

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-BCO-L-25.0

Title: Freezer Maintenance and Temperature Verification for Sample Integrity

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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APPROVALS

Full SOP	Working SOP	#pages 5
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Freezer Maintenance and Temperature Verification for Sample Integrity

1.0 Purpose and Applicability

The procedures described in this standard operating procedure (SOP) are designed to assure suitable temperature maintenance of freezers used for storage of samples.

2.0 Definitions

2.1 Freezer: storage refrigerator unit used to store samples for the project.

3.0 References

None.

4.0 Discussion

- 4.1 Maintenance of sample integrity requires storage in a suitable location. Pesticide samples, including field collected samples, extracts of these samples, and standards, must be stored at or below -4°C. Samples and extracts must be stored in a separate freezer from that used to store high-level primary standard stock solutions and primary mixed standard solutions. High level primary standards are not stored in the same freezer with samples and extracts, to avoid any potential contamination.
- 4.2 Following removal of an aliquot of a dust or soil sample for extraction, the remaining sample must be returned to the freezer for archival storage. Storage must be maintained at low temperatures in the event that the sample must be re-extracted and re-analyzed. Following GC/ECD and GC/MS analyses, sample extracts must be returned to the freezer for archival storage. Storage must be maintained at low temperatures in the event that the extract must be re-analyzed, and/or the extract must be diluted and re-analyzed.
- 4.3 The temperature of the freezer is verified every working day. If not maintained at the appropriate temperature, sample and extract integrity may be compromised. In the event of a power failure, the freezer can generally maintain temperatures for 24 h if left unopened.

5.0 Responsibilities

- 5.1 The Project Laboratory Supervisor will be responsible for ensuring that procedures are followed by project laboratory staff.
- 5.2 The project laboratory staff will be responsible for recording temperatures on all work days, for returning samples, extracts, and standards to appropriate freezers, for notifying the Project Laboratory Supervisor of freezer malfunction, and ensuring that the freezers are defrosted at least once per year.

6.0 Materials and Reagents

6.1 Materials

- 6.1.1 Freezers capable of maintaining a temperature of -4°C .
- 6.1.2 Laboratory thermometers.
- 6.1.3 Freezer log forms.
- 6.1.4 Micro-tube storage boxes (PGC Scientific).
- 6.1.5 Labels.
- 6.1.6 Sponges and towels.
- 6.1.7 Buckets and pans.

6.2 Reagents

None.

7.0 Procedure

7.1 Preparations

- 7.1.1 Place the thermometer in ice water and verify that it reads $0 \pm 2^{\circ}\text{C}$.
- 7.1.2 Place the thermometer on a middle shelf of the freezer.

7.2 Analyses

- 7.2.1 Designate one laboratory person to read and record the temperature on a daily basis on a freezer temperature log sheet (see Figure 1); designate a back-up person to do so in the absence of the primary person.
- 7.2.2 Record the temperature to the nearest degree.
- 7.2.3 Defrost freezer once a year, or more often if needed.
 - 7.2.3.1 Remove all materials in the freezer and place in a similar unit, or in coolers containing Blue Ice packs.
 - 7.2.3.2 Turn off the power to the freezer. Allow enough time for the ice to melt.
 - 7.2.3.3 Place pans and buckets below the shelves to catch the water; mop up the water with sponges and towels, as needed.
 - 7.2.3.4 When the freezer has completely defrosted, wipe down the interior and dry it with towels.
 - 7.2.3.5 Turn the power back on and allow the freezer to cool to -4°C before returning the samples and extracts to the unit.

7.4 Calculations

None.

7.5 Quality Control

7.5.1 Labeling

- 7.5.1.1 All materials in the freezer must have proper identification labels and clear notation.
- 7.5.1.2 Similar sample matrices (soil, dust, etc.) are stored together on one shelf, or in close proximity to each other.
- 7.5.1.3 All sample extracts in a batch are stored together in a micro-tube storage box with a label identifying the run log number and/or date.

7.5.2 Corrective Actions

- 7.5.2.1 If the freezer temperature is $>0^{\circ}\text{C}$, and the freezer door has not been opened in the previous 30 min, check the calibration of the thermometer by placing it in a bowl of ice water.
- 7.5.2.2 If the freezer has been closed for more than 30 min, and the thermometer is reading accurately, then note the last day of valid temperatures on the log sheet.
- 7.5.2.3 Notify the Project Director and Project Laboratory Supervisor of the malfunction.
- 7.5.2.4 Check the circuit breakers and inform the Battelle Electrical Maintenance office of any problems noted.
- 7.5.2.5 Place a call to a repair technician.
- 7.5.2.6 Move the samples and/or extracts to another working freezer.

8.0 Records

- 8.1 The freezer temperature is recorded by date on a log that is affixed to the front panel of the freezer; defrosting or any problems are also noted on the log by date.
- 8.2 The current log is maintained on the front panel of the freezer. When the sheet is completely filled, it is stored in a file folder that is attached to the side of the freezer.

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Figure 1. Example of Freezer Temperature Log Sheet for NHEXAS Arizona and NHEXAS Border Projects.