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Waste Acceptance Criteria for the Storage of Elemental Mercury at the U.S. Department of Energy Long-Term Elemental Mercury Storage Facility

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U.S. DEPARTMENT OF ENERGY
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ABBREVIATIONS AND ACRONYMS

AD	Accumulation Start Date
ASME	American Society for Mechanical Engineers
ASTM	American Society for Testing and Materials
CFR	Code of Federal Regulations
DOE	Department of Energy
DOT	Department of Transportation
LTEMSF	Long-Term Elemental Mercury Storage Facility
MEBA	Mercury Export Ban Act of 2008
MT	Metric Ton(s)
NPT	National Pipe Thread
PK	Process Knowledge
QA/QC	Quality Assurance / Quality Control
RCRA	Resource Conservation and Recovery Act
RFS	Request for Storage
TID	Tamper-Indicating Device
TSCA	Toxic Substance Control Act
TSDF	Treatment, Storage, and Disposal Facility
UHC	Underlying Hazardous Constituents
WAC	Waste Acceptance Criteria

DEFINITIONS

Accepted Process—Certified processes of generation and/or purification of elemental mercury that result in a product that has a minimum purity of 99.5% by volume of elemental mercury. An Accepted Process is certified based on demonstrated and repeatable purity levels established from representative samples product produced in the Accepted Process, rather than for each individual container. Once certified as an Accepted Process, all elemental mercury produced is considered equivalent to the demonstrated elemental mercury purity, as long as the processes and parameters generating and/or purifying the elemental mercury remain consistent. Any modifications to an Accepted Process require re-certification. Representative sampling and confirmatory analyses shall be performed periodically (i.e., nominally annually), unless process changes require more frequent validation.

Container—Any portable, sealable metal device containing elemental mercury with a nominal volume capacity of 3 liters (nominal weight of 35 kilograms of elemental mercury) or 88 liters (nominal weight of 1,000 kilograms or 1 metric ton of elemental mercury).

Elemental Mercury—The form of mercury unreacted with other compounds, exhibiting a purity of 99.5% by volume, free of any added radiological components, and not containing any water, chloride salt solutions, acid solutions, or any other possible corrosion agents.

Fingerprint Analysis—A waste acceptance sampling and analysis program based on spot check procedures developed by the Mercury Storage Contractor (MSC) to verify that the elemental mercury satisfies the Waste Acceptance Criteria (WAC) of 99.5% purity. Fingerprint analyses are screening tests and observations of incoming elemental mercury, to ensure that it matches the expected characteristics for elemental mercury and the MSC does not accept incorrectly identified wastes or Prohibited Materials. The fingerprint sampling and analysis requirements are identified in the Resource Conservation and Recovery Act (RCRA) permit issued to the Long-Term Elemental Mercury Storage Facility (LTEMSF).

Generator—Individual (such as Facility Manager, supervisor of an activity generating elemental mercury, or appointee) or organization whose act or process produces elemental mercury to be stored and managed at the DOE-designated LTEMSF.

Hazardous Material—Hazardous material means a substance or material that the Secretary of Transportation has determined is capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and has designated as hazardous under section 5103 of Federal hazardous materials transportation law (49 U.S.C. 5103). Within this WAC, hazardous materials are limited to elemental mercury.

Hazardous Waste—See RCRA hazardous waste.

Long-Term Elemental Mercury Storage Facility—Facility designated by the Secretary for the Department of Energy to manage and store elemental mercury, as directed by the Mercury Export Ban Act of 2008 (MEBA).

Mercury Export Ban Act of 2008 (MEBA)—Public Law 110-414, passed October 14, 2008 that amended the Toxic Substance Control Act (see 15 U.S.C. 2611 and 2605) to prohibit the export of elemental mercury and the sale or transfer of elemental mercury from Federal agencies. MEBA also amended the Solid Waste Disposal Act (see 42 U.S.C. 6939f), requiring the

Department of Energy to designate a facility or facilities for the purpose of long-term management and storage of elemental mercury (the LTEMSF).

Mercury Storage Contractor—The commercial entity contracted by DOE to operate and manage the LTEMSF.

Overpack—To place one or more containers into another larger container. Waste is not removed from the original container(s); the entire container is placed into the overpack container.

Process Knowledge (PK)—Use of documented knowledge of the processes and sources associated with generation of a waste or waste stream that allows a reliable estimation of the properties of the resulting waste. PK is information, ultimately based on either analytical data or knowledge of the waste generating activity, that relates to the material to be characterized, but does not directly represent the material itself. PK is only acceptable for characterizing the radioactive properties of elemental mercury delivered to the LTEMSF.

Prohibited Materials—Materials that do not meet the definition of elemental mercury, including waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and RCRA, waste for which there is insufficient knowledge about its origin or generation, or water, chloride salt solutions, acid solutions, or any other possible corrosion agents.

Repackage—To move the contents of one or more waste container(s) into another waste container.

Request for Storage (RFS)—Form submitted to the LTEMSF for storing elemental mercury. The RFS includes information about the elemental mercury to be stored.

RCRA Hazardous Waste—Any solid, liquid, or contained gaseous material (compressed gas cylinder) that is characteristically hazardous or is a listed hazardous waste as defined by Title 40 of the Code of Federal Regulations (CFR), Part 261, and/or any environmental media that contains a listed hazardous waste.

Solid Waste—Any discarded material (liquid, contained gas, semisolid, or solid) that is abandoned, including disposed of, burned, or incinerated, or accumulated, stored, or treated before or in lieu of being abandoned or incinerated; recycled; or inherently waste-like, such as those listed in 40 CFR § 261.2(d).

Third-Party Processor—Any commercial entity that operates elemental mercury purification equipment but is not a Generator. Third-Party Processors may be contracted by Generators to purify generated elemental mercury to ensure it meets the standards of this Waste Acceptance Criteria (WAC).

Waste—See Solid Waste.

Waste Characterization—The process of identifying and quantifying the chemical, physical, biological, and other properties of elemental mercury waste to be stored and managed at the LTEMSF in a manner adequate to meet the WAC identified herein.

Waste Stream—Waste material produced by a specific process or activity that is similar in material, physical form, radiological, and chemical constituents.

EXECUTIVE SUMMARY

The Waste Acceptance Criteria (WAC) established within this document are for elemental mercury being stored and managed at the U.S. Department of Energy (DOE) Long-Term Elemental Mercury Storage Facility (LTEMSF). The elemental mercury generator is responsible for ensuring that all wastes are generated, managed, transported, and certified in accordance with these WAC and state and federal requirements, until such time as the waste is accepted by the LTEMSF. Any elemental mercury transferred to the LTEMSF shall meet all LTEMSF acceptance, container, and storage requirements described herein.

These WAC were developed to ensure that elemental mercury received for storage at the LTEMSF can be handled in a safe and efficient manner, in compliance with applicable federal, state, and DOE regulations and orders. This document does not supersede applicable federal and state regulations.

1. INTRODUCTION

The Mercury Export Ban Act of 2008 (MEBA) established an export ban within the Toxic Substances Control Act (TSCA) for elemental mercury, effective January 1, 2013. To accommodate the excess elemental mercury generated from the export prohibition, MEBA requires the U.S. Department of Energy (DOE) to designate a facility for the long-term storage of elemental mercury. The DOE designated Long-Term Elemental Mercury Storage Facility (LTEMSF) is specifically intended to store elemental mercury with no further commercial use. Thus, the elemental mercury is considered a hazardous waste and the LTEMSF is permitted as a Treatment, Storage, and Disposal Facility (TSDF), in accordance with the requirements of the Resource Conservation and Recovery Act (RCRA).

This document describes the Waste Acceptance Criteria (WAC), which were developed to ensure that elemental mercury received for storage at the LTEMSF can be handled in a safe and efficient manner, in compliance with applicable federal, state, and DOE rules and regulations. The WAC established in this document apply to all elemental mercury shipped to the LTEMSF for storage. The generator is responsible for ensuring that all wastes shipped to the LTEMSF are managed, certified, and transported in accordance with the LTEMSF storage and Quality Assurance procedures and applicable federal, state, DOE, and off-site waste disposition requirements.

2. RESPONSIBILITIES

The responsibilities for managing elemental mercury are divided among three participating entities: DOE, elemental mercury generators, and the Mercury Storage Contractor (MSC). Each participating entity has unique roles and responsibilities in the storage and management of elemental mercury:

Department of Energy:

DOE has designated and shall continue to maintain the LTEMSF, as required by MEBA. Under the authority of MEBA, DOE has established these WAC, detailing the requirements and specifications for the elemental mercury and containers stored at the LTEMSF. DOE shall review and approve individual Generator Agreements with any generator that uses the LTEMSF for the storage of elemental mercury. DOE, or their designee, shall also periodically review and validate Accepted Processes used by Generators and Third-Party Processors engaged by Generators to purify elemental mercury to meet these WAC.

Elemental Mercury Generators:

Generators produce the elemental mercury that is to be stored at the LTEMSF. Before elemental mercury can be stored at the LTEMSF, generators shall have approved Generator Agreements with DOE, which shall include compliance with these WAC. If generators use a third-party processor to meet the elemental mercury purity specifications or other requirement within these WAC, the third-party processor shall be identified in the Generator Agreement.

Generators shall also ship elemental mercury for storage at the LTEMSF in containers that are compliant with the U.S. Department of Transportation (DOT), these WAC, and applicable Federal and state hazardous waste requirements. Generators shall disclose any information required by DOE or the MSC regarding the elemental mercury and/or container presented at the LTEMSF for long-term storage.

MSC:

The MSC shall maintain the facility in compliance with applicable RCRA permits, state and Federal hazardous waste regulations, and DOE standards, policies, and procedures. Site operations also require the development of receipt inspection and acceptance protocols and forms, in compliance with the RCRA permit and these WAC. Elemental mercury shipments, containers and manifests shall be reviewed and inspected by the MSC, to ensure compliance with these WAC. Documentation and records shall be reviewed for compliance and consistency. All elemental mercury containers shall be tracked in an inventory system maintained by the MSC.

The MSC shall maintain procedures and capabilities for the inspection, transfer, analysis, management, inventory, storage, rejection, repackaging, and overpacking of elemental mercury. All procedures shall comply with applicable state and Federal regulations, RCRA permit, and contract requirements.

3. WASTE ACCEPTANCE CRITERIA

The WAC established in this document are for elemental mercury being received, stored, and managed at the LTEMSF. The generator is responsible for managing elemental mercury prior to transfer to and acceptance by the LTEMSF. Any elemental mercury transferred to the LTEMSF shall meet all LTEMSF acceptance, container, and storage requirements.

3.1. ELEMENTAL MERCURY SUBMITTED FOR STORAGE

DOE has established criteria for elemental mercury stored and managed at the LTEMSF, including purity and impurity content (as a percent by weight). Additionally, RCRA establishes requirements for the content of RCRA hazardous wastes.

3.1.1. General Requirements

All elemental mercury being submitted for storage shall meet the specific WAC established in this section, in addition to being containerized, packaged, marked, and labeled in accordance with Section 3 and characterized in accordance with Section 4. A Request for Storage (RFS) shall be prepared by the generator and submitted with each shipment; the RFS includes information about the elemental mercury to be stored.

3.1.2. Elemental Mercury Purity

Elemental mercury shall meet the purity requirements established by DOE.

Elemental Mercury Purity—The elemental mercury within the container shall be 99.5% pure or greater, by volume. Elemental mercury purity shall be included in the RFS, as a percent by volume and any contaminants shall be listed by name and as a percent by weight. The elemental mercury cannot contain any Prohibited Materials.

NOTE: Only laboratory certified analysis using the methods or procedures specified within Section 5 can be used to establish elemental mercury purity, contaminant content, and contaminant names.

3.1.3. RCRA Hazardous Wastes

Elemental mercury delivered to the LTEMSF is a RCRA hazardous waste and shall be characterized and categorized in accordance with Title 40 of the Code of Federal Regulations (CFR) Parts 261–268. All RCRA hazardous wastes shall have the proper waste codes assigned, to include underlying hazardous constituents (UHCs), and be identified in the RFS as such.

The generator shall report and certify the following information on the RFS for RCRA hazardous or potentially RCRA hazardous waste as a condition of waste acceptance.

EPA Characteristic and Listed Waste Codes—The LTEMSF shall only accept elemental mercury assigned both the D009 characteristic waste code and U151 listed waste code. Any other RCRA waste codes are Prohibited Materials and unacceptable for storage at the LTEMSF.

Radioactivity—The elemental mercury cannot contain any radioactive constituents or contamination at a measured level that is above naturally occurring background radioactivity. This can be confirmed by process knowledge, as defined in Section 4.2.

3.1.4. Waste Not Fully Characterized

The LTEMSF shall not accept any elemental mercury that is not fully and completely characterized in accordance with state and Federal hazardous waste regulations and these WAC.

3.1.5. Contaminants

Contaminants within the elemental mercury shall be individually detailed by name and content, as a percent by weight. Total contaminant concentration shall be 0.5% or less by volume of the total container.

Contaminants cannot be any Prohibited Material at any concentration, including all of the following:

- Waste containing both radioactive and hazardous components;
- Waste for which there is insufficient knowledge about its origin or generation; and
- Water, chloride salts solutions, acid solutions, or any other possible container corrosion agents.

3.2. CONTAINERIZATION

The generator is responsible for containerizing the waste, which includes selecting and procuring appropriate containers, packaging the wastes, marking and labeling waste packages, and sealing and storing waste packages before transfer. All containers and waste packaging activities shall comply with the applicable requirements of DOT regulations in 49 CFR.

3.2.1. Container Requirements

Elemental mercury shall only be accepted by the LTEMSF in DOT-approved and RCRA-compliant metal containers. The container shall have a nominal volume capacity of 3 liters (3-L) or 88 liters, (which can accommodate nominally 35 kilograms or 1,000 kilograms/1 metric ton (1-MT), of elemental mercury, respectively). Containers shall be constructed of carbon steel meeting the specifications of American Society for Testing and Materials International (ASTM) A36, or other steel alloys that provide equivalent or better strength and corrosion resistance. All containers shall be demonstrably capable of supporting the hoop stress induced in the wall of the container, due to the weight of elemental mercury, and shall be pressure tested to a force of 15 pounds per square inch (psi) above atmospheric pressure per the specifications in the American Society of Mechanical Engineers Boiler and Pressure Vessel Code. The outer surface of all metal containers shall be coated with a corrosion resistant material, (e.g., epoxy, alkyd enamel, direct-to-metal coating, etc.), in a light color. The inner surface and port threads shall not be coated. The container shall be 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. Examples of elemental mercury storage containers satisfying these design standards are included in Appendix A.

All 1-MT containers shall include “C” channels that will accommodate forklift tines for lifting and handling for placement into or out of its storage configuration.

3.2.2. Container Plug and Sealing

All container plugs shall be constructed of a steel alloy that is compatible with the container construction material and shall comply with the applicable ASTM specifications (e.g., ASTM A105 for forged fittings, ASTM A197 for cast fittings, etc.). The 1-MT containers shall use

either a 2- or 3-inch National Pipe Thread (NPT) plug with a square head. 3-L containers shall use a ½-inch NPT plug, with a 3/16-inch diameter hole drilled through the head of the plug, perpendicular to the axis of the plug. The hole shall be positioned with enough material around it to safely lift the container full of elemental mercury.

Container plugs shall be sealed with polytetrafluorethylene (Teflon™) tape or equivalent. Only sealed containers shall be accepted by the LTEMSF and torqued in accordance with the containers manufacturer's instructions, such that they shall contain 15 pounds per square inch of internal pressure. Containers also shall be kept closed except when filling, emptying, or sampling a container.

3.2.3. Tamper-Indicating Devices (TID)

Generators shall ensure that containers are protected against unauthorized entry. TIDs are placed on each container in such a position that the container cannot open without breaking the seal. Each TID has a unique identification number that is recorded on the RFS.

3.2.4. Container Condition

Containers shall be in good condition with no visible cracks, holes, bulges, significant dents, significant corrosion, missing plugs, or other damage that could compromise current or future container integrity. Containers shall be new or demonstrated to not have stored any material that would adversely react with elemental mercury or the container.

3.2.5. Container Filling Requirements

All elemental mercury containers should be filled to the maximum extent possible, with a nominal 10-15% head space, to allow for elemental mercury expansion. The maximum depth of the elemental mercury within the container from the top of the container opening to the bottom surface inside the container shall be <0.7 meters, to allow for vacuum extraction.

3.3. PACKAGING

Elemental mercury shall be packaged within the container with appropriate labeling and in a manner allowing for safe long-term storage.

3.3.1. Documentation of Waste Package Contents

For all waste packages, a detailed record shall be kept of the contents, volume, and tare and gross weights of the container. This information is to be documented on the RFS.

3.3.2. Use of Pallets

If pallets are used to transport elemental mercury for storage at the LTEMSF, the pallet shall be appropriately sized, able to support a full container without distortion, constructed of non-combustible, non-porous material, and have a minimum of a two-way fork entry. Pallets cannot be constructed of any material that would require disposal as a hazardous waste. Examples of acceptable pallets include: painted steel, untreated hardwood with fire-protective and non-porous coating, or other equivalent material.

3.3.3. Container Conditions

The outside of each container shall be free of surface contamination and not exhibit any visible signs of corrosion or degradation.

3.4. MARKING AND LABELING

The generator shall label and mark all containers consistent with information on the RFS and as shown in Figures 1 and 2. All labels and markings shall be legible and properly positioned on the container and shall comply with DOT and RCRA guidance for hazardous wastes and materials. All waste containers shall have the following labels and markings listed below etched into the container or permanently printed upon the container:

- Waste container label;
- Appropriate waste category or identification labels;
- Name of supplier;
- Origin;
- Unique RFS container number;
- Hazardous waste dates required by RCRA; and
- Container contents.

3.4.1. Placement

3-L containers shall be marked on the shoulder of the container. 1-MT containers shall be marked on the top near the plug and on the side. The preferred orientation of the side label is perpendicular to the "C" channels on the container; this orientation causes the label to be facing the correct direction when placed into storage. Label placement is indicated in Figures 1 and 2.

Figure 1: 3-L Container Label Placement

Figure 2: 1-MT Container Label Placement

3.4.2. Durability and Visibility

Labels and markings shall be durable, fade-resistant, water-resistant paints, vinyl stickers, or shall be sufficiently durable to remain intact and legible during management of the waste until final disposition. Markings shall be written legibly in a color that contrasts with the container color.

3.4.3. RCRA Hazardous Wastes

The Hazardous Waste Label shall be applied to containers of confirmed RCRA hazardous waste. The accumulation start date (AD) shall be marked on all RCRA hazardous waste containers. The date accumulation begins is the date that the first drop of waste is generated and placed into a container. It is not the date when the generator receives the waste analysis results. The accumulation date may be written as AD, followed by the date.

4. WASTE CHARACTERIZATION AND CERTIFICATION PROCESS

The generator shall characterize all elemental mercury offered to the LTEMSF for storage. All elemental mercury shipments shall include individual certification statements by the generator regarding the purity, volume, and contents of the container.

For purposes of transferring elemental mercury to the LTEMSF, characterization involves the determination of elemental mercury purity and types of contaminants. All waste shall be characterized according to RCRA requirements. The characterization methods and procedures shall ensure that the elemental mercury characteristics are recorded and known during all stages of the waste management process.

4.1. RADIOACTIVITY PROCESS KNOWLEDGE

While radioactivity above naturally occurring background levels is not expected to be present in elemental mercury, all elemental mercury received for storage shall be appropriately characterized for radioactivity. When the origin and constituents of a waste stream are well known and properly documented, the generator may use process knowledge (PK) to characterize the radioactivity properties of the elemental mercury. PK is documented knowledge of the processes and sources associated with generation of elemental mercury that allows a reliable estimation of the radioactivity of the waste for handling, storage, treatment, and disposal. PK is ultimately based on either analytical data or knowledge of the activity generating the elemental mercury.

Examples of PK which may be used to characterize the radioactivity of elemental mercury are as follows:

- All originating materials, (e.g., host ore from which the elemental mercury was extracted, light bulbs, thermometers, etc.) and subsequent processing (e.g., retorting, off-gas treatment/condensation, purification, etc.) are known and validated to not contain or add any radioactive contaminants;
- Sampling and analysis results for the process, as provided in Section 5.3;
- Analytical results from similar processes;
- Administrative/procedural controls; and
- Safety Data Sheets.

If the generator wishes to use PK to characterize the radioactive properties of elemental mercury, the generator shall complete the required documentation and certification, provide copies of any analyses, and include the PK information with the RFS for review and approval by MSC.

4.2. ELEMENTAL MERCURY PURITY

Elemental mercury purity is a requirement established by DOE for accepting elemental mercury for storage. Purity requirements are established by DOE under its authority in MEBA and are separate from RCRA requirements for characterization of RCRA hazardous wastes. All elemental mercury stored at the LTEMSF shall be certified and validated to exhibit a purity of 99.5% or greater, by volume. Generators have two options for characterizing and validating elemental mercury purity:

1. The Individual Container validation option provided in Section 4.2.1, where individual containers are analyzed and certified; or

2. The Accepted Process Validation option provided in Section 4.2.2, where elemental mercury analysis is only used to validate, certify, and confirm elemental mercury purity from identified processes.

4.2.1. Individual Container Validation

Individual containers of elemental mercury can be validated by conducting any of the analyses identified in Section 5 and satisfying the waste characterization requirements of these WAC. Analysis shall be completed by an independent, third-party laboratory, and the elemental mercury purity (as a percent by weight) shall be submitted with the RFS.

4.2.2. Accepted Process Validation

Instead of validating each container of elemental mercury, generators can validate all of the processes that generate and purify elemental mercury. MSC shall not require individual container purity validation from elemental mercury generated and purified in identified and certified Accepted Processes.

To validate elemental mercury purity and contaminant concentration and name from an Accepted Process, the generator shall submit a request to certify the Accepted Process that includes all of the following:

- Identification of each process that generates and purifies elemental mercury;
- The purity of the mercury produced from each process (as a percent by weight);
- The operating parameters of each identified process;
- Independent analysis of the elemental mercury purity (as a percent by volume) generated from the final stage in the identified process; and
- A quality assurance and control (QA/QC) program that includes random sample collection and analysis of the elemental mercury purity generated from the final stage of the identified process.

The process parameters (including any third-party purification) shall be included in the Generator Agreement. Generators with Accepted Processes submit records of the process parameters and the validation of elemental mercury purity analysis as part of the elemental mercury purity requirements in the RFS. An Accepted Process validation form is included in Appendix B.

DOE, the MSC, and/or their designee reserve the right to periodically verify process and quality control parameters, training records, purification efficiency records, QA/QC programs, and QA/QC results for any process or equipment identified by the generator in the Accepted Process validation submission.

Generators shall re-validate any generation or purification process due to operational changes or activities that impact elemental mercury purity and impurity content (as a percent by weight). The generator is responsible for repeating validation as necessary to ensure that it is always accurate and up-to-date. MSC can require re-validation or additional analyses to demonstrate elemental mercury purity, at their discretion.

4.3. CHARACTERIZATION DOCUMENTATION

Documentation of the waste characterization shall be submitted or referenced with the RFS. All referenced information shall be readily retrievable from an appropriately maintained document control center or electronic record archive. Equivalent forms of documentation may be approved by the LTEMSF-Disposition Manager or designee. The documentation shall include at least the following:

- Physical and chemical characteristics;
- Purity, as a percent by volume;
- Names and contents (as percent by volume) of contaminants;
- Weight of empty container (tare weight), weight of content (waste), and gross weight (weight of container and content);
- Characterization date;
- Generating source;
- Any other information which may be needed to store the elemental mercury;
- Certification attesting the truthfulness, purity, and accuracy of the submitted information, as detailed in Section 7.

5. REPRESENTATIVE SAMPLING AND ANALYSIS

DOE has identified several methods that demonstrate the purity of elemental mercury. Any identified method within this section may be utilized by the generator to demonstrate the elemental mercury purity (as a percent by volume), contamination content (as a percent by weight), and contamination names. A generator may submit an alternate method to the MSC for consideration.

5.1. EPA METHODS

EPA has developed two methods for determining the purity of elemental mercury in its Hazardous Waste SW-846 test methods:

1. EPA Method 7473: Mercury in Solids and Solutions by Thermal Decomposition, Amalgamation, and Atomic Absorption Spectrophotometry (for elemental mercury purity only)
2. EPA Method 6020B: Inductively Coupled Plasma – Mass Spectrometry (for elemental mercury purity and contaminant content and names)

5.2. ASTM METHODS

ASTM has developed one method for determining the purity of elemental mercury:

1. ASTM D891-18: Specific Gravity of Liquids

5.3. RADIOACTIVITY

If PK is not a valid means of ensuring that the elemental mercury is not radioactively contaminated, EPA has developed procedures for determining the presence of alpha, beta, and gamma radiation:

1. EPA Hazardous Waste SW-846, Test Method 9310: Gross Alpha and Gross Beta Evaluation of Solid Waste (used for alpha and beta radiation detection)
2. EPA 402-R-12-006: Radiological Laboratory Sample Analysis Guide for Incident Response (used for alpha, beta, and/or gamma radiation detection)

5.4. ALTERNATIVE METHODS

A generator may submit a request for an alternative method for consideration by DOE. The generator shall demonstrate the equivalency of the alternate method for determining the purity of elemental mercury, contaminant content and name, or the presence of radioactivity (e.g., other dosimetry technique), with the listed, approved methods within these WAC. MSC may approve or disapprove of any alternative methods, at their discretion.

6. CONTAINER RECEIPT

Generators are responsible for submitting elemental mercury to the LTEMSF in a manner that complies with the requirements of these WAC, applicable state and Federal regulations, and applicable site RCRA permit. Incoming containers shall be inspected and analyzed to ensure compliance with these WAC. Containers that meet the WAC shall be accepted for storage at the LTEMSF. Containers that do not satisfy the WAC shall be rejected and returned to the generator, at the generator's expense.

6.1. EVALUATION

Each elemental mercury container received by the LTEMSF shall be evaluated by the MSC for compliance with these WAC, applicable state and Federal regulations, and applicable site RCRA permit. Onsite analysis can include visual inspections, weighing, comparison to the manifest and RFS, fingerprint analysis, and/or any of the analysis methods specified in Section 5. The evaluation shall include the parameters identified in Table 1.

Table 1: Container Evaluation Parameters

Parameter	Acceptable Range	Evaluation Sources
1. Purity Confirmation	≥99.5% by volume	Onsite fingerprint analysis, Manifest, RFS
2. Contaminant Confirmation	<0.5% by volume	Onsite fingerprint analysis, Manifest, RFS
3. Corrosive Material Confirmation	No corrosive materials	Onsite fingerprint analysis, Manifest, RFS
4. Radioactivity Determination	None above background	Onsite fingerprint analysis, Manifest, RFS
5. Weight Confirmation	Matches manifest 85% to 90% full	Onsite inspection
6. Container Integrity	No exterior contamination, leaks, or container failure	Onsite inspection
7. Container Labelling	Visible, appropriately placed, durable, and compliant	Onsite inspection
8. Container Size	3-L or 1-MT	Onsite inspection, Manifest, RFS
9. Container Seal / TID	Present and unmolested	Onsite inspection

6.1.1. Waste Manifest

The contents, weight, and identifying number of the container shall match the information in the manifest and RFS. Additionally, the manifest shall contain all information required by DOT and state and Federal hazardous waste regulations and include an appropriate chain-of-custody.

Containers that are not assigned a unique identification number, do not match the manifest identification number, or do not match the information (e.g., weight) on the manifest are rejected. If no manifest is present, the container is rejected.

6.2. CONTAINER REJECTION

Containers can be rejected at intake or during intake analyses for any of the reasons specified in Section 6.1. Containers rejected by the MSC shall be returned to the generator at the generator's expense. Alternatively, the generator can specify that the elemental mercury be delivered to another, third-party TSDF, at the generator's expense.

The MSC shall notify the Generator of the reasons the container is being returned and include copies of any inspections, analyses, or evidence supporting the rejection of the container.

6.2.1. Overpacking and Repackaging

Container packaging shall be maintained so that the contents are suitably confined for the duration of the anticipated storage life and subsequent shipment to on or off-site disposal. If there is exterior contamination, leaks, or failure of the container upon arrival at the LTEMSF, the container shall be overpacked and returned to the generator, if possible. If container damage is to the extent such that overpacking is unacceptable and repackaging is required, the elemental mercury shall be transferred into a new container and the MSC, at their discretion, shall either return the new container to the generator for re-certification or accept the new, repackaged container into storage. Overpacking and repackaging shall be conducted by the MSC and costs shall be borne by the generator.

Containers that have been overpacked prior to arriving at the LTEMSF shall be rejected and shall be returned to the generator.

6.2.2. Containers Exceptions

On a case-specific basis, certain containers that do not comply with the container requirements within these WAC may be accepted by the MSC, provided that these are non-routine occurrences by the generator. Examples of accepted containers may include:

- Containers not meeting the minimum fill requirements due to limited inventory from a generator;
- Containers other than 3-L or 1-MT that are part of a limited inventory from a generator (e.g., a smaller than a 3-L container that can be easily handled);
- Containers that use different plug sizes than specified;
- Containers shipped on unacceptable pallets that are DOT-approved packaging; and
- Containers that use different lifting appurtenances than specified, to the extent that they can be accommodated by existing lifting and handling capabilities at the LTEMSF.

Generators using a non-compliant container should review the non-compliance issues with MSC and the MSC prior to shipping the container to the LTEMSF. MSC is not required to accept non-compliant containers and rejected containers are returned at the Generator's expense.

NOTE: Containers arriving at the LTEMSF exhibiting any of the aforementioned conditions are not guaranteed acceptance under this exception clause. Acceptance is at the discretion of DOE or under authority designated to the MSC.

NOTE: In no circumstance shall exceptions be made for elemental mercury that does not meet the minimum purity requirement specified herein.

7. CERTIFICATION

Generators shall certify that they have complied with these WAC and that the information in their RFS and manifest(s) is accurate and complete. A certification statement shall be signed to accompany each RFS. By signing the certification statement on the RFS form, the generator certifies that information included on the RFS form and its attachments is true, accurate and complete. Generators are responsible financially for costs incurred as a result of nonconformance with the criteria established in this document.

8. REFERENCES

Boiler and Pressure Vessel Code, American Society of Mechanical Engineers (ASME) New York, NY, 2008

American Society for Testing and Materials (ASTM) A36M-14, *Standard Specification for Carbon Structural Steel*, ASTM International, West Conshohocken, PA, 2014

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APPENDIX A

EXAMPLE ELEMENTAL MERCURY CONTAINERS

EXAMPLE CONTAINERS FOR THE TRANSPORT AND STORAGE OF ELEMENTAL MERCURY

Figure 1 (below) provides an example of a 3-L flask that satisfies all of the design standards and criteria described herein. Approved 3-L flasks are commercially available and routinely used that are similar to this design, although not exactly the same. Both seamless and welded configurations are acceptable provided fabrication standards have been used and the container tested as described herein.

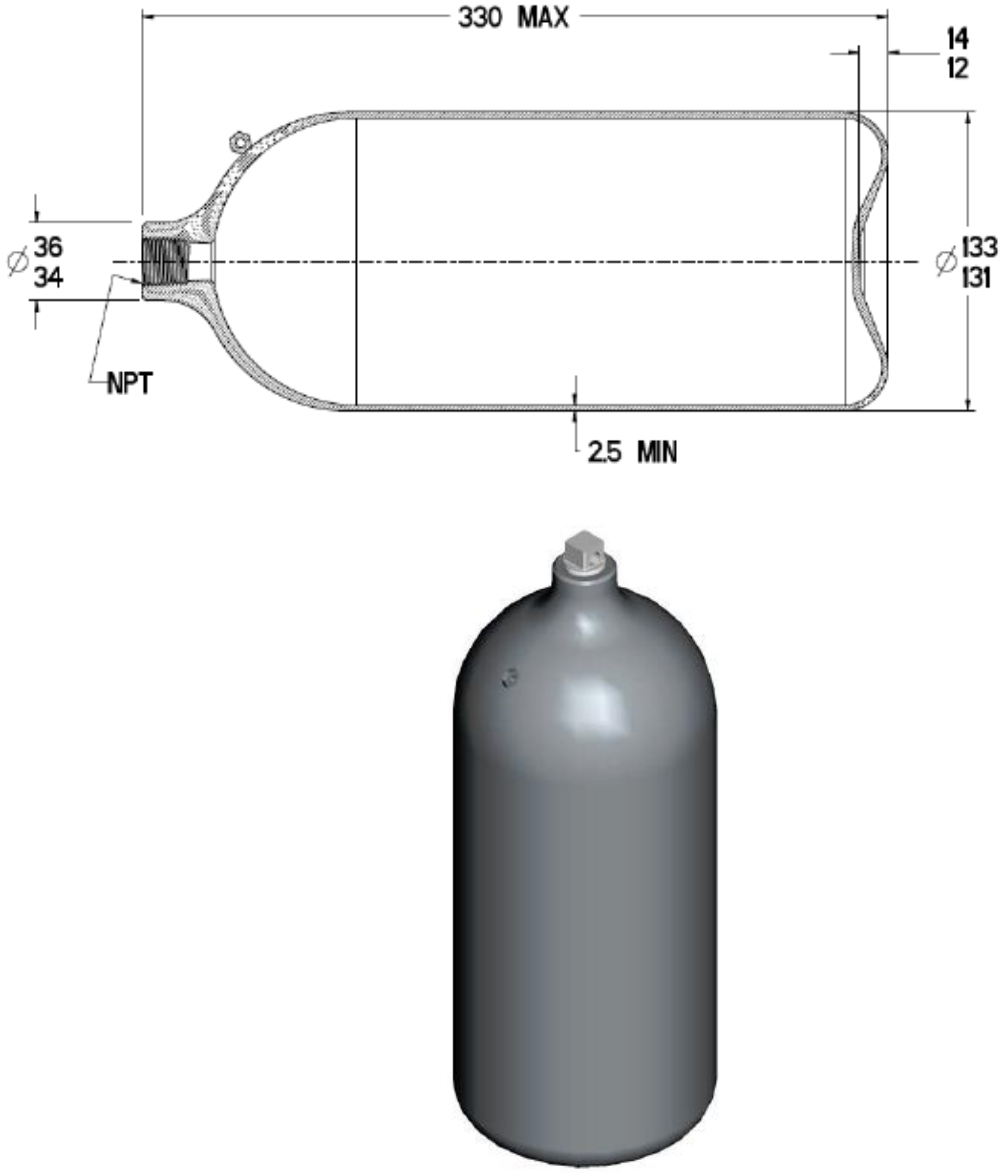

Figure 1. Example of 3-liter Flask for Storing Elemental Mercury.
(Note: all dimensions in millimeters, NPT = National Pipe Thread).

Figure 2 (below) provides an example of a 1-MT container that satisfies all of the design standards and criteria described herein. Approved 1-MT containers are commercially available and routinely used that are similar to this design, although not exactly the same. No seamless 1-MT containers are being manufactured or used in the U.S. They are considered cost-prohibitive and, given proper welding procedures and techniques, do not offer additional protection.

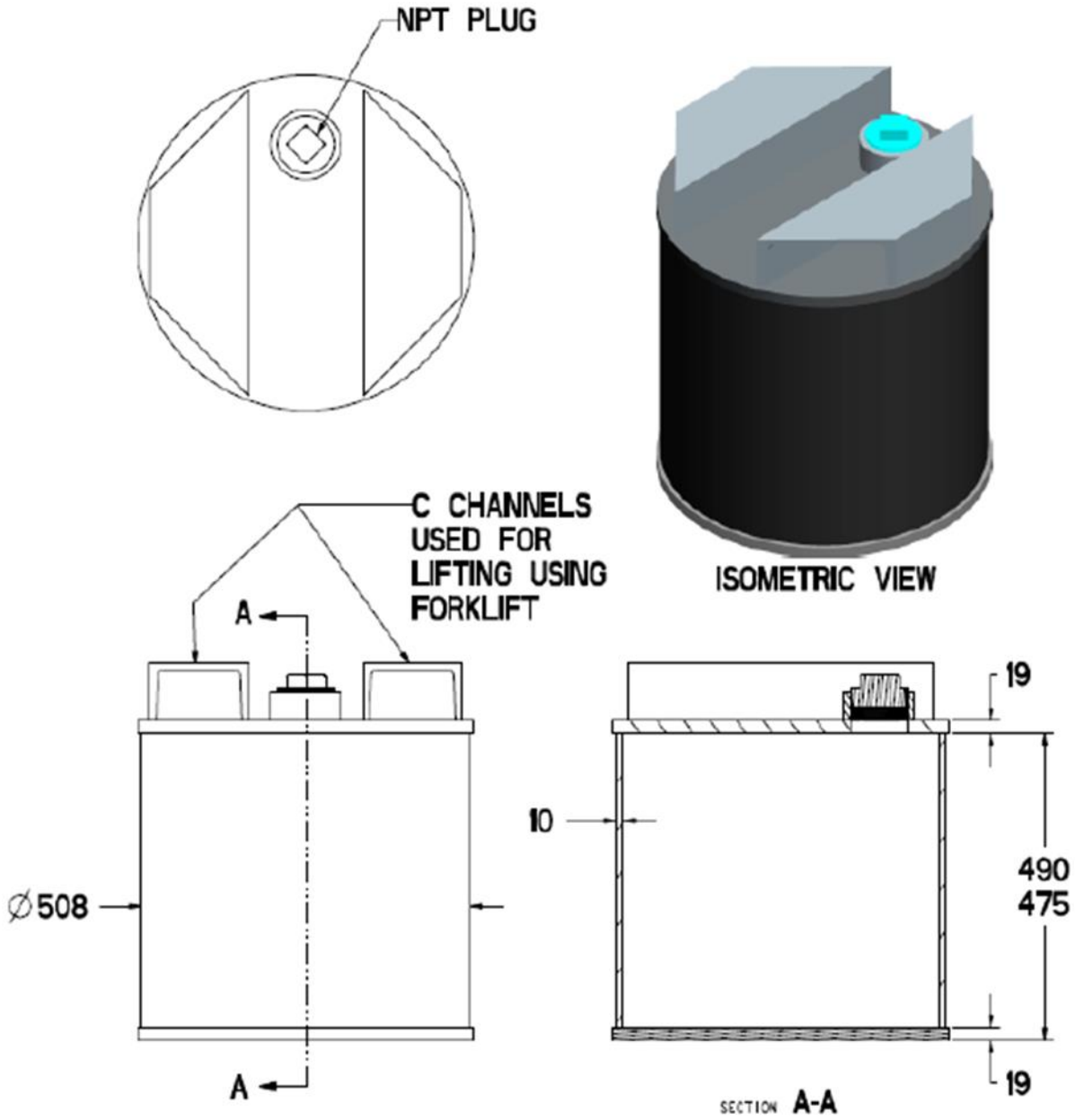

Figure 2. Example of 1-MT Container for Storing Elemental Mercury.
(Note: all dimensions in millimeters, NPT = National Pipe Thread