COLLECTION OF INDOOR DUST SAMPLES FROM CARPETED SURFACES FOR CHEMICAL ANALYSIS USING A NILFISK GS-80 VACUUM CLEANER

CONTENTS

These sections affected by Revision 0.0.

SUPERCEDES: SOP #2040; Revision 0.0; 11/18/98; USEPA Contract EP-W-09-031

COLLECTION OF INDOOR DUST SAMPLES FROM CARPETED SURFACES FOR CHEMICAL ANALYSIS USING A NILFISK GS-80 VACUUM CLEANER

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to define the procedures for the collection of carpet-embedded dust samples that can be analyzed for lead, pesticides, or any other chemicals or elements. This procedure is applicable for the collection of samples on a variety of carpeted surfaces. This SOP may be modified to include the collection of dust adhering to floor surfaces but is not intended for the collection of dust containing asbestos fibers.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with the final report.

Mention of trade names or commercial products does not constitute United States Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Sample collection is performed utilizing the Nilfisk GS-80 vacuum cleaner equipped with a high efficiency particulate air (HEPA) filter. A diagram of the Nilfisk GS-80 dust sampling apparatus is presented in Figure 1, Appendix A. Soil and other particulate matter with aerodynamic diameters of approximately 5 microns (Φm) and larger that are embedded within the carpet are collected, sieved and submitted to the laboratory for analysis.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING AND STORAGE

Following collection of a sample into a dedicated collection bag, the bag is removed from the vacuum cleaner and placed into a 32-ounce (oz) glass jar or a zip-lock plastic bag. Storage of the samples at ambient temperature is appropriate for samples that will be analyzed only for metals. Samples for organic analysis should be maintained at approximately 4 ∀ 2 degrees Celsius (^{0}C).

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are no known interferences with this method.

5.0 EQUIPMENT/APPARATUS

5.1 Sampling Equipment

- Nilfisk Model GS-80 vacuum cleaner
- Two-meter folding ruler or similar device
- Masking tape
- Deionized or distilled water
- Methanol, ACS grade
- Kimwipes or equivalent
- Vacuum collection bags

- Bottle brush
- Scrub brush
- Polyliners
- 32-ounce glass jars or Ziploc plastic bags
- Disposable gloves

5.2 Sieving Equipment

- 100-mesh sieve, 150-:m mean diameter, as specified in ASTM D 422, consisting of the cover, sieve and receiver pan
- Sieve shaker for mechanical sieving (CSC Scientific, Catalog Number 18480, Thomas Scientific, Catalog Number 8324-A10) or equivalent
- Analytical balance, capable of weighing 0.1milligrams (mg) and a range of 0.1 mg to 1000 grams (g)
- Disposable gloves
- Disposable dust mask
- Clean aluminum foil
- Kimwipes or equivalent
- Camel hair brush (Fisher Scientific, Catalog Number 03-655) or equivalent

6.0 REAGENTS

Methanol and deionized/distilled water are required for sampling train cleaning and decontamination.

7.0 PROCEDURES

7.1 Preparation

The overall sampling strategy should be designed to address the goals of the study. Users should consider factors such as foot traffic volume, types of activities, and proximity to potential sources. The sampling strategy should be described in the Work Plan (WP), Quality Assurance Project Plan (QAPP), or Sampling and Analysis Plan (SAP) prepared prior to the sampling event. The ideal sampling locations are those areas that conform with the overall sampling strategy. For example, protocol may require the selection of a carpeted area for sampling where small children play or are likely to play.

1. Determine the extent of the sampling effort, the sampling methods to be employed, the amount of dust needed to reach the desired detection limit and the types and amounts of equipment and supplies needed.

2. Obtain and organize the necessary sampling and monitoring equipment.

3. Decontaminate or pre-clean equipment, as specified in Section 7.5, and ensure that it is in working order.

4. Prepare schedule and coordinate with staff, client, regulatory agency, as appropriate.

5. Perform a general site survey prior to site entry in accordance with the site-specific Health and Safety Plan.

6. Measure the area to be sampled and outline it using masking tape or other appropriate methods. Draw a diagram of the room(s) where the sample(s) were taken, locating the sampled area(s).

7.2 Calibration Procedures

The Nilfisk GS-80 vacuum cleaner has no flow devices that require calibration prior to sampling. The sampling train shall be thoroughly inspected to ensure that it has been cleaned, properly assembled, and complete.

7.3 Field Operations

Prior to collecting a sample at a specific location, complete a Vacuum Sampling Work Sheet (Figure 2, Appendix A) recording all required information and sketch the area to be sampled.

1. Select a sampling area according to the data collection design outlined in the WP, QAPP or SAP. Typically, three rooms per floor are selected for sampling in each building. Each sample is collected with a dedicated sampling train that has been properly assembled, cleaned, and decontaminated to ensure sample integrity. The size/weight of each sample is dependent on the goals and objectives of the sampling event, the analyses requested, and the desired method detection levels (MDLs). A 100-g sample is highly desirable if multiple analyses (metals, pesticides, etc.) are requested. A minimum 5- to 10-g sample is required for metal analysis only.

2. Using the 2-meter folding ruler or any other measuring device, outline and mark the recommended 1-square meter (m^2) portion of the carpet to be sampled.

3. Begin collecting sample at one corner of the delineated sample area, moving the sampler back and forth four times over a strip running in a straight line between the defined sampling area edges. The width of the strip is defined by the width of the sampling nozzle. After completing the first strip, angle over to the second strip gradually on the next pass, again completing four double passes.

4. Continue sampling the delineated area until an adequate sample is collected. Visual observation is used to determine if enough sample has been collected from the recommended 1-m^2 area or if a larger area is required. If sampling a larger area, measure the area accurately and document accordingly.

5. Wearing surgical gloves, be sure to tap with your hand on the nozzle inlet to dislodge any dust remaining in the nozzle or the hose. This procedure will ensure complete sample recovery. Turn off the vacuum cleaner and allow to sit undisturbed for at least 30 seconds. Unsnap the two vacuum container clips to access the inside of the container. Remove the polyliner and the vacuum collection bag within it. Seal off the polyliner with the vacuum collection bag

inside, and transfer to a properly labeled 32-oz glass jar or plastic bag depending on the analysis(es) to be performed. Document the sample information on the Vacuum Sampling Work Sheet and pack properly for shipment to the laboratory.

6. Remove the hose and the nozzle, and install a new polyliner and collection bag for the collection of additional samples.

7. Decontaminate the vacuum components using the steps outlined in Section 7.5

7.4 Sieving Procedures

Prior to submitting dust samples to the laboratory for analysis, the samples are sieved through a 100-mesh sieve using the following procedure:

1. Select a clean working area in a facility equipped with a fume hood (a 4-foot by 4-foot area is sufficient). Weigh the receiver pan on an analytical balance and record the weight.

2. Wearing clean surgical gloves and a dust mask, retrieve the vacuum collection bags from the 32-ounce glass jars used to transport the bags from the field to the laboratory.

3. Empty the entire contents of the bag into the 100-mesh sieve with the receiver pan attached. Remove the plastic adaptor (blue ring) from the collection bag inlet and shake the bag as necessary to ensure all the contents have been transferred into the sieve.

4. Place the cover on the sieve and manually or mechanically shake the sieve for a minimum of 5 minutes and a maximum of 10 minutes until all the fine dust particles are collected in the bottom receiver pan. If manual shaking is performed, follow the instructions given in American Society for Testing and Materials (ASTM) D-422: "Conduct the sieving operation by means of a lateral and vertical motion of the sieve, accompanied by a jarring action in order to keep the sample moving continuously over the surface of the sieve. Continue sieving until not more than 1 mass percent of the residue on a sieve passes that sieve during 1 minute of sieving".

5. If mechanical shaking is performed, set up the recommended sieve shaker on an even and table surface. Proceed with the sieving operation following directions in the manufacturer's manual.

6. Re-weigh the receiver pan using an analytical balance. The difference in weight is the weight of the sieved sample. If total weight of material is desired, the coarse material remaining on top of the sieve must be collected on a pre-weighed sheet of aluminum foil, re-weighed and the weight added to the weight of the sieved sample.

7. Transfer the sieved sample from the receiver pan to an 8-oz wide-mouth glass jar. Use a camel hair brush to ensure complete transfer of the sample. Cap the glass jar securely.

8. Document each sample. Each sample must be provided with the following information: identification number, date of sampling, location, analysis requested. Each sample must be

recorded onto a Chain of Custody form before delivery to the analytical laboratory.

9. Before processing the next sample, thoroughly wipe clean the cover, sieve and receiver pan using a Kimwipe and deionized/distilled water. Let dry prior to sieving additional samples.

7.5 Sampling Train Decontamination

To decontaminate the sampling trains, move them to a well-ventilated area and perform the following:

1. Assemble one of the sampling trains to be used as the decontamination unit for decontaminating the nozzles, hoses, and wands. This unit must be equipped with a clean polyliner and dust bag.

2. With the vacuum cleaner turned on, decontaminate the nozzles, wands, and hoses using a bottle brush to remove any accumulated dust in the hose and nozzle. Be sure to tap the nozzle with your hand to remove any visible dirt that has accumulated, and use the scrub brush to remove any hair or fibers entangled on the nozzle's brush . When the nozzle is considered to be clean, remove and spray with reagent grade methanol and allow to air dry on a clean surface. The wand and hose are then cleaned with the bottle brush. Tap your hand on the wand inlet while cleaning with the bottle brush to remove any visible dirt. Repeat this procedure to decontaminate any remaining nozzles, wands, and hoses.

3. Remove the used dust bag from the decontamination unit and wipe clean the inside of the container with deionized/distilled water. Spray the inside of the containers with methanol and allow to air dry. When decontaminating in between residential homes, cleaning the inside of the containers with deionized/distilled water is sufficient.

8.0 CALCULATIONS

The dust weight calculations for the final sieved dust fraction is performed in accordance with ASTM Method D-422. Dividing the final dust weight by the area sampled (expressed in m^2) provides dust loading in grams per squared meter (g/m^2). When the analysis results are received, the loading of analyte in micrograms per square meter of carpet area (ug/m^2) can be calculated in the same way. The analysis provides concentrations in milligrams/kilogram (mg/kg) or micrograms/kilogram (:g/kg). If total (gross) dust loading of the sampled area needs to be calculated, the total dust weight before sieving must be obtained. The total dust weight is divided by the area sampled to obtain total dust loading in g/m^2.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance activities which apply to the implementation of these procedures. However, the following general QA procedures apply:

1. All data must be documented on field data sheets or within site logbooks.

2. All instruments must be operated in accordance with operating instructions as supplied by the manufacturer, unless otherwise specified in the work plan. Equipment checkout and calibration

activities must occur prior to sampling/operation and they must be documented.

10.0 DATA VALIDATION

The information recorded during sampling will be used in conjunction with the analytical data during validation.

11.0 HEALTH AND SAFETY

When working with potential hazardous materials, follow U.S. EPA, Occupational Safety and Health (OSHA) and corporate health and safety procedures.

12.0 REFERENCES

American Society For Testing And Materials. 2000. *Standard Practice for Collection of Dust from Carpeted Floor for Chemical Analysis*, Designation D 5438-00, Reprinted from the Annual Book of ASTM Standards, Philadelphia, PA.

American Society For Testing And Materials. 1998. *Standard Test Method for Particle Size Analysis of Soils*, Designation D 422-63, Reprinted from the Annual Book of ASTM Standards, Philadelphia, PA.

Instructions for Use-Nilfisk Model GS 80, Nilfisk of America, Inc.,Malvern, PA (1987).

13.0 APPENDICES

A - Figures

APPENDIX A
Figures
SOP #2040
May 2002

FIGURE 1. GS-80 Dust Sampling Apparatus

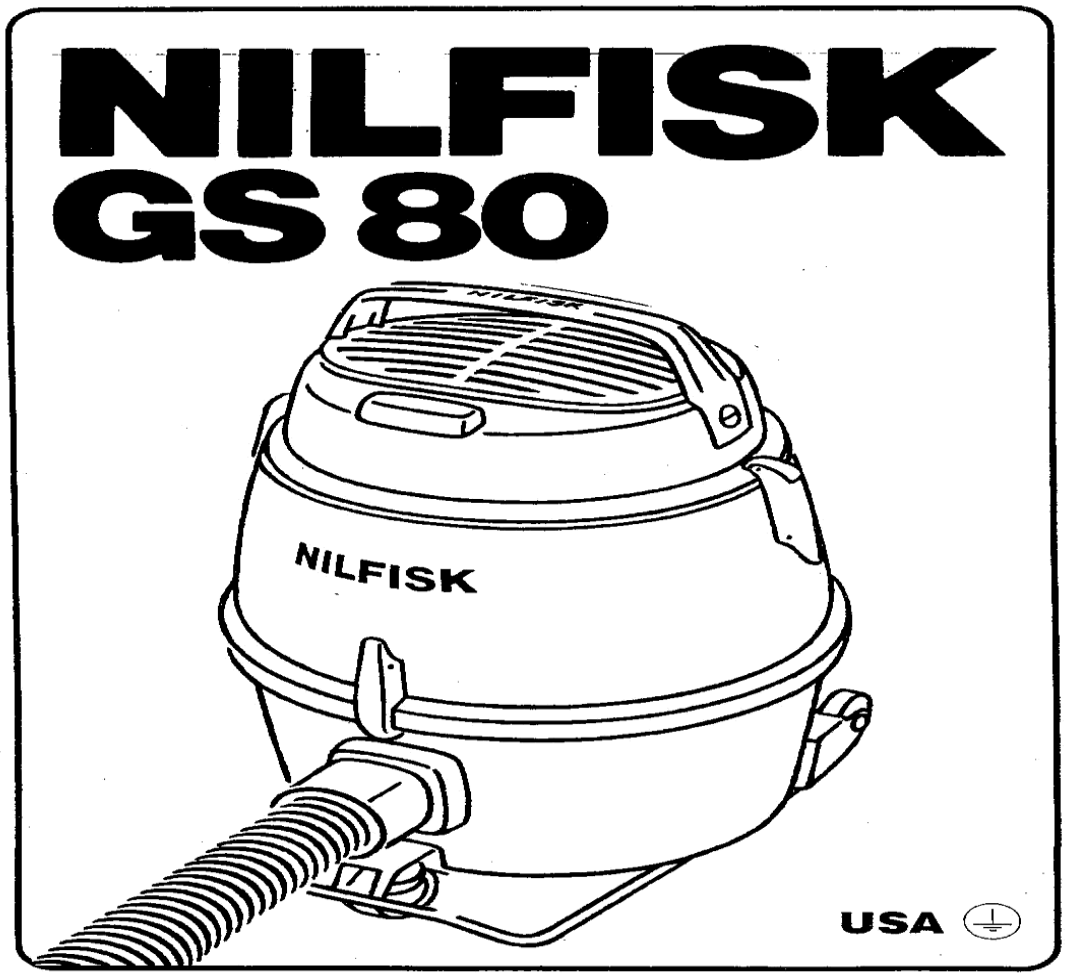

FIGURE 2. Vacuum Sampling Work Sheet

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EPA/Environmental Response Team
Scientific, Engineering, Response Analytical Services
Vacuum Sampling Work Sheet

Lockheed Martin Corp., Edison, NJ
EPA Contract No. EP-W-09-031

Site: _____ WA#: _____

Sampler: _____ U.S. EPA/ERT WAM: _____

Date: _____ SERAS Task Leader _____

Occupant's Name: _____

Address: _____

Location (s) of area sampled	Area (Units: _____)
	Total Area Sampled =

Type of surface: Carpet Style: Plush Level Loop Multilevel Shag Other
Floor Hardwood Cement Tile Vinyl Other

Sketch:

Comments: _____

_____

Date Sieved: _____ Total Dust = _____ g Sieve No.: _____ Particle size retention: _____ μm

Pan & Sample Wt: _____ g - Pan Tare Wt: _____ g = Net Wt: _____ g (Fine Dust)

Dust Loading: _____ g/m^2