

# Maintenance Plans for Vapor Mitigation Systems/ Vapor Intrusion Response Actions/Vapor Barriers

(Appendix 5 of RR-606)

RR-981

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Addendum to [Guidance on Case Closure and the Requirements for Managing Continuing Obligations \(RR 606\)](#)

A vapor mitigation system (VMS) is designed to interrupt an exposure pathway. Such a system does not remove contaminant mass. Vapor mitigation systems include a radon-type sub-slab depressurization system as well as other, more site-specific systems. When a vapor mitigation system is required, a site-specific operation and maintenance plan is essential for ensuring on-going protection of public health and safety.

In order to address issues that could compromise health and safety, an operation and maintenance plan that clearly describes the system parts, locations, and operation needs to be available to owners and renters of a property. Maintenance plans for a site may be combined. However, it is best to include a title which identifies all the continuing obligations covered, and to clearly label each section (i.e. Cover Maintenance, VMS Maintenance, Vapor Barrier, etc.)

Sub-slab depressurization systems or other types of mitigation systems may be needed for many years, especially in cases where remedial actions were not able to remove enough of the contaminant source. (Some other action may be needed to address situations where the remaining building materials themselves have become "sources" of VOCs.) Problems with long-term use of such a mitigation or sub-slab depressurization system include changes in ownership, a limited life-span on system parts such as the fan, and a lack of understanding of the importance of operation of the system.

In certain situations where the vapor intrusion pathway was protected through remedial actions and use of a vapor mitigation system, the case may be closed with conditions for a continuing obligation. In some cases, full investigation is not possible or a remedial action may not address the source of contamination due to site-specific circumstances at the time. In many, but not all cases, operation and maintenance of a sub-slab depressurization system or other type of mitigation system, or maintenance of a floor as part of a vapor mitigation system (barrier) will likely be required to continue after case closure has been approved.

## **Vapor Intrusion Pathway Protection Situations in which Closure may be Approved**

There are five general situations where a form of vapor intrusion pathway protection has been implemented, in which closure may be approved. Several of these situations will typically have a VMS required to be installed, operated and/or maintained, and a floor may be required to be maintained (A, C, D) to help ensure the VMS remains effective. In some cases, a VMS may be required post-closure, depending on changes in property or building use (B, E). Specific closure



conditions required will be based on each site's unique characteristics. Multiple options may be used or required at any given site. The general situations include:

- A. A vapor mitigation system must be operated and maintained in order to limit or prevent vapor intrusion into an occupied building where sub-slab vapor contaminant levels equal or exceed vapor risk screening levels.
- B. Chemicals of concern are still being used in operation of a business. If use of the property changes, the exposure assumptions used may not be protective. In some cases, a VMS may be required based on site-specific circumstances, such as ensuring that neighboring businesses are not affected.
- C. A dewatering system may be required, to allow a VMS to operate effectively. When used, this continuing obligation is always used with option A. It is typically used at sites due to site-specific hydrogeologic conditions, such as where contaminated groundwater may be in contact with the building foundation
- D. Site-specific vapor inhalation exposure assumptions are used. If use of the property changes, the exposure assumptions used may not be protective
- E. Sites where residual soil or groundwater contamination (particularly chlorinated VOCs) pose a risk for future buildings, will have closure conditioned on the use of vapor control technologies for future buildings, unless the property owner chooses to assess the potential for vapor intrusion, and the DNR agrees that vapor control technologies are not needed. The property owner is also required to notify the DNR before constructing a new building, or changing the occupancy or construction of existing buildings, to allow for a re-evaluation of the vapor pathway.

### **Vapor Mitigation System Operation and Maintenance Plan Checklist**

Operation and maintenance requirements to address various conditions of closure may be included in a single maintenance plan. Include the following information in the operation and maintenance plan for vapor mitigation systems. The maintenance plan needs to include all the information identified in Attachment D of the case closure request form, 4400-202. (This information is identified in italics.)

#### **I. Passive Vapor Mitigation Systems and/or Barriers**

Passive VMS are limited in effectiveness. In general, a passive VMS will be approved only for new construction under limited circumstances, or for methane issues at existing or new buildings. The decision to use or allow a passive vapor mitigation system to address vapor intrusion is on a site-specific basis.

## **Part D.1 Descriptions**

*Form 4400-202, Attachment D, Part D.1— brief description of the type, depth and location of residual contamination, description of the system/cover/barrier to be maintained, and its location on the site, maintenance activities, and contact information.*

For passive VMSs, the maintenance plan needs to include the following:

1. General Information: System Description, Purpose and Location
  - Provide a property description (address, lot, parcel numbers, etc.)
  - Date of maintenance plan
  - Provide a basic description of
    - system design;
    - location of barriers, piping systems, exhaust stacks; etc.
    - design goals (include contaminant description).
  - Identify whether the passive VMS can be converted to an active system in the future
  - Include references to the corresponding maps or diagrams.
  
2. Construction Documentation: Information on a labeled diagram or map, with labeled photos to include:
  - identify where the system is located, both inside and outside the building;
  - the layout of the building in relation to the known extent of soil and/or groundwater contamination;
  - the location of any sub-slab piping and vent locations; and
  - photographs documenting the passive VMS barrier, piping system, vent locations, etc. at the time of installation.
  
3. Include the following items in the documentation in the regularly scheduled inspections:
  - Keep vents open
  - Immediately replace or repair any system components upon discovery of a malfunction. Document actions taken
  - Take the VMS into account if changes are made to the building
  - Do not breach the barrier
  - Maintain the floor
  - Notify DNR if interior space layouts are changed (in the case where a site-specific vapor attenuation factor was used)
  - Notify DNR if interior use changes (in the case where site-specific exposure assumptions were used)

## **D.2 Location Map(s)**

Include a location map which shows:

1. the feature that requires maintenance;
2. the location of the feature(s) that require(s) maintenance: on and off the source property;

3. the extent of the structure or feature(s) to be maintained, in relation to other structures or features on the site;
4. the extent and type of residual contamination; and
5. all property boundaries.

### **D. 3 Photographs of VMS/Floor/Barrier/Dewatering System**

Include one or more photographs documenting the condition and extent of the visible parts of the VMS at the time of the closure request. Pertinent features must be visible and discernible. Include a title on each photograph, which identifies the site name and location of the feature, and the date on which the photograph was taken.

### **D.4 Continuing Obligations Inspection and Maintenance Log**

Use DNR Fillable [Form 4400-305](#).

## **II. Active Vapor Mitigation Systems and Barriers**

### **Part D.1 Descriptions**

*Form 4400-202, Attachment D, Part D.1— brief description of the type, depth and location of residual contamination, description of the system/cover/barrier/dewatering system to be maintained, and it's location on the site, maintenance activities, and contact information.*

#### **1. System Description, Purpose and Location**

- provide a property description (address, lot, parcel numbers, etc.)
- date of maintenance plan
- provide a basic description of
  - system/barrier design,
  - location of barriers, piping system, exhaust stack, etc, and
  - design goals (include contaminant description).

Include references to the corresponding maps or diagrams. Label maps or diagrams in accordance with the required attachment label in the closure request form, 4400-202.

#### **2. System Design and Construction Documentation**

- provide final construction specifications
- provide a system diagram; label all system components, especially system parts that need to be monitored. Features might include:
  - electric connections;
  - fuses;
  - on/off switches - a hard-wired electrical connection with a protected disconnect switch is preferred to a flexible plugged cord for fans installed outdoors (E2121, "Radon Systems for Low-Rise Buildings");
  - manometer or pressure gauges *Include a photograph or a diagram which clearly shows the proper reading of the manometer of pressure gauge when the system is operating at design specifications;*

- Exhaust;
- HVAC air intake locations; indicate height of exhaust in relation to air intakes and building roof;
- subfloor port;
- piping;
- fan; and
- alarm, if included.

### 3. System Maintenance:

Provide an explanation of:

- *the required maintenance of the fan/blower/venting system* – Provide detailed drawings of the system, including electrical connections, and manufacturers' specification sheets for the fan/blower
- *maintenance of the floor as a barrier to vapor intrusion*, if vapor concentrations below the floor are the source of risk. Address maintaining the structural integrity, and making sure changes due to repairs account for the need to keep the floor as impermeable as at closure.
- *the need to reassess the potential for vapor intrusion if the use of the space changes, or if the air exchange changes* (especially reductions in space).
- *Required actions/specifications in case of system removal or replacement.*
- *Repair or replace system components immediately upon discovery of a malfunction. Document actions taken in the inspection log/reports.*

### 4. Inspections

- *Provide a clear description of how to verify that an active system is operating properly, when repairs need to be made or parts replaced, and identify the frequency of monitoring and record keeping needed to document proper operation.* The closure letter will identify whether the inspection log needs to be submitted to the DNR/agency as well, and at what frequency.
- Include a provision for *maintaining an inspection log on site.*
- Include a provision for notifying DNR/the agency with administrative authority if any problem occurs for two or more successive inspections

### 5. Notifications **(Form 4400-202, Attachment D, Part 5)**

- Where changes in land or property use or system changes are required to be reported, include contact names, phone numbers and email addresses for the DNR/agency with administrative authority. Section NR 727.07 now requires that DNR be notified of any changes at least 45 days before making a change. This requirement should be included in the maintenance plan as a reminder.

### 6. Contacts **(Form 4400-202, Attachment D, Part 5)**

- List the name, address, telephone number and e-mail address of the property owner, consultant and DNR/agency project manager.

- Provide a contact at the company that installed the vapor mitigation system, for reporting problems.
- Provide a contact at a company under contract for system maintenance, if applicable.

## **D.2 Location Map(s)**

*Include a location map which shows:*

- (1) the feature that requires maintenance;*
- (2) the location of the feature(s) that require(s) maintenance: on and off the source property;*
- (3) the extent of the structure or feature(s) to be maintained, in relation to other structures or features on the site;*
- (4) the extent and type of residual contamination; and*
- (5) all property boundaries.*

Provide a labeled map, and/or labeled photos showing

- system locations, both inside and outside the building
- manometer or pressure gauges

## **D.3 Photographs of VMS/Floor/Barrier/Dewatering System**

Include one or more photographs documenting the condition of the visible parts of the VMS/barrier/dewatering system at the time of the closure request. Pertinent features must be visible and discernible. Include a title on each photograph, which identifies the site name and location of the feature, and the date on which the photograph was taken.-

## **D.4 Continuing Obligations Inspection and Maintenance Log**

Use DNR Fillable [Form 4400-305](#).

- Include an inspection log that lists key inspection items. (inspector, date, items inspected, state of system, parts replaced, repairs needed, when follow up was completed, etc.)

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