SUB-SLAB VENTILATION SYSTEM INSTALLATION REPORT
72 East Main Street, Babylon, NY

EUGENE'S DRY CLEANERS SITE – SITE # 152157
WORK ASSIGNMENT NO. D004434-27

Prepared for:

New York State Department of Environmental Conservation
Albany, New York

Prepared by:

MACTEC Engineering and Consulting, P.C.
Portland, Maine

MACTEC Project No. 3612072087

SEPTEMBER 2009

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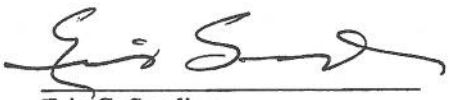
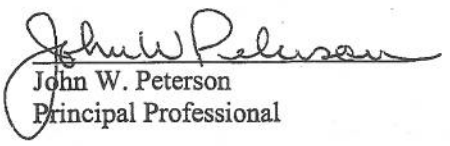
Submitted by:



Eric C. Sandin
Project Manager

Approved by:



John W. Peterson
Principal Professional

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GLOSSARY OF ACRONYMS AND ABBREVIATIONS

ESI	Ecosystems Strategies, Inc.
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PCE	tetrachloroethene
SSV	Sub-Slab Ventilation
TCE	trichloroethene
VOC	volatile organic compound
W.C.	water column

1.0 INTRODUCTION

The purpose of this document is to provide information on an active Sub-Slab Ventilation (SSV) System installed at 72 East Main Street, Babylon, New York. The SSV system was provided by the New York State Department of Environmental Conservation (NYSDEC) to limit the potential for intrusion of soil vapors through cracks and openings in the foundation. The Eugene's Dry Cleaners site, (Site # 152157) is a former dry cleaner that was located at 54 East Main Street. Volatile organic compounds (VOCs) such as tetrachloroethene (PCE) and trichloroethene (TCE) are present in the vicinity of 54 East Main Street in shallow soils and groundwater. As concentrations attenuate over time, VOCs can volatilize and migrate in soil vapor to adjacent structures.

MACTEC Engineering and Consulting, P.C. was retained by the NYSDEC to design and oversee the installation of the system. The SSV system uses a fan and piping to create a preferential pathway for soil vapors to move from beneath the building to the outside of the building. A report provided by the system installer presenting the system details, photographs, specifications, and warranty information is provided in Appendix A. For further information on soil vapor intrusion, PCE and TCE, please refer to the New York State Department of Health (NYSDOH) fact sheets provided in Appendices B through D.

2.0 DESCRIPTION OF THE SUB-SLAB VENTILATION SYSTEM

The SSV system that has been installed in the building consists of two extraction points, polyvinyl chloride piping, a u-tube manometer, and a fan. The components of a typical SSV system are shown in Figure 2.1. As designed, the fan draws air from the soil beneath the building at the extraction point and discharges it above the roof line at the vent location. The fan will also draw moisture into the tubing which will condense on the walls of the tubing. The system is designed to allow any condensation to bypass the fan and drain back to the extraction point. The manometer measures the pressure in the SSV piping and is used to verify that the system is operating properly.

3.0 INSTALLATION AND WARRANTY INFORMATION

The As-Built SSV System Plan for this installation is shown in Figure 3.1. The system was installed by Ecosystems Strategies, Inc. (ESI), a NYSDOH-Certified Mitigation Contractor. ESI states that they will provide a two (2) year warranty on the system and that this warranty is transferrable if the property is sold. The wiring for the fan was completed by Go West Electric, a Suffolk County licensed electrical contractor (Suffolk County License Number: 36253). The fan installed is the Fantech model HP-220. Because the system was professionally designed and installed the fan is under warranty for five years.

Warranty information can be found at:

1) ESI Warranty Statement is located in Appendix A (in Appendix F of ESI Final Report).
2) Fan Warranty and Bill of Sale is located in Appendix A (in Appendix E of ESI Final Report).

4.0 HOW TO CHECK THAT THE SYSTEM IS OPERATING PROPERLY

The manometer should be used to verify that the system is operating properly. A manometer reading of zero indicates system failure, and a manometer reading significantly less than the original reference reading noted on the label (approximately 2.3 W.C.) indicates degradation of the system. Please refer to the photographs appended to the Ecosystems Installation Report (Appendix A) for a picture of the manometer as operating properly. If the system was not operating, the fluid levels in the u-tube would be at equal heights. If either of these two situations has occurred, then service is required. Please contact the NYSDEC project manager Mr. Brian Jankauskas at 518-402-9620 to arrange for a service visit.

5.0 MAINTENANCE AND INSPECTION OF THE SYSTEM

The system requires minimal maintenance. The primary method of evaluating the systems operation is by the property occupant. Periodic (e.g., every 3 months) assessments are suggested to verify that the system is operating properly based on the information provided in Section 4.0. If a problem is identified, please contact the NYSDEC project manager Mr. Brian Jankauskas at 518-402-9620 to arrange for a service visit.

Audits may be performed by NYSDEC to evaluate performance of the system. These may include:

- Inspection of the manometer to see if there is failure or degradation of the system.
- Inspection of the extraction point to see that it has remained sealed.
- Inspection of piping and vent stacks for cracks or leaks on interior and exterior of the building.
- Inspection of fan and rubber mounts for leaks.
- Inspection of electrical connection and test of cut off switch by turning the switch on an off.
- Collection of air samples while the fan is on and/or off.

6.0 CONTACT INFORMATION

Comments or questions regarding the system, please contact the NYSDEC project manager Mr. Brian Jankauskas at 518-402-9620.

7.0 SUPPORTING DOCUMENTS

The following documents are attached:

- Final Report for Sub-Slab Ventilation System Installation. This report was provided by the system installer and presents the system details, photographs, specifications, and warranty information.
- NYSDOH Soil Vapor Intrusion Frequently Asked Questions
- NYSDOH Fact Sheets for Tetrachloroethene and Trichloroethene in Indoor and Outdoor Air

FIGURES

Figure 2.1

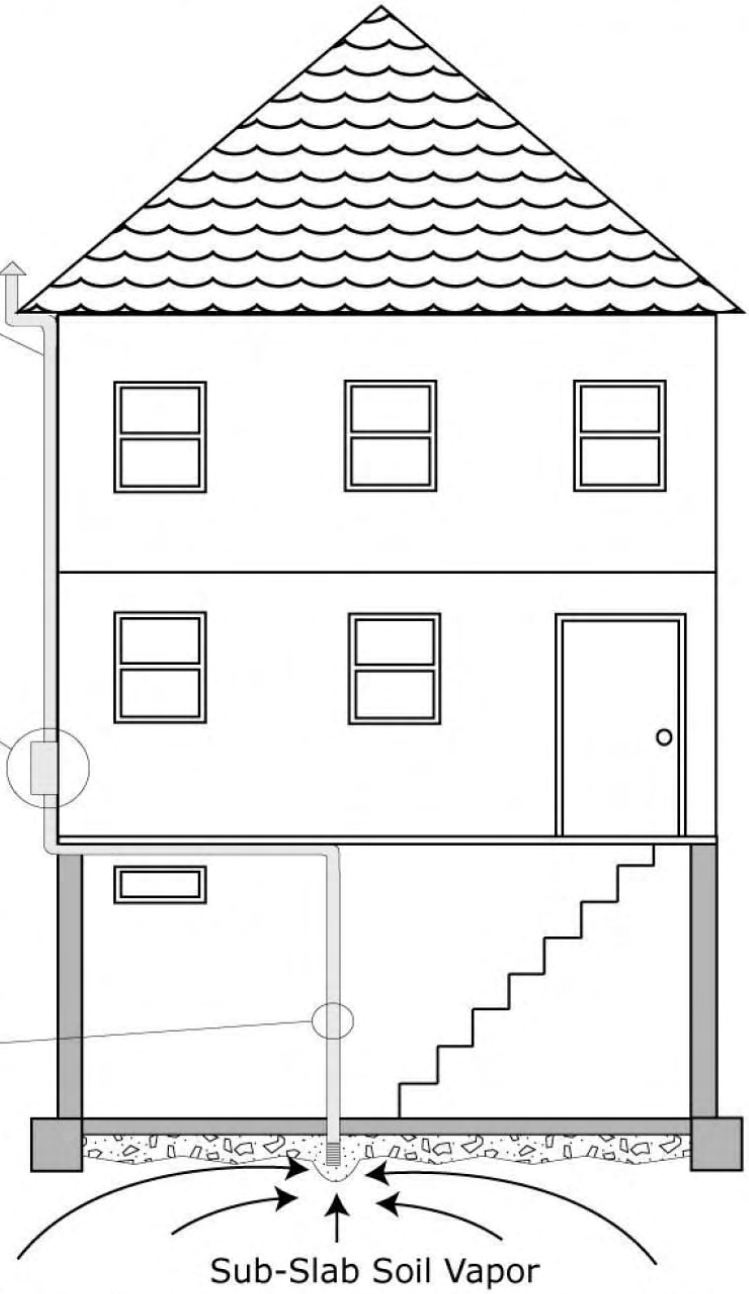
Sub-Slab Depressurization System

(commonly called a radon mitigation system)

The vent pipe is routed uo the side of the structure to a location above the roof line.

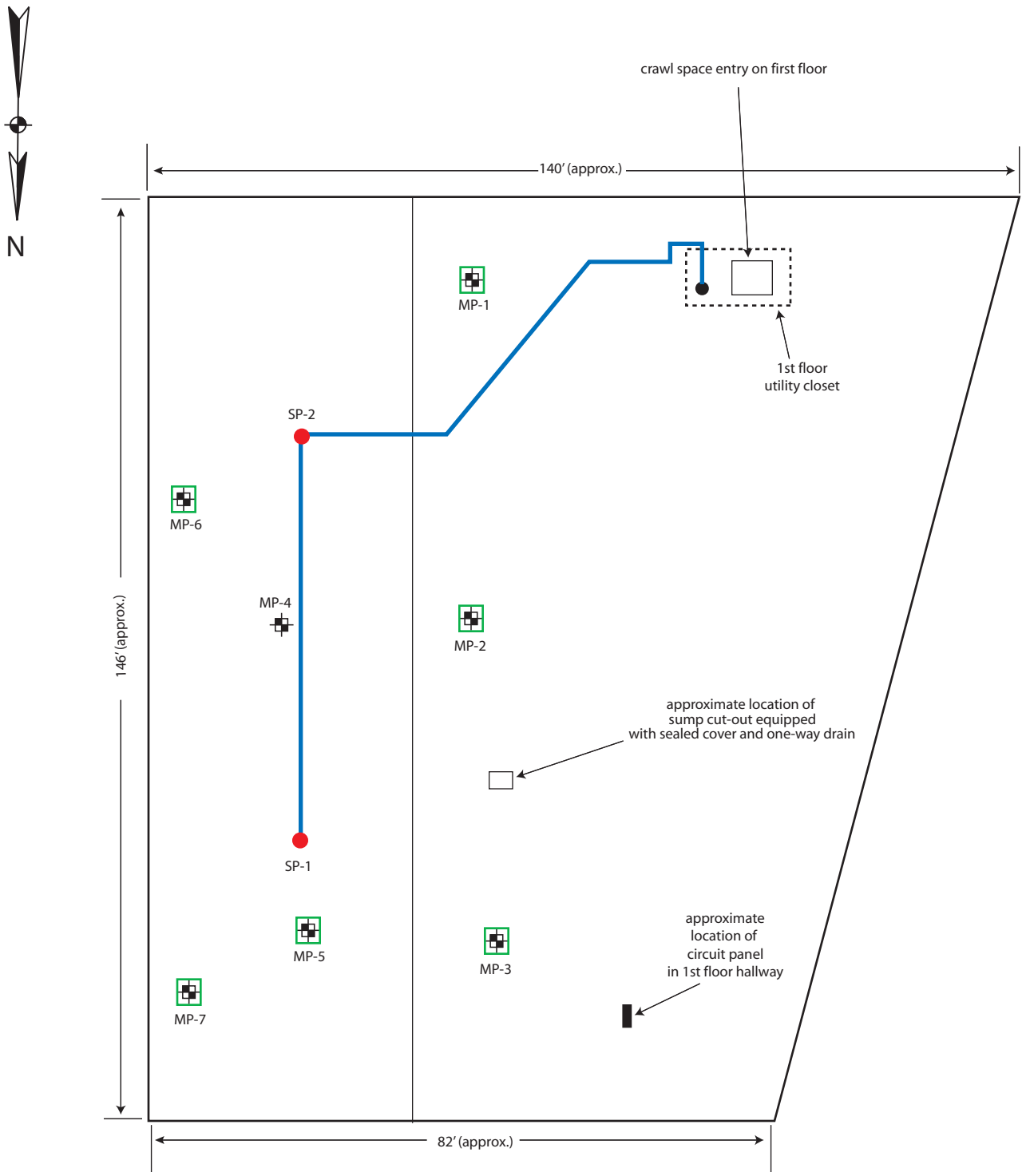
A fan is used to draw soil vapor from beneath the slab.

A liquid gauge, or manometer is used to verify that the system is operating properly



A sub-slab depressurization system vents contaminated soil vapor before it enters a structure. The fan draws vapor from beneath the building outside to the roof line where it is released to the outside air.

Source: NYSDOH 2006. Guidance for Evaluating Soil Vapor Intrusion in the State of New York



All feature locations are approximate. This map is intended as a schematic to be used in conjunction with the associated report, and it should not be relied upon as a survey for planning or other activities.

As-Built SSV System Plan

72 East Main Street
Village of Babylon
Suffolk County, New York

Legend:

- system piping (4" schedule 40 PVC)
- suction point
- permanent monitoring point
- temporary monitoring point
- location of vertical riser to building rooftop (system fan & discharge located on roof)

ESI File: MB09023.30

July 2009

Scale as shown

Figure 2.1

Source: Ecosystems Strategies, Inc., 2009. Final Report for Sub-Slab Ventilation System Installation.

APPENDIX A

INSTALLATION CONTRACTOR'S
FINAL REPORT FOR SUB-SLAB VENTILATION SYSTEM INSTALLATION

FINAL REPORT

FOR

SUB-SLAB VENTILATION SYSTEM INSTALLATION

Prepared for the
Eugene's Dry-Cleaners Site

Village of Babylon
Suffolk County, New York

Site Number: 1-53-157
NYSDEC Program Number: D004434-27

ESI File: MB09023.30R

Date of Preparation: July 2009
-REVISED September 2009

Ecosystems Strategies, Inc.
24 Davis Avenue, Poughkeepsie, NY 12603
phone 845.452.1658 | fax 845.485.7083 | ecosystemsstrategies.com

Ecosystems Strategies, Inc.

FINAL REPORT

FOR

SUB-SLAB VENTILATION SYSTEM INSTALLTION

Prepared for the
Eugene's Dry-Cleaners Site

Village of Babylon
Suffolk County, New York

Site Number: 1-53-157
NYSDEC Program Number: D004434-27

ESI File: MB09023.30R

Date of Preparation: July 2009
-REVISED September 2009

Prepared By:

Ecosystems Strategies, Inc.
24 Davis Avenue
Poughkeepsie, New York 12603

Prepared For:

MACTEC Engineering and Consulting, P.C.
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P.O. Box 7050
Portland, ME 04112-7050

The undersigned has reviewed this Final Report for Sub-Slab Ventilation System Installation and certifies to MACTEC Engineering and Consulting, P.C. that the information provided in this document is accurate as of the date of issuance by this office.

Paul H. Ciminello
President

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1.0 OVERVIEW

1.1 Introduction

This Final Report for Sub-Slab Ventilation System Installation (Final Report), prepared by Ecosystems Strategies, Inc. (ESI), documents the installation and testing of a sub-slab ventilation (SSV) system within the commercial structure located at 72 East Main Street in the Village of Babylon, Suffolk County, New York (hereafter referred to as the Site). All system installation work was performed at the Site by ESI, or designated ESI sub-contractors, on June 16 and 17, 2009. System installation methodology, testing, and observations are discussed in applicable sections below. A statement of ESI's system warranty is provided in Appendix F.

All work detailed herein was conducted in accordance with the associated MACTEC Engineering and Consulting, P.C. (MACTEC) Scope of Work (SOW), dated July 2008; the New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH Guidance), dated October 2006; the American Society for Testing Materials (ASTM) Standard Practice for Installing Radon Mitigation Systems in Existing Low-Rise Residential Structures (ASTM E2121), dated February 2003; ESI's Final Work Plan for Sub-Slab Ventilation System Installation (Final Work Plan), dated May 2009, and site-specific Health and Safety Plan (HASP), dated March 2009; and, applicable local/national building regulations and codes.

2.0 SUB-SLAB VENTILATION SYSTEM INSTALLATION

2.1 Permitting and Inspections

In accordance with local regulations, a building permit was acquired from the Village of Babylon Building Department prior to the start of installation work at the Site. Building permit number 11685 was assigned to the project on June 8, 2009. An electrical inspection was conducted by the New York Board of Fire Underwriters on July 6, 2009 and a Certificate of Occupancy (CO) was issued by the Building Department on July 10, 2009, indicating that all applicable code requirements had been met, and that the building permit had effectively been closed. A copy of the building permit, electrical inspection certificate, and CO are provided in Appendix A of this Final Report.

2.2 Safety Measures

All work conducted at the Site was conducted in accordance with ESI's site-specific HASP. The HASP provides information on hazards specific to the nature of work at the Site and defines the measures to be taken in the event of an emergency situation. Prior to the start of work at the Site on June 16, 2009, an on-site safety briefing was conducted with both ESI and MACTEC personnel.

For the purposes of ESI's installation work, the on-site crawlspace (where the majority of ESI's installation work was conducted), was considered to be an unrestricted confined space. As such, additional safety measures, above and beyond the HASP, were implemented by ESI. These safety measures included:

- Notifying the Village of Babylon Fire Department of the schedule and nature of ESI's proposed work;
- Placement of a crawlspace entry attendant, whose responsibilities included maintaining a log of on-site personnel/activities, crawlspace entry/exit times, and monitoring device readings, as well as being the primary contact for individuals within the crawlspace in the event of an emergency;
- Screening of air in the vicinity of the crawlspace entrance using a photo-ionization detector (PID), in order to determine the presence or absence of volatile organic compounds (VOCs) associated with PVC cement, which may be affecting air within the building entry foyer;
- Screening of the work area within the crawlspace using an Area RAE Monitor, to verify a permissible entry level of oxygen and monitor VOCs;
- Maintaining a fresh air blower and ample ductwork on-site, to be used in the crawlspace the event of the detection of unacceptable oxygen and/or VOC levels; and,
- Maintaining Level C respiratory protection (half-face respirators equipped with organic vapor cartridges and N95 particulate pre-filtration) on-site, to be used by individuals in the crawlspace in the event of unacceptable VOC levels.

No emergency situations were encountered during the course of the system installation work conducted by ESI, and no instrument readings were recorded which indicated the need for use of engineering controls or additional personal protective equipment (above and beyond Level D).

Copies of ESI's daily work logs, which document all activities and instrument readings, are included in Appendix B.

2.3 Pre-Installation Communication Testing

On June 16, 2009, prior to the start of any installation work, ESI performed sub-slab communication testing in order to determine if the proposed SSV system design, as described in the Final Work Plan, was capable of creating adequate negative pressure below the building slab. Adequate negative pressure has been defined by MACTEC to be a minimum pressure change of -0.025 inches of water column (W.C.).

Communication testing was conducted by creating pressure monitoring points through the building slab. Each monitoring point was created by breaching the slab with a ½" concrete drill bit. A 6.0 horsepower shop vacuum was used to apply vacuum at the proposed suction point locations (in the northeast and north-central portions of the building crawlspace), and an Infiltec digital micro-manometer (pressure resolution of 0.001 W.C. and 0.01 Pascals [Pa]), was used to collect pressure data at the monitoring points. The data collected from this initial testing indicated that the proposed suction point locations were not capable of creating adequate negative pressure at all of the pressure monitoring points.

Alternate suction points (SP-1 and SP-2) were selected to the southwest of each of the previous test points, and additional communication testing was conducted to determine the viability of those suction points. Table 1, below, presents the results of the communication testing performed while applying suction to SP-1 and SP-2. The approximate locations of SP-1, SP-2, and the pressure monitoring points (MP-1 through MP-7) are depicted on the As-Built SSV System Plan provided in Appendix C.

Table 1: Pre-Installation Communication Test Results for SP-1 and SP-2
All data provided in inches of water column (W.C.).

Monitoring Point	Initial Pressure – Vacuum Off	End Pressure – Vacuum Applied to SP-1	End Pressure – Vacuum Applied to SP-2
MP-1	0.000	-0.002	-0.500
MP-2	0.000	-0.025	NE
MP-3	0.000	-0.012	NE
SP-2*	0.000	-0.004	-
MP-4	0.000	-0.055	-0.189
MP-5	0.000	-0.366	NE
MP-6	0.000	-0.038	-0.249
MP-7	0.000	-0.037	NE

Notes:
* = Suction point SP-2 was used as a temporary monitoring point during the communication testing.
NE = Not Evaluated

The results of the communication testing with suction applied to SP-1 indicated adequate negative pressure at all monitoring points, with the exception of MP-1, MP-3, and SP-2 (used as a temporary monitoring point during the testing). The results of the communication testing with suction applied to SP-2 indicated adequate negative pressure at MP-1; however, no re-evaluation of MP-3 was made. The collected data indicated that suction applied to both SP-1 and SP-2 would induce adequate negative pressure at all points, with the exception of MP-3; however, negative pressure at MP-3 was expected to improve following construction of the suction pit at SP-1. SP-1 and SP-2 were therefore concluded to be the final system suction point locations, and system installation was initiated.

2.4 Final System Design and Installation Methodology

The final system design was determined through communication testing, observations of the Site layout, and consultation with MACTEC. A discussion of the final system design and installation methodology is provided below. The final system design, as well as other relevant Site features, is depicted on the As-Built SSV System Plan provided in Appendix C. Photographs of the system are provided in Appendix D.

2.4.1 Rooftop Suction Pipe and Electrical Conduit Penetrations

On June 16, 2009, the system rooftop suction pipe and electrical conduit penetrations were completed by All Seasons Commercial Systems, Inc. (All Seasons). ESI personnel met All Seasons on-site and showed them the locations of the rooftop penetrations. All Seasons installed a section of 4-inch Schedule 40 PVC and ¾" aluminum conduit on the building rooftop, immediately above the utility closet and crawlspace entrance, in the locations which ESI had indicated. Following installation, ESI inspected the roof penetrations and noted that they had been adequately completed.

2.4.2 System Suction Points

Given the results of the communication testing, the final system suction points (SP-1 and SP-2) were located to the southwest of those proposed in the Final Work Plan. The suction points were created by breaching the building slab with a 5-inch concrete core bit in each location. A sufficient volume of material (enough to roughly fill a 5-gallon pail) was removed from below the slab at each suction point to create a suction pit. A 4-inch Schedule 40 PVC coupler was hammered into each slab hole to provide easy connection for associated suction piping, and to enhance pipe stability at the slab penetrations. A urethane-based concrete/masonry sealant was applied around the suction point slab penetrations to create an air-tight seal.

[Note: It was observed that the material underlying the slab consisted of loosely packed, fine to medium sand, which is conducive to relatively good sub-slab air movement, as evidenced by the results of the pre-installation communication testing.]

2.4.3 Suction Piping

The suction piping installed at the Site consists of 4-inch Schedule 40 PVC. Suction piping was installed from SP-1, to the south, to SP-2. From SP-2, suction piping was installed in a generally southwest direction, toward the crawlspace entrance. Suction piping was then installed vertically, just east of the crawlspace entrance, through the first floor utility closet to the building rooftop, where the exterior-mounted system fan was installed (see Section 2.4.4, below).

All pipe unions were cemented using low-volatile organic compound (VOC) emitting PVC glue. In accordance with ASTM E2121 protocol, pipe supports (i.e., galvanized pipe clips, plastic DWV hook hangers, and plastic strapping) were installed at least every six feet on horizontal pipe runs, and at least every eight feet on vertical pipe runs, and a positive slope (at least 1/8" per linear foot of pipe) was maintained in order to allow draining of internal condensation toward the suction points. In-line dampers were installed within the suction piping above each suction point, in order to allow for balancing of vacuum below the slab.

2.4.4 System Fan

As specified in the Final Work Plan, the system fan installed at the Site is the Fantech model HP-220. A copy of the manufacturer's fan specifications, including a statement of warranty, is provided in Appendix E.

At the request of the property owner, the system fan was installed on the building rooftop in order to maintain building aesthetics. The fan was installed on the suction pipe terminus above the utility closet and crawlspace entrance, approximately two feet above the roof surface. The fan was mounted directly to the suction piping using 6-inch by 4-inch flexible couplers with steel draw bands. A Fan Guard drain system was installed on the system piping immediately above the fan and a PVC rain cap was installed above the drain to prevent excessive internal moisture and entrance of foreign materials (e.g., leaves or small animals).

On June 17, 2009, wiring of the system fan was completed by Go West Electric, a Suffolk County licensed electrical contractor (Suffolk County License Number: 36253). Wiring was installed from the building's circuit panel at the northern end of the building, south through a dropped ceiling on the first floor, to the fan above the utility closet. A system switch was wired to the system fan on the building rooftop. All external wiring was housed in external-grade, rigid aluminum conduit, and the system switch was housed in a weather-proof, external-grade box.

2.4.5 Sealing

In order to seal off an area of potential system vacuum loss and likely vapor intrusion, a ¼" thick, clear Lexan cover was installed on a sump pit located near the central portion of the crawlspace. The cover was recessed below the edge of the pit to allow collection of water, and a one-way Dranjer valve was installed that allows water to drain from above while maintaining an air-tight seal. A pliable elastomeric sealant was used to create an air-tight seal around the cover. The pliable sealant allows the cover to easily be removed and replaced as needed, providing access to the sump pit.

2.4.6 System Fail-Safe Device

A u-tube manometer, which serves as the system fail-safe device, was installed on the vertical suction piping in the first floor utility closet. The u-tube manometer was securely attached to the piping with a fastening screw and associated pressure tubing was inserted directly into the system suction pipe. The u-tube manometer measures internal system pressure (in units of W.C.) and is an indicator that the system fan is operating.

2.4.7 Permanent Pressure Monitoring Point

In accordance with the Final Work Plan, a permanent pressure monitoring point was installed at the Site. Monitoring point MP-4, located between suction points SP-1 and SP-2, was selected as the permanent monitoring point location.

The permanent monitoring point was created using a barbed hose fitting connected to ¼"-diameter polyethylene tubing via a plastic tube snap-connector fitting. Associated tubing was inserted through the slab penetration to just below slab depth. The point was set firmly in place using cement patch and the barbed fitting was capped to maintain an air-tight seal.

2.4.8 Air Sample Port

An air sample port was installed on the system piping just above the system fan on the rooftop. The sample port consists of a brass ball valve and barbed hose fitting, which allows for screening and sampling of the system effluent air, if needed.

3.0 SYSTEM START-UP AND TESTING

3.1 Start-Up and System Check

Following completion of system installation, all system components were checked:

- The system fan was started and noted to be functioning properly;
- The system fan switch and fan breaker were tested and found to be functioning properly;
- All piping and supports were inspected and noted to be firmly in place;
- The in-line damper at SP-2 was adjusted to allow vacuum to be more evenly distributed between SP-1 and SP-2;
- The sealed sump cover and one-way drain were inspected and chemical smoke was utilized to determine the presence or absence of any leaks, and no leakage was observed;
- The system u-tube manometer was inspected and noted to be functioning properly; and,
- Vertical system piping in the utility closet was labeled with ESI's contact information and instructions on how to read the u-tube manometer. The initial u-tube manometer reading (approximately 2.3 W.C.) was recorded on the label as the reference pressure.

3.2 Post-Installation Communication Testing

Post-installation communication testing was conducted following system installation, in order to verify the presence of negative pressure at each of the previously created monitoring points. Prior to the communication testing, the in-line damper above suction point SP-2 was adjusted to allow vacuum to be adequately distributed to suction point SP-1. Table 2, below, depicts the results of the post-installation communication testing.

[Note: All temporary monitoring points (MP-1 through MP-3 and MP-5 through MP-7) were appropriately sealed with hydrated bentonite clay chips and concrete patch following the collection of post-installation communication test data.]

Table 2: Post-Installation Communication Test Results
All data provided in inches of water column (W.C.).

Monitoring Point	Initial Pressure – System Off	End Pressure – System On
MP-1	0.000	-0.050
MP-2	0.000	-0.014
MP-3	0.000	-0.020
MP-4	0.000	-0.032
MP-5	0.000	-0.081
MP-6	0.000	-0.021
MP-7	0.000	-0.027

The results of the post-installation testing indicate adequate negative pressure at all points, with the exception of MP-2, MP-3, and MP-6. The recorded pressures either meet, or are relatively close to the MACTEC design requirement (-0.025 W.C.), and the overall data suggest that the system is likely to be sufficient to adequately intercept and reduce sub-slab chlorinated solvent vapors.

3.3 Back-Draft Inspection

The potential exists that an active SSV system may create back-drafting of combustion gasses (e.g., carbon monoxide) from natural draft combustion appliances (fuel burning appliances with open flue hoods that rely on natural convective flow to exhaust combustion gasses to the outside air). ESI performed an inspection for the presence of any natural draft combustion appliances and no such appliances were observed on-site.

4.0 CONCLUSIONS AND RECOMMENDATIONS

This office has completed the installation and testing of a sub-slab ventilation (SSV) system at the property located at 72 East Main Street, Village of Babylon, Suffolk County, New York. Based on the services provided and data generated, the following conclusions, and applicable recommendations (in **bold**), have been made.

1. Pre-installation communication testing indicated that the proposed suction points, as indicated in the Final Work Plan, were not capable of creating adequate negative pressure influence at all monitoring points. The final system suction points (SP-1 and SP-2), relocated to the southwest of the previous points, were determined to be effective at creating an adequate negative pressure influence at almost all of the monitoring points, and the system design (see Paragraph 2, below) was finalized.

2. Following determination of the final suction point locations, the system design was finalized. All system piping was routed overhead from suction points SP-1 and SP-2, to the location of the system fan on the building rooftop, above the utility closet and crawlspace entrance. All system materials and installation work, including the fan wiring, were consistent with the standards set forth in the MACTEC SOW, NYSDOH Guidance, ASTM E2121, and ESI's Final Work Plan.

3. In order to increase the effectiveness of the system, and to mitigate potential vapor intrusion pathways, ESI installed a sealed cover and one-way valve on an existing sump pit.

4. The system was started and all system components were inspected and found to be operational. The system was equipped with a failsafe device, and associated labeling, and the property owner was instructed on how to read the device.

   In accordance with local regulations, all system installation work was inspected by the Village of Babylon Building Inspector, and the system was found to be in compliance applicable local/national building regulations and codes.

   No additional "formal" system inspections are required at this time. The property owner, however, should perform routine (e.g., monthly) inspections of the system u-tube manometer, to note any significant changes in system pressure (>0.5 W.C.). Any significant changes should be reported to the NYSDEC for investigation and corrective action, if warranted.

5. Post Installation pressure testing indicates that the system is capable of creating adequate negative pressure influence at the permanent monitoring point (MP-1), and at the majority of the temporary monitoring points. It is ESI's conclusion that the suction created by the system is likely to be sufficient to adequately intercept and remove contaminant vapors from below the building slab.

6. The results of a back-draft inspection indicate that no natural draft combustion appliances exist at the Site and that no back-drafting will occur.

   No additional back-draft inspections are recommended.

APPENDIX A

Permit/Certificates

VILLAGE OF BABYLON

BABYLON, NEW YORK

Telephone 669-1300

Certificate of Occupancy No. 11685-A July, 10, 2009

The Building Inspector of the Village of Babylon hereby certifies, that the following premises and buildings thereon, having reference to Building Permit Application No. 11685 conform to and comply with the provisions of the Building Zone Ordinance of the Village of Babylon.

PREMISES: 72 E. Main Street
Babylon, NY

Vapor Mitigatrim system with fan.

Section 14 Block 2 Lot 10

This certificate is issued to 72 E. Main Street Properties, LLC of the aforesaid premises and buildings, address 72 E. Main Street, Babylon, NY in accordance with the provisions of the Building Zone Ordinance of the Village of Babylon.

Building Inspector

BY THIS CERTIFICATE OF COMPLIANCE THE

NEW YORK BOARD OF FIRE UNDERWRITERS

BUREAU OF ELECTRICITY

40 FULTON STREET ~ NEW YORK, NY 10038

CERTIFIES THAT

Upon the application of

GO WEST ELECTRIC INC
547 MOUNT HUNGER RD
LISLE, NY 13797,

upon premises owned by

GERARD GLASS
72 EAST MAIN ST
BABYLON, NY 11702

Located at 72 EAST MAIN ST BABYLON, NY 11702

Application Number: 4033117 **Certificate Number:** 4033117

Section: 14 Block: 2 Lot: 10 Building Permit: 11685 BDC: NS16

Described as a **Commercial** occupancy, wherein the premises electrical system consisting of electrical devices and wiring, described below, located in/on the premises at:

Outside,

A visual inspection of the premises electrical system, limited to electrical devices and wiring to the extent detailed herein, was conducted in accordance with the requirements of the applicable code and/or standard promulgated by the State of New York, Department of State Code Enforcement and Administration, or other authority having jurisdiction, and found to be in compliance therewith on the 6th Day of July, 2009.

Name	QTY	Rate	Rating	Circuits	Type
Appliances and Accessories					
Exhaust Fan	1	0			F.H.P
Wiring And Devices					
Outlet	1	0			Gen, Purpose
Switch	1	0			Gen, Purpose

seal

This certificate may not be altered in any way and is validated only by the presence of a raised seal at the location indicated.

No. 11685

BUILDING PERMIT

VILLAGE OF BABYLON

IMPORTANT

Tack This Card In A Conspicuous Place

This Card Must Be Returned To BUILDING INSPECTOR On Final Inspection

Building Inspector

APPENDIX B

ESI's Daily Work Logs

Ecosystems Strategies, Inc.
24 Davis Avenue, Poughkeepsie, NY 12603
phone 845.452.1658 | fax 845.485.7083 | ecosystemsstrategies.com

DAILY WORK LOG

Date: June 16, 2009

Site Name /
Address: 72 East Main Street, Babylon, New York

ESI Job #: MB09023.30

On-site Personnel: Adam Lee (ESI), Brain Brannick (ESI), Felipe Sipowicz (ESI), Mark Maggiore (MACTEC), Brian Jankauskus (NYSDEC), All Seasons Roofers (2 employees)

Scope of Work: Sub-slab communication testing, final SSV system design determination, and staging of materials for June 17, 2009 installation work. All Seasons to provide rooftop penetrations for suction piping and electrical conduit.

Notes: All arrive at Site @ approximately 8:30AM. On-Site safety briefing (covering HASP) with ESI and MACTEC personnel @ 9AM. Brian Brannick assigned as crawlspace (CS) entry attendant.

Roofers complete roof work and leave Site @ 11:45AM.

* Monitoring of VOCs conducted at CS entrance using MiniRae PID 2000 (Model PGM 7600).

* Monitoring of O_2 and VOCs conducted w/in CS using Area RAE Monitor (ARM).

* Fresh air blower/ducting and VOC respirators on hand.

Permissible O_2 Entry Level: 19.5% - 23.5%, VOC Action Level: >5 ppm (consistent)

PID reading 2.8 ppm before entry - likley due to humidity.

Lee and Sipowicz in CS @ 10:41AM (PID: 0.1 ppm, ARM: 20.7% O_2/0.0 ppm)

Lee out of CS @ 11:30AM (PID: 0.7 ppm, ARM: 20.9% O_2/0.0 ppm)

PID: 0.7 ppm @ 12PM, Lee and Sipiwicz out of CS @ 12:10PM for lunch break-

Lee, Sipowicz, and Maggiore in CS @ 1:13PM for communication test (PID: 0.0 ppm, ARM: 20.9% O_2/0.0 ppm)

PID: 0.0 ppm @ 1:45PM, PID: 0.1 ppm @ 2:00PM, PID: 0.1 ppm @ 2:30PM

All out of CS @ 2:45 PM (PID: 0.0 ppm, ARM: 20.9% O_2/0.0 ppm)

Begin staging materials and tools just inside CS entrance for installation work on June 17, 2009

ESI leaves Site @ approximately 3:45 PM

Ecosystems Strategies, Inc.
24 Davis Avenue, Poughkeepsie, NY 12603
phone 845.452.1658 | fax 845.485.7083 | ecosystemsstrategies.com

DAILY WORK LOG

Date: June 17, 2009

Site Name / Address: 72 East Main Street, Babylon, New York

ESI Job #: MB09023.30

On-site Personnel: Adam Lee (ESI), Brian Brannick (ESI), Felipe Sipowicz (ESI), Mark Maggiore (MACTEC), Brian Jankauskus (NYSDEC), Greg Wescott (Go West Electric) + 2 Go West employees

Scope of Work: Installation, wiring, and start-up of the SSV system, final pressure testing, and Site restoration/cleanup.

Notes: ESI arrives @ 8:15AM, MACTEC @ 8:20AM, NYSDEC @ 8:30AM, and Go West @ 8:40AM

* Monitoring of VOCs conducted at CS entrance using MiniRae PID 2000 (Model PGM 7600).
* Monitoring of O_2 and VOCs conducted w/in CS using Area RAE Monitor (ARM).
* Fresh air blower/ducting and VOC respirators on hand.

Permissible O_2 Entry Level: 19.5% - 23.5%, VOC Action Level: >5 ppm (consistent)

Sipowicz in CS @ 8:30AM (PID: 0.2 ppm, ARM: 20.9% O_2/0.0 ppm)

Lee in CS @ 9:40AM (PID: 0.3 ppm)

Lee and Sipowicz out @ 10AM

Lee in CS @ 10:37AM (PID: 0.3 ppm), Sipowicz in @ 10:40

11AM device reading - PID: 0.2 ppm, ARM: 20.9% O_2/0.0 ppm

Wiring finished around 11AM and Go West leave Site around 11:30 AM

11:40 AM PID reading: 0.5 ppm

12:30 PM piping finished to roof

1PM device reading - PID: 0.6 ppm, ARM: 20.9% O_2/0.2 ppm

3PM device reading - PID: 0.3 ppm, ARM: 20.9% O_2/0.2 ppm

system started @ 3:40PM w/ subsequent testing

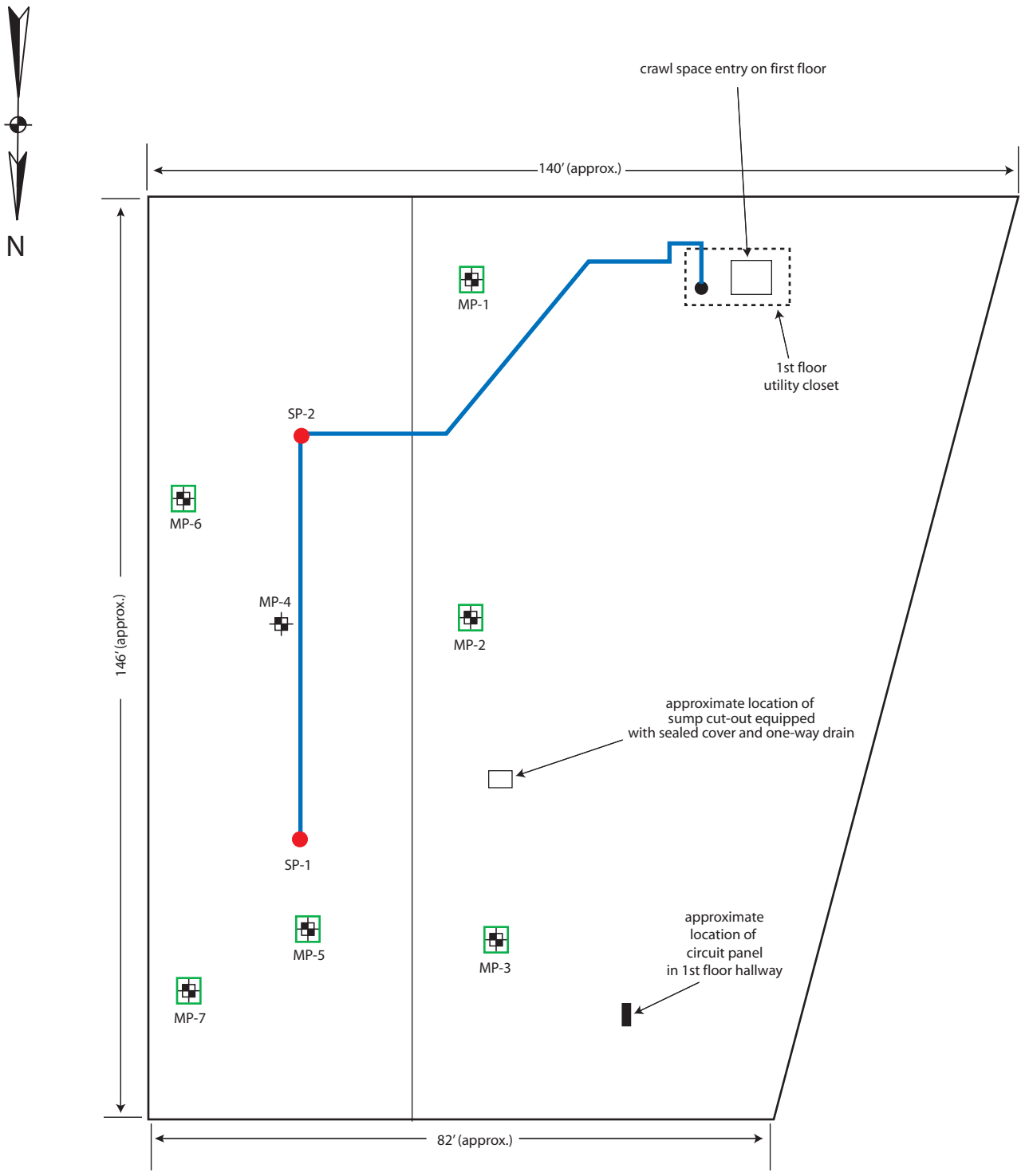
4PM device reading - PID: 0.2 ppm, ARM: 20.9% O_2/0.0 ppm

4:25PM testing and Site restoration complete, Lee and Sipowicz out of CS by 5PM, ESI leaves Site around 5:30PM

APPENDIX C

As-Built SSV System Plan

Ecosystems Strategies, Inc.



All feature locations are approximate. This map is intended as a schematic to be used in conjunction with the associated report, and it should not be relied upon as a survey for planning or other activities.

As-Built SSV System Plan

72 East Main Street
Village of Babylon
Suffolk County, New York

Legend:

- system piping (4" schedule 40 PVC)
- suction point
- permanent monitoring point
- temporary monitoring point
- location of vertical riser to building rooftop (system fan & discharge located on roof)

ESI File: MB09023.30
July 2009
Scale as shown
Appendix C

APPENDIX D

System Photographs

PHOTOGRAPHS

1. **Suction point SP-1, looking north from MP-4**

2. **Suction piping, looking south from SP-1 toward SP-2**

PHOTOGRAPHS

3. Suction point SP-2 and manifold: piping from SP-1 at left, piping to system discharge (toward crawlspace entrance) at right

4. Suction piping routed through drywall partition, looking southwest toward crawlspace entrance from eastern side of partition near SP-2

PHOTOGRAPHS

5. Suction piping at western side of drywall partition, looking south

6. suction piping, looking southwest from drywall partition toward crawlspace entrance

PHOTOGRAPHS

7. Suction piping, looking southwest from near MP-1 toward crawlspace entrance

8. Suction piping, looking southwest toward crawlspace entrance from just northeast of entrance

PHOTOGRAPHS

9. Suction piping routed through pre-existing support beam cut-out just east of crawlspace entrance, looking southwest

10. U-tube manometer on vertical suction piping located in first floor utility closet at southern end of building

PHOTOGRAPHS

11. Suction piping continuing vertically to rooftop fan and system discharge point above first-floor utility closet and crawlspace entrance

12. Exterior system features on south-central portion of building rooftop, immediately above the first-floor utility closet and crawlspace entrance

PHOTOGRAPHS

13. System fan with view of sample port and drain line

14. Sealed sump cover (recessed) with on-way Dranjer valve

APPENDIX E

Fantech Fan Specifications, Manufacturer's Warranting Information, and Bill of Sale

Fantech

Trust the Industry Standard!

Improved UV resistance!

HP Series Fans
for Radon Applications

Why put your reputation at stake by installing a fan you know won't perform like a Fantech? For nearly twenty years, Fantech has manufactured quality ventilation equipment for Radon applications. Fantech is the fan Radon contractors have turned to in over 1,000,000 successful Radon installations worldwide.

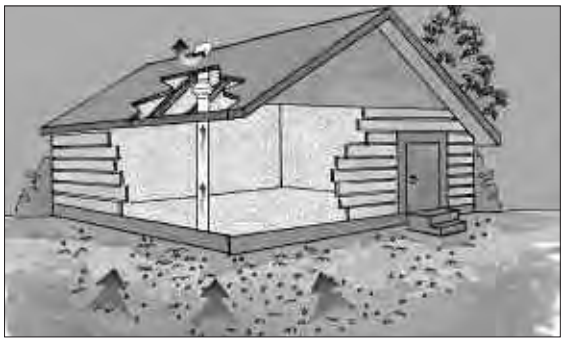
Fantech HP Series Fans Provide the Solutions to meet the challenges of Radon applications:

HOUSING
- UV resistant, UL listed durable plastic
- UL Listed for use in commercial applications
- Factory sealed to prevent leakage
- Watertight electrical terminal box
- Approved for mounting in wet locations - i.e. Outdoors

MOTOR
- Totally enclosed for protection
- High efficiency EBM motorized impeller
- Automatic reset thermal overload protection
- Average life expectancy of 7-10 years under continuous load conditions

RELIABILITY
- Five Year Full Factory Warranty
- Over 1,000,000 successful radon installations worldwide

HP Series Fans are specially designed with higher pressure capabilities for Radon Mitigation applications



Fantech has developed the HP Series fans specifically to suit the higher pressure capability requirements needed in Radon Mitigation applications. Most Radon Mitigators who previously used the Fantech FR Series fans have switched to the new HP Series.

Performance Data

Fan Model	Volts	Wattage Range	Max. Amps	CFM vs. Static Pressure in Inches W.G.								Max. Ps
				0"	0.5"	0.75"	1.0"	1.25"	1.5"	1.75"	2.0"	
HP2133	115	14 - 20	0.17	134	68	19	-	-	-	-	-	0.84
HP2190	115	60 - 85	0.78	163	126	104	81	58	35	15	-	1.93
HP175	115	44 - 65	0.57	151	112	91	70	40	12	-	-	1.66
HP190	115	60 - 85	0.78	157	123	106	89	67	45	18	1	2.01
HP220	115	85 - 152	1.30	344	260	226	193	166	137	102	58	2.46

HVI MEMBER™

Performance Curves

Fantech provides you with independently tested performance specifications.

The performance curves shown in this brochure are representative of the actual test results recorded at Texas Engineering Experiment Station/Energy Systems Lab, a recognized testing authority for HVI. Testing was done in accordance with AMCA Standard 210-85 and HVI 915 Test Procedures. Performance graphs show air flow vs. static pressure.

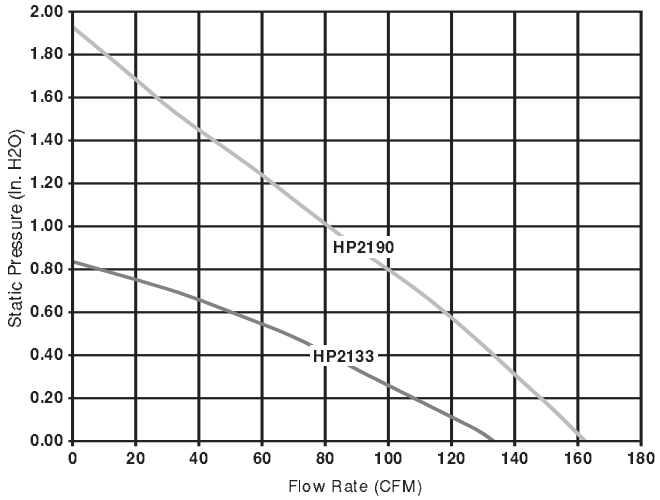
Use of HP Series fans in low resistance applications such as bathroom venting will result in elevated sound levels. We suggest FR Series or other Fantech fans for such applications.

HP FEATURES INCLUDE

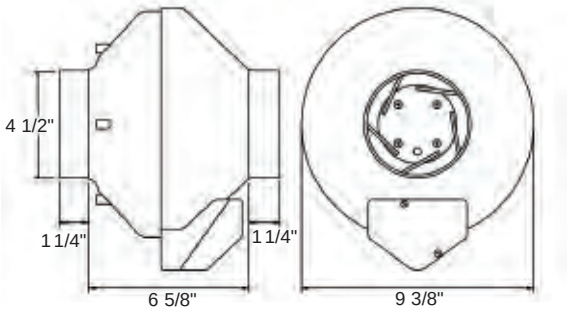
- Improved UV resistant housings approved for commercial applications.
- UL Approved for Wet Locations (Outdoors)
- Sealed housings and wiring boxes to prevent Radon leakage or water penetration
- Energy efficient permanent split capacitor motors
- External wiring box
- Full Three Year Factory Warranty

c UL US

HP2133 and 2190 Radon Mitigation Fans



Tested with 4" ID duct and standard couplings.

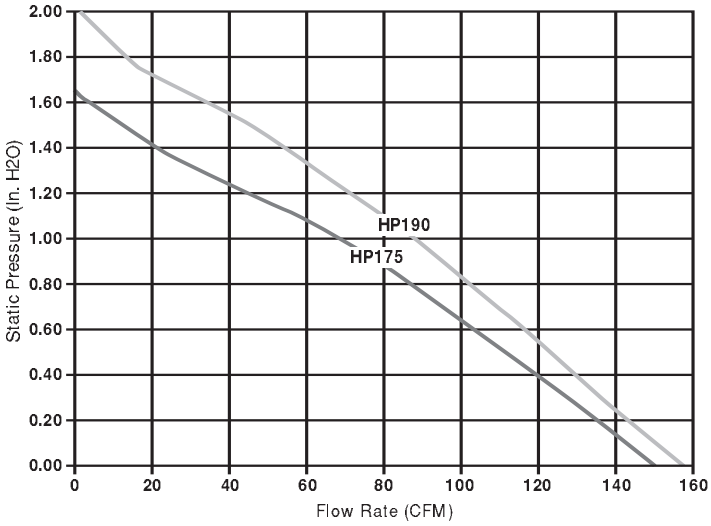


HP2133 – For applications where lower pressure and flow are needed. Record low power consumption of 14-20 watts! Often used where there is good sub slab communication and lower Radon levels.

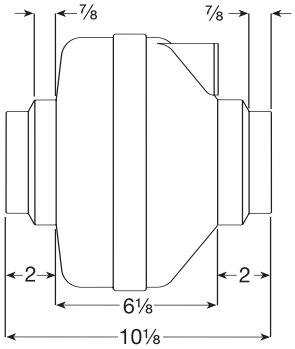
HP2190 – Performance like the HP190 but in a smaller housing. Performance suitable for the majority of installations.

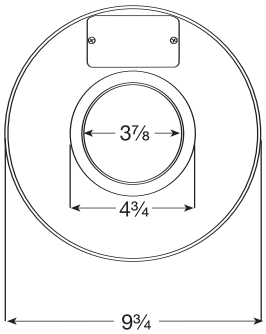
Fans are attached to PVC pipe using flexible couplings.
For 4" PVC pipe use Indiana Seals #156-44, Pipeconx PCX 56-44 or equivalent.
For 3" PVC pipe use Indiana Seals #156-43, Pipeconx PCX 56-43 or equivalent.

HP175 and HP190 Radon Mitigation Fans



Tested with 4" ID duct and standard couplings.





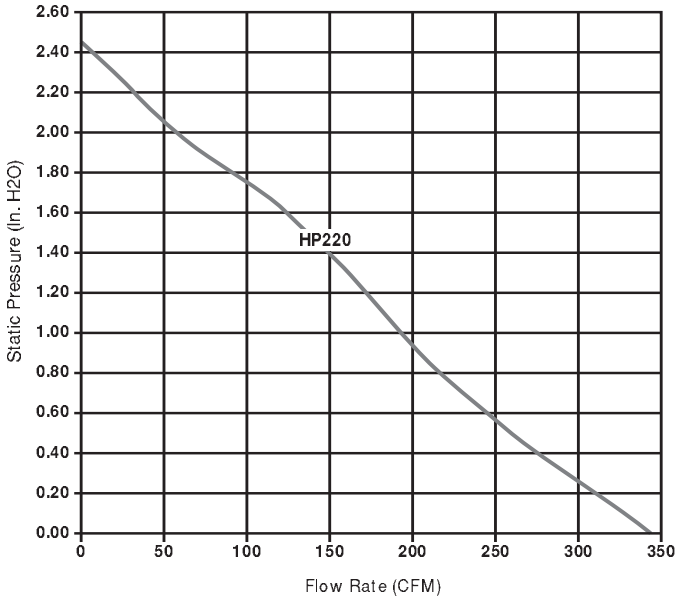
HP175 – The economical choice where slightly less air flow is needed. Often used where there is good sub slab communication and lower Radon levels.

HP190 – ***The standard for Radon Mitigation.*** Ideally tailored performance curve for a vast majority of your mitigations.

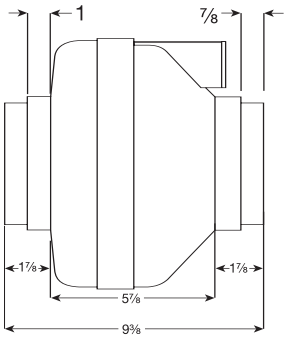
Fans are attached to PVC pipe using flexible couplings.
For 4" PVC pipe use Indiana Seals #151-44, Pipeconx PCX 51-44 or equivalent.

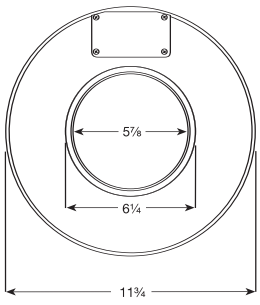
For 3" PVC pipe use Indiana Seals #156-43, Pipeconx PCX 56-43 or equivalent.

HP220 Radon Mitigation Fan



Tested with 6" ID duct and standard couplings.



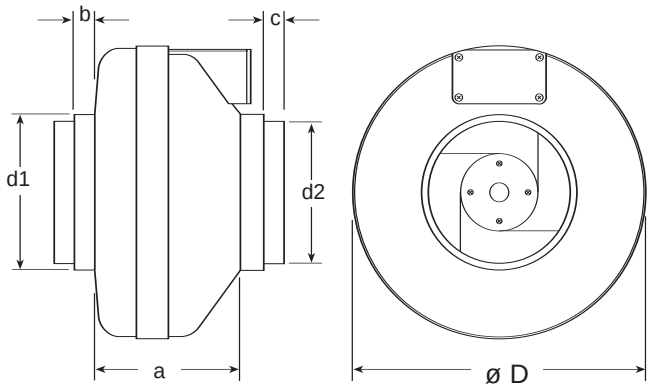


HP 220 – Excellent choice for systems with elevated radon levels, poor communication, multiple suction points and large subslab footprint. Replaces FR 175.

Fans are attached to PVC pipe using flexible couplings.
For 4" PVC pipe use Indiana Seals #156-64, Pipeconx PCX 56-64 or equivalent.

For 3" PVC pipe use Indiana Seals #156-63, Pipeconx PCX 56-63 or equivalent.

The Original Mitigator – Fantech's FR Series Fans



Dimensional Data

model	øD	d1	d2	a	b	c
FR100	9 1/2	3 7/8	4 7/8	6 1/8	7/8	7/8
FR110	9 1/2	3 7/8	4 7/8	6 1/8	7/8	7/8
FR125	9 1/2	–	4 7/8	6 1/8	7/8	–
FR140	11 3/4	5 7/8	6 1/4	5 7/8	1	7/8
FR150	11 3/4	5 7/8	6 1/4	5 7/8	1	7/8
FR160	11 3/4	5 7/8	6 1/4	6 3/8	1	7/8
FR200	13 1/4	7 7/8	9 7/8	6 1/4	1 1/2	1 1/2
FR225	13 1/4	7 7/8	9 7/8	6 1/4	1 1/2	1 1/2
FR250	13 1/4	–	9 7/8	6 1/4	–	1 1/2

All dimensions in inches

Performance Data

Fan Model	Energy Star	RPM	Volts	Rated Watts	Wattage Range	Max. Amps	CFM vs. Static Pressure in Inches W.G.							Max. Ps	Duct Dia.
							0"	.2"	.4"	.6"	.8"	1.0"	1.5"		
FR100	✓	2900	115	19	13 - 19	0.18	122	100	78	55	15	-	-	0.87"	4"
FR110	-	2900	115	80	62 - 80	0.72	167	150	133	113	88	63	41	0.60"	4"
FR125	✓	2950	115	18	15 - 18	0.18	148	120	88	47	-	-	-	0.79"	5"
FR140	✓	2850	115	61	47 - 62	0.53	214	190	162	132	99	46	-	0.15"	6"
FR150	✓	2750	120	71	54 - 72	0.67	263	230	198	167	136	106	17	1.58"	6"
FR160	-	2750	115	129	103 - 130	1.14	289	260	233	206	179	154	89	2.32"	6"
FR200	✓	2750	115	122	106 - 128	1.11	408	360	308	259	213	173	72	2.14"	8"
FR225	✓	3100	115	137	111 - 152	1.35	429	400	366	332	297	260	168	2.48"	8"
FR250*	-	2850	115	241	146 - 248	2.40	649	600	553	506	454	403	294	2.58"	10"

FR Series performance is shown with ducted outlet. Per HVI's Certified Ratings Program, charted air flow performance has been derated by a factor based on actual test results and the certified rate at .2 inches WG.
* Also available with 8" duct connection. Model FR 250-8. Special Order.

Five (5) Year Warranty

This warranty supersedes all prior warranties

DURING ENTIRE WARRANTY PERIOD:

FANTECH will replace any fan which has a factory defect in workmanship or material. Product may need to be returned to the Fantech factory, together with a copy of the bill of sale and identified with RMA number.

FOR FACTORY RETURN YOU MUST:

- Have a Return Materials Authorization (RMA) number. This may be obtained by calling FANTECH either in the USA at 1.800.747.1762 or in CANADA at 1.800.565.3548. Please have bill of sale available.
- The RMA number must be clearly written on the outside of the carton, or the carton will be refused.
- All parts and/or product will be repaired/replaced and shipped back to buyer; no credit will be issued.

OR

The Distributor may place an order for the warranty fan and is invoiced. The Distributor will receive a credit equal to the invoice only after product is returned prepaid and verified to be defective.

FANTECH WARRANTY TERMS DO NOT PROVIDE FOR REPLACEMENT WITHOUT CHARGE PRIOR TO INSPECTION FOR A DEFECT. REPLACEMENTS ISSUED IN ADVANCE OF DEFECT INSPECTION ARE INVOICED, AND CREDIT IS PENDING INSPECTION OF RETURNED MATERIAL. DEFECTIVE MATERIAL RETURNED BY END USERS SHOULD NOT BE REPLACED BY THE DISTRIBUTOR WITHOUT CHARGE TO THE END USER, AS CREDIT TO DISTRIBUTOR'S ACCOUNT WILL BE PENDING INSPECTION AND VERIFICATION OF ACTUAL DEFECT BY FANTECH.

THE FOLLOWING WARRANTIES DO NOT APPLY:

- Damages from shipping, either concealed or visible. Claim must be filed with freight company.
- Damages resulting from improper wiring or installation.
- Damages or failure caused by acts of God, or resulting from improper consumer procedures, such as:

1. Improper maintenance
2. Misuse, abuse, abnormal use, or accident, and
3. Incorrect electrical voltage or current.

- Removal or any alteration made on the FANTECH label control number or date of manufacture.
- Any other warranty, expressed, implied or written, and to any consequential or incidental damages, loss or property, revenues, or profit, or costs of removal, installation or reinstallation, for any breach of warranty.

WARRANTY VALIDATION

- The user must keep a copy of the bill of sale to verify purchase date.
- These warranties give you specific legal rights, and are subject to an applicable consumer protection legislation. You may have additional rights which vary from state to state.

For more information contact:

Fantech

web: www.fantech.net
e-mail: info@fantech.net

United States
1712 Northgate Blvd.
Sarasota, Florida 34234
Phone: 800-747-1762; 941-309-6000
Fax: 800-487-9915; 941-309-6099

Canada
50 Kanalflakt Way
Bouctouche, NB E4S 3M5
Phone: 800-565-3548; 506-743-9500
Fax: 877-747-8116; 506-743-9600

Distributed by:

Radon Control Inc..
567 Industrial Drive
Carmel, IN 46032

Voice: 317-846-7486
Fax: 317-846-5882

INVOICE

Invoice Number: 113184
Invoice Date: May 15, 2009
Page: 1
Duplicate

Bill To:	Ship to:
ECOSYSTEMS STRATEGIES, INC. 24 DAVIS AVE POUGHKEEPSIE, NY 12603	E-mail invoices GET JOB NAME FOR PO

Customer ID	Customer PO	Payment Terms	
ESI845	MACTEC	Net 15 Days	
Sales Rep ID	**Shipping Method**	**Ship Date**	**Due Date**
	UPS Ground	5/15/09	5/30/09

Quantity	Item	Description	Unit Price	Amount
3.00	HP220E	FANTECH 6" DUCT	145.50	436.50
6.00	B106-44	BLACK 6" TO 4" COUPL	7.15	42.90
1.00	LC-24	24" CLEAR COVER	29.50	29.50
1.00	F-S2	SUMP MODEL - BRASS	25.00	25.00
1.00	F-R2	RETROFIT FLOOR-BRASS	19.75	19.75
3.00	RC40	SCH.40 4" CAP	13.50	40.50
3.00	MU-93	MINI U-TUBE	7.75	23.25
3.00	FG-43	4" FAN GUARD	10.95	32.85
10.00	UC-40	4" METAL U CLAMP	1.50	15.00
25.00	UC-30	3.0" U CLAMP- sch 20	1.25	31.25

Subtotal	696.50
Sales Tax	
Freight	28.29
Total Invoice Amount	724.79
Payment/Credit Applied	
TOTAL	**724.79**

Check/Credit Memo No:

Our new catalog has been mailed. Please call for additional copies!

APPENDIX F

ESI Warranty Statement

Ecosystems Strategies, Inc.
24 Davis Avenue, Poughkeepsie, NY 12603
phone 845.452.1658 | fax 845.485.7083 | ecosystemsstrategies.com

Sub-Slab Ventilation System Limited Warranty

Ecosystems Strategies, Inc. (ESI) provides a **two (2) year** limited warranty on all ESI-installed sub-slab ventilation (SSV) systems and/or ESI-installed SSV system components*****. This warranty provides coverage for defects in materials, workmanship, or design.

ESI will repair or replace any ESI-installed system components found to be defective, or alter any ESI-installed system design features found to be ineffective within the **two (2) year** warranty period free of charge.

ESI's limited SSV system warranty **does not** provide coverage for:

1) Damages caused by accidents, neglect, physical abuse, "Acts of God" (e.g., hurricanes, floods, etc.), natural shifting or settling of the building, or natural deterioration of pre-existing building materials.

2) Damages or defects in materials or workmanship for any system components not installed by ESI (i.e., any system components or system additions installed outside of ESI's installation contract by the homeowner or any other entity).

3) Decreased system effectiveness caused by Acts of God, natural shifting or settling of the building, natural deterioration of pre-existing building materials, and/or building alterations, renovations, or additions which take place after system installation.

ESI reserves the right to determine whether a warranty claim is covered under the conditions of this warranty.

This warranty is transferrable in the event of a property transaction.

[***** The SSV system fan is warranted by the manufacturer against defects or related malfunctions that may occur within five (5) years of the date of purchase. Should a problem arise with the system fan within that period, ESI will provide the proof of purchase necessary to pursue a warranty claim with the fan manufacturer.]

APPENDIX B

NYSDOH SOIL VAPOR INTRUSION FREQUENTLY ASKED QUESTIONS

NEW YORK STATE
DEPARTMENT OF HEALTH

SOIL VAPOR INTRUSION

Frequently Asked Questions

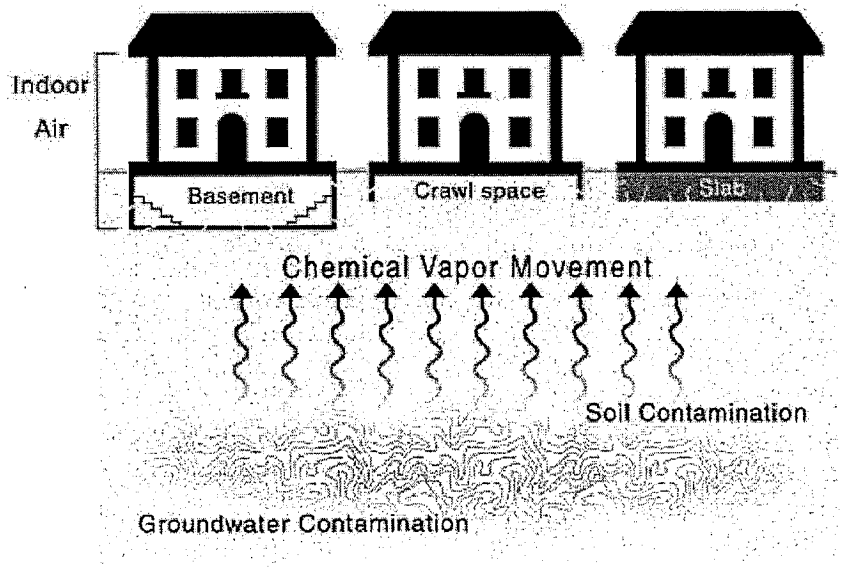
What is soil vapor intrusion?

The phrase "soil vapor intrusion" refers to the process by which volatile chemicals move from a subsurface source into the indoor air of overlying buildings.

Soil vapor, or soil gas, is the air found in the pore spaces between soil particles. Because of a difference in pressure, soil vapor enters buildings through cracks in slabs or basement floors and walls, and through openings around sump pumps or where pipes and electrical wires go through the foundation. Heating, ventilation or air-conditioning systems may create a negative pressure that can draw soil vapor into the building. This intrusion is similar to how radon gas seeps into buildings.

Soil vapor can become contaminated when chemicals evaporate from subsurface sources and enter the soil vapor. Chemicals that readily evaporate are called "volatile chemicals." Volatile chemicals include volatile organic compounds (VOCs). Subsurface sources of volatile chemicals may include contaminated soil and groundwater, or buried wastes. If soil vapor is contaminated, and enters a building as described above, indoor air quality may be affected.

When contaminated vapors are present in the zone directly next to or under the foundation of the building, vapor intrusion is possible. Soil vapor can enter a building whether it is old or new, or whether it has a basement, a crawl space, or is on a slab (as illustrated in the figure).



[Source: United States Environmental Protection Agency, Region 3]

How am I exposed to chemicals through soil vapor intrusion?

Humans can be exposed to soil vapor contaminated with volatile chemicals when vapors from beneath a building are drawn through cracks and openings in the foundation and mix with the indoor air. Inhalation is the route of exposure, or the manner in which the volatile chemicals actually enter the body, once in the indoor air.

Current exposures are when vapor intrusion is documented in an occupied building. *Potential* exposures are when volatile chemicals are present, or are accumulating, in the vapor phase beneath a building, but have not affected indoor air quality. Potential exposures also exist when there is a chance that contaminated soil vapors may move to existing buildings not currently affected or when there is a chance that new buildings can be built over existing subsurface vapor contamination. Both current and potential exposures are considered when evaluating soil vapor intrusion at a site that has documented subsurface sources of volatile chemicals.

In general, exposure to a volatile chemical does not necessarily mean that health effects will occur. Whether or not a person experiences health effects depends on several factors, including inhalation exposure, the length of exposure (short-term or acute versus long-term or chronic), the frequency of exposure, the toxicity of the volatile chemical, and the individual's sensitivity to the chemical.

What types of chemicals associated with environmental contamination may be entering my home via soil vapor intrusion?

Volatile organic compounds, or VOCs, are the most likely group of chemicals found in soil vapor, and which can move through the soil and enter buildings. Solvents used for dry cleaning, degreasing and other industrial purposes (e.g., tetrachloroethene, trichloroethene, 1,1,1-trichloroethane and Freon 113) are examples of VOCs. Examples of petroleum-related VOCs from petroleum spills are benzene, toluene, ethyl benzene, xylenes, styrene, hexane and trimethylbenzenes.

Is contaminated soil vapor the only source of volatile chemicals in my indoor air?

No. Volatile chemicals are also found in many household products. Paints, paint strippers and thinners, mineral spirits, glues, solvents, cigarette smoke, aerosol sprays, mothballs, air fresheners, new carpeting or furniture, hobby supplies, lubricants, stored fuels, refrigerants and recently dry-cleaned clothing all contain VOCs. Household products are often more of a source of VOCs in indoor air in homes than contaminated soil vapor.

Indoor air may also become affected when outdoor air containing volatile chemicals enters your home. Volatile chemicals are present in outdoor air due to their widespread use. Gasoline stations, dry cleaners, and other commercial/industrial facilities are important sources of VOCs to outdoor air.

What should I expect if soil vapor intrusion is a concern near my home?

If you live near a site that has documented soil, groundwater and/or soil vapor contaminated with volatile chemicals, you should expect that the potential for vapor intrusion is being, or has been, investigated. You may be contacted by the site owner or others working on the cleanup with information about the project. Your cooperation and consent would be requested before any testing/sampling would be done on your property. You may ask the person contacting you any questions about the work being done. You can also contact the NYSDOH's project manager for the site at 1-800-458-1158 (extension 2-7850) for additional information.

How is soil vapor intrusion investigated at sites contaminated with volatile chemicals?

The process of investigating soil vapor intrusion typically requires more than one set of samples to determine the extent of vapor contamination. Furthermore, four types of environmental samples are collected: soil vapor samples, sub-slab vapor samples, indoor air samples and outdoor air (sometimes referred to as "ambient air") samples.

Soil vapor samples are collected to characterize the nature and extent of vapor contamination in the soil in a given area. They are often collected before sub-slab vapor and/or indoor air samples to help identify buildings or groups of buildings that need to be sampled. Soil vapor samples are used to determine the *potential* for human exposures. *Soil vapor* samples are not the same as *soil* samples.

Sub-slab vapor samples are collected to characterize the nature and extent of vapor contamination in the soil immediately beneath a building with basement foundations or a slab. Sub-slab vapor results are used to determine the potential for *current* and *future* human exposures. For example, an exposure could occur in the future if cracks develop in the building's foundation or changes in the operation of the building's heating, ventilation or air-conditioning system are made that make the movement of contaminated soil vapor into the building possible.

Indoor air samples are collected to characterize the nature and extent of air contamination within a building. Indoor air sample results help to evaluate whether there are *current* human exposures. They are also compared to sub-slab vapor and outdoor air results to help determine where volatile chemicals may be coming from (indoor sources, outdoor sources, and/or beneath the building).

Outdoor air samples are collected to characterize site-specific background air conditions. Outdoor air results are used to evaluate the extent to which outdoor sources, such as automobiles, lawn mowers, oil storage tanks, gasoline stations, commercial/industrial facilities, and so forth, may be affecting indoor air quality.

What should I expect if indoor air samples are collected in my home?

You should expect the following:

- Indoor air samples are generally collected from the lowest-level space in a building, typically a basement, during the heating season. Indoor air samples may also be collected from the first floor of living space. Indoor air is believed to represent the greatest exposure potential with respect to soil vapor intrusion.
- Sub-slab vapor and outdoor air samples are usually collected at the same time as indoor air samples to help determine where volatile chemicals may be coming from (indoor sources, outdoor sources, and/or beneath the building).
- More limited sampling may be performed outside of the heating season. For example, sub-slab vapor samples without indoor air or outdoor air samples may be collected to identify buildings and areas where comprehensive sampling is needed during the heating season.
- An indoor air quality questionnaire and building inventory will be completed. The questionnaire includes a summary of the building's construction characteristics; the building's heating, ventilation and air-conditioning system operations; and potential indoor and outdoor sources of volatile chemicals. The building inventory describes products present in the building that might contain volatile chemicals. In addition, we take monitoring readings from a real-time organic vapor meter (also known as a photoionization detector or PID). The PID is an instrument that detects many VOCs in the air. When indoor air samples are collected, the PID is used to help determine whether

products containing VOCs might be contributing to levels that are detected in the indoor air.

What happens if soil vapor contamination or soil vapor intrusion is identified during investigation of a site?

Depending on the investigation results, additional sampling, monitoring or mitigation actions may be recommended. Additional sampling may be performed to determine the extent of soil vapor contamination and to verify questionable results. Monitoring (sampling on a recurring basis) is typically conducted if there is a significant potential for vapor intrusion to occur should building conditions change. Mitigation steps are taken to minimize exposures associated with soil vapor intrusion. Mitigation may include sealing cracks in the building's foundation, adjusting the building's heating, ventilation and air-conditioning system to maintain a positive pressure to prevent infiltration of subsurface vapors, or installing a sub-slab depressurization system beneath the building.

What is a sub-slab depressurization system?

A sub-slab depressurization system, much like a radon mitigation system, essentially prevents vapors beneath a slab from entering a building. A low amount of suction is applied below the foundation of the building and the vapors are vented to the outside (see illustration). The system uses minimal electricity and should not noticeably affect heating and cooling efficiency. This mitigation system also essentially prevents radon from entering a building, an added health benefit. The party responsible for cleaning up the source of the soil vapor contamination is usually responsible for paying for the installation of this system. If no responsible party is available, New York State will install the system. Once the contamination is cleaned up, the system should no longer be needed. In areas where radon is a problem, the NYSDOH recommends that these systems remain in place permanently.

What else can I do to improve my indoor air quality?

Household products and other factors, such as mold growth, carbon monoxide, and radon, can degrade the quality of air in your home. Consider the following tips to improve indoor air quality:

- Be aware of household products that contain VOCs. Do not buy more chemicals than you need at a time.
- Store unused chemicals in tightly-sealed containers in a well-ventilated location, preferably away from the living space in your home.
- Keep your home properly ventilated. Keeping it too air-tight may promote build up of chemicals in the air, as well as mold growth due to the build up of moisture.
- Fix all leaks promptly, as well as other moisture problems that encourage mold growth.
- Make sure your heating system, hot water, dryer and fireplaces are properly vented and in good condition. Have your furnace or boiler checked annually by a professional.
- Test your home for radon; take actions to reduce radon levels if needed.
- Install carbon monoxide detectors in your home; take immediate actions to reduce carbon monoxide levels if needed.

Where can I get more information?

For additional information about soil vapor intrusion, contact the NYSDOH's Bureau of Environmental Exposure Investigation at 1-800-458-1158 (extension 2-7850).

APPENDIX C

NYSDOH FACT SHEET TETRACHLOROETHENE (PERC) IN INDOOR AND OUTDOOR AIR

FACT SHEET

TETRACHLOROETHENE (PERC) IN INDOOR AND OUTDOOR AIR

MAY, 2003

This fact sheet answers a few questions about a chemical called tetrachloroethene (PERC), which is widely used to dry-clean clothes. It provides information on health effects seen in humans and animals exposed to PERC in air. It also provides information about the New York State Department of Health (NYSDOH) guideline of 100 micrograms of PERC per cubic meter of air (100 mcg/m^3) or 0.1 milligrams of PERC per cubic meter of air (0.1 mg/m^3). The fact sheet focuses on the health risks from air exposures because most of the PERC released into the environment goes into air.

Prepared by

New York State Department of Health

1. WHAT IS TETRACHLOROETHENE (PERC)?

Tetrachloroethene is a manufactured chemical that is widely used in the dry-cleaning of fabrics, including clothes. It is also used for degreasing metal parts and in manufacturing other chemicals. Tetrachloroethene is found in consumer products, including some paint and spot removers, water repellents, brake and wood cleaners, glues, and suede protectors. Other names for tetrachloroethene include PERC, tetrachloroethylene, perchloroethylene, and PCE. PERC is a commonly used name and will be used in the rest of the fact sheet.

PERC is a nonflammable, colorless liquid at room temperature. It readily evaporates into air and has an ether-like odor. Because most people stop noticing the odor of PERC in air after a short time, odor is not a reliable warning signal of PERC exposure.

2. HOW CAN I BE EXPOSED TO PERC?

People are exposed to PERC in air, water, and food. Exposure can also occur when PERC or material containing PERC (for example, soil) gets on the skin. For most people, almost all exposure is from PERC in air.

PERC gets into outdoor and indoor air by evaporation from industrial or dry-cleaning operations and from areas where chemical wastes are stored or disposed. Groundwater near these areas may become contaminated if PERC is improperly dumped or leaks into the ground. People may be exposed if they drink the contaminated water. They may also be exposed if PERC evaporates from contaminated drinking water into indoor air during cooking and washing. PERC may evaporate from contaminated groundwater and soil and into the indoor air of buildings above the contaminated area. PERC also may evaporate from dry-cleaned clothes and into indoor air or may get into indoor air after PERC-products, such as spot removers, are used. Indoor air PERC levels may get high if PERC-products are used in poorly ventilated areas.

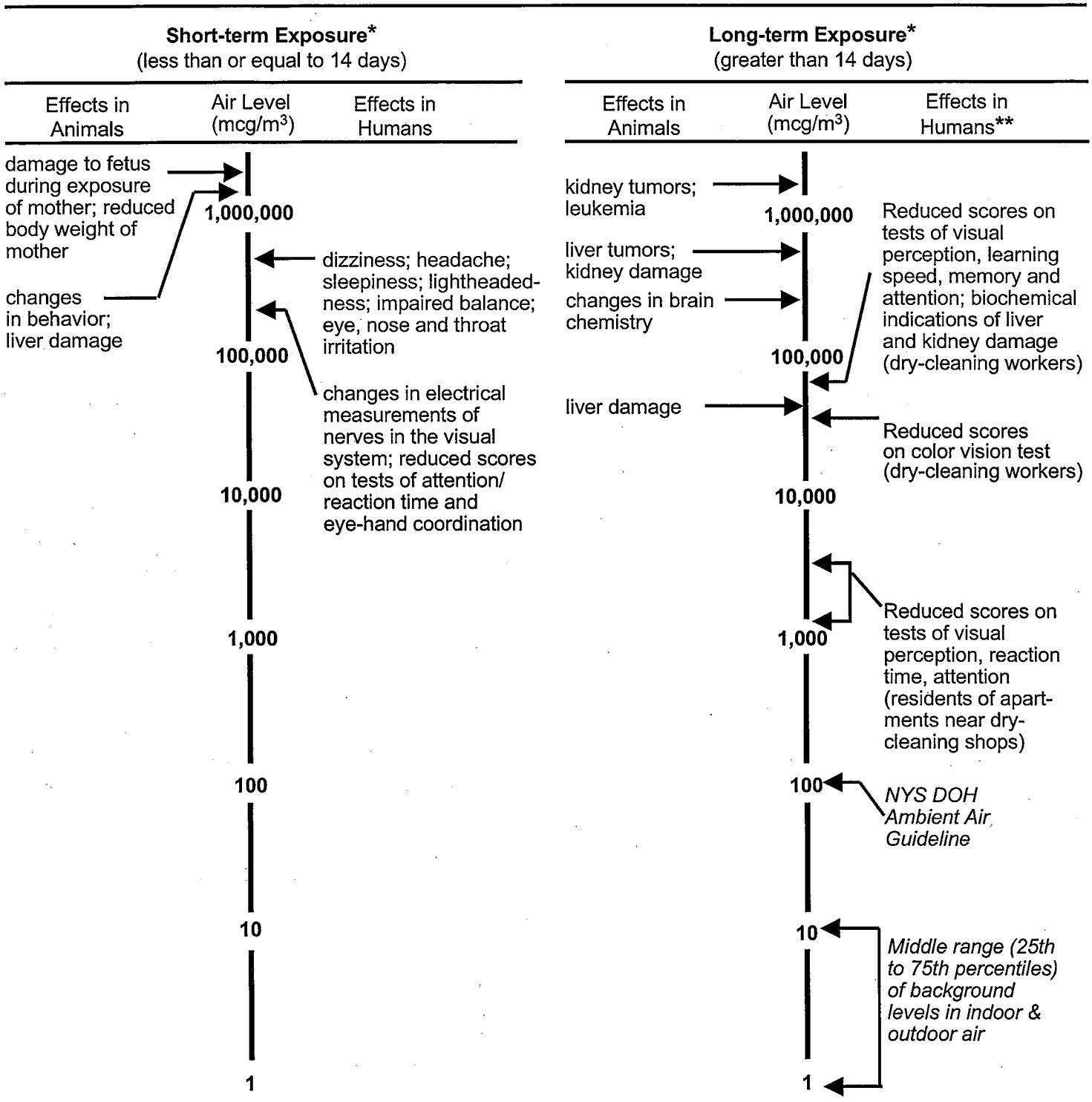
3. HOW DOES PERC ENTER AND LEAVE MY BODY?

When people breathe air containing PERC, the PERC is taken into the body through the lungs and passed into the blood, which carries it to all parts of the body. A large fraction of this PERC is breathed out, unchanged, through the lungs into the air. Some of this PERC is stored in the body (for example, in fat, liver, and brain) and some is broken down in the liver to other compounds and eliminated in urine. PERC can also be found in breastmilk. Once exposure stops, most of the PERC and its breakdown products leave the body in several days. However, it may take several weeks for all of the PERC and its breakdown products to leave the body.

4. WHAT KINDS OF HEALTH EFFECTS CAN BE CAUSED BY EXPOSURE TO PERC IN AIR?

In humans and animals, the major effects of PERC exposure are on the central nervous system, kidney, liver, and possibly the reproductive system. These effects vary with the level and length of exposure. Figure 1 shows the types of health effects seen in humans and animals and the lowest levels of PERC in air at which the effects were seen. The diagram on the right side of the figure shows the effects of long-term exposures in humans and animals whereas the diagram on the left side shows the same information for short-term exposures. Because there is a

Figure 1. Health Effects from Breathing Tetrachloroethene (PERC). The diagram shows the effects observed in humans and animals exposed to measured levels of PERC in air. The diagram contains information on the effects observed after short-term and long-term exposure. Also shown are background levels in indoor and outdoor air.



*Effects are listed at the lowest level (micrograms per cubic meter of air, mcg/m^3) at which they were first observed. They and other effects may also be seen at higher levels. 100 mcg/m^3 = 0.1 mg/m^3 (milligrams per cubic meter of air) = 15 ppb (parts per billion) = 0.015 ppm (parts per million).

**Studies have shown that workplace exposure to PERC is associated with an increased risk of cancer and spontaneous abortion, but studies did not provide good quantitative data on exposure levels.

large amount of information on the human effects of PERC, the rest of the fact sheet will discuss only the human data.

The human effects shown in Figure 1 represent the average response of a group of individuals at an estimated level of exposure (typically, the average of the measured air levels). Because data for individual people are not usually reported, some people (those sensitive to the effects of PERC) may have experienced effects at air levels below the average air level, whereas other people (those resistant to the effects of PERC) may not have experienced effects at air levels above the average air level. The difference in how people respond to the same or similar exposure levels is due, in part, to the individual differences among people. People, for example, differ in age, sex, diet, family traits, lifestyle, genetic background, the presence of other chemicals in their body (e.g., alcohol, prescription drugs), and state of health. These differences can affect how people will respond to a given exposure. One person may feel fine during and after an exposure while another person may become sick. This is known as sensitivity. Differences in sensitivity should be kept in mind when reading the following information on the human health effects of PERC.

Short-Term Exposure - Studies with volunteers show that exposures of 8-hours or less to 700,000 micrograms per cubic meter of air (mcg/m^3) cause central nervous system symptoms such as dizziness, headache, sleepiness, lightheadedness, and poor balance (Figure 1). Exposures to 350,000 mcg/m^3 for 4 hours affected the nerves of the visual system and reduced scores on certain behavioral tests (which, for example, measure the speed and accuracy of a person's response to something they see on a computer screen). These effects were mild and disappeared soon after exposure ended.

Long-Term Exposure – Numerous studies of dry-cleaning workers indicate that long-term exposure (9 to 20 years, for example) to workplace air levels averaging about 50,000 mcg/m^3 to 80,000 mcg/m^3 reduces scores on behavioral tests and causes biochemical changes in blood and urine (Figure 1). The effects were mild and hard to detect. How long these effects would last if exposure ended is not known.

One study reported reduced scores on behavioral tests in 14 healthy adults living (for 10.6 years, on average) in apartments near dry-cleaning shops. The effects were small; the average test scores of the residents were slightly lower than the average score of unexposed people. The range of measured air levels in 13 apartments was 7.6 mcg/m^3 to 23,000 mcg/m^3; one air level was below 100 mcg/m^3, five values were between 100 and 1,000 mcg/m^3, and seven values were above 1,000 mcg/m^3. The average air level in all apartments was 5,000 mcg/m^3 and the median value was about 1,400 mcg/m^3 (that is, half the measured air levels were above 1,400 mcg/m^3 and half were below it). As with the long-term occupational studies, how long these effects would last if exposure ended is not known. Confidence in the understanding of exposure in this study is less than that in the occupational studies.

Some studies show a slightly increased risk of some types of cancer and reproductive effects among workers, including dry-cleaning workers, exposed to PERC and other chemicals. Cancers associated with exposures include cancers of the esophagus, bladder, and non-Hodgkin's

lymphoma. Cancers less clearly associated with exposures include cancers of the cervix, tongue, and lung. The reproductive effects associated with exposure included increased risks of spontaneous abortion, menstrual and sperm disorders, and reduced fertility. The data suggest, but do not prove, that the effects were caused by PERC and not by some other factor or factors.

Data on the workplace air levels in these studies ranged from none (reproductive studies) to some (cancer studies); however, workplace air levels during the times these studies were conducted were considerably higher than those found in indoor or outdoor air (see next question).

5. WHAT ARE BACKGROUND LEVELS FOR PERC IN INDOOR AND OUTDOOR AIR IN AREAS THAT ARE NOT NEAR A KNOWN SOURCE OF PERC?

The United States Environmental Protection Agency (US EPA) has collected and analyzed information on PERC levels in indoor and outdoor air. Table 1 contains the results from air samples collected inside and outside of buildings that were not near known sources of PERC and other chemicals (for example, a home not known to be near a chemical spill, a hazardous waste site, a dry-cleaner, or a factory). The middle half (25^{th} to 75^{th} percentile) of PERC levels in indoor and outdoor air samples is about 1 to 10 mcg/m^3. A similar result was found for NYS homes not near known PERC sources. NYSDOH sampled 138 homes between 1989 and 1996 and the level of PERC in the indoor air was below 10 mcg/m^3 in 95% of the homes. Collectively, these data show that background levels of PERC in air are seldom above 10 mcg/m^3.

Table 1.

Sample	PERC Air Levels (mcg/m^3)[A]			Sample Size
	25^{th} Percentile	50^{th} Percentile (Median)	75^{th} Percentile	
Homes & Offices: Nationwide 1970 – 1988[B]				
Indoor	1.7	5.0	11	2,195
Outdoor	0.82	2.4	5.9	3,226
Offices: Nationwide 1994 – 1996[C]				
Indoor	not detected*	3.0	5.9	298
Outdoor		not detected*	3.0	100

[A] These databases contain air-testing results from studies where there were no known sources of chemicals or chemical spills. Outdoor samples were taken at the same time as indoor samples and at a location close to the building sampled.

[B] The US EPA Volatile Organic Compounds Database was published in March 1988.

[C] From 1994 through 1996, US EPA measured volatile organic compounds in indoor and outdoor air at 100 randomly selected public and private office buildings across the US.

* Not detected means that the amount of PERC in the air sample was less than the smallest amount of PERC that could be accurately measured (that is, the level was less than the detection limit); in these studies, the detection limit ranged from 1.4 to 2.0 mcg/m^3.

6. WHAT IS THE NEW YORK STATE DEPARTMENT OF HEALTH'S (NYSDOH) GUIDELINE FOR PERC IN AIR?

NYSDOH recommends that the average air level in a residential community not exceed 100 micrograms of PERC per cubic meter of air (100 mcg/m^3), considering continuous lifetime exposure and sensitive people. Three other ways of expressing the guideline are 0.1 milligrams per cubic meter of air (0.1 mg/m^3), 15 parts per billion (ppb) or 0.015 parts per million (ppm).

The purpose of the guideline is to help guide decisions about the nature of efforts to reduce PERC exposure. Reasonable and practical actions should be taken to reduce PERC exposure when indoor air levels are above background, even when they are below the guideline of 100 mcg/m^3. The urgency to take actions increases as indoor air levels increase, especially when air levels are above the guideline. Finally, NYSDOH recommends taking immediate action to reduce exposure when an air level is ten-times or more higher than the guideline (that is, when the air level is 1,000 mcg/m^3 or higher). In all cases, the specific corrective actions to be taken depend on a case-by-case evaluation of the situation. The goal of the recommended actions is to reduce PERC levels in indoor air to as close to background as practical.

7. SHOULD I BE CONCERNED ABOUT HEALTH EFFECTS IF I AM EXPOSED TO AN AIR LEVEL SLIGHTLY ABOVE THE GUIDELINE?

The guideline is lower than the air levels that caused either non-cancer or cancer effects (Figure 1); thus, the possibility of health effects is low even at air levels slightly above the guideline. In addition, the guideline is based on the assumption that people are continuously exposed to PERC in air all day, every day for as long as a lifetime. This is rarely true for most people, who are more likely to be exposed for a part of the day and part of their lifetime.

8. WHEN SHOULD MY CHILDREN OR I SEE A PHYSICIAN?

If you believe you or your children have symptoms that you think are caused by PERC exposure, you and your children should see a physician. You should tell the physician about the symptoms and about when, how, and for how long you think you and/or your children were exposed to PERC.

9. WHERE CAN I GET MORE INFORMATION?

If you have any questions about the information in this fact sheet or would like to know more about PERC, please call the New York State Department of Health at 1-518-402-7800 or 1-800-458-1158 (extension 2-7800) or write to the following address.

New York State Department of Health
Bureau of Toxic Substance Assessment
Flanigan Square, 547 River Street
Troy, NY 12180-2216

APPENDIX D

NYSDOH FACT SHEET TRICHLOROETHENE (TCE) IN INDOOR AND OUTDOOR AIR

NEW YORK STATE
DEPARTMENT OF HEALTH

Trichloroethene (TCE) in Indoor and Outdoor Air

FACT SHEET
February 2005

What is trichloroethene?

Trichloroethene is a manufactured, volatile organic chemical. It has been used as a solvent to remove grease from metal. Trichloroethene has also been used as a paint stripper, adhesive solvent, as an ingredient in paints and varnishes, and in the manufacture of other organic chemicals. Other names for trichloroethene include TCE and trichloroethylene. TCE is a common name for trichloroethene and will be used for the rest of this fact sheet.

TCE is a clear, colorless liquid, and has a somewhat sweet odor. It is non-flammable at room temperature and will evaporate into the air.

How can I be exposed to TCE?

People can be exposed to TCE in air, water and food. Exposure can also occur when TCE, or material containing TCE, gets on the skin.

TCE gets into the air by evaporation when it is used. TCE can also enter air and groundwater if it is improperly disposed or leaks into the ground. People can be exposed to TCE if they drink groundwater contaminated with TCE, and if the TCE evaporates from the contaminated drinking water into indoor air during cooking and washing. They may also be exposed if TCE evaporates from the groundwater, enters soil vapor (air spaces between soil particles), and migrates through building foundations into the building's indoor air. This process is called "soil vapor intrusion."

How can TCE enter and leave my body?

If people breathe air containing TCE, some of the TCE is exhaled unchanged from the lungs and back into the air. Much of the TCE gets taken into the body through the lungs and is passed into the blood, which carries it to other parts of the body. The liver changes most of the TCE taken into the blood into other compounds, called breakdown products, which are excreted in the urine in a day or so. However, some of the TCE and its breakdown products can be stored in the fat or the liver, and it may take a few weeks for them to leave the body after exposure stops.

What kinds of health effects are caused by exposure to TCE in air?

In humans, long term exposure to workplace air containing high levels of TCE (generally greater than about 40,000 micrograms of TCE per cubic meter of air (mcg TCE/m^3)) is linked to effects on the central nervous system (reduced scores on tests evaluating motor coordination, nausea, headaches, dizziness) and irritation of the mucous membranes. Exposure to higher levels (generally greater than 300,000 mcg TCE/m^3) for short periods of time can irritate the eyes and respiratory tract, and can cause effects on the central nervous system, including dizziness, headache, sleepiness, nausea, confusion, blurred vision and fatigue. In laboratory animals, exposure to high levels of TCE has damaged the central

nervous system, liver and kidneys, and adversely affected reproduction and development of offspring. Lifetime exposure to high levels of TCE has caused cancer in laboratory animals.

Some studies of people exposed for long periods of time to high levels of TCE in workplace air, or elevated levels of TCE in drinking water, show an association between exposure to TCE and increased risks for certain types of cancer, including cancers of the kidney, liver and esophagus, and non-Hodgkin's lymphoma. One study showed an association between elevated levels of TCE in drinking water and effects on fetal development. Other studies suggest an association between workplace TCE exposure and reproductive effects (alterations in sperm counts) in men. We do not know if the effects observed in these studies are due to TCE or some other possible factor (for example, exposure to other chemicals, smoking, alcohol consumption, socioeconomic status, lifestyle choices). Because all of these studies have limitations, they only suggest, but do not prove, that exposure to TCE can cause cancer in humans and can cause developmental and reproductive effects as well.

What are background levels of TCE for indoor and outdoor air?

The exact meaning of background depends on how a study selected sampling locations and conditions. Generally, sampling locations are selected to be not near known sources of volatile chemicals (for example, a home not near a chemical spill, a hazardous waste site, a dry cleaner, or a factory). In some studies, the criteria for sampling indoor air may require checking containers of volatile chemicals to make sure they are tightly closed or removing those products before samples are taken. The New York State Department of Health (NYSDOH) has used several sources of information on background levels of TCE in indoor and outdoor air. One NYSDOH study of residences heated by fuel oil found that background concentrations of TCE in indoor and outdoor air are less than 1 mcg/m^3 in most cases. In this study, most homes did not have obvious sources of volatile organic compounds (VOCs). In those homes with VOC sources, samples were taken and the data are included in the study.

What are sources of TCE in air in homes?

TCE is found in some household products, such as glues, adhesives, paint removers, spot removers, rug cleaning fluids, paints, metal cleaners and typewriter correction fluid. These and other products could be potential sources for TCE in indoor air.

Another source of TCE in indoor air is contaminated groundwater that is used for household purposes. Common use of water, such as washing dishes or clothing, showering, or bathing, can introduce TCE into indoor air through volatilization from the water.

TCE may also enter homes through vapor intrusion as described on page 1 in the question "How can I be exposed to TCE?".

What is the level of TCE that people can smell in the air?

The reported odor threshold (the air concentration at which a chemical can be smelled) for TCE in air is about 540,000 mcg TCE/m^3. At this level, most people would likely be able to start smelling TCE in air. However, odor thresholds vary from person to person. Some people may be able to detect TCE at levels lower than the reported odor threshold and some people may only detect it at concentrations higher than the reported odor threshold.

If I can't smell TCE in the air, am I being exposed?

Just because you can't smell TCE doesn't mean there is no exposure. Sampling and testing is the best way to know if TCE is present.

What is the NYSDOH's guideline for TCE in air?

After a review of the toxicological literature on TCE, the NYSDOH set a guideline of 5 mcg/m^3 for TCE in air. This level is lower than the levels that have caused health effects in animals and humans. In setting this level, the NYSDOH also considered the possibility that certain members of the population (infants, children, the elderly, and those with pre-existing health conditions) may be especially sensitive to the effects of TCE.

The guideline is not a bright line between air levels that cause health effects and those that do not. The purpose of the guideline is to help guide decisions about the nature of the efforts to reduce TCE exposure. Reasonable and practical actions should be taken to reduce TCE exposure when indoor air levels are above background, even when they are below the guideline of 5 mcg/m^3. The urgency to take actions increases as indoor air levels increase, especially when air levels are above the guideline. In all cases, the specific corrective actions to be taken depend on a case-by-case evaluation of the situation. The goal of the recommended actions is to reduce TCE levels in indoor air to as close to background as practical.

Should I be concerned about health effects if I am exposed to air levels slightly above the guideline? Below the guideline?

The possibility of health effects occurring is low even at air levels slightly above the guideline. In addition, the guideline is based on the assumption that people are continuously exposed to TCE in air all day, every day for as long as a lifetime. This is rarely true for most people who are likely to be exposed for only part of the day and part of their lifetime.

How can I limit my exposure to TCE?

TCE can get into indoor air through household sources (for example, commercial products that contain TCE), from contaminated drinking water, or by vapor intrusion. As with any indoor air contaminant, removing household sources of TCE will help reduce indoor air levels of the chemical. Maintaining adequate ventilation will also help reduce the indoor air levels of TCE. If TCE is in the indoor air as a result of vapor intrusion, a sub-slab depressurization system, much like a radon mitigation system, will reduce exposures by minimizing the movement of vapors that are beneath a slab into a building. If TCE is in the water supply of a house, a carbon filter on the water supply to remove the TCE will minimize ingestion and inhalation exposures.

Is there a medical test that can tell me whether I have been exposed to TCE?

TCE can be measured in people's breath soon after they are exposed. TCE and some of its breakdown products can be measured in the urine and blood. These tests are not routinely available at a doctor's office. Urine and blood tests can indicate that you may have recently (within the last few days) been exposed to a large amount of the chemical. However, they cannot tell you the source of the exposure. Some of the breakdown products of TCE can also be formed from other chemicals.

When should my children or I see a physician?

If you believe you or your children have symptoms that you think are caused by TCE exposure, you or your children should see a physician. You should tell the physician about the symptoms and about when, how and for how long you think you and/or your children were exposed to TCE.

What is the NYSDOH doing to educate physicians about TCE?

The NYSDOH maintains an Infoline (1-800-458-1158) that physicians or the public can call when they have questions related to various types of chemical exposures. A certified occupational and environmental health nurse is available to triage physicians' questions and to direct their inquiries to the appropriate staff member.

The NYSDOH also works closely with the federal Agency for Toxic Substances and Disease Registry (ATSDR), making their educational materials available to physicians upon request. One of these items is an environmental medicine case study entitled "Trichloroethylene (TCE) Toxicity," which provides the opportunity for physicians to earn continuing medical education credits from the Centers for Disease Control and Prevention. Physicians who would like to complete this training are encouraged to contact the NYSDOH for more information. A printed copy can be mailed to the physician or it can be accessed on-line at the following web site http://www.atsdr.cdc.gov/HEC/CSEM/tce/index.html.

Where can I get more information?

If you have any questions about the information in this fact sheet or would like to know more about TCE, please call the NYSDOH at 1-800-458-1158 or write to the following address:

New York State Department of Health
Bureau of Toxic Substance Assessment
Flanigan Square, 547 River Street
Troy, NY 12180-2216