

Procedures for Collection of Indoor Air

FSOP 2.4.3 (March 9, 2017)

Ohio EPA Division of Environmental Response and Revitalization

1.0 Scope and Applicability

Indoor air samples investigate air quality within buildings for possible vapor intrusion of volatile organic compounds (VOCs) and other volatile chemicals. Samples are collected from locations within buildings and structures that are occupied on a regular and on-going basis to evaluate potential exposure to VOCs. Analysis of the air samples are typically performed using U.S. EPA Method TO-15.

2.0 Definitions

“Summa[®] Canister”, a genericized trademark that refers to electropolished, passivated stainless steel vacuum sampling devices (i.e., evacuated canister). Sizes of canisters will vary with the most commonly used sizes being 6L and 1L. Canister size will depend on the predetermined time-frame for sampling (e.g. 24-hour v. “grab” sampling). A “Silco” canister is another name for a summa canister.

3.0 Health and Safety Considerations

- 3.1 This activity involves accessing private residences and spaces in commercial buildings. Follow Ohio EPA Standard Safety Operating Procedure Number SP11-19 (Working Alone) to determine if working alone is appropriate given the site conditions and circumstances.
- 3.2 Never enter an OSHA-defined confined space for any reason. Only Ohio EPA Office of Special Investigation (OSI) staff or other appropriately trained staff are qualified to enter confined spaces for reconnaissance or sampling activities, and will perform such work as necessary in accordance with Ohio EPA Standard Safety Operating Procedure Number SP14-4 (Confined Space Entry).
- 3.3 Follow the site specific health and safety plan (HASP), which should identify the potential presence of asbestos-containing materials and other building-specific health and safety concerns. If a site-specific HASP is not available, follow the health and safety procedures in FSOP 1.1, Initial Site Entry.
- 3.4 Be aware of potential vermin (fleas, rats, etc.)
- 3.5 Review available plans or documents before selecting sampling locations.

4.0 Procedure Cautions

- 4.1 Review the site-specific work plan (SSWP), which should include a description of the building’s size and use. In certain emergency circumstances a SSWP may not be available, and all necessary information for indoor air sampling will be need to be obtained during the pre-sampling visit as described below.
- 4.2 A pre-sampling site visit should be conducted to meet with the building’s owner and/or tenant and inspect the proposed indoor air sampling locations. During the

pre-sampling visit, address arrangements for sampling location access and associated logistical concerns. Also, determine if the sampling areas are occupied or unoccupied spaces. Obtain property access agreements prior to sampling.

- 4.3 Sampling personnel should not handle hazardous substances (such as gasoline), permanent marking pens, wear/apply fragrances, or smoke before and/or during the sampling event.
- 4.4 Care should be taken to ensure that the flow regulator is pre-calibrated to the appropriate sample collection time (8 hours, 24 hours, etc.). Eight (8) hour sample collection is utilized for commercial/industrial settings. Twenty-four (24) hour sample collection is used for residential and/or sensitive receptor settings (e.g., day care facilities).
- 4.5 The flow regulator must be correctly connected to the sample canister to eliminate the potential for leaks.
- 4.6 The regulator should be closed shortly before the actual sampling time is completed so that a small amount of vacuum remains. If it isn't closed and no vacuum remains in the canister, extracting a sample for analysis may be very difficult. In addition, sample integrity may be compromised if the canister reaches atmospheric pressure.
- 4.7 An interview of the building occupants should be conducted before sampling to determine if there are any potential chemicals present that could cause false positives during sample collection. For example, paints, woodworking products, household solvents and various chemicals used in hobbies may all contain VOCs that could be detected. If possible, the building occupants should remove such products several days before sampling takes place. A copy of Instructions for Building Occupants Prior to Indoor Air Sampling Form (attached) should be provided to the resident during the interview.
- 4.8 If sub-slab samples are to be collected from the same building that indoor air samples are being collected, it is preferable to complete the indoor air sampling prior to installing a sub-slab vapor port (FSOP 2.4.2, Construction, Installation and Decommissioning of Sub-Slab Vapor Ports). However, if site specific reasons (e.g., access or emergency conditions, etc.) dictate the need to collect both samples at the same time, care needs to be taken to install the sub-slab vapor port before beginning the indoor air sampling. In addition, the indoor air sample should be taken as far as possible from the location where the sub-slab vapor point is installed.
- 4.9 Indoor air samples should only be collected from the first floor/ground-level floor of the structure.

5.0 Personnel Qualifications

Ohio EPA personnel working at sites that fall under the scope of OSHA's hazardous waste operations and emergency response standard (29 CFR 1910.120) must meet the

training requirements described in that standard. Prior knowledge, training and experience with this sampling technique is strongly recommended before collecting samples.

6.0 Equipment and Supplies

- 6.1 Stainless steel canister(s) (request at least one additional canister as a backup). A 6L canister will be required for this sampling activity. A 1L “grab sample” canister will not provide enough volume to sample for a timed (8 hr. or 24 hr.) sample period, refer to Section 2.0 (Definitions).
- 6.2 Flow regulator(s) properly calibrated for the specific sample collection duration – 8 hr. or 24 hr. (request at least one extra regulator as a back-up)
- 6.3 In-line filters, if needed (e.g., for SVOC volatile compounds)
- 6.4 Open-end wrenches, typically 9/16” (two wrenches are recommended to tighten the fitting in two directions at the same time)
- 6.5 PID (refer to FSOP 3.1.1, Photoionization Detector)
- 6.6 Indoor Air Building Survey and Sampling Form (attached)
- 6.7 Instructions for Building Occupants Prior to Indoor Air Sampling Form (attached)
- 6.8 Vapor Sampling Data Sheet (attached)
- 6.9 Field documentation supplies and equipment, including pens, markers, field log book and additional data sheets, chain-of-custody forms, camera

7.0 Procedures

- 7.1 Sample Location Determination
 - 7.1.1 Conduct a building/structure survey using the Indoor Air Building Survey and Sampling Form to determine potential target receptors and identify potential interferences to sample collection. PID screening may also help to identify VOC sampling interferences. In addition, provide the Instructions for Building Occupants Prior to Indoor Air Sampling Form to the building residents or worker for completion at this time. Potential sampling interferences need to be recognized and eliminated before sample collection begins. This should be completed at least 48 to 72 hours prior to sample collection.
 - 7.1.2 Select indoor air sampling locations that are in inhabited or frequently used.
 - 7.1.3 Do not place sample canisters in locations near primary-use doors or open windows.

- 7.1.4 Do not place sample canisters in the pathway of indoor fans.
 - 7.1.5 If ceiling fans are in use, request that they be turned off for the duration of the sample period.
 - 7.1.6 Note any obvious odors from scented candles, mothballs, cleaning products, gas or oils.
 - 7.1.7 If the building has a dirt basement or crawl space, evaluate whether or not an indoor air canister should be placed in this area.
- 7.2 Sample Set-up
- 7.2.1 Place the sampling canisters at breathing-zone height.
 - 7.2.2 Remove the brass plug from the canister and connect the flow regulator (with in-line particulate filter and vacuum gauge, if needed) to the canister.
 - 7.2.3 Gently tighten the connection between the flow regulator and the canister using the open-end 9/16" wrenches. Do not over-tighten this connection. Before continuing, record the canister number and the associated flow regulator number on the "Vapor Sampling Data Sheet". The canister number can be used for sample identification on the COC form.
 - 7.2.4 Open the canister/regulator valve. Record the sample start time and the canister pressure.
 - 7.2.5 Photograph the canister and the surrounding area.



Example of a canister with a regulator attached and placed in the breathing zone.

7.3 Termination of Sample Collection

- 7.3.1 Return to the sample collection site a minimum of 15 minutes before the end of the sample collection interval. Examine the flow regulator to ensure that some vacuum is left on the gauge (preferably 2" to 10" of mercury on the regulator flow dial).
- 7.3.2 Record the vacuum pressure and stop sample collection by closing the flow regulator.
- 7.3.3 Remove the flow regulator from the canister using the 9/16" open-end wrenches. Re-install the brass plug on the canister fitting, and tighten it with an open-ended wrench.
- 7.3.4 Package the canister and the flow regulator into the shipping container provided by the lab. **Note:** the canister does not require preservation.
- 7.3.5 Complete the appropriate forms and sample labels as directed by the laboratory. Use the sample start time when completing the laboratory chain of custody and double check canister identification numbers for accuracy.
- 7.3.6 Ship the canisters to the laboratory for analysis.

8.0 Data and Records Management

Refer to FSOP 1.3, Field Documentation.

9.0 Quality Assurance and Quality Control

Usually, an ambient air sample is collected outside of the building where the indoor air is being sampled. The ambient air sample is collected at the same time as the indoor air sample and provides quality assurance/quality control (QA/QC) to help evaluate outdoor air quality. In addition, the work plan may specify co-located indoor air samples. Typically, the co-located QA/QC samples are collected at a frequency of 10 percent of the total samples collected.

10.0 Attachments

Indoor Air Building Survey and Sampling Form

Instructions for Building Occupants Prior to Indoor Air Sampling

Vapor Sampling Data Sheet

11.0 References

FSOP 1.1, Initial Site Entry

FSOP 1.3, Field Documentation

FSOP 2.4.2, Construction, Installation and Decommissioning of Sub-Slab Vapor Ports

FSOP 3.1.1, Photoionization Detector

Ohio EPA Standard Safety Operating Procedure SP11-19 (Working Alone)

Ohio EPA Standard Safety Operating Procedure SP14-4 (Confined Space Entry)

[Ohio EPA Division of Environmental Response and Revitalization, May 2010, Sample Collection and Evaluation of Vapor Intrusion to Indoor Air for Remedial Response and Voluntary Action Programs \(Guidance Document\)](#)



INDOOR AIR BUILDING SURVEY and SAMPLING FORM

Preparer's name: _____ Date: _____

Preparer's affiliation: _____ Phone #: _____

Site Name: _____ Case #: _____

Part I - Occupants

Building Address: _____

Property Contact: _____ Owner / Renter / other: _____

Contact's Phone: home () _____ work () _____ cell () _____

of Building occupants: Children under age 13 _____ Children age 13-18 _____ Adults _____

Part II – Building Characteristics

Building type: residential / multi-family residential / office / strip mall / commercial / industrial

Describe building: _____ Year constructed: _____

Sensitive population: day care / nursing home / hospital / school / other (specify): _____

Number of floors below grade: _____ (full basement / crawl space / slab on grade)

Number of floors at or above grade: _____

Depth of basement below grade surface: _____ ft. Basement size: _____ ft²

Basement floor construction: concrete / dirt / floating / stone / other (specify): _____

Foundation walls: poured concrete / cinder blocks / stone / other (specify) _____

Basement sump present? *Yes / No* Sump pump? *Yes / No* Water in sump? *Yes / No*

Type of heating system (circle all that apply):

hot air circulation	hot air radiation	wood	steam radiation
heat pump	hot water radiation	kerosene heater	electric baseboard
other (specify): _____			

Type of ventilation system (circle all that apply):

central air conditioning
 conditioning units
 other (specify): _____

mechanical fans
 kitchen range hood fan

bathroom ventilation fans individual air
 outside air intake

Type of fuel utilized (circle all that apply):

Natural gas / electric / fuel oil / wood / coal / solar / kerosene

Are the basement walls or floor sealed with waterproof paint or epoxy coatings? *Yes / No*

Is there a whole house fan? *Yes / No*

Septic system? *Yes / Yes (but not used) / No*

Irrigation/private well? *Yes / Yes (but not used) / No*

Type of ground cover outside of building: grass / concrete / asphalt / other (specify) _____

Existing subsurface depressurization (radon) system in place? *Yes / No* *active / passive*

Sub-slab vapor/moisture barrier in place? *Yes / No*
 Type of barrier: _____

Part III - Outside Contaminant Sources

Potential contaminated site (1000-ft. radius): _____

Other stationary sources nearby (gas stations, emission stacks, etc.): _____

Heavy vehicular traffic nearby (or other mobile sources): _____

Part IV – Indoor Contaminant Sources

Identify all potential indoor sources found in the building (including attached garages), the location of the source (floor and room), and whether the item was removed from the building 48 hours prior to indoor air sampling event. Any ventilation implemented after removal of the items should be completed at least 24 hours prior to the commencement of the indoor air sampling event.

Potential Sources	Location(s)	Removed (Yes / No / NA)
Gasoline storage cans		
Gas-powered equipment		
Kerosene storage cans		
Paints / thinners / strippers		
Cleaning solvents		
Oven cleaners		
Carpet / upholstery cleaners		
Other house cleaning products		
Moth balls		
Polishes / waxes		
Insecticides		
Furniture / floor polish		
Nail polish / polish remover		
Hairspray		
Cologne / perfume		
Air fresheners		
Fuel tank (inside building)		NA

Wood stove or fireplace		NA
New furniture / upholstery		
New carpeting / flooring		NA
Hobbies - glues, paints, etc.		

Part V – Miscellaneous Items

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

Last time someone smoked in the building? _____ hours / days ago

Does the building have an attached garage directly connected to living space? *Yes / No*

If so, is a car usually parked in the garage? *Yes / No*

Are gas-powered equipment or cans of gasoline/fuels stored in the garage? *Yes / No*

Do the occupants of the building have their clothes dry cleaned? *Yes / No*

If yes, how often? weekly / monthly / 3-4 times a year

Do any of the occupants use solvents in work? *Yes / No*

If yes, what types of solvents are used? _____

If yes, are their clothes washed at work? *Yes / No*

Have any pesticides/herbicides been applied around the building or in the yard? *Yes / No*

If so, when and which chemicals? _____

Has there ever been a fire in the building? *Yes / No* If yes, when? _____

Has painting or staining been done in the building in the last 6 months? *Yes / No*

If yes, when _____ and where? _____

Has there been any remodeling done (flooring/carpeting) in the building in the last 6 months? *Yes / No*

If yes, when _____ and where? _____

Part VI – Sampling Information

Sample Technician: _____ Phone number: () _____ - _____

Sample Source: Indoor Air / Sub-Slab / Near Slab Soil Gas / Exterior Soil Gas

Sampler Type: Tedlar bag / Sorbent / Stainless Steel Canister / Other (specify): _____

Analytical Method: TO-15 / TO-17 / other: _____ Cert. Laboratory: _____

Sample locations (floor, room):

Field ID # _____ - _____ Field ID # _____ - _____

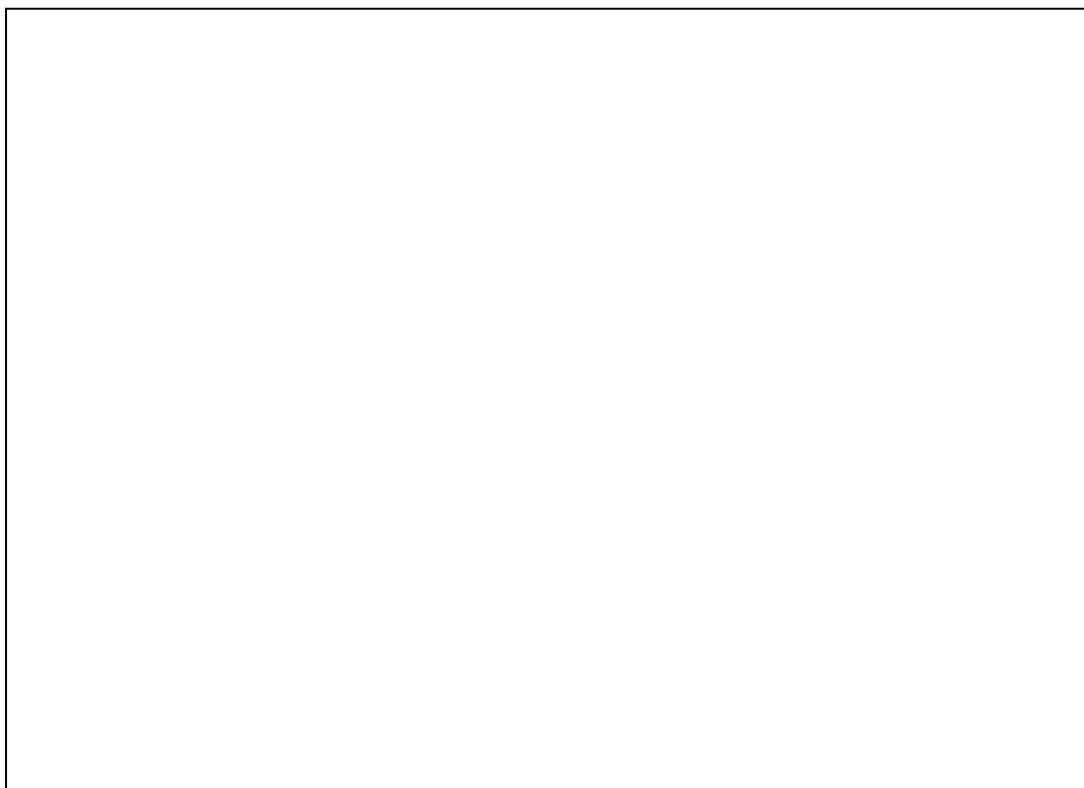
Field ID # _____ - _____ Field ID # _____ - _____

Were "Instructions for Occupants" followed? *Yes / No*

If not, describe modifications: _____

Additional Comments:

Provide Drawing of Sample Location(s) in Building



Part VII - Meteorological Conditions

Was there significant precipitation within 12 hours prior to (or during) the sampling event? *Yes / No*

Describe the general weather conditions: _____

Part VIII – General Observations

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

(NJDEP 1997; NHDES 1998; VDOH 1993; MassDEP 2002; NYSDOH 2005; CalEPA 2005; OhioEPA 2015)



Instructions for Building Occupants Prior to Indoor Air Sampling

Representatives from the Ohio EPA – Division of Environmental Response and Revitalization (DERR) - will be collecting one or more indoor air samples from your building on _____ - beginning @ _____ and ending @ _____. Your assistance is requested during the sampling program in order to collect an indoor air sample that is both representative of indoor conditions and avoids the common background indoor air sources associated with occupant activities and consumer products.

Please follow the instructions below starting at least 48 hours (2 days) prior to and during the indoor air sampling event:

- | | |
|---|---|
| <input type="checkbox"/> Do not operate your furnace and whole house air conditioner as appropriate for the current weather conditions | <input type="checkbox"/> Do not open windows or keep doors open |
| <input type="checkbox"/> Do not use wood stoves, fireplaces or auxiliary heating equipment | <input type="checkbox"/> Do not smoke in the building |
| <input type="checkbox"/> Do not use window air conditioners, fans or vents | <input type="checkbox"/> Do not apply pesticides |
| <input type="checkbox"/> Do not use paints or varnishes (up to a week in advance, if possible) | <input type="checkbox"/> Do not use air fresheners or odor eliminators |
| <input type="checkbox"/> Do not use cleaning products (e.g., bathroom cleaners, furniture polish, appliance cleaners, all-purpose cleaners, floor cleaners) | <input type="checkbox"/> Do not engage in indoor hobbies that use solvents (e.g. gun cleaning) |
| <input type="checkbox"/> Do not use hair spray, nail polish remover, perfume, etc. | <input type="checkbox"/> Do not operate gasoline powered equipment within the building, attached garage or around the immediate perimeter of the building |
| <input type="checkbox"/> Do not store containers of gasoline, oil or solvents within an attached garage. | <input type="checkbox"/> Do not bring freshly dry cleaned clothes into the building |
| <input type="checkbox"/> Do not operate or store automobiles within an attached garage | |

You will be asked a series of questions about the structure, consumer products you store in your building, and occupant activities typically occurring in the building. These questions are designed to identify “background” sources of indoor air contamination. While this investigation is looking for a select number of chemicals related to the known or suspected subsurface contamination, the laboratory will be analyzing the indoor air samples for a wide variety of chemicals. As a result, chemicals such as tetrachloroethene that is commonly used in dry cleaning or acetone, which is found in nail polish remover might be detected in your sample results.

Your cooperation is greatly appreciated. If you have any questions about these instructions, please feel free to

contact _____ at _____.

VAPOR SAMPLING DATA SHEET SUB-SLAB AND INDOOR AIR

General Information

Site Name / Address: _____

Sampling Location / Address: _____
(if other than site address)

Contact Name: _____ Phone: _____

Laboratory & Analytical Method: _____ Method of Delivery: _____
(Courier, UPS, delivered by sampler, etc.)

Sampling Team Members: _____

Met with resident/business on (date) _____ to provide information on VOC inventory and sampling cross-contamination concerns. If not, explain why: _____

Indoor Air Samples

Sample ID #: _____ Canister ID #: _____ Regulator ID #: _____

Start: Date: _____ Time: _____ Initial canister vacuum: _____ mm Hg

End: Date: _____ Time: _____ Final canister vacuum: _____ mm Hg

Regulator Calibrated for: 8 hr _____ 24 hr _____ grab (no regulator) _____

Canister/ Regulator Leak Checked: Yes _____ No _____

Sub-Slab Samples

Sample ID #: _____ Canister ID #: _____ Regulator ID #: _____

Size of canister: _____ Thickness of sub-slab (inches) _____ Port install time: _____

Sampling Start: Date: _____ Time: _____ Initial canister vacuum: _____ mm Hg

Sampling End: Date: _____ Time: _____ Final canister vacuum: _____ mm Hg

Regulator Calibrated for: 8 hr _____ 24 hr _____ grab (no regulator) _____

Canister/ Regulator Leak Checked: Yes _____ No _____ Sub-Slab Port Leak Checked: Yes _____ No _____

Type of sub-slab port: Swagelok _____ Vapor Pin: _____

Sub-Slab Port Installed by: _____ Sub-Slab Port Sealed: Yes _____ No _____

PID Reading: VOC ppb _____ % O₂ _____ PID ID#: _____

NOTES: (sampler/canister problems, other significant sampling details, or FSOP deviations)

Note: If a diagram of the sample location(s) is sketched on the back of this data sheet, check here