



# Health and Safety Best Practices Guide

## Elemental Mercury (Hg) Responses

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### Hazard Summary (See specific Safety Data Sheet for more information)

**Health Hazards:** When inhaled, elemental mercury will be rapidly distributed throughout the body. Elemental mercury can cross the blood-brain barrier and become oxidized. The oxidized species of mercury cannot cross the blood-brain barrier, and it accumulates in the brain. Mercury in other organs is removed slowly from the body, passing via the kidneys. Mercury can be irritating to the skin and eyes. Prolonged contact may lead to ulceration of the skin. Allergic reactions (i.e. rashes, welts) may occur in sensitive individuals.

**Physical Hazards:** Corrosive. Can form explosive compounds when contaminated with nitric acid and ethanol.

### Signs and Symptoms of Exposure (See SDS for more information)

**Short-term over-exposures** to high concentrations of mercury vapors can lead to breathing difficulty, coughing, acute, chemical pneumonia, and pulmonary edema (a potentially fatal accumulation of fluid in the lungs). Depending on the concentration, cardiac abnormalities, damage to the kidney, liver or nerves and effects on the brain may occur.

**Long-term inhalation over-exposures** can lead to the development of a wide variety of symptoms, including: excessive salivation, gingivitis, anorexia, chills, fever, cardiac abnormalities, anemia, digestive problems, abdominal pains, frequent urination, an inability to urinate, diarrhea, peripheral neuropathy, tremors, alteration of tendon reflexes, slurred speech, visual disturbances, and deafness.

### Emergency Actions (See SDS for more information)

**First-aid measures general:** **If exposed or concerned seek medical advice/attention immediately.**

**First-aid measures after inhalation:** Remove to fresh air and keep in a position comfortable for breathing. In case of irregular breathing or respiratory arrest, provide artificial respiration.

**First-aid measures after skin contact:** Wash immediately with water for 15 minutes. Remove affected clothing and wash all exposed skin area with mild soap and water, followed by warm water rinse.

**First-aid measures after eye contact:** Rinse immediately and thoroughly with water for 15 minutes minimum. Hold eyes lids open while rinsing.

**First-aid measures after ingestion:** Immediately call a POISON CONTROL CENTER or 911. Rinse mouth.

### Air Monitoring/Sampling Equipment

Equipment (Linked to ERTG QSG)	Notes
<a href="#">Jerome 431X</a> MVA	Use for high concentrations (>30,000 ng/m <sup>3</sup> or 30 µg/m <sup>3</sup> ). Do not place a contaminated unit in the storage case or return it to the RRC. Cover to prevent contamination.
<a href="#">Lumex RA-915+</a> Mercury Vapor Analyzer (MVA) <a href="#">Lumex RA-915 Lite</a> MVA <a href="#">Lumex RA-915M</a> MVA	The Branch operates three different Lumex Models. Each unit has a different maximum use concentration: <ul style="list-style-type: none"> <li>• RA-915M – Do not exceed 30,000 ng/m<sup>3</sup>.</li> <li>• RA-915+ – Do not exceed 20,000 ng/m<sup>3</sup></li> <li>• RA-915 Lite – Do not exceed 100 µg/m<sup>3</sup></li> </ul> The Lumex 915+ and 915M reads in ng/m <sup>3</sup> . The Lumex 915 Light reads in µg/m <sup>3</sup> .  The Lumex RA-915M has a high concentration setting to monitor for mercury vapor concentrations between 10 and 2000 µg/m <sup>3</sup>  The Lumex RA-915 Lite should only be used for screening. Do not use this unit for re-occupancy cleaning testing.
Personnel Sampling: 1. <a href="#">GilAir Sample Pump</a> 2. <a href="#">SKC Sample Pump</a>	Use one of the following analytical methods: 1. <a href="#">NIOSH 6009</a> 2. <a href="#">OSHA ID 140</a>  Will also need a <a href="#">DryCal Calibrator</a> and appropriate sampling media

**Note:** Recommend that both the Lumex MVA and the Jerome 431X MVA are deployed to elemental mercury responses due to the different detection ranges and different limits of detection.

**If a response is only conducted with the Lumex RA-915+ or the RA-915 Light MVAs, it may be necessary to upgrade to Level B PPE (SCBA) if ambient air concentrations exceed the limits of detection (>50,000 ng/m<sup>3</sup>).**

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## Exposure Limits

Agency	Mercury Concentration (mg/m <sup>3</sup> )	Mercury Concentration (µg/m <sup>3</sup> )	Mercury Concentration (ng/m <sup>3</sup> )
NIOSH IDLH <sup>6</sup>	10	10,000	10,000,000
OSHA Ceiling <sup>6</sup>	0.1	100	100,000
NIOSH REL <sup>6</sup>	0.05	50	50,000
ACGIH TLV <sup>7</sup>	0.025	25	25,000

## Action Levels:

Contaminant/Hazard Note the change in unit measure for the Mercury Action Levels	Action
<p>&gt;25,000 ng/m<sup>3</sup> Mercury &gt;25 µg/m<sup>3</sup> Mercury &gt;0.025 mg/m<sup>3</sup> Mercury</p>	<p>Leave the work zone and implement engineering controls (ventilation, mercury air scrubbers). Don Level C PPE, a full-face respirator w/ mercury-specific filter cartridges if engineering controls are not effective. Leave the work zone and replace filter cartridges if the color indicator changes or at the end of the shift, whichever occurs first.</p>
<p>End of Service Life Indicator Color Change</p>	<p>Leave the work zone and replace the mercury-specific filter cartridges.</p>
<p>&lt;19.5 or &gt;23.0% Oxygen and/or &gt;50,000 ng/m<sup>3</sup> Mercury &gt;50 µg/m<sup>3</sup> Mercury &gt;0.5 mg/m<sup>3</sup> Mercury</p>	<p>Leave the work zone and implement engineering controls (ventilation, mercury air scrubbers). Don Level B PPE (SCBA) if engineering controls are not effective.</p>

**Note:** If you have the appropriate air monitoring equipment, it may be possible to increase your Level B Action Level from 50,000 ng/m<sup>3</sup> to 625,000 ng/m<sup>3</sup>. The Jerome 431X MVA has a greater limit of detection than the Lumex and can accurately provide mercury vapor levels up to 999,000 ng/m<sup>3</sup>. Concentrations less than 625,000 ng/m<sup>3</sup> has been confirmed as protective for SCOTT<sup>9</sup> and MSA<sup>10</sup> Air Purify Respirator Cartridges Equipment only.

## Personal Protection Equipment

Level D:	Safety Toe/Shank Work Boots, Disposable Boot Covers, paper Tyvek (as needed), Safety Glasses, Nitrile Gloves, Work Gloves (as needed), Hard Hat (as needed), High-Vis Vest (as needed), Hearing Protection (as needed).
Level C:	Safety Toe/Shank Work Boots or HAZMAT Boots, Saranex (Tychem SL)/Polyethylene Coated (Tychem QC)/Paper Tyvek Suits, Full Face APR with Hg Cartridges, Nitrile Gloves, Work Gloves (as needed), Hard Hat (as needed), High-Vis Vest (as needed), Hearing Protection (as needed).
Level B:	Safety Toe/Shank Boots or HAZMAT Boots, Saranex (Tychem SL)/Polyethylene Coated (Tychem QC), SCBA, Nitrile Gloves, Work Gloves (as needed), Hard Hat (as needed), High-Vis Vest (as needed), Hearing Protection.

## Decontamination

### Personnel Decontamination

Typically consists of dry removal of PPE following standard contamination control techniques using a designated contamination reduction zone (CRZ).

Station #1 – Equipment and Tool Drop

Station #2 – Outer gloves and outer boot cover removal

Station #3 – Outer boot removal (if necessary). Wet decon with mercury removal solutions can be added if needed. Tape removal

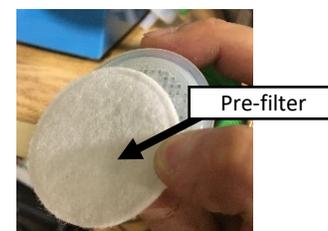
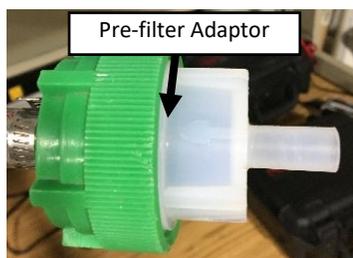
Station #4 – Suit Removal, Respirator Removal, Inner Glove Removal

Station #5 – Hand and Face Wash

## Equipment Decontamination

All equipment checked out for a mercury response from the RRC must be screened with a MVA and decontaminated before returning.

- Screen all equipment and tools that will be returned to the Regional Readiness Center, regardless of whether it was used in the Exclusion Zone (EZ). This includes equipment cases, unused PPE, traffic cones, popup tents, etc. Place equipment in a bag and scan with the Lumex MVA. Decontaminate, heat treat or dispose if the mercury concentrations exceed 1000 ng/m<sup>3</sup>.
- Decontaminate all tools and equipment with mercury decontamination/removal solutions ([Hg CS-102](#) or [HgX](#)) if material/equipment will not be disposed.
- Screen all shoes and work vehicles daily prior to departing the site. ATSDR recommends decontamination (heat treating) or disposal of clothing and personal items that screen greater than 6000 ng/m<sup>3</sup> and decontamination of vehicles if they screen greater than 3000 ng/m<sup>3</sup>.
- Recommend that street clothing worn during mercury responses also be bagged and screened. Heat treating (leaving them out in the direct sunshine) these items is typically effective at removing Hg vapor contamination.
- The Lumex MVA may capture mercury contamination in the pre-filter. Remove and dispose of air intake pre-filter and sampling hose. Remove connections from the hose and decontaminate.



## Special Considerations

- Mercury is easily tracked and spread throughout the exclusion zone. Recommend donning boot covers as you exit your vehicle. Don multiple layers of boot covers so you can remove a pair as you move from one area to another and minimize spread of the mercury contamination.
- If mercury vacuums are used, survey the exhaust with an MVA to assure the vacuum is operating properly. Have the filters changed out in the vacuum if elevated Hg levels are detected.
- The Regional Readiness Center maintains a mercury spill clean up kit as well as mercury decontamination solutions.

## Resources/References:

1. Safety Data Sheet: <http://www.bethlehemapparatus.com/pdf/MSDS.pdf>
2. [Office of Emergency Management National Mercury Workgroup](#)
3. [National Elemental Mercury Response Guidebook - 2019](#)
4. [Region 4 Mercury Field Operating Guide](#)
5. [ATSDR Suggested Action Levels for Elemental Mercury Spills - May 22, 2012](#)
6. [Emergency Response and Removal Health and Safety Standard Operating Guidelines](#)
  - a. [Equipment DECON SOG](#)
  - b. [Personnel DECON SOG](#)
  - c. [PPE Dress Out SOG](#)
7. [NIOSH Pocket Guide to Chemical Hazards](#)
8. [American Conference of Governmental Industrial Hygienist TLVs and BEIs](#)
9. [MSA Emergency Response Application \(Respirator Cartridge Calculator\)](#)
10. Decontamination Solution Information:
  - a. HgCS102: <https://chemicalsolutionsintl.com/product/hgcs-102/>
  - b. HgX: <http://ptfecatalog.actontech.com/viewitems/hgx-mercury-decontaminant/hgx-mercury-decontaminant-powder>