



STANDARD OPERATING PROCEDURE
INDOOR AIR SAMPLING
April 2023

GENERAL PROVISIONS:

The Department of Natural Resources and Environmental Control – Remediation Section (DNREC-RS) has created this standard operating procedure (SOP) as a default procedure to be followed for indoor air sampling. Any deviation from this procedure will require DNREC-RS approval *prior to* implementation.

EQUIPMENT LIST:

- 1) Pre-cleaned and individually certified summa canister*,
- 2) Field Sampling Form,
- 3) Photo Ionization Detector (PID),

* DNREC recommends, but does not require, that summa canister be pre-cleaned and individually certified.

CONSIDERATION FOR INDOOR AIR SAMPLING WHEN ALSO CONDUCTING SUB-SLAB:

- During sub-slab vapor probe installation, air from under the slab may be released into the indoor air. Time is required for this air to move out of the building prior to indoor air sampling. Based on indoor air exchange rates (indoor air being exchanged for outside air), the United States Environmental Protection Agency (EPA) recommends waiting from one (1) to three (3) days after sub-slab probe installation to sample the indoor air. This requirement is not necessary if the HVAC is turned off prior to sampling. If the air exchange rate of the building is one (1) air exchange unit per hour, then collect the indoor air samples one (1) day after the sub-slab probe installation. If the air exchange rate of the building is 0.25 air exchanges per hour, then three (3) days after the sub-slab probe installation would be required before collecting the indoor air samples.

PREPARATIONS FOR INDOOR AIR SAMPLING:

Prior to the collection of indoor air samples, the following preparations should be made:

- a) De-activate HVAC systems in advance of sampling to determine natural migration of sub-slab air more accurately into the building.

- b) Contact the laboratory to confirm the required sample size necessary to obtain the desired reporting limit.
- c) Conduct a pre-sampling inspection (Fill in Attachment 1 -Parts I -V)
 - 1) Prior to each sampling event, identify conditions that may affect or interfere with the proposed testing. Include the inspection checklist in the investigation report.
 - 2) The inspection should evaluate the type of structure, floor layout, physical conditions, and airflows of the building(s) being studied.
 - 3) Perform a product inventory to identify potential sources of interference. Use a photo ionization detector (PID) capable of screening to the low parts per billion (ppb) or a portable GC to screen containers for potential interference. If possible/available, record product name and manufacturer.
- d) Eliminate potential interference.

Potential interference from products or activities releasing volatile chemicals may need to be controlled. Removing the sources from the indoor environment a minimum of 72 hours prior to testing (EPA 2015) is the most effective means of reducing the interference. In addition, for the 72-hour period preceding indoor air sampling, avoid the following activities:

- opening any windows, fireplace dampers, openings, or vents
- operating ventilation fans unless special arrangements are made
- smoking in the building
- painting
- operating wood stoves, fireplaces, or other auxiliary heating equipment (e.g., kerosene heaters)
- operating or storing automobiles in an attached garage
- storing containers of gasoline or oil within the building,
- cleaning, waxing, or polishing furniture or floors with petroleum- or oil-based products.
- using air fresheners or odor eliminators

SAMPLE COLLECTION (Fill in Attachment 2- Excluding the following information: Purge, sample depth, soil composition, other characteristics, and QA/QC Testing Results)

***NOTE:** Sampling personnel should avoid lingering in the immediate area of the sampling device while samples are being collected to avoid undue influence from sampling.

Location

- 1) Any indoor air samples collected should be co-located with a sub-slab sample for ease of comparison of the results.
- 2) Sample collection intakes should be located in the approximate breathing zone for building occupants (typically three feet above the floor level where occupants are normally seated or sleeping). Breathing zone level may vary depending on building use and should be modified accordingly for sampling.
- 3) Air samples should be collected from the basement (1 exposure unit), as applicable, and first floor (1 exposure unit).

Frequency

- 1) A minimum of one (1) indoor air sample per exposure unit should be collected to assess potential exposure of building occupants to volatile chemicals from a sub-surface source.
- 2) The number of ambient air samples collected should be based on Site-specific conditions (e.g., wind direction -is it changing?), but each air sampling event should include at least one (1) outdoor ambient air sample.
- 3) Please see the Active Soil SOP for more details on ambient air samples.

Duration

- 1) EPA recommends collecting ambient air samples 1-2 hours prior to collecting indoor air samples (EPA 2015).
- 2) Collect samples for 24 hours (residential and commercial exposure scenarios).
- 3) In non-residential buildings, samples should be collected during normally-occupied periods to be representative of typical exposure. Canister should be retrieved within 10% of the total sample time. NOTE: Longer duration sampling periods may be appropriate depending on the goals of the investigation.

Procedure

- 1) The summa canister should be used within 24 hours of shipment to avoid cross-contamination. Canister can be stored longer with DNREC-RS permission. Record the vacuum pressure in each summa canister. If the value you just recorded is not within ± 2 psi of the value recorded by the lab prior to shipment, it cannot be used (EPA, 1992).
- 2) Place a summa canister on a flat surface in the building in the approximate breathing zone of occupants.
- 3) Prior to completing the sampling, personnel will complete a sampling form by filling in the appropriate sections (Attachment 2) noting pertinent weather conditions, vacuum present in the canister when the sampling began, whether it passed QA/QC testing, etc.
- 4) A Summa® canister sample valve will be opened to collect the sample for 24-hour sample time.
- 5) The canister must be shut off while vacuum still remains the canister. Note the remaining vacuum from the vacuum gauge on the sampling form. Summa canisters length of actual sample collection time must be within 10% of the required sampling time interval in order to be considered a valid sample and have a minimum of 1 in of vacuum remaining in the canister (Eurofins). For example, 22 hours for a 24-hour sample. Please contact DNREC-RS as soon as possible regarding any sampling issues to discuss the data usability.

ATTACHMENT 1



INDOOR AIR BUILDING SURVEY

Survey Completed By: _____ Date: _____

Site Name: _____ DE#: _____

Part 1 Occupants

Building Address: _____

Property Contact: _____

Owner/Renter/Other: _____

Contact Phone: Home: _____ Cell: _____

Contact Email: _____

Building Occupants:

Children under age 13: _____ Children 13-18: _____

Adults: _____

Special Health Concerns:

_____ Respiratory _____ Cardiovascular _____ Partially Able
_____ Home Bound _____ Other (please specify)

Allergies: ____ Yes ____ No Other (Describe): _____

Part II Building Characteristics

Building Type:

_____ Single Family Residential _____ Trailer or mobile _____ Office
_____ Multi-family residential _____ Duplex _____ Row Home
_____ Apartment _____ Strip Mall _____ Commercial
_____ Industrial _____ Other (specify)

Describe Building:

Age: _____ Construction: _____ Frame _____ Masonry _____ Steel
_____ Other (Specify) _____

Type of Insulation: _____

Type of Roof: _____

General Condition and Air Tightness: _____

Fireplace or Chimney: _____ Last Service Date: _____

Number of Floors-below grade: _____

_____ Full Basement _____ Crawl Space _____ Slab

Number of Floors-at- or above ground? _____

Number of Rooms: _____ Do the Windows Open? _____

Basement Size: _____ ft²

Basement Floor: _____ Concrete _____ Dirt _____ Floating _____ Other (Specify)

Foundation Type: _____ Poured Concrete _____ Cinder blocks (Hollow?) _____ Stone

_____ Other (Specify) _____

Type of ground cover around outside of building:

_____ grass _____ concrete _____ asphalt _____ other(specify):

Is there vegetation? _____ Does it appear stressed? _____

French Drain? _____ Flooding experienced? _____

Floor Drains present? _____ If yes, is a trap present? _____

Is there water in the trap? _____

Connected to a: _____ Sanitary Sewer _____ Storm Sewer

_____ Septic System _____ Surface Discharge _____ unknown

Basement Sump Present? _____ Sump Pump? _____

Type of heating system (Check all that apply)

_____ hot air circulation _____ hot air radiation _____ Wood

_____ Steam Radiation _____ Hot water radiation _____ Kerosene

_____ Electric Baseboard _____ Heat Pump _____ Solar/Air

____ Solar/Glycol or other heat transfer fluid _____ Solar/Water

____ Other (Specify) _____

If air, when were filters last changed? _____

Type of ventilation system: (Check all that apply)

____ Central Air Conditioning ____ Mechanical Fans ____ Kitchen Range Hood Fans

____ Bathroom Vent Fans ____ Individual Air Conditioning Units

____ Other (Specify) _____

Type of Fuel Utilized (check all that apply)

____ Natural Gas ____ Electric ____ Fuel Oil ____ Coal

____ Wood Pellets ____ Solar ____ Kerosene ____ Waste Oil

____ Outside Fresh Air intake

Septic System: ____ Yes ____ Yes, but not used ____ No-irrigation.

Private Well: ____ Yes ____ Yes, but not used ____ No

Public or Private Well: _____ If Public, name of company: _____

Existing Subsurface depressurization (radon) system in place? ____ Yes/No Running: ____ Y/N

Part III Outside Contaminant Sources

1000ft. Radius nearby contaminant source:

____ DNREC/DEN ____ Marplot ____ Brownfield Lists

Previous Land Use in Area: _____

Other Stationary Sources nearby: (Check all that apply)

Gas Stations Emission Stacks Refineries/Chemical Plants
 Waste Disposal Facilities (LFS & WWTPs) Drycleaners
 Beauty Hot Mix Plants Auto Repair Body Shop
 Fuel Oil Tanks Road Repair with Hot Water

Wetlands Nearby? (Distance and Direction)

Heavy Vehicular Traffic nearby? Or other mobile sources?

Known groundwater or soil contamination within 1000 feet?

Physical Parameters of unsaturated zone (Summarize or attach)

Sinkholes or Debris Pits? Y/N

Part IV Indoor Contaminant Sources

Potential Sources	Location(s)	Removed Prior to Sampling? (Yes / No / NA)
Gasoline storage cans		
Gas-powered equipment		
Kerosene storage cans		
Paints / thinners / strippers / glues / caulks		
Cleaning solvents		
Oven cleaners		
Carpet / upholstery cleaners		
Other house cleaning products/laundry products		
Moth balls		
Polishes / waxes		
Insecticides		
Furniture / floor polish		
Nail polish / polish remover		
Hairspray		
Cologne / perfume / after-shave, etc.		
Air fresheners		
Fuel tank (inside building) (outside)		NA
Wood stove or fireplace		NA
New furniture / upholstery		
New carpeting / flooring / paneling		NA
Recent painting in building?		
Roof repair?		
Hobbies - glues, paints, etc.		
Toilet or septic additives		
Dry drain traps, plugged drains, toilets won't flush.		
Garbage/spoiled food		
Standing water/tire piles/recent flooding		
Sewage/septic		

Potential Sources	Location(s)	Removed Prior to Sampling? (Yes / No / NA)
Dead animals (including unusual numbers of insects)?		
Mold/mildew		
Wet sheetrock/paneling/flooring		
Neighbors making drugs/explosives?		
Mercury-containing switches or instruments		
Alcohol/bleach/ disinfectants		
Recent concrete/masonry work?		
Flowers		
Pets (Specify), scented kitty litter?		
Compost/Manu		

Identify all potential indoor sources found in the building (including attached garages), the location of the source (floor & room), and whether the item was removed from the building 48-hours prior to indoor air sampling event.

Part V – Miscellaneous Items

Do any occupants of the building smoke? ____ Yes/No How often? _____

Do any of the occupants have any chronic health issues? _____ Yes/No

Has anyone smoked inside of the building within the last 48 hours? _____ Yes/No

Does the building have an attached garage? _____ Yes/No

If yes, does the garage have heat/ventilation? _____ Yes/No Windows? _____ Yes/No

Is the garage connected to the house? _____ Yes/No

Is a car usually parked in the garage? _____ Yes/No

Do the occupants of the building dry clean their clothing? _____ Yes/No

If yes, name of dry cleaner: _____

When were the dry-cleaned clothes last brought into the building? _____

Have the occupants ever noticed any unusual odors in the building? _____ Yes/No

Describe (with location) _____ Date: _____

Amount: _____

Any known spills of chemicals, fuels, or sewage immediately outside, or inside, the building? _____ Y/N

Fires? _____ Yes/No If yes, describe with location: _____

Have any pesticides/herbicides been applied around the building foundation or in the yard/garden? Y/N

Have any pesticides been applied regionally, e.g., by Mosquito Control or DSWC? _____ Y/N

If so, when and which chemicals? _____

Are odors more noticeable in certain weather conditions? _____ Y/N

If yes, describe (wind direction, speed, precipitation, temperature, humidity): _____

Attachment 2- DNREC-RS Sampling Form

DNREC RS Vapor Intrusion Policy
Field Sampling Form

(Attach Sample Map)

Project #:
Project
Name:
Sampled
By:
Date Sampled:

General Site Conditions:

Atmospheric Data:

Source of Data
Precipitation during sampling
Amount of Precipitation
Barometric Press. (Outside/Inside)
Temp (Outside/Inside)
Wind Speed
Wind Direction

Sampling System (check one)

() Whole-Air active approach (summa)
() Whole-Air passive approach
() Sorbed contaminants-active approach
() Sorbed contaminants-passive approach
() Headspace or extraction approach
() soil pore liquid headspace approach () Sample Replicate

System Purge Volume Volumes () Sample Volume
(0.086 L/ft) * Depth (ft): Purged (3):

Sorbent Device: Installed: Date/time
Recovered Date/time

Sample Container Type: Sample Container #:

Analytical Method:
_____ (Chain of Custody Attached)

Analyzer Result:

Concrete
Thickness: _____

Condition
Of Concrete
Floor near
Sample: _____

Sample
Depth: _____ Sampling rate: _____

Soil Composition: Clay _____ %
Soil Organic matter _____ %
Fine Granular Material _____ %
Coarse Granular Material _____ %

Moisture Content: _____

Other characteristics: _____ free water present _____ indurated
Free soil
_____ product _____ discoloration
probable
connecti
on to
surface
_____ contaminant odors _____ macropores

QA/QC Testing Results

Note- Each vapor point must pass all the QA\QC Tests below before sampling. Reseal and Retest until the vapor point passes the test.

Test #1A- Short Circuit Test

Oxygen reading in % O₂ : _____ Did the vapor points pass the test (<=18.8%): Y/N (circle one)

Notes: _____

Test #1B- Short Circuit Test

Oxygen reading in % O₂ : _____ Did the vapor points pass the test (<=18.8%): Y/N (circle one)

Notes: _____

Test #2- Helium Test (Please see Attachment 3- Active Soil Gas or Sub-Slab Air Sampling SOP for details)

Test #2A- Helium Concentration within the Shroud: _____

Helium Concentration within tubing: _____

Did the vapor points pass the test (tubing<10% of the shroud): Y/N (circle one)

Test #2B- Helium Concentration within the Shroud: _____ Helium Concentration within tubing: _____
 Did the vapor points pass the test (tubing<10% of the shroud): Y/N (circle one)
 Notes: _____

Test #3- Shut-in Test (Please see Attachment 3- Active Soil Gas or Sub-Slab Air Sampling SOP for details)

Test 3A# Pass Shut in test by maintaining -7 in. Hg in tubing from the shroud to the summa canister for 5 minutes:
 Y/N (circle one)
 Notes: _____

Test 3B# Pass Shut in test by maintaining -7 in. Hg in tubing from the shroud to the summa canister for 5 minutes: Y/N (circle one)
 Notes: _____

Test 3C# Pass Shut in test by maintaining -7 in. Hg in tubing from the shroud to the summa canister for 5 minutes: Y/N (circle one)
 Notes: _____

Sampling Information

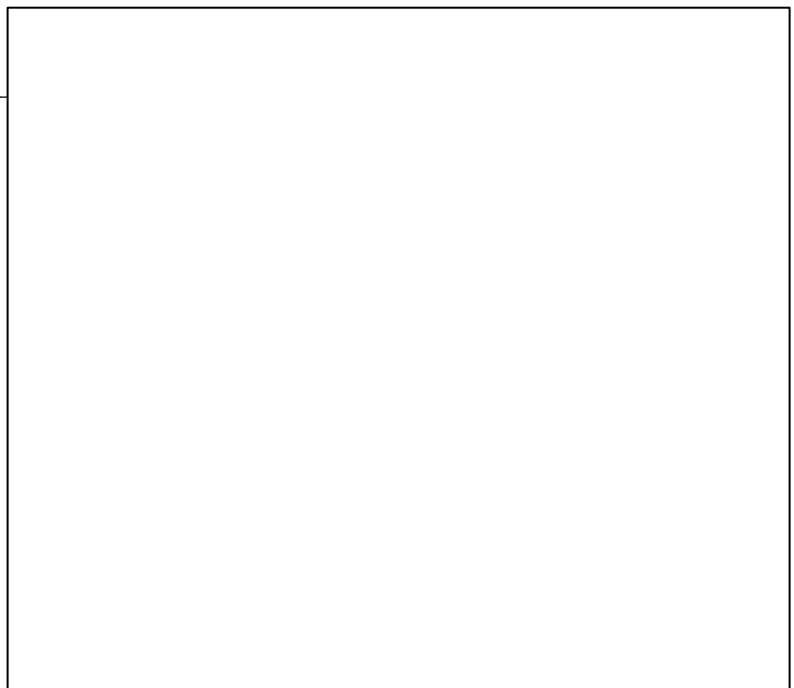
Laboratory: _____

Sample #	Floor	Room	Canister / Tube #	Pump ID # (if applicable)	Sample Start Date / Time	Sample End Date / Time

Sample location(s):

Provide Drawing of Sample Location(s) in Building

Sample # _____ - _____ →



Did the occupants not follow any of the “Instructions for Residents” directions? *Yes / No*

If so, describe modifications: _____

General Observations

Provide any information that may be pertinent to the sampling event and may assist in the data interpretation process.

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