Vapor Intrusion Mitigation System

Operation, Monitoring, And Maintenance Checklist

Scope of Checklist: The purpose of this checklist is to guide the user during the inspection of a vapor intrusion mitigation system (VIMS) to (1) verify that the VIMS is operating as designed and (2) determine if certain operation, maintenance, and monitoring (OM&M) activities are necessary for continued operation and effectiveness of the system. This checklist is intended to provide factors to consider when documenting that the VIMS is operating and is effectively mitigating the vapor intrusion pathway during the lifecycle of its operation. Not all the information presented below is necessary to document system operation for all types of systems on all types of buildings, and some items may not be needed during every monitoring event. The user should be able to identify which criteria below best represent effective operation and responsible maintenance of their specific VIMS and if the conceptual site model (under which the system was designed) is still valid.

Prior to completing the inspection, it is recommended that the user review previously prepared OM&M plans. As-built drawings and performance (baseline) criteria are needed when conducting inspections of a VIMS. Monitoring scope, schedule, and methods may follow applicable agency requirements, which may be amended on a case-by-case basis through regulatory negotiation and approval. Where applicable, the monitoring and inspections must also comply with standards of practice and applicable codes (electrical code, building code).

In some situations, OM&M plans may not exist or be available or were not provided to a new operator or new building owner. Thus, the original as-built drawings and possibly the original performance criteria may not be known. In these cases, the checklist below can still be used to assist in developing the appropriate ongoing OM&M parameters for that particular site, although additional effort may be appropriate depending on the complexity of the building and site conditions.

A downloadable version of this checklist as a fillable form is available by clicking here.

1. Site Inspection Information

Address inspected:

Date of inspection: ____________________ Date of last inspection:

Inspector(s): ____________________ Title:_______________ Company:

Building contact:__________________________________ Phone number:

Frequency of inspections:

____ Annual____ Semi-annual ___ Quarterly ___ Monthly ___Other (specify)_______

Type of system being inspected:

____

2. Mitigation System Operation

2.1 Was the mitigation system functioning as designed and operating upon arrival? *If "no," explain in Section 5, Observations and Corrective Actions, why the system was not operational and steps taken to correct the problem.* *If "no" and the cause of the system shutdown is determined, follow the start-up procedures as detailed in the system OM&M plan and complete the remainder of the checklist.*	☐ Yes ☐ No ☐ NA
2.2 Has the mitigation system been altered from what is shown in the as-built drawings? *If yes, discuss in Section 5changes and possible impacts.*	☐ Yes ☐ No ☐ NA
2.3 Has the mitigation system operated continuously since the last OM&M event? *If no, discuss in Section 5 changes and possible impacts.*	☐ Yes ☐ No ☐ NA
2.4 Have procedures and equipment been checked for proper and failsafe operation? *If no, discuss in Section 5 changes and possible impacts.*	☐ Yes ☐ No ☐ NA
2.5 Are labels identifying the system components in place and legible? *If no, specify the date of replacement.*	☐ Yes ☐ No ☐ NA
2.6 Conduct a visual inspection of accessible system piping and pipe seals, including membrane seals (if applicable), connections, etc. Were any cracks/gaps or any changes in the system configuration observed? *If yes, list the inspection results in Section 5 and document the corrections to fix these problems.*	☐ Yes ☐ No ☐ NA

3. Building Conditions and Use

3.1 Is the building's heating system or heating, ventilating, and air conditioning (HVAC) system operating? *If yes, provide a summary below and explain in Section 5 if the HVAC system operation could impact the effectiveness of the mitigation system.* Hours/day of HVAC operation_________________	☐ Yes ☐ No ☐ NA
Climate controlled?	☐ Yes ☐ No ☐ NA
3.1.1 Is the building's heating system or HVAC system on during this OM&M event?	☐ Yes ☐ No ☐ NA
3.1.2 Is the building's heating system or HVAC system equipped with outside dampers? *If yes, how many? ________ % opened ___________*	☐ Yes ☐ No ☐ NA
3.2 Has the building had a change in use since the system began operation? (i.e., Are the exposure assumptions still appropriate?) *If yes, explain in Section 5 what these changes are and how they may impact the effectiveness of the mitigation system.*	☐ Yes ☐ No ☐ NA
3.3 Has the building undergone any physical modifications (building additions, change to interior walls, new sumps or French drains, any new permits filed, etc.)? *If yes, explain in Section 5 the building changes and how they may impact the effectiveness of the passive mitigation system.*	☐ Yes ☐ No ☐ NA
3.4 Has the condition of the basement (lowest floor) walls, floors, sumps, and utility penetrations been inspected for cracks, gaps, or seal failure? *If yes, list the inspection results in Section 5 and document the corrections (if necessary) to fix any problems.*	☐ Yes ☐ No ☐ NA

3.5 Has a visual inspection been conducted assessing the presence of moisture and/or efflorescence as crystalline deposits in the basement or lowest floor, including any crawlspaces? *If evidence of moisture or efflorescence was found, list the inspection results in Section 5 and document the corrections to fix these problems.*	☐ Yes ☐ No ☐ NA

4. Monitoring and Diagnostic Measurements

4.1 Record vacuum and air flow at the suction point(s) and compare to baseline values (if applicable). Note: Field instruments such as a micromanometer can be used if in-line gauges/displays are not built-in.	
Prepare and attach monitoring data table to summarize the results.	☐ Yes ☐ No ☐ NA
If consistent, note the conclusion in Section 5. *If not consistent, explain discrepancies in Section 5 and whether further corrective steps are necessary for the VIMS or actions taken.*	
4.2 Record fan or blower/fan air flow and vacuum and compare to baseline values (if applicable) Note: Field instruments such as a hot-wire anemometer can be used if in-line gauges/displays are not built-in.	
Prepare and attach monitoring data table to summarize the results.	☐ Yes ☐ No ☐ NA
If consistent, note the conclusion in Section 5. *If not consistent, explain discrepancies in Section 5 and whether further corrective steps are necessary for the VIMS or actions taken.*	
4.3 Are telemetry systems indicating normal operating conditions?	☐ Yes ☐ No ☐ NA
If no, describe the issues and any mitigative actions in Section 5. *Type of telemetry:* ___________________ *Location:* _____________________ *Summary of operating conditions:*____	
4.4 Did any telemetry system data show irregular entries or shutdown?	☐ Yes ☐ No ☐ NA
If yes, describe the issues and any mitigative actions in Section 5.	
4.5 Conduct vapor concentration monitoring within system (if applicable). Field instruments need to be calibrated and meet detection levels of vapors being monitored. If no sampling ports are built into the system, conduct monitoring at the piping discharge/exhaust. Monitoring options include: a) field screening with a photoionization detector (PID) for total ionizable VOCs or flame ionization detector (FID) for total hydrocarbons, including methane b) landfill gas monitoring for oxygen, carbon dioxide, and methane to assess cross-slab leakage, and sub-slab ventilation rates c) whole gas (Tedlar bag, Summa canister, Bottle-Vac, etc., for analysis by USEPA Method TO-15 or similar) or sorbent sample (pumped ATD tube and TO-17 analysis). Holding time requirements of VOC samples for laboratory analysis need to be followed.	
Has there been a significant increase or decrease in concentrations since the previous monitoring event(s)?	☐ Yes ☐ No ☐ NA

<table>
<tr><td colspan="2">Multiply the concentration(s) by the flow rate to calculate mass emission rates.
• If the emission rates are higher than permit discharge limits, if present, consider off-gas treatment, taller stack, permit variance, or other options.
• If there has been a building depressurization test, is the initial mass removal rate from the system greater than the mass emissions through the building during depressurization?
• If the rate of mass removal from the system is too low to pose a potential risk to indoor air quality (i.e., the product of vent pipe concentrations multiplied by vent pipe flow rate is less than the product of the indoor air screening level multiplied by the building volume and air exchange rate), consider whether it may be appropriate to transition to a sub-slab ventilation system, semi-passive system (wind or solar fans), passive system (no fan, but open vent-pipes) or a decommissioned system.</td></tr>
<tr><td>Record the monitoring results in Section 5 or the attached monitoring data tables.</td><td>☐ Yes ☐ No ☐ NA</td></tr>
<tr><td colspan="2">Discuss in Section 5 the reason(s) for any significant changes observed.</td></tr>
<tr><td>4.6 Record differential pressure (between sub-slab and indoor air) at monitoring points beneath the building floor slab if appropriate. Is the minimum differential pressure recorded at all monitoring points?</td><td>☐ Yes ☐ No ☐ NA</td></tr>
<tr><td colspan="2">Record the monitoring results in the attached monitoring data tables.
Discuss in Section 5 the reason(s) for any significant changes observed.
Conduct a periodic leak check of the sampling probes if collecting soil gas samples.
For locations where the minimum vacuum is not observed, consider additional data collection.</td></tr>
<tr><td>a) Connect a digital micromanometer to the probe, set data logging to a 1-second frequency and cycle the fan on and off (e.g., one minute on and then off, or until the micromanometer readings have stabilized). Repeat this cycle at least two times. Does the trend show a characteristic saw-toothed pattern with a magnitude similar to the target vacuum level?</td><td>☐ Yes ☐ No ☐ NA</td></tr>
<tr><td>b) Hold a smoke pen over the probe when open. Is the smoke drawn strongly into the probe?</td><td>☐ Yes ☐ No ☐ NA</td></tr>
<tr><td colspan="2">c) Consider collecting a soil gas sample from the probe. If the vapor concentrations are below conservative sub-slab screening levels, it may not be necessary or appropriate to modify the system to exert additional vacuum to this location.</td></tr>
<tr><td>4.7 Were indoor air samples collected for laboratory analysis as performance metrics?</td><td>☐ Yes ☐ No ☐ NA</td></tr>
<tr><td colspan="2">If yes, summarize in Section 5 the results for COCs and any mitigative actions. Background sources (consumer products and building materials inside buildings and ambient outdoor air VOCs) are a common confounding factor and must be explicitly considered when interpreting indoor air samples.</td></tr>
<tr><td>4.8 Has a smoke test been conducted (if necessary) to verify the continued integrity of the liner?
If yes, summarize in Section 5 the results and any corrective actions.</td><td>☐ Yes ☐ No ☐ NA</td></tr>
<tr><td>4.9 Has the appropriate frequency for system inspections been completed to date?
If no, explain the discrepancy in Section 5.
Current frequency of inspections__________________.</td><td>☐ Yes ☐ No ☐ NA</td></tr>
<tr><td>4.10 Were batteries replaced in any battery-powered alarms (if needed)?</td><td>☐ Yes ☐ No ☐ NA</td></tr>
<tr><td>4.11 Were additional items inspected?
If yes, explain in Section 5 the item(s) inspected and the findings from the inspection</td><td>☐ Yes ☐ No ☐ NA</td></tr>
</table>

4.12 Was system component maintenance completed per equipment manufacturer specifications? *If yes, explain in Section 5 the maintenance completed.*	☐ Yes ☐ No ☐ NA

5. Observations and Corrective Actions

Document observations and corrective actions or modifications made or planned to be made to the VIMS, and the results obtained to verify the effectiveness of the actions or modifications. Refer to the specific item number above for each observation or corrective action. Use additional pages as necessary.

6. Photographic Log

Photographs taken and included as attachment?	☐ Yes ☐ No ☐ NA

7. Overall VI Mitigation System Assessment

Is the mitigation system still protective?	☐ Yes ☐ No

8. Inspector Information

Name: ___________________________

Signature: ______________________________

Date: __________

Click here to view a PDF version of this Checklist.