MERCURY

Revised December 1, 2008

SCOPE: This guideline applies to all potential exposures to elemental mercury at Defense Logistics Agency/Defense National Stockpile Center (DLA/DNSC) Depots, their satellite locations, and any other locations storing this material for the DLA/DNSC.

RESPONSIBILITY: It shall be the responsibility of the DLA/DNSC Chief of Environmental Management (DNSC-ME) to institute and monitor the procedures outlined in this guideline in order to insure that the safety and health of all authorized personnel engaged in visiting, inspecting, handling, storing, and outloading mercury from stockpile locations is maintained.

PERMISSIBLE EXPOSURE LIMITS: The Department of Labor, Occupational Safety and Health Administration (OSHA) has established permissible exposure limits (PEL's) for mercury in the workplace. No employee shall be exposed to airborne mercury vapor concentrations in excess of 0.1 milligrams per cubic meter of air (mg/m^3) as a ceiling limit.

DNSC ACTION LEVEL: Mercury vapor concentrations in excess of 0.025 mg/m^3 as a ceiling limit, when measured at the approximate breathing zone of a worker shall constitute a condition necessary to implement personal protection and monitoring procedures.

NOTE: Regardless of airborne levels of mercury vapor, skin contact with elemental mercury (liquid, not vapor) shall not be permitted. All necessary steps shall be taken to protect personnel engaged in stockpile operational activities from skin contact.

ADMINISTRATIVE CONTROLS

DNSC management shall utilize all the administrative controls necessary to maintain employee exposure to a minimum. Administrative controls are controls such as, but not limited to, reduction in number of hours personnel may be exposed during a specific work shift, employee rotation to prevent excessive and repeated potential exposure.

DNSC management shall utilize all the engineering controls at their disposal to ensure DNSC employees and other persons involved in DNSC work related activities in and around areas where mercury is stored are not exposed to airborne concentrations of mercury vapor in excess of the OSHA established limit. Engineering controls are controls such as, but not limited to, isolation, enclosure, local exhaust ventilation, reflasking, containment, and/or overpackaging used to contain mercury' and prevent it from entering the environment.

Where engineering or administrative controls are not feasible to reduce and maintain mercury levels below 0.025 mg/m^3 personal protective equipment, including respiratory protection shall be worn.

Some of the engineering methods utilized to reduce airborne concentrations of mercury at DNSC locations may include, but shall be not be limited to:

a. Rehabilitation of flasks of mercury.

b. Use of overpackaging or other containerization for flasks or drums of mercury which have developed leaks or otherwise, may spill their contents.

c. Decontamination of space and materials contaminated by mercury in a manner consistent with the examples outlined in Enclosures 1 & 2.

d. Use of portable local exhaust ventilation positioned at work locations where the concentration of airborne mercury vapors may be generated.

e. Periodic inspection of mercury containers to ensure that all necessary steps are being taken to reduce the potential for release of mercury into the general work environment.

f. Transferring and shipping mercury from a stockpile site to another location shall be carried out in such a manner conforming to all Department of Transportation (DOT) and DNSC requirements that will prevent the release of liquid mercury into an environment exterior to its outer packaging.

RESPIRATORY PROTECTION PROGRAM

The selection, use, and proper maintenance of respirators shall be in accordance with 29 CFR 1910.134, and the DNSC Respiratory Protection Program. All respirators used shall be approved by the National Institute of Occupational Safety and Health (NIOSH) for the purpose and concentrations intended.

All persons entering areas where mercury is stored, shall wear, as a minimum, an air purifying half mask respirator with a protection factor of 10, certified for use in atmospheres containing mercury vapor provided that levels monitored are in excess of the DNSC action level of 0.025 mg/m^3 but less than 0.25 mg/m^3. **If less than the DNSC Action Level no respiratory protection is warranted.**

Airborne concentrations of mercury in excess of 0.25 mg/m^3, but less than 2.5 mg/m^3, Will require as a minimum, the use of an air purifying full facepiece respirator with a protection factor of 100, certified for use in atmospheres containing mercury vapor.

Airborne concentrations of mercury in excess of 2.5 mg/m^3 will require the use of self contained breathing apparatus (SCBA) operating in the pressure demand or positive pressure mode.

NOTE: As airborne concentrations of mercury vapor elevate so does the level of respiratory protection. NIOSH criteria documents and respiratory guidelines will dictate the type of respirators needed for the concentrations of mercury found.

Work tasks, which require use of respirators shall be assigned only to those DNSC employees who have been examined by a licensed physician. The purpose of this examination is to determine that the person is capable of performing the duties assigned, while wearing restrictive type respiratory protection without potential for impairment to their health.

Useful information that should be provided to the physician in order to determine the above include: 1) a description of the employee's duties as they relate to his potential mercury exposure; 2) types of respirators that the employee will be required to wear when carrying out their work assignments; and, 3) any information from previous medical examinations which otherwise might not be available to the examining physician.

PERSONAL PROTECTIVE CLOTHING

Personal protective clothing shall be worn by all DNSC personnel and other persons, if in the judgment of the Chief of Environmental Management or his/her designee there is a reasonable potential for physical contact with mercury, or the documented airborne concentration exceeds the DNSC action level.

The "protective clothing" shall consist of "Tyvek" whole-body covering, gloves, and head and foot covering. Clothing and gloves shall be the type that will be impervious to the penetration or absorption of metallic mercury.

CHANGE ROOMS AND CLOTHING LOCKERS

At all DNSC mercury storage locations, change rooms or similarly designated areas which include areas for changing clothes, washing and showering shall be made available. It is recommended that the use of showers at these facilities be dependent upon the type of personal exposure an individual has received during the course of their workday. Requirements for their use shall be based on the exposure concentrations and the extent of exposure as determined by workplace monitoring during the work shift.

Disposable clothing contaminated with liquid mercury and used mercury vapor respirator cartridges, shall be disposed of in a polyethylene bag, sealed and labeled for proper disposal.

METHODS OF MEASUREMENT

Determination of airborne concentrations of elemental mercury as a vapor shall be made using the methods described in the manufactures instruction for the monitoring equipment.

All equipment used for monitoring mercury at DNSC facilities and satellites shall have a valid calibration prior to use.

AIRBORNE MONITORING

An initial determination of the airborne concentration of mercury vapor shall be made using a portable mercury vapor sniffer or equivalent prior to conducting operational activities in DNSC mercury storage areas. If levels are found in excess of the DNSC action level, the storage area(s) shall be thoroughly aired prior to commencement of operational activities. The information gathered during this initial survey shall dictate what administrative and/or engineering controls are necessary and what the level of personal protection is needed to protect workers and the environment.

Area sampling for airborne concentrations of mercury vapor shall be conducted on a periodic basis. A portable mercury vapor sniffer or equivalent shall be used. Monitoring shall also be performed during the handling, storage, reflasking, overpackaging, and/or shipment of mercury to establish a baseline for potential exposures during these operations. The results of initial air monitoring will establish the sampling protocol to effectively protect DNSC workers and the environment.

OBSERVATION OF MONITORING AND ACCESS TO RECORDS

DNSC, other Federal employees and contract personnel (if it relates to mercury vapor monitoring during a time period when any of the above persons were in DNSC mercury storage areas for any legitimate reason while sampling was being conducted) shall have the reasonable opportunity to observe any monitoring and have access to their monitoring results and records.

CAUTION SIGNS AND LABELS

Caution signs shall be posted outside the entrance to ALL DNSC mercury storage areas Caution labels shall also be used to identify the contents of reclaimed mercury and mercury contaminated waste.

1. Caution signs must state:

"CAUTION"
Mercury, Metallic
Highly toxic by skin absorption
and inhalation of fume or vapor

2. Shipping labels for mercury must state:

MERCURY -corrosive-UN2809

3. Reportable Quantity (RQ) Labels must state:

Mercury RQ 1 pound or .454 kilograms

4. Shipping papers must clearly state:

Mercury, UN2809, Corrosive -RQ 1 lb. or .454 kg

"THIS IS TO CERTIFY THAT THE ABOVE-NAMED MATERIALS ARE PROPERLY CLASSIFIED, DESCRIBED, PACKAGED, MARKED, AND LABELED AND ARE IN PROPER CONDITION FOR TRANSPORTATION ACCORDING TO THE APPLICABLE REGULATIONS OF THE DEPARTMENT OF TRANSPORTATION."

HOUSEKEEPING, SPILLS, AND DECONTAMINATION

All mercury storage areas shall be inspected on a timely basis to ensure they are free from accumulation of mercury. When mercury is accidentally released into the warehouse or to the outside environment, it shall be thoroughly cleaned up using the procedures contained in Enclosures 1, 2, and 3. The cleanup shall be documented in a narrative report sent to DNSC-ME.

WASTE DISPOSAL

All waste mercury or materials contaminated with mercury shall be disposed of in a manner and at a location approved by the EPA, and State environmental authorities. DLA/DRMS may also be used for this disposal action, if appropriate.

TRAINING

Upon initial mercury work assignment and biennially thereafter. Training requirements appear in Enclosure 4.

RECORDKEEPING

All environmental and personal monitoring exposure records shall be maintained by DNSC for a period of at least 20 years. One copy shall be kept on file at the respective DNSC depot office and one copy in the DNSC Safety office. If exposures exceed the DNSC action level a copy will be sent to the respective Federal Employee Occupational Safety & Health Unit for inclusion in their permanent medical records.

DNSC, other Federal employees, and other persons shall have access to any records of environmental or personal monitoring that are directly related to their exposure. Any DNSC, other Federal, and when applicable, other persons who have been exposed to mercury in excess of 0.10 mg/m^3 shall be notified in writing within five days of the finding.

A log of personnel requesting mercury records access shall be kept in the same file for the same period of time as previously noted.

MEDICAL EXAMINATIONS

Medical examinations (including a mercury in urine test) shall be provided for all DNSC employees potentially exposed to mercury. Such examinations shall be on an annual basis or more frequently if medically indicated. Additional Bio-medical monitoring of DNSC employees shall only be carried out when it has been determined by DNSC-ME to be necessary and appropriate due to exposure considerations.

MEDICAL RECORDS

A copy of all medical records relating to mercury exposure preplacement, annual, and termination of employee medical examinations shall be maintained for at least 20 years.

ACCESS

The content of ALL medical, mercury exposure and related documents shall be made available to only those parties who are authorized under existing Federal regulations.

MERCURY STORAGE AREA ENTRANCE AND EXIT RECORDS

A permanent log shall be kept of all persons entering and exiting DNSC mercury storage areas. A log shall be placed inside each separate mercury storage section near a frequently used entrance door. Information to be included in the log shall be:

a. Name of individual entering area
b. Time and date entered
c. Reason for entering
d. Personal protective equipment utilized
e. Time of exit

The log sheets shall be retrieved from the mercury storage area on a biannual basis and maintained in a file located at the respective depot office. Personnel working in mercury storage areas that enter and exit the area frequently during a work shift need only to sign in when they first enter and sign out at the end of their work shift.

ENCLOSURE 1

SPILLS AND DECONTAMINATION

Spills and leaks of mercury shall be promptly cleaned up by appropriate means. Specialized vacuum cleaners equipped with mercury vapor absorbing filters that prevent dispersal of mercury vapors back into the workplace air are the best and fastest way to cleanup mercury spills.

The following emergency procedures shall be observed when cleaning and decontaminating areas where elemental mercury has been spilled. The environmental conditions existing at the time of the spill will dictate the exact manner in which a spill is cleaned up. Specific procedures and methods for cleanup will be determined by DNSC-ME.

1. Clear all personnel from the general area of the spill. Only authorized personnel, designated as part of the cleanup and decontamination operation shall be allowed in the area of the spill during cleanup and/or decontamination.

2. Prior to putting on personal protective equipment and clothing to conduct the cleanup operation, all employees shall remove any exposed gold, copper or silver jewelry, watches, wallets, combs and other personal items (cigarettes, pipes, cigars, etc.).

3. Ensure it is understood that eating, drinking, chewing or smoking is strictly prohibited in any mercury storage area, and that the washing of exposed skin i.e. hands, face, and neck is required prior to smoke breaks, lunch breaks and that showers are required at the end of the shift.

4. Put on all necessary personal protective clothing, including respiratory protection, disposable coveralls including headgear (hoods), gloves and rubber boots.

5. Prior to entrance by personnel to conduct cleanup activities, open warehouse storage doors to disperse (airing) accumulated vapors. It may also be necessary to provided portable local exhaust ventilation to reduce the levels of mercury vapors to workable levels.

6. During the "airing" procedure, the air should be monitored to determine the airborne concentration of mercury vapors using a calibrated Mercury Vapor Sniffer. Airborne concentrations of mercury dictate which type of respiratory protection is necessary to protect workers. If airborne concentrations of mercury are in excess of 0.025 mg/m^3, after the area has been thoroughly aired, respirators shall be used in accordance with "RESPIRATORY PROTECTION PROGRAM" above.

7. Cleanup operations shall be conducted in a manner that will minimize and limit the amount of contamination to the protective clothing, equipment, and to the storage area and other materials contained therein.

8. Monitoring mercury vapor levels and visual observation should determine if the spilled mercury can be reclaimed without immediately applying a mercury vapor chemical absorbent/depressant. If it appears that mercury vapors are continuing to be generated from the spill, and reclamation is not feasible, apply an absorbent/depressant according to the manufacturer's recommendations.

9. After the majority of the spilled mercury has been cleaned up, the surface area of the spill shall be thoroughly cleaned again using suitable solution HgX or any other approved chemical absorbent/depressant.

10. Upon completion of the initial cleanup and decontamination, a mercury-indicating powder shall be applied to determine if additional decontamination is required.

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

12. Personnel directly engaged in the cleanup and decontamination operation shall thoroughly wash and shower at the end of the shift.

13. One or two persons from the clean-up team should be designated to decontaminate the rubber boots with HgX solution. This can be accomplished using a bucket with an adequate amount of solution and a scrub brush.

14. Dispose of the accumulated mercury-contaminated material and spent mercury cleanup solutions in a manner and at a location approved by the Environmental Protection Agency (EPA). DLA/DRMS may be used for this disposal action.

NOTE: Exact details of sampling, decontamination and disposal procedures in conjunction with any DNSC decontamination operation shall be developed and carefully delineated by DNSC-ME. DNSC-ME shall determine the sampling, decontamination, and disposal options best suited for the specific situation since each spill and cleanup operation is different.

ENCLOSURE 2

TEST TO CHECK THE EFFECTIVENESS OF DECONTAMINATION

A spill of metallic mercury shall be thoroughly cleaned up immediately because mercury vaporizes at room temperature. Airborne concentrations of mercury can reach dangerous levels in a very short period of time. A typical mercury spill will produce three different types of mercury droplets. The first, is large drop that is easily visible and accessible; the second, a droplet which tends to be small yet visible, but often difficult to pick up; and finally, a micro-droplet which is too small to be visible thus extremely difficult to be removed.

More often than not, cleanup operations leave residual mercury because they are undertaken in a haphazard manner. Residual mercury is generally the result of "micro-droplets" in the cracks and crevices of the floors, walls, storage containers and storage aids (i.e. pallets, trays, etc.). The use of a mercury-indicating chemical is essential to detect if there is any hidden mercury left behind. This will provide a good indication if further decontamination is necessary because on contact with actual mercury or mercury vapors the indicating chemical will change from a bone-white color to a pink or black color.

The indicating chemical is applied by sprinkling a thin layer of powder over the decontaminated area or the area in question. Vertical surfaces can be treated by preparing a thin paste with water and painting it over the area in question. After it has been applied, the indicating chemical layer should remain undisturbed for 24 hours. The presence of mercury or mercury vapor will be indicated by individual or numerous pink or black spots. Each spot pinpoints a source of mercury or mercury vapor.

If the test indicates there is no mercury vapor present, test material can be swept or wiped away. If the test is positive, however, material should be retained for disposal, along with the additional mercury contaminated waste collected during subsequent cleanup operations.

The active ingredient in the mercury-indicating chemical may be irritating, therefore personnel using this material shall avoid breathing the powder dust of the chemical by wearing an appropriate toxic dust respirator and avoid contact with the hands by wearing gloves. It is recommended that the exposed skin i.e. face, neck, and hands be thoroughly washed after using this material.

ENCLOSURE 3

CHEMICALS THAT CAN BE USED FOR CLEANUP AND DECONTAMINATION ACTIVITIES

The Mercury Spill Clean Up Kit (Product No. 4439) contains Cinnasorb absorbent base and Reabsorb mercury vapor depressant.

J.T. Baker Chemical Company
Safety Products Department
Phillipsburg, NJ 08865

FOR MEDIUM TO LARGE SPILLS

HgX Mercury Decontaminant Powder

Action Technologies
100 Thompson Street
Pittston, PA 18640

MERCURY INDICATING CHEMICAL
(Item No. 50905)

Lab Safety Supply Co.
P.O.Box 1368
Janesville, WI 53547-1368

ENCLOSURE 4

TRAINING

The DNSC-ME shall establish a training program to instruct DNSC personnel, other Federal agencies and other persons, when necessary, of the potential health hazards involved in the handling, storage and outloading of stockpile mercury. Information covered should include, but should not be limited to, the parameters listed below.

Inform personnel of correct work and storage practices, emergency procedures to be followed in case of spills, leaks, or fire and, personal protective equipment requirements. Discuss with personnel the signs and symptoms of overexposure to inorganic mercury compounds and instruct them to immediately notify the DNSC-ME should they develop any symptoms.

Instruct personnel in the DNSC operations which could result in exposure to mercury above DNSC action levels, as well as safe work practices for the handling, use, storage, or disposal of mercury in normal and emergency operational activities.

Educate personnel in the proper housekeeping practices, decontamination procedures in the event of a mercury spill, and fire emergency procedures.

Explain the possibility of ingesting inorganic mercury by hand-to-mouth contact when good personal hygiene is not practiced.

Instruct personnel in the measures necessary to protect them from excessive exposures to mercury, such as limiting the time of exposure, the use of engineering controls (such as portable exhaust ventilation), and the wearing of proper and approved personal protective clothing, respirators, and equipment.

Instruct personnel as to the purpose, proper use, maintenance, and limitations of their respirators and personal protective equipment.

ENCLOSURE 5

PERSONAL PROTECTIVE CLOTHING AND EQUIPMENT

Where protective clothing is required in this program, or under 29 CFR 1910.132, the Chief of Environmental Management (DNSC-ME) shall ensure that all DNSC employees wear appropriate protective clothing, such as, but not limited to, "Tyvek" coveralls, smocks, aprons, gloves, boots, head covering, and respirators.

1. DNSC employees shall ensure that protective clothing contaminated by mercury is discarded in a manner that will not introduce the contaminant(s) into the warehouse and surrounding environment. All protective clothing shall be removed by DNSC personnel in designated areas and deposited in properly labeled lined and covered waste containers.

2. Street clothing and street footwear will not be permitted in the workplace whenever airborne mercury concentrations exceed DNSC Action Level, or potential contact with mercury or its inorganic compounds exist. Contaminated clothing or footwear shall not leave the worksite except for disposal.

3. If protective clothing and footwear is provided for a longer period or use, they should be stored separately from personal street clothing, street footwear, food, tobacco products, and other personal effects.

4. If rubber boots are used as protective footwear and become contaminated by elemental mercury, they shall be decontaminated by washing the exterior contaminated area of the boots) in a solution of HgX, using a scrub brush designated for this purpose.

5. Shower facilities shall be provided and used prior to changing into street clothes.

6. Work and street clothes shall not be stored in the same area.

ENCLOSURE 6

OVERPACKAGING PROCEDURES FOR SUB SPEC FLASKS AND SUSPECTED LEAKERS

SCOPE: These guidelines cover the procedures, methods and materials to overpack sub spec flasks and suspected leakers so they can be handled/shipped with minimum risk of contamination. A known leaker will be set aside and reflasked before shipping. The following procedures or equivalent proven methods shall be used for sub spec flasks or known leakers:

NOTE: Medical surveillance procedures. A medical doctor shall check all employees who will be exposed to mercury before they begin work. The following areas shall be checked and discussed:

1. Dental work within last three months
2. Rashes, sores or cuts on the skin
3. Respiratory tract
4. Allergies
5. Hazards of mercury (Explain the neurological, liver, and kidney disorders that can be caused by mercury).
6. The 24-hour urine sample, collected before an individual is exposed to mercury and another 24-hour sample, collected after the project is completed.

*** THE DNSC CHIEF OF ENVIRONMENTAL MANAGEMENT WILL DETERMINE WHEN THE ABOVE MEDICAL PROCEDURES ARE APPROPRIATE BASED ON THE WORK TO BE PERFORMED.**

ENVIRONMENTAL SURVEILLANCE PROCEDURE: Monitor the area at all times with a Mercury Vapor Detector.

DESIGNATED WORK AREA: An area shall be designated for each phase of the overpackaging operation. Every effort shall be made to limit the personnel in the area. ONLY individuals responsible for the mercury overpackaging project, properly protected with suitable clothing and respirators, shall enter the work area.

OVERPACKAGING PROCEDURE

1. Place a 10' X 20' piece of 8 mil plastic on the floor over cardboard and staple to 2" X 4"'s on three sides, leaving the front open. This will serve as the primary work area. Any leakage or spills will be confined to this area. The plastic over cardboard working surface prevents the warehouse floors from being contaminated.

2. Pick up pallet with a forklift and place it into a large plastic bag shroud, pulling it around the pallet from the open end toward the forklift. Staple the end to the pallet after the pallet has been set down on a pallet jack. The shroud should be large enough to extend about 14 inches up from the bottom on the open side. The plastic shroud will contain any leakage that may occur during transport from the storage area to the primary work area. This will avoid contamination of floors by catching mercury droplets which may be on the pallets. All pallets containing mercury will be handled as contaminated.

3. Set the pallet down in the holding area which has been prepared with plastic. Move the pallets as needed to the work area. The packing area should be adjacent to the work area.

4. Prepare a new drum with required packaging materials (pads, cushions, cardboard dividers and 6 mil plastic liner) adjacent to the pallet.

5. Remove flasks from the drum containing the leaker. Check the flasks for leaks and place them into the empty drum. Overbag the leaking flask with a 6 mil plastic bag. Place the overbagged flask into the drum. Tie off the tops of the plastic bag and plastic liner.

6. Place the new drum on a new drip pan equipped flat pallet. Replace the plastic bag shroud over the original pallet and seal the shroud with duct tape. Segregate both pallets in a special holding area for eventual reflasking.

CLEAN UP: Mix a solution of HgX (calcium polysulfide) and mop the entire work area leaving a heavy film of solution on the floor to dry. Use Mercury Vapor Detector to check the floor to see if any readings can be obtained. A mercury indicating chemical can and should also be used to detect residual mercury contamination.

The following materials are the minimum required to safely work and properly overpackage mercury flasks.

1. HgX (Calcium Polysulfide)

2. Mercury Vapor Detector

3. Protective clothing (including rubber boots and gloves) and respirator

4. Metals hooks (similar to hay hook)

5. Plastic shroud, 50" x 50" x 76" (6 mil)

6. Drum, 30 gal., 18 1/4" dia. x 28" with pads, cushions, dividers and plastic liner for drum (6 mil)

7. 8 mil plastic, 10' wide, work area

8. Pallet, hardwood, 48" x 48"

9. Waste disposal containers for any mercury contaminated waste generated during the procedure

10. Plastic bags for flasks, 13" x 24"

11. Metal drip pan, 48" x 48"

ENCLOSURE 7

STANDARD EQUIPMENT AND MATERIALS FOR ALL DNSC MERCURY STORAGE AREAS

Mercury high efficiency vacuums
HgX
Mercury Indicating Chemical
Aspirator bottles
Spare clean flasks or other appropriate containers
Appropriate labels
Protective clothing to include booties, head covering
Respirators, spare canisters and parts
Shovels
Brooms
Duct Tape
Mercury Monitoring Equipment