metal that is formed into a central cylinder with a convex upper shoulder and a concave bottom. The neck of the container is formed as part of the body. Example 6 is similar to containers for compressed gases. Example 6 container is about 12 cm in diameter and about 37 cm tall to the top of the neck (not including the height of the threaded plug). Example 6 has a mass of about 4.6 kg.

G.3 INDUSTRY-PRODUCED CONTAINERS

To be accepted into the storage facility, 3-L and 1-MT containers produced by industry today are recommended to meet general guidelines. These guidelines are to minimize the risk of container failure and ensure minimum inspection requirements during storage.

G.3.1 Allowable Metals

Carbon steel. All carbon steel used should comply, at a minimum, with ASTM A36, *Standard Specification for Carbon Structural Steel*. Any standard that provides higher yield strength without compromising resistance to corrosion from elemental mercury is acceptable.

Stainless steel. All stainless steel used should comply with at least one of the following standards, depending on the type of container construction selected more than one standard may apply:

- ASTM A240, *Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Application*
- ASTM A276, *Standard Specification for Stainless Steel Bars and Shape*
- ASTM A511, *Standard Specification for Seamless Stainless Steel Mechanical Tubing*

G.3.2 Container Design

3-L container. The 3-L containers are designed to contain a minimum of 76 lb of elemental mercury. The total interior volume of the containers can range from 3.0 to 3.5 L.

1-MT container. The 1-MT container does not exceed 2400 lb of liquid mercury and must provide a minimum head space of 15% after maximum fill. The gross weight of the full container does not exceed 2750 lb.

Welding. Welding of carbon steel complies with AWS D1.1, *Structural Welding Code—Steel*. If using stainless steel for container material, AWS D1.6, *Structural Welding Code—Stainless Steel* applies. The listed standards provide clear instructions on proper welding technique and procedures.

Design. The container is capable of being self-supported in the upright position on a flat level surface, such that the plug is at the highest elevation and not in routine contact with the liquid within.

G.3.3 Plugs

Plugs. The plug should be fabricated from ASTM A36 carbon steel and a protective coating is applied (protective coating is not to be applied to threads).

3-L container. The plug provides an airtight seal to eliminate mercury vapor from escaping the container and a lifting point for the container. The plug for the 3-L container should be a ½-in. National Pipe Thread (NPT) plug. A minimum 3/16-in.-diameter hole should be drilled through the head of the plug, perpendicular to the axis of the plug, leaving enough material to safely lift the container with full mercury contents. To achieve an airtight seal, two layers of white Teflon tape are wrapped around the plug threads. The plug is hand tightened first and then rotated an additional one and three-quarter turns using a wrench.

1-MT container. The plug provides an airtight seal to eliminate mercury vapor from escaping the container. The plug should be a 2- to 3-in. NPT plug with a square head. To achieve an airtight seal, two layers of white Teflon tape are wrapped around the plug threads. The plug is first hand tightened and then rotated using a wrench until the plug provides an airtight seal.

G.3.4 Markings

Suggested markings. The following information, at a minimum, should be affixed to each container.

- Name of supplier
- Origin (state or country)
- Container number
- Gross weight
- Official corrosive label (Figure G.1)

Stainless steel tag. Required marking can be permanently stamped or etched on a stainless steel tag. The tag should be attached using a wire tie to the hex nut tack welded to the container.

Stamping. Required marking can be permanently stamped or etched on the container using a method not to be visually covered by paint or a protective coating.

Figure G.1. Corrosive label example.

G.3.5 Painting

The exterior of each carbon steel container is thoroughly cleaned and free of all oxidation products and foreign materials including dirt, oil, and weld slag. A coating of paint should be applied to all exterior carbon steel surfaces in a manner that will not leave the steel exposed. The coating is applied in a manner that minimizes blistering, peeling, or cracking of the paint.

G.3.6 References

DOT (U.S. Department of Transportation) Regulations:

49 CFR 173.24—General requirements for packagings and packages

ASTM (American Society for Testing and Materials) A36, *Standard Specification for Carbon Structural Steel*
ASTM A240, *Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Application*
ASTM A276, *Standard Specification for Stainless Steel Bars and Shape*
ASTM A511, *Standard Specification for Seamless Stainless Steel Mechanical Tubing*
AWS (American Welding Society) D1.1, *Structural Welding Code—Steel*
AWS D1.6, *Structural Welding Code—Stainless Steel*

Appendix H
RCRA SUPPLEMENTARY INFORMATION

Appendix H. RCRA SUPPLEMENTARY INFORMATION

H.1 RCRA AIR EMISSIONS

The RCRA air emission standards are implemented according to the type of waste management activity involved and the ways in which the emissions occur. 40 CFR 264/265, Subparts AA and BB, address air emissions from process vents associated with certain types of hazardous waste management processes (Subpart AA) and leaks from certain types of equipment at treatment, storage, and disposal facilities (TSDFs) and large-quantity generators (Subpart BB). At such facilities, owners and operators are required to install control equipment and employ management practices to reduce air emissions from affected units and equipment. 40 CFR 264/265, Subpart CC, regulates organic air emissions from tanks, surface impoundments, and containers located at RCRA TSDFs and large-quantity generators (LQGs). Owners and operators of TSDFs that manage hazardous waste in tanks, surface impoundments, and containers, as well as LQGs accumulating hazardous waste in tanks and containers, must install air emission controls only if these units manage waste that exceeds an average volatile organic concentration of 500 ppm by weight at the point of waste generation. Per 40 CFR 270.15(e), .24, .25, and .27, a facility would address the applicability of Subpart AA, BB, and CC requirements to its facility operations in its permit application.

For a DOE elemental mercury storage facility, Subparts AA and BB do not apply because (1) regulated processes or regulated equipment would not be in use and (2) the elemental mercury to be stored shall not contain organics at 10 ppm by weight or higher. Subpart CC could apply to a limited extent, and the facility would provide its determination in its permit application. Subpart CC requires generators to make a Subpart CC determination for their hazardous waste at the point of generation. Subpart CC applies to containers storing hazardous wastes containing at least 500 ppm by weight volatile organics. TSDFs receiving hazardous wastes must know whether the waste is Subpart CC regulated or not in order to determine whether Subpart CC could apply to their operation. Hence, Subpart CC status of the elemental mercury is to be documented in the Waste Profile submitted by the generator. Other than the Subpart CC determination [including recordkeeping (see Section 2)], other Subpart CC requirements should not apply. The facility's permit application documents its determination as to AA, BB, and CC applicability. If the Subpart CC determination is not made/documented for a container, then the waste would be considered Subpart CC regulated and proper controls implemented if required. For the most part, the actual emission controls are based on the size of the container. The TSDF would also make Subpart CC determinations for wastes generated during facility maintenance or operations.

H.2 MANIFEST (EPA FORM 8700-22)

Generally, a generator who transports, or offers for transportation, hazardous waste for off-site storage at the DOE-designated elemental mercury storage facility must prepare a Uniform Hazardous Waste Manifest. The manifest is a multiple-copy tracking document for hazardous waste shipments that is required by DOT and EPA. The manifest tracks the chain of custody for the waste from the point it leaves the generator to final disposition at a hazardous waste TSDF or a recycling facility. Each party that manages the waste signs the manifest and retains a copy, providing critical continuity between the generator and the receiving facility (40 CFR Part 262, Subpart B). Once the chain is complete, the receiving TSDF returns a signed copy of the manifest to the generator. If a generator does not receive a copy of the manifest signed by the designated facility owner or operator within 45 days of the date the waste was accepted by the initial transporter (60 days for a SQG), he or she must file an exception report (40 CFR 262.42). Under RCRA, CESQGs are not required to use a manifest when shipping their waste off site, but DOT would still require a shipping paper. Additionally, the manifest requirements do not apply to the transportation of hazardous wastes on

rights-of-way on or between contiguous properties, and along the perimeter of contiguous properties controlled by the same person [40 CFR 262.20(f)]. A copy of the manifest forms and instructions for completing it are found in the appendix to 40 CFR Part 262.

H.3 DESIGNATED FACILITY

The DOE elemental mercury storage facility should be listed as the primary designated facility for receipt of waste elemental mercury. According to 40 CFR 262.20, a generator must designate one facility on the manifest that is permitted to handle the waste described on the manifest. A designated facility, as defined in 40 CFR 260.10, is a Federally or state-permitted TSDF or a recycling facility as regulated pursuant to 40 CFR 261.6(c)(2) or 40 CFR Part 266, Subpart F. The generator may also designate an alternate facility in case the transporter cannot deliver the waste to the primary designated facility. If the transporter is unable to deliver the shipment to either facility on the manifest, the generator must designate a third facility.

H.4 INFORMATION ON UNIVERSAL WASTE IMPLICATIONS

The universal waste regulations provide an alternative set of regulations that reduce the regulatory burden on persons generating universal wastes by allowing alternative storage requirements, longer storage of these wastes and reduced recordkeeping. EPA's primary goal for the universal waste program is to encourage the recycling of these wastes (batteries, mercury-containing equipment, pesticides, and lamps).

For more information on EPA's universal waste requirements see:

EPA 2005, "Introduction to Universal Waste," EPA530-K-05-019 September 2005, at http://www.epa.gov/epawaste/inforesources/pubs/hotline/training/uwast05.pdf

H.5 REFERENCES

EPA (U.S. Environmental Protection Agency) Regulations and Forms:

40 CFR Part 260 (RCRA) Hazardous Waste Management System: General
- 40 CFR 260.10—Definitions

40 CFR Part 261 (RCRA) Identification and Listing of Hazardous Waste
- 40 CFR 261.5—Special requirements for hazardous waste generated by conditionally exempt small quantity generators
- 40 CFR 261.6(c)(2)—Requirements for recyclable materials

40 CFR Part 262 (RCRA) Pre-Transport Requirements
- 40 CFR Part 262 Subpart B—The Manifest
- 40 CFR 262.12—EPA identification numbers
- 40 CFR 262.20(f)—General requirements
- 40 CFR 262.30 to 262.33—Requirements for packaging, labeling, marking, and placarding
- 40 CFR 262.34—Accumulation time
- 40 CFR 262.41—Biennial report
- 40 CFR 262.42—Exception reporting
- 40 CFR 262.44—Special requirements for generators of between 100 and 1000 kg/month
- 40 CFR Part 262 Appendix—Uniform Hazardous Waste Manifest and Instructions (EPA Forms 8700-22 and 8700-22A and Their Instructions)

40 CFR Part 264 (RCRA) Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

- 40 CFR Part 264 Subpart B—General Facility Standards
- 40 CFR Part 264 Subpart AA—Air Emission Standards for Process Vents
- 40 CFR Part 264 Subpart BB—Air Emission Standards for Equipment Leaks
- 40 CFR Part 264 Subpart CC—Air Emission Standards for Tanks, Surface Impoundments, and Containers

40 CFR Part 265 (RCRA) Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities

- 40 CFR Part 265 Subpart AA—Air Emission Standards for Process Vents
- 40 CFR Part 265 Subpart BB—Air Emission Standards for Equipment Leaks
- 40 CFR Part 265 Subpart CC—Air Emission Standards for Tanks, Surface Impoundments, and Containers

40 CFR Part 266 (RCRA) Standards for the Specific Management of Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities

- 40 CFR Part 266 Subpart F—Recyclable Materials Utilized for Precious Metals Recovery

40 CFR Part 270 (RCRA) EPA Administered Permit Programs: The Hazardous Waste Permit Program

- 40 CFR 270.15(e)—Information on air emission control equipment
- 40 CFR 270.24—Information requirements for process vents
- 40 CFR 270.25—Information requirements for equipment
- 40 CFR 270.27—Information requirements for air emission controls for tanks, surface impoundments, and containers

40 CFR Part 273— Standards for Universal Waste Management

- 40 CFR Part 273—Subpart B, Standards for Small Quantity Handlers of Universal Waste
- 40 CFR Part 273—Subpart C, Standards for Large Quantity Handlers of Universal Waste
- 40 CFR 273.9—Definitions

EPA Form 8700-22, “Uniform Hazardous Waste Manifest.”