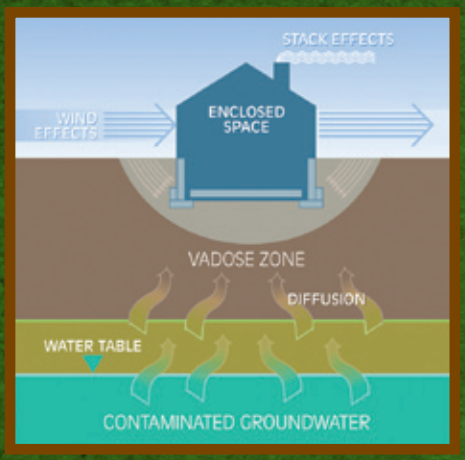

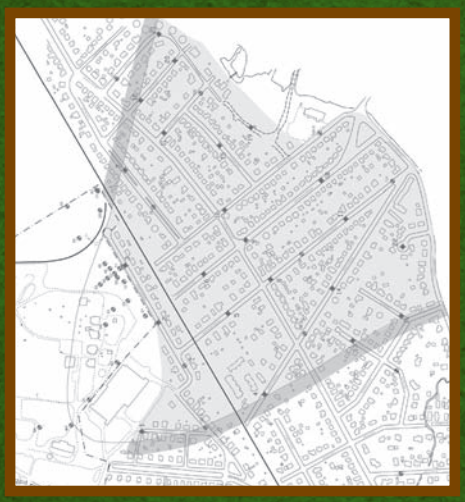

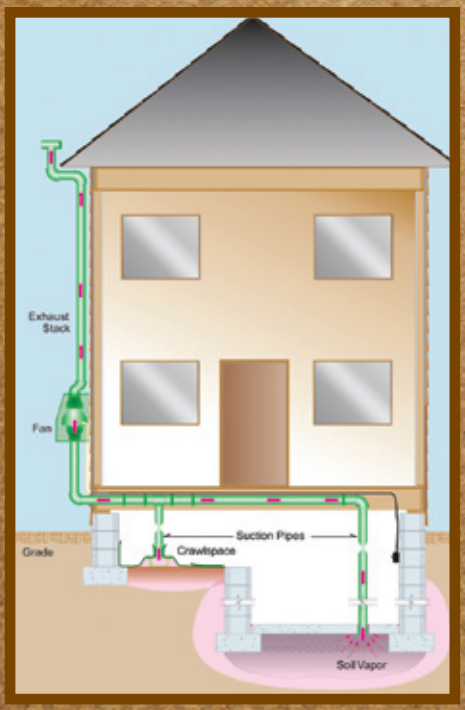

DUPONT VAPOR MITIGATION PROGRAM

The purpose of this document is to clarify information and provide homeowners within the Potential Vapor Mitigation Area (PVMA) useful and accurate information about the ongoing program.

DUPONT®

Are sub-standard components being used while installing vapor mitigation systems?

Vapor mitigation systems are not purchased as a complete package from a single manufacturer. They are built using many different components from multiple manufacturers and combined to complete a system. Although components used for vapor mitigation systems are the same types of components found in typical radon mitigation systems, DuPont has used only high quality products for every vapor mitigation system being installed as part of the Pompton Lakes mitigation program.

For example:

1. The DuPont program vapor mitigation systems utilize aluminum downspouts for exterior exhaust piping to improve the system's aesthetics by blending in with existing rain spouts on homes. DuPont offers to paint all outside components to match the house's colors. Radon mitigation systems use PVC pipe for exterior exhaust because it is cheaper and easier to install. PVC pipe is typically left white with red print; not painted.

2. The DuPont program vapor mitigation systems use Schedule 40 PVC pip inside homes. Radon mitigation systems typically use Schedule 20 PVC pipe (thinner wall).

3. The DuPont program vapor mitigation systems use a combination of pressure and DWV fittings, while radon systems typically use just DWV fittings (shallower joint connections).

4. The DuPont program vapor mitigation systems utilize a condensate bypass that diverts any condensate collected in the exhaust stack around the system fan. This is installed to help prolong the life of the fan. Radon mitigation systems typically do not use a condensate bypass.

5. Rain caps are installed on DuPont program vapor mitigation systems to minimize the collection of rain in the exhaust stack. Radon mitigation systems generally do not have rain caps.

6. Fan covers are installed on DuPont program vapor mitigation systems to improve the system's aesthetics. Radon mitigation systems typically do not have fan covers.

Why are the covers off of or non-existent on some fans?

As mentioned above, the vapor intrusion systems being installed as part of the DuPont program are installed with fan covers. Any fan without a cover is in a temporary condition between the time the system is installed and when it receives its electrically inspection. Fan covers are initially left unsecured until the electrical inspection is complete. Upon passing inspection, DuPont's contractor returns to the home to secure the fan covers. Also, there are a small number of homes in the community that have a pre-existing radon mitigation system. These systems typically do not have fan covers.

Are these radon mitigation systems? If so, you must be certified in New Jersey to install them. We called the New Jersey Department of Environmental Protection (NJDEP) and they don't know if these systems are considered radon or vapor mitigation systems.

All systems being installed as part of the DuPont program are specifically engineered to mitigate potential volatile organic compound (VOC) vapors under buildings (under its concrete slab). Although they are similar to radon mitigation systems, they are more highly engineered and undergo a more thorough testing of their effectiveness. The primary design criterion is to depressurize the entire slab so that soil vapor can be intercepted before coming indoors. Typical radon systems do not depressurize the entire slab because their design criterion is to reduce radon to a certain level.

An article that discusses the differences between vapor mitigation systems and radon systems can be viewed at: *http://www.pomptonlakesworks.com/resources*

Before beginning the mitigation work, DuPont conferred with the New Jersey Department of Environmental Protection (NJDEP) who determined that the intent and design of these systems is specific to VOC vapors, and radon mitigation system certification would not be required. However, the systems must meet the requirements of the NJDEP's Vapor Intrusion Guidance (October 2005) which include a certification of system designs by a professional engineer licensed in the state of New Jersey.

DuPont's contractor if referencing/ using the 2003 ASTM standard when they should reference/ use the 2008 ASTM standard.

The 2007 ASTM standard was not published at the time DuPont prepared and submitted to the NJDEP its Vapor Interim Remedial Measure Work Plan (June 2008). The 2008 American Society for Testing and Materials (ASTM) Standard (E2121-08) was issued 2 months later in August 2008. The 2008 standard has no substantive changes from the 2003 ASTM Standard. Mitigation systems being installed as part of the DuPont program are being designed and installed in general conformance with both the 2003 and 2008 versions of ASTM standard.

DuPont's contractor's New Jersey license as a home improvement contractor shows an effective date of October 20, 2008 yet the first systems were installed in September 2008.

The purpose of the license is to register contractors for the protection of homeowners who hire home improvement contractors. The license if not required for DuPont's program since there is no monetary or contractual agreement between DuPont's contractor, O'Brien & Gere, and the homeowners.

However, DuPont wanted to cover all possible scenarios, so therefore O'Brien & Gere completed an application for licensure as a home improvement contractor and mailed it to the New Jersey Division of Community Affairs (DCA) on August 15, 2008. Correspondence was received back from the DCA on August 27, confirming that the application was received. While the application was being processed, DuPont and O'Brien & Gere met with the Borough of Pompton Lakes Construction Office to discuss the logistics of applying for construction permits. During that meeting, it was agreed that O'Brien & Gere would be allowed to apply for building permits with the understanding that the license from the DCA was forthcoming and that the systems were being permified under a work plan approved by the NJDEP.

How many vapor mitigation systems has O'Brien & Gere installed?

O'Brien & Gere is a premier engineering and construction company with extensive vapor intrusion experience. The team of professionals has designed and installed approximately 1,200 vapor mitigation systems in homes, schools, day care centers and commercial buildings. As part of their work portfolio, they installed 557 systems at the largest vapor intrusion site in the country. O'Brien & Gere is employee-owned and have been since their inception in 1945, 64 years ago. Several of the engineers and scientists working on DuPont's program are employee owners. They have operated out of New Jersey since 1983.

How do we know the system is functioning properly?

A properly functioning system is one that depressurizes the entire slab, thereby intercepting all soil vapor before entering an indoor structure. DuPont's contractor, O'Brien & Gere, conducts testing after the system is installed and is operating. One of these tests is to directly measure the vacuum underneath the slab.

In addition, an indoor air sample is collected approximately 30 days after the system has been in operation. Because indoor air sample results can be attributed to indoor household products or outdoor site, the results of this sample are evaluated with respect to these two potential sources before being compared to the site-specific indoor air comparison levels.

Systems are equipped with a vacuum indicator. Residents are provided instructions at the time systems are installed so they can check the system's vacuum and ensure the system is functioning properly. Residents should contact DuPont if they feel there is a problem with their system.

Additionally, in accordance with the approved work plan, DuPont continues to prepare a comprehensive report for each property where a system is installed and commissioned. The detailed report contains documentation of all air sampling at the property, design testing data, as-built systems drawings and system commissioning data. Once approved by the NJDEP, a copy of this document along with an approval letter from the NJDEP is provided to the property owner. This document certifies that the system is functioning properly.

Has the high ground water in the community made the installation of the vapor mitigation system impossible?

High ground water makes vapor mitigation system design and installation more difficult, but not impossible. DuPont's contractor has yet to encounter a high ground water table beneath a structure in the community. However, we have encountered instances, after heavy rains, where rain water percolates through the surface soils to under the basement slab. Generally, the rain water will be held in the porous material under the slab, and eventually percolate further down through the ground. This is a temporary condition that does not affect the system's long-term performance. In the event that we do find high ground water under a slab, we have alternative measures that can be instituted to overcome the impact ground water may pose on the system.

Do these systems pump high ground water from beneath the slab and out the exhaust pipe?

Fans on the mitigation systems do not operate in the same manner as water pumps. Because there is not enough vacuum, water cannot be pulled through the system's fan and out the exhaust pipe.

Does rain water and/or condensate make its way into the fan and damage the fan?

The mitigation systems fans are designed to withstand impacts by rain

or condensate. The design of the system takes extra steps to prolong the life of the fan by installing exhaust stack rain condensate bypasses on every system.

Regarding manometers readings on the piping, the maximum should be 3.8 inches of water.

There are three different models of fans being used as part of the vapor mitigation program. The fan model is selected during each system's design depending upon the design testing results (the ability to create a vacuum under the slab), which are highly dependent upon the type and homogeneity of sub-slab materials (higher vacuum fans are needed for clay materials, while lower vacuum fans are adequate for gravel-type materials). DuPont's contractor has set maximum allowable vacuums at the fan's inlet, which are sometimes higher than the manufacturer's recommended maximum vacuum. Although it is not typical to allow fans to operate above the manufacturer's recommended maximum vacuum, DuPont's contractor will allow such an approach if it is warranted to achieve an effective system (i.e., depressurization of the entire slab). Operating above the recommended maximum vacuum is expected to shorten the life expectancy of the fan. However, since DuPont is conducting regular inspections of the systems, they will be monitoring the fan's performance over time and will replace it when it begins to degrade.

The design drawings state that the fan should be mounted 4 feet above grade and it is not.

The design drawings suggest a reasonable accessible fan height for inspection and maintenance, but it is not a requirement. It should be noted that there are no fan height specifications in any USEPA or ASTM guidance document. However, the actual height of the fan above grade is determined during installation based on aesthetics, accessibility and building-specific constraints.

Why are aluminum downspouts being used for fan exhaust stacks? Aluminum down spouts should not be used because they will corrode due to HCl (Hydrochloric acid) being generated as the volatile organic compounds (VOCs) breakdown in the exhaust stack.

Aluminum downspouts are being used rather than 4-inch diameter PVC pipe to improve the aesthetics of the systems. The down spouts come in various colors to match the house, blend in better with existing downspouts on the home and resemble pipe chases that pre-exist in this community (some houses use aluminum downspouts to hide air conditioning condensate lines for units installed on the second floor.) Aluminum downspouts are also recommended by the EPA for discharge stacks (Radon Reduction Techniques for Existing Detached Houses – Technical Guidance (Third Edition) for Active Soil Depressurization Systems, 1993.)

HCl generation from the degradation of chlorinated VOCs (known as reductive dechlorination) can occur. However, given the very short time period (i.e., few seconds) that chlorinated VOC molecules spend in the exhaust (downspouts), very little, if any, degradation occurs. Therefore, generation of HCl in the exhaust in highly unlikely. It is more likely that HCl is generated in the groundwater where most of the VOC degradation is taking place. Given the trace levels of chlorinated VOC in the groundwater and the slow rate of degradation, HCl generation if likely undetectable because any HCl that is generated in the subsurface will react with mineral compounds (NA+, Ca+, K+) rather than be liberated as a soil vapor. Even if HCl enters the aluminum exhaust pipe, it would be at very low concentrations due to the low condensation of chlorinated VOCs in the soil vapor. HCl would also be diluted by condensed moisture in the exhaust stack, resulting in a condensate pH that would not impact the aluminum exhaust pipe.

The use of the aluminum downspout as exhaust pipe will void the fan's factory warranty.

According to the manufacturer's (Radonaway) warranty, the use of aluminum downspout as exhaust pipe for outdoor installations in cold climate or high moisture content in soil may produce condensate. The warranty states "Failure to install a proper condensate bypass may void any warranty claims." A condensate bypass is installed on every vapor mitigation system to protect the fan. In the event the fan fails, it will be replaced (at no cost to the resident) regardless of the warranty status.

The male/female configuration that DuPont is installing on the exhaust stack creates turbulence and condensation inside the pipe.

Installing the exhaust stack with the male fitting end down is done so that condensate, when it forms, can drain down the inside of the exhaust stack without causing an obstruction. This configuration is in accordance with the EPA guidance (Radon Reduction Techniques for Existing Detached Houses, Figure 27). Turbulence and condensation will be created in the exhaust stack regardless of the male/female configuration.

What is the proper distance the exhaust point needs to be from building openings (such as windows, doors, chimneys)?

Proper distances have been defined by the American Society for Testing and Materials (ASTM). The exhaust point must be at least 10 feet from or at least 2 feet above all openings into occupiable or otherwise conditioned space.

The 2008 ASTM standard specifically references attic vents as an opening that the vapor mitigation system exhaust point must be at least ten feet away from or two feet above (as well as chimney, window or door considered to be an opening). This specific reference has been updated and is different from the 2003 ASTM standard.

There are no changes to the 2008 ASTM standard versus the 2003 standard regarding distances from discharge to openings. Section 7.3.2.9 is worded exactly the same in both standards.

Furthermore, the ASTM standards identify openings as "any window, door or other opening into conditioned (temperature controlled) or otherwise occupiable spaces." Generally, attics are neither conditioned nor occupiable, and therefore are not considered as openings into the structure. DuPont checks with each resident, who have attic vents near proposed exhaust points, to determine if they currently occupy their attic space or if they have future plans to occupy the space. In practice, if attics do not have a floor in them, they are generally considered to not be occupiable.

There is a NFPA violation (fire hazard) associated with the discharge pipe being 2 feet above the chimney. It will melt when the fireplace is being used.

Although there was not a specific NFPA code cited in the comment, NFPA 211 (Standard for Chimneys, Fireplaces, Vents and Solid Fuel-Burning Appliances) is applicable. Section 7.3 specifies that the minimum air space clearance (i.e., the minimum distance) between an exterior brick chimney and any combustible material is 1-inch. Rigid PVC pipe would be considered a combustible material per the definitions in Section 3 of NFPA 211, as well as per ASTM E136. Aluminum is not combustible. To date, DuPont has used aluminum exhaust stacks in all mitigation system installations except in one case, where the resident requested PVC pipe and in two separate instances where existing radon systems had pre-existing PVC pipes along their chimney. In all cases, DuPont provided a minimum air space clearance of 1-inch. Therefore, there is no NFPA violation.

Furthermore, according to ASTM 2121, discharges the installation of mitigation systems near chimneys, we will design such configurations at the insistence of the resident/property owner. Therefore, that is why you will see some exhausts near and above chimneys.

If the homes have French drains and we induce a vacuum under the slab with the vapor mitigation systems, will we draw carbon monoxide into the basements from the hot water tank and the furnace?

DuPont's contractor conducts a backdraft test as part of the system commissioning to ensure that the system does not create a backdraft which could draw flue gases (including carbon monoxide) from gas-fired devices (i.e., furnaces, hot water heaters) into the indoor air. The results of this test are documented and submitted to the NJDEP and resident.

Are backdraft tests being conducted?

Backdraft tests are conducted during each design testing visit on all devices located on the lowest floor that exhaust combustion gases travel through a flue. The purpose of the test is to make sure there are no existing backdraft conditions prior to installation of the mitigation system. The results of the backdraft tests are documented on design testing field forms. Backdraft tests are also conducted during the systems commissioning (immediately after installation), and are documented on commissioning field forms. If a resident believes an adequate test was not completed we encourage them to call us to discuss the testing. DuPont's contractor conducts backdraft testing following the "Simple Smoke Visualization Test" procedures specified by the EPA in Section 11.5 of their guidance document, Radon Reduction Techniques for Existing Detached Houses – Technical Guidance (Third Edition) for Active Soil Depressurization Systems (1993). This test is conducted under maximum building depressurization conditions, which is when all ventilating appliances located in the basement or on the slab on grade are in operation and all windows and doors are closed.

What happens when the power goes out? Do I need to restart the system?

The system will shut down temporarily when the power goes out. Similar to other appliances in your home, the system will restart itself once power is restored. There is nothing a resident needs to do once power is restored.

DuPont's contractor is not sealing all floor cracks in basement slabs.

Sealing off floor cracks in concrete slabs is recommended to improve depressurization, however sealing of every crack is not necessary in order to achieve an effective system (i.e., depressurization of the entire slab). ASTM E2121 states "...field experience has shown that sealing the floor-wall joint and small cracks in the slab...usually is not necessary when an active soil depressurization system is employed."

However, as their standard practice, DuPont's contractor does seal major visible cracks in floors as well as walls. Major cracks are defined as cracks that completely penetrate through the wall or floor. These cracks are identified by smoke testing. A crack that draws smoke (when the vapor mitigation system is in operation) is one that may impair system performance. Surface cracks are those that do not draw smoke and generally do not impair system performance.

In addition, not all major cracks are visible. Some may be hidden by finished flooring, large pieces of furniture, clutter, etc. The bottom line is that the mitigation system needs to be effective (i.e., depressurization of the entire slab). Testing completed during the design, installation and commissioning of the vapor mitigation system demonstrates and documents an effective system through various tests, which are verified by NJDEP.

These systems are really noisy.

The systems do create some noise and/or vibration when they operate. This noise is generally comparable to a refrigerator running. The systems offered/installed as part of the DuPont program have the following devices to reduce noise and vibration:

1. Vibration dampening materials surrounding the pipe penetration through the sill.
2. Vibration dampening mounts of the fan backer plate mounted to the house.

The contractor will make every effort to reduce noise and/or vibration, however it is not possible to completely eliminate either the noise or vibration.

Should sumps be capped off?

Sumps should be sealed to eliminate them as a pathway of soil vapor into the indoor air as well as to improve the sub-slab depressurization (i.e., cuts off the "short-circuiting" of induced vacuum from suction point to indoor air). DuPont's contractor installs pressure-treated plywood covers and seals the plywood to the basement slab. The more structurally-sound plastic covers, sold commercially because they are safer for residential buildings, particularly those with young children. Plywood can withstand an accidental step by a person, plastic covers cannot. The seals and integrity of the plywood covers will be tested during each inspection, and repairs or replacements will be made whenever necessary.

Therefore, since the plywood sump covers are safer, they are the better choice of cover material.

Is DuPont's contractor using the correct purple primer and/or glue when they attach PVC fittings in their installations?

The use of a purple primer and/or glue is not required for PVC fittings in this application. Purple primer and/or glue are required in plumbing applications where PVC pipe transports liquids, but not for PVC pipes that transport air. The vapor mitigation system designs specify use of clear low volatile organic compound glue and primer for all fittings.

NFPA 780 states that any pipe has to be grounded (referencing the aluminum down spout associated with each system).

NFPA 780 (Standard for the Installation of Lightning Protection Systems, 2008 Edition) specifies the materials and installation of lightning protection systems. It does not require that lightning protection systems be installed on residential buildings nor does it require exhaust pipes be grounded when there is no existing lightning protection system. To date, DuPont's contractor has not encountered existing lightning protection systems on houses of which we have conducted mitigation system designs. If and when we do, we will integrate the mitigation system with the existing lightning protection system in accordance with NFPA 780.

GFI is needed inside for electrical outlets.

The electrical outlets that are installed are single receptacle units for the vacuum alarm, which notifies home owners when there is a loss of vacuum in the mitigation system. According to the National Electric Code (NEC), Article 210.8(A)(5), GFCI receptacles are required in unfinished basements (GFCI are not required in finished basements) except for single receptacles that are dedicated to a single appliance. Since this is the case in the DuPont designs, GFCI receptacles are not required. In addition, DuPont does not install receptacles within 6 feet of sinks.

Inappropriate tacks are being used to attach electrical wires to joists.

Tacks, commonly referred to as staples, used by DuPont's licensed electrician are 1-1/4" x 9/16" steel staples manufactured by Metallics, Inc. (Model FST100), designed for nonmetallic sheathed cable. Therefore they are appropriate.

There are too many wires going into the junction boxes.

According to the National Electric Code (NEC), Article 314.16(A), the number of wires allowed in a junction box is dependent on the size of the box and gage of wires. The comment was not specific about these details in order to assess if the comment is correct. However, DuPont has hired a licensed electrical contractor to install all electrical wiring and connections. In addition, the Borough conducts an electrical inspection to check on these code requirements.

Speed controllers are not being used on all the systems.

Speed controllers are not required as part of the system design, therefore they do not need to be used on all systems. The controllers are being used, where applicable, to quiet the fan's noise but only if we can maintain the effectiveness of the system (i.e., depressurization of the entire slab). The need of a speed controller and its impact of the system's effectiveness are evaluated on a case-by-case basis.

Is the foam around elbows outside being installed properly?

Expanding foam is sometimes used where the system's pipe penetrates the sill (just upstream from the 90-degree elbow below the fan). The foam, or other material such as silicone sealant, is used for weather-proofing purposes. DuPont's contractor is proud of the workmanship and would like to improve any situation that the home owner deems "shoddy." We encourage home owners to contact DuPont so we can make improvements.

The groundwater treatment system on the DuPont site pollutes the sir and biases the ambient air concentrations high in the community.

DuPont has collected 110 ambient air samples since the start of its program in 2008. Of the two primary compounds found in DuPont's groundwater and soil vapor, tetrachloroethene (PCE) and trichloroethene (TCE), PCE was detected in only 4 samples, while TCE has never been detected. The average concentration of PCE in the PVMA to date is 0.8 micrograms per cubic meter (µg/m3), which is below a national average concentration of 2.7 µg/m3 reported by the EPA (Building Assessment and Survey Evaluation Database, USEPA 2001). Therefore, according to the samples collected to date, the ambient air concentrations in the PVMA for the two primary compounds are not being affected.

CONCLUSION

The DuPont program is committed to installing vapor mitigation systems with quality components and that are effective (i.e., depressurization of the entire slab). Each system is designed specific to that property; there is no one-size-fits-all. As with most construction design drawings, DuPont's contractor's drawing show typical details and are subject to field modifications. Modifications to the system design made during installation are pre-approved by the design team, documented on field forms, submitted to the Borough's Construction Official, and documented on final record drawings. Each installed system is commissioned to test and document the system's effectiveness. A document is developed for each system that provides all documentation for that property including sampling, design testing, commissioning and final system design. The document is reviewed and approved by the NJDEP, after which a copy is given to the property owner.

DuPont is also committed to maintaining the mitigation systems until soil vapors are no longer present. Regular inspections of the systems will be conducted; repairs and preventative maintenance will be completed on the systems as necessary. If any system does not meet performance criteria, the system will be modified, as necessary, to ensure that the system is again effective at mitigating soil vapor.

QUESTIONS?

DuPont encourages any property owner with questions, concerns and/or complaints to contact them at (973) 492-7703.

POMPTON LAKES WORKS