Metals in Settled Dust Sampling Instructions

Metals contamination may be found in dust from a variety of sources. The metals may be present due to a poorly performed remediation, from decaying building materials, from catastrophic events or even routine activities. Regardless of the source metals in dust may be toxic and a source for concern. Metals found in dust are generally in trace quantities which can be released into the air when the dust is disturbed. The most common means for collection of settled dust is a dust wipe.

There are four (4) methods most commonly utilized for the analysis of dust wipes for trace metals: EPA SW-846 Method 7000B (lead, FLAA), EPA SW-846 Method 6010D/NIOSH 9102 (most trace metals, ICP-OES), OSHA ID-145 (particulate mercury, CVAA) and OSHA ID-215 (hexavalent chromium).

Notes:

- SW-846 Method 6020B (ICP-MS) is often mentioned as an analytical option but is not recommended due to the significantly higher cost for lower reporting limits that are usually unnecessary.
- The reporting limits (RLs) for metals such as lead are typically 5-20X lower by ICP-OES than FLAA.
- Sampling media is crucial for proper analysis; interferences will occur if using improper media. Use of baby wipes, paper towels or tape is not acceptable for validated analytical results.
- While these analytical methods have been used for metals analysis for many years the only current regulatory limit for metals in settled dust is the dust lead action level (DLAL) set by EPA. There may be other generally accepted levels for concern in federal, state or local guidance documents.
- Results are typically reported in units of mass/area (e.g., µg/ft.^{2}, µg/100 cm^2 etc.) based upon a known wipe area provided by the sample collector.
- These methods are designed for dust; dust is different from debris. If you believe that your sampling area consists of debris, please contact the lab for alternative analysis options.

The summaries of all analytical methods are relatively similar. The dust wipe is digested/extracted with mineral acids(s) and/or other reagents, then diluted to a known volume with water. The aqueous solution is filtered and aspirated/injected whereby the instrument absorbance/emission intensity or peak area is used to determine solution concentration. From this value the total analyte (metal) mass is calculated an correlated with the wipe area for result in units of mass/area.

The appropriate wipe area is determined by several factors:

1) the analytical sensitivity of each metal for each instrumental method

2) regulatory requirements and

3) the extent of probable sample loading (e.g., risk assessment vs. clearance monitoring). The most common wipe areas are 1.0 ft.^{2} or 100 cm^2; however, a smaller area should be considered for a location with heavy dust accumulation while for a location with extremely light dust a larger area can be sampled (e.g., 288 in.^{2} is necessary for lead analysis on floors by FLAA). It is important to always provide the sampling area sizes on the chain of custody as they are used in calculations.

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Materials Needed

Contact EMSL (1.800.220.3675) for all of your supply needs.

- Chain of Custody- Sample Information Form
- Ghost Wipe (most metals), ASTM E 1792 compliant (EMSL Product ID # 8708191); see limitations below
- Gauze wipe (mercury) w/deionized water; see limitations below
- 37-mm PVC (EMSL Product ID # 8708118) or binderless quartz fiber filter wipe (hexavalent chromium)
- Stabilization solution (hexavalent chromium, plating operations); see limitations below
- Centrifuge tube (EMSL Product ID # 8708907); additional fees may apply for alternate FLAA lead tubes
- Templates (optional)
  - 10cm x 10cm (EMSL Product ID # 8708310B) or
  - 12” x 12” template (EMSL Product ID # 8708933)
- Duct/masking tape (not provided by EMSL)
- Disposable gloves

Sampling Instructions (reference: Appendix 13.1, EPA/HUD Guidelines)

1. Place a template (if practical) on the surface to be sampled.
2. Secure template to the area to be wiped by taping the outside corners with masking or duct tape.
3. Using disposable gloves remove the wipe from the supplied tube or package. **Note: excluding hexavalent chromium (dry wipe only)** if the wipe is not pre-wetted it should be moistened with reagent (deionized) water.
4. *First Wiping (side to side).* With the fingers together, grasp the wipe between the thumb and the palm. Press down firmly, but not excessively with the fingers and, if the wipe is large enough, the palm. If the sample area is a square or nearly a square, as should be the case with floor sampling, proceed to wipe side-to-side with as many “S”-like motions as are necessary to completely cover the entire sample area. Exerting excessive pressure on the wipe will cause it to curl. Exerting too little pressure will result in poor collection of dust. Do not use only the fingertips to hold down the wipe, because there will not be complete contact with the surface and some dust may be missed. Attempt to pick up all dust from the sample area.
5. *Second Wiping (top to bottom).* Fold the wipe in half with the contaminated side facing inward. (You may straighten the wipe by laying it on the sample area, contaminated side up, and folding it over.) Take care not to spill dust when folding. Once folded, place the wipe in the top corner of the sample area and press down firmly with the fingers (and the palm if the folded wipe is large enough). Repeat wiping the area with “S”-like or “Z”-like motions, but on the second pass, move in a top-to-bottom direction. Attempt to pick up all dust. Do not touch the contaminated side of the wipe with the hand or fingers. Do not shake the wipe in an attempt to straighten it out, since dust may be lost during shaking. **Note:** If the surface is a narrow rectangle, two side-to-side passes must be made over the sample area, the second pass with the wipe folded so that the contaminated side faces inward. For an interior windowsill or window trough, do not attempt to wipe the irregular edges presented by the contour of the window trough or the rounded inside edge of the interior sill. Avoid touching other portions of the window with the wipe. If there are paint chips or gross debris in the window trough, attempt to include as much of it as possible on the wipe. If it is apparent that all of the material cannot be picked up with one wipe, consider sampling only a part of the surface.

6. *Third Wiping (clean corners).* Perform a third wiping around the perimeter of the sampling area within the template. Fold the wipe in half again with the dust collection side inward and repeat the wiping motion, pressing with the fingers and concentrating on collecting any remaining dust in the corners of the wipe area. Confirm no visible dust remains following the third wiping.
7. After collecting as much dust as possible with the wipe, fold the wipe with the contaminated side facing inward again, and insert aseptically (without touching anything else) into the centrifuge tube. If gross debris is present, such as paint chips in a window well, make every attempt to include as much of the debris as possible in the wipe.
8. Measure and record the total area ($in.^2$ or cm^2) of the surface wiped on the chain-of custody.
9. Cap the centrifuge tube and label with a unique identifier traceable to the chain-of-custody.

Sampling Media Options

Ghost Wipes

Pro: Pre-wetted in individual packages, ASTM E 1792 compliant, ideal for most trace metals analyzed by FLAA or ICP-OES. Additional prep fees for other wipes (excluding gauze), even if ASTM E 1792 compliant, may be applied by EMSL due to additional labor cost for preparation.

Cons: Not used for collection of mercury or hexavalent chromium; significant levels of zinc and minerals (calcium, magnesium, sodium, potassium) result in elevated reporting limits.

When should the Ghost Wipe be used: Universally for all metals analysis (exceptions noted above). Wipes meeting the ASTM E 1792 specification are required for EPA NLLAP-compliant (lead) sampling.

Gauze Wipes

Pro: Ideal for mercury (particulate) sampling; lower zinc background levels than Ghost Wipes.

Cons: Not ASTM E 1792 compliant; not used for collection of hexavalent chromium. Not available pre- wetted in individual packages; wetting with water in the field could lead to contamination issues.
Significant levels of minerals (calcium, magnesium, sodium, potassium) result in elevated reporting limits.

When should gauze wipes be used: mercury particulate sampling or for low-level zinc analysis.

PVC/Binderless Quartz Fiber Filter Wipes Filter Wipes (hexavalent chromium)

Wipe options: the PVC filter is the most common wipe utilized for collection of hexavalent chromium on smooth surfaces. For better durability the quartz fiber wipe is preferred over the PVC filter when the surface being evaluated is coarse or uneven.

Note 1: *do not wet* either wipe to avoid potential degradation of Cr (VI}.

Note 2: if collected from a chromium plating operation the wipe must be stored upon collection in a stabilization solution; the lab may be contacted for the necessary supplies. A quartz fiber filter coated with NaOH is an alternative to the stabilization solution but not recommended for safety concerns.

Note 3: holding times are typically < 10 days regardless of the operation (plating, welding, etc.).

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Analytical Method Options

EPA SW-846 Method 7000B (FLAA)

Pro: Fast and lowest-cost for lead wipe analysis.

Cons: Metals analyzed individually, not as a group. Reporting limits are elevated compared to ICP-OES.

When should the method be used: If sufficient wipe area is collected FLAA is ideal for analyzing lead wipe "clearance" samples. FLAA is the best alternative for survey samples with potentially high lead loadings.

EPA SW-846 Method 6010D (ICP-OES)

Pro: Ability to analyze metals simultaneously with lower reporting limits than FLAA.

Cons: Slower and more costly than FLAA.

When should the method be used: For panels of metals analysis (RCRA, CAM, TAL etc., excluding mercury) or when lower reporting limits are required than can be provided by FLAA analysis.

OSHA ID-145 (Mercury, CVAA)

Pro: Very low reporting limits for particulate mercury analysis.

Cons: Instrument limitations require use of gauze wipes. The presence of high levels of organic material collected on the wipe can result in significant dilution factors.

When should the method be used: For any particulate mercury application (single analyte) or to supplement ICP-OES analytes in the RCRA/CAM/TAL panels.

OSHA ID-215 (Hexavalent Chromium, IC)

Pro: Very low reporting limits and highly specific for hexavalent chromium analysis.

Cons: Requires stabilization solution for plating operations to avoid conversion to Cr (III). Samples collected from a spray paint operation require additional preparation steps and associated fees.

When should the method be used: For analysis of hexavalent chromium collected on all surfaces.