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-L-8.1**

Title: Preparation of PM and URG Impactors and Impaction Plates

Source: The University of Arizona

U.S. Environmental Protection Agency
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Title: PREPARATION OF THE PM & URG IMPACTORS AND IMPACTION PLATES

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Form TP-1

Preparation of PM and URG Impactors and Impaction Plates

1.0 Purpose and Applicability

The purpose of this SOP is to describe the stages of preparation required for the impactor: 1) prior to in-field use of the particulate sampling system, 2) in-field sampling, and 3) disassembly after field use. This procedure applies directly to the disassembly, oiling of plates, and routine checks for the impactor units of the Harvard particulate matter (PM) samplers used for the EPA NHEXAS and EPA Border projects of the University of Arizona/Battelle/Illinois Institute of Technology consortia, as well as future "Health in the Environment" investigations..

2.0 Definitions

2.1 Black Box = Harvard PM Sampling unit

2.2 Impactor Plate = Round metal plate placed under the impactor orifice to catch large particles admitted through the air stream.

2.3 PM Impactor = One of the two main components of the Harvard PM Sampling unit (the other being the pumping unit). As the size selective component (for the deposition of atmospheric particles), the impactor is made up of five parts: 1) the inlet, 2) two impaction plates, 3) two nozzles, 4) the body, and 5) the base (Figure 1).

2.4 PM = Particulate matter

2.5 PM 2.5 = Respirable particulate matter (RP); 2.5 μm diameter orifice

2.6 PM 10 = Respirable particulate matter (RP); 10.0 μm diameter orifice

2.7 SOP = Standard Operating Procedure

2.8 URG Impactor = Impactor designed to sample personal air samples

3.0 References

3.1 Turner, W.A. Manual for the Indoor Sampler Draft Version, Harvard School of Public Health, Boston, MA, 1985.

3.2 Turner, W.A., Marple, V.A., and Spengler, J.D. Indoor Aerosol Impactor Presented at "First International Aerosol Conference," Minneapolis, Minnesota, September, 1984.

4.0 Discussion

As a quality control function, standardized laboratory operations and routine checking, and preparation of the impactor and/or its parts will help ensure reliable, unbiased data for the collection and assessment of particulate matter (PM). All impaction plates must be cleaned (UA-L-5.1) before use since it is not possible to check for cleanliness once readied for field use.

5.0 Responsibilities

5.1 The Project Director will be responsible for:

5.1.1 Final review and approval of this procedure.

5.2 The Project Lab Coordinator will be responsible for:

5.2.1 Insuring SOP procedures are followed by the Project Lab Staff.

5.2.2 Notifying the appropriate technicians with needed repairs. In cases when the item can not be fixed in house, Project Field Coordinator will generate the appropriate paperwork, notify the appropriate vendor or company, and ship the disfunctional item.

5.3 The Project Lab Staff will be responsible for:

5.3.1 Knowing and following the procedure described in this SOP.

5.3.2 Recording the information as directed in this SOP.

5.3.3 Notifying the Project Lab Supervisor with down equipment and repair supplies needed (where applicable).

5.3.4 Providing the Project Lab Supervisor with down equipment label and isolating the down equipment into the down equipment area.

5.3.5 Insuring proper labeling techniques of down equipment.

5.3.6 Repairing the item (where applicable) in a timely manner.

6.0 Materials and Equipment

6.1 Equipment

6.1.1 Aluminum foil (size: 5" squares)

6.1.2 Deionizing units with Po_{210} to dissipate static electricity

6.1.3 Labeled plastic container for dirty impactor plates

6.1.4 Nucleopore drain disks, 37mm

6.1.5 O-rings (1/16" wall, 1 1/4" inner diameter)

6.1.6 Plastic filter holders (Sierra-Andersen, FH-240P)

6.1.7 Teflon coated forceps

6.1.8 Teflo filters, 25mm and 37mm, with 2.0 μm pore size

6.2 Materials

6.2.1 DDW (distilled deionized water)

6.2.2 Impactor Plate Oil (Dow Corning #704)

7.0 Procedure

7.1 PM Filters

7.1.1 Filter installation.

A. Place a clean plastic filter holder into each plastic filter dish.

B. Place a clean (UA-L-5.1) 37 mm Nucleopore drain disk on top of the filter holder.
C. Remove a 37mm Teflo filter from its sample bag using Teflon forceps. Gently tap the forceps on a solid object to remove residual particles, pass the filter over a deionizing unit and tap the forceps again.
D. Place the teflon filter on top of the plastic filter holder and drain disk. Place the top plastic filter holder onto the set-up and press together.
E. Place the filter set-up into the basal portion of the impactor and cover the top with foil to maintain cleanliness.
F. Repeat steps 7.1.1 A through E for each teflo filter until each plastic filter dish is filled.

7.2 Impactor Plates

7.2.1 Oiling of PM and URG Impactor plates for Field Sampling

A. Set out only the number of impactor plates that need to be set up for field sampling.
B. Place one drop of Impactor plate oil (Dow Corning #704) on the center of the impaction plate (figure 2).
C. Allow the oil to soak in for approximately one minute. The oil should have soaked into plate, and there will be no residue on the surface. If residual oil is observed, do not use that plate. It should be re-cleaned.

7.3 PM Impactors

7.3.1 PM Impactors assembly

A. Setup the pieces of the clean impactors (base, 10 or 2.5 pm head) needed for field sampling.
B. Using figure 1 as an assembly procedure outline, and using the teflon coated forceps, assembly the PM impactors using the oiled impactors.
C. Once assembly of the impactor has been completed, cover the top with aluminum foil and place in the Material Technicians area to await field assignment.

7.3.2 PM Impactor disassembly

A. Disassemble the impactor by carefully twisting and lifting off each section (Figure 1).
B. Carefully remove the impactor plates from each nozzle section and place them into the "dirty impactor plate" container to await cleaning (UA-L-5.1).
C. Visually inspect the three sets of rubber O-rings. Replace any that are broken or frayed.
D. Place the disassembled impactor in the area labeled "Dirty Impactors" to await cleaning (UA-L-5.1).

7.4 URG Impactors.

7.4.1 URG Impactor assembly.

A. Take the URG Impactor and unscrew the top with the red cap.

B. Using teflon coated tweezers take the oiled URG impactor plate and place onto theURG impactor plate tool. Place the upper portion of the disassembled impactor onto the tool and push gently down to seat the impactor plate into the impactor.

C. Take a weighed 25 mm filter and place it onto the metal screen contained in the basal portion of the disassembled URG impactor. Place the plastic ring on top of the filter.

D. Ensure that all pieces are seated and will not be damaged as you reassemble the impactor. Screw together the basal and top portion of the impactor.

E. Complete impactor assembly, wrap in bubble wrap and place in a plastic freezer bag to await field use.

7.4.2 URG Impactor disassembly.

A. Disassemble the impactor by carefully unscrewing the upper portion of the impactor. Be careful not to lose the screen assembly that the filter sits upon.

B. Carefully remove the impactor plate and place it into a container labeled "dirty impactor plates" to await cleaning (UA-L-5.1).

C. Place the disassembled impactors in the area labeled "Dirty Impactors" to await cleaning (UA-L-5.1).

7.5 Quality Control

7.5.1 Tolerance limits

A. Impactor plate oil should not be visible on the impactor plate once applied.

7.5.2 Detection limits

Not applicable

7.5.3 Corrective Actions

A. Impactor plates that exhibit impactor plate oil are not to be used and are to be re-cleaned before use.

B. Replace any impactor items that appear worn.

8.0 Records

8.1 Data collected by this procedure

Not applicable

8.2 Location/Placement of Forms

Not applicable

Figure 1 The PM impactor and its parts

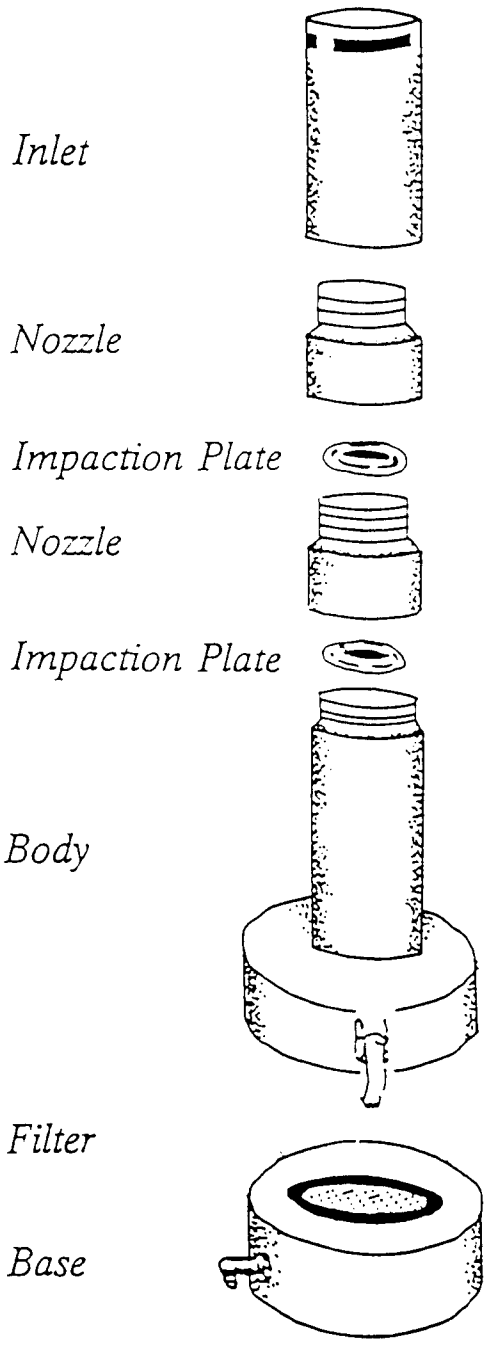
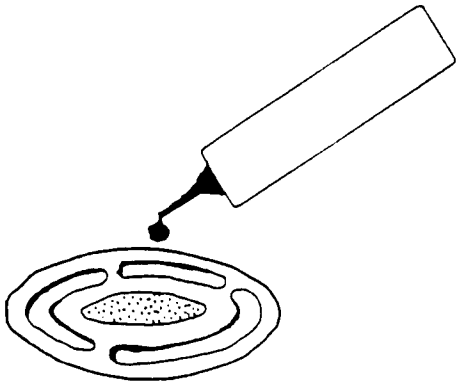


Figure 2 Schematic of the PM and URG impaction plates



Oiling an Impactor Plate