The Arizona Border Study

An Extension of the
Arizona National Human Exposure Assessment Survey (NHEXAS)Study
Sponsored by the Environmental Health Workgroup of the Border XXI Program

Quality Systems and Implementation Plan for Human Exposure Assessment

The University of Arizona
Tucson, Arizona 85721

Cooperative Agreement CR 824719

Standard Operating Procedure **SOP-UA-F-7.1**

Title: Field Collection and Post-Field Handling of Indoor Floor Dust Samples

Source: The University of Arizona

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

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Title: **FIELD COLLECTION OF INDOOR FLOOR DUST SAMPLES** ↑and Post-Field Handling of) ESG 7.14.97

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Form TP-1

Field Collection and Post-Field Sample Handling of Indoor Floor Dust Samples

1.0 PURPOSE AND APPLICABILITY

This SOP is to establish a uniform procedure for the collection of indoor floor dust samples in the field. This procedure must be followed to insure consistent data retrieval of dust samples for the NHEXAS Arizona project, AZ Border project (BORDER AZ), and other Health and Environment projects.

2.0 DEFINITIONS

2.1 AZ Border = The US border region is defined as 100 km north of the border. In this study, we define the border as 40 km north of the border. The Arizona Border Study or "Border AZ" is an alias for "Total Human Exposure in Arizona: A Comparison of the Border Communities and the State" conducted in Arizona by the University of Arizona / Battelle / Illinois Institute of Technology Consortium.

2.2 BUCKET = A plastic container with a buckle top or tight-fitting lid. One bucket is assigned to each household to be sampled. Household identification and stage numbers are listed on the outside of the container. The bucket contains all paperwork and questionnaires 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.

2.3 CHAIN OF CUSTODY RECORD (Fig.2) = A vital data tracking and quality assurance form which is attached to the dust filter storage container. This Custody Sheet is sent into the field with pre-weight information recorded on it. Post sample weights are recorded on the sheet before it is shipped to Battelle for analysis.

2.4 FLOOR DUST SAMPLING DATA SHEET = A field form to record specific information regarding sample collection, custody, and quality control (QC) (Fig.1).

2.5 DATA COORDINATOR= The employee of the research project who supervises data batching, entry and verification.

2.6 FIELD COORDINATOR= The employee of the research project who supervises field data collection and operations. The Field Coordinator collates individual data into HH packets, and upon completion of all visits, sampling and QA checks, forwards the packet to the Data Coordinator.

2.7 FIELD KIT = A sampling tool-box containing appropriate collection and storage utensils. For floor/carpet dust sampling, the kit contains filter packets, indelible labeling

pens, tape measure, kim wipes, a 4 m long chain, and additional copies of the Floor Dust Sampling Data Sheet (Fig.1).

2.8 FIELD STAFF = There are the Field Coordinator, the Team Leader and the Team Members.

2.9 FILTER = This is a 6 inch by 6 inch Teflon coated fiberglass backed filter. The filter has been tested for potential metals contamination from the fiberglass backing at the Field Office. Results indicate that since the Teflon face and the sample may be easily stripped from the backing, the risk of contamination is negligible.

2.10 FILTER HOLDER = This is a stainless steel or mesh apparatus that fits between the head and tail of the vacuum inlet. Once the filter is inserted it will trap the household dust, dirt and debris which would otherwise be deposited in the vacuum cleaner bag.

2.11 FILTER INSERTION RING (FIR) = The plastic ring that enables us to properly insert the filter into the filter holder.

2.12 FILTER PACKET= A polyethylene Ziploc brand freezer bag which houses the 6" X 6" filter, the field form with pre- sample weights, the Chain of Custody Record for the original filter, a Chain of Custody Record for the in- field aliquot, and an extra Ziploc bag (for the aliquot). The Custody Records and field form contain unique sample-ID numbers generated by the Materials Tech upon receipt of the filter from the manufacturer.

2.13 HRP OFFICE = The **H**ealth **R**elated **P**rofessions building, currently located at 1435 N. Fremont Avenue; Tucson, AZ 85719. This is an annex of the Arizona Prevention Center and the primary site of the operations for NHEXAS Arizona, the AZ Border project, and other Health and Environment projects.

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

2.15 **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) relating to the household.

2.16 LAB SUPERVISOR = The employee of the research project who supervises laboratory handling at the University of Arizona. The supervisor or delegate receives the filter and custody record from the Materials Tech in the Filter Packet. The filter is pre-weighed, the data recorded on the Field Sheet, and the entire packet returned to the Materials Tech for HH assignment.

2.17 MAIN ROOM = This is the most frequently occupied room in the Household. Most often

this will be the living room or the family room. Bedrooms are not eligible for main room status.

2.18 N/A = Not Applicable.

2.19 NHEXAS Arizona = Acronym for National Exposure Assessment Survey, a research project conducted in Arizona by the University of Arizona / Battelle / Illinois Institute of Technology Consortium.

2.20 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.

2.21 PAH = Polycyclic Aromatic Hydrocarbons

2.22 QUALITY ASSURANCE (QA) = All those planned and systematic actions necessary for ensuring the accuracy, validity, integrity, preservation and utility of collected data.

2.23 QUALITY CONTROL (QC) = Those quality assurance actions providing a means to control and measure the characteristics of a datum, processor the adherence to established parameters.

2.24 RESPONDENT = A person in the study population of NHEXAS Arizona, AZ Border project, and other Health and Environment projects. Each household is assigned an HHID. All the family respondents are assigned an Individual Respondent Number (IRN). Each respondent can be uniquely identified by a combination of HHID and IRN.

2.25 SAMPLE = The dust deposit left on the filter after vacuuming in participating HHs. The Sample may also be referred to as the 'Dust Sample'.

2.26 SAMPLE IDENTIFICATION NUMBER = A numeric code that uniquely identifies every sample. This number is assigned to the blank filter as it is received from the manufacturer and logged into the Tracking Database (UA-G-5.X).

2.27 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.

2.28 TEAM MEMBER= Member of a field team responsible for assisting the Team Leader in the collection of data and quality control checks in the field.

2.29 VACUUM = A 2.2 horse power port-a-power vacuum cleaner with expandable hose and 6" wand attachment.

2.30 VACUUM INLET (Fig.3) = The stainless steel and plexiglass device which contacts the sampling surface and traps the dust on the filter. It consists of two parts: the Head and the Tail. The vacuum inlet is frequently referred to as the dust trap (Fig. 3).

2.31 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.

4.0 DISCUSSION

4.1 This SOP outlines the correct procedure for collecting floor dust samples at participating households according to the strategies outlined in the NHEXAS project, AZ border project and other Health and Environment projects. Floor dust samples will be composited from the floor in the most frequently occupied room in the home and from the bedroom of the primary respondent. A minimum of 2 grams of fine dust fraction (excluding hair/fuzz/debris etc.) per HH is required for analysis. More rooms may be sampled if minimal yield is not achieved in the two mandatory sampling sites.

4.2 This composite sample (at least 2 rooms on one filter) will be split and aliquoted in the University of Arizona lab. One aliquot will be analyzed for metals, a second aliquot will be analyzed for pesticide and a third will be analyzed for PAH content after it is shipped to Batelle labs. The entire sample will be returned to the field office on blue-ice.

4.3 Proper sample collection, custody and handling must be of primary concern to all Field Staff.

5.0 RESPONSIBILITIES

5.1 The Field Coordinator is responsible for:

(a) knowing the procedures described in this SOP and ensuring that they are followed by the Field Staff;
(b) supervising floor dust collection as a QC audit in one out of every ten Households;
(c) accepting custody of the filter packets and annotating the receipt in the Chain of Custody Record that accompanies the Carpet/ Floor Dust Sampling Data Sheet;
(d) properly storing the filter packets in the freezer at -20°C
(e) QA check of the Chain of Custody Records (Fig. 2) and the Floor Dust Sampling

Data Sheet (Fig. 1).

5.2 The Team Leader is responsible for:

(a) knowing the procedures described in this SOP and ensuring they are followed by the Team Members;
(b) arranging sampling dates and times with the HH;
(c) collaborating with the Team Member(s) to select the appropriate sampling site at each HH;
(d) ensuring the integrity and preservation of the dust sample and field forms collected;
(e) completing the Chain of Custody Record (Fig. 2);
(f) quality control checks in the field;
(g) properly storing the Filter Packets in the freezer at -20 C after return from the field;
(h) forwarding QC checked field forms to the Field Coordinator for QA check within 24 hours of sample collection;

5.3 All Team Member(s) are responsible for:

(a) knowing and following the procedures described in this SOP;
(b) obtaining the dust sample according to the directions in this SOP;
(c) collaborating with the Team Leader to select the appropriate sampling site at each HH;
(d) properly storing and labeling the collected sample during transportation from the household to the HRP Office;
(e) completing the Floor Dust Sampling Data Sheet (Fig. 1);
(f) quality control (QC) checks in the field.

5.4 The Lab Supervisor is responsible for:

(a) pre-weighing the filter and recording the weight on the field sheet.
(b) post-weighing and handling the filter and aliquots once they are returned from the field.

6.0 MATERIALS AND REAGENTS

6.1 Materials

(a) 2.2 Horse Power, Hoover port-a-power vacuum cleaner (or equivalent) with a 6" wand attachment;
(b) a vacuum inlet consisting of two pieces: the Head and the Tail (Fig.3);
(c) the Field Kit which contains:

1. Filter Holder (stainless steel screen);
2. Filter Insertion Ring (plastic);
3. Filter Packets with a pre-weighed filter, field sheet, custody records and extra Ziploc bag;
4. a 4m long chain;
5. indelible labeling pen;
6. Kim wipes;
7. additional copies of the Floor Dust Sampling Data Sheet (Fig.1) and the Chain of Custody Record (Fig.2);

(d) -20°C Freezer at the HRP Office;
(e) portable cooler;
(f) Ice-Packs/ Blue Ice;
(g) one Nalgene squeeze bottle.
(h) brushes, to clean the vacuum inlets and funnel.
(i) one electronic timer/or wristwatch with a second hand;
(j) wide mouth polyethylene bottle
(k) Non-sterile, non-powdered latex gloves

6.2 Reagents

6.2.1 Deionized water.

7.0 PROCEDURE

7.1 Preparation

7.1.1 Field Site Selection Criteria

(a) Team Leader collaborates with the Team Members to select the most appropriate selection sites. Selection criteria include type of floor covering, expected dust yield per unit area and room usage by respondents. The main room and the bedroom of the primary respondent must always be sampled. More rooms may be sampled, but this depends on expected yield.
(b) Carpeted areas will likely yield more dust than tile, brick or wood surfaces.
(c) If there is a fire place or any other type of heating device note the presence on the Field Sheet.
(d) Areas between a couch and a T.V. are very good sampling sites.
(e) A total of **$3m^2$** will be vacuumed per room from which **$1m^2$** will be collected at the corners of each room. From this $1m^2$, one quarter($0.25\ m^2$) of it should be sampled at each of the four corners of the room sampled.
(f) If, after sampling $3m^2$ in the Main Room and $3m^2$ in the bedroom of the Primary Respondent, the Team Member suspects that 2 grams of fine fraction dust have not been collected, the Field Team must sample additional rooms. Prefield trials

suggest that it is unlikely that this will occur.

(g) Sample collection should be proportional to the type of surface area of the room sampled. For example, if the room sampled is 60% carpeted and 40% tiled, sample collection should demonstrate 60% collected from carpet and 40% collection from tile. The type of floor sampled will be marked on the field data sheet.

7.1.2 Standards & Blanks

(a) Field Blank:

In one out of every twenty HH sampled, a Filter Packet will be taken to the HH's sampling site, along with the Chain of Custody Record. It will remain sealed in the Ziploc freezer bag, and experience the same transportation conditions as other valid samples both pre- and post-sample collection.

(b) Lab Blank:

One out of every twenty Filter Packets prepared by the Lab Supervisor, will be assigned a Chain of Custody Record, and stored in the freezer at -20°C.

(c) Field Blanks and Lab Blanks will be analyzed with other valid filters.

7.1.3 Samplers

(a) equipment needed:

1. Make sure that the Field Kit and HH Bucket are stocked with appropriate materials, specifically: a 4m long chain, filter packets, filter holders, kim wipes, plastic ties, indelible labeling pen, a vacuum inlet and additional copies of the Floor Dust Sampling Data Sheet (Fig.1). The particular Floor Dust Sampling Data Sheet for each HH to be sampled should be in the HH bucket.
2. Verify that the vacuum cleaner bag is empty before operation. If not, empty, clean or replace the bag.

(b) cleaning of vacuum inlet:

1. Make sure that the vacuum inlet (Fig.3) is cleaned before every visit. If the Field Staff goes from one HH to another HH without returning to the HRP Office first, the vacuum inlet and the filter holder must be cleaned in the field.

2. Clean the nozzle end of the vacuum inlet and the stainless steel tray thoroughly using distilled water and the teflon coated wire brush in the floor dust field kit. Force the wire brush into the narrow portion of the inlet and be sure to rinse thoroughly with distilled water. Use kim wipes to dry the outer and accessible inner surfaces of the sampling apparatus and allow the vacuum inlet to air dry.

(c) preparation of Filter Packets:

1. Filter Packets are prepared under controlled conditions at the HRP office prior to the HH visit. Floor dust filters are pre-weighed by the UA Lab Supervisor. This information is recorded on the Chain of Custody Record (Fig. 2) by the Lab Supervisor. The Chain of Custody Record for the entire filter (with the pre-assigned sample id number) and the Field Sheet accompany the filter packet into the field.

(d) assembly of the Vacuum Inlet:

Assembly is performed in the HH, after Team Leader obtains Consent for sampling and selects the sampling sites.

1. Don a pair of non-sterile, non-powdered latex gloves.

2. Place the filter over the Filter Insertion Ring (FIR) and cup the filter so it conforms to the ring and appears as a bowl shape.
NOTE: When looking into the Filter Holder, the non-textured teflon surface should face up. Beware of rips and tears in the filter especially on the teflon material.

3. Carefully slide the FIR inside the Filter Holder.
NOTE: The FIR should not be pushed tightly into the Filter Holder Ring. Doing so may shear the filter as the Insertion Ring crimps the filter against the stainless steel filter holder.

4. Insert the Filter Holder into the Vacuum Inlet's Tail.

5. Place the Vacuum Inlet's Head on top of the Vacuum Inlet's Tail, align the two fastening clips and lock them securely.

6. Attach the Vacuum Inlet to the Vacuum's hose 6" wand.

7.2 Sample Collection

The data/sample flow diagram representing the handling of dust samples from floors is shown in Fig. 5. The relative timing of floor dust sampling to other sampling types by stage is shown in Fig. 6.

7.2.1 The Team Leader Coordinates with, and obtains consent from the respondents in each HH. The Team Leader along with the Team Member(s) will then select the appropriate sampling sites for the carpet/floor dust sampling. Certain Field Site Selection Criteria must be followed depending on expected yield per unit area and frequency of room usage by respondents.

7.2.2 Dust samples will be collected by vacuuming **$3m^2$** in the main room and compositing another **$3m^2$** in the primary respondent's bedroom. Additional rooms may be sampled if the $6m^2$ fails to meet minimum yield requirements.

7.2.3 Sampling sites, floor type, measurements and any sampling adjustments will be recorded on the Floor Dust Sampling Data Sheet (Fig. 1). All field observation/ notes are recorded on this form.

7.2.4

A. IN FIELD

(a) Consult with Team Leader for the exact sampling site(s).
(b) Plug in the vacuum cleaner. Check for proper operation. Verify that the vacuum cleaner bag is empty
(c) Assemble the vacuum inlet as in UA-F-7.1.3.d. and attach to the vacuum hose and 6" wand. Record the Temp and RH before sampling.
(d) Verify a snug fit with no leaks between the wand and vacuum inlet, or along the vacuum cleaner hose.
(e) Verify that the toggle/slide flow controller on the 6" wand is fully closed.
(f) Place the 4m long ($1m^2$) chain on the floor surface and **FORM A SQUARE** with approximately 1m long sides. Keep the perimeter and the chain taut.
(g) If there is insufficient room on the floor to form a $1m^2$ square, fold the chain to serve as the perimeter of a .25 m^2 square (see n. below) and sample multiple locations in the available space in the room, or, lay out the chain in the shape of a rectangle. Note: this rectangle will not provide an area of $1m^2$, thus the sides of the rectangle must be recorded to compute the true area of the rectangle. Record the dimensions (length x width) of the sampled area under "comments" on the field sheet.
(h) Set the electronic timer to sound an alarm after two minutes, or keep time with a stopwatch, or wristwatch.
(i) Start the time and the vacuum simultaneously.
(j) Vacuum the area within the chain thoroughly. Sweep with vacuum must be slow

and deliberate but plan to cover the entire $1m^2$ in two minutes. Thorough coverage is essential.

(k) Sweep across the $1m^2$ surface with firm even pressure once in the first minute. Then change your position and sweep across the same $1m^2$ (bounded by the chain) at an angle (Preferably, but not necessarily 90^o) to the orientation of your previous sweep direction. **Sampling at orthogonal/ perpendicular directions is preferable, however when not possible due to furniture of site constraints, diagonal sampling is acceptable**

(l) Stop sampling the floor surface once the timer alarms, but, do not turn-off the vacuum cleaner or turn the dust trap with opening downward when shifting to a new $1m^2$ location.

(m) Repeat steps d through l once more, at a different sampling site within the same room. This will yield total of $2m^2$ sampled of the total $3m^2$ required for that room.

(n) The remaining $1m^2$ is obtained by reducing the area captured by the chain to 1/4 m^2 and sampling that $1/4m^2$ outline in each of the four corners of the room.

(o) To get $1/4m^2$ to vacuum four corners (Fig.4):

1. extend the chain, with its ends connected, to its full length;
2. twist ends A and B, in opposite directions to form another point 'O';
3 pull the ends A and B together while holding point O to create a new "chain", which, when extended, has a total area of $1/4m^2$;

(p) Place the new "chain" at a corner and form a square of approximately **25cm** per side.

(q) Set the timer for 30 seconds. Begin sampling the corner area as you start the timer, or keep time with a wristwatch.

(r) Vacuum as close as possible to the baseboard, but do not move or sample under furniture. Do not allow respondents to rearrange furniture for easier access. Vacuum for 15 seconds in each of two orthogonal/perpendicular directions. **Sampling at orthogonal/perpendicular directions is preferable, however when not possible due to furniture of site constraints, diagonal sampling is acceptable.**

(s) After 30 seconds (by timer) move to the next corner and repeat steps p - r. After the fourth corner turn-off the vacuum cleaner but hold the vacuum inlet upright so dust does not fall from the filter and out through the inlet.

(t) Turn the vacuum cleaner off, then move to the next room and repeat steps e through s (above).

(u) When you have vacuumed the minimum $6m^2$ turn-off the vacuum cleaner and move to an area where the air current is minimal. Remove the head of the vacuum inlet and estimate the weight of the sample (fine fraction only). Average yields in pre-field trials after sampling $8m^2$ were 6 to 10 grams of fine fraction and since 2 grams of fine fraction are needed for the analysis, a $6m^2$ sample of a carpeted surface should normally be sufficient.

(v) If yield (fine) is expected to be less than 2 grams, replace the vacuum inlet head and sample additional rooms.

(w) If yield (fine) is sufficient, remove filter carefully and roll the edges closed over the debris/sample. Gather the ends of the filter and tie with a plastic tie holder. Once rolled the filter/sample will resemble a parachute.

(x) Place the sample in the sample container and seal it. Complete the Field Sheet and Chain of Custody documentation after placing the sampler in the cooler.

(y) Clean the sample head with DIDW using the Nalgene container, brush, and squirt bottle. Dry with kim wipes.

(z) Transport the sample to the UA lab at 4°C in the cooler. Place the sample in the -20°C Freezer upon return from the field. The Chain of Custody Record remains with the sample at all times.

B. POST FIELD: WEIGHING (SEE UA-L-9.X)

(a) Lab Supervisor or Delegate retrieves sample, Chain of Custody and Field Sheet from -20°C Freezer.

(b) Lab Supervisor or Delegate logs receipt of sample from field area into NHEXAS tracking system.

(c) In the lab, lay out the blocks of Blue Ice; place a tray on the blocks; place a clean layer of kim wipes on the tray.

(d) Take one sheet of VWR weighing paper (6 x 6 in) and crease/pinch gently one edge, about a cm, to form a valley for subsequent pouring.

(e) Open the dust filter and place next to, and slightly overlapping the weighing paper.

(f) Using clean Teflon-coated forceps, remove the fuzz/hair/fur mat from the dust sample, and discard; also discard any big rocks/stones.

(g) Use clean Teflon-coated spatula and draw line down the center of the dust (do not cut the filter).

(h) Using the flat side of the spatula, scrape/push one-half of the dust off onto the weighing paper.

(i) Lift up the weighing paper and pour the dust into a 125 mL wide-mouth polyethylene (PE) bottle (we may need to add a polypropylene powder funnel here to facilitate that pouring without spills); tap the paper and funnel to transfer as much dust as possible into the bottle; this will be the pesticide and PAH dust sample; label as such.

(j) Store pesticide and PAH dust at - 20°C at UA; ship to Batt on Blue Ice.

C. PESTICIDES/PAH-BATT LAB:(SEE BCO-L-1.X)

(a) Transfer entire contents of PE bottle into PE weighing pan; discard any additional pebbles/stones and record total pesticide and PAH dust weight in g (this is expected to have both true dust and fine gravel/stones, around 0.5 mm in diameter).

(b) Weigh out around 1 g (weight to nearest 0.1 g) into extraction tube for pesticides analysis. ; Weigh out a second gram (weight to nearest 0.1 g) into extraction tube

for PAH analysis. If the total sample weight is less than 2 grams, take 50% for pesticides and 50% for PAHs.

(c) Return remainder of dust sample to PE bottle and restore in freezer.

(d) Extract and analyze sample; record concentration as µg/g of total pesticide (TPD) and PAH (TPAHD) dust weight.

D. METALS-UA LAB: (SEE UA-L-12.X)

(a) Shake/scrape dust free of the filter onto clean weighing paper or weighing dish; discard filter; discard any additional pebbles/stones.

(b) Weigh the resulting dust sample, and record the total metals dust weight (TMD) in grams.

(c) Sieve the dust to selected size (150 um; 100 mesh sieve).

(d) Weigh the fine fraction (FMD) in gr and record the weight.

(e) Calculate the relative amount of FMD ad FMD/TMD (e.g. 0.85).

(f) Transfer the FMD to XRF cup (if excess remains, put the excess into a 125mL PE bottle); XRF the sample and record concentration as ug/cm¨; after XRF, add that analyzed portion to the PE bottle as well and ship to Batt.

E. METALS-BATT LAB: (SEE BCO-L-3.X)

(a) At Batt, weigh out necessary amount for analysis.

(b) Digest, analyze.

(c) Calculate the metal concentrations as ug/g of FMD.

F. CALCULATIONS FOR EXPOSURE:

(a) For pesticides: µg/g of FD
(µg/g of TPD) / (FMD/TMD)

(b) For pesticides: $\mu g/m^2$
((µg/g of FD) x {g of FMD + [g of TPD x (FMD/TMD)]}) divided by area vacuumed
= [µg/g of FD x (g of FMD + g of FPD)] / area vacuumed
= (µg/g x total g of FD) / area vacuumed

(c) For PAHs: µg/g of FD
(µg/g of TPAHD) / (FMD/TMD)

(d) For PAHs: $\mu g/m^2$
((µg/g of FD) x {g of FMD + [g of TPAHD x (FMD/TMD)]}) divided by area vacuumed
= [µg/g of FD x (g of FMD + g of FPD)] / area vacuumed
= (µg/g x total g of FD) / area vacuumed

(e) For metals at Batt: µg/g of FD

as measured/calculated in (s); same as µg/g of FMD.

(f) For metals at Batt: $\mu g/m^2$
((µg/g of FD) x {g of FMD + [g of TPD x (FMD/TMD)]}) divided by area vacuumed

(g) For metals at UA: µg/g of FD
$\mu g/cm^2$ x (area of cup, cm^2/g of FMD)

(h) For metals at UA: $\mu g/m^2$
((µg/g of FD) x {g of FMD + [g of TPD x (FMD/TMD)]}) divided by area vacuumed.

7.3 Analysis

7.3.1 Standards/Blanks - N/A

7.3.2 Samples - At least two grams of sample must be collected for valid chemical analysis. Multiple rooms (in addition to the two standard locations) may need to be sampled to achieve this minimum yield.

7.4 Calculations

The total area vacuumed to obtain this composite sample must be recorded. Sum the total number of complete $1m^2$ and $1/4m^2$ sub-areas to calculate this total area.

7.5 Quality Control (QC)

7.5.1 In the HH sampling site the Team Leader supervises all work and forms completed. Team members work collectively and check each other's work for accuracy, precision and compliance with SOP procedure and policy. The Field Coordinator QA checks 10% of all samples collected, through field audits.

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

7.5.3 Tolerance Limits

Area sampled will be recorded in meters squared plus or minus one quarter meter squared. Each square meter will be sampled for two minutes plus or minus 5 seconds. Every effort must be made to cut the filter/sample into equal halves, but since the sample concentration will be a function of the total combined weight, eye estimation is acceptable. Any total weight of fine fraction greater than 2 grams is acceptable.

7.5.4 Detection Limits

Area sampled is measurable to the nearest 1/4m^2. Timers have a resolution of 1 second. Eye estimation of total yield (>2 grams) and 1/2 the sample for aliquoting is acceptable and detection limits are undefined. Filters are deliberately not weighed in the field to avoid pesticide loss through volatility and to minimize subject burden.

7.5.5 Corrective Actions

Apparent mis-labeling problems detected in the field may be corrected by the Team Members when appropriate in accordance with SOP #UA-C-2.X. Additional rooms may be sampled to increase minimum yield.

8.0 RECORDS

8.1 Floor Dust Sampling Data Sheet

8.1.1 This data sheet (Fig.1) will serve as the primary record of floor dust samples collected in the field. All Team Members are responsible for the thorough completion of this form.

8.1.2 The completed Floor Dust Sampling Data Sheet will be sent to Battelle with the pesticide aliquot within one week of collection. A photocopy will be maintained by the Field Office to place in HH Packet.

8.2 Chain of Custody Record

8.2.1 This data record (Fig.2) will serve as the primary record of sample custody. The Team Leader is responsible for the thorough completion of this form.

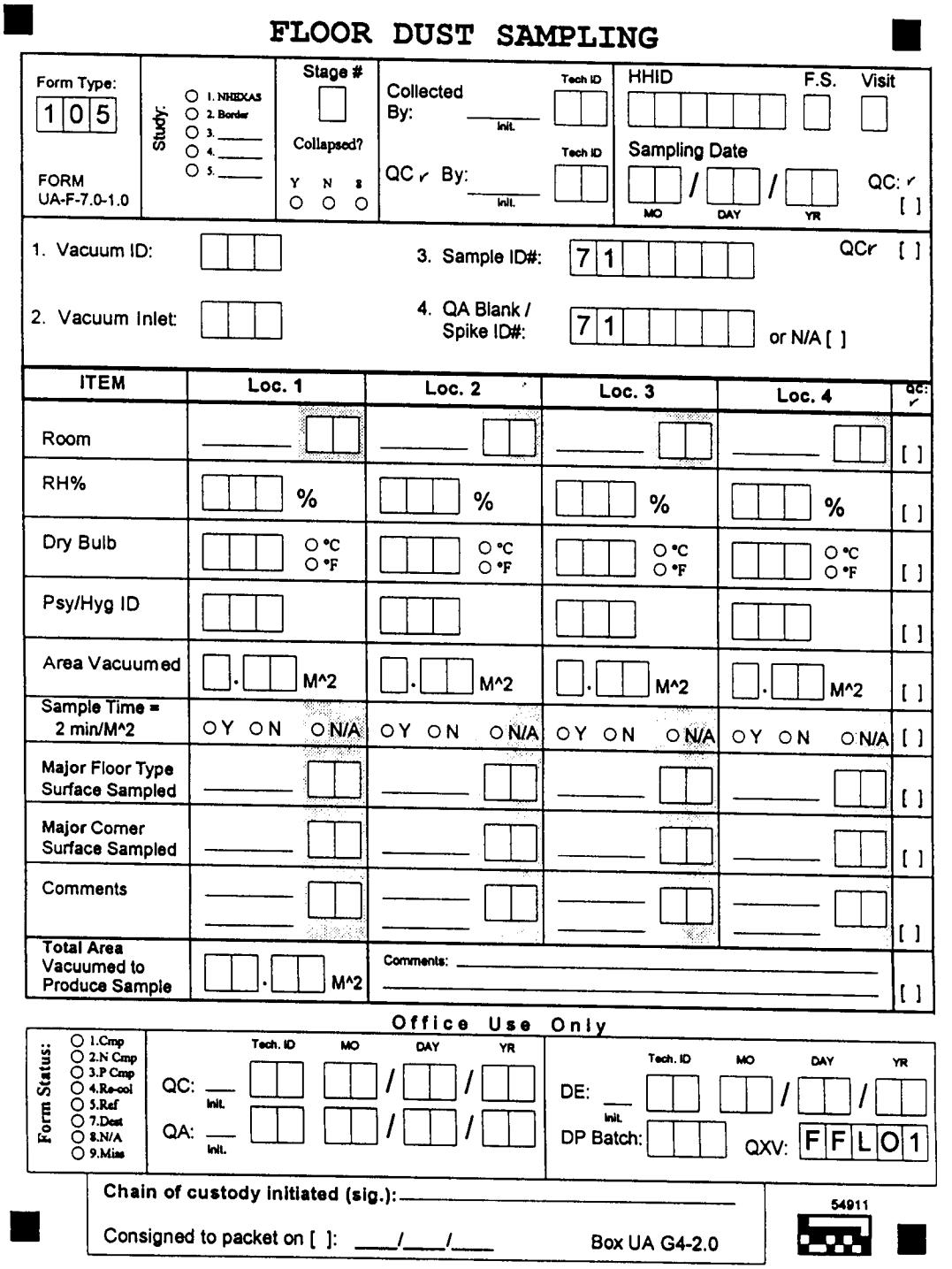
8.2.2 The completed original Chain of Custody Record will remain with the sample at all times

8.3 Data Sample

8.3.1 The Filter Packet will have the HHID, Date, and Team Member initials recorded upon it with indelible labeling ink.

8.3.2 Filter Packets will be processed for delivery to the appropriate laboratory upon return to the HRP Office.

Figure 1. Floor Dust Sampling Data Sheet.



FLOOR DUST SAMPLING

Form Type: 105
FORM UA-F-7.0-1.0

Study: ○ 1. NHEXAS ○ 2. Border ○ 3. ____ ○ 4. ____ ○ 5. ____

Stage #

Collapsed? Y ○ N ○ 8 ○

Collected By: ____ Init. Tech ID

QC ✓ By: ____ Init. Tech ID

HHID F.S. Visit

Sampling Date ___ / ___ / ___ MO / DAY / YR

QC: ✓ [ ]

1. Vacuum ID:
2. Vacuum Inlet:
3. Sample ID#: 71
4. QA Blank / Spike ID#: 71 or N/A [ ]

QCr [ ]

ITEM	Loc. 1	Loc. 2	Loc. 3	Loc. 4	QC: ✓
Room	____	____	____	____	[ ]
RH%	%	%	%	%	[ ]
Dry Bulb	○ °C ○ °F	○ °C ○ °F	○ °C ○ °F	○ °C ○ °F	[ ]
Psy/Hyg ID					[ ]
Area Vacuumed	. M^2	. M^2	. M^2	. M^2	[ ]
Sample Time = 2 min/M^2	○Y ○N ○N/A	○Y ○N ○N/A	○Y ○N ○N/A	○Y ○N ○N/A	[ ]
Major Floor Type Surface Sampled	____	____	____	____	[ ]
Major Corner Surface Sampled	____	____	____	____	[ ]
Comments	____ ____	____ ____	____ ____	____ ____	[ ]
Total Area Vacuumed to Produce Sample	. M^2	Comments: ____ ____			[ ]

Office Use Only

Form Status: ○ 1.Cmp ○ 2.N Cmp ○ 3.P Cmp ○ 4.Re-ool ○ 5.Ref ○ 7.Dest ○ 8.N/A ○ 9.Miss

QC: ___ Init. Tech. ID MO / DAY / YR

QA: ___ Init. Tech. ID MO / DAY / YR

DE: ___ Init. Tech. ID MO / DAY / YR

DP Batch: ___ QXV: FFLO1

Chain of custody initiated (sig.): ____

Consigned to packet on [ ]: ___/___/___ Box UA G4-2.0

54911

Figure 2. Chain of Custody Record.

Sample Weights and Chain of Custody Sheet
NHEXAS Arizona
Vacuum Dust Sample

Sample ID#: _____ HHID: _____ FS: ____ Status: ____ √ √√ 0 0

(#1)Filter:_____ g. (#2)Tie:_____ g. (#3)Filter + Tie:_____ g.
wt. wt. wt.

(#4)Total Wt.:_____ g. -.(#3)_____ g. = (#5)_____ g. 0 0
Filter + Tie wt. Collected wt.

(#4)Total Wt.:_____ g. - (#6)_____ g. = (#7)_____ g. 0 0
Dirty Filter + Tie wt. Sample wt.

Standard Wt. #: _____ Weight: _____ g. 0 0

Pesticide Aliquot ID#: _____ 0 0

(#8)Split Wt. _____ g. - (#10)_____ g. = (#12)_____ g. 0 0
Weighing Paper wt. Aliquot wt.

Metals Aliquot ID#: _____ 0 0

(#9)Split Wt. _____ g. - (#11)_____ g. = (#13)_____ g. 0 0
Weighing Paper wt. Aliquot wt.

Standard Wt. #: _____ Weight: _____ g. 0 0

Custody Record

Relinquished or Received	Signature	Date mo./day/yr.	Time	Action
[Rel] [Rec]		___/___/___	___:___	
[Rel] [Rec]		___/___/___	___:___	
[Rel] [Rec]		___/___/___	___:___	
[Rel] [Rec]		___/___/___	___:___	
[Rel] [Rec]		___/___/___	___:___	
[Rel] [Rec]		___/___/___	___:___	
[Rel] [Rec]		___/___/___	___:___	
[Rel] [Rec]		___/___/___	___:___	
[Rel] [Rec]		___/___/___	___:___	
[Rel] [Rec]		___/___/___	___:___	

L-12.0-2.0

Figure 3. Vacuum Inlet Apparatus.

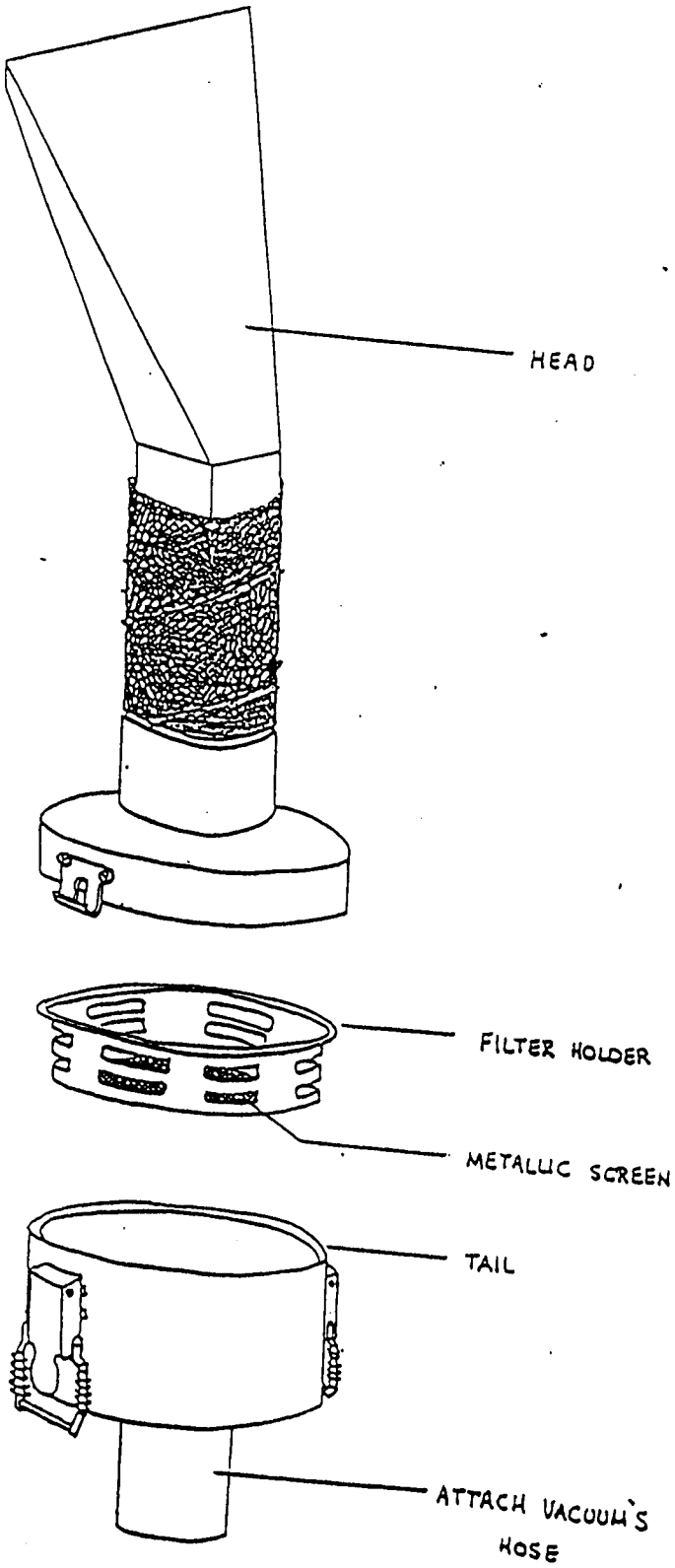


Figure 4. Chain Folding Method to Collect Corner Samples.

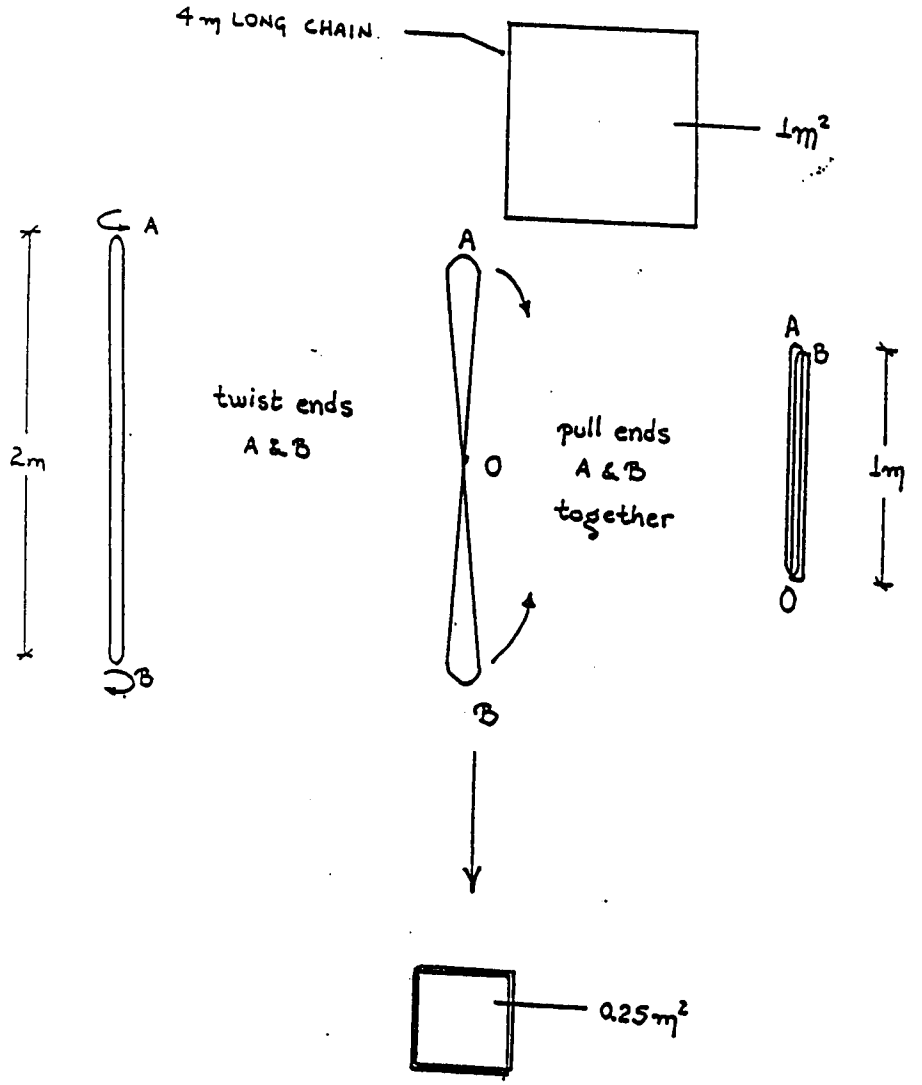


Figure 5. Data Sample Flow Diagram Vacuum Dust Sample.

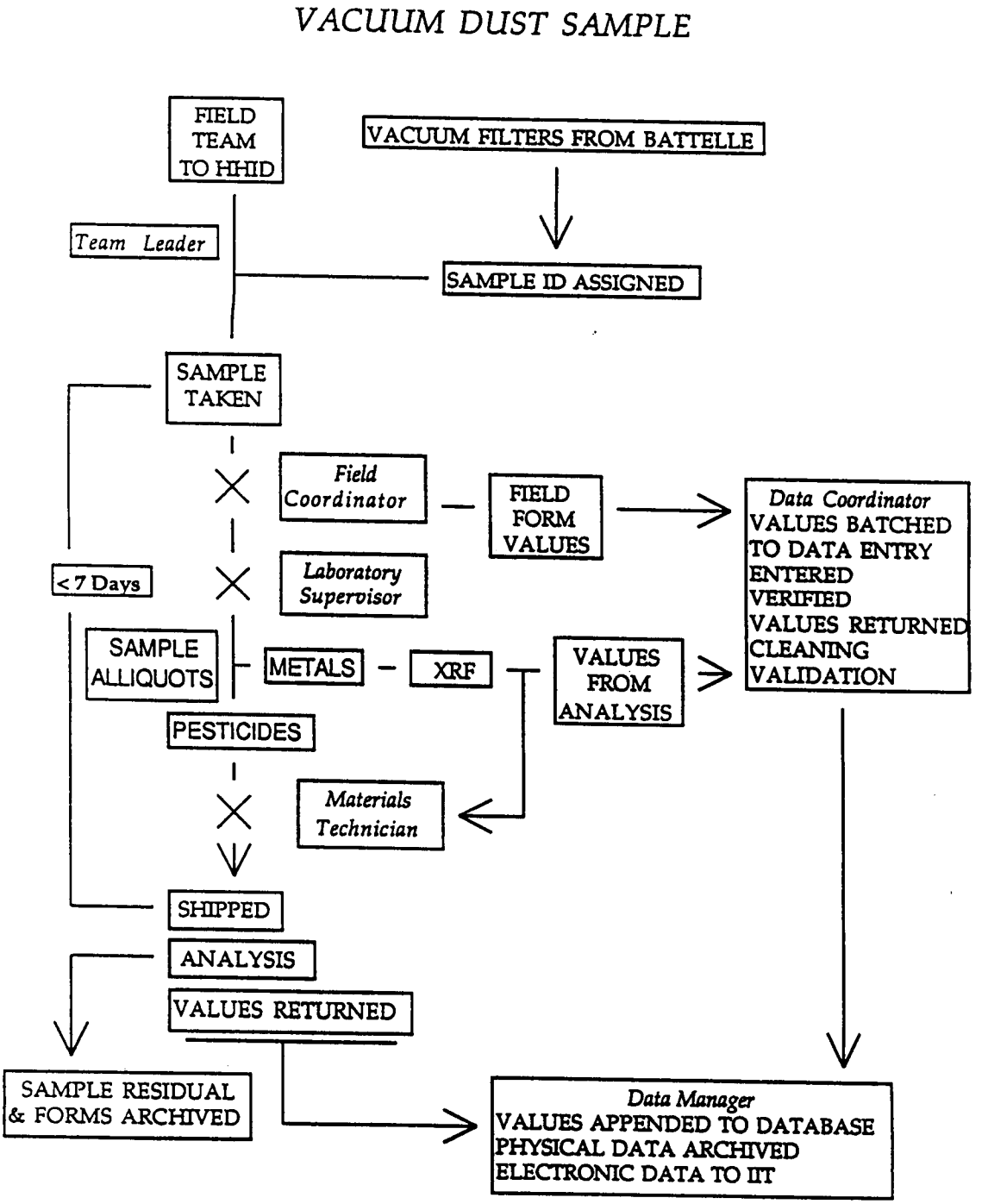


Figure 6. Relative Timing of Floor Dust Sample by Stage. (page 1 of 3)

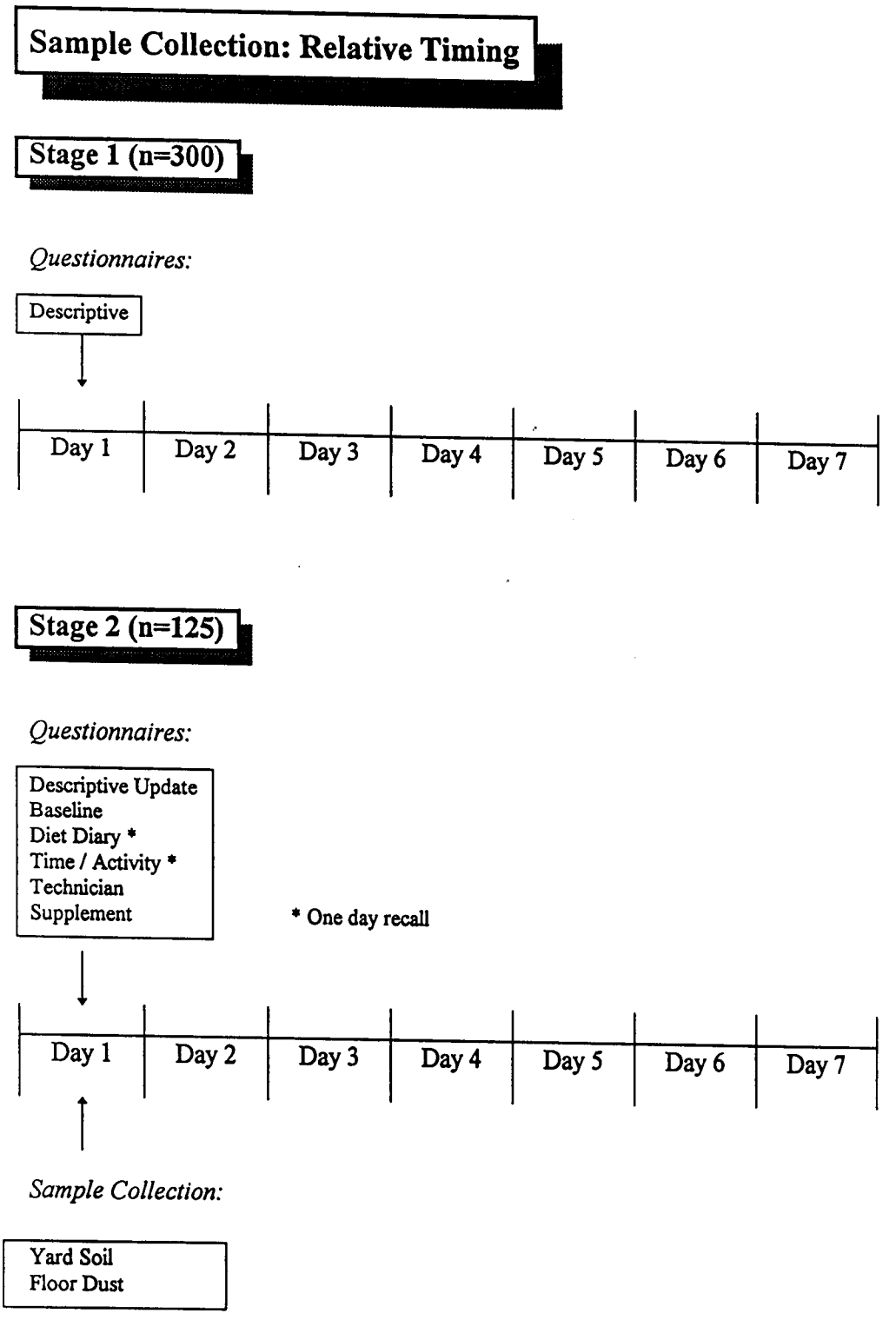
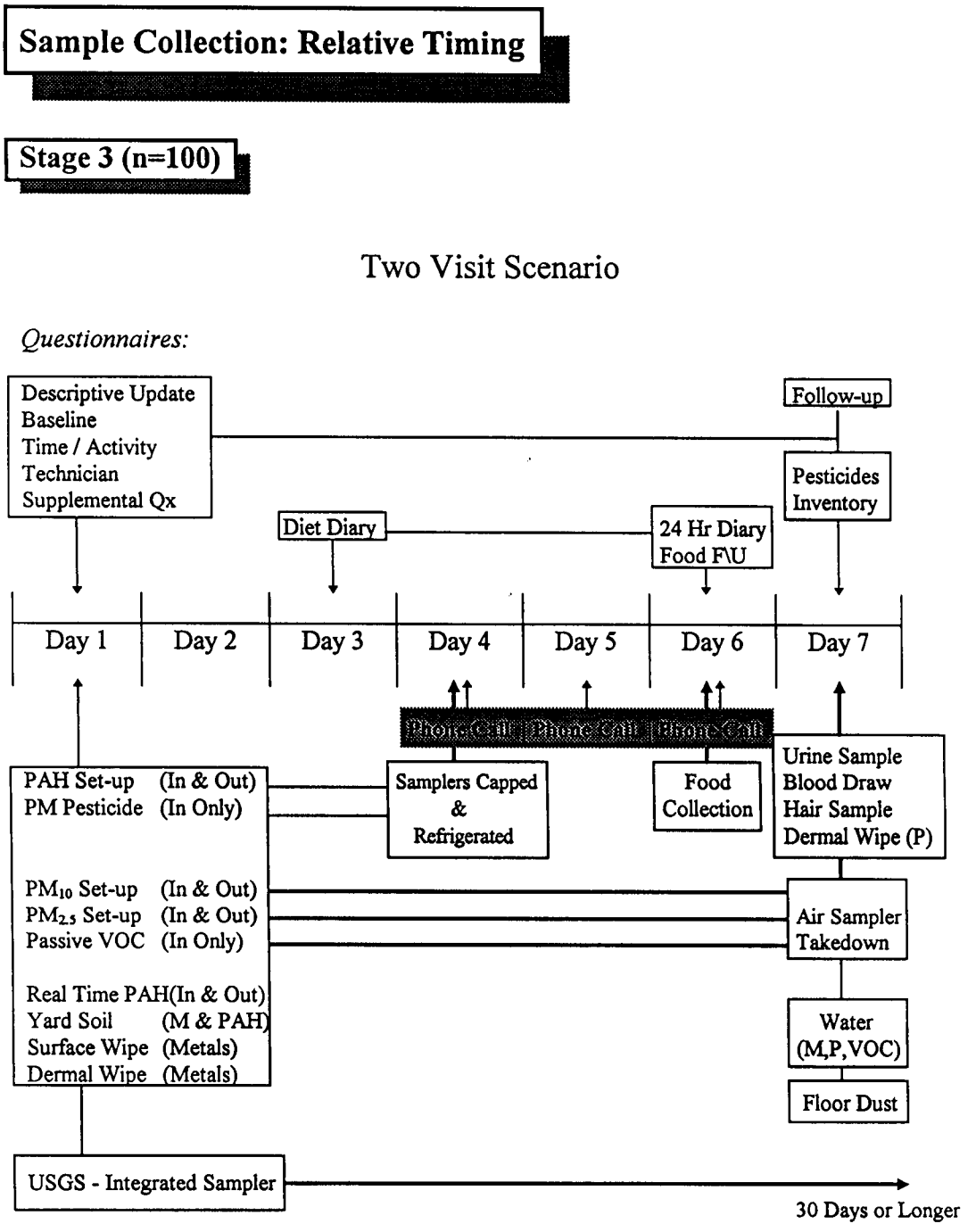
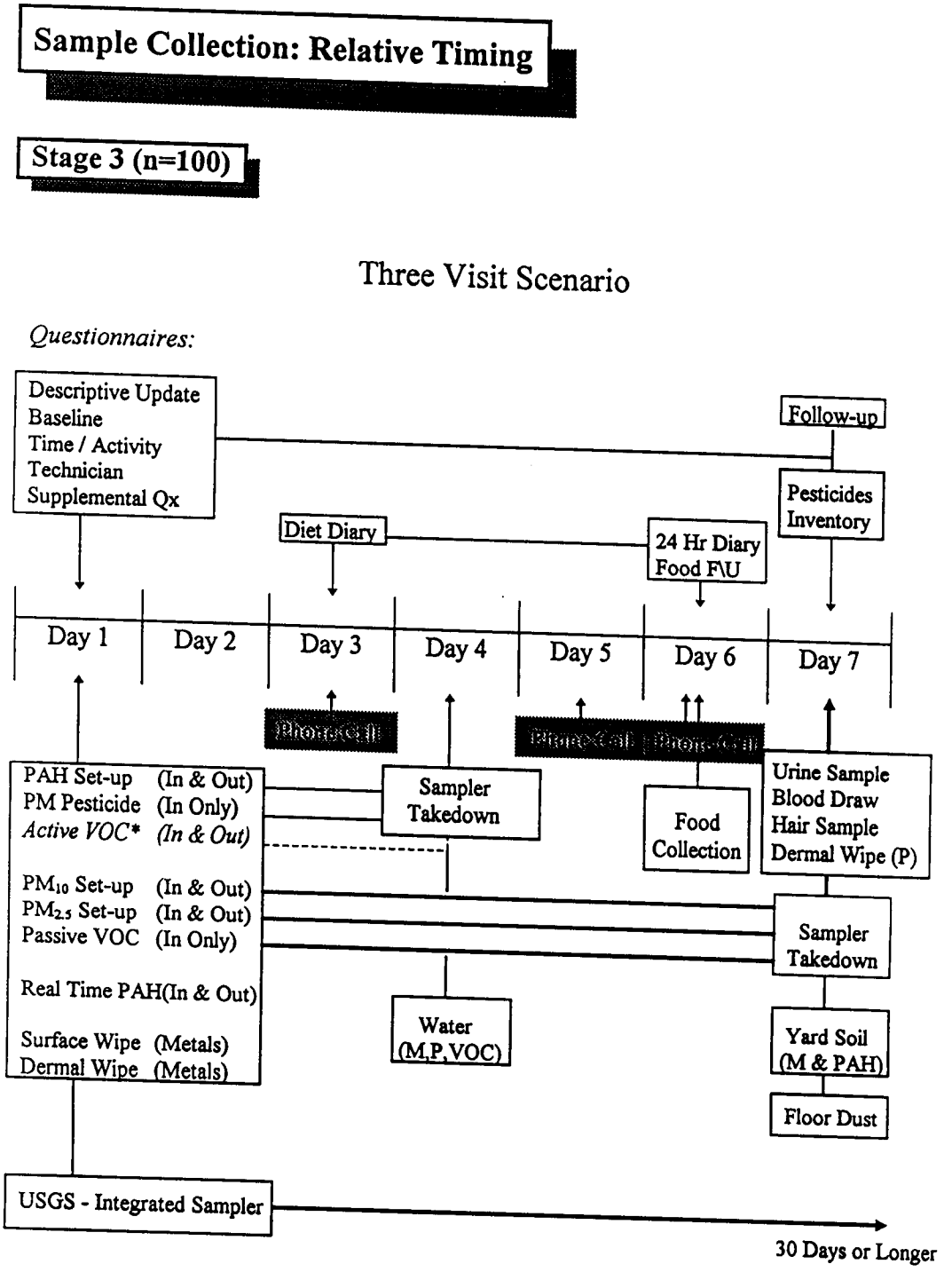


Figure 6. Relative Timing of Floor Dust Sample by Stage. (page 2 of 3)



* Active VOC is collected in a subset of 25 homes only

Figure 6. Relative Timing of Floor Dust Sample by Stage. (page 3 of 3)



* Active VOC is collected in a subset of 25 homes only

Figure 7. Field Notes and Troubleshooting Guide of Floor Dust Sample by Stage (page 1 of 2).

SUMMARY:

1. Make sure that the Field Kit and HH Bucket are stocked with appropriate materials.

2. Make sure that the vacuum inlet is cleaned and the vacuum cleaner bag is empty before every visit.

3. Floor dust samples will be composited from the floor in the most frequently occupied room in the home and from the bedroom of the primary respondent.

4. A minimum of 2 grams of fine dust fraction (excluding hair/fuzz/debris etc.) per Household is required for analysis. Any total weight of fine fraction greater than 2 grams is acceptable.

5. A total of 3 square meters will be vacuumed per room, from which $1m^2$ square will be collected at the corners. From this $1m^2$, one quarter ($0.25\ m^2$) of it should be sampled at each of the four corners of the room sampled.

6. Sweep with vacuum must be slow, but planned to cover each $1m^{¨}$ in two minutes +/- five seconds. Each $0.25\ m^{¨}$ should be vacuumed in 30 seconds.

7. Place the sample in the sample container, seal it and put it immediately in the cooler, at 4°C.

8. Clean the sample head with DIDW using the Nalgene containers and squirt bottle. Dry with Kim Wipes. Use the teflon coated scrubbing brush to thoroughly clean the inlet.

9. Place the sample in the -20°C Freezer upon return. The Chain of Custody Record remains with the sample at all times.

10. In one out of every 20 Households, a Filter Packet will be taken to the HH's sampling site, along with the Chain of Custody record, and it will experience the same transportation conditions as other valid samples.

11. If there is a fireplace or any other type of heating device note the presence on the Field Sheet.

12. If yield (fine) is less than 2 grams, replace the vacuum inlet head and sample additional rooms.

Figure 7. Summary and Troubleshooting Guide of Floor Dust Sample by Stage (page 2 of 2)

13. If corner areas are occupied by furniture, do not allow respondents to rearrange furniture for easier access. Vacuum as close as possible to the baseboard, but do not move or sample under furniture.

14. If the vacuum becomes disconnected from the sampling head, hold the sampling head and the filter upright and re-connect the sampling train. Record discrepancies/incidents on the Field Sheet.

15. If you notice that the filter is ripped or torn after sampling, note the problem on the field sheet and notify the Field Coordinator once you return from the field. The Field Coordinator will decide if and when the HH should be re-sampled.