Rapid Response & Ventilation for Vapor Intrusion Mitigation Fact Sheet

ITRC has developed a series of fact sheets that summarizes the latest science, engineering, and technologies regarding vapor intrusion (VI) mitigation. The fact sheets are tailored to the needs of state regulatory program personnel who are tasked with making informed and timely decisions regarding VI-impacted sites. The content is also useful to consultants and parties responsible for the release of these contaminants, as well as public and tribal stakeholders. This fact sheet:

- provides an overview of rapid response as a preliminary method to consider
- describes the typical options related to rapid response
- describes the advantages and limitations of implementing a rapid response
- provides general cost considerations related to rapid response
- describes other special circumstances to consider when deciding if rapid response is applicable

More detailed information on specific rapid response options is included in the ITRC Preferential Pathway Sealing and Ad Hoc Ventilation, Indoor Air Treatment, and HVAC Modification Technology Information Sheets.

1 Introduction

Rapid response is an interim VI mitigation approach that may be appropriate, under certain conditions (e.g., high contaminant concentrations and sensitive populations present), prior to implementing a long-term mitigation strategy for an occupied room or building. For the purposes of this fact sheet, a rapid response is one that could be easily implemented and verified on a timescale of days to weeks, whereas a long-term mitigation strategy typically takes longer to design and implement but is more effective, practicable, and often more cost-effective to operate over a long period of time. Some technologies or mitigation methods characterized in this fact sheet as rapid may also be suitable as long-term mitigation strategies. A rapid response may be implemented prior to developing a complete VI conceptual site model. Acceptable rapid response methods can vary based on site location and building use; however, a good understanding of building occupant demographics and building use is helpful to evaluate the need and type of rapid response. For cases where chemicals of concern are detected in indoor air at concentrations exceeding short-term exposure criteria, a rapid response may be required (Beringer, 2017). Rapid response actions can include administrative controls, such as relocating occupants and eliminating occupant access to the building, or engineering controls that reduce chemical vapor exposure through building ventilation, indoor air treatment, or by physically preventing vapor entry into the building.

Other Terminology Used to Describe a Rapid Response

• Depending on the regulatory framework and the measured indoor or subsurface concentrations for the chemical(s) of concern, the term "rapid response" can correspond to one or more of the following:

- *accelerated response*
- *urgent response*
- *expedited response*
- *emergency response*
- *immediate response*
- *imminent hazard response*

• For certain regulatory frameworks, several terms are used corresponding to different notification requirements and response time frames.

The requirement for a rapid response can vary significantly from state to state and among regulatory programs or health agencies. The criteria that may trigger the need for a rapid response and the time frame that qualifies a response as "rapid" also vary among jurisdictions. This fact sheet presents approaches and methods that should be considered when a rapid response has been deemed necessary.

The scope of this fact sheet is limited to scenarios where there may be an acute risk to human health from chemical VI and does not include "emergency" situations (i.e., "call 911" situations) where combustible, explosive, or oxygen-deficient conditions may exist inside a building. If these conditions are believed to be present, first responders should be contacted immediately.

2 Options for Rapid Response

2.1 Administrative Controls

2.1.1 Notification

Notification is an administrative control that should be considered. Notification is simply the act of communicating information about the VI condition and anticipated actions to various stakeholders (e.g., property owner, tenants, and occupants). This information would include but not be limited to background information on the site and VI, data or information that is triggering the rapid response, how a rapid response differs from a long-term response, what possible next steps might be, and contact information for entities that can provide more information and answer questions. Examples of notification include communications with tenants or inter-agency communication (e.g., the state environmental agency notifies the state health department). For additional information, see ITRC's ***Public Outreach During Vapor Intrusion Mitigation Fact Sheet***.

2.1.2 Temporary Relocation

Temporary relocation of a building's occupants eliminates receptor exposure to the VI-contaminated indoor air. This rapid response action typically includes a high level of public communication (see also ITRC's ***Public Outreach During Vapor Intrusion Mitigation Fact Sheet***); engagement with government agencies with statutory authority to evacuate an occupied building, including private property owners; and coordination and assistance with temporary accommodations until additional interim or final mitigation measures result in improvement to indoor air quality. In some cases, an occupant may decide to temporarily relocate based on personal risk tolerance regardless of whether relocation is being mandated by a regulatory body, or by a property manager, in the case of residential rental properties or commercial/industrial properties. Temporary relocation may not be required for an entire building or building population—for example, temporary workers or infrequent building users. Higher contaminant concentrations can pose greater risk to sensitive populations; therefore consideration should be given to limiting access to certain portions of the building where VI is occurring or temporarily relocating sensitive populations.

Benefits of temporary relocation include:

- can be implemented very quickly
- can be implemented irrespective of building construction or use
- immediately eliminates building occupant exposure

Limitations and requirements of temporary relocation include:

- significant building occupant disruption and potential economic hardship for commercial or industrial building owners
- building occupant communication and coordination is necessary
- does not remediate the source of VI
- typically not accepted as a long-term mitigation strategy
- requires some form of enforcement mechanism
- may require relocating pets, which can limit relocation options and/or increase relocation costs

Temporary relocation often includes weighing the risk of adverse acute health effects with the risks that come with the significant disruption that temporary relocation causes. In many instances, simple measures (such as opening windows) may suffice in the short term. If possible, the decision to temporarily relocate should rest with the individual after they have been informed of the risks. The decision to evacuate a building should consider the thoughts of an individual, but ultimately it is the regulator's responsibility to protect health and safety.

2.2 Engineering Controls

Engineering controls include those methods or strategies that involve utilizing technology or making physical changes to the building or building systems to reduce concentrations of VI contaminants to acceptable levels or as low as practicable if still above acceptable long-term levels. Engineering controls that could be part of a long-term mitigation strategy (e.g., a sub-slab depressurization system) are addressed in the ***Active Mitigation Approaches for Vapor Intrusion Mitigation Fact Sheet*** and ***Passive Mitigation Approaches for Vapor Intrusion Mitigation Fact Sheet***.

2.2.1 Ad Hoc Ventilation

Ad hoc ventilation can often be done immediately and easily, and does not require special skills or training. Opening a building's doors and windows or turning on existing ventilation fans that bring fresh air into the building are examples of ad hoc ventilation. This type of rapid response is typically short-lived or significantly limited in areas and times of year when climate control is required for building occupancy. Consideration should be given to how ad hoc ventilation may change heating, ventilating, and air conditioning (HVAC) system operation, potentially exacerbating vapor intrusion in other areas of the building. Consideration should also be given to potential issues with humidity, mold, and combustion appliance exhaust that could arise from ad hoc ventilation. See the ***Preferential Pathway Sealing and Ad Hoc Ventilation Technology Information Sheet*** for additional information.

2.2.2 Indoor Air Treatment

Temporarily placing indoor air purification units (APUs) in occupied spaces to filter chemicals of concern in indoor air is also an option that may allow an occupant to stay in their space while a long-term mitigation strategy is put in place (USEPA, 2017). Several APUs available on the market have demonstrated an ability to remove volatile organic compounds (VOCs) from indoor air using carbon adsorption if there is a long enough contact time between the indoor air and carbon media. The ability of APUs to improve indoor air quality is a function of indoor air volume and air flow rate capabilities of the device, allowing indoor air contaminants adequate time to adsorb onto carbon media. The ability of APUs to improve and maintain indoor air quality relies on properly sizing a device for each building area or room, maintaining a power source, and providing routine carbon media maintenance matching the device deployment interval. See the ***Indoor Air Treatment*** Technology Information Sheet for additional information.

Engineering controls listed in this section offer benefits, including:

- reduction or elimination of building occupant exposure
- ability to incorporate into or provide benefit for long-term mitigation strategy (e.g., sealing)

These controls have the following limitations or requirements:

- building occupant communication and coordination is necessary
- these controls do not remediate the source of VI
- mild to moderate disruption for building occupants

2.2.3 Preferential Pathway Sealing

Floor cracks or other openings, including electrical and plumbing conduits and floor drains, can constitute potential vapor intrusion pathways. Such pathways should be identified and sealed whenever they are readily accessible to reduce advective flow of soil gas into the building. Sealing these potential VI pathways can typically be done quickly. Sealing will also be beneficial for and likely be part of an effective long-term mitigation approach (USDOD, 2009). See the ***Preferential Pathway Sealing and Ad Hoc Ventilation Technology Information Sheet*** for additional information.

2.2.4 HVAC Modification

It may be possible to mitigate VI by adjusting a building's HVAC system to increase the fresh air intake and/or pressurize the building. Unlike ad hoc ventilation described in Section 2.2.1, this type of response requires some knowledge of building HVAC operations and special skills, certifications, or training. Ventilation and HVAC modification may allow occupants to stay in their building until confirmation sample results verify ventilation efficacy. See the ***HVAC Modification Technology Information Sheet*** for additional information.

3 Other Considerations

Rapid response is an interim VI mitigation approach easily implemented and verified on a timescale of days to weeks prior to implementing a long-term mitigation strategy for an occupied room or building. After implementation of a rapid response, efforts should transition to planning and implementing a more permanent, long-term mitigation strategy.

3.1 Verification Testing

Follow-up verification testing/performance monitoring of a rapid response may be appropriate prior to the implementation of

a long-term mitigation approach when the severity of the conditions warrant it (e.g., high contaminant concentrations, sensitive populations). Verification testing across differing seasonal conditions is typically not necessary given the timescale of rapid response approaches; however, more than one round of verification testing should be considered if weather conditions change considerably during implementation of a rapid response. Depending on the regulatory framework, indoor air testing may be recommended or required. In addition to indoor air testing, other verification testing may be useful. Regular monitoring of equipment, such as HVAC units or indoor air purifier units, should be conducted to verify operation.

3.2 Costs

The costs and sustainability of implementing rapid response actions are strongly dependent on a variety of factors, including the size of the occupied building, the number of occupants, and building construction. If temporary relocation is required in a commercial or industrial setting, significant business costs could be incurred from lost production or sales. If ventilation and air treatment are implemented, then capital costs may be incurred for equipment. Ongoing operation and maintenance cost (e.g., increased air conditioning) may also be incurred until the long-term mitigation strategy can be implemented.

4 Public Outreach/Community Engagement

It is essential to develop and implement a site-specific community involvement plan that addresses, among other things, how to win trust and gain access to properties, communicate risk to potentially exposed individuals, and minimize the disruption of people's lives and businesses. Instances that require immediate action should be broached in a more succinct directive without causing undo panic. Transparency in expedited responses may require communicating incomplete information with follow-up as more information becomes available. To build trust, it is better to provide incomplete information immediately, with appropriate caveats, than to withhold it. The increased anxiety from immediate action situations may require repeating information multiple times with multiple follow-ups to directly affected individuals. For more details, see ITRC's ***Public Outreach During Vapor Intrusion Mitigation Fact Sheet***.

5 References and Acronyms

The ITRC VI Mitigation Training web page includes lists of acronyms, a full glossary, and combined references for the fact sheets. The user is encouraged to visit the ITRC VI Mitigation Training web page to access each fact sheet and supplementary information and the most up-to-date source of information on this topic.

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