A DAY & ZIMMERMANN COMPANY

MOBILE MERCURY TRANSFER SYSTEM
OPERATING PROCEDURES

January 2020

ACRONYMS AND ABBREVIATIONS

CAPP	Chemical Accident Prevention Program
CMTR	certified material test report
DAS	data acquisition system
DLA Strategic Materials	Defense Logistics Agency Strategic Materials
DOT	U.S. Department of Transportation
FES	Fire and Emergency Services
GS	Guard Services
HEGA	high efficiency gas absorber
Hg	mercury (chemical symbol)
HVAC	heating, ventilation, and air conditioning
HWAD	Hawthorne Army Depot, Hawthorne, Nevada
ID	inside diameter
MMSP	Mercury Medical Surveillance Program
MMTS	Mobile Mercury Transfer Facility
MOC	Management of Change
MSSP	Mercury Stockpile Stewardship Program
MT	metric ton (1000 kilograms)
NAC	Nevada Administrative Code
NCR	Non-Conformance Report
NDEP	Nevada Division of Environmental Protection
90DAA	90-day accumulation area
NPT	national pipe thread
NRS	Nevada Revised Statutes
OD	outside diameter
OG	off gas
ORNL	Oak Ridge National Laboratory, Oak Ridge, Tennessee
PCDAS	Process Control and Data Acquisition System
PPE	personal protective equipment
QD	quick disconnect
RCRA	Resource Conservation and Recovery Act
SOC	Securing Our Country
SP	Standard Procedure
UPS	uninterruptible power supply
WG	water gauge

ES EXECUTIVE SUMMARY

Title: Executive Summary **Doc. No.** MMTS-0-Rev8

Approval Signatures and Date

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	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

Rev. No.	Change description	Author
8	Annual Review- Updated signatory authority to current signatures. Added Revision number to document number.	Rob Mathias
7	Annual Review- Updated signatory authority to current signatures	Rob Mathias
6	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
5	Replaced verbiage on page xv. Replaced list of videos started on page xv. Replaced the Operating Limits Table starting on page xvii.	Burton Packard and Renee Rodriguez
4	Added the MMTS Operating Limits Table	Burton Packard and Renee Rodriguez

3	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez
2	Pg. vii, 2nd bullet, added text to clarify which tray is described. Pg. viii, 1st bullet, changed scale capacity from 5,000 to 3,000 lb. and added explanation.	
1	Pg. xxii, revised description of placing the 30th flask in a sequence into special six-pack tray and noting when to process the contents of that special six-pack tray.	

***NOTE**: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
2014-MSSP-41	Process Safety Information for the Mobile Mercury Transfer System to Comply with NDEP- CAPP

Purpose: The Executive Summary procedure MMTS-ES is intended to provide a brief background and a list of requirements common to many procedures. Part of worker training includes reading this procedure and following all requirements.

Background: Defense Logistics Agency Strategic Materials (DLA Strategic Materials) is the custodian of the national stockpile of mercury, which is now located at the Hawthorne Army Depot (HWAD), Hawthorne, Nevada. At the direction of DLA Strategic Materials, the mercury inventory currently stockpiled at HWAD will be transferred from the existing 76-lb flasks to 1MT containers in a purposely constructed facility called the Mobile Mercury Transfer System (MMTS).

The MMTS is mobile and could be located adjacent to any or all of those HWAD warehouses that currently store the existing mercury flask stockpile. The MMTS is installed adjacent to Building 110-66, to re-containerize inventory in that warehouse, based in part on the existing synergies for the electrical upgrade required. To minimize costs and downtime, the MMTS is expected to remain in its current location until the entire mercury stockpile has been transferred from the existing 76-lb flasks to 1-MT containers.

This report was developed by Oak Ridge National Laboratory (ORNL) to document operations and maintenance procedures needed for use in the MMTS. Specific actions for 27 separate topical categories of MMTS procedures are described. A summary listing of each set of these procedures is given in Table S.1 below. The procedures are written for use and implementation by DLA Strategic Materials. Some procedures are stand-alone such as Mercury Training Plan (SOC.QP.EMP.HG.0002). Mercury handling procedures require execution in combination with others. For instance, executing pallet and drum handling and

flask removal(MMTS-4 and MMTS-5) are required prior to Fume Hood 1 and Fume Hood 2 operations (MMTS6 and MMTS-7). The content and interfaces of each procedure must be understood by the MMTS operating staff.

Consistent with ensuring required employee participation all operators of the MMTS facility shall have the opportunity to comment and improve these procedures. The DLA Strategic Materials Safety Manager and MMTS Facility Manager shall assure that cross-training shall be implemented for special mercury container and handling operations to be performed in the drum and flask handling processing rooms.

The procedures address findings and suggestions identified in the Process Hazards Assessment. To ensure that each document being used is the latest revision available, each MMTS Operating Procedure contains the following statement: "***NOTE****: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

It is the user's responsibility to ensure, prior to use, the revision of this document is the latest available. Check the master list, if unsure of document status, prior to use. Downloaded, printed or copied document, unless supplied and so indicated by a DCA as being a controlled document are uncontrolled.

It is the responsibility of management and workers to ensure that all documents are current. Check the revision history and current operating conditions; advise management if existing conditions do not accurately reflect document content. Each worker is responsible to ensure that the document being followed is the current version.

The DLA Strategic Materials shall strive for excellence in safety, health, and environmental leadership through the implementation of sustainable, sound, and proactive programs. All DLA Strategic Materials staff and subcontractors are expected to adhere to safety, health, and environmental requirements defined by Hawthorne Army Depot (HWAD) and DLA Strategic Materials for the work they perform.

Prior to shipment of the MMTS, the MMTS functional testing was completed at the seller equipment installation site. Site preparation at Building 110-66, installation-readiness requirements, and inspection during set-up was completed. Acceptance and functional operational testing was performed on the installed equipment and systems at the Hawthorne, Nevada off-site location. Acceptance and functional operational testing was performed on the installed equipment and systems at Building 110-66 which is the current operating location on the HWAD site. The MMTS could be moved to other mercury buildings on the site, but utility and site upgrades would be required.

The first shipment of metric ton containers from the Tooele Army Depot (TEAD), vendor supplied Mercury Monitoring System, HVAC units, personnel access steps, rails and platforms arrived and were installed at Building 110-66 timely with the MMTS transport and set-up. The HWAD site preparation requirements specified by DLA Strategic Materials were completed prior to MMTS transport to and setup at Building 110-66.

Table ES 1. MMTS procedures documented in this report

Section	Procedure topic (description)	Document number
ES	Mobile Mercury Transfer System Procedures Executive Summary	MMTS-ES
1	Metric Ton Container Acceptance and Staging	MMTS-1
2	Metric Ton Container Setup	MMTS-2
3	Metric Ton Container Transport and Storage	MMTS-3
4	Pallet Transport and Handling	MMTS-4
5	Drum Handling	MMTS-5
6	Fume Hood 1 – Mercury Access	MMTS-6
7	Fume Hood 2 – Mercury Transfer	MMTS-7
8	Metric Ton Container Unhook and Close	MMTS-8
9	Empty Flask Disposition and Transport	MMTS-9
10	Waste Management	MMTS-10
11	Routine Cleaning	MMTS-11
12	Emergency Response and Spill Clean Up	MMTS-12
13	Data Acquisition and Inventory Management	MMTS-13
14	Mercury Vapor Monitoring System	MMTS-14
15	Inspection, Testing and Maintenance	MMTS-15
16	Fire Protection	MMTS-16
17	Equipment Calibration	MMTS-17
18	Security	MMTS-18
	Training	SOC.QP.EMP.HG.0002
20	Mercury Medical Surveillance	MMTS-20
21	Decontaminating and Decommissioning	MMTS-21
22	Personnel Notifications	MMTS-22
23	Operations Under Adverse Conditions	MMTS-23
24	Diesel Generator Operations-Startup, Shutdown, Refueling, and Periodic Maintenance	MMTS-24
25	Air Handling System — Startup, Shutdown, and Filter Replacement	MMTS-25
26	Mercury Transfer from Mercury Drum	MMTS-26
27	Defense National Stockpile Mercury Inventory Control	MMTS-27

Common Requirements:

Design

- The Process Safety Information for the Mobile Mercury Transfer System to Comply with the NDEP – CAPP (2014-MSSP-41, Rev. 1) (PSI) examines process limits in Chapter 3, §3.4.1 Safe Upper and Lower Limits, Pressure and Temperature. Regarding pressure and thermal limits, the PSI states that 'The MMTS process is a material transfer process; there are no chemical, thermal or pressure requirements associated with the transfer process, other than building environment conditions that are suitable for personnel safety and comfort.

- Section 3.4.2 of the PSI documents an examination of the actions of the peristaltic pump that cause the flow of mercury through a stainless steel siphon tube and flexible tubing to the metric ton container. The peristaltic pump and the flow of mercury can be stopped by the operator taking his/her foot off the actuating switch, someone pushing either of the two Emergency Stop switches, or automatically through the Process Control and Data Acquisition System interface based on the weight of mercury or the height (level) of the mercury column in the metric ton container. The automated shutoff designs are described in §§ 4.4.3 and 4.4.4 of the PSI for weight and level, respectively.

- In procedure 7, §§7.4.3 and 7.4.5, Procedure 8, §8.3.2 and Procedure 27, §27.3, the operator is directed to limit to 29 the number of flasks emptied into a metric ton container. The transferred mass would be very close to 1 metric ton. The automated mercury weight and mercury level shutdowns are designed to prevent overflow of the metric ton container in the event the operator attempts to transfer the contents of more than 29 flasks into the metric ton container. The automatic shutdowns of the peristaltic pump are set to operate at a weight of 2280 lb and, as a backup to the weight limit, at a level 2 inches below the top of the metric ton container.

- The design of the ventilation system is detailed in §4.10 of the PSI. The ventilation system, including the fume hoods and portable Airfiltronix™ snorkels, is designed to allow mercury transfer activities without the need for respirators. In the absence of the ventilation system function, mercury vapor concentrations could exceed the 25 $\mu g/m^3$ exposure limit set by DLA Strategic Materials and HWAD. The Mercury Monitoring System (MMS) is described in §5.1 of the PSI and in Procedure 14 (2015-MMTS-14). The MMS samples mercury vapor concentrations at 16 location throughout the MMTS and alarms if the mercury vapor concentration at any of the sample points reaches or exceeds 25 $\mu g/m^3$. Procedure 22, Personnel Notifications, §22.3, directs the workers to leave the MMTS if the MMS alarm sounds. The 25 $\mu g/m^3$ limit is very protective of health; leave in an orderly manner and avoid incidental injuries.

- Although not listed among the typical operating limits, extreme weather conditions may necessitate safe shutdown of operations. Severe dust storms may clog the ventilation system and lightning from severe thunderstorms may interrupt power. Procedure 23, §§23.3.1 and 23.3.2 describe the appropriate responses for the Facility Manager and workers in the event such severe weather conditions occur.

- Procedure 22, Personnel Notifications, §22.3, explains what the worker should do to correct low flow (less than 100 ft/min face velocity) through a fume hood face – reduce the opening size.

- If the peristaltic pump unexpectedly shuts off, Procedure 22, §22.3 directs the worker to perform specific actions. Section 22.3 gives the worker no specific corrective actions resulting from an unexpected peristaltic pump shut off. Any corrective actions depend upon determining the cause of the shutoff. The shutoff may result from reaching an automatic shutoff (mercury weight > 2280 lb or height of mercury < 2 in from the top of the metric ton container top plate) or power to the peristaltic pump may have been interrupted.

- The system is designed with engineering controls and redundancy to maintain 29 flasks per container. In the event the mass per metric ton container and/or number of flasks processed for a specific metric ton container becomes an issue, an orderly, normal startup is allowed once weights and flask numbers are resolved using scales and available electronic and hard copy records. The use of the 2,500 lb ± 0.25 lb and calibrated scales allows uncertainties to be resolved.

- If the MMS alarms, the worker should respond as directed in Procedure 22, §22.3. Corrective actions may include following the directions in Procedure 12, Emergency Response and Spill Cleanup, to don appropriate PPE, including a respirator, and clean up mercury.

- The green/red lights at the entrance to the MMTS are activated by the readings received from the MMS. Corrective actions from encountering a red light would be the same as those described for hearing an MMS alarm.

- If a scale reset (re-zero) is required during daily operations, e.g., power to the scale is lost, follow the directions for beginning of day reset (re-zero) given in Procedure 2, §2.3.

- The design of the ventilation system is described in detail in Chapter 4 of the PSI [Process Safety Information for the Mobile Mercury Transfer System to Comply with the NDEP – CAPP (2014-MSSP-41, Rev. 1)]. The filtration system [pre-filters to remove dust and debris and sulfur-impregnated carbon – HEGA (high efficiency gas absorber) filters to remove mercury] is described in Chapter 5 of the PSI. Changeout of the prefilters is determined by pressure drop and is discussed in Procedure 15,

Inspection, Testing, and Maintenance (MMTS-15). The sulfur-impregnated carbon system contains 220 lb of sulfur and is conservatively sized in terms of mercury sorption capacity and air flow to never require change-out. Change-out procedures for HEGA filters and pre-filters are given in Procedure 15, §15.8, Attachment 15.5. The filtration system design is based on no change-out expected for the HEGA filters. Mercury monitoring ports to the MMS-16 are included both upstream and downstream to collect performance data and allow for emission modelling as required. A continuing increase of the monitored mercury emissions over an extended period may indicate a need to plan for replacement of the HEGA filters.

- Although the flexible tubing used to transfer the mercury is not a 'hard pipe line,' the tubing is inspected daily, and the contact point is moved about two inches daily; with operating experience, a different daily offset may be determined. Procedure 7, §§7.4.3 and 7.4.5, Procedure 8, §8.3.2 and Procedure 27, §27.3 direct the operator to limit to 29 the number of flasks emptied into a metric ton container. The transferred mass would be very close to 1 metric ton. The automated mercury weight and mercury level shutdowns are designed to prevent overflow of the metric ton container in the event the operator attempts to transfer the contents of more than 29 flasks into the metric ton container. The automatic shutdowns of the peristaltic pump are set to operate at a weight of 2280 lb and, as a backup to the weight limit, at a level 2 inches below the top of the metric ton container. The design of the ventilation system is detailed in §4.10 of the PSI. The ventilation system, including the fume hoods and portable Airfiltronix™ snorkels, is designed to allow mercury transfer activities without the need for respirators. In the absence of the ventilation system function, mercury vapor concentrations could exceed the 25 $\mu g/m^3$ exposure limit set by DLA Strategic Materials and HWAD. The Mercury Monitoring System (MMS) is described in §5.1 of the PSI and in Procedure 14 (MMTS-14). The MMS samples mercury vapor concentrations at 16 location throughout the MMTS and alarms if the mercury vapor concentration at any of the sample points reaches or exceeds 25 $\mu g/m^3$. Procedure 22, Personnel Notifications, §22.3, directs the workers to leave the MMTS if the MMS alarm sounds. The 25 $\mu g/m^3$ limit is very protective of health; leave in an orderly manner and avoid incidental injuries (Refer to the MMTS Operating Limits Table beginning on page xvii). Although not listed among the typical operating limits, extreme weather conditions may necessitate safe shutdown of operations. Severe dust storms may clog the ventilation system and lightning from severe thunderstorms may interrupt power. Procedure 23, §§23.3.1 and 23.3.2 describe the appropriate responses for the Facility Manager and workers in the event such severe weather conditions occur. The change-out rate of the flexible tubing inside the hood is frequent during initial operations and will be maintained at a conservative frequency for establish operations. Workers are instructed on flexible tubing change-out timing in Procedure 15, §15.4.3. Should a failure occur the operator promptly stops the mercury flow by releasing the footswitch as directed in Procedure 7, §§7.4.6 - 7.4.8. Spillage is retained in the hood with use of a splash plate over the roller balls. Cleanup is performed as directed in Procedure 12.

- The PHA [Process Hazard Analysis Mobile Mercury Transfer System (MSSP-43 Rev2)] examines in detail the progression of the design from concept to a process flow diagram to P&IDs to construction and assembly. Previous experience andevents with mercury are considered. Each step in the process is examined for potential hazards and recommended mitigations are provided for the identified hazards. As applicable, mitigations are incorporated into operating procedures to ensure worker safety.

- The Safety System Description (SSD) is presented in Attachment E to the PSI [Process Safety Information for the Mobile Mercury Transfer System to Comply with the NDEP – CAPP (2014-MSSP-41, Rev. 1)]. The codes to which the MMTS was designed are given in Chapter 6 of the PSI.

General Policies

- Training on the procedures presented in this document is accomplished by reading.

- It is the Facility Manager's (or designee's) responsibility to ensure that workers perform their tasks in accord with the procedure(s) defining those tasks. This responsibility will be executed by observing worker actions and confirming that the actions are called for by the procedure(s) defining the task.

- It is the worker's responsibility to ensure that the procedure being followed is the most current version. The first page of each MMTS procedure contains a directive: NOTE: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" website to verify the current version. The header on each page of SOC procedures contains the statement: It is the user's responsibility to ensure, prior to use, the revision of this document is the latest available. Check the master list, if unsure of document status, prior to use. Downloaded, printed or copied documents, unless supplied and so indicated by a DCA as being a controlled document, are uncontrolled.

- All staff and contractors are expected to adhere to safety, health, and environmental requirements defined by HWAD and DLA Strategic Materials for the work they perform.

- Facility Manager will ensure that staff and contractors follow the procedures in this document and that they document inspection, testing, and maintenance of CAPP regulated equipment. Facility Manager will ensure that staff and contractors are properly trained. Facility Manager will also ensure that maintenance materials, spare parts and equipment are available and suitable for the process for which they will be used and that Management of Change is followed.

- In the event of power loss, the emergency generator (located adjacent to the north end of the MMTS) will be used long enough to close all open mercury. Procedure 23, Operating under Adverse Conditions, §23.3.3 provides detailed guidance. The generator is not used for normal operations in the event of power loss.

- Following a power loss, the peristaltic pump will require manual restart once the power comes back on line after all control logic is in place to activate the use of the footswitch. Procedure 15, §§15.3.4 and 15.4.2, provide the directive to ensure the peristaltic pump functions as described.

- Prior to leaving the MMTS for work breaks and lunch, ensure that the ventilation system is operating, the peristaltic pump is turned off, compression on the flexible tubing is released from the peristaltic pump head, loops in the flexible tubing are emptied of mercury, the doors to the fume hoods are closed and operating snorkels left in use for venting are positioned to not pose safety hazards to returning workers.
- Staff and contractors perform the required inspections and tests on CAPP-regulated equipment, document those inspections and tests, and complete the required maintenance according to the schedule listed herein.

- A properly functioning fume hood draws room air through the entrance (face) of the fume hood. This air then exits the fume hood sweeping mercury vapors with it into the ventilation system and away from a person working at the face of the fume hood. To ensure optimal functioning of the fume hood, the face velocity should be near or above 100 fpm. One hundred fpm is the face velocity recommended by the American Society of Heating, Refrigeration, and Air-Conditioning Engineers in ASHRAE 110. Procedure 22 details the actions the worker should take upon hearing a face velocity alarm sounds.

- Fume hood airflow is checked daily by momentarily increasing the opening of the fume hood doors until the airflow alarm is sounded. Conversely if the low airflow alarm sounds during operations, decrease the opening of the fume hood doors until the alarm is silenced.

- The allowable fume hood opening for work access is based on maintaining 100 ft/min face velocity to maintain airflow. Slidegate door openings between the two fume hoods should be closed when only working in one hood. Slidegate door opening to the downdraft conveyor should be managed to maintain airflow to Fume Hood 1.

- The operator shall always use two hands when handling individual flasks to minimize the possibilities of injuries or dropping flasks.

General Health and Safety

- Do not eat, drink or smoke when in the MMTS or the mercury buildings.

- The properties of and health hazards presented by mercury are detailed in Chapter 2, §2.1 and Attachment A of the Process Safety Information for the Mobile Mercury Transfer System to Comply with the NDEP – CAPP (2014-MSSP-41, Rev. 1). Significant exposure to mercury may occur through inhalation or contact with the skin and eyes. The mercury MSDS (Attachment A to Process Safety Information for the Mobile Mercury Transfer System to Comply with the NDEP – CAPP (2015-MSSP-41, Rev. 1) provides details of the recommended first-aid treatments for inhalation and contact with the skin and eyes: leave the area of high mercury vapor concentration and apply artificial respiration, if needed, and place the affected body part under running water for at least fifteen minutes, respectively. Because the DLA Strategic Materials' mercury vapor exposure limit is very protective (it is numerically equivalent to the ACGIH recommended time weighted average for workers exposed 8 hours per day, 5 days per week) and the mercury vapor monitoring system alarms at the DLA Strategic Materials' mercury vapor exposure limit, workers, who follow the instructions in Procedure 22 for what to do if the mercury vapor monitoring system alarm sounds, are very unlikely to require first aid for inhalation of mercury vapors.

- Pregnant mercury operations workers may self-identify and request an alternate assignment for the duration of the pregnancy.

- All workers have the right and responsibility to stop work in the event of any unsafe condition or if a mercury leak is noticed during operation.

- Procedure 5, §5.3.3 directs the worker to leave a leaking flask in its original drum and return that drum to Building 110-66. The drum could be placed in an overpack drum prior to returning it to Building 110-66 (the lifting fixture in the Drum Handling Room could be used to handle it), but there is no reason to use an overpack drum. Drum integrity is established (the entire mercury stockpile was inspected and rusting drums were replaced), and there is no corrosion mechanism other than external rust, of which there is typically little to none. In the over 21,600 drums inspected during the most recent DLA Strategic Materials' inspection campaign, only one flask was found that had leaked.

- Plan-of-day meeting should emphasize worker safety. For example, workers should always apply good safety practice for handling or moving heavy objects, and operating fume hood doors, windows and special tools. Forklift operators should practice safe driving to ensure personnel safety, and exercise care to protect both mercury containers and the MMTS facility.

- Previously used personal protective equipment must be removed before exiting the MMTS.

- MMTS workers must not engage in activities that would require a Safety Work Permit,
  e.g., lock-out/tag-out, hot work, line breaking, and confined space entry. These activities require specialized training. All such activities associated with mercury-related buildings and equipment will be performed by purposely trained personnel, not MMTS personnel.

- Workers must follow manufacturer's recommendations when using lift fixtures.

- Operations must be within safe industrial hygiene limits for mercury vapors (< 25 $\mu g/m^3$). The mercury monitoring system alarms when the mercury vapor concentration reaches or exceeds 25 $\mu g/m^3$. Procedure 22 describes the actions a worker should take upon hearing the mercury monitoring system alarm.

NOTE: *The breathing zone mercury vapor concentrations shall be below the MMTS limit for workers, 25,000 ng/m^3 = 25$\mu g/m^3$. This is a conservative short-term exposure limit adopted by DLA Strategic Materials. This exposure limit is numerically the same as the permissible 8-hour time-weighted average permissible exposure level developed by the American Conference of Governmental Industrial Hygienists.*

- Equipment and tools shall remain in the fume hoods or be carefully cleaned prior to removal.

- Mercury surveillance monitoring is required for the MMTS staff per procedure MMTS-20.

- A portable dock is required to enhance worker safety and reduce the potential for accidents during forklift operations. Physical stops are installed around the outboard perimeter of the portable dock to substantially reduce the potential for the forklift to be driven off the dock. A ramp directly in line with doors, with ground loading, may be substituted for a portable dock.
- Ensure that two functional eye wash stations are available in case of emergencies. Inspect and test per manufacturer requirements.

- Periodic inspection and benchmarking mercury concentrations (mapping by location) using a portable monitor is required to monitor for changes in the dress area, office, general access areas, break areas, and rest rooms.

- To prevent personal injury, an operator should never attempt to save a falling flask or tool.

- Prior to using a snorkel, ensure that a flow path exists and verify that suction is occurring.

- Workers should use the sliding doors in the fume hoods, as necessary and practical, as shields from mercury micro-droplets and/or flask solids.

- All workers transporting and staging MT containers require the following personal protective equipment: side-shield safety glasses and steel-toe shoes.

- All workers in the MMTS where drums, flasks, and MT containers are handled require the following personal protective equipment: paper suits (coveralls), side-shield safety glasses, steel-toe shoes, disposable shoe covers, and gloves: leather for protection from pinch points and rotating equipment or nitrile for prevention from contact with mercury. If additional PPE is required for specific tasks, the additional PPE is specified in the procedure that explains the task (e.g., in Procedure 12, Emergency Response and Spill Cleanup, §12.3.1 requires the involved workers to use respirators rated for mercury service). Facility Manager (or designee) ensures that a sufficient supply of personal protective equipment is available for use by the staff dealing with drums, flasks, pumping-related equipment, and metric ton (MT) containers.

NOTE: *Nitrile gloves should be worn during any MMTS operations for which leather gloves are not required.*

- A drum (either full or empty) should never be opened for a casual inspection. A drum should be opened to access flasks or to deposit waste material and only when all equipment is on hand for monitoring and ventilation.

- To prevent excessive exposure to mercury vapors, workers should keep their heads above the top of an opened drum and outside the plane of the fume hood doors and downdraft roller conveyor table door.

- To ensure industrial hygiene control a portable snorkel is used with the fixed vacuum system to direct mercury vapors through absorbers away from workers. Even so, the workers should keep their heads away from the top of an opened drum and outside the plane of the fume hood doors and downdraft roller conveyor table door.
- Each flask should be lifted just a few inches inside the drum and the secure connection to the stopper verified prior to fully lifting and placement in the six-pack.

General Information

- Four six-pack trays containing 6 flasks and one six-pack tray containing 5 flasks are required to fill an MT container; the total batch for transferring mercury is 29 flasks. Twenty-nine (29) flasks of mercury is the maximum amount to be transferred into an MT container.

- A re-sealable bag is placed in each six-pack flask space prior to placement of the flask in the six-pack. This is a contamination control measure to keep the rollers and other fume hood hardware clean and the bag is ultimately used with empty flask placement in the waste drum.
- Every fifth six-pack tray is configured to be a five-pack tray (one location is blocked), with the 30th flask going into a special dedicated six-pack tray (also known as the BIG ORANGE six pack tray). After the first six (6) pallets are processed (six metric-ton containers are filled), the first BIG ORANGE six-pack tray is processed as the first six-pack tray for the next metric ton container to be filled. The BIG ORANGE six-pack tray is sequenced in a consistent, straight-forward manner without trying to keep track of drum and pallet numbers in the input data for this special six-pack tray.

- A drum containing six (6) mercury-filled flasks weighs approximately 550 lbs.

- The presence of loose mercury is expected to be a rare event; however, each drum must be carefully inspected for mercury prior to flask removal. Portable lights are used in conjunction with cart-mounted portable snorkels (see under General Supplies and Equipment for more details on cart-mounted portable snorkels).

- Slightly more than one-fourth (1110 out of 4300) of the drip trays for drums will be reused as drip trays for metric ton containers. Only drip trays in the best condition should be returned to service.

- The maximum number of six-pack trays that can be in Fume Hood 2 is three.

General Supplies and Equipment

- To enhance cushioning, NoTrax® or equivalent floor tiles can be placed on the floor in front of the fume hoods and on the side of the downdraft hood.

- Herculite® or equivalent material can be placed on the floor in front of the fume hoods, in the vicinity of the conveyer table and where operators handle drums and flasks. Herculite® is non-slip and some taping is required. This added safety measure is used extensively at ORNL to minimize floor contamination of mercury and the cost is simply the cost of the material since available solid waste disposal capacity exists in the quantity 30-ga drums planned for disposal.
- Cart-mounted portable snorkel (Airfiltronix® or equivalent) with sulfur-impregnated charcoal filters are available for MMTS operations and are to be used as needed to supplement fixed snorkels. Appropriate operations include drum opening, flask handling in the Drum Handling Room, and empty flask filling of drums in the Flask Handling Room.

- Supplies needed for MMTS operations include:

- Re-closable 3-mil (min.) slider zip polyethylene bags; 18” x 20” for flasks, and 13” x 18” for waste containers

- Gauze wraps, cheesecloth or equivalent

- Vinyl tape and Herculite®

General Operations

- Wireless handheld data input units with insufficient battery charge for the entire next workday should be plugged into a battery charger. All wireless handheld data input units should be plugged into a battery charger before a weekend (3-day period) or longer holiday or vacation periods.

- Manual shutdown of the Process Control and Data Acquisition System (PCDAS) and the Mercury Monitoring System (MMS) is a rare event other than for maintenance on those systems. If it appears that a power outage will extend beyond 60 minutes [the nominal rating for the uninterruptible power supply (UPS) is 80 minutes], perform a manual shutdown of PCDAS and MMS by following the instructions in Section 13.3.4.

- The 3,000-lb Arlyn scales should be re-zeroed each day as required to ensure no drift has occurred, and the function (accuracy) of the scales checked using test weights at a frequency consistent with operating experience. The scale accuracy is 0.1% of full scale. At 0.1% of 3,000 lb, the absolute accuracy is ± 3 lb. Two replacement scales, 100% spares, are stored near the MMTS.

Informational Videos

As an aid to training and understanding equipment and systems several hours equivalent of basic informational/demonstration videos were prepared during the research and acceptance testing/training phase, including:

- Mercury Transfer Phase 2 R&D 01 7604 2008 1st gen ORNL
- Portable Building ORNL animation MMTS first gen outdated
- Fill Coupling Attachment
- Fill Coupling Removal
- Flask Disposal
- MMTS Hood 2 Tube Assembly and Disposal Dec 2013 ORNL
- AirFiltronix Smoke Demo2
- AirFlow Discussion Drum Room

- MMTS Equipment Room Description
- Oct 2013 Saber shop test Auburn CA ORNL
- Pump deadhead test-Oct 2013 ORNL
- MMS Computer Details
- MMS Computer Details Wrap up
- MMS Interface Discussion
- MMS Rack Discussion
- PCDAS MMTS Saber
- Video of April31-May1, training
- Video of generator operations
- Video of scale operations (Saber {Jim Ricketts} talking)
- Get list of videos from CDs and from robotics server

- scalesCalibrationMMTS.mov – Mobile Mercury Transfer System (MMTS) ORNL Trip Report to HWAD January 21-22, 2015
- crackVideo.mov – Mobile Mercury Transfer System (MMTS) ORNL Trip Report to HWAD January 21-22, 2015
- IMG_2684.MOV – ORNL HWAD Trip Report for Completing MMTS PSSR Week of October 20-23, 2014 issued October 31, 2014
- IMG_2685.MOV – ORNL HWAD Trip Report for Completing MMTS PSSR Week of October 20-23, 2014 issued October 31, 2014
- IMG_2689.MOV – ORNL HWAD Trip Report for Completing MMTS PSSR Week of October 20-23, 2014 issued October 31, 2014
- Tiger-VacDiscussion.mov – ORNL HWAD Trip Report for Completing MMTS PSSR Week of October 20-23, 2014 issued October 31, 2014
- SNAP0014.jpg Trip Report — Tooele Army Depot Audit / inspection MSSP Containers May 6-7, 2014 issued May 28, 2014
- SNAP0015.jpg Trip Report — Tooele Army Depot Audit / inspection MSSP Containers May 6-7, 2014 issued May 28, 2014
- SNAP0016.jpg Trip Report — Tooele Army Depot Audit / inspection MSSP Containers May 6-7, 2014 issued May 28, 2014
- VlDEO009.mp4 Trip Report — Tooele Army Depot Audit / inspection MSSP Containers May 6-7, 2014 issued May 28, 2014
- VIDEO010.mp4 Trip Report — Tooele Army Depot Audit / inspection MSSP Containers May 6-7, 2014 issued May 28, 2014
- VlDEO011.mp4 Trip Report — Tooele Army Depot Audit / inspection MSSP Containers May 6-7, 2014 issued May 28, 2014
- CO_2 System Discussion 1 4_30_2014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- CO_2 System Discussion 2 4_30_2014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2

- Flask Packaging 1 4_30_2014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- Flask Packaging 2 4_30_2014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- Flask Packaging 3 4_30_2014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- Flask Packaging 4 4_30_2014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- Flask Packaging 5 4_30_2014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- Flask Transfer 1 4_30_2014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- Flask Transfer 2 4_30_2014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- Hands On Training Comments 4_29_2014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- Supplemental PHA Comments 2 4302014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- Supplemental PHA Comments 4_30_2014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- Supplemental Scales Discussion4_30_2014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- Training Discussion Plan of Day 4_30_2014.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- Tubing Replacement 4_30_2D14.MTS Mobile Mercury Transfer System (MMTS) HWAD Training April 29-30, 2014 Supplemental Videos DVD 1 of 2
- Fume Hood 2 Comments 1 5_01_2014.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training May 1, 2014 Supplemental Videos DVD 2 of 2
- Fume Hood 2 Comments 2 5_01_2Q14.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training May 1, 2014 Supplemental Videos DVD 2 of 2
- Fume Hood 2 Comments 3 5_01_2Q14.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training May 1, 2014 Supplemental Videos DVD 2 of 2
- Fume Hood 2 Comments 4 5_01_2014.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training May 1, 2014 Supplemental Videos DVD 2 of 2
- General Discussion & Plan of Day 5_01_2014.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training May 1, 2014 Supplemental Videos DVD 2 of 2
- Generator 1.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training May 1, 2014 Supplemental Videos DVD 2 of 2
- Generator 2.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training May 1, 2014 Supplemental Videos DVD 2 of 2
- Generator 3.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training May 1, 2014 Supplemental Videos DVD 2 of 2

- Generator 4.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training May 1, 2014 Supplemental Videos DVD 2 of 2
- Metric Ton Container Scales Comments 5_01_2014.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training May 1, 2014 Supplemental Videos DVD 2 of 2
- Pump Shutoff Comments 5_01_2014.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training May 1, 2014 Supplemental Videos DVD 2 of 2
- Training Wrapup.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training May 1, 2014 Supplemental Videos DVD 2 of 2
- A. Training Scope Objectives & Plan.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations A-F and Core Videos DVD 1 of 3
- B. Mercury Inventory As Stored.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations A-F and Core Videos DVD 1 of 3
- C. CAPP Description With SOC Interfaces.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations A-F and Core Videos DVD 1 of 3
- D. MMTS Process Flow Diagrams.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations A-F and Core Videos DVD 1 of 3
- E. MMTS P&IDs.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations A-F and Core Videos DVD 1 of 3
- F. Procedures & References.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations A-F and Core Videos DVD 1 of 3
- G. HVAC & PVAC & Hood Operations.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations G-M and Core Videos DVD 2 of 3
- H. PDCS MMS-16.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations G-M and Core Videos DVD 2 of 3
- I. Informational Videos.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations G-M and Core Videos DVD 2 of 3
- J. Waste Management.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations G-M and Core Videos DVD 2 of 3
- K. Special Maintenance & Tubing & Fixtures.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations G-M and Core Videos DVD 2 of 3
- L. Mercury Analyzers & Data Trends.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations G-M and Core Videos DVD 2 of 3
- M. Scales & Mass Balance & Engraver.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations G-M and Core Videos DVD 2 of 3
- N. Metric Ton Container & Documentation.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations N-Z and Core Videos DVD 3 of 3
- O. General Electrical Design & Generator & UPS.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations N-Z and Core Videos DVD 3 of 3
- O.1. Supplemental Generator Comments.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations N-Z and Core Videos DVD 3 of 3
- P. Data & IT Management.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations N-Z and Core Videos DVD 3 of 3

- Q. ORNL Applied Research Experiences. MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations N-Z and Core Videos DVD 3 of 3
- R. Design Documents & O&M Manuals.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations N-Z and Core Videos DVD 3 of 3
- S. Acceptance Testing.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations N-Z and Core Videos DVD 3 of 3
- T. PSI.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations N-Z and Core Videos DVD 3 of 3
- U. PHA.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations N-Z and Core Videos DVD 3 of 3
- V. IAMTHEKEY.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations N-Z and Core Videos DVD 3 of 3
- W. Signage.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations N-Z and Core Videos DVD 3 of 3
- X. Regulatory Status Air Permit & CAPP.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations N-Z and Core Videos DVD 3 of 3
- Y. Schedule.MTS – Mobile Mercury Transfer System (MMTS) HWAD Training Presentations N-Z and Core Videos DVD 3 of 3
- Fill Coupling Attachment.avi – Informational Training Videos by ORNL Taken February 27, 2014 During MMTS Acceptance Testing at 110-66 issued March 6, 2014
- Fill Coupling Removal.avi – Informational Training Videos by ORNL Taken February 27, 2014 During MMTS Acceptance Testing at 110-66 issued March 6, 2014
- Flask Disposal.avi – Informational Training Videos by ORNL Taken February 27, 2014 During MMTS Acceptance Testing at 110-66 issued March 6, 2014
- Fill Coupling Attachment.mpg – Informational Training Videos by ORNL Taken February 27, 2014 During MMTS Acceptance Testing at 110-66 issued March 6, 2014
- Fill Coupling Removal.mpg – Informational Training Videos by ORNL Taken February 27, 2014 During MMTS Acceptance Testing at 110-66 issued March 6, 2014
- Flask Disposal.mpg – Informational Training Videos by ORNL Taken February 27, 2014 During MMTS Acceptance Testing at 110-66 issued March 6, 2014
- MMS_Computer_Details.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19,2013, including MMS,PCDAS, and drum handling room portable snorkel smoke testing DVD 1 of 2 issued February 14, 2014
- MMS_Computer_Details_Wrapup.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19,2013, including MMS,PCDAS, and drum handling room portable snorkel smoke testing DVD 1 of 2 issued February 14, 2014
- MMSJnterface_Discussion.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19,2013, including MMS,PCDAS, and drum handling room portable snorkel smoke testing DVD 1 of 2 issued February 14, 2014
- MMS Rack Discussion.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19,2013, including MMS,PCDAS, and drum handling room portable snorkel smoke testing DVD 1 of 2 issued February 14, 2014

- Airfiltronix_Smoke_Demo2.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19,2013, including MMS,PCDAS, and drum handling room portable snorkel smoke testing DVD 2 of 2 issued February 14, 2014
- Aiiflow_Discussion_Drum_Room.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19,2013, including MMS,PCDAS, and drum handling room portable snorkel smoke testing DVD 2 of 2 issued February 14, 2014
- Equipment_Room_Description.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19,2013, including MMS,PCDAS, and drum handling room portable snorkel smoke testing DVD 2 of 2 issued February 14, 2014
- 01 Hawthorne Training Video.mpg – Mercury Stockpile Stewardship Program (MSSP) Mobile Mercury Transfer System (MMTS) Videos - ORNL/W. H. Hermes DVD 1 of 2 issued February 14, 2014
- 02 IMG_0557.MOV – Mercury Stockpile Stewardship Program (MSSP) Mobile Mercury Transfer System (MMTS) Videos - ORNL/W. H. Hermes DVD 1 of 2 issued February 14, 2014
- 03 PCDAS Input.mp4 – Mercury Stockpile Stewardship Program (MSSP) Mobile Mercury Transfer System (MMTS) Videos - ORNL/W. H. Hermes DVD 1 of 2 issued February 14, 2014
- 04 Tube Assembly and Disposal.mpg – Mercury Stockpile Stewardship Program (MSSP) Mobile Mercury Transfer System (MMTS) Videos - ORNL/W. H. Hermes DVD 2 of 2 issued February 14, 2014
- 05 MMTS Training Video - Animation.mpg – Mercury Stockpile Stewardship Program (MSSP) Mobile Mercury Transfer System (MMTS) Videos - ORNL/W. H. Hermes DVD 2 of 2 issued February 14, 2014
- 06 Mercury Transfer -01.m2t – Mercury Stockpile Stewardship Program (MSSP) Mobile Mercury Transfer System (MMTS) Videos - ORNL/W. H. Hermes DVD 2 of 2 issued February 14, 2014
- PCDASFINAL2.mpg – Mercury Stockpile Stewardship Program (MSSP) - Mobile Mercury Transfer System / Process Control and Data Acquisition System (PCDAS) informational video taken the week of December 16-20, 2013, delivered by Saber Engineering's Jim Rickets and produced by ORNL issued February 14, 2014
- MMS_Computer_Details.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19, 2013, including MMS, PCDAS, and drum handling room portable snorkel smoke testing DVD 1 of 2 issued January 16, 2014
- MMS_Computer_Details_Wrapup.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19, 2013, including MMS, PCDAS, and drum handling room portable snorkel smoke testing DVD 1 of 2 issued January 16, 2014
- MMS Interface_Discussion.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19, 2013, including MMS, PCDAS, and drum handling room portable snorkel smoke testing DVD 1 of 2 issued January 16, 2014
- MMS Rack 0iscussion.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19, 2013, including MMS, PCDAS, and drum handling room portable snorkel smoke testing DVD 1 of 2 issued January 16, 2014

- AirFiltronix_Smoke_Demo2.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19, 2013, including MMS, PCDAS, and drum handling room portable snorkel smoke testing DVD 2 of 2 issued January 16, 2014
- AirFlow_Discussion_Drum_Room.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19, 2013, including MMS, PCDAS, and drum handling room portable snorkel smoke testing DVD 2 of 2 issued January 16, 2014
- Equipment_Room_Description.avi – Special Training Videos from MMTS Off-site Acceptance Testing December 17-19, 2013, including MMS, PCDAS, and drum handling room portable snorkel smoke testing DVD 2 of 2 issued January 16, 2014
- IMG_0577.MOV – Mercury Stockpile Stewardship Program (MSSP) Mobile Mercury Transfer System Off-Site Testing Acceptance Testing Trip Report by ORNL (completed December 17-19, 2013) issued January 16, 2014
- 01 Hawthorne Training Video.mpg – Mercury Stockpile Stewardship Program (MSSP) Mobile Mercury Transfer System (MMTS) Training Videos - ORNL/W. H. Hermes Disc 1 of 2 issued December 4, 2013
- 02 IMG_0557.MOV – Mercury Stockpile Stewardship Program (MSSP) Mobile Mercury Transfer System (MMTS) Training Videos - ORNL/W. H. Hermes Disc 1 of 2 issued December 4, 2013
- 03 PCDAS Input. mp4 – Mercury Stockpile Stewardship Program (MSSP) Mobile Mercury Transfer System (MMTS) Training Videos - ORNL/W. H. Hermes Disc 1 of 2 issued December 4, 2013
- 04 Tube Assembly and Disposal.mpg – Mercury Stockpile Stewardship Program (MSSP) Mobile Mercury Transfer System (MMTS) Training Videos - ORNL/W. H. Hermes Disc 2 of 2 December 4, 2013
- 05 MMTS Training Video - Animation.mpg – Mercury Stockpile Stewardship Program (MSSP) Mobile Mercury Transfer System (MMTS) Training Videos - ORNL/W. H. Hermes Disc 2 of 2 issued December 4, 2013
- H_2O_14_inch.wmv – March 17, 2010 Chemical Accident Prevention Program (CAPP) Training by ORNL Enhanced and Reissued January 10, 2013
- Hg_14_inch.wmv – March 17, 2010 Chemical Accident Prevention Program (CAPP) Training by ORNL Enhanced and Reissued January 10, 2013
- Hg_28_inch.wmv – March 17, 2010 Chemical Accident Prevention Program (CAPP) Training by ORNL Enhanced and Reissued January 10, 2013

Table XX – MMTS Operating Limits

NDEP CAPP COMMENT	Additional Information	Response
Page 9 - a. Do SOPs include steps for Start-Up following a Turnaround (which includes system tightness checking, purging, isolation, blind removal)? ***Executive summary states "if a scale reset is required during daily operations follow the directions for beginning of day reset given in Procedure 2.3. This procedure begins with placing an EMPTY container on the scale, so it is unclear how to proceed in the case when the scale resets with the container partially filled.***	The metric ton scale is dynamically tested each day using a 2500 lb. +/- 0.25 lb. certified test weight. There are five (5) available Arlyn scales on site at this time, with two (2) required for normal operations for both metric ton filling stations. The scale will not reset unless operator action is taken. Twenty-nine flasks at 76 lb. mercury per flask will fill a metric ton container. The metric ton container is designed with headspace for expansion of mercury to 120 F even if overfilled by 1 flask, and stored long term. At 80 F, the container excess volume is sufficient to accommodate over 3 flasks. Inventory management is managed to control each container to 29 flasks and not store containers with over 30 flasks.	Procedure 2, §§2.3.2.1 and 2.3.2.2, direct worker actions required to perform reset (re-zero) activities in the morning when a partially filled MT container is sitting on the scale. The scale weight readings are recorded in the Process Control and Data Acquisition System (PCDAS) and local read-outs are provided. If the container is partially filled at the end of the operating day then that data is stored and available the next day in PCDAS. A separate administrative control is used by the operator by use of a clipboard to record the data. Prior to operation the metric ton container is lifted and the scale is re-zeroed and then placed back on the scale and the weight data compared with the recorded weight. If there is a variance the metric ton container is unhooked and the test weight applied to achieve the functional test.
Page 10 - iii. Does each Operating Limit define steps or actions required to correct or avoid deviation from that limit? ***Since there is no comprehensive compilation of all operating limits (This is typically seen in a table including consequences of deviation from those limits, as well as actions required to correct or avoid deviation from those limits.), it is unclear how one would correct for overfilling of the Hg container, for example.***	This mercury process is very simple. There are four (4) operating limits considered. Design conservatism has been applied to these four (4) limits. Redundancy is built in with engineering controls and administrative controls for critical parameters that impact safety and/or environmental controls.	The MMTS Operating Limits Table below has been prepared to compile critical operating limits, consequence of deviation and actions to correct or avoid. The approved PHA also addresses similar subject matter associated with these four (4) limits.

Table YY – MMTS Operating Limits Table

Operating Limit	Consequences of deviation	Mitigative Measures	Actions to avoid
Inventory – Overfilling a container - The operating limits to control inventory and overfilling are defined in conjunction with the fact that there is very sound technical data to prove each 3-L flask has very close to 76 lb. mercury contents. Twenty-nine flasks at 76 lb. mercury per flask will fill a metric ton container, which is the industry standard. Each 3-L flask contains ~ 2.5 L mercury.	The metric ton container would fill and change to the peristaltic pump operation in hood 2 would be observed by the operator. The flow of mercury would stop and the entire volume of the container would be filled. The MMS-16 vapor monitor reading would likely increase in the vicinity of the filling station. The system is enclosed and there is no danger to personnel but a process variance would occur. If overfilling occurs the pump can be reversed and pumped back into the 3-L flasks inside hood 2 until the level is restored to the 29 flask basis.	As defined in the PHA engineering controls and administrative controls are implemented to make this event very unlikely. Scales are used with alarm points and interlock shut-off to the pump, as well as a secondary engineering control consisting of a conductively probe set at a preset level with alarm points and interlock shut-off to the pump. The procedures also include administrative action to count 6packs and flasks fed to control operation so no more than 29 flasks are fed.	Operator attention is required to count flasks as the tertiary back-up to the engineering controls so care to manage the recorded data quality is required. Follow procedures for scale usage with care applied daily to ensure functionality as defined above and in the procedures.
Industrial Hygiene - The operating limit for control to the Industrial Hygiene standard (ACGIH) for mercury exposure in the workplace is based on 25 micro-grams/cubic meter for 8-hr exposure time weighted average (40-hr work week) and OSHA is higher. DLA Strategic Materials applies the 25 micro-grams/cubic meters as the alarm point to take action.	The consequence of exceeding the IH limit is to shut hoods and drums and assess the cause of the spike. The 8-hr time weighted average was selected as an alarm point to ensure process induced changes could be addressed systematically.	The conservative set-point for alarm has been applied in the procedures. A fixed vacuum system through sulfur impregnated carbon has been designed and installed and tested to ensure sufficient flow into hoods and over 20 elephant trunk snorkels. There are multiple portable snorkels used that vent through activated sulfur impregnated carbon for use with drums. This equipment is used in conjunction with a 16-point mercury analyzer with feeds near breathing level and floor level (MMS-16). Besides the MMS-16 there are two (2) portable Jeromes that are used to verify mercury concentrations when needed. Operating	Ensure that the mercury analyzers remain in calibration and apply lessons learned with

		experience will allow for optimization of their use for providing local alarms as well.	
Purge vacuum system flow at constant speed	The ID Fan in the equipment room must be available for controlling hood operations to ensure flow. Operations cannot commence without the ID Fan operating and providing the draft pressure profile required for hoods and snorkels.	The average flow is ~ 1850 scfm and once through and constant speed. The sulfur impregnated carbon adsorption system is designed for full plant life without changeout, with total mercury mass capacity of ~ 20 lbs. Portable snorkels are used to enhance control of mercury concentration management in the vicinity of drums. The flow through the purge vacuum system is once-through and not recycled. There is a spare fan motor and the ID Fan is on the preventative maintenance schedule.	Ensure the ID Fan maintenance is executed per the maintenance plan. Ensure the hoods are tested for 100 fpm inlet velocity minimum per the required certification schedule. Ensure the roughing filters in the system upstream of the carbon absorber are changed out per required preventative maintenance schedule and that the pressure drop remains within the prescribed range.
Pre-filter and carbon absorber integrity/pressure drop controlled within range	Pre-filters are used to collect particulate upstream of the carbon absorber and pressure drop instrumentation is provided with the alarm set point at ~ 0.35 inch W.C. The filters protect the carbon and remove airborne dust. If the pressure drop is exceeded the pre-filter must be changed out to ensure carbon adsorption integrity is maintained.	The pressure drop across each filter is monitored with visual alarm in the control room at ~ 0.35 inch W.C. and a local visual in the equipment room. The alarm point may be changed to a value slightly higher based on operating experience.	The pressure drop instrumentation (transducer/transmitter) must be maintained per standard maintenance and care is required to evaluate operating data.

1 - METRIC TON CONTAINER ACCEPTANCE AND STAGING

Title: Metric Ton Container Acceptance and Staging **Doc. No.** MMTS-1-Rev5

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-5-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

Rev. No.	Change description	Author
5	Annual Review- Updated signatory authority to current signatures. Added Revision number to document number.	Rob Mathias
4	Changes to One-Metric Ton Mercury Container Specification MSSS-28, Rev 4 a. Revised E.3.1 - ISO requirement to reflect latest "ISO9001:2015, or current version". b. Revised "C - Basic Info" (Page 4) to reflect current production phase vice First Article status (i.e "Offeror" to "Contractor") c. Revised para 2.7; American Welding Society (AWS) B5.1, Latest Revision to current "2013". d. Revised (3.4.2, 3.4.3, 5.4.5.2, 5.4.5.3 and 5.4.5.4) to reflect Primer, Top Coat changes, respective surface preparation processes. 1. Removed: "Primer - Carboline Carbozinc® 11 WB (color gray: 0700)" - Replaced with: "Primer ZMP - 300/301 VOC Zinc Rich Primer (reddish-gray)". 2. Removed: "Top Coat —Carboline Carboguard 890 VOC (safety blue: 5150)", Replace with "AUE-370 (safety blue)".	Rob Mathias

	e. Revised language in 5.4.5.2 to support current Utah state regulatory requirements, and promote use of both functionally and environmentally acceptable alternatives.	
3	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
2	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

***NOTE**: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
MSSP-49	*Metric Ton Container Quality Assurance Report*, Oak Ridge National Laboratory, Oak Ridge, Tenn., August 2013
MSSP-28, Rev. 3	*One-Metric Ton Mercury Container Specifications*, Oak Ridge National Laboratory, Oak Ridge, Tennessee, June 6, 2013

1.1 PURPOSE

This procedure is designed to ensure that the received metric ton (MT) containers are acceptable for the intended use: long-term storage of elemental mercury at the HWAD. Further, this procedure is designed to ensure safe onsite transport and storage of the MT containers in Building 110-51 prior to moving MT containers to Building 110-66 for feed supply to the MMTS.

1.2 SCOPE

Inspect and evaluate the containers to verify that what is received is in accord with the bill of lading (BOL), including count per shipment. Inspection actions are required to verify transport did not cause physical damage and quality assurance/quality control documentation requirements have been met. Upon site acceptance verification intra-site transport to Building 110-66, unloading, and storing in the 110-66 designated area is required.

***NOTE**: The initial shipment quantity of metric ton containers is 100, with 10 units stored for use at the end of the overall MMTS operation. A total of approximately 4,440 units will be required for the expected life of the MMTS operation. Multiple suppliers may be used, and each supplier*

shall have an option to provide 400 units. Each contract shall require 2 % to be stored as empty until the end of the operations; at that time the 100 containers saved for future (potential) DOT testing can be utilized. The supplier for the first 800 units is Tooele Army Depot (TEAD).

1.3 OPERATIONS

1.3.1 Inspection

Inspections are performed on the incoming containers upon initial receipt at HWAD to determine whether the containers meet quality standards and the requirements of the specification document and the Seller's contract. However, the receiver is not limited to the inspections listed below to determine quality and specification conformance. Conformance will be indicated by a Y (yes) or N (no) in the "Y/N" column, and negative responses documented on the Nonconformance Report (NCR) and attached to the checklist.

- Conduct a 100% inspection of receipt of MT containers.

Perform the inspections described on the form in Section 1.6, Attachment 1.1 on the incoming containers to determine whether the containers meet quality standards and the requirements of the specification document and the contract.

1.3.2 Evaluation

Conformance is indicated by a Y (yes) or N (no) in the "Y/N" column, and negative responses are documented on the Nonconformance Report (see Attachment 2) and attached to the checklist.

- Complete the checklist (Section 1.7, Attachment 1.1) for each inspected container.

For any unacceptable containers, fill out a nonconformance report (Attachment 1.2) and attach it to the checklist.

***NOTE**: Evaluation results will be provided to <u>the MMTS Operations Manager</u>.*

1.3.3 Transport and Stage

Transport the empty containers to Building 110-66; unload per approved handling procedure [using a portable dock (see Attachment 1.3) equipped with physical stops on the outboard perimeter]; and store the units in the location designated by the Facility Manager, a possible location is shown in Attachment 1.4.

1.4 METRICS

Inspections will be tracked and the results documented. Deficiencies found will be trended and that information will be used to evaluate the need for more frequent inspections or the need for communication to the Defense Logistics Agency (buyer) and/or supplier.
The QA records for each metric ton container production are organized in individual packets and should be reviewed by the Facility Manager prior to transport of the container from the 110-66 warehouse. This action ensures records are complete and validates the serial number prior to engraving the stainless-steel tag.

1.5 RECORDS

- Inspection records
- Nonconformance reports
- QA records for each metric ton container production, as summarized in MSSP-49, *Metric Ton Container Quality Assurance Report*, Oak Ridge National Laboratory, Oak Ridge, Tenn., August 2013 (CD), and stored in the comfort trailer cabinets.

1.6 FORMS

See Section 3.10.

1.7 ATTACHMENTS

Receipt Inspection Record (Attachment 1.1)
Nonconformance Report (Attachment 1.2)
Portable Dock in Use at Building 110-66 (Attachment 1.3)
Physical Lay-Out for Building 110-66 that Shows Storage for 100 Empty MT Containers (Attachment 1.4)

1.7.1 Receiving Inspections

(Excerpted from MSSP-28, Rev. 3, *One-Metric Ton Mercury Container Specifications*, Oak Ridge National Laboratory, Oak Ridge, Tennessee, June 26, 2013)

The following inspections will be performed on the incoming containers by the Company to determine whether the containers meet quality standards and the requirements of this specification document and the contract. However, the receiver is not limited to the below inspections to determine quality and specification conformance. Conformance will be indicated by a Y (yes) or N (no) in the "Y/N" column, and negative responses documented on the Nonconformance Report (NCR) and attached to the checklist.

ATTACHMENT 1.1 Receipt Inspection Record

Container Serial Number(s)			
Receiver Inspection Quality Control (QC) Checklist for Incoming Containers			
Quality Control Conformance		**Y/N**	**"No's" are to be documented on DLA Strategic Materials Nonconformance Report, with checklist attached.**
1	Dimensions		Container dimensions are in accordance with the design drawing (see Section 4).
2	Exterior/Interior		Container is painted safety blue (see Sections 3.4 and 5.4.5).
			No significant scratches, corrosion, dents, bare metal areas, etc. (see Section 6.2.2).
			Container is clean (see Section 5.4.5.2).
3	Welds		Container welding per specification and drawing requirements (see Section 5.4).
4	Container Identification		Container marked per specification requirements (see Section 3.5).
5	Container Documentation		One (1) hard copy of container documentation for each container (inspection results, certified material test reports (CMTRs), Certificates of Compliance, etc.), and one (1) complete electronic copy being submitted to Company Buyer (see Section 5.7.1).
6	Suspect/ Counterfeit Components		There are no suspect/counterfeit components (see Section 3.1.1).

Remarks:

Signature	Date

ATTACHMENT 1.2 Nonconformance Report

Nonconformance Report

MMTS	**MMTS Receipt Inspection**	**Report Number**

Section 1 *To be completed by the Inspector*

1. Contract number and Item Number(s):

2. Contract title:

3. Contractor:

4. Item identification:

5. Requirement:

6. Description of the non-conformance:

7. Proposed remedial action: [ ] use as is [ ] rework [ ] repair [ ] reject [ ] alt. use

8. List of attachments:

9. Proposed non-conformance category:

[ ] **MINOR** non-conformance
(*Report to be sent to DLA for information and remedial action implemented)*

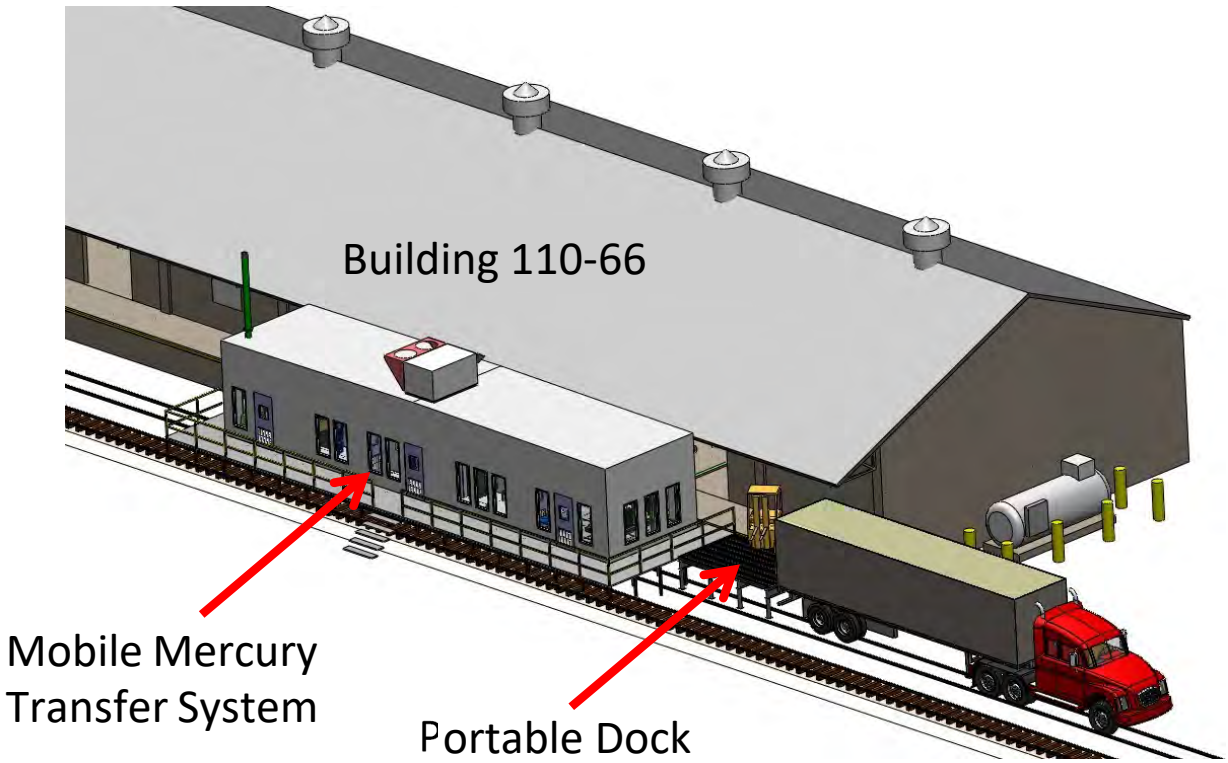
[ ] **MAJOR** non-conformance
(*Remedial action to be implemented only after DLA written acceptance)*

Contractor's Responsible Officer	Contractor's Quality Officer
Name *Date* *Signature*	*Name* *Date* *Signature*

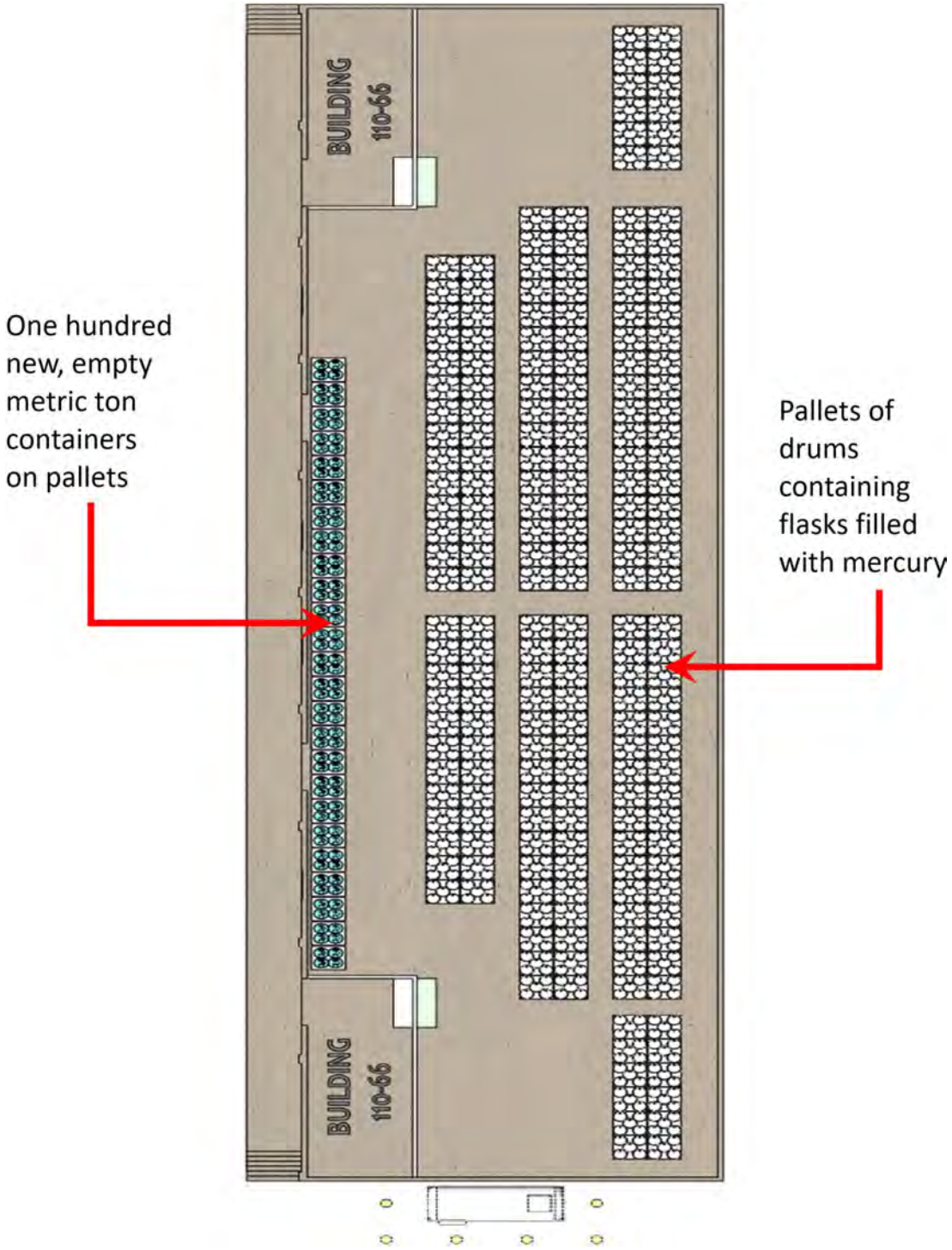
Section 2 *To be completed by DLA*

Technical Responsible Officer Decision:	QA Technical Officer Comment:
Name *Date* *Signature*	*Name* *Date* *Signature*
Chief Engineer Comment:	
Name *Date* *Signature*	

ATTACHMENT 1.3 Portable Dock in Use at Building 110-66



ATTACHMENT 1.4 Example of Physical Lay-Out for Building 110-66 that Reflects Storage for 100 Empty MT Containers (Attachment 27.3 is an improved/completed layout which shows eight (8) pallets of four (4) MT containers per pallet.)



2 - METRIC TON CONTAINER SET-UP

Title: Metric Ton Container Set-up **Doc. No.** MMTS-2-Rev4

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date:2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-5-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

Rev. No.	Change description	Author
4	Annual Review- Updated signatory authority to current signatures. Added Revision number to document number.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
2	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title

2.1 PURPOSE

This procedure describes the activities and requirements that deal with:

- Transporting the empty MT containers from Building 110-66 to the loading dock outside the MMTS.
- Handling and placement of MT containers on the scales located inside the MMTS.
- Installation of the quick disconnect (QD) transfer fitting needed to fill the MT container with elemental mercury.

2.2 SCOPE

This procedure covers the following activities:

- Fork lift operation to move one or both MT containers from Building 110-66 to the loading dock and from the loading dock into the Flask Handling Area.
- Placement of one or both MT containers onto the digital scales located inside the MMTS.
- Installation of the transfer fitting into the 3-inch half-coupling of the MT container.

***NOTE**: All operations involving the QD transfer fitting will include local area venting using one or more of the overhead snorkels placed in the vicinity of these tasks or using the cart mounted Airfiltronix™ snorkel.*

2.3 OPERATIONS

A single MT container will be transported from Building 110-66 to the 12-ft rollup door at the north end of the MMTS. The empty container will be placed gently onto an unoccupied digital scale. The QD transfer fitting will be installed into the half-coupling of the container that is to be filled. If so directed by the MMTS Facility Manager, the operator repeats these handling steps to place a second metric ton container on the other digital scale.

***NOTE:** Peristaltic pumping operations (i.e., transferring mercury) are <u>never</u> permitted while MT containers are being moved into place or undergoing set up operations.*

2.3.1 Required Equipment and Supplies (PPE as specified on page XI of the Executive Summary under General Safety and Health) The following equipment is required for operations:

- Two (2) threaded portions of the transfer fitting (one for each MT container) are needed to mate to the collar portion of the fitting
- Torque wrench for installing the 3-inch NPT plug
- Yellow Teflon® tape to wrap the 3-inch container plugs

2.3.2 Locate and Position MT Containers

2.3.2.1 Forklift operator (material handler)

- Locates and transports an empty MT container from within 110-66 to the MMTS, as needed.

NOTE: *The weight of the empty container ranges from ~250 lb to ~280 lb. The forklift tines must be spaced at ~12½ inches center-to-center to ensure the tines fit the fork pockets.*

- Gently places a MT container on a scale inside the MMTS roll up door under the direction of a Flask Handling Area worker (inside the MMTS), who helps direct elevation and placement of the container on the approximate center of the scale.
- Repeats this operation for MT containers as they are needed in the MMTS.
- On mornings when a partially filled MT container is sitting on a scale, the forklift operator (under the direction of a co-worker) cautiously lifts the MT container one to two inches above the scale while the co-worker re-zeros the scale at the scale display mounted on Fume Hood 2. Upon completion of the re-zeroing activity, the forklift operator gently places the MT container back on the scale.

2.3.2.2 Flask Handling Area worker

- Opens the roll up door
- Ensures that the scale reading is zero before positioning the container.

On mornings when a partially filled MT container is sitting on a scale, the worker communicates with the forklift operator, ensures that all cables and hoses are out of the way of the container lift and re-zeros the scale at the scale display mounted on Fume Hood 2.

Note*: The Flask Handling Area worker may be the same worker responsible for operating the pumping station for transferring mercury (Refer to Procedure MMTS-7, "Fume Hood 2 – Mercury Transfer").*

2.3.3 Setup and Installation of the QD Transfer Fitting

Flask Handling Area worker

- After the MT container has been positioned on a scale, record the tare (container weight) before removing the 3-in. national pipe thread (NPT) plug from the container. Zero-out the tare weight at the scale display before the QD fitting has been installed.

NOTE: The nominal weight of the empty MT container, including the 3-in. NPT plug, is 225 lbs. The total weight of the drip collar (set-up) and QD in place, minus the 3-in. national pipe thread (NPT) plug, is ~ 3-5 lbs. The actual mercury added is determined after the QD and drip collar are removed and the 3-in. plug is placed back on the container.

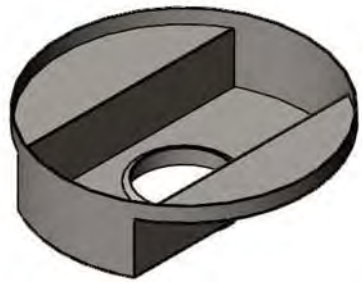


Figure 1-1 Drip collar for MT container

- After removing the plug, place three (3) wraps of yellow Teflon® tape on the threads; place the plug in a storage bucket for reinstallation after the MT container has been filled.

- Install the drip collar (see Figure 2.1) over the top of the MT container being certain to allow clear access to the NPT half coupling; the collar provides local containment in the unlikely event of mercury drips when the fill tube is extracted.

Place a layer of gauze, cheesecloth or equivalent in the drip collar and over all exposed horizontal surfaces of the MT container.

NOTE: It is imperative that no mercury comes in contact with the external surfaces of the MT container.

- Screw the threaded (lower) portion of the QD transfer fitting into the MT container, hand-tight. *(**NOTE:** The threaded fitting is to be installed with bare threads, i.e., **no** Teflon® tape on the threads.)*

- Remove the QD transfer fitting from its port on the fume hood wall. Hold cheesecloth, a gauze pad or equivalent on the base of the fill tube to minimize incidental transfer of mercury during handling of the QD fitting.

- Figure 2.2 shows the assembled transfer QD fitting. Figure 2.3 shows the QD fitting separated into the threaded portion and the upper portion.

NOTE: *The upper portion of the QD fitting is connected to the flexible transfer tubing (shown in green), the fill-vent line, and a conductivity probe.*

- The fitting needs to be in place in the Fume Hood 2 the holster (storage port) at the end of each work day to contain potential mercury vapors when the exhaust fan is not running.

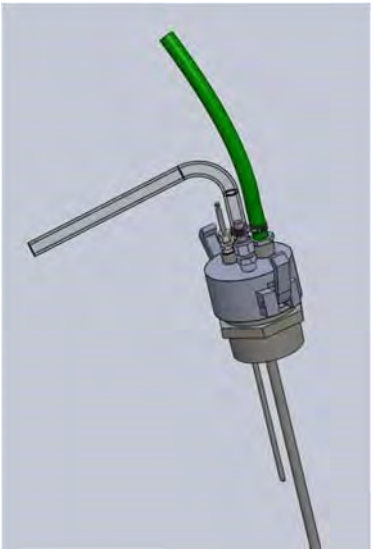


Figure 1-2 Transfer fitting assembly

- The upper portion of the QD fitting is then inserted into the container and the locking clamps engaged. After a visual inspection by the Facility Manager and concurrence that other procedure requirements are met, mercury transfer operations may commence.

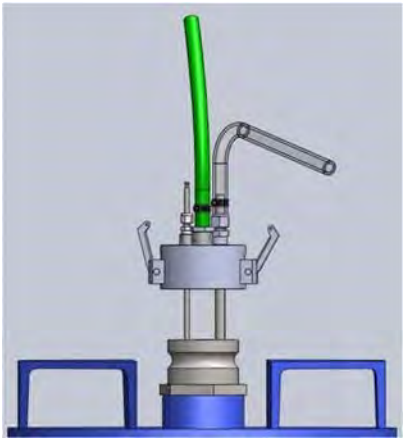


Figure 1-3 Upper portion of transfer fitting being inserted into MT container

3 - METRIC TON CONTAINER TRANSPORT AND STORAGE

Title: Metric Ton Container Transport and Storage **Doc. No.** MMTS-3-REV4

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 FEB 2020
Approved by:	Charles R King	Date:2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

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4	Annual Review - Updated signatory authority to reflect current required signatures. Added Revision number to document number.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
2	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title

3.1 PURPOSE

This procedure describes the activities and requirements that deal with:

- Transporting filled MT containers from the MMTS into Building 110-66.
- Transporting filled MT containers from Building 110-66 to Building 110-XX.

Other than Building 110-66, storage readiness of a specific building for full metric ton containers (seven (7) buildings required in total) will be established while that building is being emptied of pallets of drums containing mercury in flasks (see Procedure MMTS-27, "Defense National Stockpile Mercury Inventory Control," for a list of suggested long-term storage buildings).

3.2 SCOPE

This procedure covers the following activities:

- Removal of a filled MT containers from the digital scales located inside the MMTS.
- Forklift operations to move a filled MT container from the MMTS into Building 110-66.
- Forklift and truck operations to move a filled MT container from Building 110-66 into Building 110-XX.

***NOTE**: Care must be exercised to ensure that all mercury transfer hardware is out of the pathway during MT container removal from the MMTS.*

3.3 OPERATIONS

***NOTE:** Peristaltic pumping operations (i.e., transferring mercury) are <u>never</u> permitted while MT containers are undergoing closure operations or being removed from or being placed in MMTS.*

3.3.1 Transport and Store MT Container in Building 110-66

- After an MT container is closed and the required data is recorded (see Procedure MMTS-8, "Metric Ton Container Unhook and Close"), the forklift operator carefully transports the MT container into Building 110-66 and places it in a drip tray at the location specified by the Facility Manager.
- Using the wireless handheld data input unit, the forklift operator enters the drip tray location, the MT container number, and the building number (110-66, in this instance) on the MT TRANSFER screen (see description in Section 13.5 on pages 13-6 and13-14).
- . When complete, press ENABLE.

3.3.2 Transport and Store MT Containers in Building 110-XX

- Forklift operator loads the truck with the MT containers designated by the Facility Manager and with sufficient drip trays for all MT containers – four MT containers per drip tray.
- Upon arrival at Building 110-XX, the forklift operator unloads drip trays and MT containers from the truck and places them in locations designated by the Facility

Manager. After placing the containers and drip trays, the forklift operator enters the MT container serial number, the drip tray location and the building number (110-XX, in this instance) into the wireless handheld data input unit as described in Section 3.3.1.

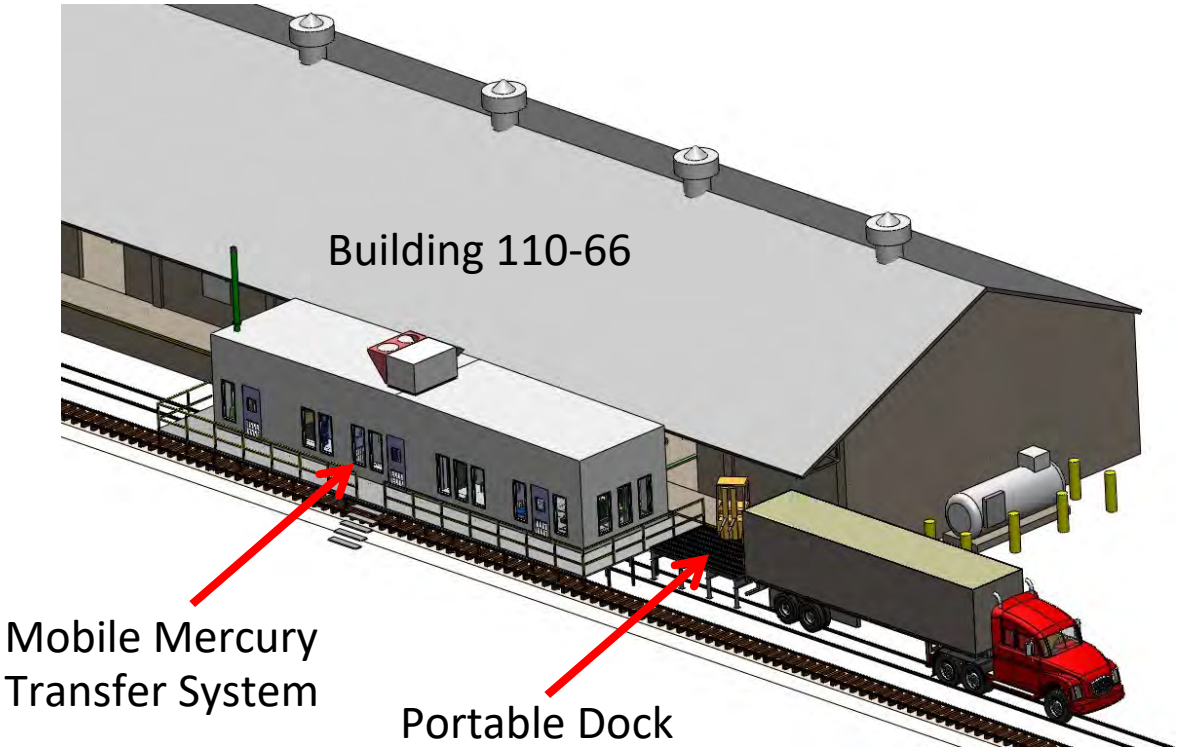
3.4 RECORDS

- MT container serial numbers, drip tray locations and building number(s)
- Up-to-date inventory tracking spreadsheets showing all mercury moves from the beginning to the end of the workday.

3.5 ATTACHMENT

Portable Dock in Use at Building 110-66 (Attachment 3.1)

ATTACHMENT 3.1 Portable Dock in Use at Building 110-66



4 - PALLET TRANSPORT AND HANDLING

Title: Pallet Transport and Handling **Doc. No.** MMTS-4-Rev4

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

***NOTE**: This document will be reviewed at least annually to ensure its suitability.*

Revision History

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4	Annual Review - Updated signatory authority to reflect current required signatures. Added Revision number to document number.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
2	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

***NOTE**: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title

4.1 PURPOSE

This procedure describes pallet and drum handling operations: (1) from Building 110-66 to the MMTS and (2) from Building 110-XX to the MMTS staging zone in Building 110-66.

4.2 SCOPE

This procedure covers pallet and drum-related activities for the forklift operator in Buildings 110-66 and 110-XX and in the MMTS. This procedure also covers the truck driver who transports the materials between the warehouses.

4.3 OPERATIONS

4.3.1 Required Equipment and Supplies (PPE as specified on page XI of the Executive Summary under General Safety and Health)

The following equipment is required for operations

Permanent marker or equivalent

Masking tape or equivalent tag material

4.3.2 Pre-Operations Check

At the start of a workday, the material handling staff shall follow normal DLA Strategic Materials procedures to ensure that the forklifts are functional and can be operated safely. Drum and flask lift fixture equipment shall be examined for wear or damage.

NOTE*: The Facility Manager shall be notified if a forklift or any lifting fixture or equipment is not ready for operation.*

4.3.3 Pallet of Drums Containing Flasks Filled with Mercury to the MMTS

- Facility Manager designates a pallet of drums containing flasks filled with mercury for movement to the MMTS. The Facility Manager tracks pallet moves with inventory tracking spreadsheets: Spreadsheet 2 – Modified Warehouse Inventory and Spreadsheet 3 – Current MMTS and Building 110-66 Inventory (see Procedure MMTS-27, “Defense National Stockpile Mercury Inventory Control”).
- Forklift operator locates the designated pallet and inspects the drip tray for evidence of mercury before moving the pallet. If any mercury is observed in the drip tray, the forklift operator notifies the Facility Manager. The Facility Manager determines if an alternate pallet should be transported to the MMTS. The Facility Manager uses the methodology of Procedure MMTS-12, “Emergency Response and Spill Cleanup” to ensure the loose mercury is secured and the pallet, drip tray and drums are acceptable for movement.
- Forklift operator carefully and safely transports pallet to diked area adjacent to exit from warehouse and removes metal banding and 2” x 4” boards (dunnage) (wears leather

gloves for this operation). Banding and dunnage are placed in a container designated for reuse or disposal as clean waste (non-hazardous).

- Forklift operator carefully and safely transports the pallet of filled drums and with spotting assistance from a Drum Handling Area worker, the forklift operator carefully and safely places the pallet of drums on the roller conveyor inside the MMTS.

- Facility Manager enters the former building number for this pallet into PCDAS when MT containers are filled from flasks originating on this pallet [Needed information is retrieved from inventory tracking spreadsheets (see Procedure MMTS-27)].

4.3.4 Transport Pallets of Drums Containing Flasks with Mercury from Building 110-XX to Building 110-66

- Facility Manager designates a truckload of pallets (fourteen pallets) containing drums filled with mercury for transport from Building 110-XX to Building 110-66. The Facility Manager tracks pallet moves with inventory tracking spreadsheets: Spreadsheet 2 – Modified Warehouse Inventory and Spreadsheet 3 – Current MMTS and Building 110-66 Inventory (see ProcedureMMTS-27).
- Forklift operator locates the pallets of drums designated for Building 110-66 and inspects all drip trays for evidence of mercury before moving any pallets. If any mercury is observed in a drip tray, the forklift operator notifies the Facility Manager. The Facility Manager evaluates the situation, ensures cleanup occurs and determines if an alternate pallet should be transported.
- The forklift operator marks the building number (110-XX) on a masking tape or equivalent tag and attaches it to at least one drum on each pallet (This tag serves as a backup for the information recorded in the inventory tracking spreadsheets.).
- Truck driver transports load of pallets and drums to Building 110-66.

4.3.5 Unload and Store in Building 110-66 Pallets of Drums Containing Flasks with Mercury

- Facility Manager assigns locations in Building 110-66 for the pallets of drums and updates the inventory tracking spreadsheets (see Procedure MMTS-27) after confirming the pallets are placed in the assigned locations.
- Forklift operator checks to ensure that at least one drum on each pallet has a masking tape or equivalent tag giving the building of origin (110-XX).

4.3.6 Actions at the End of Workday Operations

If a full pallet of drums remains in the MMTS at the end of the workday, the material handling staff should return that pallet to the Building 110-66 staging area. A full pallet of drums should not remain in the MMTS overnight. To enhance operational flexibility, a full pallet of drums

may remain in the MMTS overnight. The Facility Manager must ensure that the inventory tracking spreadsheets correctly show the location of this pallet.

The material handling staff follows normal procedures defined by DLA Strategic Materials to ensure that the forklifts are stored safely.

4.4 RECORDS

- Tags showing building of origin for each pallet transported.
- Up-to-date inventory tracking spreadsheets showing all mercury moves from the beginning to the end of the workday.

5 - DRUM HANDLING

Title: Drum Handling **Doc. No.** MMTS-5-Rev5

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date: 2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

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5	Annual Review - Updated signatory authority to reflect current required signatures. Added Revision number to document number.	Rob Mathias
4	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
2	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez
1	Modified §5.3.2 in to add clarity to Facility Manager's actions in tracking placement of the 30th flask into a dedicated six-pack tray. Modified description in §5.3.4 of actions of the Drum Handling Room worker to store dedicated six-pack tray at the end of a workday.	

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
Procedure MMTS-7	Fume Hood 2 – Mercury Transfer
Procedure MMTS-10	Waste Management

5.1 PURPOSE

This procedure describes operations in the MMTS: drum handling, flask removal, and flask placement in six-pack transfer trays (six-pack trays). Also covered is disposition of any drums containing loose mercury and management of empty drums, drip trays and pallets.

5.2 SCOPE

This procedure covers the drum and flask-related activities for operators in the Drum Handling Area. This procedure also covers waste handling activities by operators in the Drum Handling Area and by the forklift operator.

5.3 OPERATIONS

5.3.1 Required Equipment and Supplies (PPE as specified on page XI of the Executive Summary under General Safety and Health)

In addition to personal protective equipment, the following equipment is required for operations:

- Drum lift fixture,
- Flask-lift fixture and flask-foot fixture,
- Bag cutting blade,
- Waste containers

5.3.2 Drum Venting, Placement and Opening

- **Drum Handling Area worker**
    - Attaches a masking tape or equivalent label (tag) to the flask six-pack tray giving the pallet number and drum number. Facility Manager updates inventory tracking spreadsheets, as appropriate, to follow the mercury in flasks that is removed from a drum and placed in a six-pack tray.
    - Places the cart-mounted portable snorkel on the drum lid near the bung. Loosens the bung, removes the bung, and places an overhead snorkel into the drum lid. Repeats for each of the drums on the pallet, typically five (5). The snorkel must remain in each drum for at least five (5) minutes. Replaces the bung (finger tight

only) immediately prior to lifting the drum. Wear leather gloves for this operation.

- Follows the manufacturer's procedures for using the drum lift fixture (the drum lift fixture is shown in Section 5.4, Attachment 5.6).
- Lifts the drum and inspects the bottom for mercury leaks or damage. Positions the drum adjacent to the conveyor table and gently lowers the drum approximately onto the center of the 1000-lb capacity digital scale (see Section 5.4, Attachments 5.1 and 5.3).
- On a clipboard, records the drum weight and drum number compares the drum weight to the range of weights given in the following NOTE; notifies the Facility Manager if the drum weight is outside the acceptable range for a drum containing six (6) filled flasks.

NOTE: *The expected weight of the drum, packaging, flasks and mercury is about 550 lb ± 25 lb. The range accounts for differing flask weights and small variations in the amount of mercury. Alert the Facility Manager if the weight is outside the given range. Weights substantially below the given range may indicate that the drum contains fewer than the typical six flasks of mercury. The mercury stockpile records indicate that only 24 drums have fewer than six (6) flasks, out of over 21,600 drums in the mercury stockpile. Each of these drums has a special tag on it to highlight this fact.*

- Removes the drum lid, cuts a 3 to 4 inch slit in the polyethylene liner bag, inserts the snorkel tube into the bag for venting, and loosely replaces the drum lid (wears leather gloves for this operation).
- Removes the snorkel tube and drum lid. Makes visual check for loose mercury in the bag and/or drum. If loose mercury is observed, replaces drum lid without the locking ring, notifies Facility Manager and follows operations in Section 5.3.3.
- Positions the Airfiltronix® snorkel (located on the conveyer table) adjacent to the top of the open drum to collect vapors from the open drum-liner bag.
- Cuts the bag completely open to gain access to all the flasks (wears leather gloves for this operation); removes the cardboard flask separator and places it into the adjacent waste drum; inspects for loose mercury at the bottom of the drum using additional lighting.
- Slides back the cover over the fume hood conveyer table to access an empty flask tray.
- Places an empty bag (18"x20" re-sealable/3-mil) in each six-pack flask space prior to placement of a flask in the six-pack.
- Attaches the appropriate lift fixture (see notes below) to a flask and slowly raises the flask sufficiently to clear the six-pack tray on the conveyor table; and lowers the flask into the six-pack tray.

- Positions the hoist directly above the flask that is to be lifted.
- Lifts each flask a few inches and visually inspects the integrity of the connection prior to lifting the flask beyond the plane of the drum.

NOTE*: Lift fixtures were designed, fabricated and tested for suitable use at ORNL. A multi-purpose lift fixture that can accommodate the different sizes of flask plug and the cross-drilled holes in the flask plugs can be used for lifting flasks out of the drum. This device is shown in Section 5.4, Attachment 5.2a. A second multi-purpose lift fixture that can also accommodate differently sized flask plugs and cross-drilled holes is shown in Section 5.4, Attachment 5.2b. All devices must be certified for service. The second lift fixture is designed to allow the lifting pin to be placed through the hole in the flask plug prior to grasping the pin and securing the fixture for the lift and is expected to be the primary device used. There are spare pins available and a cable attachment is utilized to ensure the pin is retrievable in the event the operator drops it.*

NOTE*: Occasionally, a flask plug without a cross-drilled hole may be encountered; for that situation, the worker shall use the flask foot fixture (see Section 5.4, Attachment 5.5) for lifting after the "normal" flasks have been removed from the drum.*

- Carefully pushes a filled tray to an unoccupied position on the conveyer table and closes the table cover.
- In the now empty drum, places the pillow in the polyethylene liner bag and, using an available snorkel or vacuum line, evacuates the bag liner resulting in a smaller waste package; seals the package with vinyl tape; and places package into the waste drum. The cardboard divider material should be folded to reduce volume as much as practicable prior to evacuating the bag.
- Returns the empty drum to the pallet. Places the drum lid and locking ring on the drum. Tightens the locking ring sufficiently to prevent the drum lid from falling off (wear leather gloves for this operation).
- Wraps the pallet of empty drums with plastic or secures the drums in an equivalent fashion to prevent any drums from falling from the pallet while the pallet is being moved by forklift.

- **Facility Manager**

  Ensures the operations of Section 5.3.2 are repeated to maintain a full inventory of flasks ready for transferring mercury into the MT containers. Updates inventory tracking spreadsheets, as appropriate, to follow the mercury that is removed from drums and placed in six-pack trays, including 1) the fifth six-pack tray in a sequence, i.e., the one that has one position blocked off and 2) the dedicated six-pack tray (also known as the BIG ORANGE six-pack tray) that contains the 30th flask from each sequence of five six-pack trays.
- **Forklift operator**

Retrieves and transports the pallet of five empty drums to the drum accumulation area in Building 110-66. Places the drip tray and pallet in the reuse or recycle sorting areas.

5.3.3 Disposition of Damaged Flask in Drum

- **Facility Manager**
  - Using the cart-mounted portable snorkel, lifts lid and verifies the presence of loose mercury.
  - Marks the drum and the lid to indicate the drum contains loose mercury and a damaged flask, and directs the drum handling area worker to seal the drum and return it to the pallet. Updates inventory tracking spreadsheets, as appropriate, to show location of the drum with loose mercury.
- **Forklift operator**
  - Retrieves and transports the pallet of drums (four empty and one with loose mercury) to Building 110-66
  - Places the empty drums in the drum accumulation area.
  - Places the pallet and the drum with loose mercury in the location designated by the Facility Manager.

NOTE*: The drum with loose mercury is placed onto a pallet/drip tray at a temporary storage area in Building 110-66. Within a year, the drum will be returned to MMTS where Procedure MMTS-26 will be followed to extract the mercury and clean up the drum and flasks sufficiently for disposal.*

5.3.4 Actions at the End of the Workday

- **Drum Handling Area worker**

  Ensures that the dedicated six-pack tray (also known as the BIG ORANGE six-pack tray) containing the 30th flask from each sequence of five six-pack trays is stored in Fume Hood 1 and the side door between the conveyor table and Fume Hood 1 is closed.

- **Facility Manager**

  Ensures that the inventory tracking spreadsheets correctly show any mercury located in Fume Hood 1.

5.4 RECORDS

Up-to-date inventory tracking spreadsheets showing all mercury moves from the beginning to the end of the workday.

5.5 ATTACHMENTS

Arrangement of Conveyer Table, Fume Hood Station One, Fume Hood Station Two, and Related Equipment (Attachment 5.1)

Flask Lifting Fixtures (Attachments 5.2a and 5.2b)

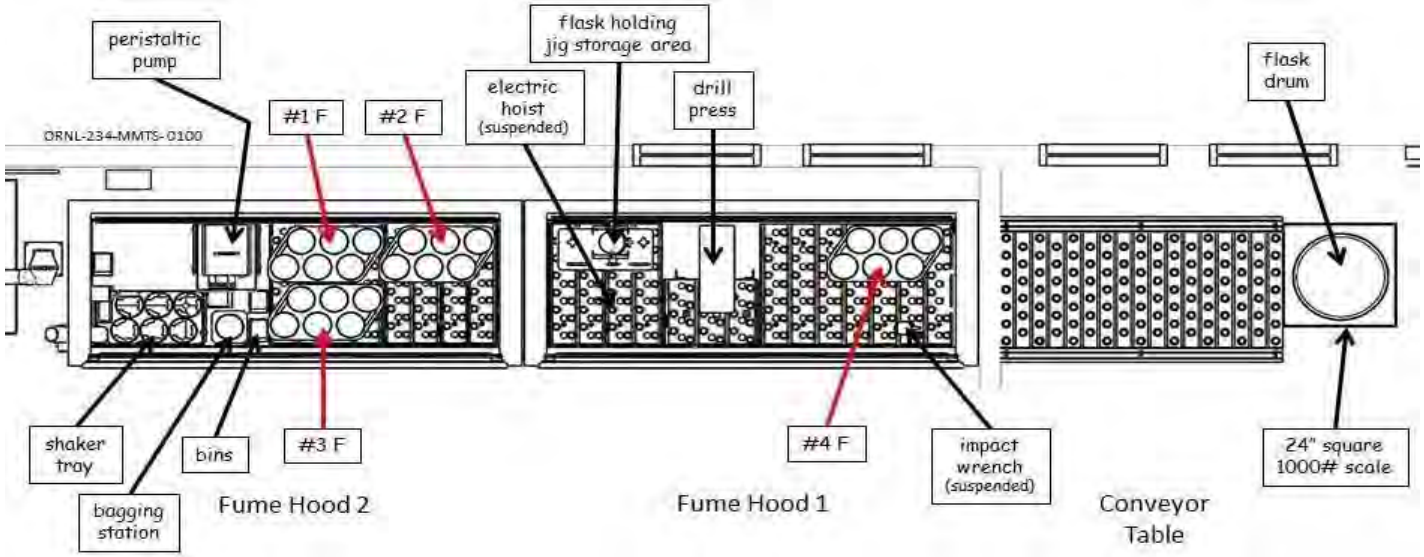
Digital Scale – PDS-1000, 1000 Pound Capacity Drum Scale (Attachment 5.3)

Airfiltronix® portable snorkel mounted on the conveyor table and positioned to remove

mercury vapor from a drum (Attachment 5.4) Flask foot fixture (Attachment 5.5)

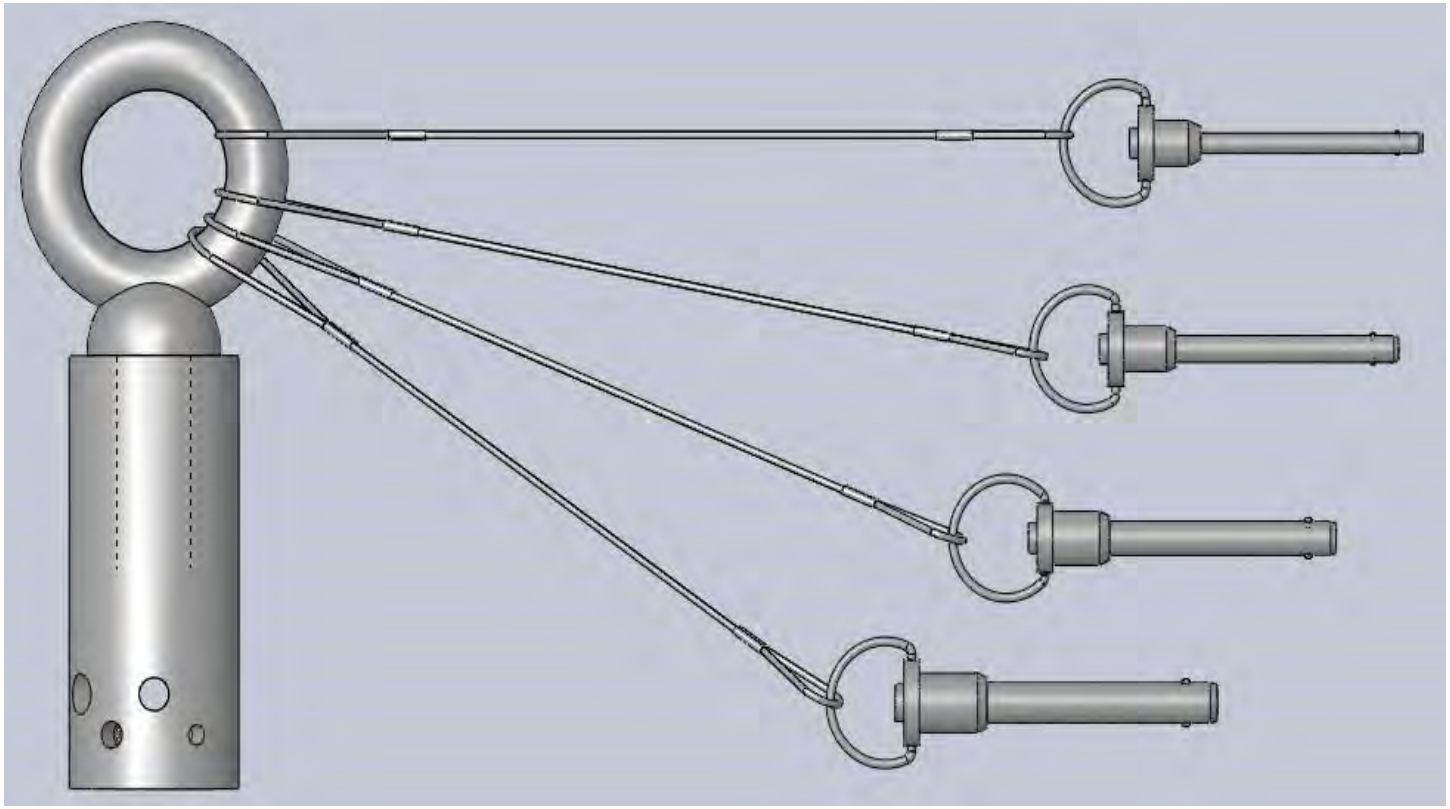
Drum lift fixture (Attachment 5.6)

ATTACHMENT 5.1 Arrangement of Conveyer Table, Fume Hood Station One, Fume Hood Station Two, and Related Equipment



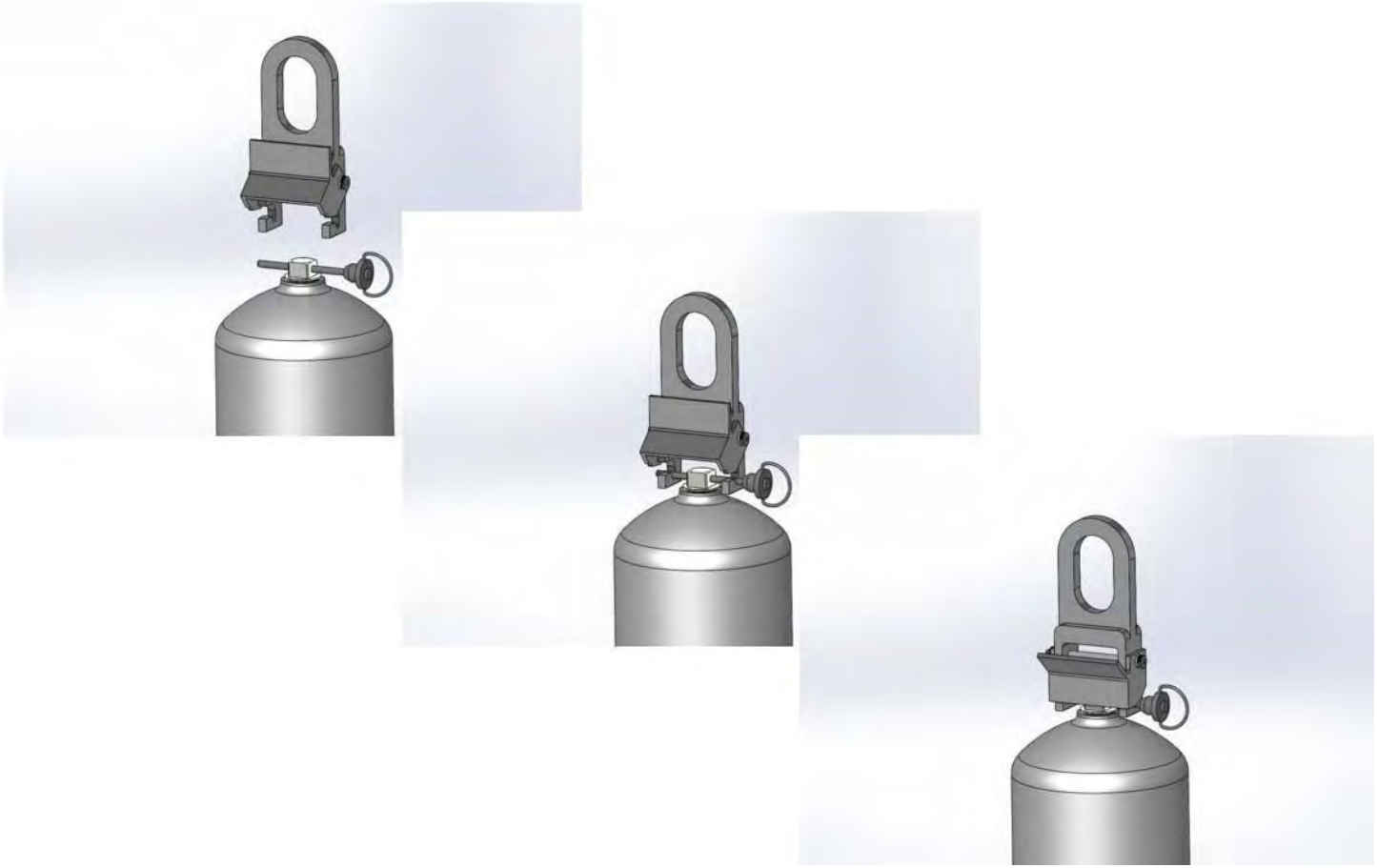
This drawing shows the Conveyer Table, Fume Hood Stations 1 and 2, and equipment located in the fume hoods. The four flask trays shown are the maximum number of trays that can be under the controlled environment of the hoods. Note in this arrangement the “F” designation for the trays means they contain flasks full of mercury.

ATTACHMENT 5.2a Flask Lifting Fixture



This figure shows a flask lifting fixture that requires the hole in the lifting shell to be aligned with the hole in the flask stopper prior to secure insertion of the lifting pin.

ATTACHMENT 5.2b Flask Lifting Fixture



This figure shows a flask lifting fixture that attaches securely to the lifting pin after the lifting pin is inserted through the hole in the flask stopper.

ATTACHMENT 5.3 Digital Scale – PDS-1000, 1000 Pound Capacity Drum Scale

PDS-1000 Drum Scale

[Home] [Up]

A and A Scales LLC

Phone 800-481-4114 or 973-800-3965

Open 7 days a week

No sales tax for customers outside New Jersey

We will not be undersold!

E-MAIL

PDS-1000 Drum Scale

1000 lb x 0.5 lb

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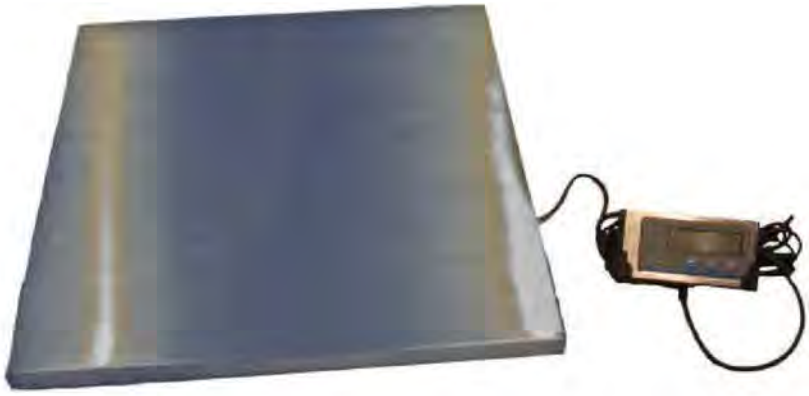
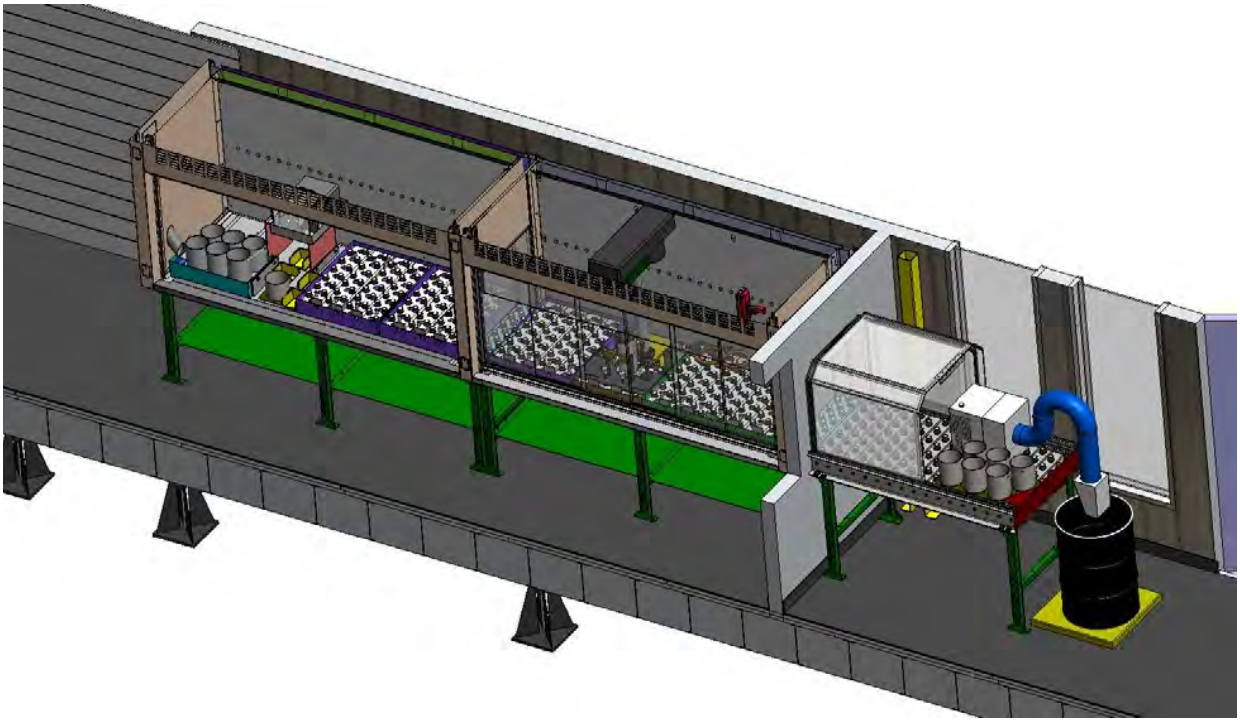
Buy

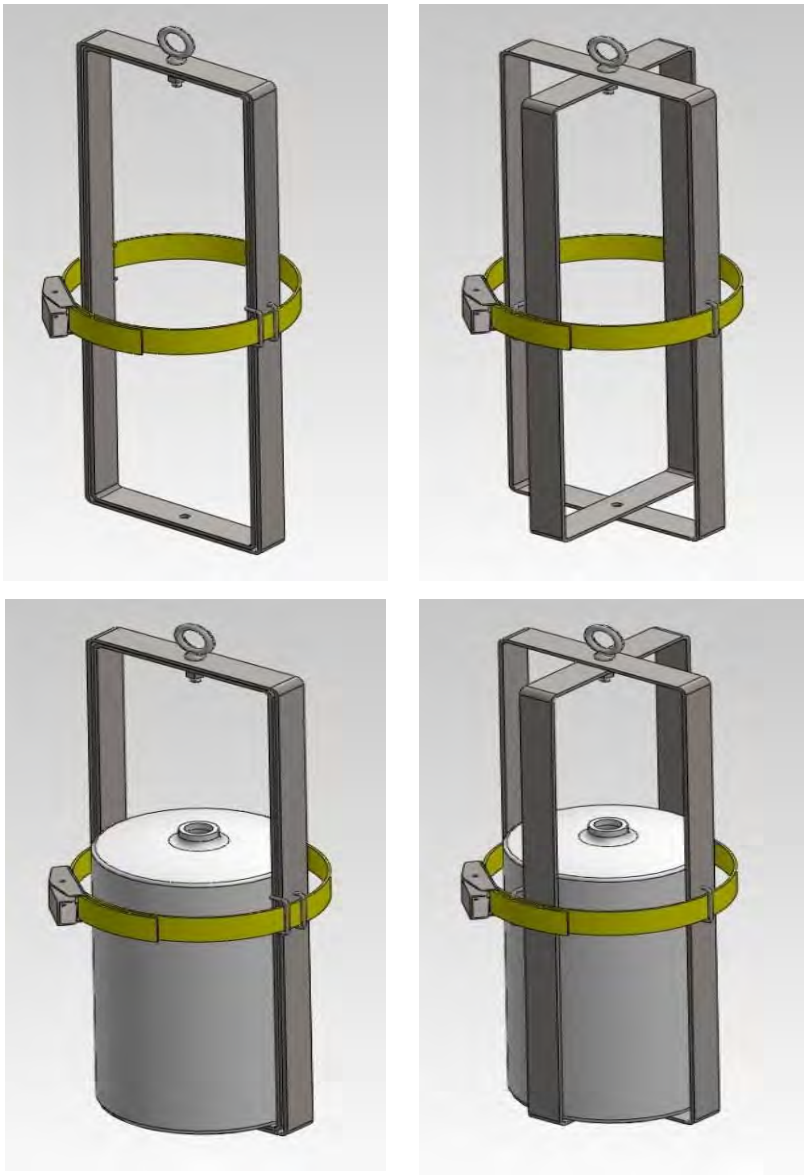


* 24" x 24" - 1000 lb capacity platform
* Stainless Steel cover, painted steel substructure
* Digital Display is battery / Electric powered
* Low profile scale platform
* Easy to read LCD display
* Digital Display comes standard with wall mounting bracket
* 15 ft cable from platform to display

ATTACHMENT 5.4 Airfiltronix® portable snorkel mounted on the conveyor table and positioned to remove mercury vapor from a drum



ATTACHMENT 5.5 Flask foot fixture



The flask foot fixture allows a worker to safely remove from a drum a flask that has a damaged flask plug or a flask plug without a cross-drilled hole. This fixture is used after as many flasks as possible have been removed using a lift fixture shown in Attachment 2a or 2b.

ATTACHMENT 5.6. Drum lift fixture

6 - FUME HOOD 1 – MERCURY ACCESS

Title: Fume Hood 1 – Mercury Access **Doc. No.** MMTS-6-Rev5

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date: 2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

Rev. No.	Change description	Author
5	Annual Review- Updated signatory authority to current signatures. Added Revision number to document number.	Rob Mathias
4	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
2	Reformatted and replaced verbiage in the second bullet under §6.3.2.	Burton Packard and Renee Rodriguez
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
Procedure MMTS-7	Fume Hood 2 – Mercury Transfer
Procedure MMTS-10	Waste Management
Procedure MMTS-20	Mercury Medical Surveillance

6.1 PURPOSE

This procedure describes the steps and procedures that deal with flask handling, including flask plug removal and drilling operations (if required) under the fume hood.

6.2 SCOPE

This procedure covers preparing flasks for transferring mercury, i.e., the removal of plugs and drilling flasks if required.

NOTE*: Flask handling activities that relate to transferring mercury under the fume hood are covered in Procedure MMTS-7, "Fume Hood 2 – Mercury Transfer."*

6.3 OPERATIONS

NOTE*: This procedure should be followed in concert with procedures MMTS-10, "Waste Management") and MMTS-7, "Fume Hood 2 – Mercury Transfer."*

The six-pack trays containing flasks are moved into Fume Hood 1, where the flask plugs are loosened using the overhead electric impact wrench. A flask with plug that cannot be removed must have a hole drilled into it using the drill press in Fume Hood 1.

NOTE*: Flask handling operations in Fume Hood 2 that deal specifically with mercury transfers and flask disposal are covered in MMTS-9, "Fume Hood 2 – Mercury Transfer."*

6.3.1 Required Equipment and Supplies (PPE as specified on page XI of the Executive Summary under General Safety and Health)

The following equipment is needed by those performing work in Fume Hood 1:

- Flask clamp
- Mill cutter (9/16" diam.) and flask holding fixture

NOTE: *The recommended mill cutter is Kwik Cut C/T Hole Saw, UZ® Engineered Products, Part No. 121937.*

- Drill bit stop (9/16" diam.)

NOTE*: The drill stop may be needed if a cutting tool other than the Kwik Cut C/T Hole Saw is used; otherwise it is not required.* ☐ Foil tape – sticky on one side

- Magnetic rod (to collect drill chips)

6.3.2 System Startup and Shutdown

- Startup
  - Prior to beginning operations, the Facility Manager (or designee) starts the ventilation system by following the steps given in §25.3.1. Following ventilation system startup, the Facility Manager (or designee) examines the face velocity (low meters on the fume hoods to verify that the face velocity is > 100 ft/min and switches the flow meter silence switches from silence to alarm. The face velocity flow meters on each fume hood automatically alarm at less than 100 ft/min.

  - Prior to daily operation, the operators will inspect the equipment for damage and check fume hood airflow.

For periods when the fume hood will be left unattended, the operator closes all fume hood doors, including both side doors.

At the conclusion of daily operations

- The operator checks for any equipment operation issues and inspects equipment for mercury contamination/sludge, reporting results to the Facility Manager.
- Operator checks that fume hood doors are completely closed, including both side doors.
- The operator cleans up any waste materials, including gauze, cheesecloth or equivalent and tape, and packages those materials in a slider zip polyethylene bag along with any contaminated cleaning supplies, and moves that (those) bag(s) in an empty tray back through the fume hood door and the conveyor system to the hazardous waste drum in the pallet/drum handling area.

6.3.3 Plug Loosening

- The Flask Handling Area worker moves six-pack trays into the first of two fume hoods, Fume Hood 1 (see Section 8.10, Attachment 1). The trays are positioned so that flask plugs can be removed using the impact wrench (see Section 6.4, Attachment 6.2). The worker engages at least two tray “down-locks” so that the tray cannot move on the roller conveyer table and then installs a flask clamp (see Section 6.4, Attachment 6.3) to prevent flask rotation.
- The operator wraps the neck of the flask with gauze cloth, cheesecloth or equivalent to avoid “flying” plugs and to collect any mercury droplets that may be present.
- The worker engages the overhead impact wrench and loosens the plug. The plug remains in the flask finger tight.

After all flasks in a six-pack tray have had their plugs loosened, the Flask Handling Area worker disengages the flask clamp and flask tray down-locks and moves the tray to the next open location toward Fume Hood 2 (into Fume Hood 2 if possible).

6.3.4 Off Normal Event – Flask Drilling

- Flasks with plugs that cannot be loosened using the impact wrench require a 9/16-inch drilled hole in the shoulder area of the flask to permit mercury to be siphoned from the flask. The problem flask is removed from the six-pack tray using the overhead electric hoist, and placed in the adjustable flask holding fixture (see Section 6.4, Attachment 6.4) that positions the flask shoulder perpendicular to the drill bit, and rigidly holds the flask. After removing the problem flask, the six-pack tray is moved to the next work position (into Fume Hood 2 if possible).
- The Flask Handling Area worker applies foil tape around the top of the flask to retain chips (see Section 6.4, Attachment 6.5); locks the flask in a position perpendicular to the drill axis, locks the flask holding fixture into position, and proceeds to drill into the flask, just through the shoulder. Before drilling, a 9/16-inch drill stop set to 1 inch should be installed on the mill cutter bit to prevent it from extending down into liquid mercury (see note about the drill stop in Section 6.3.1). After drilling is completed, the flask (still mounted in the drilling fixture) is moved to Fume Hood 2 for mercury transfer.
- After the hole is drilled, the worker carefully removes the foil tape and loose chips. The worker also collects loose drilling chips with a magnetic rod.
- Using gauze pads, cheesecloth or equivalent the worker wipes up the remaining chips; wipes the drill bit and the rod; and places used gauze, metal tape and chips into the hazardous waste accumulation bag for transfer to the hazardous waste drum at the end of the workday.
- Stores the magnetic rod in its storage container within the fume hood.

6.4 ATTACHMENTS

General Arrangement of Work Stations (Attachment 6.1)

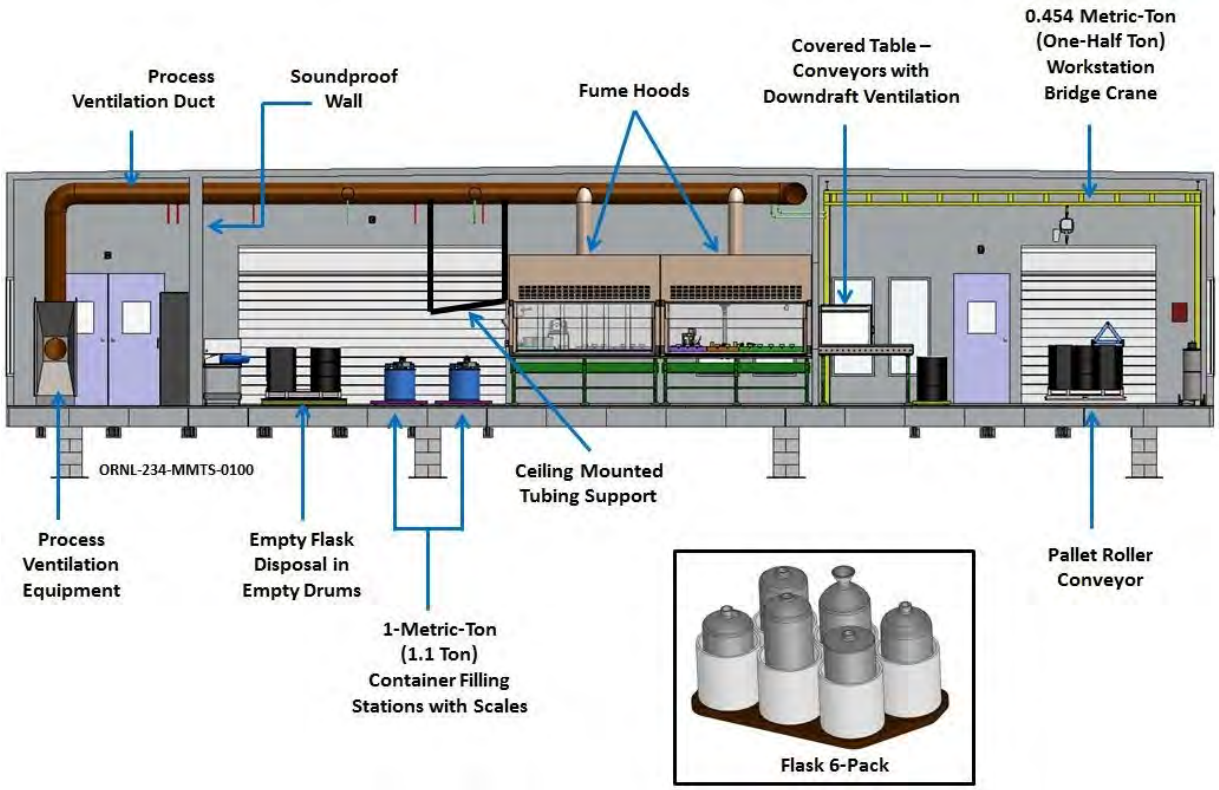
Fume Hood 1 (Attachment 6.2)

Flask Clamp for Trays (Attachment 6.3)

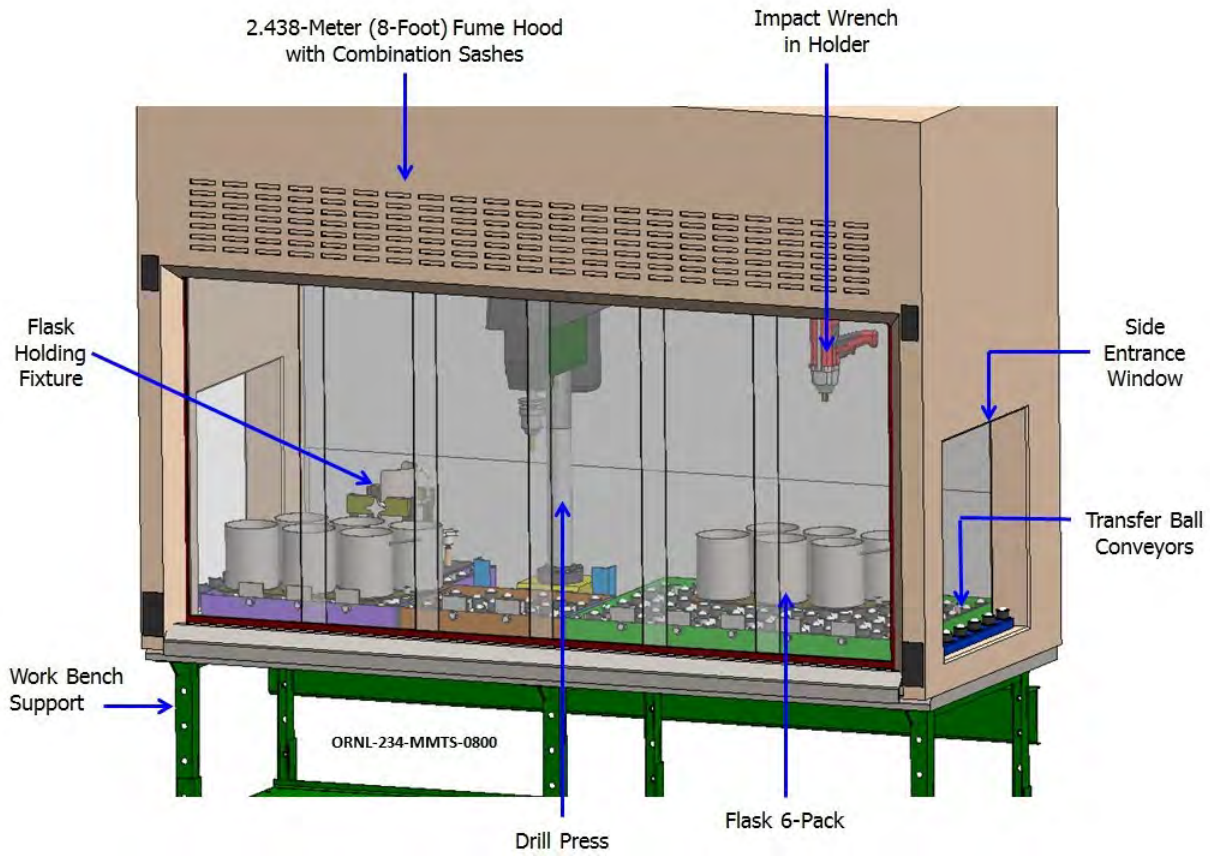
Flask Holding Fixture for Drilling (Attachment 6.4)

Photo of a Flask with Foil Tape (Attachment 6.5)

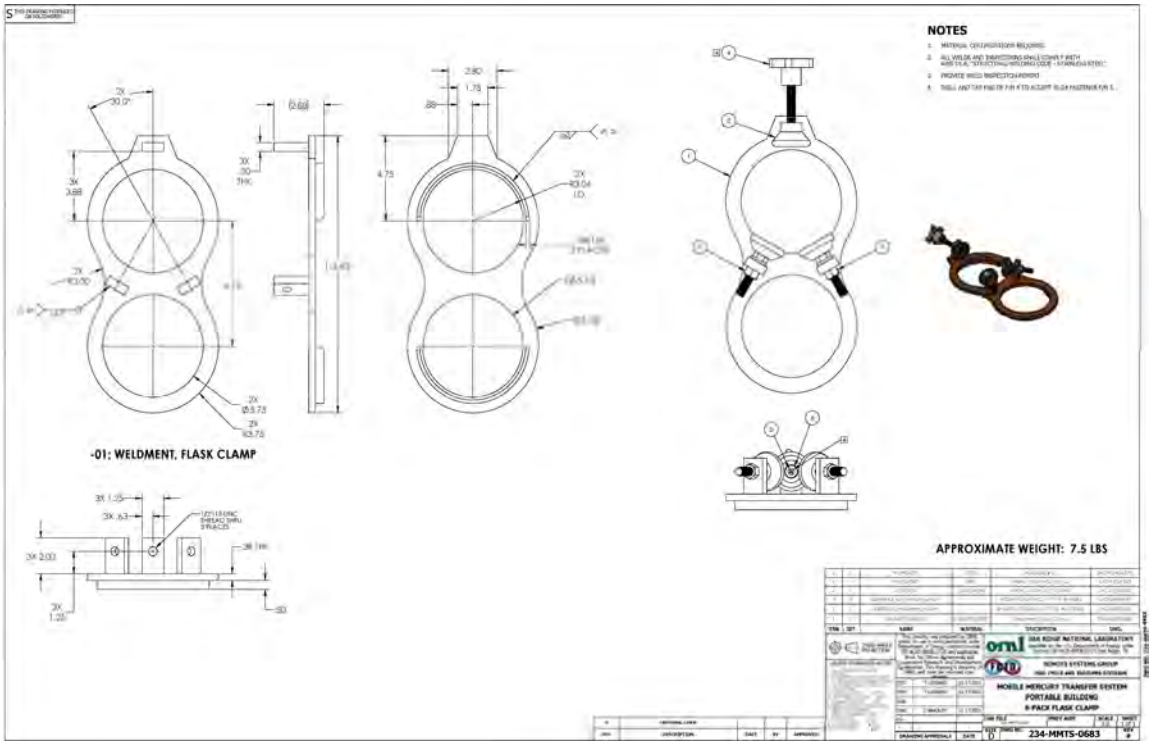
ATTACHMENT 6.1. General Arrangement of Work Stations



ATTACHMENT 6.2. Fume Hood 1

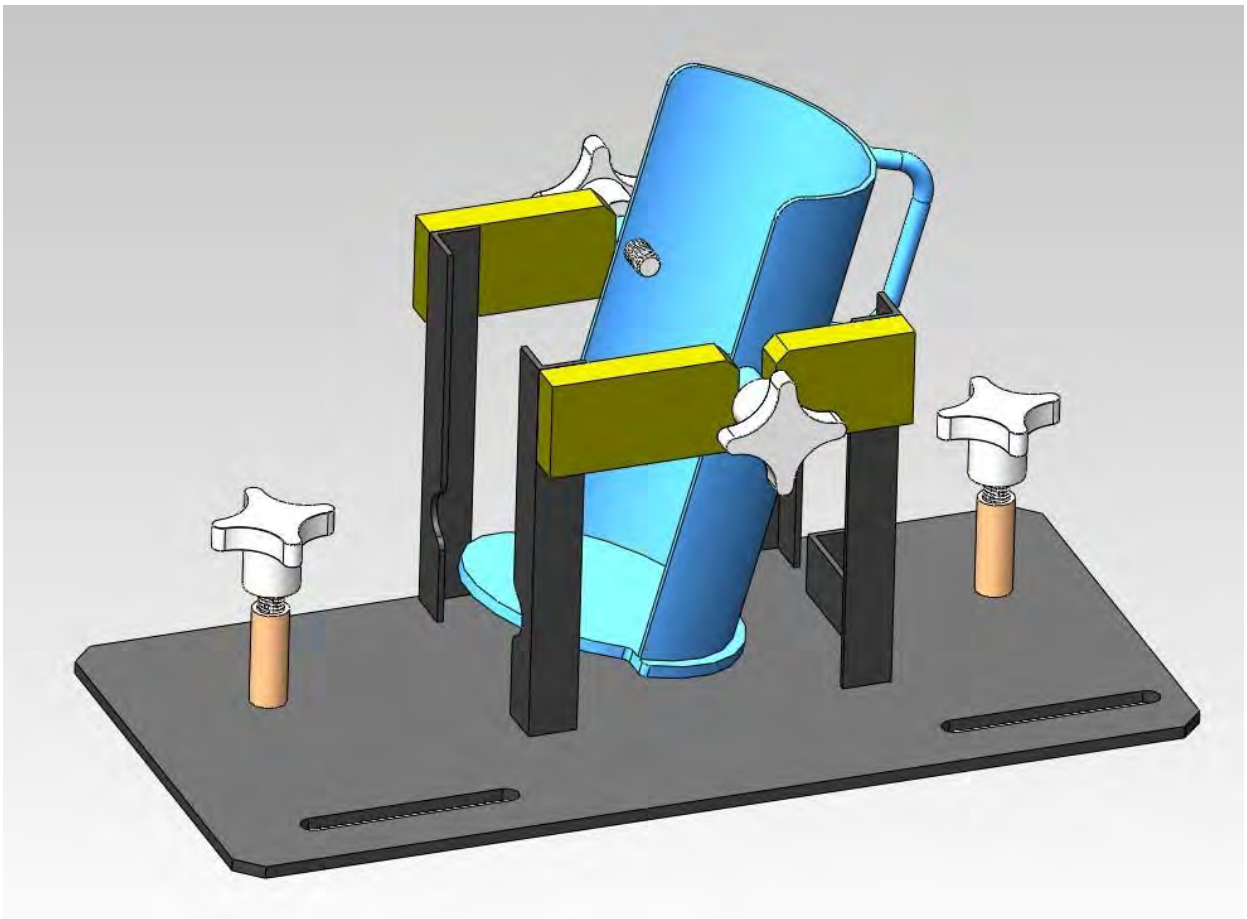


ATTACHMENT 6.3. Flask Clamp for Tray



When the impact wrench is used for plug loosening, the clamping collar is employed to firmly hold flasks in their respective trays.

ATTACHMENT 6.4. Flask Holding Fixture for Drilling



While firmly holding the flask, the flask holding fixture adjusts the position of a flask for perpendicular drilling using the drill press.

ATTACHMENT 6.5. Photo of a Flask with Foil Tape

A collar of aluminum foil tape, sticky on one side, placed around a flask before drilling captures most of the drilling chips.

7 - FUME HOOD 2 – MERCURY TRANSFER

Title: Hood 2 – Mercury Transfer **Doc. No.** MMTS-7-Rev4

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

Rev. No.	Change description	Author
4	Annual Review- Updated signatory authority to current signatures. Added Revision number to document number.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
2	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
Procedure MMTS-2	Metric Ton Container Set Up
Procedure MMTS-6	Fume Hood 1 – Mercury Access
Procedure MMTS-12	Emergency Response and Spill Cleanup

Procedure MMTS-15	Inspection, Testing and Maintenance
Procedure MMTS-20	Mercury Medical Surveillance

7.1 PURPOSE

This procedure describes operations under Fume Hood 2 for pumping mercury from 76-lb flasks into MT containers.

***NOTE**: Other flask handling operations under a fume hood that interface with Mercury Transfer Operations are covered in Procedure MMTS-6, "Fume Hood 1 – Mercury Access."*

7.2 SCOPE

This procedure covers Fume Hood 2 activities for the worker in the Flask Handling Area. These activities include:

- Set up and operation of the peristaltic pump.
- Inserting and removing the stainless steel siphon tube into and out of 76-lb storage flasks.
- Using the Adjustable Flask Holding Fixture, if needed, to minimize mercury retained in a flask
- Placing emptied flasks, inverted, into the shaker tray.
- Siphoning mercury that was collected in the shaker tray.
- Plugging, bagging, and placing emptied flasks into the nonhazardous waste drum.

7.3 FLOWCHARTS

Section 9.10, Attachment 1 shows work locations in the fume hood, related equipment and movement of conveyer trays.

7.4 OPERATIONS

7.4.1 Required Equipment and Supplies (PPE as specified on page XI of the Executive Summary under General Safety and Health)

The workers need the following supplies for operations described in this procedure:

- Rubber plugs (to substitute for a steel plug that cannot be inserted into a flask)
- Tube clamps
- Hand-held mirror

7.4.2 System Startup

At the start of the workday, the Flask Handling Area worker shall:

- Follow the startup instructions in Section 6.3.2.
- Verify that there are sufficient trays with filled flasks available to begin operations.
- Visually inspect the work area within the fume hood, and ensure that the flexible tubing connections inside and outside the fume hood, and at the quick disconnect (QD) transfer fitting are snug and leak free.
- Verify that the QD transfer fitting is properly connected to a metric ton (MT) container.
- Verify that non-hazardous waste drums are available for accumulation of emptied flasks.
- Verify that a hazardous waste drum is available (in the Drum Handling Area) for disposing of personal protective equipment.
- Place the flexible tubing into the pump head at a location approximately 2-inches away from the markings made the previous workday; with operating experience, a different daily offset may be determined. Test the operation of the peristaltic pump.
- Ensure that PCDAS and MMS-16 are functioning correctly. If not, consult the operating manuals.
- Remove loosened plugs from a tray of flasks if that task has not already been done. Place the plugs in the available container where they are ready to be replaced into the flasks.
- Power on the peristaltic pump using the switch at the left-side rear of the pump.

***NOTE**: The Facility Manager shall be notified if any of the above checks are not satisfactorily met, and cannot be corrected by the worker.*

7.4.3 Mercury Transfer Operations

The Flask Handling Area worker shall:

- Using a clipboard and pen, record the initial weight for the MT container into which mercury is to be pumped.

***NOTE**: If no mercury has been pumped into the MT container, the scale should read zero. Procedure MMTS-2, "Metric Ton Container Set Up," directs the worker to zero out the tare weight of the container.*

***NOTE:** If the scale reading goes to zero without operator interaction while the MT container is on the scale, have the forklift operator lift the MT container off the scale ½-1inch. While the MT container is elevated, re-zero the scale (Make no changes to PCDAS). Have the MT container returned gently to the scale. Record the weight using the clipboard and pen. Also record the time of the interruption and what was occurring immediately prior to the scale reading going to zero. When requested, give the record to the Facility Manager.*

- Move one or more six-pack trays into Fume Hood 2 (refer to Section 7.6, Attachment 7.1) and lock the tray using the down-lock fittings.
- Enter information for this MT container, pallet, drum, and flask six pack tray into the FILLING INFORMATION screen of the wireless handheld data input unit (see

description in Section 13.5, pages 13-7,13-11 and 13-12). This action should be performed by an operator who is working outside Fume Hood 2 and is wearing a clean pair of gloves.

NOTE*: The six-pack tray is called a carrier in the description in Section 13.5.*

- The Facility Manager enters the originating warehouse information on the FILLING INFORMATION screen using either the PCDAS computer or a wireless handheld data input unit.
- Remove the loosened plugs from a tray of flasks; place the plugs in the available storage container where they will be ready for reinstallation into the flasks before disposal.
- Insert the stainless steel siphon tube into the bottom of flask no. 1, holding the siphon tube with a gauze wipe wrapped around the neck of the flask.
- Activate the pump using the foot-operated switch.

NOTE: After suction has been "lost" and mercury is no longer being siphoned, the operator is expected typically to consider the flask to be "empty." If the operator has reason to believe that the mercury dregs in the flask may not be minimized, the Adjustable Flask Holding Fixture may be used to assist with achieving an "empty" flask (see the following steps for using the Adjustable Flask Holding Fixture).

- Using the Adjustable Flask Holding Fixture
- Move the currently used six-pack tray to the back of Fume Hood 2
- Position and lock the Adjustable Flask Holding Fixture at the location vacated by the six-pack tray
- Using caution to ensure the siphon tube remains in the flask, move the flask from the six-pack tray to the Adjustable Flask Holding Fixture
- Adjust the Adjustable Flask Holding Fixture to maximize access to the mercury.
- Activate the pump using the foot-operated switch.
- After suction has been "lost" and mercury is no longer being siphoned, the operator is to consider the flask to be "empty." The operator follows the directions for removing the siphon tube.
- After placing the "empty" flask in the vibration tray, the positions of the Adjustable Flask Holding Fixture and the six-pack tray are swapped and normal operations are resumed.

Continue pumping while the siphon tube is removed slowly from the flask. Pull the siphon tube through the gauze wipe to capture small beads of mercury adhered to the siphon tube. As the tube is raised, the mercury in the flexible tubing loop will pass through the pump rollers thereby minimizing the amount of mercury that would fall back into the flask. Move

the siphon tube into flask no. 2 with the gauze held over the siphon tube end and repeat the pumping process. Repeat until all flasks have been emptied. Turn off the pump after the mercury in the tube loop has passed through the pump head. Place the gauze wipe into a sealable polyethylene bag and into the small hazardous waste accumulation receptacle within the fume hood. The bag is to be disposed of as hazardous waste at the end of each day.

NOTE*: Each "emptied" flask may contain up to 10 ml of mercury, most of which is expected to be collected at the shaker tray.*

- Using a clipboard and pen, record the scale weight (ending weight) after the mercury in all the flasks in the flask six pack tray has been transferred. Compare the difference between the ending weight and the beginning weight with the table of acceptable weights and weight differences. Move the siphon tube into the next flask with the gauze, cheesecloth or equivalent held over the siphon tube end.

NOTE*: The typical weight difference will be 456 lbs. (6 flasks at 76 lbs. of mercury per flask). The final tray will contain only five flasks (29 flasks per MT container). The typical weight difference for the final tray will be 380 lb. (5 flasks at 76 lbs. of mercury per flask). If at any time the weight difference is not within 6 lbs. of the typical value (within 5 lbs. for the final tray that only contains 5 flasks), notify the Facility Manager. Do not proceed without the approval of the Facility Manager.*

- The worker who is operating the shaker tray should wear hearing protection. With care, manually invert the six (6) emptied flasks into the shaker tray. (See Section 7.6, Attachment 7.1, for a diagram of the work positions and other pertinent equipment arrangements). Activate the shaker tray and vibrate the emptied flasks while the next tray is being emptied of mercury; 30-60 seconds of shaking will be is sufficient.
- Release the down-lock fittings of the now empty six-pack tray and move that tray to an open space under the fume hood and move the next six-pack tray of flasks containing mercury to the pumping station.

7.4.4 Dispose of Emptied Flasks

After the emptied flasks have been inverted and "shaken" under the fume hood to remove small quantities of remaining mercury a Flask Handling Area worker removes each flask one at a time from the shaker tray and

- Reinstalls an appropriately sized steel plug to contain residual vapors.

NOTE*: Two workers are required for bagging and disposing of empty flasks.*

- A worker with clean gloves places a 3-mil re-closable slider zip polyethylene bag, 18-in. wide × 20-in. tall into the "single flask" bagging station so that placing the flask into the bag, and sealing the bag is simplified.
- A different worker (the one who has removed the flask from the shaker tray and reinstalled a steel plug) places each flask into the re-closable slider zip polyethylene bag. This worker is wearing gloves that may have contacted micro droplets of mercury.

- The worker with clean gloves closes the bag, seals it, carries the bagged flask to the 30gallon non-hazardous waste drum and places it in the drum.

***NOTE**: With assistance of MMTS supervisor, a Flask Handling Area worker arranges for a pallet of empty waste drums when needed.*

7.4.5 Resume Mercury Transfers

- Before resuming mercury transfers from the next tray, inspect the shaker tray for an accumulation of mercury/crud using a hand held mirror. Siphon the accumulated material if necessary.
- Move the next six-pack tray of full flasks to the pumping station and repeat the transfer process for the second tray. Operator with clean gloves updates drum and six-pack tray data in the wireless handheld data input unit.
- After flasks from the second tray are placed in the shaker tray, position both empty trays so that they can be moved out of the fume hood and bring in two (2) full trays for mercury transfer.
- Following the actions in Sections 7.4.4 and 7.4.5, repeat the entire mercury transfer and flask disposal process until the MT container is filled with the contents of 29 flasks.

***NOTE**: Prior to leaving the MMTS for work breaks and lunch, ensure that the ventilation system is operating, the peristaltic pump is turned off, compression on the flexible tubing is released from the peristaltic pump head, loops in the flexible tubing are emptied of mercury, the doors to the fume hoods are closed and operating snorkels left in use for venting are positioned to not pose safety hazards to returning workers.*

***NOTE**: Before all breaks, including lunch, and at the end of each workday, the Flask Handling Area operator transferring mercury ensures that there is no mercury in the tubing loops, turns off the peristaltic pump power switch located at the left-side rear of the motor controller, and opens the pump head to release the roller compression on the flexible tubing.*

Shutdown operations at the close of each workday are specified for the Drum Handling Room in Procedure §§6.3.2 and 7.4.9 and for the Flask Handling Room in Procedure §§2.3.3, 4.3.6 and 5.3.4.
***NOTE**: If the "high mercury vapor alarm" is set off while pumping operations are under way, the worker shall immediately shut down the pump operation, close the fume hood, and await instructions from the Facility Manager. Pumping may resume upon direction by the Facility Manager.*

***NOTE**: Additional snorkel venting is available using the cart-mounted portable snorkel (Airfiltronix® or equivalent) that contains replaceable sulfur-impregnated charcoal filters.*

7.4.6 Off Normal Event – Burst Flexible Tubing

If the flexible tubing should burst (a very unlikely event), the Flask Handling Area worker

- Immediately shuts off the peristaltic pump.

- Closes the fume hood sash.
- Notifies the Facility Manager
- Follows the instructions in Procedure MMTS-14, “Emergency Response and Spill Cleanup.”
- After the cleanup activities, follows the instructions in MMTS-15, “Inspection, Testing and Maintenance” for replacing the flexible tubing and disposing of the burst tubing as hazardous waste.

7.4.7 Off Normal Event – Clogged Flexible Tubing

If the Tygon® becomes clogged (a very unlikely event), the Flask Handling Area worker

- Immediately shuts off the peristaltic pump.
- Closes the fume hood sash.
- Notifies the Facility Manager
- Follows the instructions in MMTS-15, “Inspection, Testing and Maintenance” for replacing the flexible tubing and disposing of the clogged tubing as hazardous waste.

7.4.8 Off Normal Event – Pump Damaged

- If the peristaltic pump breaks and damages the flexible tubing such that there is a breach, the Flask Handling Area worker:
    - Immediately shuts off the peristaltic pump.
    - Close the fume hood sash.
    - Notifies the Facility Manager
    - Follows the instructions in Procedure MMTS-12, “Emergency Response and Spill Cleanup.”
    - After the cleanup activities, follows the instructions in MMTS-15, “Inspection, Testing and Maintenance” for replacing the flexible tubing.
    - Installs spare pump and tubing to resume operation.
- If the peristaltic pump should break such that it does not damage the flexible tubing, the Flask Handling Area worker:
    - Immediately shuts off the peristaltic pump.
    - Notifies the Facility Manager
    - Installs spare pump to resume operations.
    - Disposes of the pump and parts by packaging in a large zip lock or twist tie polyethylene bag. Sends the waste back through the Fume Hood 2 door to Fume Hood 1, and then to the conveyor table for placement in the hazardous waste drum.

7.4.9 System Shutdown

- At the conclusion of workday operations, the Flask Handling Area worker (operator) checks for any equipment operations issues and inspects equipment for mercury contamination/sludge, reporting results to the Supervisor.
- For final shutdown for the day, the operator:
    - Places the siphon tube into the collection port on the shaker tray to siphon mercury that has been collected from “emptied” flasks.
    - Verifies that the peristaltic pump is turned off after pumping operations are completed using the power switch located at the left-side rear of the peristaltic pump motor-controller, and that the siphon tube is secured upside down in its storage position.
    - Marks both ends of the flexible tubing, where the tube exits the pump head, with a permanent marker and opens the pump head. (At the start of the next workday the operator places the tube into the pump head at a location approximately 1-inch away from the markings.)
    - Cleans up any residual sludge in the shaker tray, packages it in a slider zip polyethylene bag along with any contaminated cleaning supplies and PPE (all the hazardous waste accumulated during the workday), and moves that bag in an empty tray back through Fume Hood 2, Fume Hood 1, and the conveyor table to the hazardous waste drum in the pallet/drum handling area.
    - Verifies that the quick disconnect fitting remains properly installed in a MT container or is securely placed into its storage holder at the end wall of Fume Hood 2 (for location of the storage holder see Section 7.6, Attachment 7.2).
- All fume hood doors should be closed prior to leaving the fume hood unattended.

7.5 RECORDS

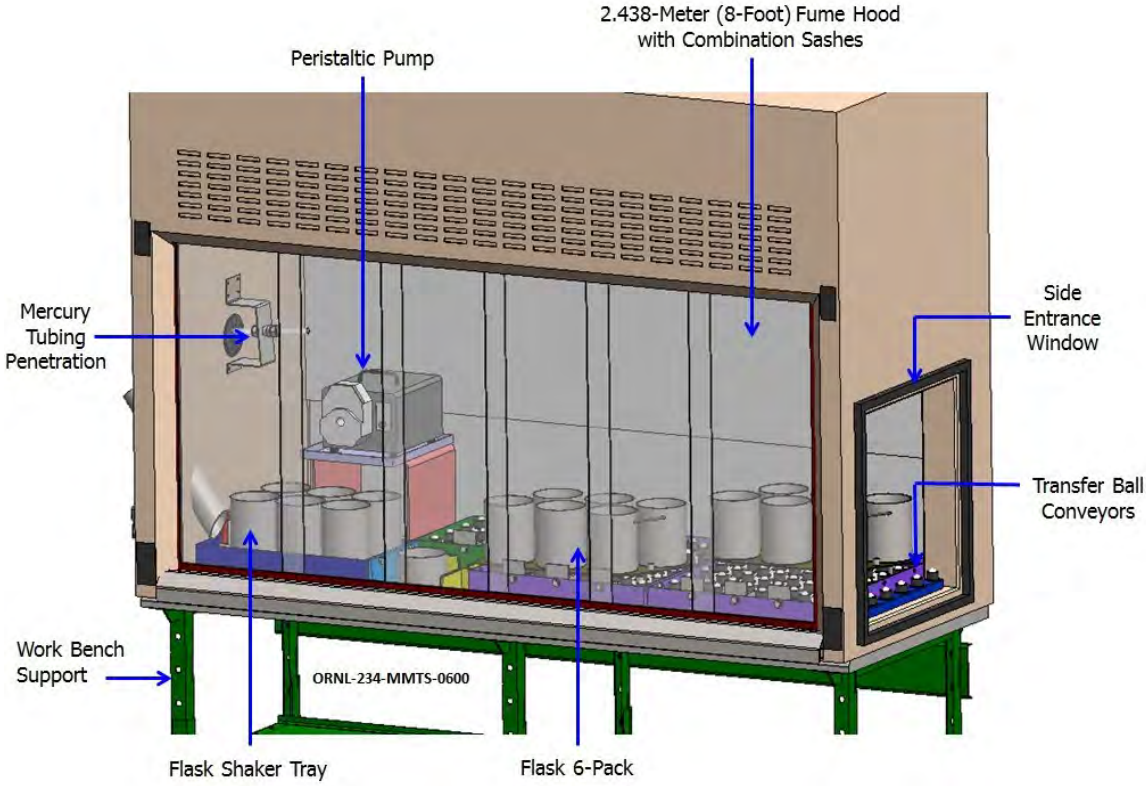
- Database entry for the number of flasks emptied during a workday.
- Operating log of equipment problems and resolution.
- Up-to-date inventory tracking spreadsheets showing all mercury moves from the beginning to the end of the workday. Daily tracking spreadsheet information should include the original warehouse, pallet and drum numbers associated with the mercury pumped into each MT container.

7.6 ATTACHMENTS

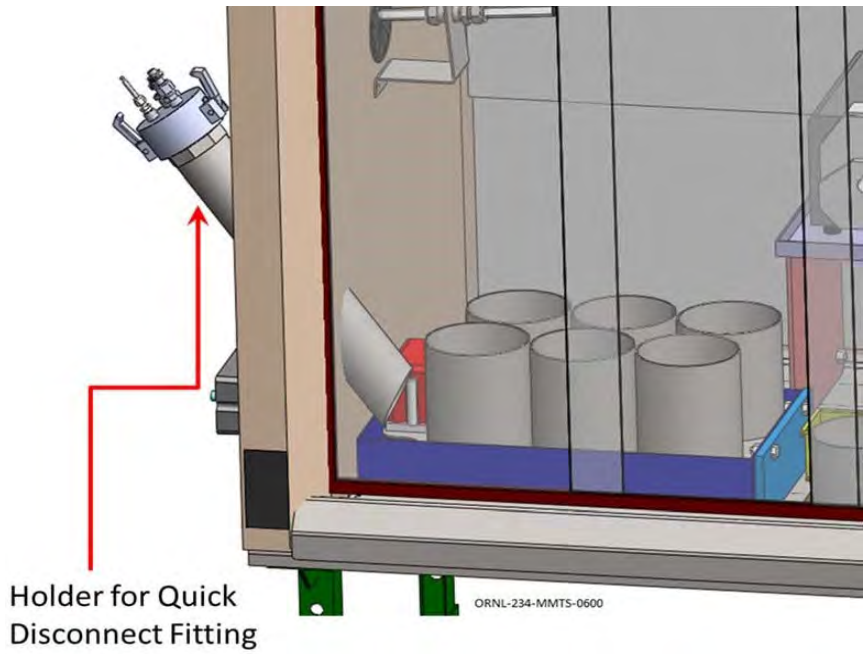
Ball Conveyer Table and Fume Hood Work Stations (Attachment 7.1)

Storage of the Quick Disconnect Transfer Fitting (Attachment 7.2)

ATTACHMENT 7.1 Fume Hood 2



ATTACHMENT 7.2 Storage of the Quick Disconnect Transfer Fitting



8 - METRIC TON CONTAINER UNHOOK AND CLOSE

Title: Metric Ton Container Unhook and Close **Doc. No.** MMTS-8-Rev5

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date:2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date:2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

Rev. No.	Change description	Author
5	Annual Review- Updated signatory authority to current signatures. Added Revision number to document number.	Rob Mathias
4	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
2	Replaced image of Attachment 8.1 to image MPX90.docx file.	Burton Packard and Renee Rodriguez
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title

8.1 PURPOSE

This procedure describes the activities and requirements that deal with:

- Removal of the QD fitting (see Section 8.5, Attachment 8.2) from the MT container
- Preparation of the MT container for storage
- Create a record of the filled MT container information in the inventory database system

8.2 SCOPE

This procedure covers the following activities:

- Removing the QD fitting from the MT container
- Closing the MT container
- Preparing and affixing the identification tag
- Recording MT container information in the inventory database system

***NOTE**: Care must be exercised to ensure that all mercury transfer hardware is out of the pathway before MT container removal from the MMTS.*

8.3 OPERATIONS

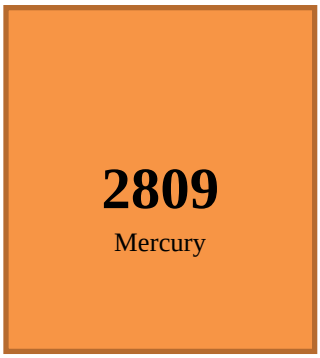
The QD transfer fitting (see Section 8.5, Attachment 8.2) will be removed from the half-coupling of the MT container that has been filled.

***NOTE:** Peristaltic pumping operations (i.e., transferring mercury) are **never** permitted while MT containers are undergoing closure operations or being removed from the MMTS.*

8.3.1 Required Equipment and Supplies (PPE as specified on page XI of the Executive Summary under General Safety and Health)

Workers need the following supplies and equipment to accomplish the tasks detailed in this procedure:

- Torque wrench for installing the 3-inch NPT plug
- Yellow Teflon® tape to wrap, or rewrap the 3-inch container plugs
- U.S. DOT labels/markings shown below.



8.3.2 Removal of the Transfer Fitting

- Upon completion of transferring mercury from 29 flasks, the Flask Handling Area worker ceases operations with the peristaltic pump and renders the pump in a safe shut-off mode.
- Following safe shut off, the worker does the following:
    - Removes mercury that remains in the looped sections of the transfer tubing by lifting the loops and draining them by gravity. The upstream tubing is drained into the flask; the downstream tubing is drained into the MT container. After the gravity drain is completed, the pump rollers may be released (opened).
    - Disengages the QD clamps of the upper portion of the transfer fitting (see Section 8.5, Attachment 8.2). The fitting is slowly withdrawn while "wiping" the fill tube with a gauze pad to ensure that any small beads of mercury adhering to the tube are captured as the tube is extracted. While holding the gauze at the bottom (the open end) of the fill tube, the fitting is then placed into the adjacent container which has already been fitted with a second threaded portion of a transfer fitting.

NOTE: *In addition to the available overhead snorkel hoses which are placed in the vicinity of these tasks, the cart-mounted Airfiltronix® snorkel may be used for additional air filtration.*

- Used gauze pads will be placed in a hazardous waste accumulation container in Fume Hood 2. At the end of the day the container contents will be bagged and placed into the hazardous waste drum located in the Pallet/Drum Handling Area. The worker shall manage used (mercury contaminated) gauze as hazardous waste (refer to Procedure MMTS-10, "Waste Management").

NOTE*: If an adjacent empty MT container is not available (i.e., both containers have been filled), the upper portion of the fitting will be placed into its storage port (see Section 8.5, Attachment 8.3) where it remains until needed for additional mercury transfers. The storage port has a removable cap that remains in place when the transfer fitting is not being stored.*

8.3.3 MT Container Weighing and Removal

The Flask Handling Area worker performs the following actions:

- Removes the threaded portion of the QD transfer fitting (QD bottom) from the MT container that has been filled and places the QD bottom in its storage in Fume Hood 2 until it is needed for filling the next MT container.
- If any mercury is observed on the collar or on the threaded portion, refers to Procedure MMTS-12, "Emergency Response and Spill Clean Up" for techniques to clean the collar. Informs the Facility Manager of the need to clean the collar or the threaded portion.
- Inspects the drip pan on the MT container and the gauze for evidence of mercury droplets. If none, places the pan on the adjacent container; if droplets are observed, informs the Facility Manager of the need to clean the pan.

- Installs the 3-in. NPT plug into the MT container half-coupling according to NPT plug specifications.

***NOTE*:** The plug threads were previously wrapped with 3 wraps of yellow Teflon® tape.

***NOTE**: Screw the NPT plug into the MT container, hand tight, while the container is still on the scale. After the forklift has raised the container several inches above the scale, use a torque wrench set to 60 ft.-lbs. to achieve final plug tightness. Do not apply the torque wrench while the container is on the scale. While the MT container is elevate, re-zero the scale (Make no changes to PCDAS). After the forklift returns the MT container to the scale, record the final weight.*

***NOTE**: After each filled MT container is removed from the scale, check the scale calibration using the 2500 lb. test weight.*

- Using a wireless handheld data input unit, completes the final entries on the FILLING INFORMATION screen (see description in Section 13.5 on pages 13-7, 13-11 and 13-12), engraves the stainless steel tag using the tag engraving machine (see Section 8.5, Attachment 8.1) with the tare, net and gross weights and date of final fill (information needed is on the FILLING INFORMATION screen), and affixes the stamped tag to the container.

- Applies the "Corrosive" label to the MT container along with appropriate U.S. Department of Transportation (DOT) markings, "UN2809 Mercury 8 PG III," before the container is removed from the MMTS.

The Facility Manager performs the following actions:

- Verifies that the serial number, tare, net and gross weights have been entered into the PCDAS. Verifies that the stainless steel tag has been properly engraved, including the serial number, date filled and tare, net and gross weights, and installed on the MT container. Verifies that the container has proper labels adhered.
- Updates the inventory tracking spreadsheets showing all pertinent information for the filled MT container: serial number and tare, net and gross weights. Update should include the original warehouse, pallet and drum numbers associated with the mercury in the MT container.
- Notifies the forklift operator to move out the filled container and move in an empty MT container.

The Flask Handling Area worker performs the following actions:

- After the Facility Manager's verification is complete, opens the roll-up door sufficiently to remove a MT container.

- After the forklift operator has raised the container several inches above the scale, uses a torque wrench set to 60 ft-lbs to achieve final plug tightness.

***NOTE**: Do not apply the torque wrench while the container is on the scale.*

The Fork Lift Operator performs the following actions:

- In cooperation with the Flask Handling Area worker, uses the fork lift to raise the container several inches above the scale to allow the plug to be tightened with the torque wrench.
- Moves filled container from MMTS to a designated location in Building 110-66 (refer to Procedure MMTS-5, “Metric Ton Container Transport and Storage.”)
- Using a wireless handheld data input unit, records the required information on the MT TRANSFER screen (see Section 3.3.1 for details).
- Retrieves an empty MT container from Building 110-66 and places it on the empty scale with assistance from the Flask Handling Area worker (refer to Procedure MMTS-3, “Metric Ton Container Transport and Storage.”).

8.4 RECORDS

- Metal identification tag placed on each filled MT container
- Filled MT container data in the inventory database: serial number and weights (gross, net and tare)
- Up-to-date inventory tracking spreadsheets showing all mercury moves from the beginning to the end of the workday, in particular, the serial number and tare, net and gross weights for MT containers filled. Daily tracking spreadsheet information should include the original warehouse, pallet and drum numbers associated with the mercury in each MT container.

8.5 ATTACHMENTS

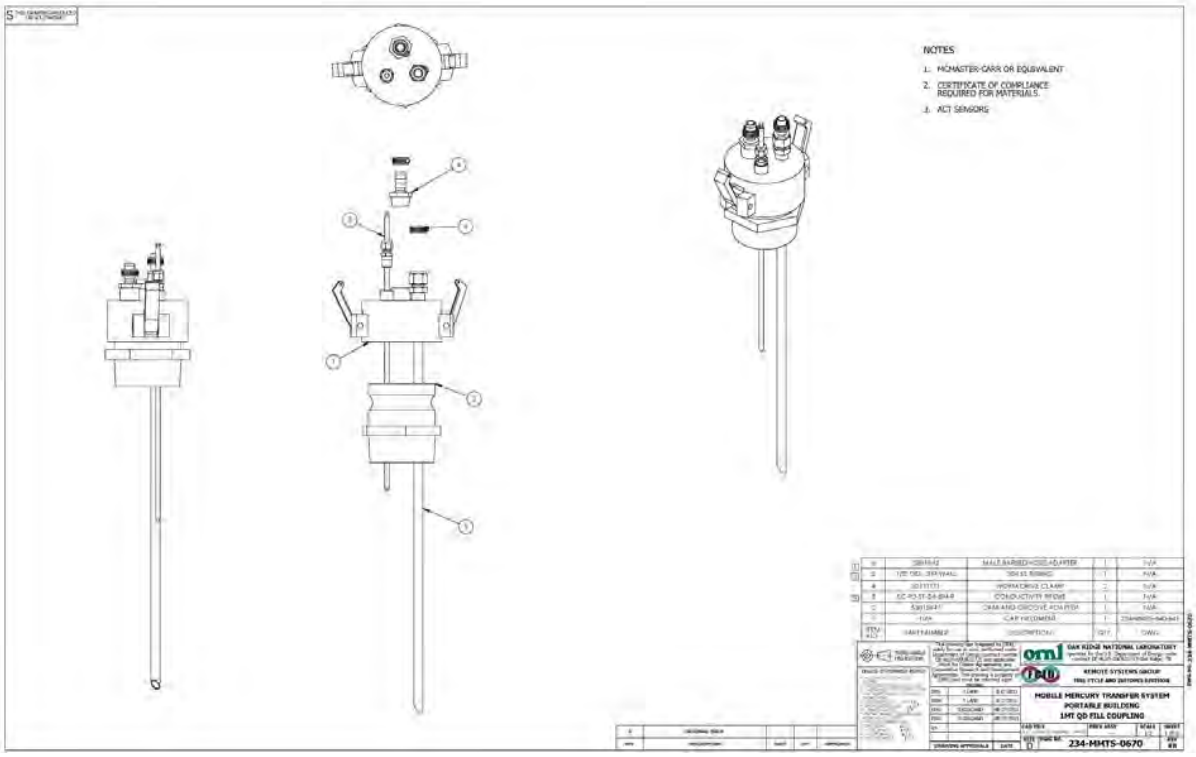
Tag engraving machine (Attachment 8.1)

Quick disconnect fitting (Attachment 8.2)

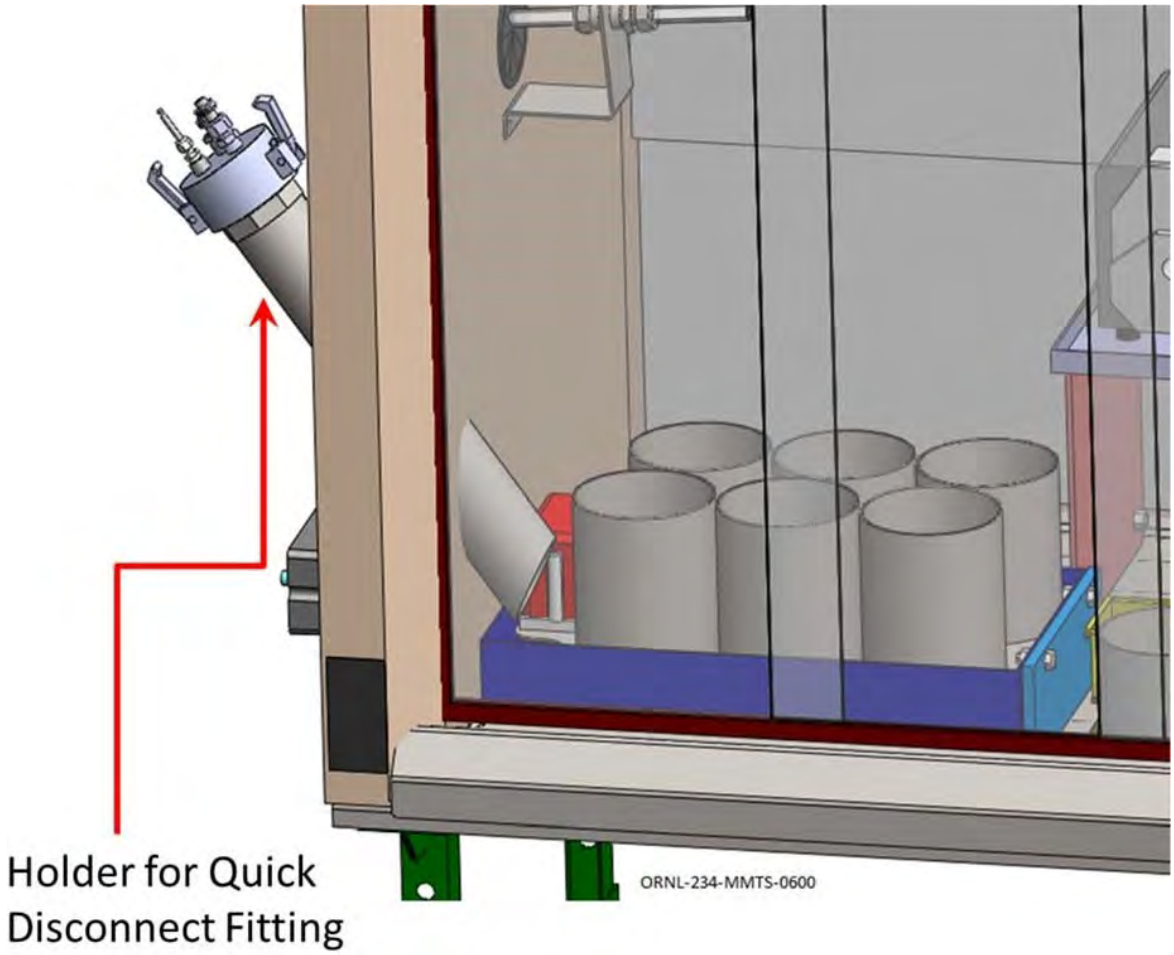
Holder for quick disconnect fitting (Attachment 8.3)

ATTACHMENT 8.1 Tag Engraving Machine

ATTACHMENT 8.2 Quick Disconnect Fitting



ATTACHMENT 8.3 Holder for Quick Disconnect Fitting



9 - EMPTY FLASK DISPOSITION AND TRANSPORT

Title: Empty Flask Disposition and Transport **Doc. No.** MMTS-9-Rev5

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

Rev. No.	Change description	Author
5	Annual Review- Updated signatory authority to current signatures. Added Revision number to document number.	Rob Mathias
4	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
2	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez
1	Pg. 9-1, added QP.EMS.HG.0004 to references. Pgs. 9-4 and 9-5, §9.3.3, changed text to make Proc. 9 consistent with QP.EMS.HG.0004 and deleted text that no longer applies.	

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
QP.EMS.HG.0004	Waste Analysis and Characterization Plan for Mobile Mercury Transfer System

9.1 PURPOSE

This procedure describes empty flask, drum, and pallet disposition activities in the Flask Handling Area and Building 110-66.

9.2 SCOPE

This procedure covers the following activities:

- Plug, bag, and place emptied flasks into the nonhazardous waste drum.
- Pick up from the Flask Handling Area, transport, and place a pallet of drums containing empty flasks in the warehouse at a specified location.
- Transport a pallet of empty drums and place a pallet in the Flask Handling Area
- Remove hazardous wastes and transfer them to the hazardous waste drum

9.3 OPERATIONS

9.3.1 Dispose of Emptied Flasks

NOTE*: The first four steps of this section are also contained in Procedure 7, Fume Hood 2 – Mercury Transfer, Section 7.4.4, Dispose of Emptied Flasks.*

- After the emptied flasks have been inverted and "shaken" under the fume hood to remove small quantities of remaining mercury, a Flask Handling Area worker removes each flask one at a time from the shaker tray, reinstalls a steel plug, places the flask in a prepositioned plastic bag, seals the bag, picks up the bagged flask and places it in the adjacent 30-gallon non-hazardous waste drum.

NOTE*: Two workers are required for packaging empty flasks. One worker maintains clean gloves to prevent mercury contamination on the outside of the bagged flasks.*

NOTE*: A fume removal snorkel (the cart mounted Airfiltronix® unit) should be positioned to reduce the potential for mercury vapors in the breathing zone immediately adjacent to the open drum of bagged empty flasks (see Figure 9-1).*

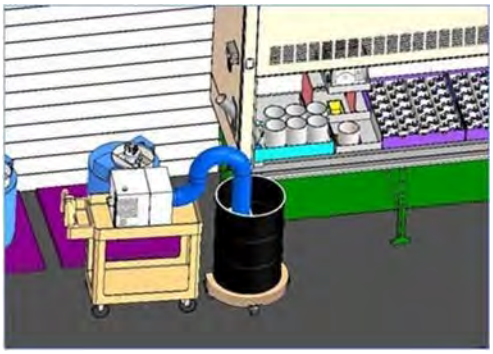


Figure 8-1 Drum on dolly with Airfiltronix® snorkel unit on cart

NOTE*: A drum (either full or empty) should never be opened for a casual inspection. A drum should be opened solely to access flasks or to place waste material and only when all equipment is on hand for monitoring and ventilation.*

- The workers repeat the previous actions until the drum is filled; place the lid and locking ring on the drum; seal the drum; mark the drum as containing "non-hazardous waste – empty flasks;" and transport the drum to the pallet for drums of empty flasks (see Figures 9-2 and 9-3).

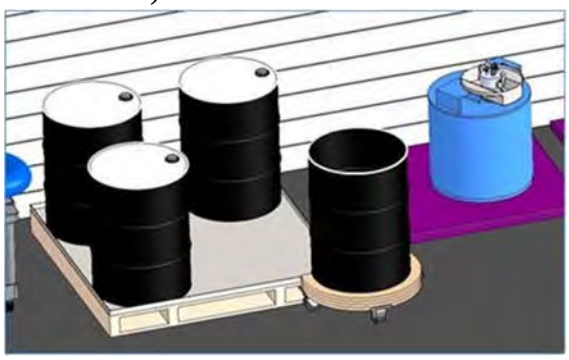


Figure 8-2 Drum on dolly next to the pallet with drip pan

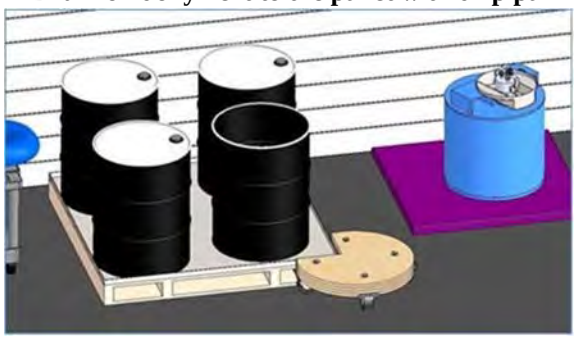


Figure 8-3 Drum is moved from the dolly onto the drip pan, which is lower than the dolly

- A worker assists the forklift operator to remove a pallet of filled drums and replace it with a pallet of empty drums.

NOTE*: With assistance of MMTS supervisor, a Flask Handling Area worker arranges for a pallet of empty waste drums when needed.*

***NOTE**: Breathing zone monitoring is periodically required to ensure that flask-surface vapors are being properly contained in the bagged flasks.*

9.3.2 Pallets of Non-Hazardous Wastes

- After notification by the Facility Manager and with assistance from the Flask Handling Area worker, the forklift operator
    - Removes pallets containing drums filled with empty flasks and places them in Building 110-66 at the designated location.
    - Retrieves a pallet of empty drums from Building 110-66 and places the pallet in the Flask Handling Area of the MMTS.
- The Facility Manager records that a pallet of drums filled with empty flasks, has been placed in Building 110-66 and that a pallet of empty drums has been placed in the MMTS.

9.3.3 Hazardous Waste Removal from MMTS

- At the end of each workday, a Flask Handling Area worker places all hazardous wastes in sealed bags and transports them through Fume Hood 2 and Fume Hood 1 and places them in the hazardous waste drum located in the Drum Handling Area.

***NOTE**: A drum (either full or empty) should never be opened for a casual inspection. A drum should be opened solely to access flasks or to place waste material and only when all equipment is on hand for monitoring and ventilation.*

***NOTE**: A fume removal snorkel should be positioned to reduce the potential for mercury vapors in the breathing zone immediately adjacent to the drum of hazardous wastes prior to opening the drum.*

- At the end of each workday, a Drum Handling Area worker inspects any drums containing hazardous wastes
    - If the drum is full, the worker seals the drum and marks it as hazardous waste, U151, MMTS process debris as directed in Waste Analysis and Characterization Plan for the Mobile Mercury Transfer System (QP.EMS.HG.0004). The worker then arranges to have the drum moved to the appropriate satellite accumulation area and notifies the Facility Manager.
    - If the drum is not full, the worker closes the drum in accord with the container closure requirements of Waste Analysis and Characterization Plan for the Mobile Mercury Transfer System (QP.EMS.HG.0004).
- After receiving notification from the Drum Handling Area worker, the Facility Manager
    - Inspects the hazardous waste drum to determine that it is properly sealed and marked.

    - Instructs the forklift operator to coordinate with the Drum Handling Area workers to remove the hazardous waste drum and take it to the 90-day hazardous waste accumulation area in Building 110-66.

- As soon as possible consistent with maintaining operations, the forklift operator
    - With the assistance of Drum Handling Area workers, removes the drum filled with hazardous wastes.
    - Transports the drum to the 90-day hazardous waste accumulation area in Building 110-66.
- The Drum Handling Area worker moves the pallet to the designated location.
- The Facility Manager records that a drum filled with hazardous wastes has been placed in the 90-day hazardous waste accumulation area in Building 110-66.

NOTE*: A fume removal snorkel should be positioned to reduce the potential for mercury vapors in the breathing zone immediately adjacent to the open drum of bagged hazardous wastes.*

NOTE*: The Facility Manager keeps track of the length of time hazardous wastes have been in Building 110-66 and coordinates with SOC Environmental Services to have them removed consistent with Waste Analysis and Characterization Plan for the Mobile Mercury Transfer System (QP.EMS.HG.0004).*

9.4 RECORDS

See Procedure MMTS-10, “Waste Management,” for details of records required when placing hazardous wastes in 110-66.

9.5 ATTACHMENTS

T-5 flasks (most common in the DLA stockpile – 56,845) – 8 flasks placed vertical in 30 gallon drum (Attachment 9.1)

T-5 flasks (most common in the DLA stockpile – 56,845 flasks) – 8 flasks placed vertical and 8 flasks placed horizontal – 16 flasks per drum (Attachment 9.2)

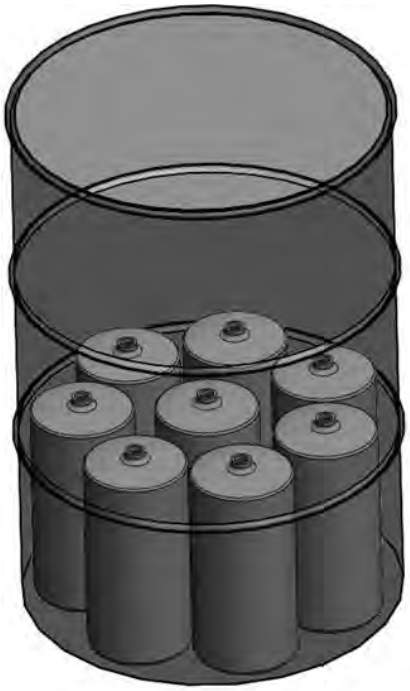
T-5 flasks (most common in the DLA stockpile – 56,845 flasks) – 8 flasks placed vertical and 8 flasks placed vertical (assumed no “cupped” bottom) and 2 flasks placed horizontal – 18 flasks per drum (Attachment 9.3)

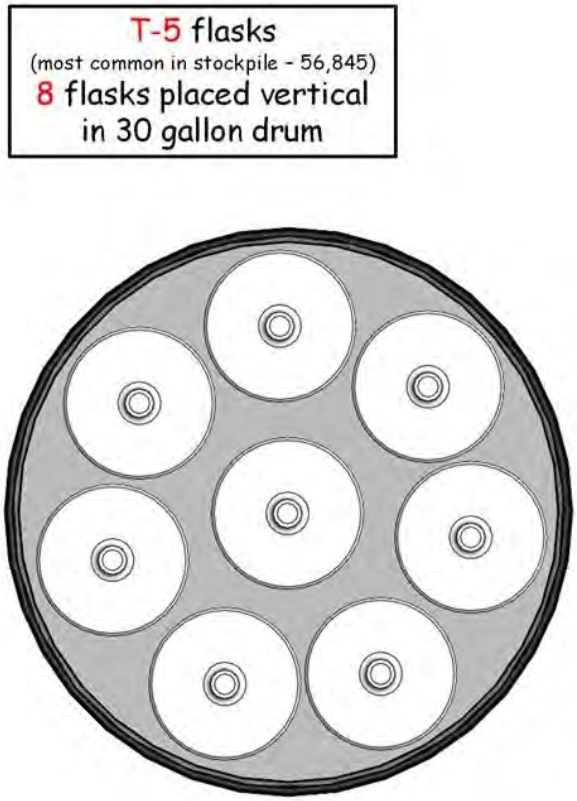
T-1, T-2, and T-3 flasks – 12 flasks dropped into 30 gallon drum (Attachment 9.4)

T-1 flasks – 8 flasks placed vertical in 30 gallon drum (Attachment 9.5)

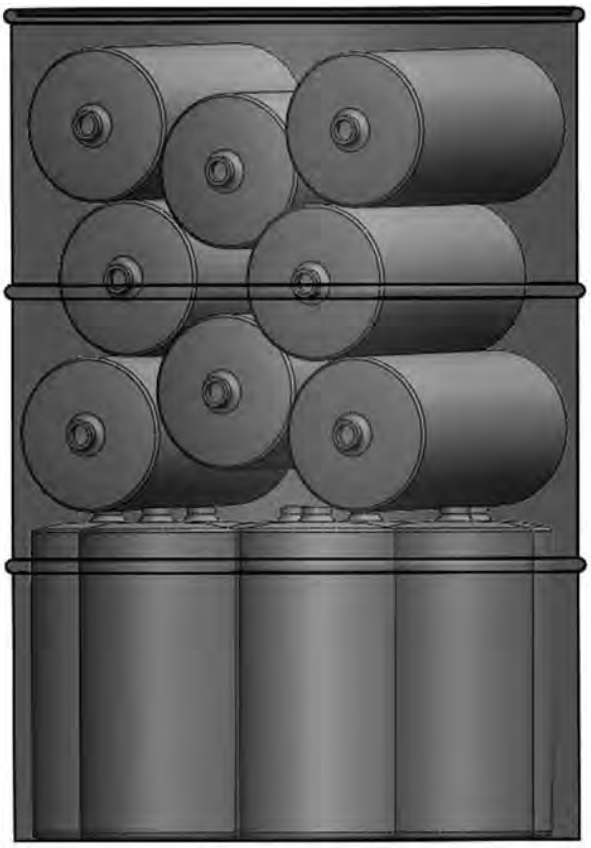
T-2 flasks – 9 flasks placed vertical in 30 gallon drum (Attachment 9.6)

ATTACHMENT 9.1 T-5 flasks (most common in the DLA stockpile – 56,845) – 8 flasks placed vertical in 30 gallon drum





ATTACHMENT 9.2 T-5 flasks (most common in the DLA stockpile – 56,845 flasks) – 8 flasks placed vertical and 8 flasks placed horizontal – 16 flasks per drum



T-5 flasks
(most common in stockpile - 56,845 flasks)
8 flasks placed vertical
and
8 flasks placed horizontal
16 flasks per drum

56,845 flasks = 1895 pallets

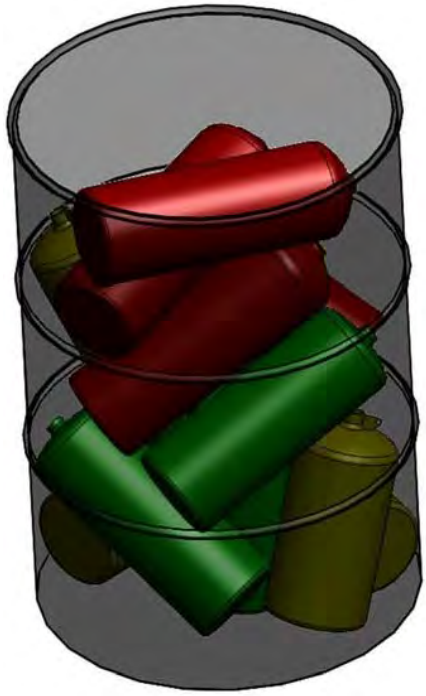
16 flasks per drum
80 flasks per pallet
710 pallets required for disposal
instead of 948
238 pallets = 1190 drums for recycling

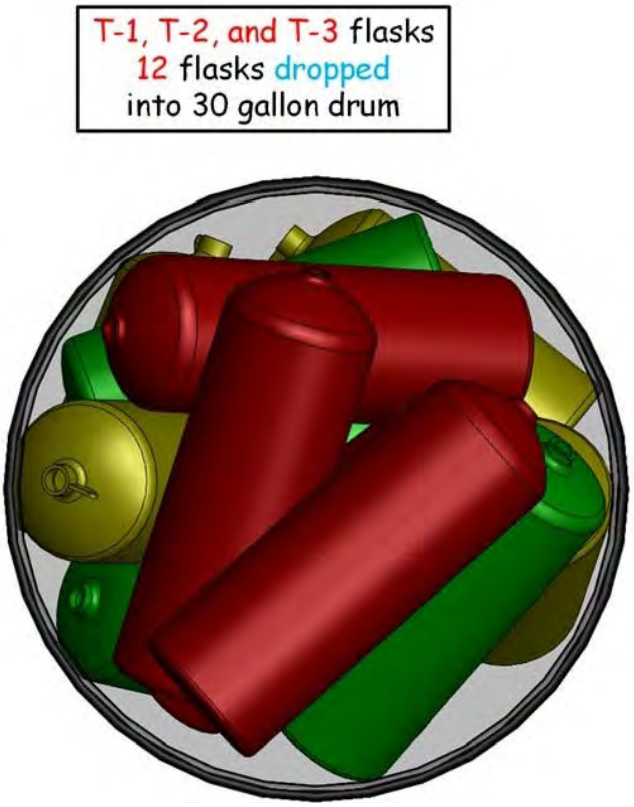
ATTACHMENT 9.3 T-5 flasks (most common in the DLA stockpile – 56,845 flasks) – 8 flasks placed vertical and 8 flasks placed vertical (assumed no “cupped” bottom) and 2 flasks placed horizontal – 18 flasks per drum

T-5 flasks
(most common in stockpile - 56,845 flasks)
8 flasks placed vertical
and
8 flasks placed vertical
(assumed no "cupped" bottom)
and
2 flasks placed horizontal

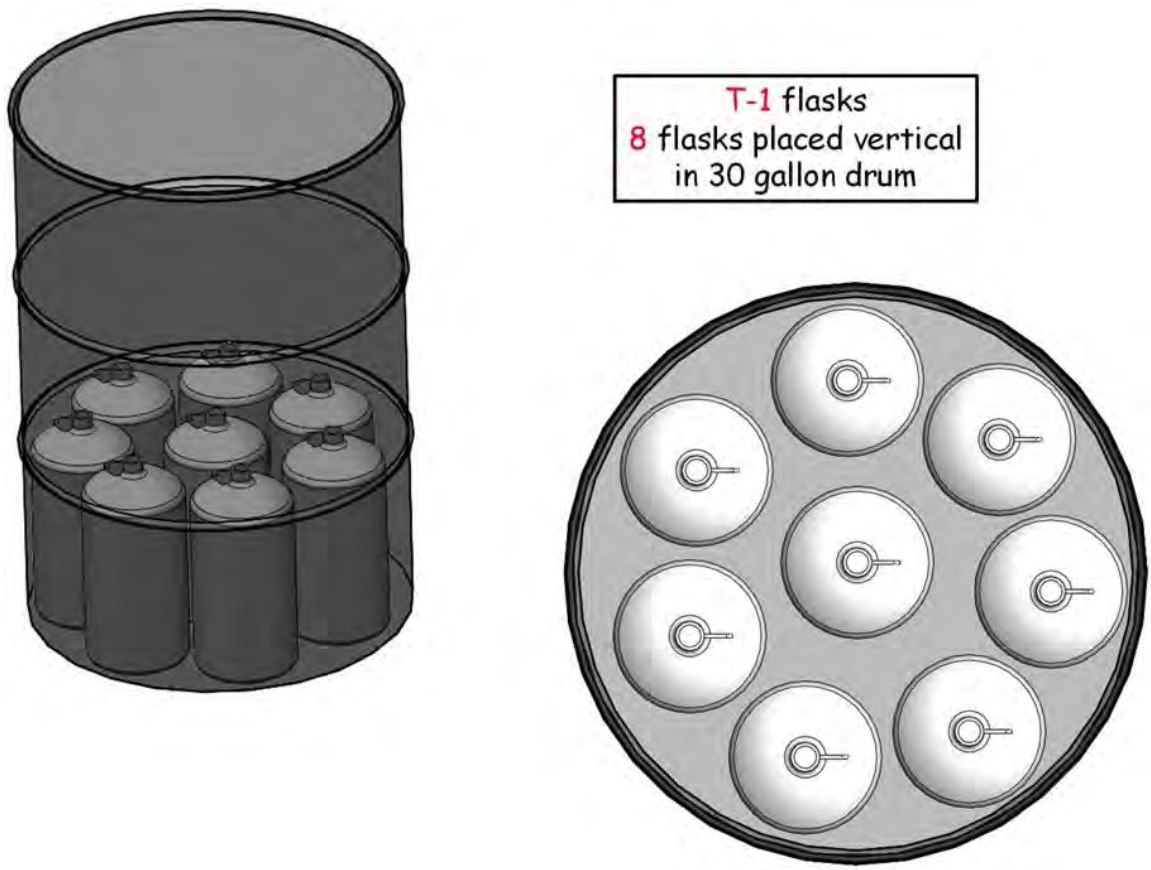
18 flasks per drum

ATTACHMENT 9.4 T-1, T-2, and T-3 flasks – 12 flasks dropped into 30 gallon drum ()

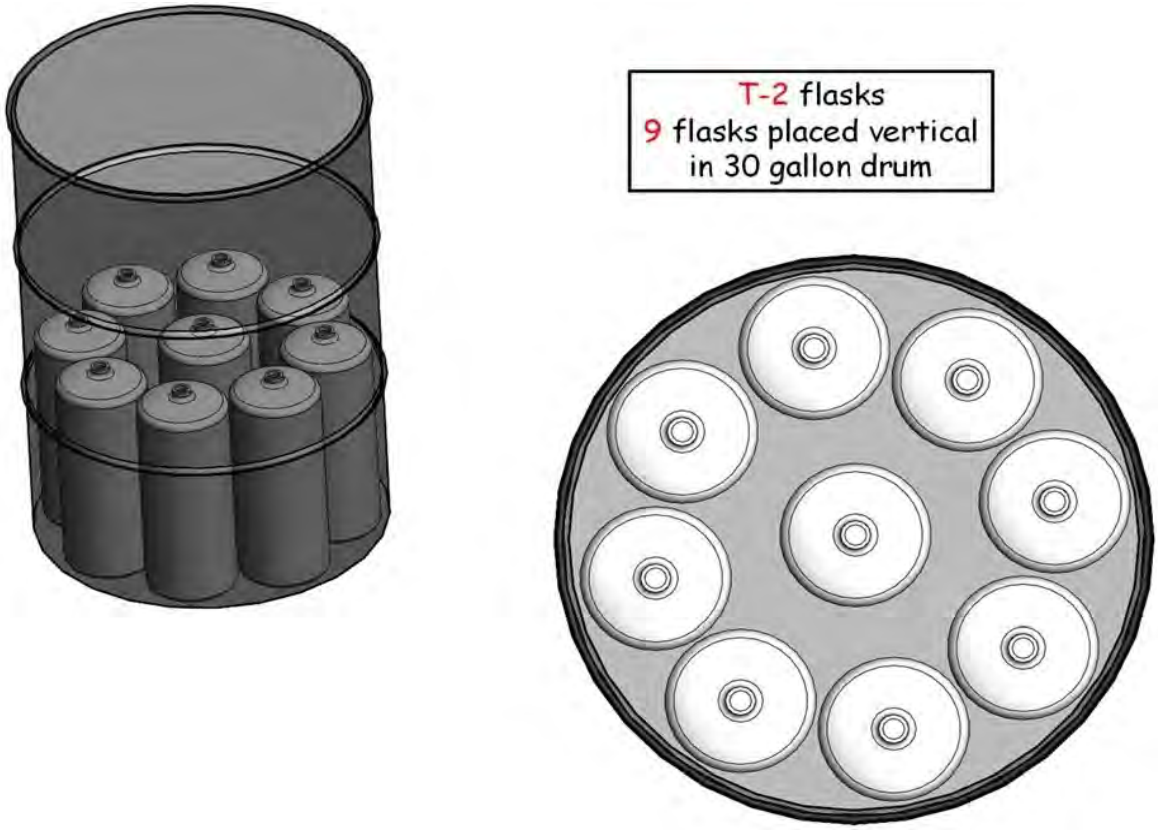




ATTACHMENT 9.5 T-1 flasks – 8 flasks placed vertical in 30 gallon drum ()



ATTACHMENT 9.6 T-2 flasks – 9 flasks placed vertical in 30 gallon drum ()



10 -WASTE MANAGEMENT

Title: Waste Management **Doc. No.** MMTS-10-Rev5

Approval Signatures and Date

Prepared/Reviewed by:	*Rob Mathias Depot Manager*	Date: 2-13-2020
Approved by:	*Jason D Boynton Mercury PM*	Date: 2-05-2020
Approved by:	*Kristi Lammel-Schilling*	Date: 17 Feb 2020
Approved by:	*Charles R King*	Date:2/19/2020

	Initial Release	***X***	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

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5	Annual Review - Updated signatory authority to reflect current required signatures. Added Revision number to document number.	Rob Mathias
4	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
2	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez
1	Pg. 10-1, added QP.EMS.HG.0004 to references. Pgs. 10-2 through 10-4, §§10.3.1 and 10.3.2, changed text to make Proc. 10 consistent with QP.EMS.HG.0004; added explanatory text; and deleted text that no longer applies.	

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
TBD	HWAD RCRA Contingency Plan
TBD	HWAD RCRA Part B Permit
QP.EMS.HG.0012	Waste Analysis and Characterization Plan for the Mobile Mercury Transfer System

10.1 PURPOSE

This procedure describes how wastes generated during MMTS operations are managed. The MMTS staff minimizes; properly characterizes; packages; labels; and manages hazardous wastes, solid wastes, and recyclables.

10.2 SCOPE

This procedure applies only to MMTS operations at HWAD. To facilitate operations, the MMTS Drum Handling Area should be designated a hazardous waste satellite accumulation area (SAA).

10.3 OPERATIONS

10.3.1 Required Equipment and Supplies (PPE as specified on page XI of the Executive Summary under General Safety and Health)

- Waste containers
  - Use and position waste containers as directed in Waste Analysis and Characterization Plan for the Mobile Mercury Transfer System (QP.EMS.HG.0004).
  - NOTE: *Volume reduction of hazardous waste using a snorkel is an objective that is best met with experience.*
- Container labels for each waste stream
  - Label containers as empty or by waste type as specified in Waste Analysis and Characterization Plan for the Mobile Mercury Transfer System (QP.EMS.HG.0004). Use labels provided by SOC as directed in QP.EMS.HG.0004.
  -
- Logbook for each waste stream

NOTE*: Hazardous waste containers must be in good condition (without any holes, dents, severe rust, or other faults or structural defects that might impair proper containment). The emptied 30-gallon drums are compatible (made of, or lined with, a material that will not react with the waste to be stored) with the mercury-contaminated hazardous wastes generated within the MMTS. Emptied drums, including those with faults or defects, can also*

be used for accumulation of solid wastes as long as those faults or structural defects do not impair proper containment.

***NOTE**: Seal containers well. A closed container of hazardous waste must not lose its contents if flipped/turned over.*

10.3.2 Waste Preparation

- Keep containers of hazardous waste closed unless adding hazardous waste. Container closure is defined in Waste Analysis and Characterization Plan for the Mobile Mercury Transfer System (QP.EMS.HG.0004). Label containers as directed in QP.EMS.HG.0004.
- Label hazardous waste containers with the appropriate waste code and the words "hazardous waste."
- Mark each hazardous waste container with the date it was sealed (waste additions have ended).
- Label non-hazardous solid waste containers as "non-hazardous waste" or similar words, such as "non-hazardous trash," "empty drum" or "nonhazardous emptied flasks."

- Provide sufficient waste characterization information as required by SOC Environmental Services staff to initiate waste pickup in a timely manner. Process knowledge is used to characterize the wastes, therefore, maintain documentation of that process knowledge. Review the waste characterization annually or any time a process change occurs to ensure the waste characterization/process knowledge is still appropriate.

For wastes requiring sampling and analysis, the Facility Manager directs sampling and analysis as defined in Waste Analysis and Characterization Plan for the Mobile Mercury Transfer System (QP.EMS.HG.00004).

- Set up and manage hazardous waste satellite accumulation areas (SAAs) in the MMTS for the visible mercury and non-visible mercury waste streams as directed in Waste Analysis and Characterization Plan for the Mobile Mercury Transfer System (QP.EMS.HG.0004). The SAA for aerosol cans will be set up in Building 110-66.
- Move sealed, labeled non-hazardous waste containers to Building 110-66. Move and store sealed, labeled hazardous waste containers in the 90-day accumulation area within Building 110-66. Movement, storage and labeling are to be in accord with Waste Analysis and Characterization Plan for the Mobile Mercury Transfer System (QP.EMS.HG.0004). Facility Manager contacts SOC Environmental Services staff to coordinate waste pickup.

Segregate wastes as directed in Waste Analysis and Characterization Plan for the Mobile Mercury Transfer System (QP.EMS.HG.0004).

Facility Manager works with SOC Environmental Services staff to ensure that all wastes and recyclables are picked up in a timely fashion.

10.4 RECORDS

The following records should be maintained and managed at the MMTS:

- Log of each waste stream with the following information for each container: start date, end date (date container is closed/sealed), list of contents and date each hazardous waste drum was taken to a site 90-day/180-day area.

11 - ROUTINE CLEANING

Title: Routine Cleaning **Doc. No.** MMTS-11-Rev4

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

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NOTE: *This document will be reviewed at least annually to ensure its suitability.*

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4	Annual Review - Updated signatory authority to reflect current required signatures. Added Revision number to document number.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
2	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
Procedure MMTS-10	Waste Management
Procedure MMTS-12	Emergency Response and Spill Cleanup

	HgX® MSDS http://www.actontech.com/hgx6.htm

11.1 PURPOSE

This procedure addresses the routine cleaning of work surfaces and break areas that could be contaminated with mercury (e.g., mercury work stations) as a result of mercury handling and transfer operations within the Mobile Mercury Transfer System (MMTS).

***NOTE**: It is imperative to record mercury contamination levels throughout the MMTS, regardless of how low they are, to establish a baseline for contamination before mercury is introduced into the MMTS. Comparable measurements are needed for the personnel trailer.*

11.2 SCOPE

This procedure applies to MMTS staff and/or their contractors that work in the Flask Handling and Drum Handling Areas and their supervisors and addresses equipment cleaning steps that are to be completed as a part of routine operations to minimize the spread of mercury contamination. It does not cover steps for cleaning up mercury that has been spilled during drum or flask handling or mercury transfers (see Section 12, Emergency Response and Spill Cleanup).

11.3 INSPECTION AND CLEANING OPERATIONS

11.3.1 Required Equipment and Supplies (PPE as specified on page XI of the Executive Summary under General Safety and Health)

Workers need the following equipment to perform the actions described in this procedure:

- HgX® solution in spray bottles (To prepare: add 1.5 pounds of HgX® slowly or sift into 5 gallons of water - do not dump. Use cold tap water to make up solutions. If the water, after adding the recommended quantity of HgX®, does not turn milky (white) within 15 minutes or half hour, add additional HgX® until it does. The solution upon standing several hours (overnight) will turn clear but retain its efficacy. The precipitation on the bottom of the container is merely the excess above saturation.)

***NOTE**: There is no water source in the MMTS nor is there water available in the mercury storage warehouses. Therefore, the HgX® solution will be prepared and stored at another HWAD location until it is needed for the cleaning operation.*

- Water in spray bottle

11.3.2 Routine Inspection and Cleaning

***NOTE**: Upon commencement of mercury handling and transfer operations in the MMTS, visual examinations and swipe tests for possible contamination shall be done weekly in the areas noted below, to establish a baseline for the working conditions. When the MMTS supervisor and operators are satisfied that the working surfaces within the fume hoods, and the floors and walls of the work area, remain within acceptable limits of contamination (perhaps after a month or two of full operations), the monthly wipe down procedure may be implemented. However, visual inspection is still a requirement for operators before, during, and at the end of each workday.*

- Flask Handling Area and Drum Handling Area workers visually examine work surfaces inside the fume hoods and the conveyer table at the end of each work month. (Equipment that is affixed inside the fume hood or conveyer table (rollerball assemblies, drill, pump, etc.) are not removed or loosened for this inspection or cleaning.)
- Flask Handling and Drum Handling workers wipe down the work surfaces and equipment (pump, drill, flask trays, scales, transfer fitting assembly holder, etc.) monthly using gauze pads with a small amount of HgX® solution (or equivalent). Refer to the attached Material Safety Data Sheet for health and safety information.
- Periodic mercury vapor analysis, conducted initially on a weekly basis, will be done in all other MMTS and personnel trailer areas to test for the possible spread of mercury to nonwork areas. The areas sampled will include the MMTS dress out area, office area, general access areas, and the personnel trailer break areas and restrooms. In the event of detection of mercury above baseline levels, cleaning staff wipe down the table and desk tops, floors, and human contact surfaces using gauze pads with a small amount of HgX® solution (or equivalent). Wiping and mercury vapor analyses continue until mercury is no longer detected. At the discretion of the Facility Manager, the sampling period may be lengthened in the absence of detectable mercury. When mercury is detected, the sampling period returns to weekly until no mercury is detected, and the Facility Manager determines that the sampling period may be extended.
- When using HgX® solution, workers avoid contact with eyes, skin or clothing and use nitrile gloves. Do not mix HgX® with other cleaning agents or any other materials.
- Flask Handling and Drum Handling workers clean all HgX® treated metal surfaces with clear water and dry thoroughly. HgX® solution may cause corrosion to some metals so removal with clear water is needed.
- Staff manage used gauze and contaminated personal protective equipment as hazardous waste per Section 12. Waste Management.
- Hazardous wastes accumulated during fume hood operations should be packaged in sealed plastic bags and moved back through the fume hoods and the conveyor table and placed in the hazardous waste drum in the Pallet/Drum Handling Area.

- The operation with a high probability for spreading mercury contamination is flask shaking to remove residual mercury from the flasks, prior to empty flask disposal. At the end of each workday the flask handling operator in Fume Hood 2 will siphon any accumulated mercury from the shaker tray.

- At the end of a week of operations, the flask handling operator in Fume Hood 2 will place a sheet of gauze on the roller balls adjacent to the shaker tray; lift the flask-holder portion of the shaker tray and place it on the gauze; and inspect the tray for accumulated material. The accumulated material is to be removed using a gauze wipe, placed in a sealable bag (also the gauze from under the flask holder portion of the shaker tray should be placed in this sealable bag). The bag containing this material is be moved through the fume hoods and the conveyor table to the Drum Handling Area where it is be placed in the hazardous waste drum for wastes that exceed 260 mg/kg mercury concentration and/or do not meet acceptance criteria for disposal per SOC Waste Services and/or DLA Strategic Materials classification.

12- EMERGENCY RESPONSE AND SPILL CLEANUP

Title: Emergency Response and Spill Cleanup **Doc. No.** MMTS-12-Rev6

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2019
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

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3	Reformatted and replaced verbiage under §12.3.3.	Burton Packard and Renee Rodriguez
2	Added verbiage to include fire emergencies as part of the procedure.	Burton Packard and Renee Rodriguez
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
Procedure MMTS-2	Metric Ton Container Setup
Procedure MMTS-6	Fume Hood 1 – Mercury Access
Procedure MMTS-7	Fume Hood 2 – Mercury Transfer
Procedure MMTS-13	Data Acquisition and Inventory Management
ORNL MSSP-13	Review of Spill Cleanup Methods and Waste Disposal
	HWAD RCRA Contingency Plan
DZHC-EOP Annex C	Emergency Response
	HgX® MSDS http://www.actontech.com/hgx6.htm

12.1. PURPOSE

This procedure describes how the Mobile Mercury Transfer System (MMTS) staff should respond to emergencies, including medical emergencies and non-emergency (off-normal) situations: (1) What to do in the event of small mercury spills, (2) How to deal with a leaked or leaking mercury flask, and (3) What to do if there is a power outage.

NOTE*: This procedure should be read in conjunction with: (1) MMTS-5, "Metric Ton Container Setup and Removal;" (2) MMTS-8, "Flask Handling Operations;" and (3) MMTS-9, "Mercury Transfer Operations." In addition, an earlier document, MSSP-13, "Review of Spill Cleanup Methods and Waste Disposal," prepared for the Defense Logistics Agency by Oak Ridge National Laboratory (ORNL) in August 2009, must be part of the training for Emergency Response and Spill Cleanup procedures. This procedure works in concert with the Hawthorne Army Depot (HWAD) Resource Conservation and Recovery Act (RCRA) Contingency Plan and DZHC-EOP Annex C Emergency Response Plan.*

12.2 SCOPE

This procedure covers the following possible emergency and other non-emergency events that could occur in the MMTS:

- Fire Protection System
- Medical emergencies during operations.
- Non-emergency discovery of leaked or leaking flasks during drum or flask handling operations.

- Non-emergency loss of mercury (i.e., drips or spills during flask handling and/or transfer operations).
- Non-emergency loss of power to the MMTS during daytime operations, or at night when the building is unoccupied.

12.3 PROCEDURES

12.3.1 Required Equipment and Supplies (PPE as specified on page XI of the Executive Summary under General Safety and Health)

Workers need the following specific equipment and supplies to perform the actions specified in this procedure:

- HgX solution (refer to Material Safety Data Sheet at http://www.actontech.com/hgx6.htm)
- Mercury high efficiency vacuum (stored in Building 110-66)
- Respirators rated for mercury service
- Drum markers

12.3.2 Emergency and Non-emergency Response

Fire Protection- The HWAD fire alarm systems are designed and constructed to provide warning for necessary emergency actions and for adequate reaction for safe escape of employees. Three (3) fire alarm pull boxes are located near the exits in the hall area, the pallet/drum handling area, and the ventilation equipment area. These locations are unobstructed, conspicuous and readily accessible. Fire alarm/detection system will trigger the audible and visual fire alarms to activate; the alarms notify affected employees to evacuate. There will be a high decibel audible signal and strobe lights that will flash. Activation of either system will send a signal by radio alarm to the Guard Operations Center (GOC) (audio and visual). GOC dispatch will notify the FES by pager and radio. Battery backup is available to run the alarms, lighting, etc. in the event of a power outage. The audible alarm systems are designed to be heard above ambient noise in the MMTS. All employee alarm systems are restored to normal operation condition as promptly as possible after each test or alarm and spare alarm equipment/components are available in sufficient quantities and locations for prompt restoration of a system.

Table 12.1 below summarizes emergencies and non-emergency events that could be encountered by workers during operations, or off-normal events that could occur when the MMTS is vacant of operating personnel (i.e., nighttime, weekends, and holidays).

A broken fluorescent bulb will be cleaned up following Table 12.1 directions based on location: within a fume hood or outside the fume hoods. Broken fluorescent bulb components will be treated as RCRA waste.

Table 12.1 Summary of responses for fire, medical emergencies, leaky flasks, loss of mercury, or loss of power

Fire emergency	Response	Notes
Fire	• Cease operations and shut down equipment • Evacuate 150 ft. upwind and wait for further directions by Senior Fire Officer	
Medical emergency	**Response**	**Notes**
Drum Handling Worker feels ill (e.g., dizzy, nauseous, and disoriented)	• Stop work in the Drum Handling Area. • Contact HWAD Fire and Emergency Services (FES) and describe nature of emergency.	1
Drum Handling Worker collapses, may be conscious or unconscious	• Contact HWAD FES and describe nature of emergency. • Stop all work in the MMTS.	
Flask Handling Worker feels ill (e.g., dizzy, nauseous, and disoriented)	• Facility Manager or any worker observing this condition presses E-stop to turn off the mercury transfer pump if operator is incapable of doing so. • Stop flask handling operations at the fume hood. • Contact HWAD FES and describe nature of emergency.	2
Flask Handling Worker collapses, may be conscious or unconscious	• Supervisor or any worker observing this condition presses Estop to turn off the mercury transfer pump. • Contact HWAD Fire and Emergency Services: describe nature of emergency. • Stop all work in the MMTS.	3
Worker has mercury contaminated puncture wound	• Cease operations and safely shutdown equipment • Notify supervisor and rinse wound at eye wash station • Facility Manager or designee contacts FES	
Leaky flasks	**Response**	**Notes**

Leaky flask in drum	• Drum handling worker replaces drum lid. • Tightens lid band to drum manufacturer's specification. • Marks drum and lid to identify that loose mercury is contained therein. • Notifies Facility Manager. • Follows the procedure referenced in Note 4.	4
Leaky flask observed while lifting from a drum onto the conveyer table	• Drum handling worker lowers the flask back into the drum. • Removes the lift fixture. • Replaces drum lid. • Tightens lid band to drum manufacturer's specification. • Marks drum and lid to identify that loose mercury is contained therein.	4
	• Notifies Facility Manager or designee. The Facility Manager or designee alerts HWAD FES and advises that the situation is under control. • Upon instruction by Facility Manager, don appropriate personal protective equipment and perform cleanup of any loose mercury. Use high efficiency mercury vacuum as needed; follow manufacturer's recommendations. • Follows procedure referenced in Note 4.	
Leaky flask observed in the flask tray on the roller conveyer table	• Drum handling worker ceases placing additional flasks into the flask tray. • Worker notifies the MMTS Facility Manager. The Facility Manager or designee alerts HWAD FES and advises that the situation is under control. • With Facility Manager or designee's permission, mercury transfer operator continues mercury transfer operations under the Fume Hood 2 until only empty flask trays remain. • Mercury transfer operator moves empty flask trays out of Fume Hood 2 and moves only the flask tray with a leaky flask into Fume Hood 2. • Mercury transfer operator transfers mercury remaining in the leaky flask per Procedure MMTS-9, "Fume Hood 2 – Mercury Transfer." • Mercury transfer operator removes the leaky flask from the flask tray and wipes the flask exterior with HgX® solution* (or equivalent) using a gauze wipe before placing the leaky flask into the shaker tray.	5

	• Mercury transfer operator transfers the loose mercury in the flask tray tube (i.e. the 6-pack) using the peristaltic pump and siphon tube. • Mercury transfer operator wipes the interior surface of the flask tray with HgX® solution (or equivalent) using a gauze wipe before placing the flask tray in a sealable bag for subsequent vapor monitoring tests before reusing that flask tray.	

* HgX® solution in spray bottles (To prepare: add 1.5 pounds of HgX® slowly or sift into 5 gallons of water - do not dump. Use cold tap water to make up solutions. If the water, after adding the recommended quantity of HgX®, does not turn milky (white) within 15 minutes or half hour, add additional HgX® until it does. The solution upon standing several hours (overnight) will turn clear but retain its efficacy. The precipitation on the bottom of the container is merely the excess above saturation.)
NOTE: There is no water source in the MMTS nor is there water in the mercury storage warehouses. Therefore, the HgX® solution will be prepared and stored at another HWAD location until it is needed for cleaning operation.

	• Mercury transfer operator places used gauze wipes into sealable bag for disposal as hazardous waste.	
Leaky flask observed in the flask tray under the fume hood	• Mercury transfer operator notifies Facility Manager of leak in flask tray. Then Facility Manager alerts HWAD FES and advises that situation is under control. • With Facility Manager's permission, mercury transfer operator continues mercury transfer operations under the fume hood for that tray. • Mercury transfer operator transfers mercury remaining in flask per Procedure MMTS-9, "Fume Hood 2 – Mercury Transfer." • Mercury transfer operator removes the flask from the flask tray and wipes the exterior surface of the flask with HgX® solution (or equivalent) on gauze wipe before being placed into shaker tray. • Mercury transfer operator transfers the loose mercury in the tray tube using peristaltic pump and siphon tube. • Mercury transfer operator wipes interior tube surface with HgX® solution (or equivalent) before placing tray in sealable bag for subsequent vapor monitoring tests before reusing that tray. • Mercury transfer operator places gauze wipes into sealable bag for disposal as hazardous waste.	5

Loose mercury outside the fume hood	• Mercury transfer operator stops pumping, presses E-stop to turn off peristaltic pump and turns off power switch on the pump motor-controller. • Mercury transfer operator advises Facility Manager and alerts others in the vicinity to exit the Flask Handling Area. Then Facility Manager alerts HWAD FES and advises that situation is under control. • If it is safe to do so, worker contains spill to minimize spread of contamination outside the fume hood. • Under the guidance of the Facility Manager or designee, workers don the required personal protective equipment, including a respirator, and follow the cleanup procedures given in *MSSP-13, "Review of Spill Cleanup Methods and Waste Disposal," prepared for the Defense Logistics Agency by Oak Ridge National Laboratory*. • Use high efficiency mercury vacuum as needed; follow manufacturer's recommendations.	6
Leaking transfer QD fitting to MT container	• Mercury transfer operator immediately ceases mercury transfer operations by turning off peristaltic pump.	6

	• Since this is "loose mercury outside the fume hood," the steps outlined above are to be followed. • It is likely that the MT container, the scale, and the drip tray under the scale are contaminated. Cleanup procedures outlined in the document referenced in Note 6 are to be followed. • Upon instruction by Facility Manager, don appropriate personal protective equipment and perform cleanup of any loose mercury. Use high efficiency mercury vacuum as needed; follow manufacturer's recommendations.	

Loss of power	Response	Notes
Loss of electrical power during daytime operations	• Worker in the Flask Handling Area turns off the main power switch to the peristaltic pump and presses the E-stop button. • Facility Manager contacts Security and FES and notifies them of the power outage. • Facility Manager ensures that all affected operations are in safe standby (i.e., that a flask in the Drum Handling Area that was partially lifted out of a drum has been manually placed back into the drum, and that the fume hood doors are closed). • Facility Manager oversees orderly exit of workers from the MMTS (some workers will have to remove PPE first).	7
Loss of electrical power at night	• Upon arrival for morning activities, the Facility Manager notices a visual signal that either power is not available or that power was lost sometime during the night. • Facility Manager or designee contacts Security and FES and notifies them of the power outage. • Facility Manager or designee does not allow workers into the building until an "all clear" is received from Security and/or FES. • Facility Manager or designee reschedules operations accordingly.	7
Loss of mercury outside the MMTS	**Response**	**Notes**
	• Facility Manager or designee contacts HWAD FES and notifies them of the quantity and location of loose mercury • FES responds and performs the appropriate cleanup activities	8

Notes.

1. Operations in the Flask Handling Area may continue unless the Facility Manager "stops work."
2. Even if the mercury transfer operator has stopped operating the transfer pump, the E-stop must be pressed to render the transfer pump inactive since the operator may have only released the foot operated on/off switch, and the main power switch to the transfer pump may be in the "on" position. The main transfer pump toggle switch is located at the back of the transfer pump must also be turned off. The E-stop remains "pressed" until the work Facility Manager determines that the transfer pump has been properly de-energized.
3. Facility Manager determines when it is safe to release the E-stop and turn on the main power switch to the transfer pump.

4. Document MMTS-5, “Drum Handling.”
5. The 6-in. ID by 7-in. high tube in the flask tray is designed to contain up to 0.9 L of mercury from a flask having a 5-in. OD. Flasks contain 2.5 L of mercury.
6. MSSP-13, “Review of Spill Cleanup Methods and Waste Disposal,” is a detailed treatise of proper cleanup and waste disposal methods that also identifies numerous procedures, equipment, and materials needed for mercury cleanup. It was prepared for the Defense Logistics Agency by Oak Ridge National Laboratory in August 2009, and made available to the HWAD.
7. The Mercury Monitoring System is equipped with a back-up power supply sufficient to continue monitoring the concentration of mercury in the air for about eighty minutes after electrical power is lost to the MMTS.
8. The HWAD FES staff members respond to and perform cleanup of all loose mercury outside the MMTS.

***NOTE**: Because of the potentially serious nature of these events as they relate to the health and safety of the workers and the environment, a worker must never be alone in the MMTS (i.e., use of the “buddy system” should be enforced.) If there is a valid reason for not having a co-worker also present, the worker must notify the Guard Operations Center at 775.945.7911 and state when he/she will enter the MMTS and what time the worker expects to leave MMTS. The worker must notify the Guard Operations Center again after he/she leaves the MMTS.*

12.3.3 Restoring Power after a Loss-of-Power Event

The Facility Manager or designee must ensure that the PCDAS and MMS systems are restarted following a Loss-of-Power event that lasts longer than the capacity of the UPSs (nominally 80 minutes). After restoring power to the MMTS, the MMS computer must be turned on (see Section 13.5 page 109). The PCDAS computer auto boots (confirm that this occurs; if not, follow the turn-on sequence shown in Section 13.5).

12.4 RECORDS

- Industrial Safety and Health records for health or safety incidents
- FES records for emergency response/spill cleanup
- Data Acquisition System records for incidents

13 - DATA ACQUISITION AND INVENTORY MANAGEMENT

Title: Data Acquisition and Inventory Management **Doc. No.** MMTS-13-Rev5

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

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NOTE: *This document will be reviewed at least annually to ensure its suitability.*

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4	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
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1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
QP.EMS.HG.0006	Mechanical Integrity Procedure (Tier 1)
	Saber Engineering - 212057 Mercury Transfer Operation and Maintenance Manual, Revision 1.6, March 23, 2015”
	Video describing MMTS data acquisition system

13.1 PURPOSE

This procedure describes operations related to the MMTS data acquisition system.

13.2 SCOPE

This procedure covers the following types of activities related to operation and data archiving for the data acquisition system:

- Data acquisition system operation.
- Data archiving and backup.
- Report creation

13.3 OPERATIONS

13.3.1 Pre-Operations Check

Because the data acquisition system continuously monitors facility environmental conditions as well as process progress, it should be in operation at all times except during system maintenance or repair. At the start of a workday, the Facility Manager performs the following actions:

- Confirms that the computers for PCDAS and the MMS are turned on and the computer displays are working.
- If the computers are off, power up the systems by following the instructions in Section 13.5 on page 13-19.
- Inputs his name on the USERS screen under SUPERVISOR NAMES (see Section 13.5, page 13-10). Inputs the name of all MMTS staff present under STAFF NAMES.
- If the systems do not respond as expected, notify the Facility Manager who will contact Maintenance to correct the problem if he/she is unable to resolve the concern.

At the start of workday, a Flask Handling Area worker performs the following actions:

- Retrieves a wireless handheld data input unit and touches the screen to gain access. Verifies that the PCDAS input screen is present (an image of the input screen is shown in Section 13.5 on page 13-21).
    - If the input screen fails to appear, turns on the wireless handheld data input unit; checks for sufficient battery reserve; and initiates the PCDAS application by following the instructions in Section 13.5 on pages 13-19 through 13-21.
    - If the battery reserve is insufficient to turn on or to complete a full day of operations, attaches the wireless handheld data input unit to a charger and repeats the verification process with another wireless handheld data input unit.
    - Verify that process equipment is in a safe and ready condition to begin operations.

NOTE*: The Facility Manager shall be notified if any of the above checks are not satisfactorily met and cannot be corrected by the data acquisition system operator.*

13.3.2 Data Acquisition and Control System Operation

The data acquisition and control system for the MMTS monitors local environmental conditions as well as manages all process control necessary to support mercury transfer operations and material inventory. Environmental monitoring includes 16 channels of mercury concentration in air, inside and outside temperature and humidity, and barometric pressure. MMTS process monitoring and control includes 1-MT container weighing during mercury transfer operations, mercury transfer pump monitoring and control, and any process annunciators to alarm offnormal conditions.

A camera monitoring system and a fire protection and security system exist to support the facility. However, they function completely independently of the data acquisition and control system. The fire protection and security system is part of the MMTS and HWAD site monitoring. The camera system operates as a standalone system. The camera system provides multiple views back to a dedicated computer in the Facility Manager's office (Computer Area).

13.3.3 Required Equipment and Supplies (PPE as specified on page XI of the Executive Summary under General Safety and Health)

- Sixteen (16) sensors/data recorders for mercury concentration in air
- Environmental data logging system [inside and outside thermometers and humidity and barometric pressure(equal inside and outside)]
- Process monitoring and control includes weight sensors/recorders for two scales
- Mercury transfer pump sensor

Process annunciators

13.3.4 Maintenance

- Maintenance on PCDAS should be performed as directed by and to the schedule suggested in the manufacturer's operation and maintenance manual (see reference in Section 13).

- The Facility Manager or designee should shut down the PCDAS and MMS, including the computers, prior to maintenance or power outage by following the instructions in Section 13.5 on pages 13-17 and 13-18.

- Following maintenance or power outage, the Facility Manager or designee should restore power to the PCDAS and MMS by following the instruction in Section 13.5 on page 1319.

13.4 RECORDS

The data acquisition system can generate reports from the records it collects automatically (see description of data acquired in Section 13.2) and the data input into it. The reports may be generated from the PCDAS computer in the Computer Area. The Facility Manager or designee accesses the computer screen shown in Section 13.5 on page 13-9. Instructions for creating a new report or retrieving a previously created report are given in Section 13.5 on page 13-16.

The details of the two report types (summary and detailed) are given below.

- <u>Weekly/monthly summary report</u>
    1. Reporting period – accumulated weekly and reports generated as needed.
    2. Amount of mercury transferred from 3-L to 1-MT containers during the reporting period.
    3. Number of 1-MT containers filled during the reporting period.
    4. The specific warehouse(s) receiving 1-MT containers and the number of 1-MT containers received during the reporting period.
    5. The specific warehouses(s) contributing 3-L containers, drums and pallets and the number of each removed during the reporting period – make a note of any deviations from six flasks per drum and five drums per pallet.
    6. Maximum and minimum environmental parameters measured during the reporting period with the date and time of each measurement (timestamps).
    7. Maximum and minimum mercury concentrations measured during the reporting period with timestamps.
    8. Summary of any unexpected/off-normal events that occurred during the reporting period with timestamps (where possible) and all personnel involved.

- <u>Weekly/monthly detailed report</u>
    1. Reporting period – accumulated weekly and reports generated as needed.

2. Amounts of total and daily transfers of mercury from 3-L to 1-MT containers during the reporting period.
3. Total and daily number of 1-MT containers filled during the reporting period.
4. Mercury content of each of the 14 warehouses at the beginning and end of the reporting period, designate any buffer stocks in Building 110-66 as such.
5. The specific warehouses(s) contributing 3-L containers, drums and pallets and the number of each removed during the reporting period – make a note of any deviations from six flasks per drum and five drums per pallet – list drum and pallet numbers with timestamps – present incremental (time period) and total datasets.
6. The specific warehouse, the drip tray locations within the warehouses [locations should be equivalent between warehouses (e.g., 110-52-1 should be at the same relative location as 110-93-1)] and number of 1-MT containers on each drip tray, including timestamps – present incremental (time period) and total datasets.
7. Daily maximum and minimum environmental parameters with timestamps.
8. Daily maximum and minimum mercury concentrations with timestamps.
9. Detailed explanation of any unexpected/off-normal events that occurred during the reporting period with timestamps (where possible) and all personnel involved.

The data acquisition system is designed to run periodic operating system backups and data archiving. Operating information is provided in the Saber operation and maintenance manual and in the video featuring the representative of the data acquisition system supplier.

13.5 ATTACHMENTS

Excerpted pages 7-22 of 47 from Saber's Operations and Maintenance manual

6 GUI Interface

There are 4 pages available to the operator for system control and reporting control.
Main
Trend
Alarms
Reports

6.1 Main

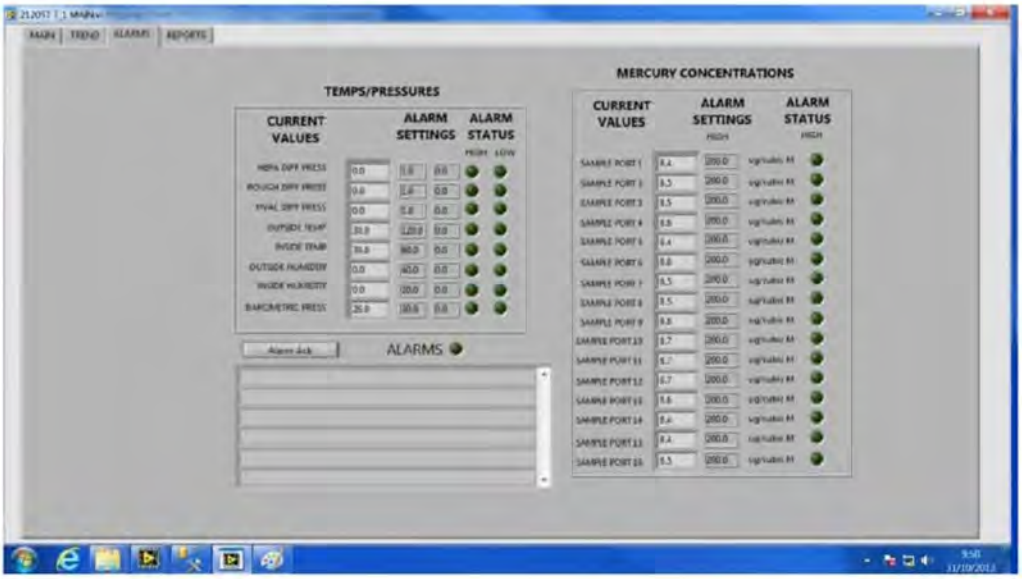
The main screen is where the operator will enter information for transferring MT's and filling MT containers.

There are three operations that happen on the **Main** screen
Transferring MT's to warehouses
Listing the names of current users
Filling MT's

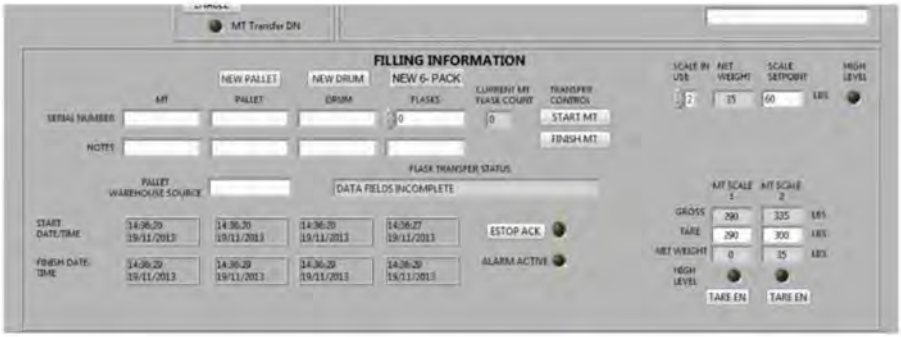
Transferring MT's and Listing Staff Names

6.2 Alarms

The alarm screen provides feedback for the user to identify if a measured value is out of range. It also provides access to the user to set the limits of the alarms and provides the current value of the measured variable. Also available on the alarms screen is a list of alarms that have occurred.

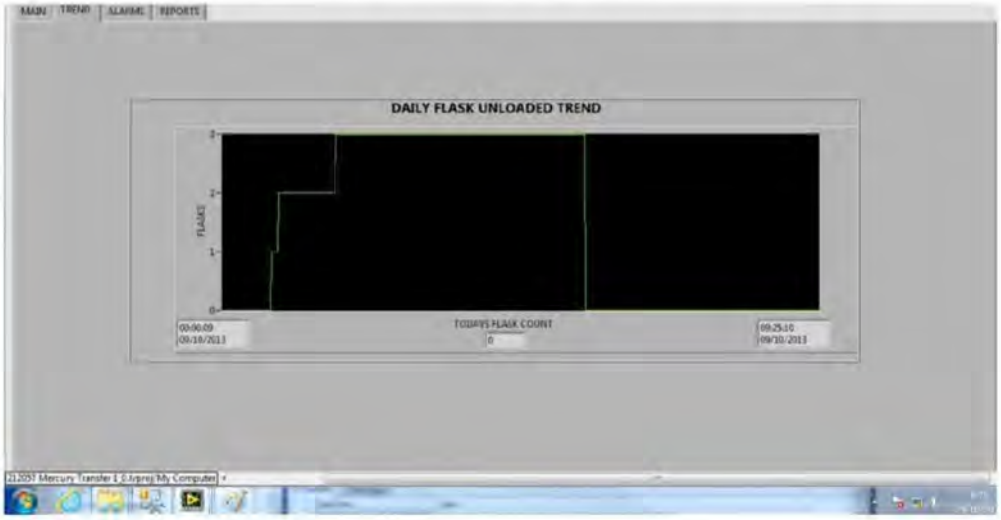


6.3 Filling MT's



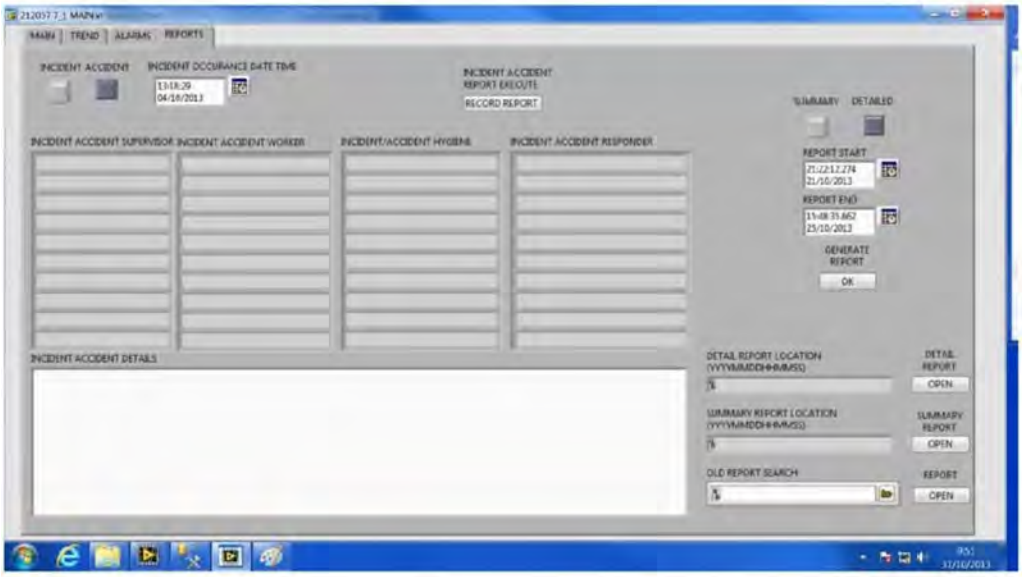
6.4 Trending

The trending screen displays how many flasks have been transferred in the last 24hrs. The current daily flask count is also displayed at the bottom of the screen.



6.5 Reports

The reports screen allows the user to create a incident/accident report as well as generate a report from the transfer data. The reports are created in ".PDF" format.



6.6 System Operation

The system is operated from the 4 screens listed above. The following instructions are to document the operation sequence of the different functionality of the system.

6.6.1 User Entry

The user entry section allows data entry of the staff on duty. Supervisors, workers, and hygiene staff must log in for the system to track whom was present during alarms.

1. Click in a box below the user column appropriate to the user's duty.
2. Type the first and last name of the user.
3. Click anywhere outside the box.

6.6.2 MT Filling

1. The MT filling process is controlled from the MAIN page.
2. The operator selects the main page. (The wireless terminal is always on the main page. Use tabs at the top of the screen if using a stationary computer.)
3. The operator brings a 6-pack of flasks into the area where mercury transfer is accomplished.
4. The operator loads an MT on one of the scales
5. The operator selects which scale that the MT is loaded on.
6. The operator selects the scale maximum setpoint.
7. The operator Presses and releases the "TARE EN" button
8. The operator Enters the following information in the fields shown
9. MT Serial Number
10. Pallet Serial Number
11. Notes regarding the Pallet
12. Drum Serial number
13. Notes regarding the Drum
14. The quantity of flasks in the 6-pack
15. Notes regarding the flasks in the 6-pack
16. Warehouse that pallet was sourced from
17. Operator presses the "START MT" button.
18. The operator presses and holds the foot pedal to start the mercury transfer process.
19. When a flask is empty, the user releases the foot pedal and moves the suction hose to the next flask.
20. Step 9 is repeated until the all flasks in the 6-pack are empty.

Presenting a new 6-Pack

1. DO NOT PRESS FINISH "MT UNLESS" THE MT IS COMPLETE
2. The operator releases the foot switch and the pump stops.
3. The operator presses the "NEW 6-pack" button on the MAIN page. (The button will stay selected after release)
4. The operator enters the flask count and 6-pack notes if necessary.
5. The operator presses the "NEW 6-pack" button on the MAIN page. (The button will now turn off)

Go to step 14 in "MT Filling" above.

Presenting a new DRUM

1. DO NOT PRESS "FINISH MT" UNLESS THE MT IS COMPLETE
2. The operator releases the foot switch and the pump stops.
3. The operator presses the "NEW DRUM" button. (The button will stay selected after release)
4. The operator enters the "NEW DRUM" button. (The button will now turn off)

Go to step 14 in "MT Filling" above.

Presenting a NEW PALLET

1. DO NOT PRESS "FINISH MT" UNLESS THE MT IS COMPLETE
2. The operator releases the foot switch and the pump stops.
3. The operator presses the "NEW PALLET" button. (The button will stay selected after release)
4. The operator enters the "NEW PALLET" button. (The button will now turn off)

Go to step 14 in "MT Filling" above if necessary

Finishing an MT

1. The operator releases the foot switch and the pump stops.
2. Press the "FINISH MT" button

EMERGENCY STOP

There are two EMERGENCY STOP mushroom pushbuttons. If one of the emergency pushbuttons is pressed, perform the following.

1. Identify the problem that instigated the ESTOP condition.
2. Rectify the condition that instigated the ESTOP
3. Twist the ESTOP pushbutton to reset the button.
4. Press the ESTOP acknowledge button the MAIN screen to allow pumping to begin again.

6.6.3 MT Transfer

The MT transfer function allows the operator to move the MT from one warehouse to another or from the filling trailer to the warehouse. To perform an MT transfer, perform the following:

1. Navigate to the "MAIN" page. (Use the tabs at the top of the screen)
2. Enter the MT serial number in the "MT S/N" box on the MAIN page in the upper left hand corner of the screen.
3. Enter the warehouse that the MT will be sent to in the "MT DESTINATION" box
4. Enter the location within the warehouse that the MT will be sent to in the "MT DESTINATION IN WAREHOUSE BOX".
5. Press and release the "ENABLE" button

6.6.4 Trending

Trending allows the user to identify how many flasks have been transferred since midnight the day before. Therefore, each night at midnight the daily count will be set to zero. There are no controls on this screen.

6.6.5 Alarms

The alarm screen provides information to the user with regard to alarm limits. At the bottom left of the screen is also an alarm display to show the alarms that have occurred. Alarms are listed as follows.

Date-Time-Alarm type-Value of the variable-Alarm setpoint

Setting alarm limits
The alarm limits are located to the right of the variable displayed on the alarm screen. Except for the mercury levels, each setpoint has a high and low.

Changing Limits:

1. Navigate to the "ALARMS" screen. (Use the tabs at the top of the screen)
2. Click in the box to the right of the variable that you would like to change.
3. Verify that you are changing the "HIGH" or "LOW".
4. Enter the new value
5. Click anywhere outside the alarm limit box.

6.6.6 Reports

The reporting page allows the user to enter an accident/incident report or produce a report from the system database. The reports are created in an adobe acrobat format. "xxxx.pdf"

Accident/Incident reports:
Accident/Incident reports are based on the time and whom was present at the incident/accident occurrence.

To record an accident or incident report:

1. Navigate to the "REPORTS" page (Use the tab at the top of the screen)
2. Click the button at the top left of the screen that indicates the type of report desired. (The options are accident or incident)
3. Enter the date of the incident or accident (If the date icon is clicked, the date can be selected using a dialog box.)
4. Enter the time of the incident or accident (The time can be entered manually by clicking the icon as stated in item 3)
5. Enter the full names of the Supervisors on duty at the time of the incident/accident.
6. Enter the full names of the workers/staff on duty at the time of the incident/accident.
7. Enter the full names of the Hygiene staff on duty at the time of the incident/accident.
8. Enter the full names of the Responders on duty at the time of the incident/accident.
9. Enter the details and notes desired in the white space near the bottom of the screen labeled "INCIDENT ACCIDENT DETAILS" by clicking in the white area and typing the desired notes.
10. When all information is complete, click the "RECORD REPORT" button and the report will be saved to the database.

Summary/Detail reports

Summary and Detail reports are generated from the "REPORTS" page. To generate a Summary or Detail report, do the following:

1. Navigate to the "REPORTS" page (Use the tab at the top of the screen.)
2. Select the type of report desired by clicking the button under the report type.
3. Select the time and date for the beginning of the report by clicking the icon next to "REPORT START"
4. Select the time and date for the ending of the report by clicking the icon next to "REPORT END"
5. Click on the "OK" button below Generate Report.
6. The filename and path will be displayed in a window below the "OK" button.
7. The window displaying the report name will be based on which report is generated. Observe that titles of the windows. They are "DETAIL REPORT LOCATION" or "SUMMARY REPORT LOCATION".
8. Click the "OPEN" button that is located to the right of the report to be opened.
9. Report will open in WordPad.
10. Click the "X" in the upper right hand corner of word pad to close the report.

Opening existing reports

1. The report page provides a tool for opening existing reports. To open an existing report:
2. Navigate to the "REPORTS" page (Use the tabs at the top of the page)
3. Locate the "OLD REPORT SEARCH" at the lower right hand corner of the screen.
4. Click the folder icon located to the right of the white box.
5. Use the windows dialog box to locate the file you would like to open.
6. Click on the desired file. (Not that the type of report is in the file name)
7. Click "OK".
8. After the windows dialog box closes, locate the "OPEN" button located under "Report".
9. Click the "OPEN" button.
10. The file will open in WordPad.
11. Click the "X" in the upper right hand corner of WordPad to close the report.

6.6.7 Powering Down the system

Powering down the control system for the mercury transfer system requires several steps. They are listed below.

Control PC shutdown

1. From the User screen navigate to the "Main" page.
2. Click the "Finish MT" button.
3. Click the "STOP APPLICATION" button.
4. Click the "CLOSE APPLICATION" button on the popup screen.
5. Click the windows icon in the lower left corner of the screen.
6. Click the "shut down" button.
7. Wait for the windows to shut down completely. (The screen will go dark)

Mercury Monitor PC shutdown (It has the label "Turtle" on the front)

1. Navigate to the top of the screen.
    a. Click "measurement"
    b. Click "stop measurement"
2. Click the "X" at the top right hand corner of the window.
3. Click "yes" on the confirmation box.
4. Click the windows icon in the lower left corner of the screen.
5. Click the "shut down" button.
6. Wait for the windows to shut down completely. (The screen will go dark)

Mercury Monitor Control Cabinet (see photo at right)

1. Open the door to the control cabinet.
2. Turn the black switch at the bottom left corner of the cabinet to the "OFF" position.
3. Close the cabinet door.

Mercury Transfer Control Cabinet (see photo at right)

1. Open the door to the cabinet.
2. Locate the main circuit breaker. See photo below
3. Move the grey switch on the main circuit breaker to the "OFF" position. (Move to the right for the originally installed equipment.)
4. Close the door of the electrical panel.

Close all the electrical panels. The system is now powered off.

6.6.8 Powering up the system (Refer to the power down system instructions for figures)

1. Turn on the power to the mercury transfer control cabinet
2. Turn on the power to the mercury monitoring cabinet.
3. Turn on the power to the mercury transfer PC. (The "GUI" pc)
4. Turn on the power to the mercury monitoring PC. ("Turtle")
5. Close all of the electrical panels. The system is now powered on. The PC's boot to their applications automatically.

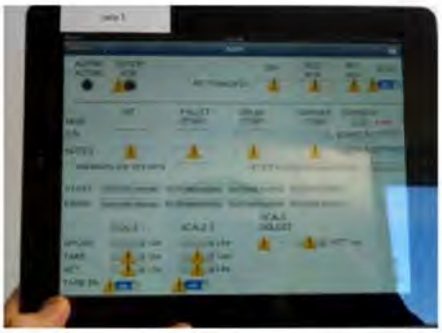
6.6.9 Powering up the IPAD (wireless terminals)

1. Press and hold the power button at the top right corner of the IPAD.
2. Screen will show an apple to indicate the boot process has begun.
3. When boot is complete the following screen will be shown
4. Touch the screen and slide the white button in the direction of the arrow. This will unlock the screen.
5. From the page shown, touch and slide the screen to the left.

6. Double touch the "dashboard" icon.

7. You will see a "National Instruments" screen when the application is booting.
8. Single Touch the play button.

9. The application is now running. You may see warning icons as shown below. This indicates that the screen has not been updated yet. When the user begins entering data, the fields will update with each change. This only occurs when the system is powered off or the data connection is broken.



10. The wireless terminal is now ready to use. The controls are the same as that of the PC.

14 - MERCURY VAPOR MONITORING SYSTEM

Title: Mercury Vapor Monitoring System **Doc. No.** MMTS-14-Rev4

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

Rev. No.	Change description	Author
4	Annual Review - Updated signatory authority to reflect current required signatures. Added Revision number to document number.	Rob Mathias
3	DLA Strategic Materials is removing the current language that states tests should be conducted to 4 detectors daily with a known concentration of mercury. We believe the technical basis from the manufacturer of the MMS supports our proposal due to the continuous reading and calibration of the MMS system. MOC has been approved.	Rob Mathias
2	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
QP.EMS.HG.0006	Mechanical Integrity Procedure (Tier 1)
	Mercury Monitoring System MMS-16: Operating Manual, Version 2.0
Chapter 12, SOC.OHS.SP.0002	Lockout/Tag Out
Chapter 10, SOC.OHS.SP.0002	Hot Work Permit
Procedure MMTS-13	Data Acquisition and Inventory Management
QP.EMS.HG.0007	Management of Change (Tier 1)

14.1 PURPOSE

This procedure addresses operation of the mercury vapor monitoring system in the MMTS at HWAD. The purpose of this procedure is to ensure that the mercury monitoring equipment associated with the MMTS is designed, installed, maintained, and operated correctly. Proper operation of the mercury monitoring system ensures that operating personnel in the MMTS are not exposed to mercury vapor in excess of the limits recommended by the American Conference of Governmental Industrial Hygienists and it evaluates the effectiveness of the OG treatment system for removing mercury vapor from the OG stream.

14.2 SCOPE

This procedure applies to staff and contractors that inspect, test, or maintain the mercury monitoring equipment within the MMTS.

14.3 PROCEDURE

The primary mercury vapor monitoring system is an automated system that sequentially monitors fixed locations in the MMTS and records the measurements for historical information. Personnel may use portable mercury monitoring instruments (e.g., the Jerome J505 Mercury Vapor Analyzer) to supplement the automated measurement system and/or to monitor the facility in the event that the automated system is not functioning properly.

The Facility Manager shall verify that the system is functioning at the start of each workday.

14.3.1. Equipment Needed

- Automated MMS with computer – 16 sensors/data recorders for mercury concentration in air with high vapor alarm(s)
- Hood face velocity sensors
- Interface of the automated MMS with the MMTS facility's data acquisition system

- Portable mercury monitoring instruments (as required).

14.3.2. Inspection and Testing

- Facility Manager identifies CAPP-regulated mercury monitoring system equipment subject to this procedure and identifies the schedule for the conduct of inspections and tests based on manufacturer's information or good engineering practices, or more frequently, if determined to be necessary by previous experience in operating the equipment.

- Staff (or contractors) performs inspections and tests of the CAPP-regulated equipment. Safe work practices, such as the HWAD Lockout/Tagout and Hot Work supporting procedures, apply to equipment identified in this procedure.
- Staff will startup, operate, and shutdown mercury monitoring instrumentation in accordance with the instructions found in the MMS operating manual.
- Staff will have mercury monitoring instruments calibrated on the frequency recommended by the manufacturers, Mercury Instruments (see Attachment 1) and Arizona Instrument.
- Staff (or contractors) document the following on the appropriate inspection/testing forms:
    - The date of the inspection or test
    - The name of the person who performed the inspection or test
    - The serial number or other identifier of the equipment on which the inspection or test was performed
    - A description of the inspection or test performed
    - The results of the inspection or test

If there is a deficiency, staff (or contractor) will notify the MMTS Facility Manager for issues needing resolution; the Facility Manager considers the need for Management of Change.

14.3.3. Maintenance

- Staff (or contractors) correct any deficiencies in the equipment that are outside the acceptable limits which are described in the MMTS process safety information before using the equipment again.

NOTE*: Deficiencies posing immediate threat to safety, health, or the environment, as identified in this procedure, are corrected immediately. Otherwise, deficiencies are evaluated and prioritized by the Facility Manager and corrected accordingly.*

- The MMS has sample point filters that should be changed regularly based on cleanliness of the operation—change out may occur anytime from once every two weeks to once a year (see MMS-16 operating manual).
- Prior to maintenance on the MMS, the Facility Manager or designee follows the shutdown steps in Section 13.5 on pages 13-17 and 13-18. The Facility Manager or designee starts up the MMS by following the steps in Section 13.5 on page 13-19.

14.3.4. Quality Assurance/Quality Control

- Changes, new equipment, instruments and controls are checked by the Facility Manager or designee before implementation/installation to ensure suitability with the process by following the Process Safety Information, Process Hazard Analysis, Management of Change, and Pre-Startup Safety Review procedures.
- The Facility Manager or designee ensures that maintenance materials, spare parts, and equipment are suitable for the process for which they will be used.
- Part Replacement and Quality Control

Part replacement will occur as needed or required by operation maintenance procedures. All parts removal/replacement shall be performed in accordance with instructions cited in the manufacturer's operation and maintenance manual (see MMS-16 operating manual) or Best Engineering Practices. If there are competing instructions or recommendations, the most conservative (personnel safety protective) instructions will be followed.

Check spare parts storage for replacement part availability. If the part/component is available, confirm part model number with review by the shop Supervisor. Once the part has been verified, then proceed with replacement.

If parts/components are not available from spare parts supply, the part/component will be ordered as follows:

- Replacement parts/components shall be replacement in kind.
- If a replacement in kind part/component is not available, the proposed replacement part /component shall be subject to review by the Mechanical Integrity Team as described in the Tier 1 Procedure to ensure that it is suitable for the process in which it will be used. This process shall be subject to Management of Change, Process Safety Information, Pre-Startup Safety Review and, if warranted, a Process Hazard Analysis.
- Check the part model number and compare it with the as-built drawings and the Maximo or equivalent parts listing.
- Order the part/component; ordering of the part/component shall be in writing to the Maintenance Section.

- During the process of ordering the part/component, a second check shall be performed against Maximo or equivalent to ensure accuracy of the part/component.
- The Purchase Request will be submitted to Manager of Quality Control for analysis in the Government Industry Data Exchange Program to ensure vendor acceptability prior to submission of Purchase Request to the Purchasing Agent.

When the ordered part/component is received, verify the correct part model number against the part order form. Shop Supervisor will also confirm the correct part model number has been received prior to use and replacement of the defective part/component.

- Any staff member discovering a nonconforming item or material (including suspect/counterfeit items) notifies their manager to initiate resolution of that nonconformance. The manager notifies the Environmental Services Manager and the Quality Assurance Manager of the nonconformance.
- The nonconformance resolution process, overseen by the Quality Assurance Manager, provides for the identification, control, and resolution of problems associated with items, activities, or conditions that do not conform to requirements. The process also provides a means for preventing the inadvertent installation or use of nonconforming items, materials, or services.

Install the part/component by ensuring all required lock out/tag out requirements have been completed, or that the system(s) are at a zero energy state.

- Install part/component in accordance with manufacturer's instructions or recommendations.
- After installation the shop Supervisor will verify the part/component has been installed per manufacturer recommendation or specification. Both the Operator and the Supervisor shall sign the work order form verifying the correct part/component was used and installed correctly. The work order form will be returned to the Manager of Maintenance, Planning, and Housing for data entry into Maximo or equivalent.
- After verification that the part/component has been installed correctly, the lock out/ tag out devices shall be removed and the system energized if required.
- Verify replacement part is functional and operates in accordance with operating manual or best engineering practices.

14.4 METRICS

Weekly, monthly, biannual and/or annual inspections, tests and maintenance will be tracked and the results documented. Deficiencies found will be trended and that information will be used to evaluate the need for more frequent inspections or tests.

14.5 RECORDS

- Facility Manager, staff and/or contractor training records.
- Inspection, testing and maintenance records for each piece of regulated equipment are maintained for a period of at least five years after the inspection/test/maintenance activity.

Instrumentation calibration records are maintained for a period of at least five years after the activity.

Management of Change records

15 - INSPECTION, TESTING AND MAINTENANCE

Title: Inspection, Testing, and Maintenance **Doc. No.** MMTS-15-Rev5

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

Rev. No.	Change description	Author
5	Annual Review - Updated signatory authority to reflect current required signatures. Added Revision number to document number.	Rob Mathias
4	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
2	Replaced and made changes to §15.3.4 and §15.4.2.	Burton Packard and Renee Rodriguez
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
QP.EMS.HG.0006	Mechanical Integrity Procedure (Tier 1)

	Manufacturer's Equipment Information
QP.EMS.HG.0007	Management of Change (Tier 1)
Procedure MMTS-10	Waste Management
Procedure MMTS-13	Data Acquisition and Inventory Management
Chapter 10, SOC.OHS.SP.0002	Hot Work Permit
Chapter 12, SOC.OHS.SP.0002	Lockout/Tag Out

15.1 PURPOSE

This procedure addresses inspection, testing and maintenance of the mercury transfer equipment within the MMTS, equipment related to worker and environmental health and safety, the air handling equipment within the MMTS, the power supplies and instrumentation within the MMTS and the equipment specific to the MMTS. This procedure is designed to address CAPP requirements as defined by the HWAD Mechanical Integrity Procedure. The purpose of the Mechanical Integrity Procedure is to ensure that critical process equipment associated with the MMTS is designed, installed, maintained, and operated correctly. That procedure verifies that operations and maintenance activities follow generally accepted sound engineering practices for the purpose of minimizing the risk of unintentional releases of elemental mercury (Hg).

***NOTE**: Activities related to the data acquisition system are covered in Procedure MMTS-13, "Data Acquisition and Inventory Management." Site Hot Work Permit and/or Lockout/Tagout procedures may apply to some steps within this procedure.*

15.2 SCOPE

This procedure applies to staff and contractors that inspect, test, or maintain the mercury transfer equipment located within the MMTS, equipment related to health and safety, the air handling equipment located within the MMTS, the power supplies and instrumentation located within the MMTS, and the equipment specific to the MMTS.

15.3 INSPECTION AND TESTING

15.3.1 Health and Safety

- Prior to any maintenance operations, the electrician and/or instrument technician shall:
    - Verify that all MMTS processes are in a safe standby mode.
    - Verify that power has been removed from all equipment to be checked for all inspections.
    - Verify that high voltages are not exposed for any calibration checks that require energized circuits.

- Ensure that all workers responsible for maintenance of the electrical and instrumentation systems of the MMTS use the following PPE when performing hands-on work on energized systems: safety glasses with side shields, insulating gloves and cotton work clothes. Additionally, remove all jewelry, including rings, and watches, from hands.

***NOTE**: PPE requirements apply when engaging voltages >50 V, including 120 VAC circuits.*

***NOTE**: All operations should be conducted with the module under consideration powered down if possible. Live hands-on testing should be minimized.*

***NOTE**: All site-established electrical and instrumentation guidelines are to be followed in conducting test and maintenance of equipment. This procedure does not supersede site requirements.*

***NOTE**: The Facility Manager and SOC supervisor shall be notified if any planned tasks cannot be adequately completed or if any off normal conditions are noticed.*

15.3.2 Equipment Needed

- Inspection and Testing Forms—See Tables 15.1-15.4 below.
- Tools
  - As specified in the manufacturer's testing, inspection and maintenance instructions
  - Conductivity probe to test the conductivity sensor on the MT container transfer fitting.

15.3.3 Inspection and Testing

- Facility Manager identifies the equipment subject to this procedure and identifies the schedule for conducting inspections and tests based on manufacturer's recommendations, good engineering practices, or more frequently if determined to be necessary by previous experience in operating the equipment.

Staff (or contractors) perform inspections and tests of the CAPP-regulated equipment. Safe work practices, such as the HWAD Lockout/Tagout and Hot Work supporting procedures, apply to equipment identified in this procedure.

Manual shutdown of the Process Control and Data Acquisition System (PCDAS) and the Mercury Monitoring System (MMS) is a rare event other than for maintenance on those systems. If a power outage will extend beyond 60 minutes (the nominal rating for the UPSs is 80 minutes), perform a manual shutdown of PCDAS and MMS by following the instructions in Section 13.3.2.

15.3.4 Items to be Inspected and Tested

The mercury transfer equipment items to be inspected or tested and the recommended frequency of inspection/testing are listed below. Information to be documented is given on the form shown in Section 15.7.

- Peristaltic pump and foot-activated on/off switch—verify that the speed and roller compression are optimal and that the foot-operated on/off switch is in working order. Operation of the peristaltic pump must be enabled by PCDAS. Follow the directions given in the Saber Operations and Maintenance manual, §6.6.2, steps 8-17 (see Procedure 13, Data Acquisition and Inventory Management, §13.5). Dummy values may be input for the purpose of performing this test.

- Flexible tubing at pump station
- Scales and shutoff control for pump (see note above)
- QD transfer fitting—conductivity sensor
- Flask trays
- Shaker tray
- Fume hood face velocity sensor
- Tubing from pump to MT container
- Emergency pump shut off (“E-stop”) at Supervisor’s station and at Fume Hood 2
- Flooring

Table 15.1. Equipment list for inspection and testing of the mercury transfer equipment

Equipment item	Inspection/test frequency
Peristaltic pump; foot-activated switch control; E-stop switch	Operability/pump settings - Before start of shift and per manufacturers recommended schedule
Flexible tubing at pump station	Cracks, discoloration - Before the start of each shift; replace weekly until operating experience assures that a less frequent replacement is appropriate.
Digital scales	Visual and pump shutoff setting - Before start of shift, quarterly check, and annual calibration
QD transfer fitting/conductivity sensor	Operability - Monthly

Flask trays	Cracks or visible mercury contamination - Weekly
Fume hood face velocity sensor	Alarm activation and screen readout - Before start of shift
Flexible tubing connections from the pump to the MT container – integrity of tube	Cracks, discoloration - Before start of shift
clamps inside and outside the fume hood, and at the QD transfer fitting	
Pump “E” stops	Operability - Before start of shift
Flooring	Tears or punctures that may allow mercury to pass through the floor liner - monthly and following any incident where heavy sharp objects are dropped or heavy objects are moved around within the MMTS

The air handling equipment items to be inspected or tested and the frequency of inspection/testing are listed in Table 15.2, Information to be documented is shown on the form in Section 15.7. Specific actions to be taken during inspection and testing are shown in Attachment 4, Section 15.8.

Table 15.2. Equipment list for inspection and testing of the air handling equipment

Equipment item	**Inspection/test frequency**
Fans	Daily
	Annually
Spare fans	Quarterly
HEGA filters	TBD
Offgas (OG) filters	Monthly until sufficient operating experience is gained to suggest a different interval is appropriate
Heat pump	Daily
	Annually
Fume hood	Annually
Snorkel	Annually
OG and HVAC ducts	Annually

HVAC registers	Annually

The power supplies and instrumentation items to be inspected or tested are listed below, and related information documented on the form shown in Table 15.3. Information to be documented is shown on the form in Section 17.7.

- Power connections
- Cooling fans and cooling fins
- Sensor calibration
- Power supply calibration

Table 15.3. Equipment list for inspection and testing of the power supplies and instrumentation

Equipment item	**Inspection/test frequency**
Power connections	Monthly - check for frayed wiring and/or bad connections and/or corrosion
Cooling fans and fins	Monthly - check for dust that might reduce cooling efficiency
Sensor calibration	Annually - consistent with vendor-supplied test and maintenance guidelines
Power supply calibration	Annually - consistent with vendor-supplied test and maintenance guidelines

The MMTS-specific equipment items to be inspected or tested are listed below, and related information documented on the form shown in Table 15.4. Information to be documented is shown on the form in Section 17.7.

- Building tie-downs
- Stabilizers
- Tires
- Electrical connections

Access doors and alarms

Table 15.4. Equipment list for inspection and testing of the MMTS-specific equipment

Equipment item	Inspection/test frequency
Building tie-downs	Annually or more frequently if specified by vendor or experience
Stabilizers	Annually or more frequently if specified by vendor or experience
Tires	Annually or more frequently if specified by vendor or experience
Electrical connections	Monthly or more frequently if specified by vendor or experience
Access doors and alarms	Monthly or more frequently if specified by vendor or experience

Table 15.5. Safety systems and mercury monitoring frequencies

Equipment item or task	Inspection/test frequency
Eyewash stations	Monthly or more frequently if specified by vendor or experience (see below for specific inspection details)
Portable snorkels	Monthly or as specified by vendor or experience to assess efficacy of charcoal/sulfur filters
Mercury levels in work areas	Weekly or more frequently if specified by vendor or experience
Mercury levels in dress areas	Weekly or more frequently if specified by vendor or experience
Mercury levels in office/general access areas	Weekly or more frequently if specified by vendor or experience
Mercury levels in break room and rest rooms	Weekly or more frequently if specified by vendor or experience

The emergency eyewash station(s) shall be inspected monthly for condition and adequate operation. Details of testing will be according to the manufacturer's operation and maintenance manual with; consideration of following basics elements: highly visible signage should be in place, the eyewash should be easily activated, water should flow equally from both nozzles at the same height in a steady stream until turned off, and water should drain adequately.

NOTE: Reference, *www.uottawa.ca/services/ehss/docs/eyewash_inspection_2009.pdf)*

- Mercury detection should consist of a visual inspection and mercury vapor analysis near floors, work surfaces, change lockers, and personnel trailer eating surfaces and restrooms.

15.3.5 Documentation of Inspection and Testing

Staff (or contractors) document the following on the appropriate inspection/testing form(s); refer to Section 15.7:

- Date of the inspection or test,
- Name of the person who performed the inspection or test,
- Serial number or other identifier of the equipment on which the inspection or test was performed,
- Description of the inspection or test performed, and

Results of the inspection or test.

If there is a deficiency, staff (or contractor) will contact personnel at the Trouble Desk to prepare a follow-on Work Order, and/or they will contact their supervisor.

15.4 MAINTENANCE

15.4.1 Maintenance Staff

Staff (or contractors) correct any deficiencies in the equipment that are outside the acceptable limits that are described in the MMTS process safety information before using the equipment again.

NOTE*: Deficiencies posing immediate threat to safety, health, or the environment, as identified in this procedure, are corrected immediately. Otherwise, deficiencies are evaluated and prioritized by the Facility Manager and corrected accordingly.*

15.4.2 Quality Assurance/Quality Control

- The Facility Manager or designee changes and checks new equipment, instruments, and controls before implementation/installation to ensure suitability with the process. This is to be achieved by following the Process Safety Information, Process Hazard Analysis, Management of Change, and Pre-Startup Safety Review procedures.

- The Facility Manager or designee ensures that maintenance materials, spare parts, and equipment are suitable for the process for which they will be used.

    - Part replacement will occur as needed or required by operation maintenance procedures. All parts removal/replacement shall be performed in accordance with instructions cited in the manufacturer's operations and maintenance manuals or Best Engineering Practices. If there are competing instructions or recommendations, the most conservative (personnel safety protective) instructions will be followed.

    - Parts will be replaced using exact replacements when possible. When exact replacement parts cannot be obtained, Management of Change will be followed to determine the appropriate replacement parts.

- Quality Control will be performed in accordance with the HWAD-specific maintenance/quality control procedures.
- After verification that the part/component has been installed correctly, the lock out/tag out devices shall be removed and the system energized if required.
- Verify replacement part is functional and operates in accordance with operating manual or best engineering practices.

15.4.3 Scheduled Maintenance

The peristaltic pump and the digital scales shall be maintained according to the manufacturers' recommended procedures as described in their maintenance and operations manuals. The digital scales shall be checked quarterly and calibrated annually and the date of calibration affixed to each scale.

The flexible tubing that passes through the peristaltic pump head is to be replaced weekly when operations in the MMTS begin, until an experience base is established. Thereafter, replace the flexible tubing that passes through the peristaltic pump head monthly (after approximately 16-20 hours of pump on-time). Twenty hours is significantly less than the manufacturer's data suggests; therefore, that timeframe may be changed as operating experience is gained.

Plastic spiral cord wrap is installed around the power cord for the vibration tray vibrator motor to provide the power cord with protection from abrasion through contact with the wall of Fume Hood 2. The plastic spiral cord wrap and vibrator motor power cord should be inspected to determine if any problems are emerging. The inspection interval should be monthly until sufficient operating experience is gained to suggest a different interval is appropriate.

Maintenance of the MMTS-specific equipment shall be performed on a schedule determined by the Facility Manager in consultation with HWAD maintenance staff based on experience, standards, and vendor/manufacturer recommendations.

15.5 METRICS

Daily, weekly, monthly, quarterly and/or annual inspections, tests and maintenance will be tracked and the results documented. Deficiencies found will be trended and that information will be used to evaluate the need for more or less frequent inspections or tests.

15.6 RECORDS

Inspection, testing and maintenance records for each piece of regulated equipment are to be maintained for a period of at least five (5) years after the inspection/test/maintenance activity.

Nonconformance Reports

Management of Change records

Records specific to air handling equipment – MMTS log including Data Acquisition System readings

Records specific to instruments and power supplies – All instrument and power supply calibration results should be kept in a calibration log.

15.7 FORMS

Inspection and Testing Form for Mercury Transfer Equipment

Equipment item	Inspection/ test frequency	Date of inspection/ test	Performed by	Equipment Serial No.	Description of inspection/ test	Results
Peristaltic pump; foot activated switch control; E-stop switch	Before start of morning shift; manufacturer's schedule				Visual and pump settings; emergency stop; manufacturers recommended maintenance	
Digital scales	Before start of morning shift quarterly; annual				Visual to ensure zero settings and pump shutoff setting; operability check; calibration	
Tubing from the pump to the MT container	Before start of morning shift				Visual for piping/tubing connections and proper installation of transfer fitting in MT container	
Pump "E" stops	Before start of morning shift				Pressing E-stop must turn off pump	
Fume hood face velocity sensor	Before start of morning shift				Moving sash above threshold level must trip audible alarm and register on the digital readout screen	

Flooring	Monthly and following any incident where heavy sharp objects are dropped or heavy objects are moved around within the MMTS				Visual for tears or punctures that may allow mercury to pass through the floor liner	
Flask trays	Weekly				Visual for cracks and Hg contamination	
QD Transfer fitting/conductivity sensor	Monthly				Verify that closed circuit of conductivity sensor turns off pump	
Flexible tubing	1 month or 20 hrs. of pump-on operation				Visual for cracks, discoloration	
Equipment Item: Plastic spiral cord wrap and vibrator motor power cord	Inspection/test frequency: Monthly until sufficient operating experience is gained to suggest a different interval is appropriate.				Description of inspection/test: Visual for wear	

Inspection and Testing Form for Air Handling Equipment

Equipment item	Inspection/ test frequency	Date of inspection/ test	Performed by	Equipment Serial No.	Description of inspection/ test	Results
Fans	Daily				Visual. general noise level	
Heat pump	Daily				Data Acquisition System readings	
OG filters	Monthly replacement until sufficient operating experience is gained to suggest a different interval is appropriate				Records of the roughing filter pressure drop accumulated by the PCDAS should be examined and compared with performance of the air flow at the fume hoods. A 1-in. w.g. pressure increase may indicate that the filter needs replacement.	
Spare fans	Quarterly				Rotate shaft	
Fans	Annual				Overall system check	
Heat pump	Annual				Data Acquisition System readings and overall system check	
Fume hoods	Annual				Overall system check	
Snorkels	Annual				Overall system check	

OG and HVAC ducts	Annual				Overall system check	
HVAC registers	Annual				Clean	
HEGA filters	TBD				Observe changes in vapor readings	

Inspection and Testing Form for Power Supplies and Instrumentation

Equipment item	Inspection/ test frequency	Date of inspection/ test	Performed by	Equipment Serial No.	Description of inspection/ test	Results
Power connections	Monthly				Visual – check for frayed wiring and/or bad connections and/or corrosion	
Cooling fans and fins	Monthly				Visual – check for dust that might reduce cooling efficiency	
Sensor calibration	Annually				As directed in vendor-supplied test and maintenance guidelines	
Power supply calibration	Annually				As directed in vendor-supplied test and maintenance guidelines	
Generator inspections and testing	Weekly, Monthly, Annually and based on hours of operation				As directed in Procedure 24 and in vendor-supplied test and maintenance guidelines	

Inspection and Testing Form for MMTS-Specific Equipment

Equipment item	Inspection/ test frequency	Date of inspection/ test	Performed by	Equipment Serial No.	Description of inspection/ test	Results
Electrical connections	Monthly or more frequently if specified by vendor or experience				As recommended by vendor	
Access doors and alarms	Monthly or more frequently if specified by vendor or experience				As recommended by vendor	
Building tie-downs	Annually or more frequently if specified by vendor or experience				As recommended by vendor	
Stabilizers	Annually or more frequently if specified by vendor or experience				As recommended by vendor	
Tires	Annually or more frequently if specified by vendor or experience				Measure air pressure; perform visual inspection for dry rot	

Nonconformance Report

MMTS	**MMTS Receipt Inspection**	**Report Number**

Section 1 *To be completed by the Inspector*

16 Contract number and Item Number(s):

17 Contract title:

18 Contractor:

19 Item identification:

20 Requirement:

21 Description of the non-conformance:

22 Proposed remedial action: [ ] use as is [ ] rework [ ] repair [ ] reject [ ] alt. use **23** List of attachments:

24 Proposed non-conformance category: [ ] **MINOR** non-conformance
(*Report to be sent to DLA for information and remedial action implemented)*
[ ] **MAJOR** non-conformance
(*Remedial action to be implemented only after DLA written acceptance)*

Contractor's Responsible Officer	Contractor's Quality Officer
Name *Date* *Signature*	*Name* *Date* *Signature*

Section 2 *To be completed by DLA*

Technical Responsible Officer Decision:	QA Technical Officer Comment:
Name *Date* *Signature*	*Name* *Date* *Signature*
Chief Engineer Comment:	
Name *Date* *Signature*	

15.8 ATTACHMENTS

This section has five attachments, as follows:

- Masterflex® I/P® pump drive, EW-77411-00 (Attachment 15.1)
- Conductivity probe, ELC-9-1 (Attachment 15.2)
- Digital scales, Arlyn 5200 Series, Large Floor Scale (Attachment 15.3)
- Digital scales, PDS-1000 Drum Scale (Attachment 15.4)
- Specific actions to be taken during inspection and testing of air handling equipment (Attachment 15.5)

ATTACHMENT 15.1 Masterflex® I/P® pump drive, EW-77411-00.

MASTERFLEX®

I/P®

77411-00 pump drive

Model Nos.
N° de modèle
Modellnummer
Número de modelo
Modello nº

77410-10
77411-00

OPERATING MANUAL:
PUMP DRIVES
pages 1-10

MODE D'EMPLOI:
ENTRAÎNEMENTS DE POMPES
F1-F10

BETRIEBSANLEITUNG:
PUMPENANTRIEBE
D1-D10

MANUAL DE FUNCIONAMIENTO:
MOTOR DE BOMBAS
E1-E10

MANUALE DI ISTRUZIONI:
UNITÀ DI CONTROLLO POMPA
T1-T10

Cole-Parmer Instrument Co.
1-800-MASTERFLEX (627-8373) (U.S. and Canada only)
11 (847) 549-7600 (Outside U.S.) • (847) 549-7600 (Local) • www.masterflex.com

Barnant Company
1-800-637-3739 (U.S. and Canada only)
11 (847) 381-7050 (Outside U.S.) • (847) 381-7050 (Local) • www.barnant.com

A-1299-1037
Edition 02

ATTACHMENT 15.2 Conductivity Probe, ELC-9-1

Advanced Control Technology Inc.

The Leader in Industrial and Commercial Sensors and Controls

"If You don't see what you need Contact Us" Contact Us

Home
Custom Sensors
Switches
Controls
About Us
Search
Contact Us

Toll Free:
1-877-800-8820
Email:
info@actsensors.com

Liquid Level Sensor

Electronic Level Control ACT ELC-9-1 for tank control pump up or down

Application:

Detect conductive liquids with probes set at high and low control points and cycle the output relay between these probes. **Pump Up (filling) or Pump Down (emptying** independently field selectable.

Features:

- ✓ 100,000 ohms conductivity range
- ✓ Double power connections
- ✓ AC probe signal prevents probe plating
- ✓ SPDT output relay
- ✓ Control functions field selectable

Options:

- ✓ Enclosures
- ✓ Power relays
- ✓ Snap in mounting hardware

A.C.T. will modify controls to provide the best solution for your application.

Specifications:

Board size 4"x 3"
Sensitivity range (ohms) 100,000

Ordering Information

Select Qty:	Part Number	Image & Data	Supply voltage	Output relay	Power consumption	Probe voltage	Qty. in Stock
0	ELC-9-1-120A-S-Q		120 VAC	10 amp SPDT	4.5 watts	6 VAC	1400

Quantities greater than 10 qualify for quantity discounts.

ATTACHMENT 15.3 Digital scales, Arlyn 5200 Series, Large Floor Scale

ARLYN SERIES 5200 LARGE FLOOR SCALES

THE FIRST LARGE PLATFORM SCALE WITH ONE INEXPENSIVE FEATURE- THE PRICE!

Indicator Included

Don't be fooled. The new Arlyn Series 5200 all electronic Large Floor Scales boast expensive features. Instead of aluminum or plated steel, there are four heavy duty stainless steel load sensors, for maximum ruggedness. While inexpensive scales use a simple enamel paint, Arlyn applies a 3-part galvanized epoxy coating for maximum protection. Others us a cheap readout. Arlyn provides a water resistant, fully graphical, fully programmable, large LCD display. In fact, the only inexpensive feature you'll find on these scales is the price. But that's perfectly understandable. Because ARLYN electronic scales are shipped to you direct from the factory, and require no dealer services. So instead of paying for a scale and a dealer, you pay only for the scale you need and nothing more.

Weighs in lbs., grams, kg.,ounces, troy, grains, etc.

Ramps Optional

EXPENSIVE SCALE FEATURES

(Features found on scales costing 3 to 5 times as much as Series 5200)

HIGH ACCURACY - High weight resolution to 0.5 lbs.
- Internal resolution to 1 part in 500,000

EXTREMELY DURABLE - Rugged heavy-duty construction
- Stainless steel "ArlynLOAD" cell system
- Large diamond plate low profile platform
- 3-part galvanized epoxy platform coating
- Adjustable large diameter leveling legs
- Remote mount water resistant display

ELIMINATES MAINTENANCE - No moving parts

EASY OPERATION - Pushbutton functions for automatic and keyboard tare, tare functions with memory, net/gross
- Unit conversion with mode indicators
- Movable display head for easy viewing

NO SET UP OR DEALER SERVICES -
- Automatic calibration functions

All other models also available in **ss** (stainless steel construction)

Model number	5-3305	5-4404	5-4405	5-4405ss	5-5510
Capacity	5000 lb. 2200 kg	2500 lb. 1150 kg	5000 lb. 2200 kg	5000 lb. 2200 kg	10000 lb. 4400 kg
Readability	1 lbs. .5 kg	.5 lb. .2 kg	1 lb. .5 kg	1 lb. .5 kg	2 lb. 1 kg
Internal Res.	1 part in 500,000	1 part in 500,000	1 part in 500,000	1 part in 500,000	1 part in 500,000
Platform Dimensions	3' x 3'	4' x 4'	4' x 4'	4' x 4'	5' x 5'

Most other sizes and capacities are available, up to 8' x 10' and up to 30,000 lbs. CALL!

ADDITIONAL SPECIFICATIONS

POWER REQUIREMENTS-
AC-117 VAC, 50/60 Hz. (220VAC Optional)
DC-Rechargeable Battery approx. 20 hours use, 4 hour recharge

ACCURACY- 0.1% of full scale

DIMENSIONS- 4' x 4' x 2.8'
350 lb. shipping weight

TARE, ZERO RANGE- 100% of full scale

OPERATING TEMP.- 14°F to 104°F

DISPLAY- 1" high, easy-to-read Graphics LCD Display with status annunciators

DISPLAY SPEED- 0.4 seconds, adjustable

OVERLOAD CONDITION- Display warning message at 102% of scale capacity.

ELECTRONICS-
32-bit microcomputer circuitry, self test feature. All electronics on 1-plug-in board for easy service.

WEIGHING FEATURES-Adjustable filter constants, adjustable display update, automatic calibration

OPTIONS-
USB Computer port
RS-232 Computer port, adjustable rates
Time and Date output
4-20 ma or 0-5vdc analog output
Label, page and ticket printers
Automatic Setpoints - Battery Pack
Post for display
Aluminum platform
Stainless steel platform

Arlyn Scales

ARLYN SCALES www.arlynscales.com
CALL TOLL FREE 1-800-645-4301 - Fax# 516-593-4607
59 2ND St., E. Rockaway, NY 11518 (in NY 516-593-4465)

ATTACHMENT 15.4 Digital scales, PDS-1000 Drum Scale

PDS-1000 Drum Scale

[Home] [Up]

A and A Scales LLC

Phone 800-481-4114 or 973-800-3965

Open 7 days a week

No sales tax for customers outside New Jersey

We will not be undersold!

E-MAIL

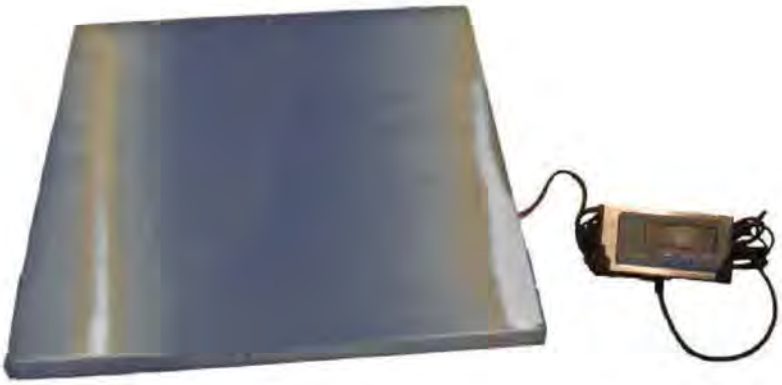
PDS-1000 Drum Scale

1000 lb x 0.5 lb

Price: $499

Free shipping

Buy



* 24" x 24" - 1000 lb capacity platform
* Stainless Steel cover, painted steel substructure
* Digital Display is battery / Electric powered
* Low profile scale platform
* Easy to read LCD display
* Digital Display comes standard with wall mounting bracket
* 15 ft cable from platform to display

ATTACHMENT 15.5 Actions to be taken during Inspection and Testing of Air Handling Equipment

Fans (to be checked periodically: daily, quarterly, and yearly)

(a) Daily: On a daily basis, the fans should be checked for nascent problems by Ventilation Area walkthrough. General noise level may be monitored, along with cowling checks for indications of overheating or excessive vibration. Noise or vibration meters may be used, or simple qualitative changes from recent observations may be noted. Emerging problems noted on such walkthroughs should be used in maintenance planning.

(b) Quarterly: On at least a quarterly basis, the shaft of the spare fan should be rotated at least one turn to prevent bearing set. Failure to do this may result in eccentric shaft rotation on future use.

(c) Annually: On an annual basis, and in coordination with other annual maintenance actions, MMTS operations should cease and the fan should be turned off under Lockout/Tagout, to allow for annual checks and maintenance. Immediately after turning the fan off, the hood and snorkels should be closed. Bearings should be checked, repacked or replaced. Belts should be checked and replaced if they show signs of wear, cracking, fraying, or stretching. The sheave-sheave belt connection between motor and impeller should be retightened. Vibration mounts should be checked to ensure they show no play but firmly support the fan load without bottoming out. After deficiencies are remedied, and the remainder of the Exhaust Ventilation system is readied, the system should be monitored on start-up.

Roughing Filters (to be checked as needed)

(a) Roughing filters: Until sufficient operating experience has been gained, the roughing filters should be replaced monthly. Records of the roughing filter pressure drop accumulated by the PCDAS should be examined and compared with performance of the air flow at the fume hoods. An increase in roughing filter pressure drop by 1.0 in. water gauge (w.g.) suggests filter loading. Staff should start planning for an opportune time to change the filters. Until replacement can occur, staff should increase monitoring of flow at hood, and draw on snorkels.

(b) Replacement should be planned for off-shift, and is begun with fan shutdown and snorkel and hood closure. The MMTS log should be reviewed for notes on the most recent filter changes, which may facilitate the replacement operation. Full PPE, including a full-face respirator with mercury-rated cartridge or a self-contained breathing apparatus will be required. Portable mercury vapor analyzer and Airfiltronix® snorkel should be available in the Ventilation Area. Materiel should be prepared and arranged by the HEGA housing doors and the filters should be installed, one at a time, in accord with the recommendations in the manufacturer's operation and maintenance manual. The old, bagged filters should be labeled, and managed as waste for disposal (see Procedure 2015MMTS-10, Waste Management). On successful filter change, the date of change and any notable observations should be included in the MMTS log to assist future maintenance planning.

(c) HEGA filters: The HEGA filters are sized such that they should last the entire expected ~15-year MMTS life without change. Proper roughing filters changes, as detailed in the prior section, will ensure the HEGA filter adsorption surfaces do not become clogged with dust. If the pressure drop does increase, this is a peripheral indication of improper roughing filter seat, and a warning that the HEGA filters may no longer be fully serviceable. However, the main indication of need for change is from MMS-16 vapor readings. A climb in mercury vapor readings with time indicates a need to plan for a HEGA filter change.

(d) HEGA filter change is performed in a similar manner to roughing filter changes. The Vesti Heftilift HYD-10 or equivalent is used to lift and position the ~ 200 lb HEGA filters. Both filters should be changed sequentially in a HEGA change out. On fan restart, a notably low HEGA pressure drop (i.e., well less than 4.1 in. w.g.) suggests improper seating, the best measure is pre- and post- HEGA measure of Hg vapor levels. If (low) pressure drop or poor Hg vapor reduction are noted, then the HEGA filter should be checked for reseat. Like the roughing filter, a used HEGA filter should be bagged, and labeled as waste (refer to MMTS-10, Waste Management).

Heat Pump (Checking Period: daily by the Data Acquisition System; yearly by staff and AAON)

(a) Daily: The AAON heat pump has two in-series filters on the clean air intake: 1) A 30% efficient 2-in. pre-filter, and 2) an 85% - efficient 4-in. MERV-13 main filter. Windy or dusty days may quickly load the filters and loaded filters may cause automatic shutdown of the heat pump (by the P6250 “dirty filter sensor”). To prevent this, the filter pressure drop should be checked, and the Data Acquisition System has a real-time measure so that roof access is not regularly needed. A normal, clean filter reading is 0.09 in. w.g., and at or near 0.44 in. w.g. the heat pump clogged filter trip will engage. Therefore, filter change is recommended by 0.30 in. w.g. to prevent sudden system shutdown and impact on MMTS operations.

(b) Annual: An MMTS maintenance representative should review the MMTS log, locate any materiel, arrange for a vendor representative visit, and attend the maintenance actions. Unlike the exhaust ventilation system, only fresh or HEGA-filtered air enters the HVAC system, so the system should be clean and no special PPE is needed for filter change or maintenance. A vendor representative or HWAD maintenance staff should perform all the checks and replacements specified in the manufacturer’s operation and maintenance manual. Record pressure drop on the data acquisition system, and check for proper system control and operation in both heating and cooling modes. Dispose of heat pump wastes as nonhazardous (refer to

(c) MMTS-10, Waste Management). Any needed materiel should be (re)ordered, including motor, belts, filters, and any high-frequency and long-lead parts that appear reasonable for order from review of maintenance trends.

Miscellaneous Materiel (Checking Period: variable)

(a) Fume Hood: Hood inspection should occur on at least a yearly basis, and it is recommended to be coordinated with annual heat pump and fan inspections. Sash condition and unbound operation should be checked. Counterweight or track dry lube may be required if sash movement is difficult. Sash windows should be inspected for visibility sufficient for operation, and for cracks which may compromise safety. Mercury film or liquid should be cleaned up and removed.

(b) Snorkels: Weekly checks should be performed on snorkels, for general condition, and snug end attachment to nipple and plug. Change out for a new segment should be performed if the user-end of the snorkel is dirty, or if cracks are seen. Process as nonhazardous waste.

(c) Exhaust Ventilation and HVAC ducting: Coupled with the annual review, the ceiling tiles should be removed so that Exhaust Ventilation and HVAC ducting can be visually inspected. The entire run of each system should be inspected, from intake to discharge, and the recirculation leg between the two systems should be checked as well. With a flashlight, the systems should be checked for signs of seam-opening, gasket integrity, duct buckling or sagging, free and unbound butterfly actuation, and hanger or support integrity (to include stack and guide wire condition). Where necessary, a ladder and appropriate PPE should be used for close inspection. Any deficiencies should be judged for immediacy of needed repair, and scheduled accordingly.

(d) HVAC registers: Annual check should also be performed on registers. HVAC supply register position should be marked, and then the accessible areas should be cleaned. On restart of the HVAC and Exhaust Ventilation systems, the air flow should be checked with an anemometer and, if necessary, the registers should be re-trimmed for comfort and fullest coverage. At this time, infiltration from walls, windows and roof penetrations, as well as personnel/roll-up doors for signs of precipitation or dust infiltration may also be noted and addressed by normal means, such as common weather stripping.

16 - FIRE PROTECTION

Title: Fire Protection **Doc. No.** MMTS-16-Rev4

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

Rev. No.	Change description	Author
4	Annual Review - Updated signatory authority to reflect current required signatures. Added Revision number to document number.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
2	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
QP.EMS.HG.0006	Mechanical Integrity Procedure (Tier 1)
Chapter 12, SOC.OHS.SP.0002	Lockout/Tagout

PURPOSE

This procedure addresses inspection, testing and maintenance of the Fire System Equipment within the MMTS, and is designed to address CAPP requirements as defined by the Mechanical Integrity Procedure.

NOTE: *Site Hot Work Permit and/or Lockout/Tagout procedures may apply to some steps within this procedure.*

16.1. SCOPE

This procedure applies to staff and contractors that inspect, test, or maintain the Fire System Equipment within the MMTS.

16.2. INSPECTION AND TESTING

16.2.1. Equipment Needed

- Inspection and Testing Forms—See Section 18.10 below.
- Equipment Testing Tools

16.2.2. Inspection and Testing

- Facility Manager identifies CAPP-regulated Fire System Equipment subject to this procedure, and identifies the schedule for conducting inspections and tests based on manufacturer's information or good engineering practices, or more frequently if determined to be necessary by previous experience in operating the equipment.
- Staff (or contractors) will perform inspections and tests of the CAPP-regulated equipment. Safe work practices, such as the HWAD Lockout/Tagout and Hot Work supporting procedures, apply to equipment identified in this procedure.

16.2.3. Items to be Inspected and Tested

The items to be inspected or tested are listed in Table 16.1, and related information documented on the form shown in Section 16.7.

- Type ABC fire extinguishers
- Heat, smoke, and infrared sensors
- Annunciators/alarms
- Signal acquisition and formatting system
- Wireless transmission system

16.2.4. Documentation of Inspection and Testing

Staff (or contractors) document the following on the appropriate inspection/testing forms:

- Date of the inspection or test,
- Name of the person who performed the inspection or test,
- Serial number or other identifier of the equipment on which the inspection or test was performed,
- Description of the inspection or test performed, and

Results of the inspection or test.

If there is a deficiency, staff (or contractor) will contact cognizant personnel at FES to determine the proper course of action which may include contacting personnel at the Trouble Desk to prepare a follow-on Work Order under Maximo or equivalent.

Table 16.1 Equipment list for inspection and testing of the Fire System Equipment

Equipment item	Inspection/test frequency
Type ABC fire extinguishers	Test annually with records kept in the Fire Station
Heat, smoke and infrared sensors	Frequency determined by FES or vendor
Annunciators/alarms	Frequency determined by FES or vendor
Signal acquisition and formatting system	Frequency determined by FES or vendor
Wireless transmission system	Frequency determined by FES or vendor

16.3. MAINTENANCE

16.3.1. Maintenance Staff

FES staff (or contractors) will correct any deficiencies in the equipment that are outside the acceptable limits for the safety of personnel and property before using the equipment again. Where maintenance is required, FES or contractor initiates actions via a work order under Maximo or equivalent.

NOTE*: Deficiencies posing immediate threat to safety, health, or the environment, as identified in this procedure, are corrected immediately. Otherwise, deficiencies are evaluated and prioritized by the FES Chief and Facility Manager and corrected accordingly.*

16.3.2. Quality Assurance/Quality Control

- The Facility Manager, FES Chief or designee changes and checks new equipment, instruments, and controls before implementation/installation to ensure suitability with the process. This is to be achieved by following the FES procedures.
- The Facility Manager, FES Chief, or designee ensures that maintenance materials, spare parts, and equipment are suitable for the process for which they will be used.
- Quality Control will be performed in accordance with the HWAD FES procedure.
- After verification that the part/component has been installed correctly, the lock out/tag out devices shall be removed and the system energized if required.
- Verify replacement part is functional and operates in accordance with operating manual or best engineering practices.

16.3.3. Scheduled Maintenance

Maintenance of the fire system equipment shall be performed on a schedule determined by the FES based on experience, standards, and vendor recommendations.

16.4. METRICS

Weekly, monthly, biannual, and/or annual inspections, tests and maintenance will be tracked and the results documented. Deficiencies found will be trended and that information will be used to evaluate the need for more frequent inspections or tests.

16.5. RECORDS

- The FES Chief, FES staff, and/or contractor will manage and maintain training records.
- Inspection, testing and maintenance records for each piece of regulated equipment are to be maintained for a period of at least five years after the inspection/test/maintenance activity.

16.6. FORMS

Fire System Inspection, Testing and Maintenance Form

Equipment item	Inspection/ test frequency	Date of inspection/ test	Performed by:	Equipment serial no.	Description of inspection/test	Results
Type ABC fire extinguishers	In accord with a list maintained by Fire and				As described in I.O.P.FFO.0001.	
	Emergency Services					
Heat, smoke and infrared sensors	Annually				Tested by FES and records maintained in the Fire Station – Put in MAXIMO to generate an annual work order	
Annunciators/ alarms – Part of Fire Alarm Panel	Based on MAXIMO work order				In accord with I.O.P.FST.0016	
Signal acquisition and formatting system – Part of Fire Alarm Panel	Based on MAXIMO work order				In accord with I.O.P.FST.0016	
Wireless transmission system – Part of Fire Alarm Panel	Based on MAXIMO work order				In accord with I.O.P.FST.0016	

Form, DZHC 167-E, which is titled “Maximo Preventive Maintenance Form”

17 - EQUIPMENT CALIBRATION

Title: Equipment Calibration **Doc. No.** MMTS-17-Rev5

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

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5	Annual Review - Updated signatory authority to reflect current required signatures. Added Revision number to document number.	Rob Mathias
4	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
2	Replaced information in§17.7.	Burton Packard and Renee Rodriguez
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
QP.EMS.HG.0006	Mechanical Integrity Procedure (Tier 1)

MMS-16	Mercury Vapor Monitor System, Mercury Instruments USA
AFA 1000/1 Mk3	Fume Hood Velocity Sensor, TEL-UK Ltd.
Jerome J505	Mercury Vapor Monitor, Arizona Instrument Corp.
5200 Series, Model 5-3305	Large Floor Scale, Arlyn Scales Inc.
PDS-1000	Drum Scale, A and A Scales, LLC
Chapter 10, SOC.OHS.SP.0002	Hot Work Permit
Chapter 12, SOC.OHS.SP.0002	Lockout/Tagout

17.1. PURPOSE

This procedure addresses calibration of the mercury transfer equipment within the MMTS, and is designed to address CAPP requirements as defined by the HWAD Mechanical Integrity Procedure. The purpose of the Mechanical Integrity Procedure is to ensure that critical process equipment associated with the MMTS is designed, installed, maintained, operated and calibrated correctly. That procedure verifies that operations and maintenance activities follow generally accepted sound engineering practices for the purpose of minimizing the risk of unintentional exposures and releases of elemental mercury (Hg).

17.2. SCOPE

This procedure applies to staff and contractors that inspect, test, or maintain the mercury transfer equipment within the MMTS.

17.3. OPERATIONS

17.3.1. Items to be Calibrated

- Facility Manager identifies CAPP-regulated mercury transfer equipment subject to this procedure, and identifies the schedule for conducting inspections and tests based on manufacturer's information or good engineering practices, or more frequently if determined to be necessary by previous experience in operating the equipment.
- Safe work practices, including the HWAD Lockout/Tagout and Hot Work supporting procedures, apply to equipment identified in this procedure.

17.3.2. Calibration Schedule

The items to be calibrated and frequency are listed below and in Table 17.1.

- Automated mercury vapor monitoring system (Mercury Vapor Monitoring System, MMS-16, Mercury Instruments USA))
- Scales (Arlyn 5-3305) and PDS-1000 drum scale
- Fume hood face velocity sensor (Phoenix ZPS 3 10 –STL)

Hand-held mercury monitoring equipment (Jerome J505)
Staff and contractors shall ensure that the required calibrations on CAPP-regulated equipment are performed on the schedule given in this procedure.

17.3.3. Calibration Documentation

Documentation of calibration for the items shown in Table 17.1 is recorded on the appropriate calibration forms (refer to Section 17.6). The completed records include all the information specified on the forms.

If there is a substantial deficiency, staff (or contractor) contacts the Facility Manager, who then authorizes recalibration or replacement.

Table 17.1 Equipment list for calibration of the mercury transfer equipment

Equipment item	Calibration frequency
Mercury vapor monitoring system	Annually or more frequently if specified by vendor or experience
Scales	Annually or more frequently if specified by vendor or experience
Fume hood face velocity sensor	Semi-annually or more frequently if specified by vendor or experience
Jerome mercury vapor monitors	At least annually or more frequently if specified by vendor or experience

17.4. METRICS

Semi-annual and annual (or more frequently if required by vendor or experience) calibrations will be tracked and the results documented. Deficiencies found will be corrected and that information will be used to evaluate the need for more frequent calibrations or equipment replacement.

17.5. RECORDS

Calibration records for each piece of regulated equipment are to be maintained for a period of at least five years after the calibration activity.

17.6. FORMS

DZHC 167-E, which is titled “Maximo Preventive Maintenance Form”

Calibration Record

Equipment item	Calibration frequency	Date of calibration	Performed by	Equipment Serial No.	Description of calibration	Results
Mercury vapor monitoring system	Annually or more frequently if specified by vendor or experience				Mercury vapor readings are correct to within the accuracy of the instrument	
Scales	Annually or more frequently if specified by vendor or experience				Weight reading is correct to within the accuracy of the scale	
Fume hood face velocity sensor	Semiannually or more frequently if specified by vendor or experience				Velocity reading is correct to within the accuracy of the sensor	
Jerome mercury vapor monitors	At least annually or more frequently if specified by vendor or experience				Mercury vapor readings are correct to within the accuracy of the instrument	

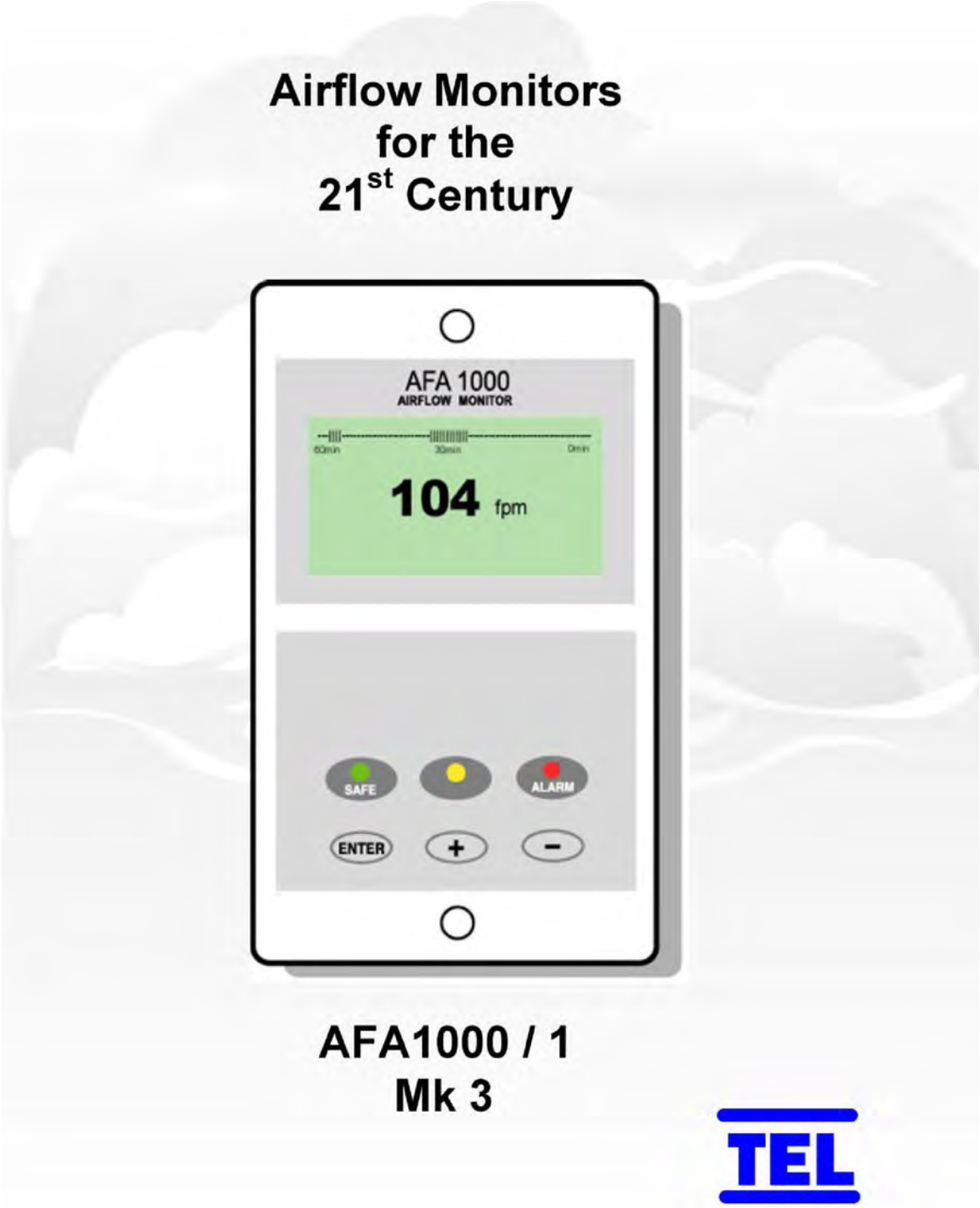
17.7. ATTACHMENTS

- Mercury vapor monitoring system (Attachment 17.1)
- Fume hood velocity sensor (Attachment 17.2)
- Jerome J505 manufacturer's information (Attachment 17.3)
- Digital scales – 3000 pounds and 1000 pounds (Attachments 17.4A and 17.4B)

17.1. Mercury Vapor Monitoring System (MMS-16, Mercury Instruments USA)

ATTACHMENT

17.1. Fume hood velocity sensor



ATTACHMENT

17.2. Jerome J505 Portable Mercury Vapor Analyzer

JEROME®

APPLICATIONS

Ambient Air Analysis
Clean Up Compliance
Detection Compliance
Disposal & Recycling
Exhaust Duct Monitoring
Facility Monitoring
Fluorescent Lamps
Gold Mining
Hazardous Waste Sites
HAZMAT
Landfill Monitoring
Leak Detection
Mercury Exclusion Testing
Mercury Spill Response
Monitoring: light bulbs, mercury switches equipment
Plant Environment
Quality Control
Scrubber Efficiency Testing
Source Surveys
Worker Safety

CERTIFICATIONS

ISO 9001:2008

MADE IN THE USA

ARIZONA INSTRUMENT LLC
3375 N Delaware St | Chandler, AZ
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NEW

JEROME® J505
Atomic Fluorescence Spectroscopy Mercury Vapor Analyzer

The NEW! Jerome® J505 Mercury Vapor Analyzer is a portable fluorescence spectroscopy analyzer, which allows the detection cell to be simpler, smaller, lighter weight and more durable than competing spectroscopy instruments. The highly efficient optical cell requires less flow to purge the system, allowing the J505 to run at a lower flow rate minimizing sample dilution as found in competing spectroscopy instruments.

FEATURES

Meets EPA & ATSDR Cleanup Levels
Flexible Data Handling
Choice of Two Independently Adjustable High Limit Alarms
Programmable Auto Sampling Mode
Choice of 3 Units of Measurement (nanograms, micrograms, milligrams)
Color Display with Easy to Use Menu System
Battery Operation for 10+ Hours | Battery Charges in 3 Hours or Less
A USB Keyboard can be used for Easy Entry of Locations (optional)
Integrated Data Logging Saves all Test Results (excludes search mode)

SPECIFICATIONS

Resolution	0.01 $\mu g/m^3$ (10ng/m^3) in standard test mode	
Detection Range	0.05 to 500 $\mu g/m^3$	
Data Storage Capacity	Up to 10,000 test results, 100 test locations	
Operating Environment	5 to 45°C, non-condensing, non-explosive	
Accuracy	0.3 $\mu g/m^3$	±15%
	1 $\mu g/m^3$	±10%
	25 $\mu g/m^3$	±10%
	100 $\mu g/m^3$	±10%
Typical Response Time	Search	8 sec. first reading; continuous 1 sec. updates
	Quick	16 sec.
	Standard	28 sec.
Flow Rate	1 liter/minute	

JEROME®

Power Requirements	12VDC power adapter runs on 100-240VAC, 0.8A
Internal Battery Pack	Rechargeable nickel metal hydride (NiMH) with 10+ hours of operation | Battery charges in 3 hours or less
Dimensions	12" L x 6.2" W x 8.4" H
Weight	6.5 lb
Output	USB flash drive
Warranty	1 year, factory parts and labor

ACCESSORIES

990-0230	USB Keyboard
990-0244	AC Adapter Power Supply (supply/charger)
990-0246	Soft Handle Grip
990-0247	Soft Carrying Case
Y990-0234	Mercury Spill Kit

PARTS

345-0241	Intake Fritware (pack of 5)
1400 2002	Probe
Z2600 3905	Zero Air Filter

More Information

Rentals Available
Loaners Available
24 Hour Customer Support

Sales Representatives
800.528.7411 | 602.470.1414
sales@azic.com

Extended Warranties and Parts
800.528.7411 | 602.470.1414
sales@azic.com

ARIZONA INSTRUMENT LLC
3375 N Delaware St | Chandler, AZ
www.azic.com

ATTACHMENT 17.**4A** Digital scale: Arlyn 5200 Series, Large Floor Scale

ARLYN SERIES 5200 LARGE FLOOR SCALES

THE FIRST LARGE PLATFORM SCALE WITH ONE INEXPENSIVE FEATURE- THE PRICE!

Indicator Included

Don't be fooled. The new Arlyn Series 5200 all electronic Large Floor Scales boast expensive features. Instead of aluminum or plated steel, there are four heavy duty stainless steel load sensors, for maximum ruggedness. While inexpensive scales use a simple enamel paint, Arlyn applies a 3-part galvanized epoxy coating for maximum protection. Others us a cheap readout. Arlyn provides a water resistant, fully graphical, fully programmable, large LCD display. In fact, the only inexpensive feature you'll find on these scales is the price. But that's perfectly understandable. Because ARLYN electronic scales are shipped to you direct from the factory, and require no dealer services. So instead of paying for a scale and a dealer, you pay only for the scale you need and nothing more.

Weighs in lbs., grams, kg.,ounces, troy, grains, etc.

Ramps Optional

EXPENSIVE SCALE FEATURES

(Features found on scales costing 3 to 5 times as much as Series 5200)

HIGH ACCURACY - High weight resolution to 0.5 lbs.
- Internal resolution to 1 part in 500,000

EXTREMELY DURABLE - Rugged heavy-duty construction
- Stainless steel "ArlynLOAD" cell system
- Large diamond plate low profile platform
- 3-part galvanized epoxy platform coating
- Adjustable large diameter leveling legs
- Remote mount water resistant display

ELIMINATES MAINTENANCE - No moving parts

EASY OPERATION - Pushbutton functions for automatic and keyboard tare, tare functions with memory, net/gross
- Unit conversion with mode indicators
- Movable display head for easy viewing

NO SET UP OR DEALER SERVICES -
- Automatic calibration functions

All other models also available in **ss** (stainless steel construction)

Model number	5-3305	5-4404	5-4405	5-4405ss	5-5510
Capacity	5000 lb. 2200 kg	2500 lb. 1150 kg	5000 lb. 2200 kg	5000 lb. 2200 kg	10000 lb. 4400 kg
Readability	1 lbs. .5 kg	.5 lb. .2 kg	1 lb. .5 kg	1 lb. .5 kg	2 lb. 1 kg
Internal Res.	1 part in 500,000	1 part in 500,000	1 part in 500,000	1 part in 500,000	1 part in 500,000
Platform Dimensions	3' x 3'	4' x 4'	4' x 4'	4' x 4'	5' x 5'

Most other sizes and capacities are available, up to 8' x 10' and up to 30,000 lbs. CALL!

ADDITIONAL SPECIFICATIONS

POWER REQUIREMENTS-
AC-117 VAC, 50/60 Hz. (220VAC Optional)
DC-Rechargeable Battery approx. 20 hours use, 4 hour recharge

ACCURACY- 0.1% of full scale

DIMENSIONS- 4' x 4' x 2.8"
350 lb. shipping weight

TARE, ZERO RANGE- 100% of full scale

OPERATING TEMP.- 14°F to 104°F

DISPLAY- 1" high, easy-to-read Graphics LCD Display with status annunciators

DISPLAY SPEED- 0.4 seconds, adjustable

OVERLOAD CONDITION- Display warning message at 102% of scale capacity.

ELECTRONICS-
32-bit microcomputer circuitry, self test feature. All electronics on 1-plug-in board for easy service.

WEIGHING FEATURES-Adjustable filter constants, adjustable display update, automatic calibration

OPTIONS-
USB Computer port
RS-232 Computer port, adjustable rates
Time and Date output
4-20 ma or 0-5vdc analog output
Label, page and ticket printers
Automatic Setpoints - Battery Pack
Post for display
Aluminum platform
Stainless steel platform

Arlyn Scales

ARLYN SCALES www.arlynscales.com
CALL TOLL FREE 1-800-645-4301 - **Fax# 516-593-4607**
59 2ND St., E. Rockaway, NY 11518 (in NY 516-593-4465)

ATTACHMENT 17.**4B** Digital scale: PDS 1000 Drum Scale

PDS-1000 Drum Scale

[Home] [Up]

A and A Scales LLC

Phone 800-481-4114 or 973-800-3965

Open 7 days a week

No sales tax for customers outside New Jersey

We will not be undersold!

E-MAIL

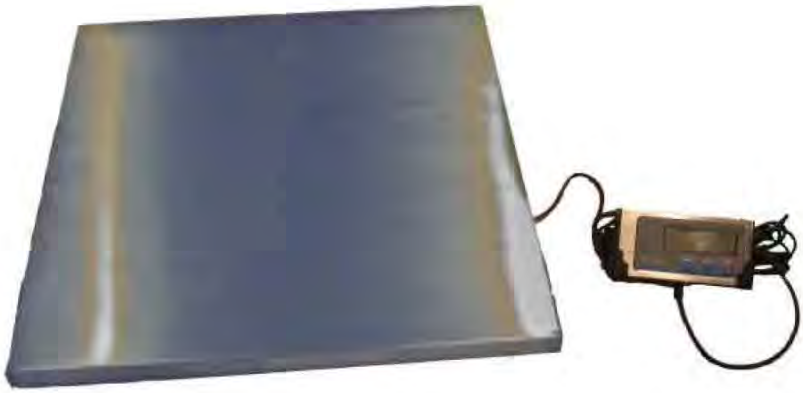
PDS-1000 Drum Scale

1000 lb × 0.5 lb

Price: $499

Free shipping

Buy



* 24" × 24" - 1000 lb capacity platform
* Stainless Steel cover, painted steel substructure
* Digital Display is battery / Electric powered
* Low profile scale platform
* Easy to read LCD display
* Digital Display comes standard with wall mounting bracket
* 15 ft cable from platform to display

18 - SECURITY

Title: Security **Doc. No.** MMTS-18-Rev4

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

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NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

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4	Annual Review - Updated signatory authority to reflect current required signatures. Added Revision number to document number.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
2	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title

18.1. PURPOSE

This procedure describes the actions taken to permit entry at the beginning of a shift and the actions taken to ensure the security of the MMTS and its contents.

***NOTE**: Actions required to ensure the security of the MMTS and its contents must be in accordance with the Guard Services (GS) procedure for securing the mercury-containing warehouses.*

18.2. SCOPE

This procedure covers start of shift (entry) and end of shift (exit) steps for staff (Facility Manager, shift supervisor, Flask Handling Area workers and/or Drum Handling Area workers) at the MMTS.

1. Perform actions required to enter the MMTS at the start of the shift.
2. Perform actions required to secure the MMTS at the end of the shift.

***NOTE**: This procedure also covers access controls for visitors to the MMTS. This procedure does not cover security requirements (entry/exit) for the storage warehouses for forklift operators.*

18.3. OPERATIONS

Entry to the MMTS will be controlled by limiting access to door keys and by use of an automated (monitored) alarm system when facility staff is not present. The facility will be locked except when operating staff are present. Keys will be assigned to the Facility Manager and shift supervisors. Other support staff (such as FES, fork lift operators, electricians, and technicians) must contact the Facility Manager for entry. The automated alarm system will be monitored at the Guard Operation Center; guards will respond any time alarms indicate there has been an unauthorized access. Access by visitors is controlled; visitor entry/exit information is documented in a logbook kept in the Computer/Communications Office.

18.3.1. Open at Start of Workday

At the start of a workday, the Facility Manager or designee shall notify the Guard Operations Center prior to entry and unlocking the MMTS.

***NOTE**: The Facility Manager or designee shall be notified if an element of the procedure fails.*

18.3.2. Close at End of Workday

At the end of a shift, the Facility Manager or designee shall notify the Guard Operations Center prior to locking the MMTS and activating the MMTS alarm system.

***NOTE**: The Facility Manager or designee shall be notified if an element of the procedure fails.*

18.3.3. Visitor Access

MMTS staff ensures that visitors sign in and out of the MMTS and record the information on a logbook maintained in the Computer/Communications Office.

18.4. RECORDS

- Access alarms (unauthorized entry) date/time stamp

Visitor logbook

18.5. FORMS

VISITOR LOGBOOK				
Visitor Name	**Company**	**Date**	**Time in**	**Time out**

19 – TRAINING
(Retired with full reliance on SOC.QP.EMP.HG.0002)

Title: Training **Doc. No.** MMTS-19-Rev8

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
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Approved by:	Charles R King	Date:2/19/2020

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NOTE: *This document will be reviewed at least annually to ensure its suitability. Reference: QP.QMS.0001 and Chemical Accident Prevention Program (CAPP) Standard Operating Procedure.*

Revision History

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8	Annual Review - Updated signatory authority to reflect current required signatures. Added Revision number to document number.	Rob Mathias
7	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
6	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur

Retired (with full reliance on SOC.QP.EMP.HG.0002)	The two training programs that were provided most recently for review by NDEP were SOC.QP.EMP.HG.0002 and 2015MMTS-19. The decision was made by Mercury Storage and Transfer Program management to consolidate training under one plan. The SOC training plan (SOC.QP.EMP.HG.0002) was modified to include all mercury-associated functions performed at the Hawthorne Army Depot (HWAD) by DLA Strategic Materials operations personnel. The MMTS-19 training document served its purpose in achieving readiness for operations and is hereby retired as a functioning, auditable training plan. The Mercury Storage and Transfer Program training plan is documented in SOC.QP.EMP.HG.0002.	Burton Packard and Renee Rodriguez

***NOTE**: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title

20 - MERCURY MEDICAL SURVEILLANCE

Title: Mercury Medical Surveillance **Doc. No.** MMTS-20-Rev5

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Approved by:	Charles R King	Date:2/19/2020

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NOTE: *This document will be reviewed at least annually to ensure its suitability.*

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3	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
2	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez
1	Pg. 20-3, §20.3.2, deleted Baseline handwriting sample.	

NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
	Blando, James D., December 2004. *Controlling Metallic Mercury Exposure in the Workplace—A Guide for Employers*, New Jersey Department of Health and Senior Services, Trenton, New Jersey, http://www.ni.gov/health/surv/documents/mercemp.pdf

20.1 INTRODUCTION

The Mercury Medical Surveillance Program (MMSP) presented in this document is focused on monitoring potential worker exposure to mercury from operations in the MMTS and is intended to supplement similar worker safety programs at HWAD.

The MMSP, in conjunction with many of the procedures governing operations in the MMTS, will ensure a safe work environment for the health of the workers.

20.2 SCOPE

Exposure to mercury vapor over time can affect different organs in the body, especially if exposure is high. Symptoms of high exposures to metallic mercury may include nausea, vomiting, diarrhea, increased blood pressure and heart rate, chest tightness, and numerous other irregularities. However, in most cases exposure is low and health effects are more subtle, requiring careful medical evaluation. The MMSP is focused on monitoring the subtle effects of mercury exposure because the administrative and engineered controls in the MMTS are designed to avoid high exposure. The MMSP is intended to apply to workers with the potential for direct contact with mercury, including Mercury Transfer Operators and Drum Area Workers, MMTS Supervisor, and staff maintaining equipment that is contaminated with mercury.

20.3 MEDICAL SURVEILLANCE

20.3.1 Implementation

A daily worker list (example provided in Table 20.1) shall be maintained by the supervisor of staff handling flasks and drums containing mercury in the MMTS, or staff doing maintenance on mercury contaminated equipment. The list shall be made available to the HWAD medical services as needed. Medical Services, after consulting with the MMTS Facility Manager, shall determine the frequency of medical exams and which workers should receive exams, upon reviewing the daily sheets at least monthly. An example of the daily worker list is shown below; it is maintained by the MMTS Facility.

Table 20.1. Example daily worker list

Worker	Drum handling	Flask handling	Metric ton container replacement	Maintenance (describe)	Duration (h)
Name		√			3.5
Name	√				1.5
Name				Replace pump tubing	0.5
Name		√			3.0
Name			√		0.5

20.3.2 Medical Monitoring

Periodic evaluation of workers who may be exposed to mercury vapor shall be done to ensure they are experiencing no subtle adverse effects. The periodic evaluation also serves as a back-up for routine air monitoring, which is the primary means for ensuring that exposure is below threshold levels that may cause adverse health effects.

A baseline examination should be given to all workers trained to handle flasks and other potentially contaminated equipment in the MMTS. The purpose is to provide a baseline for future health monitoring. Examinations should be conducted by a physician knowledgeable in occupational medicine, repeated annually, and compared to the baseline data.

The examination should include:

- Complete medical history and symptom questionnaire.
- Physical examination focusing on target organs such as kidneys, lungs, eyes, and skin.
- Blood analysis

Urinalysis – biologic monitoring is recommended for workers exposed to mercury. (Collection should be made over a 24-hour period, but spot sampling may also be done.)

NOTE*: Urine samples must be submitted to a laboratory proficient in mercury analyses. The laboratory selected by DLA Strategic Materials will outline the procedure for collecting samples and provide mercury-free containers that have a special preservative.*

20.4 METRICS

Trending of the results of medical monitoring should be analyzed to determine if changes should

be made in the MMTS operations or staffing assignments.

20.5 RECORDS

- Daily record of worker activities in MMTS are maintained in the MMTS
- Baseline medical examination for MMTS workers and results of medical monitoring are maintained in DLA Headquarters records.

21 – (B) DECONTAMINATING AND DECOMMISSIONING

Title: Decontaminating and Decommissioning **Doc. No.** MMTS-21-Rev4

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Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
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NOTE*: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
Procedure MMTS-10	Waste Management
	MSDS for HgX® http://www.actontech.com/hgx6.htm

	HgX®: The Mercury Decontaminant http://www.actontech.com/pdf/hgx-mercurydecontaminant.pdf

21.1 PURPOSE

This procedure addresses steps for permanent shutdown (i.e., closure) and decontamination of the MMTS in preparation for off-site transport from HWAD. After decontamination, certain equipment may be disconnected and/or removed before final transport of the mobile facility to a location designated by DLA Strategic Materials.

21.2 SCOPE

This procedure addresses basic steps to close and decontaminate the MMTS. After decontamination is completed, external connections/equipment are disconnected and/or removed as necessary and the transport vehicle is attached. The facility is then transported to an offsite location for storage or reuse for DLA Strategic Materials operations.

21.3 OPERATIONS

Closure of the MMTS will be initiated after all mercury transfer operations have been completed

21.3.1 Cleaning/Decontamination

Initial steps address removal of residual mercury contamination. After cleanup is completed, staff will inventory equipment as it is being packaged for shipment to DLA Strategic Materials. Staff will prepare shipping papers to return the MMTS and associated equipment to DLA Strategic Materials.

The following actions are required to clean/decontaminate equipment and work surfaces:

- Staff wipes down loose equipment (hand tools, flask trays, etc.) with HgX® solution on gauze wipes and monitors with Jerome before removing that equipment from the flask handling area or drum handling area for subsequent inventory/packaging. Refer to the attached Material Safety Data Sheet for health and safety information.
- Staff wipes down equipment with HgX® solution on gauze wipes after it has been detached/removed for cleaning. This is limited to equipment that should not be left attached during transport. Staff place this equipment in the area assigned for equipment inventorying and packaging.
- Staff wipes down the work surfaces and any remaining attached equipment (pump, drill, scales, etc.) using gauze pads with a small amount of HgX® solution (or equivalent).
- When using HgX® solution, follow the manufacturer's recommendations.

21.3.2 Inventory of Equipment

MMTS staff prepare inventory list of equipment (packaged separately) for shipment to the designated DLA Strategic Materials location.

- This inventory will include (1) equipment that has been detached for return to DLA Strategic Materials (such as external heating and ventilating equipment, building tie downs) and (2) loose equipment (tools, etc.).
- This inventory along with the waste equipment inventory should be consistent with the inventory of equipment received (refer to Section 1. MMTS Receipt and Inspection Onsite).

21.3.3 Dismantling

Using the detailed set-up and transport instructions in reverse, dismantle the MMTS portable building for transport to another DLA Strategic Materials-designated location. The major steps are listed below.

- Detach external equipment and package for return to DLA Strategic Materials
- Remove all elements necessary to gain access beneath the portable building; jack up the portable building as needed.

21.3.4 Shipment documentation

HWAD staff prepares shipping papers to initiate the transport of the portable building and any packaged equipment.

21.4 RECORDS

- Equipment inventory (items being shipped and items being disposed)
- Shipping papers for MMTS and equipment

22 – PERSONNEL NOTIFICATIONS

Title: Personnel Notifications **Doc. No.** MMTS-22-Rev4

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NOTE: *It is the user's responsibility to ensure, prior to use, the revision of this document is the latest available*.

Reference Documents

Document number	Document title
SOC.QP.EMP.HG.0002	Mercury Training Plan

22.1 PURPOSE

This section discusses the various Personnel Notifications that exist to alert workers in the MMTS that an off-normal situation has occurred or is about to occur, and describes the workers' response to each. All personnel working in the MMTS must be aware of the following five notification sources:

- Mercury pump automatic shutoff,
- Fume hood face velocity monitor,
- Mercury monitoring system (MMS) annunciator, ☐ Camera surveillance at the supervisor's station, and ☐ Visual indicators identifying safe entry.

22.2 SCOPE

Personnel notifications are an integral part of the following systems and equipment in the MMTS:

- The peristaltic pump shutoff prevents overfilling a metric ton (MT) container. The pump will be shut off if 2280 lb is exceeded, or if the level of mercury in the MT container reaches a preset limit. There is no audible signal. The mercury weight limit shutoff (2280 lb) and the mercury height (level) limit shutoff (2 in below the bottom of the upper plate) are designed to prevent overfilling the metric ton container. The mercury weight shutoff is set to occur first; if it does not shut off the peristaltic pump, the mercury level shutoff actuates and shuts off the peristaltic pump.
- The fume hood monitor alerts an operator if the fume hood face velocity drops substantially below 100 ft/min. The monitor has a digital readout of face velocity mounted outside the fume hood and activates an audible signal at levels below the threshold.
- The mercury monitoring system (MMS) samples and records environmental data from sixteen (16) stations in the MMTS. The data for mercury vapor concentration in air related to mercury operations is of specific interest. If the preset level (<25,000 ng/m^3 = 25 µg/m^3) is exceeded, an audible signal is emitted. The location(s) of, and level of mercury vapor is recorded on the supervisor's computer.
- Camera surveillance provides multiple views to a dedicated video monitor in the supervisor's office. This notification is available only to someone who is watching the video monitors.
- Red light-green light visuals are located above the west exterior entrance leading into the MMTS. The red light warning indicates that the mercury vapor concentration in air within the MMTS exceeded 25,000 ng/m^3 = 25 µg/m^3.

22.3 STAFF RESPONSES TO PERSONNEL NOTIFIERS

- If the peristaltic pump has an unexpected shut off, the operator shall release the foot activated remote controller and turn off the main power supply to the pump with the toggle switch at the back of the pump motor; notify the supervisor; determine the reason for the shut off, i.e. overfilling a MT container or a local power outage. Operations resume at the discretion of the Facility Manager.

- If the fume hood audible alarm sounds, cease operations and reduce the open area of the hood by closing one or more of the sliding doors, or lowering the sash. If that does not stop the alarm, reduce the net open area to ~10% of the maximum permitted (13.5 ft^2.) open area and notify the Facility Manager. Operations resume at the discretion of the Facility Manager.

- If the MMS audible signal is activated, cease all operations, render the work area to a safe condition (if the worker's safety is not compromised), all staff leave the building, and notify the Guard Operations Center (GOC) at 775.945.7911. Operations resume at the discretion of Fire and Emergency Services and the Facility Manager.

- Camera stations are monitored by the supervisor or his designee in the supervisor's office. If an off-normal occurrence is observed, the Facility Manager or designee shall investigate personally and determine an appropriate action. Operations resume at the discretion of the Facility Manager.

- Before entering the MMTS, all personnel shall observe the area over any entrance to determine if it safe to enter. A green light indicates safe entry; a red light indicates an unsafe condition inside and entry is prohibited. Upon observing a red light, the worker shall notify the GOC at 775.945.7911 (the GOC will pass on the request for assistance to Fire and Emergency Services) and the supervisor, and shall remain outside to ensure that others do not enter. The Fire and Emergency Services will determine when entry is safe after they assess conditions inside the MMTS. Operations resume at the discretion of the Facility Manager.

23 - OPERATIONS UNDER ADVERSE CONDITIONS

Title: Operations Under Adverse Conditions **Doc. No.** MMTS-23-Rev4

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Reference Documents

Document number	Document title
QP.EMS.HG.0007	Management of Change (Tier 1)

23.1 PURPOSE

This procedure outlines boundaries of operation, i.e., conditions under which operations are considered to be unsafe; safe shutdown under those conditions; and emergency evacuation for the MMTS staff under certain conditions.

23.2 SCOPE

This procedure deals with worker activities primarily in the Drum Handling Area and the Flask Handling Area, whereby worker safety could be adversely affected by conditions inside or outside of the MMTS. These conditions include severe dust storm, severe thunderstorm, loss of power, loss of building air conditioning, loss of building exhaust ventilation, and loss of mercury.

23.3 OPERATIONS

23.3.1 Dust Storm

Severe dust storms are capable of clogging the filtered-ventilation for the HVAC system. All controlled outside air enters the MMTS through the HVAC system filters. This air supplies the HVAC system, fume hood ventilation, and snorkel ventilation. All of this air passes through the filters of the building exhaust ventilation system before entering the building stack.

- Facility Manager determines if a dust storm is severe; if it is, calls for a work stoppage.
- Workers safely cease operations in the fume hoods; shutdown operating equipment; close all fume hood doors; and safely cease operations in the Drum Handling Area such as transporting pallets and drums, or loading flasks into conveyer 6-packs.
- Facility Manager ensures that personnel doors and rollup doors are closed.
- All workers remain within the building until it is determined that the severity of the storm has subsided.
- Facility Manager maintains contact with HWAD FES until the storm diminishes.

23.3.2 Severe Thunder Storm

Severe thunder storms are capable of intense lightening that may cause loss of power to MMTS.

- Follow the actions detailed in Section 23.3.3.

23.3.3 Loss of Power

Loss of power to MMTS requires ceasing routine operations. If the standby diesel generator is available and can be connected without exposing workers to unsafe conditions, the standby diesel generator is started and operations resume long enough to ensure no open mercury

remains in the MMTS. However, if the use of the generator is not feasible, safe shutdown of all operations is required.

- Following the availability of power from the standby generator, workers ensure that no open mercury remains in the MMTS. After that is accomplished, workers safely cease operations in the fume hoods, close switches to equipment that was operating, close all fume hood doors, and safely cease operations in the Drum Handling Area such as transporting pallets and drums, or loading flasks into conveyer packs.
- Facility Manager ensures that personnel doors and rollup doors are closed.
- Facility Manager maintains contact with HWAD FES.
- If it is determined that the power outage will be prolonged, Facility Manager will dismiss workers and ensure that MMTS is secured upon leaving.

23.3.4 Loss of Building Air Conditioning

Loss of the air conditioning system in MMTS does not necessarily require ceasing operations. If the outside temperature is near or below 75º F, the personnel doors and/or the rollup doors may be opened to maintain a comfortable work environment.

- Facility Manager determines if worker operations may continue operations based on weather and temperature conditions outside MMTS; if conditions are not suitable, supervisor will call for MMTS shutdown as noted above.
- Facility Manager attempts to determine the cause of loss of air conditioning and arranges for inspection and maintenance of the system.

23.3.5 Loss of Building Exhaust Ventilation

Loss of the building exhaust ventilation system in MMTS requires ceasing operations that have open sources of mercury vapor. The exhaust ventilation system provides the air flow into and through the fume hoods and overhead snorkels, and is the means for collecting and filtering vapor-contaminated air. As a temporary measure during safe shutdown, the Airfiltronix® snorkels may be used to locally capture mercury vapor while shutdown procedures are under way.

- Workers safely cease operations in the fume hoods; close switches to equipment that was operating, close all fume hood doors, and safely cease operations in the Drum Handling Area such as transporting pallets and drums, or loading flasks into conveyer packs.
- Facility Manager ensures that personnel doors and rollup doors are closed.
- Facility Manager attempts to determine the cause of loss of exhaust ventilation and arranges for inspection and maintenance of the system.

23.3.6 Loss of Mercury

This section deals with a major loss of mercury outside the fume hoods or in the Drum Handling Area.

- Workers safely cease operations in the fume hoods; close switches to equipment that was operating, close all fume hood doors, and safely cease operations in the Drum Handling Area.
- Worker who notices loss of mercury advises Facility Manager and alerts others in the vicinity to exit the Flask Handling Area and/or the Drum Handling Area.
- Worker who notices loss of mercury should provide containment before leaving the area, if it is safe to do so.
- Facility Manager or designee contacts HWAD FES and states the extent of loose mercury that is outside the MMTS (i.e., the estimated quantity and where it resides).

NOTE*: There are two areas of responsibility for the cleanup of loose mercury: within the MMTS and outside the MMTS.*

Within the MMTS: MMTS workers are responsible for cleaning up loose mercury within the MMTS.

Outside the MMTS: HWAD FES is responsible for cleanup of all mercury spills.

- Facility Manager ensures that all personnel have exited the MMTS and all personnel doors and rollup doors are closed.

23.4 RECORDS

- Management of Change records as required

24 - DIESEL GENERATOR OPERATIONS—STARTUP, SHUTDOWN, REFUELING, AND PERIODIC MAINTENANCE

Title: Diesel Generator Operations, Startup, Shutdown, Refueling, and Periodic Maintenance

Doc. No. MMTS-24-Rev5

Approval Signatures and Date

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Reference Documents

Document number	Document title
QP.EMS.HG.0007	Management of Change (Tier 1)

	Equipment Maintenance Checklist, The Hartford Steam Boiler Inspection and Insurance Company, 06/2008, http://www.hsb.com/HSBGroup/uploadedFiles/HSB_COM/Information_Resources/433%20%20%20Equipment%20Maintenance%20Checklist.pdf
	Electrical Preventive Maintenance, The Hartford Steam Boiler Inspection and Insurance Company, 06/2008,
	http://www.hsb.com/HSBGroup/uploadedFiles/HSB_COM/Information_Resources/Electrical%20Preventive%20Maintenance.pdf
	US Power and Environment, Procedural Guidelines—Projects Powered by Expertise, December 30, 2009, http://dieselgeneratorservice.com

24.1 PURPOSE

This procedure outlines operation, refueling, and maintenance of the diesel backup generator (Cummins Power Generation 100DSGAA Diesel Generator Set) for the MMTS.

24.2 SCOPE

This procedure covers operation, refueling, and maintenance for the diesel generator that will support MMTS operations in the event of an emergency loss of electrical power. Backup generation is intended to allow full facility operation for a sufficient length of time for any in process mercury transfer operations to be completed and to bring the MMTS facility to a safe shutdown condition.

24.3 OPERATIONS

Connect to and Disconnect from Power

NOTE: The MMTS MMS and PCDAS have approximately eighty (80) minutes of operation on internal battery backup; this allows time for staff to connect and power up backup generation as needed once it is known that the site power failure will be more than momentary. All other systems within the MMTS have no battery backup and will cease operation as soon as site power is lost.

The PCDAS archive computer (located in the Personnel Trailer) has local battery backup good for about 45 minutes of operation following power outage. The Personnel Trailer is not powered by the backup generator. Operator involvement is needed only to make certain that power is available for the PCDAS archive computer at the wall outlet after site power is restored.

24.3.1 Switch from Site Power to Backup Generation

- Switch off the Site Power Disconnect to the MMTS.
- Move the MMTS power transfer switch from Site to Backup.
- Connect the backup generator power cable to the MMTS.
- Execute backup generator startup sequence (Section 24.6.3).

24.3.2 Switch from Backup Generation to Site Power

- Execute backup generator shutdown sequence (Section 24.6.4).
- Disconnect backup generator power cable to the MMTS.
- Move the MMTS power transfer switch from Backup to Site.
- Switch on the Site Power Disconnect to the MMTS

24.3.3 Startup Sequence

- Ensure MMTS electrical equipment, except for MMS and PCDAS, are powered off.
- Switch from site power to backup power cabling and switch positions.
- Conduct equivalent of weekly periodic maintenance check (Section 24.6.7).
- Execute backup generator engine startup.
- Allow engine to run at idle for 5 minutes before placing it under load.
- Sequentially switch on MMTS facility electrical loads.
- Verify MMTS electrical systems functional.
- Verify backup generator functioning in a proper stable manner—power output, engine temperature, and safe operation in general.
- During initial operation of the generator and periodically until generator-powered operations cease, confirm that the carbon monoxide concentration in the MMTS is within safe working limits.

24.3.4 Shutdown Sequence

- Verify that site electrical power is available and stable at the MMTS
- Ensure MMTS electrical equipment, except for MMS and PCDAS, are powered off.
- Allow engine to run at idle for 5 minutes before shutdown.
- Execute engine shutdown.
- Switch from backup power to site power cabling and switch positions.

- Sequentially switch on MMTS facility electrical loads.
- Verify MMTS electrical systems functional.

24.3.5 Refueling

- Fuel level should be monitored during operation. Monthly load testing should be used to determine fuel use rate and to determine periodic check intervals.
- Under normal circumstances, refueling should occur only when the engine is not running and cold.
- Under extreme circumstances, refueling may occur on a running engine. Extreme caution must be exercised, and at least two staff members must be present. Fire extinguishers should be immediately at hand.
- When not in operation, maintain fuel tank level at ¾ full or greater.

24.3.6 Periodic Maintenance

- Regular maintenance is necessary to ensure operation in time of need. Failures of the engine are typically related to lubrication, cooling, fuel system, or starting circuits. Failures of the generator are typically related to moisture buildup in the generator windings.
- Keep a maintenance log of all maintenance activities along with fluid levels and any periodic test results.

24.3.7 Conduct weekly inspections

- Look for fluid leaks (coolant, oil, fuel).
- Check and document all fluid levels and condition (coolant, oil, fuel).
- Check that electrical connections are tight and free from corrosion.
- Inspect intake, exhaust, and radiator for damage, dirt, and/or corrosion.

24.3.8 Monthly

Run the generator under facility load for one hour.

24.3.9 Annually or 500 hours of operation, whichever comes first:

- Dispose and replace any fuel that is over one year old.
- Change engine oil and filter; change air filter and fuel filter.
- Inspect any/all belts for cracks and/or wear and replace as necessary.

- Inspect engine and generator mounts.
- Inspect crankshaft vibration damper.
- Inspect water pump for play in shaft.

24.3.10 4000 hours of operation:

- Inspect/adjust fuel injectors and valve lash.
- Internal engine rebuilding is not expected to occur. In the event of a major failure or excessive wear upon inspection, the unit should be replaced.

NOTE*: MMTS Facility Manager must consider Management of Change implications for any issues or problems. Information may be found in the reference documents listed in Section 24.11*.

24.4 RECORDS

- Operation (runtime, etc.), refueling, and maintenance log
- Management of Change records

25 - AIR HANDLING SYSTEM — STARTUP, SHUTDOWN, AND FILTER REPLACEMENT

Title: Air Handling System - Startup, Shutdown, and Filter Replacement

Doc. No. MMTS-25-Rev 5

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Reference Documents

Document number	Document title
QP.EMS.HG.0007	Management of Change (Tier 1)
MMTS-15	Inspection, Testing, and Maintenance
MMTS-23	Operations Under Adverse Conditions
2012-MSSP-37	Mobile Mercury Transfer System Air Handling and Carbon Adsorber Design Basis/Technical Data
	Aaon RN SERIES – Packaged Rooftop Units, Heat Pumps, & Outdoor Air Handling Units: Installation, Operation, & Maintenance, R90721, Rev. B, 140225
	Twin City Fans & Blowers – Heavy Duty Centrifugal Fans: Installation, Operation & Maintenance Manual, ES-995, September 2012

25.1 PURPOSE

This procedure outlines startup and shutdown operations, and filter replacement of the Air Handling System for the MMTS. The MMTS air handling system consists of two separate systems: (1) the heating, ventilation and air conditioning (HVAC) system manufactured by Aaon, and (2) the exhaust ventilation system manufactured by Twin-City Fan. The HVAC system is physically located on the roof of the building, however the controls are in the Ventilation Equipment Area. The exhaust ventilation system and controls are all located in the Ventilation Equipment Area.

25.2 SCOPE

The procedure covers operation, maintenance and filter replacement for the HVAC system that provides conditioned air for personnel and the exhaust ventilation system, which provides air flow through the fume hoods, snorkel suction throughout MMTS, and filtered discharge of MMTS air into the atmosphere.

25.3 OPERATIONS

Prior to entry into the MMTS Ventilation Equipment Area verify the “green” status light is established for safe entry.

If “red” status light is illuminated, utilize a portable mercury vapor analyzer to verify safe entry. Verify that mercury levels are safe to enter the Ventilation Equipment Area. The exhaust ventilation fan control panel and the electrical breaker panel are in the equipment room. If no status light is on, follow the same steps as if the status light were red.

Prior to entry to MMTS process areas the “safe status” should be assured via outputs from the PCDAS/MMS and/or portable mercury vapor analyzers.

Prior to starting MMTS daily operations, the supervisor or designated operator shall ensure:

- That the air handling is operating properly if it is already in the "on" mode, or
- Turn on the system following startup procedures, and ensure that it is operating properly.

At the end of the workday, the Facility Manager or designated operator determines if the system is to remain in the "on" mode, or be turned off until the next workday. This will depend on the expected outside temperature conditions, overnight, over a weekend, or over an extended holiday. The designed mode is to manage on/off operation via the setback thermostat on the HVAC system. However, if the system is to be manually turned off, shutdown procedures shall be followed.

Notes for operation of HVAC and exhaust fan equipment:

- ***The HVAC can be on without the exhaust fan.***
- ***The exhaust fan cannot be on without makeup air; the HVAC provides the makeup air. Makeup air could be provided by opening windows and doors when the weather permits.***
- ***The wall-mounted HVAC slider switch may be used to set back the temperature at the end of the day; colder in winter and warmer in summer during off-hours when the MMTS is unoccupied.***
- ***The exhaust fan may be turned off at the end of the day after mercury sources are closed. Shutting off the exhaust fan at the end of the day improves energy efficiency and reduces maintenance costs.***
- ***If the exhaust fan is turned off overnight, the fume hood alarm silence switches must be set to silence (turned from alarm to silence).***
- ***If the wall-mounted HVAC slider switch has been used to set back the temperature at the end of the day, the supervisor pushes the reset button at the start of the next day to return to the operating set points.***

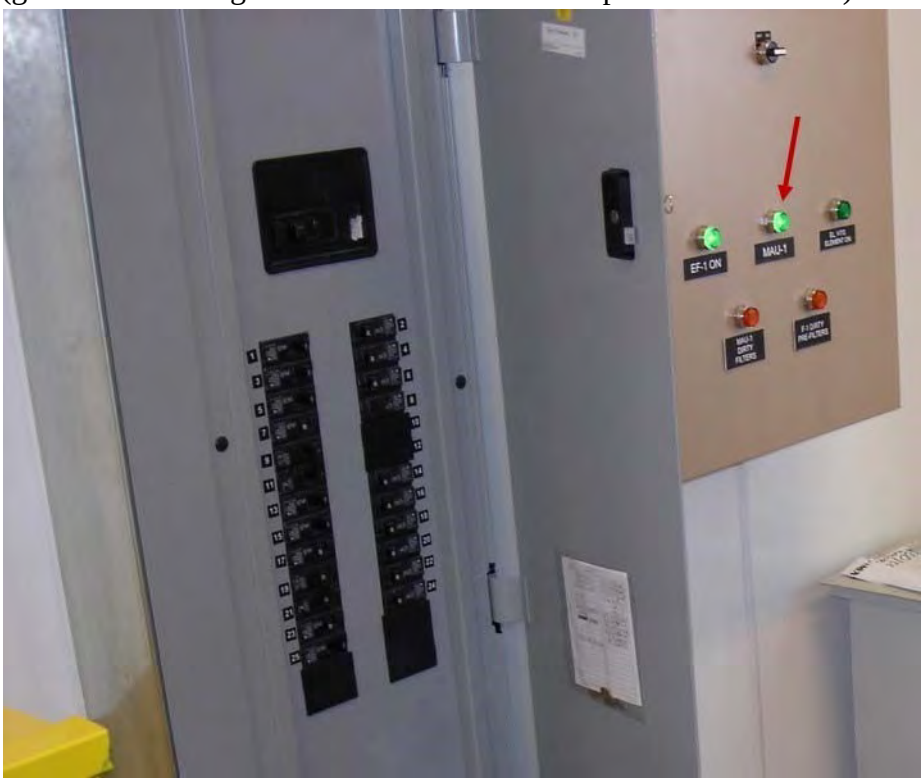
NOTE*: Roughing filters (for particulates) must always be used for both the HVAC and exhaust ventilation fan when operating the Air Handling System. In addition to routine filter inspections, the roughing filters must be inspected after severe dust storms.*

NOTE*: End-of-day operations require that all drums, including waste drums, must be closed; no waste materials may remain in the fume hoods; flasks remaining in the fume hoods must have their plugs installed; fume hood doors must be closed; and all snorkels must be dead-headed. Afternoon operations are managed such that the number of loaded mercury drums stored in the MMTS overnight is minimized and their lids are tightly sealed.*

25.3.1 Startup Procedure

Normally the HVAC unit will be left on overnight. If it has been turned off previously, start this system first because it must be on prior to starting the exhaust ventilation system. The HVAC system provides the make-up air for the exhaust ventilation fan.

- The HVAC system is started by turning on the electrical breakers #10 and #12 in the electrical breaker panel in the Ventilation Equipment Area. Turning on the breakers should be done by a qualified SOC electrician. Verify that the HVAC system has started (green indicator light “MAU-1” on the control panel should be on).



- Start the exhaust ventilation fan from the control panel in the Ventilation Equipment Area. Turn the control switch to “ON”. Verify that the exhaust fan has started. The fan is relatively loud when it starts; there should be no problem hearing it (also green indicator light “EF-1” on the control panel should be on).
- Verify the set-point of the HVAC system is set for human comfort with exhaust ventilation fan set to be on continuously during operations.
- Switch the fume hood alarm silence switches from silence to alarm.

25.3.2 Shutdown Procedure

The end-of-day procedures apply whether the Air Handling System is turned on or off. End-of-day operations require that:

- *All drums including waste drums must be closed.*
- *No waste materials remain in the fume hoods.*
- *Flasks remaining in the fume hoods must have their plugs installed.*
- *Fume hood doors are closed, and all snorkels are dead-headed.*
- *Afternoon operations are managed such that the number of loaded mercury drums stored in the MMTS overnight is minimized and all drum lids are tightly sealed.*
- Shut off the exhaust ventilation fan from the control panel in the Ventilation Equipment Area.
- The HVAC system will continue to operate and control building temperature as long as it is on.
- Verify the set-point of the HVAC system is set for overnight operation, with logic applied to minimize operation of the exhaust fan.

25.3.3 Periodic Maintenance

- Regular maintenance outlined in MMTS-15 is necessary to ensure reliable operation.
- A log is to be kept of all maintenance activities including inspections, component replacements, filter replacements, and any periodic test results. Names and dates are to be included.

NOTE*: The following information is taken from MMTS-15*

Table 28.1. Summary table for inspection and testing of the air handling equipment

Equipment item	**Inspection/test frequency**
Exhaust ventilation fan	Daily
	Annually
HVAC heat pump	Daily

	Annually
HVAC roughing filters	Monthly or more frequently per weather conditions
Exhaust ventilation HEGA filters	TBD
Exhaust ventilation roughing filters	Monthly or more frequently as operations and weather conditions suggest
Fume hoods	Annually
Snorkels	Annually
OG and HVAC ducts	Annually
HVAC registers	Annually
Spare fans	Quarterly

25.3.4 Conduct daily inspections

Inspect the indicator lights on the control panel labeled “MAU-1 DIRTY FILTERS” for the HVAC unit filters, and “F-1 DIRTY PRE-FILTERS” for the exhaust ventilation fan roughing filters daily (see photo in Section 25.3.1).

25.3.5 Conduct monthly inspections

For the HVAC unit, perform the following actions monthly:

WARNING*: Electric Shock Hazard. Shut off all electrical power to the HVAC unit to avoid shock hazard or injury from rotating parts. Refer to the Aaon operation and maintenance manual for all precautions and details.*

- Inspect and replace pre-filters and filters.
- Inspect condensate drain pan for possible plugging and microbial growth. Cleaning of microbial growth should only be done by a qualified service technician.
- Fans, evaporator coils and blower wheels should be inspected for excessive dust build-up and cleaned if required.

For the exhaust ventilation system, perform the following actions monthly:

WARNING: This equipment must not be operated without proper guarding of all moving parts. While performing maintenance be certain all power switches are locked off. Refer to Twin City operation and maintenance manual for all precautions and details.

- Inspect the motor for dirt buildup, and clean if needed.

- Inspect V-belt drives for dirt buildup, burrs, or obstructions. Inspect sheaves for wear and belts for fraying and misalignment.
- Inspect fan wheel for dirt buildup, corrosion, and signs of stress or fatigue (distortion or cracks). Clean if needed.
- Inspect structural components, such as structure, vibration mounts and bolts for tightness, signs of corrosion, stress or fatigue (distortion or cracks). Clean if needed.
- Inspect duct connections, including flexible connections, for distortion, signs of degradation or stress (cracks) and that bolts are tight.
- Lubricate the fan drive bearings every two months per the schedule shown on the housing decal.

25.3.6 Conduct annual inspections

- The HVAC unit should be checked at least once each year by a trained, qualified service technician.
- All original fan motors and bearings are furnished with factory lubrication. The bearings may need to be lubricated periodically. The schedule will depend on the operating duty, temperature variations or other server atmospheric conditions. Bearings should be lubricated when at normal operating temperatures, but not running. Rotate the fan shaft by hand and add only enough grease to purge the seals.

***NOTE**: Do Not Over Lubricate!*

- The exhaust ventilation fan motor should be lubricated every 5 years. Lubrication requirements are attached to the motor. Use the motor manufacturer's recommendations for lubrication.

***NOTE**: MMTS Facility Manager must consider Management of Change implications for any issues or problems noted.*

25.4 RECORDS

- Operation (e.g., runtime), and maintenance log
- Management of Change records

26 – **MERCURY TRANSFER FROM A MERCURY DRU**M

Title: Mercury Transfer from a Mercury Drum **Doc. No.** MMTS-26-Rev5

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date: 2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

Rev. No.	Change description	Author
5	Annual Review - Updated signatory authority to reflect current required signatures. Added Revision number to document number.	Rob Mathias
4	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
3	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
2	Reformatted	Burton Packard and Renee Rodriguez
1	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez

NOTE*: Hard copies of this document may not be the current version. Refer to the "IamTheKey" to verify the current version.*

Reference Documents

Document number	Document title
QP.EMS.HG.0007	Management of Change (Tier 1)

26.1. PURPOSE

This procedure describes the activities and requirements that are associated with recovering loose mercury and flasks of mercury from a drum.

26.2. SCOPE

This procedure covers the drum, flask and metric ton container activities for special operations in the Drum Handling Area in the event of a low-probability occurrence that a flask structural inside the drum is noted by the presence of loose mercury inside the drum. The procedure covers the special equipment and metric ton container transport and handling activities for the operators, including waste handling activities by operators in the drum handling area.

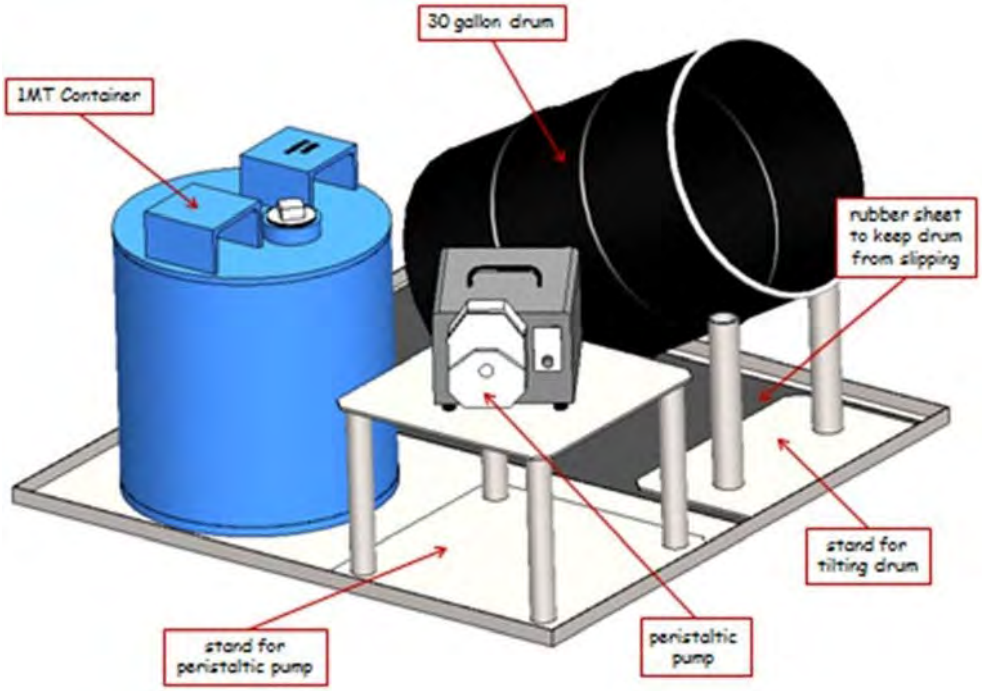
26.3. FLOWCHART

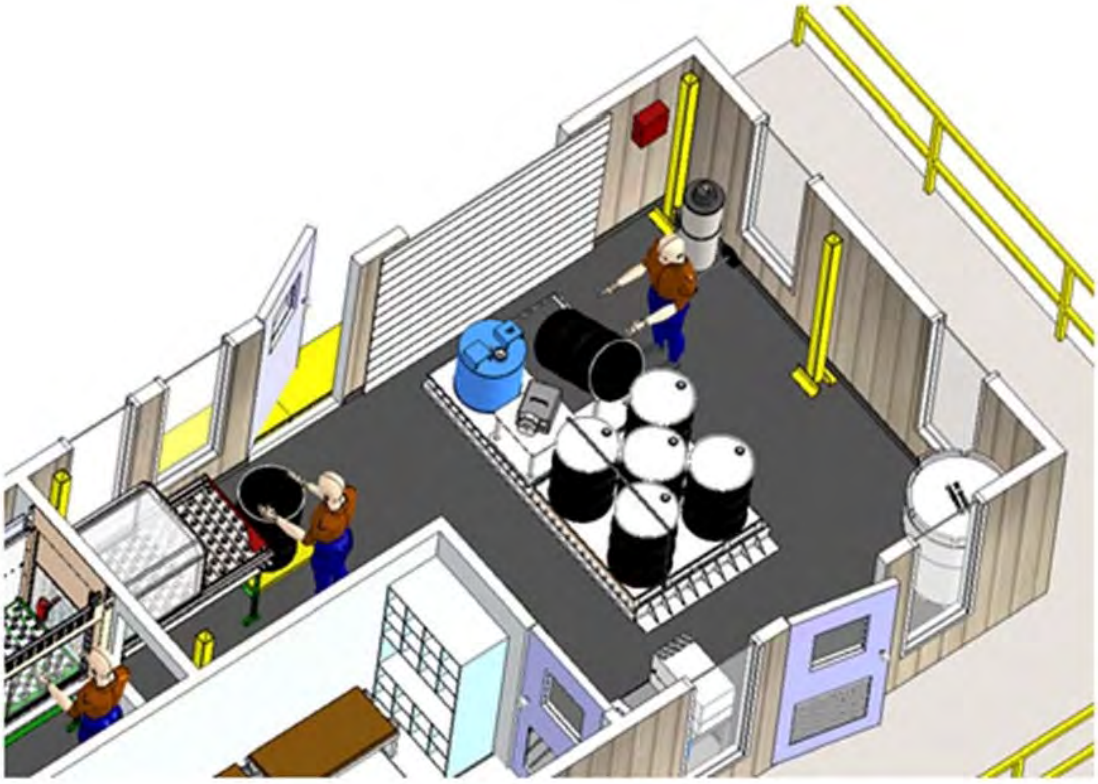
The three (3) figures below reflect the special equipment required and the lay-out for special operations in the Drum Handling Area. The special assembly of equipment sits on a catch pan, with the entire Drum Handling Area diked. As part of routine mercury flask removal the operator is required to inspect the internal drum plastic bag for free mercury. This procedure is applicable to removing that free mercury and respirators may be required, with the probability of occurrence being very small. This procedure may not be required for several of the years of operations. If a drum is identified the mercury is safely contained in the drum which sits on a catch pan when stored inside the mercury storage building. To utilize efficiencies for providing health and safety controls and maintaining the integrity of the operation, the operator may execute this procedure annually to batch a group of such drums, if required.

26.4. RESPONSIBILITIES

The following personnel are required to read this procedure and be trained accordingly to handle equipment and mercury containers safely and to recovery loose mercury safely from a drum:

- Supervisors and staff who oversee operations
- Drum Handling Area workers who will vent and open drums, lift flasks from drums, clean flasks, place flasks in six-pack trays, place failed flask in a bag, manage use of a portable snorkel and mercury analyzer, and remove loose mercury from the drum using the peristaltic pump. The pump directs the free mercury into a metric ton container, in similar fashion to routine Fume Hood 2 operations, but with special provisions for operating in the Drum Handling Area.
- Workers who will operate the forklift to transport equipment, drum and metric ton container. The metric ton container weight management (to acquire net mercury added to it in the Drum Handling Area) is established using the scales in the Flask Handling Area, so a couple extra forklift handling efforts are required.


30 gallon drum
1MT Container
rubber sheet to keep drum from slipping
stand for tilting drum
stand for peristaltic pump
peristaltic pump



26.5. OPERATIONS

NOTE: The operation requires support from the full staff, as directed by the Facility Manager or designee, with careful procedure review and a dry run utilized as needed, with notes taken by an observer. The operations are not required until six months of normal operations experience are gained and lessons learned.

- Drum is placed on 4 ft ×4 ft catch pan on a pallet. The pallet and catch pan stay on the roller conveyor, which may be specially prepared with plywood and roller immobilized.
- Verify there is a waste RCRA drum ready and available, per the figures provided herein.
- The HVAC set at normal temperature. Exhaust fan is required and fume hoods and Flask Handling Room snorkels can be closed if beneficial to formation of a draft in the vicinity of the drum.
- This is a rare operation but uses routine equipment by trained operators. Set up the system initially with no mercury flasks in the MMTS and no other metric ton containers present in the MMTS.
- Inspect drum integrity since no catch pan will be used on the scale.
- Apply cheese-cloth and/or Herculite as required per experience to prepare surfaces.

- Using the drum lift fixture as normal, move drum to 1,000-lb scale for venting with portable and fixed snorkels. Use bung access first for venting.
- A portable mercury monitor is manned and used with the MMS-16.
- Verify portable snorkels and lights are laid out and ready.
- Vent drum with snorkel inside drum and drum lid partly covering drum opening.
- Operators may wear respirators but are not required unless the mercury vapor concentration trigger is met, which is 25 $\mu g/m^3$ at the breathing level. Lower concentration levels are anticipated and the operator can determine what percentage of the 8-h continuous trigger is used to don air purification respirators.
- Inspect contents and lift out flasks one at a time. Utilize scale readings to ascertain if weight per flask is ~ 84 - 90 lbs. If that criterion is met, that flask can be removed. If the 84 lb criterion is not met, the flask should be bagged and then lowered, unhooked and left in drum.
- As acceptable flasks (by weight) are elevated, wipe the bottom in vertical position and apply Merc-X and use the special Tiger-Vac mercury vacuum as appropriate.
- Continue to inspect/autopsy drum and remove flasks one at a time.
- Assume liquid mercury (likely within the drum bag) and 1 flask will remain at the bottom of drum after the other 5 flasks are removed. Utilize a heavy duty 3-gallon bag to contain the failed flask in the drum. A 'Hg Waste Solutions zip bag' could be used if desired.
- Move flask to bag at scale station.
- Remove cardboard packaging from drum at scale station.
- Move drum to 4 ft × 4 ft catch pan on pallet using a hoist.
- Use catch pan to contain metric ton and peristaltic pump and support equipment as shown in Figures.
- Have available supports to lean drum down at 30 degree angle for access.
- Use pump and deliver by closed loop the free elemental mercury to 1 metric ton container.
- Use Tiger-Vac mercury vacuum as prudent and clean-out reservoir of elemental mercury into metric ton container (using peristaltic pump).
- Take action to have accurate tare weight of metric ton container.
- Remove bags/pillow/dunnage into bags and into the RCRA waste drum.
- Clean-up traces with HgX® and apply Tiger-Vac mercury vacuum and dispose of all residuals in RCRA drum.
- Drum disposed as RCRA.
- Clean-up.
- Weigh metric ton container and manage inventory/records.

- Repeat for each drum in smart manner applying lessons learned.

26.6. RECORDS

- Database entry of the quantity of mercury placed in the MT container
- Updated inventory tracking spreadsheets recording the quantity of mercury placed in the MT container.
- Operating log of equipment problems and resolution

27- DEFENSE NATIONAL STOCKPILE MERCURY INVENTORY CONTROL

Title: Defense National Stockpile Mercury Inventory Control

Doc. No. MMTS-27-Rev7

Approval Signatures and Date

Prepared/Reviewed by:	Rob Mathias Depot Manager	Date: 2-13-2020
Approved by:	Jason D Boynton Mercury PM	Date:2-05-2020
Approved by:	Kristi Lammel-Schilling	Date: 17 Feb 2020
Approved by:	Charles R King	Date:2/19/2020

	Initial Release	X	Annual Review/No Revision Required		Annual Review/Update (see history below)

NOTE: *This document will be reviewed at least annually to ensure its suitability.*

Revision History

Rev. No.	Change description	Author
7	Annual Review - Updated signatory authority to reflect current required signatures. Added Revision number to document number.	Rob Mathias
6	Annual Review - Updated signatory authority to reflect current required signatures.	Rob Mathias
5	Annual Review - Updated signatory authority to reflect current required signatures.	Karli Wilbur
4	Reformatted	Burton Packard and Renee Rodriguez
3	Change description Crosswalk Between NDEP CAPP Review Comments (dated 2014-12-09, 2015-01-30 and 2015-02-26) and Mercury Storage and Transfer Program Document Contents March 10, 2015	Burton Packard and Renee Rodriguez
2	Pgs 27-2 and 27-5, revised text to explain scale accuracy. Revised Table 27.1 and Attachment 27.2 spreadsheets for Building 110-98 based on updated information acquired the week beginning October 20, 2015. Corrected Example 1 in Attachment 27.1 to make it consistent with the data for Building 110-66 in Revision 1.	

1	Revised Table 27.1 and Attachment 27.2 spreadsheets for Buildings 110-66 and 110-98 based on updated information acquired the week beginning September 21, 2015.	

***NOTE**: Hard copies of this document may not be the current version. Refer to the "IAmTheKey" to verify the current version.*

Reference Documents

Document number	Document title
QP.EMS.HG.0007	Management of Change (Tier 1)
	Spreadsheet containing 14 building pallet layouts and mercury inventory prior to mercury transfer operations – original
	Working spreadsheet to manage inventory transfers
ORNL-TM-2009-003-V1 and V2	Flask Characterization for the DNSC Stockpile, Volumes 1 and 2
Procedure MMTS-3	Metric Ton Container Transport and Storage
Procedure MMTS-4	Pallet Transport and Handling
Procedure MMTS-13	Data Acquisition and Inventory Management (includes specified report generation requirements for the MMTS Process Control and Data Acquisition System)

27.1. PURPOSE AND BACKGROUND

The purpose of this procedure is to provide means to control mercury mass balance on the HWAD site. The current mass balance is based on 76 lb mercury per flask. The metric ton container sits on a scale that is accurate to ± 3 lb; therefore, the accuracy of the mass balance of the entire inventory is improved by implementation of this project. This procedure describes implementation of an inventory control system for the Mercury Transfer Program based on spreadsheets. This spreadsheet-based system (or equivalent) will be used for start-up and testing and will be maintained during the approximately 15-year duration of the Mercury Transfer Program. The spreadsheet system details the mass of mercury within the 14 mercury storage buildings and the MMTS at the end of each workday. The spreadsheet system is used to track and record intrasite changes, i.e., movement of mercury inventory among buildings. Building 110-66 is the operations building used to accumulate loaded metric ton containers for transfer to the other long-term storage buildings. Along with Building 110-66, six long-term storage buildings are required for the entire inventory. The MMTS data acquisition and database management system will also be used for validating the mercury mass balance and supporting record and report generation.

27.2. SCOPE

This procedure describes the responsibilities of the Facility Manager (or designee when the Facility Manager is not present) to maintain an up to date (daily), accurate record of the mercury mass balance and the methods to be used to accomplish that end. Detailed layouts showing the current mercury inventory in the 14 mercury storage buildings, future layouts in metric ton containers in six identical buildings and in-process layouts for use in Building 110-66 as the operations center are provided in this procedure. A CD accompanies this procedure and it contains the baseline inventory spreadsheet (Spreadsheet 1).

27.3. BASIS AND SOFTWARE

The operation is based on transferring 29 flasks (~2.5 L mercury per flask) into each metric ton container; close to 2,205 lb mercury is expected to be transferred into each MT container.

The processing basis is defined to be 30 MT containers based on the pallet to drum to flask to MT container ratios. Each pallet holds five (5) drums and each drum contains six (6) flasks for a total of 30 flasks on a pallet. Each MT container holds the mercury from 29 flasks. Hence, the mercury contained on 29 pallets will fill 30 MT containers with no residual flasks.

Three (3) spreadsheets (or a combination of spreadsheets and worksheets) will be maintained to document and demonstrate control of the mercury mass balance. These are Spreadsheet 1 – Original Warehouse Inventory, Spreadsheet 2 – Modified Warehouse Inventory and Spreadsheet 3 – Current MMTS and Building 110-66 Inventory.

A separate working spreadsheet is required for use to include 110-66 and MMTS (Spreadsheet 3). This spreadsheet accounts for daily moves of pallets into MMTS and those retained in MMTS as full flasks either in drums or hoods, as well as end of day balance in the MT container and/or even retaining a loaded metric ton container overnight. The procedures are designed to keep these transfers and associated accountability simple with all drums emptied and end of day based on completion of a filled metric ton container moved out. Operations can be kept flexible by allowance of limited closed containers left in the MMTS overnight and this spreadsheet will account for each pound of mercury (flask or partially filled metric ton container) present.

After each processing basis of 30 metric ton (MT) containers (29 pallets), the Facility Manager (or designee when the Facility Manager is not present) uses Spreadsheet 2 to prepare a report and submits it to the SOC Mercury Storage Program CAPP manager for use in updating the Mercury Storage Program CAPP records. It is noted herein that no filled metric ton containers will be moved outside Building 110-66 until the entire mercury contents in Building 110-66 have been transferred into metric ton containers and placed for long-term storage.

Four metric ton container serial numbers can fit into a catch pan space in Spreadsheet 2. The operator will input the alpha numeric logic/tags to locate metric ton containers within the building and shall tie the serial numbers to each box.

27.4. MASS BALANCE DETAILS

The mass balance for flasks is based on 76 lb/flask. The mercury is stored as a commodity with government mandates never to sell it or transfer it off the site. The 76 lb/flask is the inventory control basis used to define the book value of the elemental mercury inventory stored (see Section 27.8, Attachment 27.1, Example 1).

The configuration of the mercury stockpile prior to starting mercury transfer operations is shown in Table 27.1. Note that Table 27.1 provides information about flask types that occur in each building. Flask types are described in the reference document entitled *Flask Characterization for the DNSC Stockpile, Volumes 1 and 2 (ORNL-TM-2009-003-V1 and V2).*

Table 0.1 Initial configuration of the mercury stockpile at HWAD

HWAD Mercury Storage	PALLETS	DRUMS	FLASKS	NET WT (pounds)	NET WT (metric tons)
BUILDING #110-52 / ALL TYPE 5	316	1,580	9,462	719,112	326.2
BUILDING #110-66 / ALL TYPE 5	203	1,015	6,090	462,840	214.1
BUILDING #110-77 / ALL TYPE 5	316	1,580	9,480	720,480	326.8
BUILDING #110-78 / MIXED TYPES 5,6,7,8,14	316	1,580	9,480	720,480	326.8
BUILDING #110-87 / TYPE MIXED	316	1,580	9,475	720,100	326.6
BUILDING #110-88 / TYPE MIXED	316	1,580	9,480	720,480	326.8
BUILDING #110-89 / ALL TYPE MIXED	316	1,580	9,348	710,448	322.3
BUILDING #110-92 / TYPES UNK,1,2,6,16	316	1,580	9,480	720,480	326.8
BUILDING #110-93 / TYPES 6 & 15	316	1,580	9,474	720,024	326.6
BUILDING #110-94 / TYPES MIXED & 13	316	1,573	9,430	716,680	325.1
BUILDING #110-95 / ALL TYPE 13	316	1,580	9,480	720,480	326.8
BUILDING #110-96 / TYPES 13 & 5	303	1,515	9,090	690,840	313.4
BUILDING #110-97 / All TYPE 3	316	1,580	9,478	720,328	326.7
BUILDING #110-98 / TYPES 3,4,5,6,7,8,14,31,UNK,ORNL	316	1,576	9,452	718,352	325.8
TOTALS	**4,298**	**21,479**	**128,699**	**9,781,124**	**4,436.6**

Figures showing the spreadsheet-style layouts of each building are given in Section 27.8, Attachment 27.2. The spreadsheets (worksheets) for each building are attached as files on a CD that accompanies this procedure. The building-specific spreadsheet (worksheet) (Spreadsheet 2) will be used (expanded) to include cells with entries for metric ton containers. The pallet number will be replaced with container serial number, and each catch pan is used to store 4 containers. The change to the storage configuration records and the mass per building will be updated monthly.

The mass balance will be improved as the mercury transfer program progresses because the flask basis is an estimate based on industry standards and practice, and the mass of mercury in a metric ton container (29 flasks/MT container) is a measured value specified to be ± 3 lb. The equivalent 214 MT containers will be stored in Building 110-66.

To make room for additional metric ton container storage in the second building to be processed a five-truck transport of 70 pallets will be made (see Section 27.8, Attachment 27.1, Example 2). Each shipment is assumed to be 14 pallets. A sufficient number of catch pans will be returned to the building of origin from Building 110-66 to allow for placement of a filled MT container on a catch pan at that same location. Note that 30 MT containers (generated from 29 pallets) will fit on 8 drip pans; the remaining 21 drip pans (from the 29 pallets) may be reused elsewhere or recycled. The building inventory reported to SOC for the Mercury Storage Program CAPP will be based on a report generated every 30 MT container shipment period. The filled MT containers are stored temporarily in Building 110-66 and transferred to Building 110-XX for long-term storage.

27.5. RESPONSIBILITIES

The following personnel are required to read this procedure and be trained accordingly to maintain the accounting and generate records for the mercury inventory:

- Facility Manager and designee who record mass balance information in spreadsheets (or a combination of spreadsheets and worksheets)
- MMTS workers who perform tasks that result in reportable quantities for the mercury mass balance.

27.6. OPERATIONS

The mercury transfer operation is based on transferring 29 flasks (~2.5 L mercury per flask) into each metric ton container; close to 2,205 lb mercury is expected in each MT container.

As a space opens up because the pallet occupying the space has been removed, the serial numbers of four (4) metric ton containers will fit into a catch pan space (Spreadsheet 2). The Facility Manager (or his designee when the Facility Manager is not present) will input the alpha numeric logic/tags to locate metric ton containers within the building and shall tie the serial numbers to each box.

A separate working spreadsheet (Spreadsheet 3) is required for use to integrate 110-66 and MMTS operations. This spreadsheet accounts for daily moves of pallets into MMTS and mercury retained in MMTS as full flasks either in drums or hoods, as well as end of day balance in the MT container and/or even retaining a loaded metric ton container overnight. The procedures are designed to keep these transfers and associated accountability simple with all drums emptied and end of day based on completion of a filled metric ton container moved out. Operations can be kept flexible by allowance of limited closed containers left in the MMTS overnight and this spreadsheet (Spreadsheet 3) will account for each pound of mercury (flask or partially filled metric ton container) present.

The Building 110-66 configuration for startup includes space allocation for 207 mercury pallets, 42 pallets of empty flask waste drums, palletized industrial waste (stored in North-end diked area), empty drums and drip pans, metal strapping and wood waste containers (located in south end diked area), new empty metric container staging, and filled metric ton container staging (see Section 27.8, Attachment 27.3, Building 110-66).

The inventory of mercury in metric ton containers is based on measured amounts and it is useful procedurally for the Facility Manager to spot check the difference in weight between 2,205 lb. and the measured weight for each container. The Facility Manager (or his designee when the Facility Manager is not present) will include in Spreadsheet 3 a calculation of the difference in weight of each metric ton container and the total weight difference every 29 pallets, the frequency for reporting to SOC the overall mass balance in each building. The mercury storage building inventory will be based on a report generated every 30 MT shipment period (report based on Spreadsheet 2).

The basis for using the 30-MT shipment period as the incremental reporting period follows. If the processing rate is 1.5 containers per day and 29 pallets generates 30 metric ton containers, then 20 days of operation is the operational basis for generating a revised mass balance report for SOC. 20 days divided by 4 days per week = 5 calendar weeks. Maintaining operations with some material remaining for processing, and adding 70 pallets to Building 110-66 from time to time, is required. Lay-outs are included in this procedure to verify space availability exists (see Attachments 27.3). These lay-outs include provisions for container retrieval utilizing the specific model forklift procured for this service (see Section 27.8, Attachment 27.6). In some locations a limited number of containers must be moved to access a specific container. The space is available for this operation, which could be performed quickly.

Each metric ton move requires Spreadsheet 2 and 3 to be updated. Each truck move of pallets and metric ton containers also requires updates to Spreadsheet 2 and 3. There will need to be two people on staff expert in the use of these spreadsheets.

It will take 13-14 months to generate 214 MT containers in Building 110-66, i.e., to process the existing pallets in that building. Therefore, there is a significant time after the start of mercury processing prior to staging metric ton containers for moving from Building 110-66 to Building 110-XX.

Starting to load other buildings is based on storing 237 MT containers; 214 produced from pallets of mercury in Building 110-66 and 23 others added to allow for an even distribution in the other six (6) long-term storage buildings. Storing 237 MT containers will take an additional period beyond the 13-14 months required to generate the original 214 MT containers. The total period could be extended if more space were to be used in Building 110-66 for permanent storage, but flexibility is provided to keep that building largely open by using a total of seven (7) buildings for storage of the 4,437 MT inventory over the course of the MMTS operations. There is a need to process some containers from a second building to make space for storing the metric ton containers in that second building. That phase is a long way off and procedures are made flexible now to allow it to happen without being unduly constrained.

The suggested sequence of building usage and quantity stored is shown in Table 27.2. This grouping of mercury storage buildings was chosen to keep the long-term mercury storage buildings near each other. Aside from starting in Building 110-66, the precise sequence for filling

the long-term storage buildings is at the discretion of the Facility Manager. A suggested building processing sequence is given in Attachment 27.4.

NOTE: The eight pallets ORNL used to do drum and flask integrity research are currently in Building 110-98. At some point, these eight pallets can be staged in Building 110-66. In order to preserve the ability to assess changes in flask integrity, the mercury from these eight pallets should be transferred at the very end of operations.

The suggested lay-out of MT containers on drip pans for each of the seven (7) long-term storage buildings is shown in Section 27.8, Attachment 27.3. Note that Building 110-66 retains about one-third the number of MT containers stored in each of the other six (6) long-term storage buildings (237 versus 700).

Table 0.2 Sequence of buildings used for long-term storage and inventories

Order	Lay-out* and sequence of fill	Number of MT containers	Number of catch pans loaded with MT containers
1	110-66	237	60
2	110-52	700	175
3	110-77	700	175
4	110-78	700	175
5	110-87	700	175
6	110-88	700	175
7	110-89	700	175

27.7. RECORDS

- Spreadsheet 2
- Spreadsheet 3

Section 27.8, Attachment 27.5 provides a current description of the planned records generation capability of the MMTS Process Control and Data Acquisition System. This capacity and functionality will improve with operations experience.

27.8. ATTACHMENTS

Mass balance example calculations (Attachment 27.1)

Current lay-outs/mass balance spreadsheets for mercury storage in flasks in drums – Spreadsheet 1 (Attachment 27.2)
Building 110-66 layout including filled metric ton containers and Layout of remaining six identical mercury storage buildings (Attachment 27.3)

Suggested processing sequence for reflasking mercury (Attachment 27.4)

Reports generation by for the MMTS Process Control and Data Acquisition System (Attachment 27.5)

Toyota forklift model 8FGU20 (Attachment 27.6)

ATTACHMENT 27.1 Mass Balance Example Calculations

- Example 1 – Processing the contents of Building 110-66

Two hundred-three (203) pallets of drums are currently stored in Building 110-66 and will be processed initially. This operation will take over one (1) year. The 203 pallets expressed in pounds of mercury are

$$203\ pallets * 5\frac{drums}{pallet} * 6\frac{flasks}{drum} * 76\frac{\quad}{flask}\ 462{,}840$$

This mass of mercury expressed in metric ton containers is

$$462{,}840 * \frac{1}{2{,}205} \sim 209$$

- Example 2 – Processing 70 pallets from 110-XX

Seventy (70) pallets are brought to Building 110-66 from Building 110-XX on a basis of 14 pallets per truck. The 70 pallets expressed in pounds of mercury are

$$70\ pallets * 5\frac{drums}{pallet} * 6\frac{flasks}{drum} * 76\frac{\quad}{flask}\ 159{,}600$$

This mass of mercury expressed in metric ton containers is

$$159{,}600 * \frac{1}{2205} \sim 73$$

ATTACHMENT 27.2 Current lay-out/mass balance spreadsheet images for mercury storage in flasks in drums

The CD contains complete lay-out/mass balance spreadsheets for all 14 mercury storage buildings.

WAREHOUSE #110-66

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Implementation of Long-Term Inspection
Sponsor: DLA Strategic Materials
Oak Ridge National Laboratory - UT-Battelle, LLC

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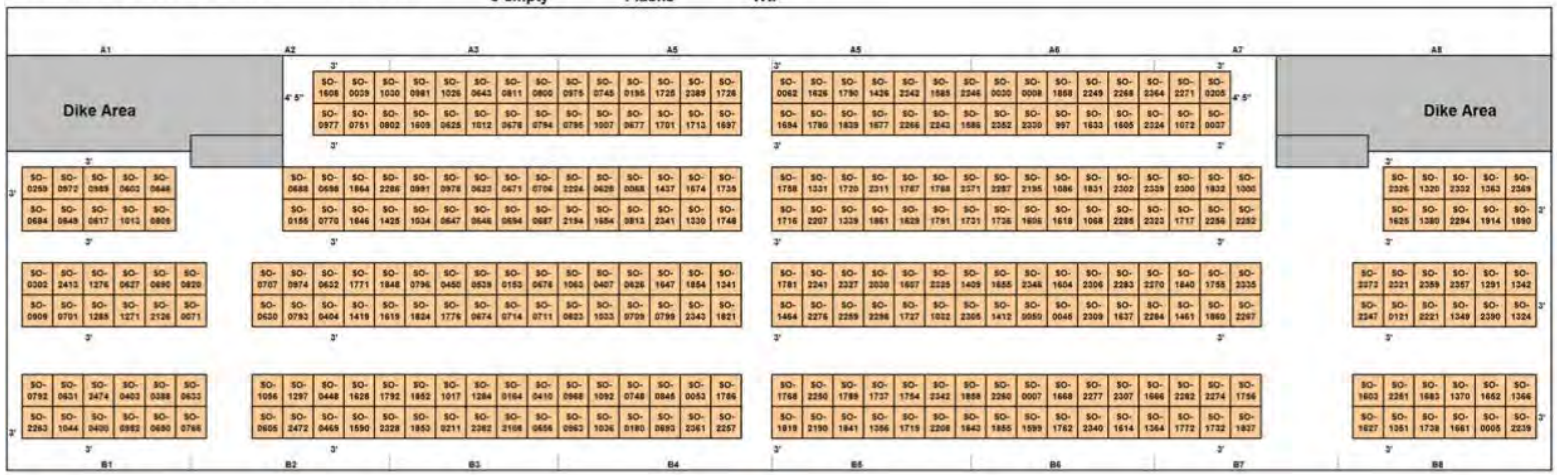
BUILDING #110-88

BUILDING #110-88 TYPE MIXED | 316 Pallets | 1,580 Drums 0 empty | 9,480 Flasks | 720,480 Net Wt.



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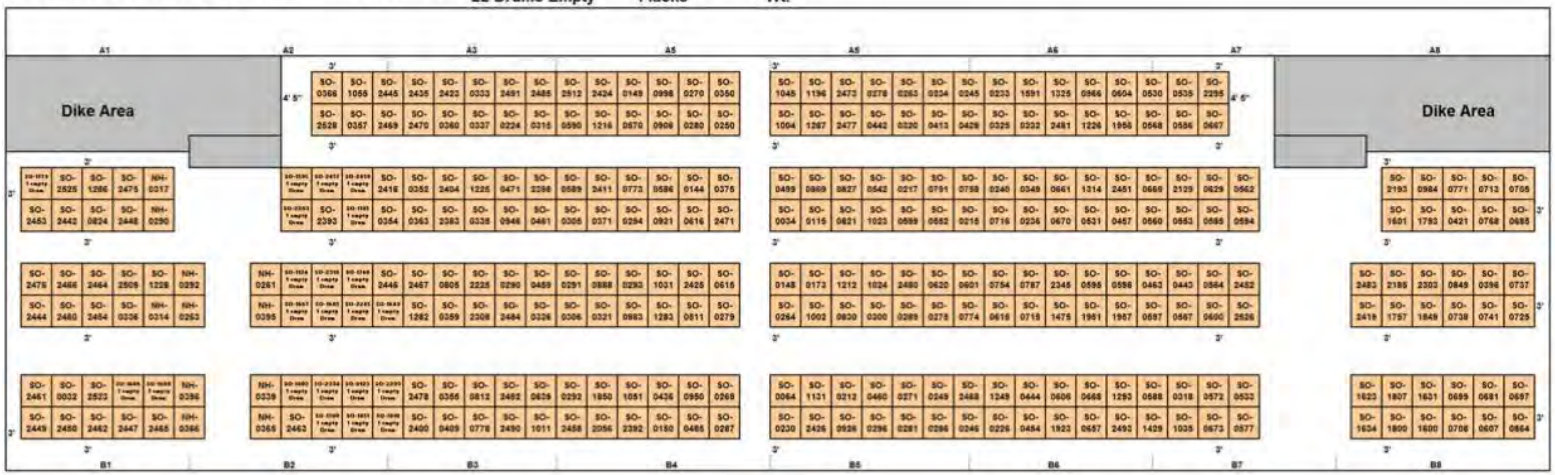
BUILDING #110-89

BUILDING #110-89 ALL TYPE MIXED | 316 Pallets | 1,580 Drums 22 Drums Empty | 9,348 Flasks | 710,448 Net Wt.



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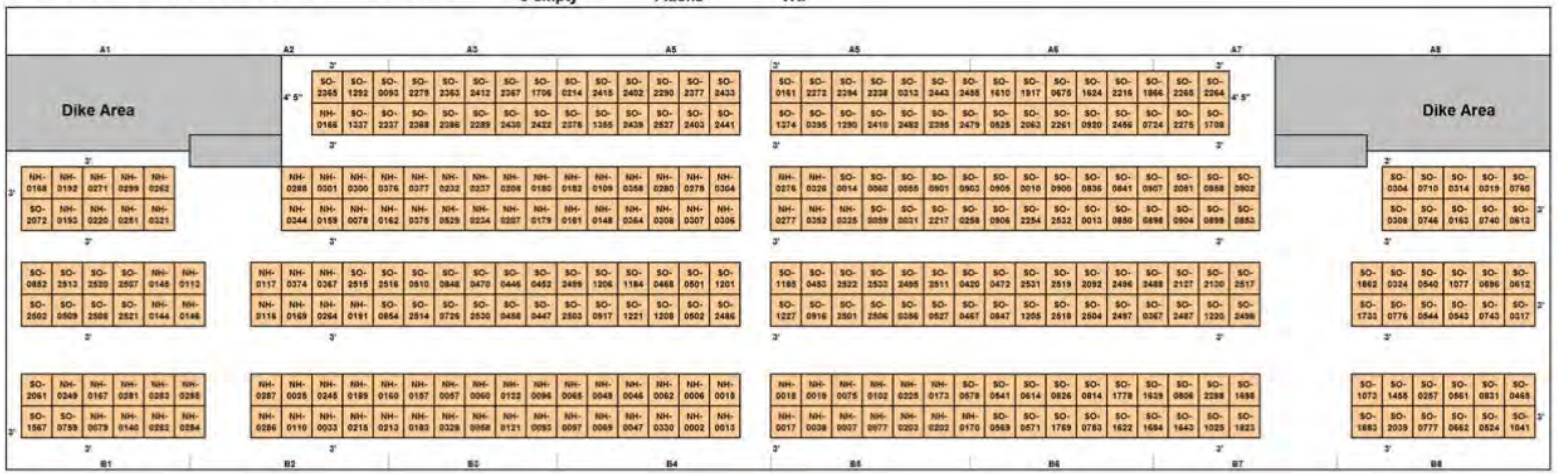
BUILDING #110-92

BUILDING #110-92 Types UNK,1,2,6,16 | 316 Pallets | 1,580 Drums 0 empty | 9,480 Flasks | 720,480 Net Wt.



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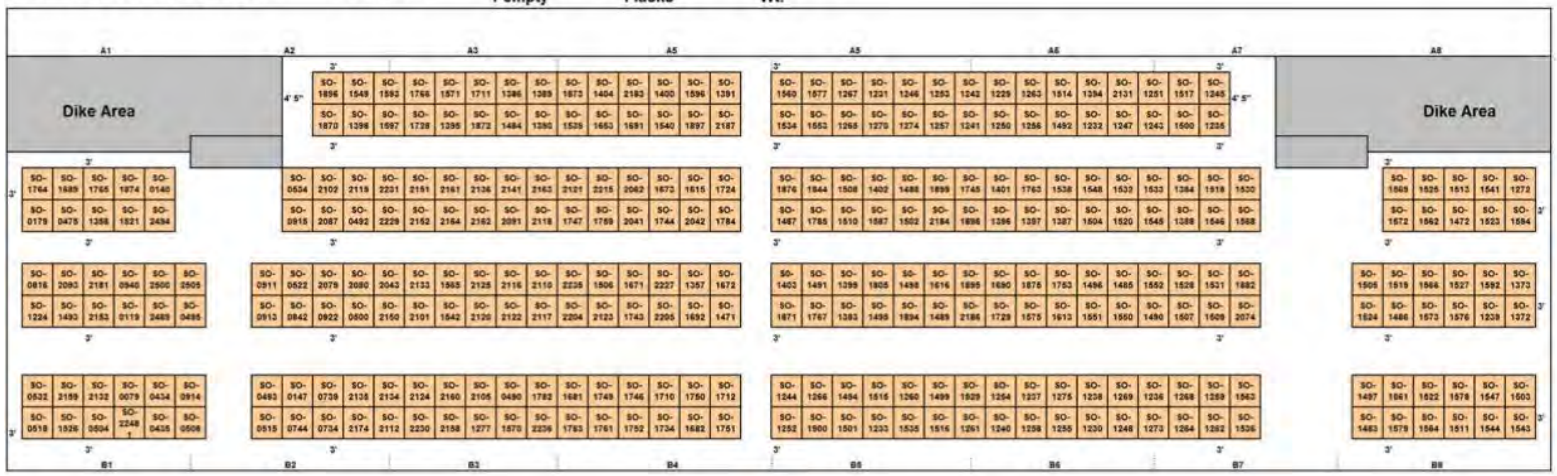
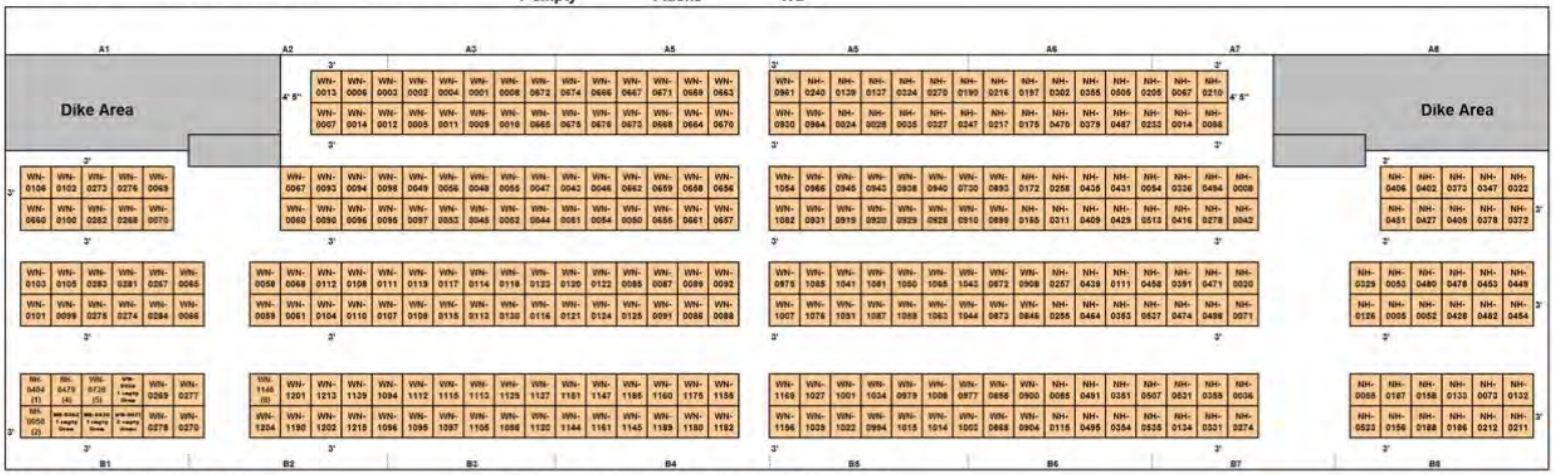
BUILDING #110-93

BUILDING #110-93 TYPES 6 & 15 | 316 Pallets | 1,580 Drums 1 empty | 9,474 Flasks | 720,024 lbs Net Wt.



BUILDING #110-94

BUILDING #110-94 TYPES MIXED & 13 | 316 Pallets | 1,573 Drums 7 empty | 9,430 Flasks | 716,680 Net Wt.



(1) Pallet NH-404 drum NH-02682 contains 3 flask only.
(2) Pallet NH-060 drums 138-140 contain type 5 flask. Drum 137 contains type Unknown flask. Drum 134 contains type Mixed flask.
(4) Drum NH-02392 contains flask type Unknown. Remainder of pallet NH-479 contains flask type MIXED.
(5) Drum#3627 only 1 flask also 3 empty drums on pit.

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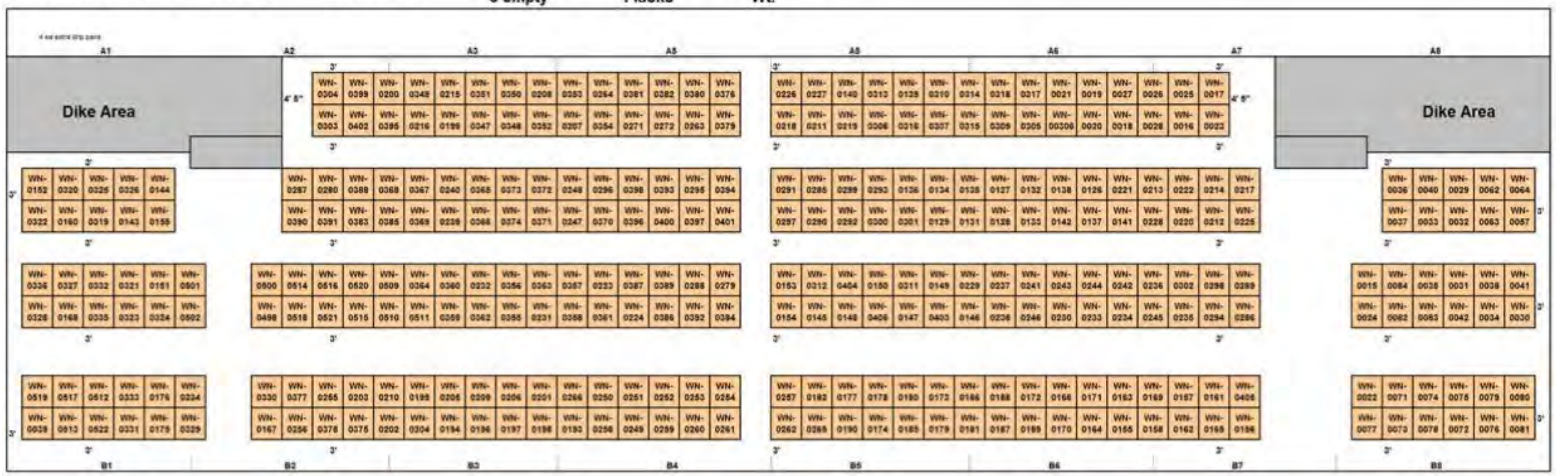
BUILDING #110-95

BUILDING #110-95 ALL TYPE 13 | 316 Pallets | 1,580 Drums 0 empty | 9,480 Flasks | 720,480 Net Wt.



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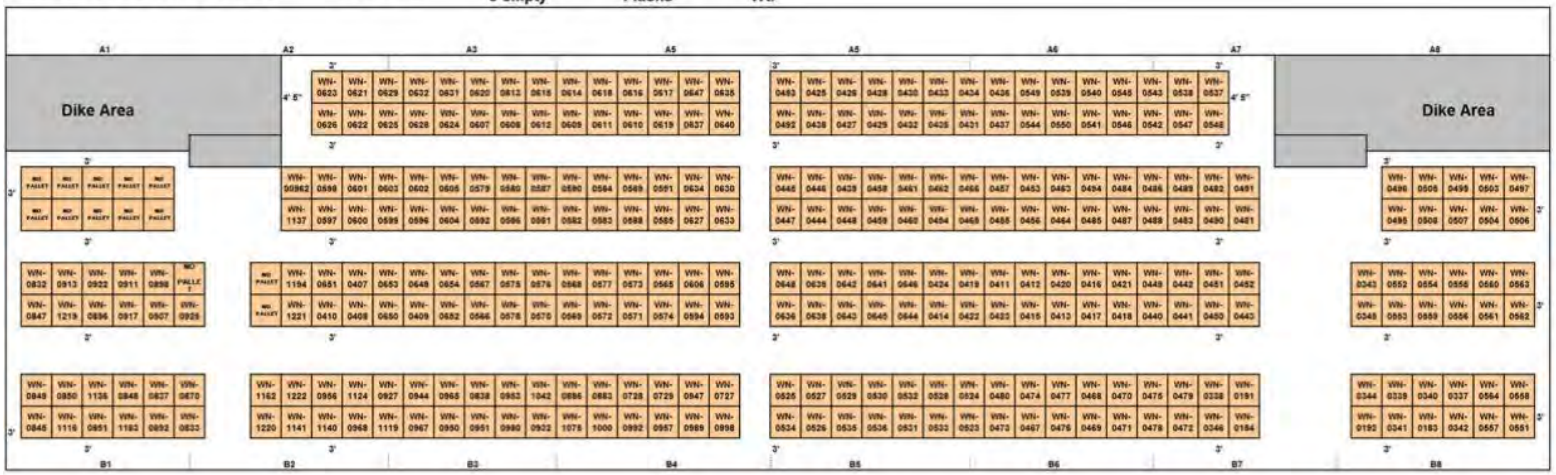
BUILDING #110-96

BUILDING #110-96 TYPES 13 & 5 | 303 Pallets | 1,515 Drums 0 empty | 9,090 Flasks | 690,840 Net Wt.



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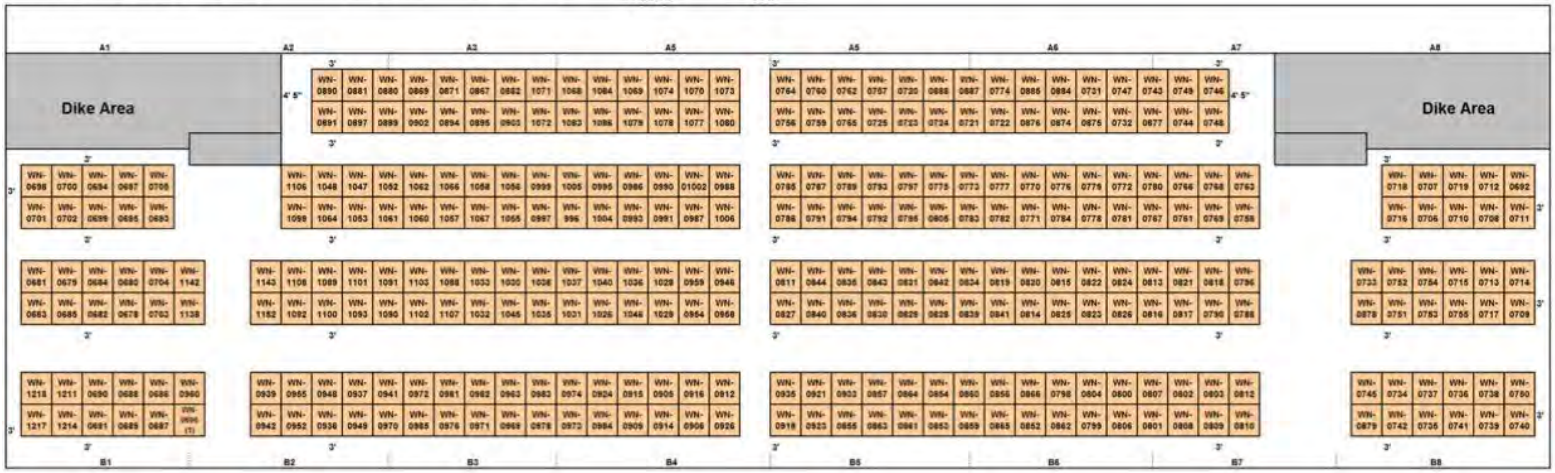
BUILDING #110-97

BUILDING #110-97 All TYPE 3 | 316 Pallets | 1,580 Drums | 9,478 Flasks | 720,328 Net Wt.



(1) Pallet WN-0696 Drum 3476 has 2 flasks

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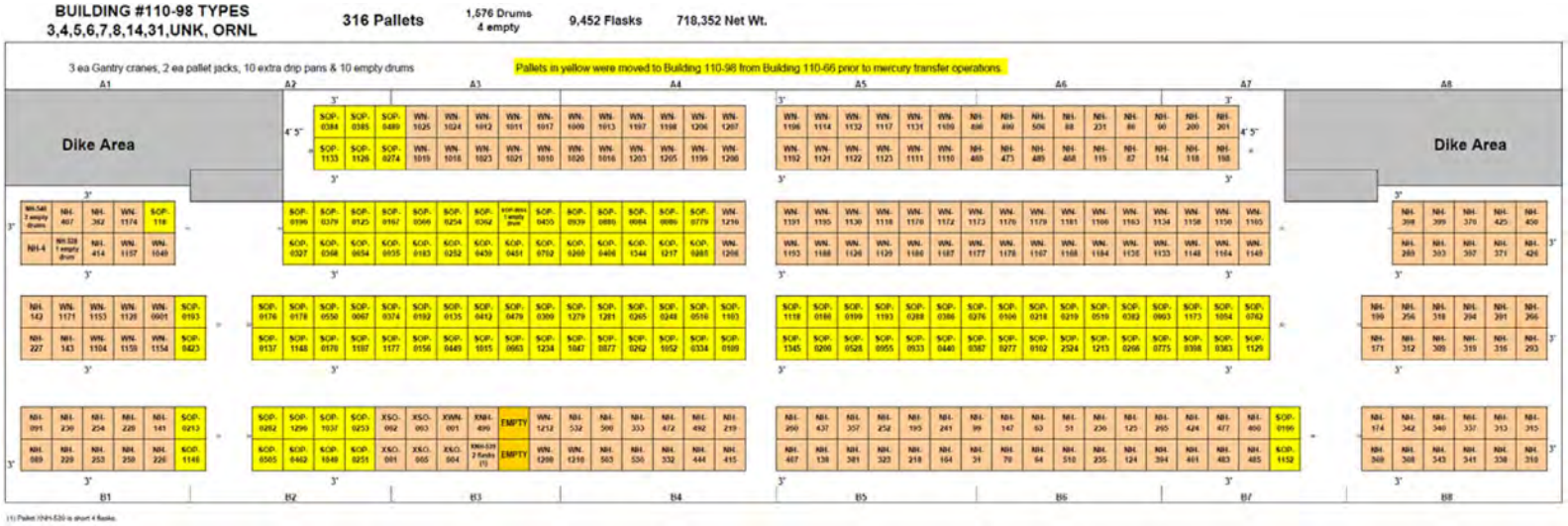
WAREHOUSE #110-98



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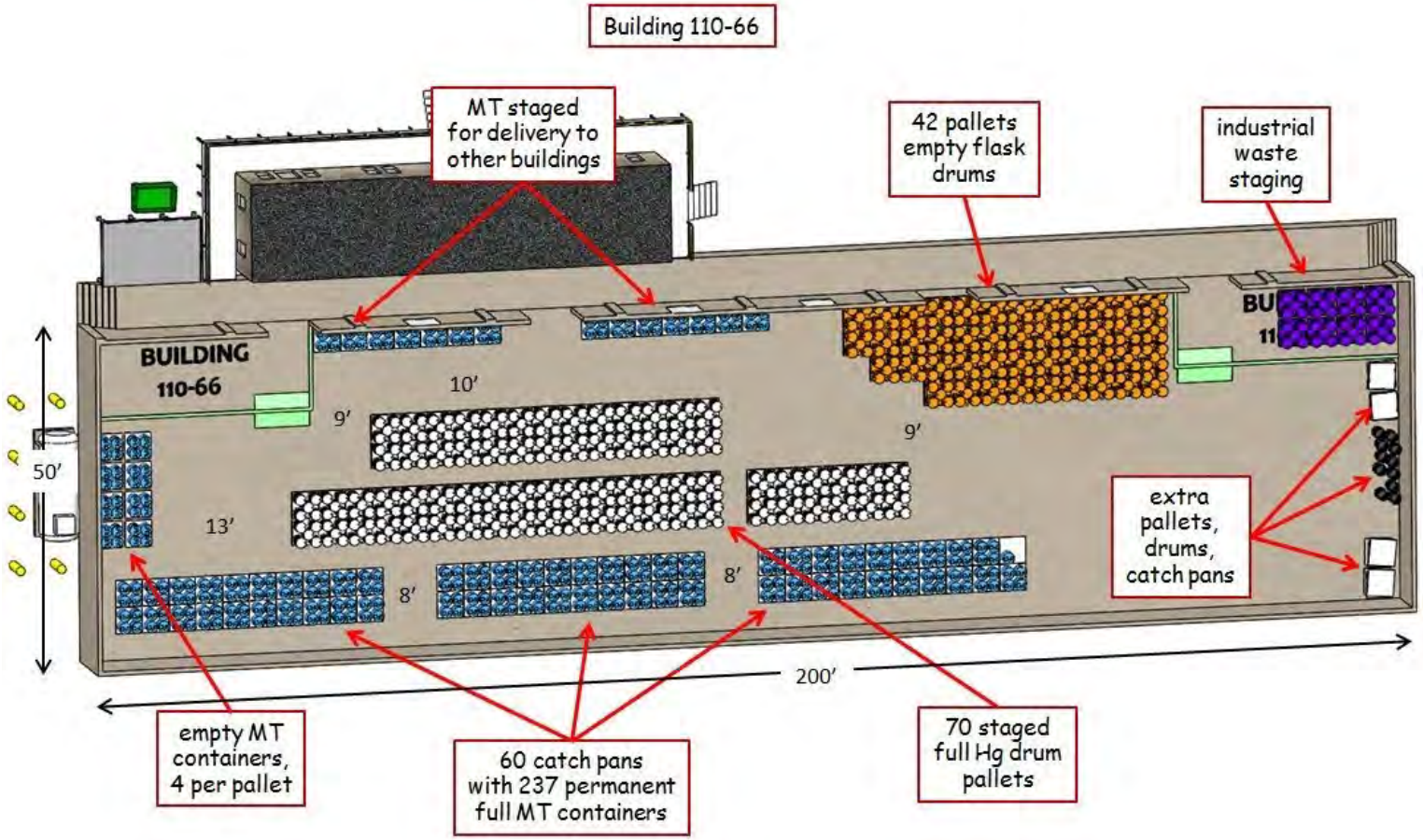
ATTACHMENT 27.3 Building 110-66 layout including filled metric ton containers



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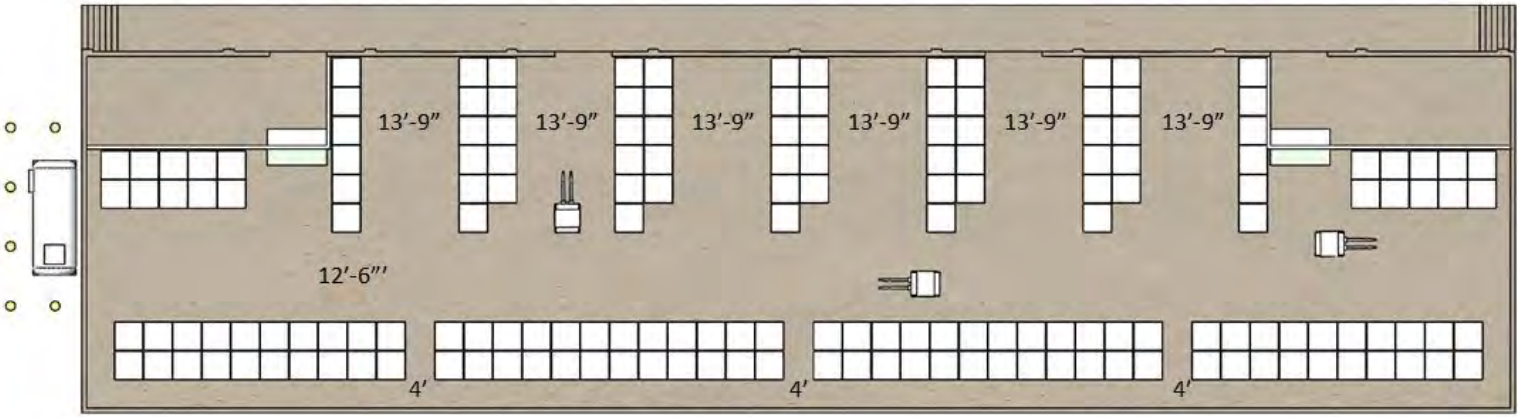
Layout of remaining six identical mercury storage buildings

6 Buildings
110-52
110-77
110-78
110-87
110-88
110-89

175 reused catch pans
4 MT containers per catch pan
700 MT containers per building
4200 MT containers



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ATTACHMENT 27.4 Suggested processing sequence for reflasking mercury.

MODEL FOR WAREHOUSE PROCESSING SEQUENCE

Sequence	Building	Rationale
1	110-66	Makes room for processing and eliminates greatest risks first – all T-5 flasks[1]
2	110-52	All T-5 flasks – eliminates greatest risks first
3	110-77	
4	110-78	Substantial number of pallets made up solely of T-5 flasks – eliminates
5	110-96	greatest risks first
6	110-97	All T-3 flasks[2] – eliminates high risks
7	110-98	Eliminates remaining pallets made up solely of T-3 and T-5 flasks – set aside the two ORNL pallets until the end of the repackaging campaign
8	110-87	Records show no pallets made up solely of T-3 or T-5 flasks. In the absence
9	110-88	of an overarching rationale for reflasking the contents of these in a specific
10	110-89	order, numerical sequence is suggested.
11	110-92	
12	110-94	
13	110-93	All T-6 and T-15 flasks[3] – suitable for long-term storage
14	110-95	All T-13[4] – suitable for very long-term storage

[1]Based on studies conducted by ORNL, T-5 flasks (> 44% of the stockpile) constitute the greatest qualitative risk of failure.

[2]T-3 flasks (> 16% of stockpile) follow closely behind T-5 flasks in qualitative risk of failure.

[3]T-6 flasks (> 4% of stockpile) and T-15 flasks (>4% of stockpile) are high quality seamless flasks – low qualitative risk of failure

[4]T-13 flasks (> 15% of stockpile) are very high quality seamless flasks – very low qualitative risk of failure

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ATTACHMENT 27.5 Reports generation by the MMTS Process Control and Data Acquisition System

REPORTING REQUIREMENTS

The PCDAS (Process Control and Data Acquisition System) shall be capable of generating production reports. This system shall be optimized during the first few months of operation, with additional standard reports implemented. The inventory control reports are managed using spreadsheets; the following summary and detailed reports are for back-up and trending. The standard report contents using the PCDAS system will be finalized in conjunction with operating experience.

Weekly/monthly summary reports

- Reporting period—define the interval.
- Amount of mercury transferred from 3-L containers to 1-MT containers during the reporting period.
- Number of 1-MT containers filled during the reporting period.
- Warehouse(s) receiving 1-MT containers and the number of 1-MT containers received during the reporting period.
- Warehouse(s) contributing 3-L containers, drums and pallets, and the number of each removed during the reporting period—make a note of any departures from six flasks per drum and five drums per pallet.
- Maximum and minimum environmental parameters measured during the reporting period with the date and time of each measurement (time stamps).
- Maximum and minimum mercury concentrations measured during the reporting period with time stamps

Weekly/monthly detailed reports

- Reporting period—define the interval.
- Amount of total and daily mercury transferred from 3-L containers to 1-MT containers during the reporting period.
- Total and daily number of 1-MT containers filled during the reporting period.
- Mercury content of each of the 14 warehouses at the beginning and end of the reporting period, designate any buffer stocks in Building 110-66 as such.
- Warehouse(s) contributing 3-L containers, drums and pallets, and the number of each removed during the reporting period—make a note of any departures from six flasks per

drum and five drums per pallet—list drum and pallet numbers with time stamps—present incremental (time period) and total datasets.

- Warehouse, drip tray locations within the warehouses (locations should be equivalent between warehouses, e.g., a drip tray at position 110-52-1 should be at the same relative location as a drip tray at position 110-93-1) and number of 1-MT containers on each drip tray, including time stamps—present incremental (time period) and total datasets.
- Daily max and min environmental parameters with time stamps
- Daily max and min mercury concentrations with time stamps

ATTACHMENT 27.6 Toyota forklift model 8FGU20

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SPEC-CHECKER : Product specifications

Toyota

Model: 8FGU20

Draft specifications (awaiting approval)

Market
World

Equipment Type
Forklift - Conventional (I.C.E.)

Description
8-Series pneumatic tire truck, 4000lb capacity

Tip! Position your mouse over specification name for description.

Tools: Roll over icons for explanation

General information

Fuel type	Gas/LPG
Capacity A	4000 lb (1,814.37 kg)
@ Load centre A	24 inch (609.60 mm)

Performance specifications

Lift speed, with load	23.6 inch / sec. (599.44 mm/sec)
Travel speed forward, with load	10.9
Climbing performance, with load (%)	41

Power specifications

Rated power	51 HP
@ rpm	2570

Dimensions and weight

Lowered height	83.1 inch (2,110.74 mm)
Machine length	84.7 inch (2,151.38 mm)
Machine width	45.3 inch (1,150.62 mm)
Outside turning radius	84.7 inch (2,151.38 mm)
Right angle stacking aisle	103.2 inch (2,621.28 mm)

Wheels, tyres and brakes

Tyres, type	Pneumatic

Source:
Last updated: Thursday, 14 June 2007

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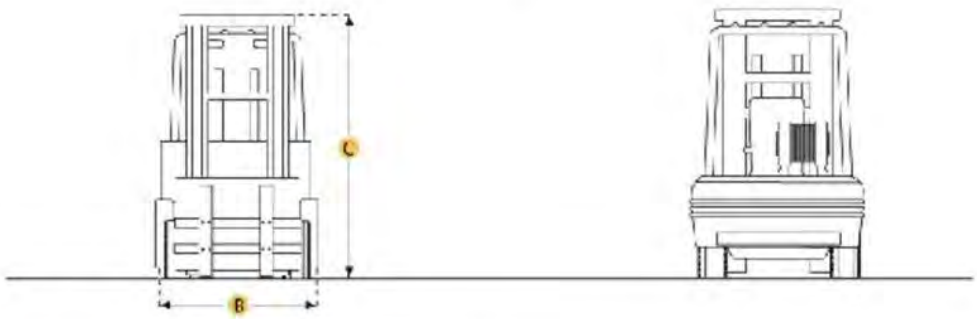

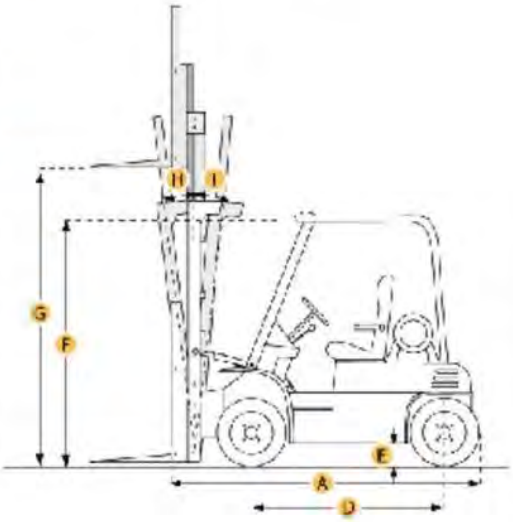

Selected Dimensions

Dimensions		
A. LENGTH TO FORK FACE	8.5 ft in	2575.6 mm
B. OVERALL WIDTH	3.8 ft in	1150.6 mm
C. OVERALL HEIGHT - MAST LOWERED	ft in	mm
F. HEIGHT TO TOP OF OVERHEAD GUARD	6.9 ft in	2110 mm

Specification

Engine		
MODEL	4Y-ECS	
POWER	51 hp	38 kw
TORQUE	115.1 lb ft	156 Nm
POWER MEASURED @	2570 rpm	
TORQUE MEASURED @	2100 rpm	
FUEL TYPE	Gas	
Operational		
TIRE TYPE	Pneumatic	
NUMBER OF FRONT WHEELS	2	
NUMBER OF REAR WHEELS	2	
MAX SPEED	10.9 mph	17.5 km/h
MAST		
LOAD CAPACITY	4000 lb	1814.4 kg
LOAD CENTER	23.6 in	600 mm
LIFT SPEED	118 ft/min	m/min
Dimensions		
LENGTH TO FORK FACE	8.5 ft in	2575.6 mm
OVERALL WIDTH	3.8 ft in	1150.6 mm
OVERALL HEIGHT - MAST LOWERED	ft in	mm
TURNING RADIUS	7.1 ft in	2159 mm
HEIGHT TO TOP OF OVERHEAD GUARD	6.9 ft in	2110 mm
RIGHT ANGLE STACK	8.6 ft in	2621.3 mm