1.0 Purpose & Scope  This document describes a field procedure for taking wipe samples for metals on surfaces. It is based on methodology described in NIOSH 9100 “Lead in Surface Wipe Samples” of the NIOSH Manual of Analytical Methods.

The goal of the procedure is to provide a uniform methodology to collect representative samples. Using this method will ensure repeatability between various sampling personnel and between surface configurations. It is used for characterizing surface levels for the following reasons:
  o Decommissioning operational areas
  o Evaluating the effectiveness of clean-up of a spill
  o Evaluating compliance with housekeeping levels in operational areas
  o Characterizing a piece of equipment for release.

2.0 Responsibilities

2.1 Demonstrated Competency:  This procedure is administered through the SHSD Industrial Hygiene Group. Only persons who have demonstrated competency in performing this procedure in accordance with Section 7 are qualified to use this procedure.

2.2 Chain of Custody procedures:  The qualified sampler is responsible for samples until they have been properly transferred to the IH Group laboratory using the IH51300 Chain of Custody procedures.

2.3 Hazard Analysis of the Sampling Task:  It is the responsibility of persons using this method and their supervisors to:
  • Use appropriate personal protective equipment; see section 5.2 and Table 1.
  • Obtain required training and qualification for hazards in areas.
  • Comply with all work planning and work permit system requirements.

3.0 Definitions

Equipment Release level (recommendations for metals other than beryllium):  Internal guidelines used to determine acceptable surface levels of metals for the transfer of equipment to non-operational areas or to the public.

Equipment Release level (mandatory for Beryllium) 10CFR 850.31
(a) clean beryllium-contaminated equipment and other items to the lowest contamination level practicable, but not to exceed the levels (b) and (c), and label the equipment or other items,
before releasing them to the general public or a DOE facility for nonberyllium use, or to another facility for work involving beryllium.

(b) Before releasing beryllium contaminated equipment or other items to the general public or for use in a nonberyllium area of a DOE facility, must ensure that:

1. The removable contamination level of equipment or item surfaces does not exceed the higher of 0.2 ug/100 cm² or the concentration level of beryllium in soil at the point or release, whichever is greater;
2. The equipment or item is labeled in accordance with 850.38(b); and
3. The release is conditioned on the recipient’s commitment to implement controls that will prevent foreseeable beryllium exposure, considering the nature of the equipment or item and its future use and the nature of the beryllium contamination.

(c) Before releasing beryllium contaminated equipment or other items to another facility performing work with beryllium, must ensure that:

1. The removable contamination level of equipment or item surfaces does not exceed 3 ug/100 cm²;
2. The equipment or item is labeled in accordance with 850.38(b); and
3. The equipment or item is enclosed or placed in sealed, impermeable bags or containers to prevent the release of beryllium dust during handling and transportation.

Housekeeping level (recommendation for metals other than beryllium): An internal guideline used to answer “how clean is clean?” for surfaces that personnel access. Surface levels should be below these guideline levels during non-operational periods.

Housekeeping level (mandatory for Beryllium) 10CFR850.30(a): Where beryllium is present in operational areas of DOE facilities, conduct routine surface sampling to determine housekeeping conditions. Surfaces contaminated with beryllium dusts and waste must not exceed a removable contamination level of 3 ug/100 cm² during non-operational periods. This sampling would not include the interior of installed closed systems such as enclosures, glove boxes, chambers, or ventilation systems.

Operational areas: areas where metals are routinely used, handled or stored and personal hygiene control practices are in place (e.g. eating, drinking are prohibited; hand washing is expected on exiting the area).

Operational periods: times of a day when operations with metals are active.

Non-operational areas: areas where metals are not routinely handled and personal hygiene control practices are not in-place (e.g. eating & drinking are allowed; hand washing is not expected on exit of the area).

Non-operational periods: times of the day when:
- operational areas are not active (e.g. off-hours)
- anytime in a non-operational area (such as offices, lunch rooms, housing units).
4.0 Prerequisites

Area Access:
4.1 Training for hazards may be needed for entry into restricted areas.
4.2 Contact the appropriate Facility Support Representative or Technician to obtain approval to enter radiological areas.
4.3 Verify if a Work Permit or Radiological Work Permit is needed or is in effect. If so, review and sign the permit.
4.4 Use appropriate PPE for area.

5.0 Precautions

5.1 Hazard assessment: Taking surface wipe samples may cause some exposure to health risks. The surface wipe sampling technique can use hazardous solvents. Sampling may be performed in areas with metal, chemical or radiological contamination. These hazards must be assessed on a case-by-case basis by a competent individual knowledgeable of the hazards of the area.

5.2 Job Risk Assessment: Consult the Job Risk Assessment SHSD-JRA-05 for the risk analysis of this operation based on the hazards and controls of this SOP.

5.3 Personal Protective Equipment: Use appropriate personal protective equipment when implementing this procedure.
5.3.1 Hand: Use gloves in areas of known or suspected chemical or radiological contamination. Exam-style, splash gloves are acceptable. Acceptable polymers are: Nitrile, PVC, and Natural Rubber. The gloves must have sufficient impermeability to the surface contaminant and solvent used on the collection media to allow safe handling. See Table 1.
5.3.2 Body: Use a disposable suit if contact of the body with contaminated surfaces is anticipated. Acceptable chemical protective equipment materials include: Tyvek®, KleenGuard®, and cotton. Contact the ECR/WMR for disposable of garments. If personal clothing items become contaminated, they must be surrendered for BNL cleaning or disposal.
5.3.3 Foot: Use disposable shoe coverings, boots or booties if contact of the feet with contaminated surfaces is anticipated. Acceptable CPC material include: Tyvek®, KleenGuard®, and rubber. If personal shoes become contaminated, they must be surrendered for BNL cleaning or disposal.
5.3.4 Respiratory: Under normal use, respiratory protection is not required. Use a respirator in an area with the potential to exceed the OSHA, ACGIH, or DOE standards. The person collecting using respiratory protection must comply with the BNL Respiratory Protection Program.
5.3.5 Eye: Use safety glasses with side shields in laboratories, construction, and general industry areas.
5.4 **Radioactive Concerns:** It is possible that some surfaces to be tested may have radioactive contamination. In these cases, personal protective equipment and administrative controls must be implemented for the radiological contaminant hazard.

In addition, the collected sample must be analyzed for the radiological hazard before it can be submitted to the IH Group for analysis. The radiological contamination must be below the permissible release limits to the general public.

5.5 **Work Planning:** All requirements of work permits and work planning system reviews must be met in performing this procedure.

5.6 **Environmental Impact and Waste Disposal:** This technique does not have adverse impact on the environment. Based on WMD testing of similar material, templates and gloves can be disposed as normal trash. See Attachment 9.5.

### 6.0 Procedure

#### 6.1 Equipment

<table>
<thead>
<tr>
<th>Sample container (either):</th>
<th>Bag, plastic, sealable with “zip” type seal.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vial, glass or plastic. (Glass is needed for hexane solvents based samples).</td>
<td></td>
</tr>
<tr>
<td>Sample media (any of these):</td>
<td>Gauze: 2” x 2” or 4” x 4” cotton gauze</td>
</tr>
<tr>
<td>Paper: Ashless quantitative filter paper (typical diameter is 1.5 to 4 inches)</td>
<td></td>
</tr>
<tr>
<td>Pre-moistened wipe: manufacturer foil wrapped, solvent soaked disposable cloths (An acceptable brand is the GhostWipes™; via Environmental Express.)</td>
<td></td>
</tr>
<tr>
<td>Gloves</td>
<td>Appropriate for contaminant and solvent (see Table 1) and site hazards.</td>
</tr>
<tr>
<td>Solvent</td>
<td>Distilled water, Isopropanol, ethanol, methanol, n-hexane, or pre-moistened. See Table 1 for recommended solvent for each contaminant.</td>
</tr>
<tr>
<td>Template</td>
<td>Plastic sheet or cardboard: See Table 1 for size needed</td>
</tr>
<tr>
<td>• 100cm²: 10 cm x 10 cm square –or- circle of 11.24 cm diameter.</td>
<td></td>
</tr>
<tr>
<td>• 1ft²: 1 foot x 1 foot, or other shape totaling 144 in².</td>
<td></td>
</tr>
</tbody>
</table>

6.2 **Wipe Technique:** BNL SHSD IH Group has selected the NIOSH method of collecting wipe samples. For uniformity, this method should be used for all sampling surface to be sampled (Visually depicted in Figure A)

*Figure A: NIOSH Surface Wipe Method*
6.2.1 Use a pre-moistened wipe (e.g. GhostWipe™) or moisten the sample media with 1 to 2 ml of the appropriate solvent (see Table 1). Apply only enough solvent to moisten approximately 80% of the area of the media. Avoid excess solvent on the filter or pad as it may cause drips and running on the surface thus diluting the sample.

Table 1

<table>
<thead>
<tr>
<th>Contaminant</th>
<th>Media</th>
<th>Solvent(1)</th>
<th>PPE Glove(2) Disposable Style</th>
<th>Sample Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead</td>
<td>Gauze or Filter</td>
<td>Distilled Water</td>
<td>Natural Latex Rubber, Nitrile, PVC, or Polyethylene</td>
<td>1 square foot, 100 cm² requires advanced approval by IH professional verifying that sensitivity is adequate</td>
</tr>
<tr>
<td></td>
<td>GhostWipe™ (should be cut in half) (3)</td>
<td>Wipe is premoisten (Water &amp; Benzalkonium Chloride)</td>
<td>Natural Latex Rubber, Nitrile, PVC, or Polyethylene</td>
<td>1 square foot minimum needed always</td>
</tr>
<tr>
<td>Beryllium</td>
<td>Gauze or Filter</td>
<td>Distilled Water Isopropanol, Methanol, Ethanol</td>
<td>Natural Latex Rubber, Nitrile, PVC, or Polyethylene</td>
<td>1 square foot minimum needed always</td>
</tr>
<tr>
<td></td>
<td>GhostWipe™ (should be cut in half) (3)</td>
<td>Wipe is premoisten (Water &amp; Benzalkonium Chloride)</td>
<td>Natural Latex Rubber, Nitrile, PVC, or Polyethylene</td>
<td>1 square foot minimum needed always</td>
</tr>
<tr>
<td>Arsenic, Cadmium, Chromium, or Nickel</td>
<td>Gauze or Filter</td>
<td>Distilled Water</td>
<td>Natural Latex Rubber, Nitrile, PVC, or Polyethylene</td>
<td>100 cm² typically acceptable</td>
</tr>
<tr>
<td></td>
<td>GhostWipe™ (should be cut in half) (3)</td>
<td>Wipe is premoisten (Water &amp; Benzalkonium Chloride)</td>
<td>Natural Latex Rubber, Nitrile, PVC, or Polyethylene</td>
<td>100 cm² typically acceptable</td>
</tr>
<tr>
<td>Hexavalent</td>
<td>DO NOT USE GHOST</td>
<td>None: For chrome Powderless:</td>
<td>100 cm² typically acceptable</td>
<td></td>
</tr>
</tbody>
</table>
6.2.2 Place the template over the area to be sampled or measure out 1 ft² or 100-cm² surface area, as per Table 1. If the object has a total surface area of less than 1 ft² or 100 cm², sample the whole surface area, if possible, and record the surface area. If the surface does not allow the use of a template, carefully determine the dimensions that will equal 1 ft² or 100 cm².

6.2.3 Wipe the surface with firm pressure, using “S” strokes, covering the entire surface (edge to edge). If the surface is very rough (such as concrete), a dabbing action may be substituted for the full contact pressure rubbing of the media across the surface. When dabbing, make sure to completely cover the same area as in the S-stroke wipe. Indicate dabbing done on Attachment 9.3.

Fold the exposed side of the pad or filter inward (i.e. fold in half).

6.2.4 Using the once-folded media, wipe the same area S-strokes (see Figure A), starting at right angles to the first wipe. Fold the exposed side of the pad or filter inward.

6.2.5 Using the twice-folded media, wipe with S-strokes (see Figure A) starting at the original point and wipe in the same direction. Fold the exposed side of the pad or filter in.
6.2.6 Place the media in a plastic bag or vial. Seal the zip lock or vial. Record the sample identification on the bag or vial.

6.2.7 Thoroughly clean reusable templates or discard paper templates in preparation of the next sample. Based on WMD testing of similar material, templates can be disposed as normal trash.

6.2.8 Remove gloves by pulling them off inside-out and discard appropriately before handling the next filter or pad.

6.2.9 Record the sample identification, surface area sampled, and description of the sample and surface on the sample form in Attachment 9.3.

6.2.10 Include 1 blank filter or pad (moisten and placed in bags or vials) with each set of samples (provide 1 blank per 6 samples).

6.3 Surface Wipe Technique for Hexavalent Chromium: see Attachment 9.2.

6.4 Sampling Protocol:

6.4.1 Determine HOW MANY samples to take. It is not possible to provide definitive guidance on the number of samples to be taken in every case. Table 2 provides general guidance on which to base professional judgment determining the number of samples. Factors that should be considered in selecting the number of samples include: the size of the area to be tested, the predicted uniformity of contamination over the surface area, and the eventual fate of the surface area (disposal, remediation, background measurement, etc.)

If more than six (6) samples are to be taken, it is suggested that at least one (1) duplicate sample be taken in close proximity to one other to verify the precision (repeatability) of the sampling.

<table>
<thead>
<tr>
<th>Surface Configuration</th>
<th>Minimum Number of Samples</th>
<th>Qualifier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entire Surface is less than 100 cm2 (example: a small article)</td>
<td>1</td>
<td>If possible, sample the whole item, one sample is usually sufficient.</td>
</tr>
<tr>
<td>Surface Area of object or area is greater than 100 cm2 but only a few square feet (example: table top on which a process is done)</td>
<td>1</td>
<td>If only one sample is taken, select the area with highest potential contamination</td>
</tr>
<tr>
<td>Surface Area of object or area is greater than a few square feet (example: floor or wall of a room)</td>
<td>1 - 3</td>
<td>Ideally three samples are taken, but fewer samples may be taken depending on the purpose for sampling</td>
</tr>
</tbody>
</table>
6.4.2 Determine WHAT KIND of samples (LOCATION). Consider these locations when characterizing levels of surface metals:
- surfaces that are frequently accessed,
- surfaces that hazardous metal object rest on,
- surfaces that are infrequently cleaned or disturbed (such as top of cabinets or high shelves)
- sources of the contamination (such as process equipment, lab apparatus, site of known spills),
- areas where contamination is not expected (these serve as a control), and
- areas where contamination would not be permissible (such as lunch rooms).

6.5 Results interpretation: Normalize the units of sampling results from the laboratory to the base units of the Acceptable Surface Levels listed in Table 3.

Conversion of data between various laboratory reporting units of measures: Data can be converted from the various regulatory reporting and laboratory reporting units of measure based on the following values:

\[ 1 \text{ sq.ft.} = 929 \text{ cm}^2 \quad 1 \text{ mg} = 1000 \text{ ug} \]

<table>
<thead>
<tr>
<th>Unit Conversion</th>
<th>Multiply by</th>
</tr>
</thead>
<tbody>
<tr>
<td>ug/100 cm² to ug/sq ft</td>
<td>9.29</td>
</tr>
<tr>
<td>ug/sq ft to ug/100 cm²</td>
<td>0.1076</td>
</tr>
</tbody>
</table>

6.6 Reporting results: Convey the assessment of results to the requestor of the sampling, ESH Coordinator and the IFM management in the form of a written analysis documenting: sampling and analysis methods, contamination levels measured, compliance with regulatory and recommended levels, and recommended corrective actions (if necessary).

Table 3 (BNL Surface Wipe Criteria for metals)

<table>
<thead>
<tr>
<th>Compound</th>
<th>Acceptable Surface Level</th>
<th>Criteria type</th>
<th>M/R</th>
<th>Basis for Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ug/100cm²</td>
<td>ug/sq ft</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arsenic (As)</td>
<td>15</td>
<td>139</td>
<td>Housekeeping- all</td>
<td>R2</td>
</tr>
<tr>
<td></td>
<td>1</td>
<td>9.3</td>
<td>Equipment Release- all</td>
<td>R2</td>
</tr>
<tr>
<td>Beryllium (Be)</td>
<td>3</td>
<td>28</td>
<td>Housekeeping - all</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>3</td>
<td>28</td>
<td>Equipment Release- Be operational areas</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td>0.2</td>
<td>1.9</td>
<td>Equipment Release- public &amp; non-Be operational areas</td>
<td>M</td>
</tr>
</tbody>
</table>
Table 3 (BNL Surface Wipe Criteria for metals)

<table>
<thead>
<tr>
<th>Compound</th>
<th>Acceptable Surface Level (ug/100cm²)</th>
<th>Criteria type</th>
<th>M/R</th>
<th>Basis for Calculation</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>ug/sq ft</td>
<td></td>
<td></td>
<td>TLV 2011 ug/m³</td>
</tr>
<tr>
<td>Cadmium (Cd)</td>
<td>3  27.9</td>
<td>Housekeeping-all</td>
<td>R2</td>
<td>DOE Be correlation</td>
</tr>
<tr>
<td></td>
<td>0.2  1.9</td>
<td>Equipment Release-all</td>
<td>R2</td>
<td>Z.2</td>
</tr>
<tr>
<td>Chromium III (Cr³⁺)</td>
<td>750 6968</td>
<td>Housekeeping-all</td>
<td>R2</td>
<td>DOE Be correlation</td>
</tr>
<tr>
<td>Chromium VI (Cr⁶⁺)</td>
<td>7.5  69.7</td>
<td>Housekeeping-all</td>
<td>R2</td>
<td>DOE Be correlation</td>
</tr>
<tr>
<td>Cobalt (Co)</td>
<td>30  278.7</td>
<td>Housekeeping-all</td>
<td>R2</td>
<td>DOE Be correlation</td>
</tr>
<tr>
<td>Lead (Pb)</td>
<td>26.9 250</td>
<td>Housekeeping-Pb operational areas</td>
<td>R1</td>
<td>DOE TSCA (40CFR745) &amp; HUD Sills 250 ug/ft²</td>
</tr>
<tr>
<td></td>
<td>4.3  40</td>
<td>Housekeeping-non-Pb operational areas</td>
<td>R1</td>
<td>DOE TSCA (40CFR745) &amp; HUD Floors 40 ug/ft²</td>
</tr>
<tr>
<td>Manganese (Mn)</td>
<td>300 2786</td>
<td>Housekeeping-all</td>
<td>R2</td>
<td>DOE Be correlation</td>
</tr>
<tr>
<td></td>
<td>20  184</td>
<td>Equipment Release-all</td>
<td>R2</td>
<td>DOE Be correlation</td>
</tr>
<tr>
<td>Nickel (Ni)</td>
<td>1500 13935</td>
<td>Housekeeping-all</td>
<td>R2</td>
<td>DOE Be correlation</td>
</tr>
<tr>
<td></td>
<td>100 929</td>
<td>Equipment Release-all</td>
<td>R2</td>
<td>DOE Be correlation</td>
</tr>
<tr>
<td>Silver (Ag)</td>
<td>15 139</td>
<td>Housekeeping-all</td>
<td>R2</td>
<td>DOE Be correlation</td>
</tr>
<tr>
<td></td>
<td>1   9.3</td>
<td>Equipment Release-all</td>
<td>R2</td>
<td>DOE Be correlation</td>
</tr>
</tbody>
</table>

M = Mandatory based on regulation applicable to BNL
R1 = Recommended based on regulation not applicable to BNL
R2 = Recommended based on ratio of TLV/PEL airborne to DOE Beryllium housekeeping or release criteria

Basis for the R2 recommendations

DOE Beryllium Housekeeping criteria (3 ug/100cm²) = BNL Housekeeping recommendation for toxic metal (in ug/100cm²)
DOE/OSHA airborne PEL for beryllium (2 ug/m³) = ACGIH 2011 Airborne TLV or OSHA Airborne PEL (in ug/m³)

DOE Beryllium Release criteria (0.2 ug/100cm²) = BNL Release recommendation for toxic metal (in ug/100cm²)
DOE/OSHA airborne PEL for beryllium (2 ug/m³) = ACGIH 2011 Airborne TLV or OSHA Airborne PEL (in ug/m³)

7.0 Implementation and Training

7.1 Qualification Criteria: Use of this SOP shall be limited to persons who have demonstrated the competency to satisfactorily use the procedure, as evidenced by experience and training. All persons must have demonstrated competency in the qualification criteria set in the Job Performance Measure (Attachment 9.4.).

7.2 Qualification on this JPM is required on a 3 year basis.

8.0 References
8.1 ACGIH Threshold Limit Values 2011
8.3 OSHA Instruction CPL 2-2.20B: Sampling for Surface Contamination, 2/5/90.
8.4 OSHA 29CFR1910.1000 Table Z1, Z2.
8.5 EPA: Toxic Substance Control Act (TSCA) 40CFR761.130.

9.0 Attachments

9.1 Sample of Signs for Areas and Material
9.2 Liberty Mutual Wipe Sampling Technique for Hexavalent Chromium
9.3 Surface Contamination Sampling Form
9.4 SHSD Job Performance Measure (JPM) Completion Certificate
9.5 SHSD Environmental Evaluation of Surface Wipe Sampling

10.0 Procedure Documentation

<table>
<thead>
<tr>
<th>ISM Review - Hazard Categorization:</th>
<th>□ High; ☑ Moderate; □ Low/Skill of the craft</th>
</tr>
</thead>
<tbody>
<tr>
<td>Validation:</td>
<td>□ Formal Walkthrough ☑ Desk Top Review □ SME Review</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Rev</th>
<th>Revision Log</th>
</tr>
</thead>
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<tr>
<td>0</td>
<td>New document. Prepared By R. Selvey, CIH 02/25/2000; Technical Reviewed By: N. Bernholc, CIH 02/27/00; RCD Facility Support Approved By: 04/22/01 N. Foster Procedure Committee Review; QA Review : E. Tucker; SHSD Approved By: R. Selvey 03/02/2000</td>
</tr>
<tr>
<td>1</td>
<td>Revised for minor correction noted in training classes. Reviewed By: R. Selvey 10/6/00</td>
</tr>
<tr>
<td>2</td>
<td>Added new format, SBMS header and reviewed sections on Hazard assessment, PPE. Added Waste Disposal and Environmental Impact text. Reviewed By: R. Selvey 02/05/01</td>
</tr>
<tr>
<td>3</td>
<td>Minor format change. Converted SOP number from IH-FP-3.2 to new system IH75190. Reviewed By: R. Selvey 03/09/01</td>
</tr>
<tr>
<td>4</td>
<td>Revised to include RCD Facility Support Procedure Committee comments. Reviewed By: R. Selvey 04/22/01</td>
</tr>
<tr>
<td>5</td>
<td>Updated Table 1 adding Arsenic and Cadmium Media. Update Table 3 with Arsenic and Cadmium Release Criteria and update EPA Lead Criteria. Reviewed By: R. Selvey 04/10/02</td>
</tr>
<tr>
<td>6</td>
<td>Updated Table 1 to correct error in lead criteria. Insert Section 7 and transfer information from section 4. Renumbered attachments. Reviewed By: R. Selvey 4/17/02</td>
</tr>
<tr>
<td>7</td>
<td>Added Best Management Practice release criteria for Arsenic and Cadmium to Table 3. Reviewed By R. Selvey 08/16/02</td>
</tr>
<tr>
<td>8</td>
<td>Added Best Management Practice release criteria for Nickel to Table 3. Reviewed By: R. Selvey 10/17/02</td>
</tr>
<tr>
<td>10</td>
<td>Added reference and link to JRA-05 in 5.1. Added text to 6.2.2 to clarify using Table 1 to determine 100cm2 versus 1 sq ft. Changed “S-stroke” wording in 6.2.3 through 6.2.5 to avoid confusion with the S-stroke used the Health Physics terminology. The two patterns are different. Changed the qualification criteria in Section 7 to reflect the unified qualification policy. Updated the Sample form (Attachment 9.1) to reflect the Compliance Suite order of sample numbering. Reviewed By: R. Selvey 02/21/06</td>
</tr>
<tr>
<td>11</td>
<td>Reworded the “S-stroke” wording in 6.2.3 through 6.2.5 to avoid confusion with the S-stroke used the Health Physics terminology. Passage on “dabbing” was modified to indicate that the dabbing action replacing pulling the media, but does not replace the S-pattern. Minor typo corrections in Section 5 and 6. Reviewed By: R. Selvey 02/21/06</td>
</tr>
</tbody>
</table>
Section 6.3 was added with a reference to new Attachment 9.4; Table 1: was updated to include hexavalent chromium. Attachment 9.4 was added to include Liberty Mutual Wipe Sample Method. Liberty Mutual method was added. Section 8 References and Attachment 9.4 was added and included in Section 9.0 Attachments.

Reviewed By: J. Peters 11/28/06; Reviewed By: R. Selvey 12/05/06

13 Added Section 4.1, 4.2 and 5.6. Revised 5.2. Added document control to attachment 9.3 and 9.4.

Reviewed By: R. Selvey 05/23/07

14 Table 3: Updated to include Cobalt and description of calculation. Changed IH training link in Step 7.1.

Reviewed By: M. Chuc 09/22/08 Reviewed By: R. Selvey 10/13/08

15 Added Attachment 9.5. Reviewed By: R. Selvey 02/09/09

16 Edited section 4.0 and 5.2 for brevity. Added definition for Release and Housekeeping Criteria. Changed Cr6 release level based on OSHA recommendation. Added ANSI Caution to Attachment 9.1 sign. Revised directions in Attachment 9.2. Reviewed By: R. Selvey 03/21/11

17 Full review of steps 1 to 7. Expanded and revised Release and Housekeeping Criteria definitions in Section 3 and in Table 3. Reviewed By: R. Selvey 04/27/11

18 Corrected error in units in section 3: mg/100cm² to ug/100 cm².

Reviewed By: R. Selvey 05/10/11

19 Edited Section 2 and 7 to remove reference to rescinded HP65100. Changed format of Section 9.

Reviewed By: R. Selvey 03/04/14
Attachment 9.1

Samples of Signs for Areas and Material

**CAUTION**

**Cadmium Surface Contamination**

Some surfaces in this area have Cadmium levels above BNL Guidelines

- Do NOT perform operations that causes the dust to become airborne (such as using an air hose to clean surfaces or dry sweeping)
- Contact SHSD IH Group x-7475 prior to Building Renovations or Demolition
- Wash hands prior to eating, drinking, chewing gum, or smoking
- Do not eat or drink in this area.

**CLEAN**

The material on this pallet is below (i.e. cleaner than) the SHSD Best Management Practice Surface Release Guidelines for Lead and Cadmium

It is appropriate to be released and used anywhere at BNL without any specific precautions.

**Exceeds Guidelines for Lead or Cadmium**

The material on this pallet is above (i.e. not cleaner than) the SHSD Best Management Practice Surface Release Guidelines for Lead and/or Cadmium

Specific precautions are needed in areas where this material is used or stored.

- No operations that cause airborne dust (such as air hoses, blowers, or dry sweeping)
- Wash hands prior to eating, drinking, chewing gums, or smoking.
- Do not eat or drink in this area.
- Notify occupants of the area of the presence of Lead/Cadmium on these surfaces.
Attachment 9.2

WIPE SAMPLING TECHNIQUE FOR HEXAVALENT CHROMIUM

Materials supplied by the lab:

Sampling media

For chrome plating: PVC or binderless quartz filter. Immediately after sampling, place the filter sample in a vial containing 10% Na₂CO₃ with 2% NaHCO₃ to stabilize the Cr⁶⁺.

All other operations:

- 5 um, 37-mm PVC filter for smooth surfaces
- 0.45 mm thick 37-or 47-mm binderless quartz fiber filter for rough surfaces (preferred media for both smooth and rough surfaces)

Do not use Ghost wipe®, Whatman, mixed cellulose ester (MCE) or glass fiber filter as they convert Cr⁶⁺ to Cr³⁺.

Template (10 cm x 10 cm)
Teflon coated or plastic tweezers
Empty glass vials
Glass vials containing 5 ml aqueous solution of 10% Na₂CO₃ with 2% NaHCO₃ for chrome plating samples
Powderless gloves

Sampling Technique:

1. Prepare a sufficient number of vials, each labeled with a unique number.
2. Sketch a diagram of the room or area to be sampled.
3. Wear a new pair of clean gloves for each sample. DO NOT use powdered gloves.
4. Record the sample vial number and location where the sample is taken.
5. Remove the filter from the carrying container with a clean PTFE-coated tweezers or plastic tweezers. DO NOT use metal tweezers to handle the filters, as they could deposit Cr⁶⁺ onto the filters.
   Note: Surfaces should not be wetted with water as the water will allow any metal interference to interact with Cr⁶⁺ thereby affecting the results.
6. Use firm pressure when wiping the surface. Start at the one corner moving to the opposite side then upward one wipe width and wipe back to the starting side. Repeat to cover the whole surface area. Fold inward and repeat wiping the entire surface again. Fold in and repeat a third time.
7. After wiping, fold the filter with the contaminant side inward. Place the filter immediately in the sample vial and cap.
   Filter samples taken in chrome plating operation must be placed in a vial containing 10% Na₂CO₃ with 2% NaHCO₃ to stabilize the Cr⁶⁺.
8. Submit at least one blank wipe filter, treated in the same fashion, but without wiping.
9. Sample results will be reported as ug/100cm². OSHA’s target concentration is 0.050ug/100 cm².
10. Ship samples immediately. If unable to ship immediately, keep cold then ship next day air to:
    Liberty Mutual IH Lab, Bldg C;  71 Frankland Road;  Hopkinton, MA 01748
**Surface Contamination Sampling Form**

**Brookhaven National Laboratory**
**Safety & Health Service Division**
**Industrial Hygiene Group**

---

**Sample Media:**
- Ghost Wipe™
- Cotton Gauze
- Filter Paper

**Solvent:**
- Pre-Moistened
- Distilled Water
- Hexane
- Isopropanol

**Surface Area Measurement:**
- Template
- Measured Area
- Estimated Area

---

**Sample Identification**

<table>
<thead>
<tr>
<th>Sample Number</th>
<th>Sample Location</th>
<th>Surface Type</th>
<th>Surface Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bldg#</td>
<td>MMDDYY</td>
<td>Analyte Symbol</td>
<td>Sample #</td>
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</tbody>
</table>

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**Additional Samples next page**

| Total Number of Samples: ______________ |

---

**SAMPLE DATE:**

**RELINQUISHED TO SHSD IH LAB BY: (SIGNATURE):**

**SAMPLES TAKEN BY: (Print Name and Signature):**

**RECEIVED BY SHSD IH LAB EMPLOYEE (SIGNATURE):**

---

**DATE / TIME:**

---

**LOCATION NAME, ROOM NUMBER & DESCRIPTION:**

---

**REASON FOR SAMPLING:**
- Area Characterization
- Pre-Remediation
- Post Remediation

---

**Other:**

---

**DEPT:**

---

**BUILDING:**

---

**LOCATION NAME, ROOM NUMBER & DESCRIPTION:**

---

**Other:**

---

**Sample Media:**
- Ghost Wipe™
- Cotton Gauze
- Filter Paper

**Solvent:**
- Pre-Moistened
- Distilled Water
- Hexane
- Isopropanol

**Surface Area Measurement:**
- Template
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**Additional Samples next page**

| Total Number of Samples: ______________ |

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<td></td>
<td></td>
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<tr>
<td>Sample #</td>
<td></td>
<td></td>
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</tr>
<tr>
<td></td>
<td></td>
<td>Metal / Plastic / Glass / Painted Wood / Wood / Painted Concrete / Concrete</td>
<td>1 ft² 100 cm²</td>
</tr>
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<td></td>
<td></td>
<td>other:</td>
<td></td>
</tr>
</tbody>
</table>

SAMPLE DATE: 

RELINQUISHED TO SHSD IH LAB BY: (SIGNATURE): 

DATE / TIME: 

SAMPLES TAKEN BY: (Print Name and Signature) 

RECEIVED BY SHSD IH LAB EMPLOYEE (SIGNATURE): 

DATE / TIME: 

BNL-IH75190 Attachment 9.3 Form Rev: 05/23/2007
Chemical Surface Wipe Sampling
Job Performance Measure (JPM) Completion Certificate

Candidate's Name
Life Number:
Qualification Number: HP-IHP-75190

Knowledge of the Principles of Surface Wipe Sampling

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Qualifying Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Analysis</td>
<td>Understands the need to perform a hazard analysis of the sampling area and potential exposure to the sampler.</td>
</tr>
<tr>
<td>Personal Protective Equipment</td>
<td>Understands the need to be aware of the potential surface contamination and airborne levels of contaminants and knows how to determine the need for PPE.</td>
</tr>
<tr>
<td>Sampling Protocol</td>
<td>Understands the exposure monitoring logic necessary to appropriately select sampling locations to accurately measure worker, public and environmental exposure potential.</td>
</tr>
<tr>
<td>Analysis of data</td>
<td>Understands the need to perform analysis on the sampling data to assess potential exposure to the sampler, worker, public and environment, and to recommend corrective actions as necessary.</td>
</tr>
</tbody>
</table>

Practical Skill Evaluation: Demonstration of Surface Wipe Methodology

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Qualifying Performance Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling Equipment</td>
<td>Knows where equipment needed for the procedure is located and how to properly sign it out.</td>
</tr>
</tbody>
</table>
| Moistening Media               | a. Filter/gauze: Moists media with the appropriate solvent. Applies solvent to moisten approximately 80% of the area of the media. Does not over moisten.  
b. For pre-moistened media, shows reduction in size of wipe.                                                                                                                                                                                                                                      |
| Size of Area & Use of Template | Understands the importance of quantifying the area sampled. Demonstrates placing template on surface or measuring the surface area.                                                                                                                                                                                                                       |
| Folding Media at each wipe step| Demonstrates the inward folding of media after each wipe and placement of media into container so that surfaces loaded in the wiping are not exposed.                                                                                                                                                                                                                      |
| NIOSH Method wipe pattern      | Demonstrates the technique of three passes of wiping in “S” pattern, changing the direction on second pass, original direction on third pass.                                                                                                                                                                                                                |
| Choose correct solvent         | Knows how to select correct solvent from Table 1.                                                                                                                                                                                                                                                                                                         |
| Select the correct number of samples | Knows how to choose the appropriate numbers of samples based on Table 2.                                                                                                                                                                                                                                                                                   |
| Record forms                   | Shows how to correctly and completely fill all forms associated with this SOP.                                                                                                                                                                                                                                                                                 |

I accept the responsibility for performing this task as demonstrated within this JPM and the corresponding SOP.

Candidate Signature: ____________________________ Date: ____________________________

I certify the candidate has satisfactorily performed each of the above listed steps and is capable of performing the task unsupervised.

Evaluator Signature: ____________________________ Date: ____________________________

SOP-IH75190 JPM Form (Revision Date: 05/23/07)
### SHSD Environmental Evaluation of Surface Wipe Sampling for Chemicals/Metals

**Operation Description:** Field samples for potential metals or chemicals are collected on pre-moistened pads. This process concentrates toxic substances on the media. The wipes are either sent off-site for analysis or in some instances are analyzed at BNL by the IH Group using direct reading meters.

**Frequency of Operation:** 10 to 20 times per year.

**Environmental impact:**

- The wipes sampled at BNL are consumed in the analysis at the end of test by the off-site lab. Conformance with proper wipe disposal by the off-site vendor laboratory is validated to BNL IH Group’s satisfaction in the AHIA Accreditation process.

- PPE used during sampling and the paper templates are disposed of at the direction of the EPD ECR. The current policy is for disposal as non-hazardous waste. This is justified because the concentration is too low to be of concern (a few micrograms per wipe surface).

**Waste Disposal:**

- PPE and paper templates are disposed of as non-hazardous waste, unless otherwise directed by EPD.