

MERCON™

Mercury Management Systems

How to Handle Spill and Cleanup Mercury

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Note: Mercon™ products and waste materials should be stored, handled and used in accordance with municipal, provincial, state, federal and all applicable laws.

1. ABOUT MERCURY

1.1. Chemical Characteristics

- Chemical symbol: Hg
- In elemental form, Mercury is a silver/white metal
- Liquid at room temperature (melting point -38°C)
- Emits Mercury vapor
- Vaporization increases with temperature and surface area
- Metallic form is insoluble
- Metallic form is 13.5 times as dense as water (1 litre weighs 13.5 Kg)

1.2. Forms of Mercury

1.2.1. Vapor

- Extremely toxic
- Invisible, odorless & tasteless
- Biologically harmful
- Soluble in fat

1.2.2. Inorganic Forms (Mercury salts)

- Mercury combined with an element other than carbon
- Two different types (Hg + or Hg ++)
- Emits vapor
- Biologically harmful

1.2.3. Organic Mercury

- Mercury attached to a short chain of carbon molecules
- Can emit vapor
- Fat soluble and very toxic
- Insoluble in water
- Some organic forms such as methyl or alkyl mercury are particularly toxic and more readily absorbed into the body and more difficult to excrete

1.3. Useful Properties of Mercury

- Uniform volume expansion over a wide range of temperatures
- Liquid at room temperature
- Electrically conductive
- High density
- Low vapor pressure
- Forms alloys with metals (except iron and platinum)

1.4. Occupational Exposure

- Mining ore treatment, smelting of alloys, dental amalgam, hospitals (thermometers, sphygmomanometers), laboratories, coal-burning power plants, manufacturing of batteries, manufacturing of fluorescent and neon lights, incineration facilities, industrial catalysts, felt making, paints, mercury vapor lamps, meteorological instruments, temperature and pressure meters, mercury switches, electrical devices. **Note: this is not meant to be a complete list.**

□ 1.5. Routes of Entry

1. **1.5.1. Inhalation** of mercury vapor and/or dust
2. **1.5.2. Absorption through skin** of vapor, dust and direct contact
3. **1.5.3. Ingestion** of metallic inorganic, organic forms directly or indirectly through our food chain

□ 1.6. Disposition of Ingested, Inhaled or Absorbed Mercury

- Due to fat-soluble nature, Mercury is not easily excreted from the body
- Tends to concentrate and accumulate in brain, liver, nervous and fetal tissue

1.7. Mode of Biological Action

- Alters cell membrane physiology
- Inhibits production and action of enzymes
- Damages liver and kidneys
- Decreases velocity of nerve impulses which leads to trembling of hands and eventual loss of fine motor control

1.8. Cumulative Nature

- Mercury has a half-life of 70 days
- Mercury can be slowly excreted from the body, but its effects (and damage) are not easily repaired. Therefore, the effects of mercury exposure tend to be cumulative and irreversible.

1.9. Biological Symptoms of Mercury Exposure

- Headaches, vertigo, nausea, diarrhea
- Restlessness, irritability
- Tremors, loss of fine motor control
- Psychological disturbances such as mood and personality changes
- Blurring of vision
- Lesions on skin with prolonged contact
- Increased peri-natal mortality

2. MERCURY LEVEL REGULATIONS

2.1. Ambient Mercury Vapor Levels

- **National Institute for Occupational Safety and Health**

Note more than 50 milligrams per cubic metre ($0.05/\text{m}^3$) of air. This standard may vary in various jurisdictions.

- **American Conference of Governmental and Industrial Hygienists**

Not more than 150 micrograms per cubic metre ($0.15 \text{ mg}/\text{m}^3$) of air, based on 15 minute exposures at intervals of 60 minutes.

- **OSHA**

Not more than 10 micrograms per cubic metre ($0.010 \text{ mg}/\text{m}^3$) for alkyl compounds.

Note: Please check with your local health, environmental and/or occupational health and safety authorities to ensure you are using the applicable standard for your situation.

2.2. Physiological Indicators of Biological Mercury Levels

- **Urine:** Limit of 15 micrograms per liter (15 ppb), since Mercury does not concentrate in urine.
- **Blood:** Limit of 10 micrograms per liter (10 ppb).
- **Hair:** Higher than urine or blood concentrations. Analysis of hair is best measure of long-term mercury exposure.

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3. HOW MERCON™ PRODUCTS WORK

Mercon™ is first and foremost a powerful mercury vapor suppressant. All products work by immediately oxidizing with the physical mercury. Then a chemical change occurs converting the elemental mercury in the more stable non-vapor-producing mercuric sulphide. In addition, all **Mercon™** spill control kits, solutions absorb mercury vapor and dust from the air and stop the methylation of mercury in water.

3.1. MerconTAINER™, Mercon-X™

- Converts mercury to mercuric sulphide, which is the natural compound found in nature before mercury ore is mined and refined
- Patented mercury decontamination formula is designed to increase the surface reactivity between the active ingredients and available mercury molecules
- Formula absorbs available mercury molecules from surfaces and the surrounding air

3.2. MerconSpray™, MerconWIPES™, MerconVAP™

- Produces mercuric iodide
- Antibacterial
- Absorbs available mercury molecules from surfaces and the air

3.3. MerconGEL™

- Antibacterial, antiviral
- Stops the methylation of mercury in water
- Dissolves very slowly in water. Coats the inside of drain pipes and evacuation lines, thereby allowing longer contact times with mercury waste, bacteria and viral contaminants

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4. PREVENTIVE MEASURES

- **Provide Adequate Ventilation (air changes)** to the contaminated area.
- **No Eating or Smoking** in work areas.
- **Wear Protective Clothing** with daily changes.
- **Preclude Exposure of Any Kind** for pregnant or lactating women, and for anybody with a nervous system disorder, or for those with skin, lung, liver, kidney or gastro-intestinal problems.
- **Regular Physical Examination** of exposed persons at periodic intervals; including determination of mercury levels in urine, blood as well as neurological evaluations with specific attention to tremors, visual field changes, sensory changes, insomnia and weight loss.
- **Employee Education.** All employees must be educated to the risks of unmanaged exposure to mercury, and must be trained in proper procedures for transporting, handling, storing, and spill management.
- **Use Mercon™ or Equal Mercury Vapor Control and Decontamination Products** wherever mercury materials are being used, stored, transported, cleaned up and disposed. **Caution: A lot of products make vapor control and decontamination claims. Don't rely on the claims alone. Use a mercury vapor meter before; during and after mercury cleanups to ensure that mercury vapor is no longer being emitted. Mercon™ products work, while others don't work as well, or in some cases don't work at all. Be cautious when it comes to Mercury cleanup!**
- **Never Ignore a Possible Mercury Event.** Good education, housekeeping, preparedness, and prompt action are needed wherever Mercury materials are being stored, transported and/or used. If in doubt, contact Ross Healthcare, Inc. to discuss your Mercury management questions, concerns and issues. Our Toll Free number in North America is 1-800-663-8303.

4.1. Helpful Hints

- Weekly preventive maintenance and workstation cleanup will reduce the danger of mercury vapor build-up; thereby creating a safer environment.
- After the initial use of any Mercon™ Mercury Management products, always ensure that you have a back-up unit or replacement products available. Replace MERCON™ products every 3 years to ensure full effectiveness and compliance with applicable health and safety regulations.
- Always contact your local Health and Safety Officer prior to disposal of mercury waste or contaminated material, instruments or tools.
- Always seek professional advice if mercury spills occur near a heat source, or if mercury in any form makes its way into air handling or water systems.

- . • *Do not incinerate or bury Mercury waste.*
- . • *Never heat Mercury rich materials to refine gold or silver at home.*
- . • *Never attempt to clean up Mercury spills if you are pregnant, and ensure that those that are pregnant do not work or enter areas where Mercury materials are being used, stored or being cleaned up.*
- . • *Do not 'play' with Mercury; and teach your children about Mercury's hazards.*

4.2. Points to Remember

- . • *Mercury and Mercury Amalgam vaporize at room temperature. Mercury vapor is extremely toxic.*
- . • *Ambient Mercury levels in your breathing zone can be controlled if you and other personnel are aware of and trained in safe mercury management.*
- . • *Be conscious of the hazard of unseen Mercury contamination in cracks, corners and untreated storage containers.*
- . • *Never dispose of Mercury into toilets, drains, sinks or other wastewater collection systems. It may find its way back!*
- . • *If you are not certain about anything related to Mercury – ASK!*

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5. SPILL MANAGEMENT PROCEDURES

Depending on the size of the spill and the site conditions, a variety of clean-up tools and solutions are available including: MerconKIT™ I,II or III (small-scale spill control kits) MerconDRUM™ (a self-contained large-scale spill cleanup kit), MerconVAP™ or Mercon-X™ bulk cleanup solutions, MerconGEL™ drain and collection system cleanup solution, and MerconWIPES™ (mercury decontamination wipes for quickly cleaning up spill residue, tools and equipment).

Call EPS Chemicals, Inc. at 1-800-663-8303 to discuss the Mercon™ mercury cleanup supplies that are right for you.

5.1. Small Scale Spill Cleanup (using MerconKIT™ I, II or III)

Step 1:

Block off from foot traffic a large radius (approximately 6 feet) around center of spill site. Check clothing and footwear for mercury debris. Remove any contaminated clothing and footwear at edge of spill site.

Step 2:

Remove the MerconSPRAY™ from the spill kit, and wearing gloves and goggles; proceed to spray the ambient air zone above the spill zone. Spray generously (18 – 20 pumps) into the air, starting at the breathing level and working down towards the floor, concentrating on the actual spill itself.

Step 3:

On the Merconvap™ bottle, replace shipping cap with squirt nozzle from kit. Cover all visible Mercury with MerconVAP™, leaving a wide margin for any unseen Mercury beads. Ensure that any cracks in the flooring are saturated with Merconvap™ to suppress any Mercury beads that may be out of sight. The spill is now safe to clean up.

Step 4:

Open the MerconTAINER™ in the kit. Using the Mercury aspirator pick up any visible mercury and deposit them in the Mercontainer™. Some kits contain MerconWIPES™ to help clean up broken glass, tools and surfaces. Ensure that all Mercury waste is placed in the MerconTAINER™. The same MerconTAINER™ may be used for several spills, provided that it is no more than ½ full. Always ensure that there is a back-up MerconTAINER™ available.

Step 5:

To complete the decontamination of the Mercury spill site, re-apply MerconVAP™ liquid to spill zone; and, using MerconWIPES™ or disposable towels soaked in MerconVAP™ wipe any remaining residue.

Step 6:

Dispose of used MerconTAINER™ and any contaminated items as per local environmental regulations. Do not incinerate. Do not throw away in ordinary garbage. Wipe shoes, gloves and any other contaminated items with MerconWIPES™ or disposable towels soaked with MerconVAP™.

5.2. Large Scale Spill Clean-up (using MerconDRUM™)

Note: All large scale spills must be reported to the proper authorities as required by law. If in doubt contact your public health office, local police and/or fire department.

EPS Chemicals, Inc. disapproves of any Mercury cleanup procedures without proper training, protective clothing and self-contained breathing apparatus. Initial and periodic monitoring of ambient air is essential to properly evaluate the extent of the problem and to assess the effectiveness of the cleanup process. Monitoring should be carried out with a Jerome 411 or equal Mercury vapor monitor every 2 hours during the course of the cleanup. Post cleanup monitoring is advisable to ensure that there are no residual Mercury molecules that have not been treated and /decontaminated.

Step 1: Evacuate area immediately, placing placards or border tape to warn other personnel of spill hazard. Ensure all contaminated objects remain at immediate spill site to restrict the contamination of other areas. Shoes should be left, changed or 'booted' to prevent the spread of contaminants.

Shut Off any Ventilation Systems within the affected area to avoid the risk of spreading airborne Mercury.

Open Windows to reduce the concentration of ambient mercury vapor.

Shut off Heating Systems within the affected area to reduce the rate of vaporization of Mercury.

Step 2:

Using either MerconSpray™ or Merconvap™ with a sprayer, spray the air in a large radius from the spill center. Spray from breathing level down towards floor, concentrating on the spill itself. **Caution: The floor and other surfaces, ladders and tools may be extremely slippery.**

Step 3:

Placing the squirt cap provided on the MerconVAP™ (475 ml) bottle, cover all visible Mercury with MerconVAP™ liquid. (As a general rule, use 1 liter of MerconVAP™ for every 5 kilograms of Mercury.) Leave a wide margin of MerconVAP™ around spill center to decontaminate any unseen Mercury droplets/beads. Ensure that any cracks in flooring and other surfaces are saturated with MerconVAP™ to suppress any droplets that may be out of sight and easy reach.

Step 4:

Remove all contents of MerconDRUM™, leaving only the pre-soaked mercury vapor suppressing sponge in place. Using the mercury aspirator, dustpan and squeegee provided in MerconDRUM™ gather/cleanup all mercury debris (including any remaining MerconVAP™ liquid) by moving all of it to the center of the spill. Deposit all of the mercury and cleanup debris, including the dustpan and mercury aspirator into the MerconDRUM™.

Step 5: Decontaminate spill area using MerconVAP™ and the sponge mop provided. Mop entire area around spill center using (as a rule of 'thumb') 1 liter of MerconVAP™ liquid for every 200 square feet of floor or surface.

Note: The amount of MerconVAP™ needed increases with permeability of the surface being decontaminated.

After cleaning up the spill area, leave the MerconVAP™ to dry naturally for at least 24 hours.

Caution: The floor will remain very slippery until dry.

Step 6:

Make sure to place all articles used in the cleanup procedure into the MerconDRUM™. Dispose in accordance with applicable environmental regulations.

Step 7:

Repeat mopping procedure using MerconVAP™ and then mop spill area one week after spill. Subject to the results of mercury vapor reading, repeat mopping the spill area until the mercury vapor reading is negligible or under the acceptable standard for your location.

5.3. INDUSTRIAL DECONTAMINATION, REMEDIATION AND MAINTENANCE (Using MerconVAP™ or Mercon-X™ bulk decontamination solutions)

Note: *All large scale spills and/or mercury decontamination projects must be reported to the proper authorities as required by law. If in doubt contact your public health office, local police and/or fire department.*

EPS Chemicals, Inc. disapproves of any Mercury cleanup procedures without proper training, protective clothing and self-contained breathing apparatus. Initial and periodic monitoring of ambient air is essential to properly evaluate the extent of the problem and to assess the effectiveness of the cleanup process. Monitoring should be carried out with a calibrated Jerome 411 or equal Mercury vapor monitor every 2 hours during the course of the cleanup. Post cleanup monitoring is advisable to ensure that there are no residual Mercury molecules that have not been treated and /decontaminated.

Step 1: Evacuate Area immediately, placing placards or border tape to warn other personnel of spill hazard and/or decontamination site. Ensure all contaminated objects remain at immediate spill site to restrict the areas affected. Shoes should be left, changed or “booted” to prevent the spread of contaminants.

Shut Off Any Ventilation Systems within the affected area to avoid the risk of spreading airborne contaminants to other areas.

Open Windows to reduce the concentration of ambient mercury vapor.

Shut Off Heating Systems within the affected area to reduce the rate of vaporization.

Step 2:

Using either MerconVAP™ or Mercon-X™ with sprayer, spray the air in a large radius from spill center. Spray from breathing level down towards floor concentrating on the spill, or contaminated area itself.

Caution: The floor surface may now be extremely slippery.

Step 3:

Agitate and/or stir the MerconVAP™ or Mercon-X™ to ensure that the cleanup solution is uniform in color. Wearing appropriate safety clothing and breathing apparatus begin the cleanup. Using a sprayer or washing technique cover all visible mercury and/or apply MerconVAP™ or Mercon-X™ to contaminated areas to initiate vapor suppression. Leave a wide margin of MerconVAP™ or Mercon-X™ around spill and/or contaminated areas to ensure that all possible traces of mercury material has been treated. Ensure that any cracks in flooring are saturated with the MerconVAP™ or Mercon-X™ to suppress and droplets of mercury that may be out of sight and reach.

Step 4: Decontaminate spill area and/or equipment with undiluted MerconVAP™ or Mercon-X™ solution with a sprayer or mop. Spray and/or mop entire area around contamination center using (as a rule of 'thumb') 1 liter of MerconVAP™ or Mercon-X liquid for every 200 square feet of floor or surface. Leave the cleanup solution on the contaminated area for at least 24 hours. Note that MerconVAP™ changes color as it comes in contact with mercury. If you are using MerconGEL™ to clean up drainage and collection systems, pour the undiluted solution into the contaminated lines and leave it for at least 24 hours.

After the MerconVAP™ or Mercon-X™ or MerconGEL™ has had an opportunity to dry for at least 24 hours, more solution may be applied to bring TLV within the desired range. Allow the solutions to dry naturally or leave as long as possible.

Caution: The floor will remain very slippery until dry.

After the solutions have dried, surfaces may be cleaned and washed in the normal manner.

Step 5: Measure the Ambient Mercury Vapor Level Frequently in and around the contaminated area before, during and after cleanup to ensure that the TLV is dropping and finally settles within the allowable standard for your area. Keep accurate records as to time, place and levels of all mercury-monitoring results.

Note: The amount of MerconVAP™ needed increases with permeability of the surface being decontaminated. Mercury vapor build-up will vary with temperature, atmospheric pressure (altitude), air circulation type of surface involved, and the effects of other contaminants. Highly porous surfaces and heavily contaminated soils may require more decontaminant.

Step 6:

Make sure to place all articles used in the cleanup procedure into a MerconDRUM™ or sealed container. Dispose in accordance with applicable environmental regulations.

Step 7:

Repeat spraying or mopping and cleanup procedure with MerconVAP™, Mercon-X™ or MerconGEL™ one week after initial application.

Step 8:

Monitor the site to ensure that all sources of mercury contamination have been identified, cleaned or removed; and file a formal incident and/or cleanup report with management, and the appropriate health/safety and environmental official. Repeat monitoring on a regular basis.