National Human Exposure Assessment Survey (NHEXAS)

Arizona Study

Quality Systems and Implementation Plan for Human Exposure Assessment

The University of Arizona
Tucson, Arizona 85721

Cooperative Agreement CR 821560

Standard Operating Procedure **SOP-UA-F-21.0**

Title: Thin Film Collection of Indoor and Outdoor Dust for Metals Analysis

Source: The University of Arizona

U.S. Environmental Protection Agency
Office of Research and Development
Human Exposure & Atmospheric Sciences Division
Human Exposure Research Branch

Notice: *The U.S. Environmental Protection Agency (EPA), through its Office of Research and Development (ORD), partially funded and collaborated in the research described here. This protocol is part of the Quality Systems Implementation Plan (QSIP) that was reviewed by the EPA and approved for use in this demonstration/scoping study. Mention of trade names or commercial products does not constitute endorsement or recommendation by EPA for use.*

Thin Film Collection of Indoor and Outdoor Dust for Metals Analysis

1.0 PURPOSE AND APPLICABILITY
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This SOP establishes a uniform procedure for the collection of thin film samples for XRF analysis in yards and homes. This procedure must be followed to insure consistent and reliable collection of indoor and outdoor dust samples for XRF in the NHEXAS Arizona project of the University of Arizona/Battelle/Illinois Institute of Technology Consortium.

2.0 DEFINITIONS

2.1 BUCKET = A plastic container with a buckle top. One bucket is assigned to each household to be visited. Household identification and stage numbers are listed on the outside of the container. The bucket contains all paperwork to be completed by field staff or household respondents. It serves as the primary vehicle for securing and transporting forms, data and samples to and from the field through the course of the study.

2.2 CHAIN OF CUSTODY RECORD = A vital data tracking and quality assurance form which is attached to every field sampling data sheet. Chain of custody commences (except for blank samples) with sample collection by field team members (see Fig. 3).

2.3 FIELD KIT = A sampling tool-box containing appropriate collection and storage utensils. For thin film sampling the kit contains thin film sample blots, indelible ink pens and additional copies of both the Soil Sampling Data Sheet (Fig.1) and the Surface Wipe Sampling Sheet (Fig.2).

2.4 HOUSEHOLD(HH) = The residence occupied by study respondent(s).

2.5 HOUSEHOLD IDENTIFICATION NUMBER(HHID) = A unique number and character
combination which is assigned to each respondent household for identification purposes. This number must be recorded on all data (forms, samples, questionnaires and correspondence) generated by the household.

2.6 N/A = Not Applicable.

2.7 PACKET = A sturdy, envelope-like container that can be fully closed and is large enough to hold the physical data forms generated from sampling

and surveying a study household.

2.8 SAMPLE = The dust deposit left on the thin film sampling material after collection. One sample is taken as a composite of two indoor window sills; the second sample is collected from the curb, sidewalk driveway or other flat outdoor surface.

2.9 SAMPLE ID = A numeric code that uniquely identifies every sample. It is generated by the NHEXAS tracking system by the Materials Technician at the HRP Office, when the sample material is logged into the tracking system.

2.10 SOIL SAMPLING DATA SHEET = A tracking sheet to record specific information regarding the film application, yard soil collection, transport, storage and custody (see Fig.1).

2.11 SURFACE WIPE SAMPLING SHEET = A tracking sheet to record specific information regarding thin film application, surface wipe collection, storage, transport and custody (see Fig.2).

2.12 TEAM LEADER = The member of the field team who is primarily responsible for respondent contact, data collection, field form and questionnaire completion, and site QC checks of all data.

2.13 THIN FILM KIT = a sequentially numbered Ziploc bag containing a 10 cm square of lamination material retaining its backing and a 10 cm square piece of mylar film.

2.14 VISIT = A scheduled appointment with participating respondents at their place of residence (HH) for the collection of samples, questionnaires and other data.

3.0 REFERENCES

3.1 Lebowitz, M.D. 1993. Study Design (Revision of 31 Dec. 1993). EPA NHEXAS Cooperative Agreement

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4.0 DISCUSSION

4.1 This SOP outlines the thin film procedure for collecting surface dust samples at participating households according to the strategies outlined in the NHEXAS study. Outdoor thin film surface samples will be obtained from the curb closest to the road, the driveway, or the mailbox. Indoor thin film surface samples will be collected as a composite of two window sills already sampled for metals and pesticides. The collection will be recorded on the same soil (Fig.1) or surface wipe sampling data sheet (Fig.2) although the samples will be stored in separate containers. Thin film samplers will retain their own Chain of Custody Record.

4.2 These surface samples will be processed using XRF analysis to determine metal content (SOP # UA-L-10.0). Proper sample collection, custody and handling procedures must be of primary concern to all field staff.

5.0 RESPONSIBILITIES

5.1 The Field Coordinator is responsible for:

(a) 100% QA check of field forms;
(b) Accepting custody of the thin film samples from the Team Leader;
(c) Transferring the sample to the Lab Coordinator;
(d) Performing 10% QA in-field audit of collection, transportation and storage methods.

5.2 The Team Leader is responsible for:

(a) arranging sampling dates and times with the HH;
(b) selecting the sample sites at each HH;
(c) custody of the thin film samples and supplementary data collected;
(d) completing the Chain of Custody Record (Fig. 3);
(e) quality control checks in the field.
(f) transferring the sample to the Field Coordinator.

5.3 All Team Members are responsible for:

(a) obtaining the Thin Film samples according to protocol;
(b) properly storing and labeling the collected sample;
(c) completing the Thin Film portions on the Soil Sampling Data Sheet (Fig. 1) and the Surface Wipe Sampling Sheet (Fig.2).
(d) quality control checks in the field.

5.4 The Laboratory Supervisor is responsible for:

(a) preparing the laminate film squares, and the mylar film squares and placing 1 each in ziploc freezer bag and giving them to the materials technician, and

(b) selecting 1 bag from each prepared batch as a lab blank.

5.5 The Materials Technician is responsible for:

(a) assigning thin film kits to each house for sampling,
(b) recording the assigned kits in the materials tracking system, and
(c) selecting 1 kit from each batch as a field blank.

6.0 MATERIALS AND REAGENTS

6.1 Materials

Sample storage containers (ziploc freezer bags), indelible ink pen, C-line 100 lamination film or the equivalent, Soil Sampling Data Sheet, Chain of Custody Record, and Surface Wipe Sampling Data Sheet.

7.0 PROCEDURE

7.1 Preparation

(a) C-line 100 lamination film can be commonly purchased in rolls at most office supply stores.

(b) Cut the lamination film into small squares 10 cm on a side. Leave the "backing" on the lamination film.

(c) Place 1 square of the Thin Film sampling material in sequentially numbered, individual Freezer Ziploc bags.

(d) Create batches of these bags (n= 20 bags per batch with each bag assigned a unique sample ID number.

7.1.1 Field Site Selection Criteria

(a) Outdoor Surface. Select a concrete curb or other surface as close as possible to the road but still on the property of the respondent. If

no curb is available, sample the smooth surface of a driveway or sidewalk. A mailbox or other roadside surface would also suffice, but is less desirable than the above sites.

(b) Window sills. Thin Film samples are collected as a composite of two window sills within the Household. The sample is collected on those unsampled portions of sills from which metals and pesticide wipes have been collected in the main room and bedroom of the Primary Respondent.

7.1.2 Reagents: None.

7.1.3 Standards & Blanks

(a) One thin film kit is randomly chosen and marked by the Laboratory Supervisor as a laboratory blank. This bag is set aside in the lab and the laminate and mylar are analyzed with the rest of the batch when it returns from the field.

(b) The Materials Technician selects 1 thin film kit from each batch field blank. This kit is randomly assigned to a HH. In the field the technician:

1. opens the kit,
2. takes the laminate film square and places it to one side as the actual sample is being collected,
3. uses caution not to remove/disturb the blank or backing,
4. labels the laminate "sandwich" with indelible ink along one edge (HHID, Date, Site),
5. places the laminate "sandwich" back in the labeled bag after the real sample has been collected,
6. completes a sample custody form and places it with the field blank,
7. transports the sample back to the office/lab in the HH bucked.

7.2 Sample Collection

7.2.1 Blanks deployed

Field blanks are subjected to the same storage and shipment conditions as the other soil sample containers but returned unexposed. They are analyzed with the other soil samples.

7.2.2 Sample Collection

(a) Outdoor Samples:
(Gloves are optional when collecting thin film samples.)

(1) open the kit,
(2) take the laminate film square and peal-off the backing,

(3) place the adhesive side of the laminate on the selected surface and add pressure; thus collecting the outdoor sample,
(4) remove particulate greater than 2 mm elevation above the laminate film surface,
(5) place the backing over the sample and adhesive surface of the laminate forming a "sandwich", and staple the two together,
(6) label the laminate "sandwich" with indelible ink along the non-adhesive side with HHID, Date, Site and Sample ID,
(7) place the labeled laminate "sandwich" back in the labeled Freezer Ziploc bag,
(8) complete the appropriate sections of the Soil Sampling Data Sheet (Fig.1).
(9) notify the Team Leader that Thin Film sampling is complete,
(10) complete appropriate sections of the Chain of Custody record (Fig.3).
(11) transport the sample back to the office/lab in the HH Bucket.

(b) Indoor Thin Film samples are collected from window sills . (Gloves are optional for thin film, but must be worn for surface wipe sampling. UA-F-8.0).

(1) open the kit,
(2) take the laminate film square and peal-off of the backing,

(3) place half of the adhesive side of the laminate on the first window sill and blot (add pressure); thus collecting the first half of the composite sample,

(4) turn the laminate to the unexposed side and place on the second window sill; pressure is again added thus collecting the second half of the sample. Make sure that the samples taken on both sides of the laminate are overlaped.

(note: in the lab both sides will be measured and the results averaged; identifying window swaths on the laminate is not necessary).

(5) remove particulate greater than 2 mm elevation above the laminate film surface,

(6) place the backing over the sample and adhesive surface of the laminate forming a "sandwich", and staple the two together,

(7) label the laminate "sandwich" with indelible ink along the non-adhesive side (HHID, Date, Site, and sample ID),

(8) place the labeled laminate "sandwich" back in the labeled Freezer Ziploc bag,

(9) complete the appropriate sections of the Surface Wipe Sampling Data Sheet (Fig.2).

(10) notify the Team Leader that Thin Film sampling is complete,

(11) complete appropriate sections of the Chain of Custody record (Fig.3).

(13) transport the sample back to the office/lab in the HH bucket.

7.2.4 When the Field Team returns from the field:

(a) The collector relinquishes the samples to the Team Leader;

(b) the Team Leader transfers custody to the Field Coordinator and the exchange is documented;

(c) Field Coordinator transfers custody to Lab Coordinator.

7.3 Calculations - N/A

7.4 Quality Control

Ten percent of all samples will be used for QA/QC purposes.

7.4.1 General

(a) In the HH sampling site the Team Leader supervises all work and completion of forms. Team Members work collectively and check each other's work for accuracy, precision and compliance with SOP procedure and policy.

(b) The comments section on the data sheet must be completed as

necessary, e.g.. "soil under gravel", "cement over the sampling area", "sample collected after rain", "strong wind", "grass included", etc.

(c) The Field Coordinator supervises 1 out of 10 sampling procedures to assure the proper collection.

7.4.2 Tolerance Limits

In cases with unusual circumstances notify the Team Leader of the situation and document on the Soil Sampling Data Sheet (Fig.1) or the Surface Wipe Sampling Sheet (Fig.2) as appropriate.

Site location is an approximation.

7.4.3 Detection Limits

Collect a sample wherever possible. If the outdoor sample site has no suitable surface, such as a tile, concrete or brick covering, collect the sample elsewhere and document the nature of the surface as appropriate.

7.4.4 Corrective Actions

Apparent mis-labeling problems detected in the field may be corrected by the Team Members when appropriate and in accordance with SOP #UA-C-2.0.

If sample integrity is compromised recollect the sample when possible.

8.0 RECORDS

8.1 Soil Sampling Data Sheet

8.1.1 This data sheet (Fig.1) will serve as the primary record of outdoor Thin Film sample collection. The sample collector is responsible for the thorough completion of this form. Enter data in the appropriate fields on the form.

8.1.2 The completed original Soil Sampling Data Sheet will be securely archived with the HH packet upon completion of post field QA checks.

8.2 Surface Wipe Sampling Sheet

8.2.1 This data sheet (Fig.2) will serve as the primary record of indoor Thin Film sample collection. The sample collector is responsible for the thorough completion of this form. Enter data in the appropriate fields on the form.

8.2.2 The completed original Surface Wipe Sampling Sheet will be securely archived with the HH packet upon completion of post field QA checks.

8.3 Chain of Custody Record

8.3.1 This Record (Fig.3) will serve as the primary record of sample custody after collection in the field. The Team Leader and the collector are responsible for the thorough completion of this form. Enter data in the appropriate fields on the form.

8.3.2 The completed original Chain of Custody Record will remain with the data sample at all times.

8.4 Sample

8.4.1 The Thin Film backing will also have HHID, Date, sample type, sample ID and collector's initials recorded on it with indelible ink.

Figure 1. Soil Sampling Data Sheet (see UA-F-5.0 and UA-F-6.0).

Figure 2. Surface Wipe Sampling Data Sheet (see UA-F-8.0).

Figure 3. Chain of Custody record.

Figure 4. Relative Timing of Thin Film Sample Collection (Page 1 of 2).

Figure 4. Relative Timing of Thin Film Sample Collection (Page 2 of 2).

Figure 5. Summary and Troubleshooting Guide for Thin Film Collection.

There are no field notes or Troubleshooting guides are currently on record for UA-F-21.0. Additions will be appended and the SOP

reviewed and updated in accordance with UA-G-1.0 as appropriate.