Construction, Installation and Decommissioning of Sub-Slab Vapor Ports
FSOP 2.4.2 (May 2, 2018)
Ohio EPA Division of Environmental Response and Revitalization

1.0 Scope and Applicability

Sub-slab vapor ports are used to sample the vapor contained in the interstitial spaces beneath the floor slab of dwellings and other structures for volatile organic compounds (VOCs) and other volatile chemicals. Sub-Slab vapor ports may be constructed using a custom fit stainless steel implant with Swagelok® fittings or a custom pre-manufactured Vapor Pin™.

2.0 Definitions

Summa® Canister: Genericized trademark that refers to electro-polished, 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 pre-determined time-frame for sampling (e.g. 24-hour vs. "grab"). 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 This activity may result in the creation of silica dust when drilling through concrete. To prevent exposure to silica, a HEPA vacuum with an associated dust containment system must be used when drilling through concrete. Staff must be trained in the proper use of the silica dust collection equipment before installing sub-slab vapor probes.

3.5 When using electricity, be cautious of wet areas or areas with standing water, e.g., wet basement floors, sump pumps, etc.

3.6 Be aware of potential vermin (fleas, rats, etc.)

3.7 Hearing protection should be worn while using a hammer drill.

3.8 A dust mask may be worn during drilling if desired.

3.9 Use a photoionization detector (PID) to evaluate VOC concentrations during vapor port installation in accordance with FSOP 3.1.1, Photoionization Detector.

3.10 Review available plans or documents before selecting sampling locations. Ensure that all sub-slab utilities (public and private or building specific) have been located and marked prior to installation.

3.11 Do not attempt to drill through steel-reinforcement (e.g., rebar) within a concrete slab.

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 sub-slab vapor port installation and sampling will need to be obtained during the pre-sampling visit as described below. If a pre-sampling meeting cannot be held due to time constraints, please collect as much of the information as possible as listed below. This information can be obtained during a telephone call or in person.

4.2 A pre-sampling site visit should be conducted to meet with the building's owner and/or tenant and inspect the proposed vapor port sampling locations. During the pre-sampling visit, discuss sample location access and associated logistical concerns, including, but not limited to, lighting and electrical power, the need to temporarily move furnishings, the need to remove floor coverings (e.g., carpet or tile), the location of floor drains and/or other sub-slab utilities, and whether or not the sampling areas are occupied or unoccupied spaces.

4.3 The thickness of concrete slabs varies from structure to structure. A single structure may also have a slab with variable thickness. Drill bits of various sizes and cutting ability may be required to penetrate slabs of variable thicknesses. If a slab contains steel reinforcement (e.g., rebar), a sub-slab vapor port can only be installed if SIFU can find a location where steel reinforcement is not present. SIFU cannot drill through the steel reinforcement within a concrete slab.

4.4 There is a potential for high concentrations of VOC vapors to exist under the slab. Perform work quickly to ensure minimal exposure to VOCs.

4.5 When installing sub-slab vapor ports in commercial or industrial buildings, there is the potential to encounter sub-slab utility conduits (e.g., floor drains or electric, gas or water lines). Follow the procedures provided in section 7.1 for sub-slab utility clearance before installing vapor ports.

4.6 Unless approved by Ohio EPA management and the building owner, sub-slab vapor ports should never be installed in the floor of a building with an existing

sub-slab vapor barrier that is a component of a vapor mitigation system because vapor port installation could penetrate the barrier. However, sub-slab vapor ports may be installed through sub-slab moisture barriers that are typically not components of vapor mitigation systems, providing that the vapor port is decommissioned in accordance with section 7.7 when it is no longer needed for sampling purposes.

4.7 When using the drill and HEPA vacuum, you will exceed 15 amps which is the standard for most household outlets. Therefore, be prepared to connect the drill and the HEPA vacuum to separate outlets.

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

General

6.1 Hammer drill or rotary hammer drill
6.2 Alternating current (AC) extension cord
6.3 AC generator, if AC power is not available on site
6.4 Hammer or rotary hammer drill bit, ⅜" diameter
6.5 Hammer or rotary hammer drill bit, 1" diameter
6.6 1 – ¾" open end wrench or 1 – medium adjustable wrench
6.7 2 – $^{9}/_{16}$" open end wrench or 2 – small adjustable wrenches
6.8 Disposable cups, 5 ounces (oz.)
6.9 Disposable mixing implement (i.e., popsicle stick, tongue depressor, etc.)
6.10 Vapor Sampling Data Sheet, Sub-Slab and Indoor Air (attached) or log book
6.11 Pens and markers
6.12 Flashlight or equivalent head lamp
6.13 Utility knife
6.14 Disposable syringe (60 cc)
6.15 Personal protective equipment appropriate for site-specific work activities\
6.16 Disposable mixing implement (i.e., popsicle stick, tongue depressor, etc.)
6.17 Tap water, for mixing anchoring cement/grout
6.18 Hand broom and dust pan
6.19 Small bottle brush to remove loose debris clean side walls of borehole
6.20 Portable HEPA vacuum
6.21 Dust collector

Swagelok® Equipment and Supplies

6.22 Hex head wrench, ¼"

6.23 Tubing cutter and pipe cutter
6.24 Swagelok® SS-400-7-4 female connector, ¼" national pipe thread (NPT) to ¼" Swagelok® connector
6.25 Swagelok® SS-400-1-4 male connector, ¼" NPT to ¼" Swagelok® connector
6.26 Hose barb adapter, brass, 3/16" barb x ¼" male iron pipe (MIP)
6.27 ¼" NPT flush mount hex socket plug
6.28 ¼" outer diameter (OD) stainless steel tubing, pre-cleaned, instrument grade
6.29 ¼" OD Teflon™ or nylon tubing
6.30 Teflon™ or nylon washer ID ¼", OD ¾"
6.31 ¼" OD stainless welded tubing, 12" to 24" length
6.32 Swagelok® tee, optional (SS-400-3-4TMT or SS-400-3-4TTM)
6.33 Appropriate size tubing

Vapor Pin™ Equipment and Supplies

6.34 Cox-Colvin Vapor Pin™ Kit
6.35 Dead blow hammer
6.36 Appropriate silicon tubing
6.37 Vapor Pin™ protective cap to prevent vapor loss prior to sampling
6.38 Standard Operating Procedure Installation and Extraction of the Vapor Pin™ http://vaporpin.coxcolvin.com/wp-content/uploads/2015/02/Vapor-Pin-SOP-02-27-15-Web.pdf

7.0 Procedures

7.1 Review the 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 sub-slab vapor port installation and sampling will need to be obtained during the pre-sampling visit as described below. If a pre-sampling visit is not feasible, call the owner and/or tenant prior to sampling to obtain the information.

7.2 A pre-sampling site visit should be conducted to meet with the building's owner and/or tenant and inspect the proposed vapor port sampling locations. During the pre-sampling visit, discuss sample location access and associated logistical concerns, including but not limited to lighting and electrical power, the need to temporarily move furnishings, the need to remove floor coverings (e.g., carpet or tile), the location of floor drains and/or other sub-slab utilities and whether or not the sampling areas are occupied or unoccupied spaces.

7.3 Before installing sub-slab vapor ports in a commercial or industrial building, use the following procedures for sub-slab utility clearance:

7.3.1 Perform a visual inspection of the area(s) of the building where vapor ports are to be located for potential sub-slab utility lines.

7.3.2 Discuss the presence and location(s) of sub-slab utility lines with the building owner and/or operator and review any available building construction plans that may show the location of sub-slab utility lines.

7.3.3 If the presence or location(s) of sub-slab utility lines cannot be verified following the procedures in sections 7. 1 and 7. 2, contract a private utility locating company to locate potential sub-slab utility lines before installing vapor ports.

7.4 Preparation and Drilling of the Vapor Port

7.4.1 Connect the dust collector to the HEPA vacuum. Ensure that all connections are tight.

7.4.2 Plug the HEPA vacuum into the outlet and place the dust collector on the floor. Turn on the HEPA vacuum and ensure that the dust collector has created a tight seal with the floor. If a tight seal is not present, turn off the vacuum and check to ensure that all of the connections between the vacuum and the dust collector are tight. If the connections are tight, check the filter. It may be full, and need replaced. Also make sure the rubber gasket on the dust collector is in good condition. Finally, reposition the dust collector to a smoother floor surface. Retest the seal between the dust collector and the floor.

7.4.3 After ensuring that there is a good seal between the floor and the dust collector, set-up the drill and make sure the dust collector is positioned over the location selected for the vapor port. Turn on the vacuum and then the drill.

7.5 Swagelok® Probe Assembly and Installation for Multiple Sampling Events

7.5.1 Drill a ⅜" diameter pilot hole to a depth of approximately 2" (Figure 1).

7.5.2 Using the ⅜" pilot hole as your center, drill a 1" diameter outer hole to a depth of approximately 1 ⅜" (Figure 1). Vacuum cuttings out of the hole.

Figure 1: Assembled sub-slab port ready for installation

7.5.3 Continue drilling the ⅜" inner or pilot hole through the slab and a few inches into the sub-slab material.

7.5.4 Determine the length of stainless steel tubing required to reach from the bottom of the outer hole, through the slab and into the open cavity below the slab. To avoid obstruction of the probe tube, ensure that it does not contact the sub-slab material. Using a tube cutter, cut the tubing to the desired length.

7.5.5 Attach a measured length (typically 3"-4") of ¼" OD stainless tubing to the female connector (SS-400-7-4) with the Swagelok® nut. Make sure that the tubing rests firmly in the fitting body and that the nut is finger tight. While holding the fitting body firmly, tighten the nut 1¼ turns.

7.5.6 Insert the ¼" hex socket plug into the female connector. If using a stainless steel socket plug, wrap one layer of Teflon™ thread tape around the threads to prevent binding. If using a brass socket plug, Teflon™ tape is not needed. Tighten the plug slightly. Do not over tighten. If excessive force is required to remove the plug during the sample set up phase, the probe may break loose from the anchoring cement.

7.5.7 Place the completed probe into the outer hole to check fit and to ensure that stainless steel tubing is not in contact with the sub-slab material. Make necessary adjustments to the hole or probe assembly.

7.5.8 In a disposable cup or other container, mix a small amount of the anchoring cement or grout. Add water sparingly to create a mixture that is fairly stiff and moldable. Place a spoonful or two of the cement/grout around the stainless steel tubing adjacent to the female connector nut. Mold the cement/grout into a mass around the connector nut and up around the main body of the probe assembly. Slide the Teflon™ washer onto the stainless steel tube so that it rests next to the cement/grout mixture. The washer will prevent any anchoring cement/grout from flowing into the inner hole during the final step of probe installation.

7.5.9 Carefully place the probe assembly into the drilled hole, applying light pressure to seat the assembly. While inserting the probe assembly, work the concrete/grout mixture to fill voids. Clean up cement/grout that discharged out of the hole during placement; avoid getting any of the concrete/grout into fittings or on fitting threads. Allow the cement/grout to cure according to manufacturer's instructions before sampling (typically 24 hours). This elapsed time also allows for subsurface conditions to equilibrate prior to sampling.

7.6 Swagelok® Sample Set-Up and Collection

7.6.1 Conduct a leak test prior to sampling. Follow project-specific DQO's and/or the SSWP to determine which of the following method(s) are appropriate:

7.6.1.1 The water dam that is included in the Cox-Colvin Vapor Pin™ kit is a simple means of determining if there are any leaks (see Cox-Colvin instructions, Figure 6). To use the water dam, simply attach the water dam to the floor using putty ensuring that there are no holes between the putty and the floor. Then add water to the dam and observe whether there are any air bubbles. If there are no air bubbles, the seal is tight. If there are air bubbles, refer to Section 7.7.

7.6.1.2 Another option is to evaluate the oxygen concentration by attaching an oxygen sensor (Multi-RAE Pro meter) to the vapor pin. If the percent oxygen drops, it can be inferred that there is a tight seal. However, since this method draws in sub-slab vapor, a longer waiting period may be required before collecting the sample to allow for the sub-slab air to re-equilibrate.

7.6.1.3 A tracer gas can be used during sample collection to evaluate whether the connections between the vapor pin and the sample container have any leaks. A tracer gas is very lightly sprayed on a paper towel and the paper towel is briefly laid around the fittings. As an alternative, the tracer gas can be lightly sprayed into the atmosphere near the sample train. Do NOT spray directly on the fittings. **Note**: you will not know if there were any leaks until after the sample has been analyzed. The recommended tracer gas is 1,1-Difluoroethane, which is present in some brands of dust cleaner for electronics.

7.6.2 Wrap one layer of Teflon™ thread tape onto the NPT end of the male connector OR wrap one layer of Teflon™ tape onto the threaded end of the hose barb adapter (3/16" barb x ¼" MIP).

7.6.3 Carefully remove the ¼" hex socket plug from the female connector. Refer to Section 7.7 if the probe breaks loose from the anchoring cement/grout during this step.

7.6.4 To ensure that the sub-slab port has not been blocked by the collapse of the inner hole below the end of the stainless steel tubing, a stainless steel rod, ⅛" diameter, may be passed through the female connector and the stainless steel tubing. The rod should pass freely to a depth greater than the length of the stainless steel tubing, indicating an open space or loosely packed soil below the end of the stainless steel tubing. Either condition should allow a soil gas sample to be collected. If the port appears blocked, the stainless steel rod may be used as a ramrod to open the port. If the port cannot be cleared, the probe should be reinstalled, or a new probe installed in an alternate location.

7.6.5 Screw and tighten the Teflon™ taped male connector into the female connector, or screw and tighten the hose barb adapter (3/16" barb x ¼" MIP) into the female connector. Do not over tighten. This may cause the

probe assembly to break loose from the anchoring cement/grout during this step or when the male connector/hose barb adapter is removed upon completion of the sampling event. Refer to Section 7.7 if the probe breaks loose from the anchoring compound during this step.

7.6.6 If a co-located sub-slab sample or split sample is desired, a stainless steel Swagelok® T, may be used in place of the male connector.

7.6.7 Using a short piece of silicon tubing, attach a length of ¼" tubing (Teflon™ or nylon) to the sampling container (e.g., SUMMA® canister) or system (e.g., lung box for Tedlar® bag) to be used for sample collection. Connect the other end of the tubing to the male connector with a Swagelok® nut or connect directly to the barbed hose adapter.

7.6.8 Refer to site specific work plan for canister size and type of sample required (e.g., 6-liter canister with regulator for either 8-hour or 24-hour sample collection or a 1-liter evacuated canister for a grab sample). After sampling, use a PID to measure the VOC concentrations to provide the laboratory with an indication of how concentrated the VOCs may be in the sample. Provide this information to the laboratory. **Note**: PID readings are not contaminant-specific quantifications. Do not assume that the PID reading equates (or approximates) the concentration of the contaminant of concern.

7.6.9 After sample collection, remove the male connector or barbed hose adapter from the probe assembly and reinstall the ¼" hex socket plug. Make sure the plug threads are wrapped with Teflon tape. Do not over tighten the hex socket plug. If excessive force is required to remove the plug during the next sampling event, the probe may break loose from the anchoring compound. Refer to Section 7.7 if the probe breaks loose from the anchoring compound during this step.

7.7 Repairing a Loose Swagelok® Probe Assembly

7.7.1 If the probe assembly breaks loose from the anchoring compound while removing or installing the hex socket plug, the Swagelok® male connector, or the barbed hose adapter, lift the probe assembly slightly above the surface of the concrete slab.

7.7.2 Hold the female connector with the ¾"open-ended wrench.

7.7.3 Complete the step being taken during which the probe broke loose, following the instructions contained in this SOP (i.e., do not over tighten the hex socket plug, the male connector, or the barbed hose adapter).

7.7.4 Push the probe assembly back down into place and reapply the anchoring cement/grout.

Figure 2: Swagelok® port connected to canister and ready for sampling

7.8 Vapor Pin™ Probe Installation

7.8.1 Refer to attached Cox-Colvin Vapor Pin™ Standard Operating Procedure for proper vapor pin installation and removal.

7.8.2 After installing a Vapor Pin™ place the small rubber cap over the barbed inlet to prevent and gas from escaping.

7.8.3 Conduct a leak test. The project specific DQO's or SSWP may dictate which of the following method(s) may be followed. **Note**: There are other techniques beyond those listed that may be used.

7.8.3.1 The water dam that is included in the Cox-Colvin Vapor Pin™ kit is a simple means of determining if there are any leaks (see Cox-Colvin instructions, Fig 6). To use the water dam, attach the water dam to the floor using putty ensuring that there are no holes between the putty and the floor. Then add water to the dam and observe whether there are any air bubbles. If there are no bubbles, the seal is tight. If there are air bubbles, remove the water and reset the vapor point. Test with the water dam again to see if the seal is now tight. Remove the water and dam once test is complete.

7.8.3.2 Another option is to attach an oxygen sensor (Multi-RAE Pro meter) to the vapor pin and evaluate the oxygen concentration. If the percent oxygen drops, it can be inferred that there is a tight seal. However, since this method draws in sub-slab vapor, a longer waiting period may be required before collecting the sample to allow for the sub-slab air to re-equilibrate.

7.8.3.3 A tracer gas can be used during sample collection to evaluate

whether the connections between the vapor pin and the sample container have any leaks. A tracer gas is very lightly sprayed on a paper towel and the paper towel is briefly laid around the fittings. As an alternative, the tracer gas can be lightly sprayed into the atmosphere near the sample train. Do NOT spray directly on the fittings. **Note**: you will not know if there were any leaks until after the sample has been analyzed. The recommended tracer gas is 1,1-Difluoroethane, which is present in some brands of dust cleaner for electronics.

7.8.3.4 Allow 2 hours for the sub-slab soil gas conditions to re-equilibrate prior to sample collection unless site-specific work plan requires a different equilibration time.

Figure 3: Vapor Pin™ installed and ready for sampling

7.9 Vapor Pin™ Sample Collection

7.9.1 Remove the rubber cap and attach a piece of ¼" tubing (Teflon™ or nylon) to the barbed hose adapter. The tubing must be long enough to span from the sample port to the sample container (e.g., SUMMA® canister) or system (e.g., lung box for Tedlar® bag).

7.9.2 Refer to site specific work plan for canister size and type of sample required (e.g., 6-liter canister with regulator for either 8-hour or 24-hour sample collection or a 1-liter evacuated canister for a grab sample). After sampling, use a PID to measure the VOC concentrations to provide the laboratory with an indication of how concentrated the VOCs may be in the sample. Provide this information to the laboratory. **Note:** this number is not contaminant specific. Do not assume that your contaminant of concern equates to the reading from the PID.

7.10 Vapor Port Decommissioning

Remove the vapor pin according to the attached Cox-Colvin Vapor Pin™ Standard Operating Procedure for proper vapor pin installation and removal.

7.10.1 Prior to filling the vapor port hole, measure the slab thickness. One method is to use a "hole hook", a section of rigid wire (such as a stiff-wire coat hanger) with a small (0.25-inch) 90-degree crimp at one end. Insert the hole hook inside the drilled hole and catch the hooked end on the underside of the concrete slab. Mark the wire where it meets the top of the slab, remove the hole hook, and measure the distance between the hooked end and marked end of the wire to determine the slab thickness. Record the measured slab thickness on the log sheet or in a field note book. This information is necessary if a sub-slab treatment system is ever installed.

7.10.2 Gently pour dry granular bentonite into the hole to fill any void space in the gravel or soil below the underside of the slab that may have been created during the drilling of the slab or installation of the vapor port. Continue adding bentonite until the level is approximately one inch below the top of the slab.

7.10.3 Slowly add a small amount of water to hydrate the bentonite without creating a column of standing water in the hole. Use of a flashlight when adding water helps to visually determine when the bentonite stops absorbing water. If too much water is added, use a syringe or absorbent material (e.g., paper towels) to remove the standing water. While adding water, try to wet the hole side walls to help create good contact with the floor tile grout that will be used to fill and seal the hole as described below.

7.10.4 Mix approximately ¼ cup of floor tile grout with a small amount of water using a disposable spoon. Add water until the consistency of the grout mixture is a little stiffer than drywall or spackling compound.

7.10.5 Use a plastic knife, putty knife, tongue depressor or similar tool to add the tile grout mixture to the hole until it is completely full. Use a concrete trowel or similar tool to remove any excess grout and finish the top of the seal so that it is smooth and even with the surrounding floor.

7.10.6 Clean up the area around the sealed hole and complete any needed field documentation, including photographs if required.

8.0 Data and Records Management

Refer to FSOP 1.3, Field Documentation.

9.0 Quality Assurance and Quality Control

9.1 Clean Vapor Pins™ and sampling ports prior to installation by washing in warm water with laboratory-grade detergent, followed by rinsing with hot water and then rinsing with deionized water. Always inspect equipment before use.

9.2 Leak testing should be conducted to document the quality of the sample.

9.3 Photographs of the sampling location and equipment may be required for project documentation.

9.4 Refer to the data quality objectives (DQOs) provided in the work plan.

10.0 Attachments

Cox-Colvin Standard Operating Procedure, Installation and Extraction of the Vapor Pin™

Vapor Sampling Data Sheet, Sub-Slab and Indoor Air (revised May 2018)

11.0 References

FSOP 1.1, Initial Site Entry

FSOP 1.3, Field Documentation

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)

Standard Operating Procedure Installation and Extraction of the Vapor Pin™

Updated February 27, 2015

Scope:

This standard operating procedure describes the installation and extraction of the Vapor Pin™ for use in sub-slab soil-gas sampling.

Purpose:

The purpose of this procedure is to assure good quality control in field operations and uniformity between field personnel in the use of the Vapor Pin™ for the collection of sub-slab soil-gas samples or pressure readings.

Equipment Needed:

- Assembled Vapor Pin™ [Vapor Pin™ and silicone sleeve(Figure 1)]; Because of sharp edges, gloves are recommended for sleeve installation;
- Hammer drill;
- 5/8-inch (16mm) diameter hammer bit (Hilti™ TE-YX 5/8" x 22" (400 mm) #00206514 or equivalent);
- 1½-inch (38mm) diameter hammer bit (Hilti™ TE-YX 1½" x 23" #00293032 or equivalent) for flush mount applications;
- ¾-inch (19mm) diameter bottle brush;
- Wet/Dry vacuum with HEPA filter (optional);
- Vapor Pin™ installation/extraction tool;
- Dead blow hammer;
- Vapor Pin™ flush mount cover, if desired;
- Vapor Pin™ drilling guide, if desired;
- Vapor Pin™ protective cap; and
- VOC-free hole patching material (hydraulic cement) and putty knife or trowel for repairing the hole following the extraction of the Vapor Pin™.

Figure 1. Assembled Vapor Pin™

Installation Procedure:

1) Check for buried obstacles (pipes, electrical lines, etc.) prior to proceeding.

2) Set up wet/dry vacuum to collect drill cuttings.

3) If a flush mount installation is required, drill a 1½-inch (38mm) diameter hole at least 1¾-inches (45mm) into the slab. Use of a Vapor Pin™ drilling guide is recommended.

4) Drill a 5/8-inch (16mm) diameter hole through the slab and approximately 1-inch (25mm) into the underlying soil to form a void.

5) Remove the drill bit, brush the hole with the bottle brush, and remove the loose cuttings with the vacuum.

6) Place the lower end of Vapor Pin™ assembly into the drilled hole. Place the small hole located in the handle of the installation/extraction tool over the Vapor Pin™ to protect the barb fitting, and tap the Vapor Pin™ into place using a dead blow hammer (Figure 2). Make sure the installation/extraction tool is aligned parallel to the Vapor Pin™ to avoid damaging the barb fitting.

Figure 2. Installing the Vapor Pin™.

During installation, the silicone sleeve will form a slight bulge between the slab and the Vapor Pin™ shoulder. Place the protective cap on Vapor Pin™ to prevent vapor loss prior to sampling (Figure 3).

Figure 3. Installed Vapor Pin™

7) For flush mount installations, cover the Vapor Pin™ with a flush mount cover, using either the plastic cover or the optional stainless-steel Secure Cover (Figure 4).

Figure 4. Secure Cover Installed

8) Allow 20 minutes or more (consult applicable guidance for your situation) for the sub-slab soil-gas conditions to re-equilibrate prior to sampling.

9) Remove protective cap and connect sample tubing to the barb fitting of the Vapor Pin™. This connection can be made using a short piece of Tygon™ tubing to join the Vapor Pin™ with the Nylaflow tubing (Figure 5). Put the Nylaflow tubing as close to the Vapor Pin as possible to minimize contact between soil gas and Tygon™ tubing.

Figure 5. Vapor Pin™ sample connection.

10) Conduct leak tests in accordance with applicable guidance. If the method of leak testing is not specified, an alternative can be the use of a water dam and vacuum pump, as described in SOP Leak Testing the Vapor Pin™ via Mechanical Means (Figure 6). For flush-mount installations, distilled water can be poured directly into the 1 1/2 inch (38mm) hole.

Figure 6. Water dam used for leak detection

11) Collect sub-slab soil gas sample or pressure reading. When finished, replace the protective cap and flush mount cover until the next event. If the sampling is complete, extract the Vapor Pin™.

Extraction Procedure:

1) Remove the protective cap, and thread the installation/extraction tool onto the barrel of the Vapor Pin™ (Figure 7). Continue turning the tool clockwise to pull the Vapor Pin™ from the hole into the installation/extraction tool.

2) Fill the void with hydraulic cement and smooth with a trowel or putty knife.

Figure 7. Removing the Vapor Pin™.

3) Prior to reuse, remove the silicone sleeve and protective cap and discard. Decontaminate the Vapor Pin™ in a hot water and Alconox® wash, then heat in an oven to a temperature of 265° F (130° C) for 15 to 30 minutes.

The Vapor Pin™ to designed be used repeatedly, however, replacement parts and supplies will be required periodically. These parts are available on-line at VaporPin.CoxColvin.com.

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_____ **% 02**_____ **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 ☐

Revised: 05.2018