

# BANKER & TRADESMAN

THE REAL ESTATE, BANKING AND COMMERCIAL WEEKLY FOR MASSACHUSETTS

ESTABLISHED 1872

## Vapor Intrusion Can Pose Threat In Brownfields Redevelopment

By William W. Nineve

According to the Massachusetts Department of Environmental Protection, the state is committed to the cleanup and redevelopment of brownfields properties as a way to stimulate the economy and promote environmental protection goals. While there is no formal definition of the term "brownfields" in Massachusetts, such properties often have certain characteristics in common: they are typically abandoned or for sale or lease; they typically have been used for commercial or industrial purposes; they may have been reported to MassDEP because contamination has been found; or they may not have been assessed due to fear of unknown contamination conditions.

There appears to be a natural attraction to older buildings, which often have building characteristics not found in newer buildings. When those details are preserved and restored, they offer a unique touch. Unfortunately, not much thought was given to the disposal of chemicals in the past, and environmental issues may be encountered at those sites during renovation activities.

Vapor intrusion is becoming a more significant concern in the redevelopment of contaminated properties or reuse of existing buildings. Concerns are raised when the soil or groundwater under a building is contaminated with volatile organic compounds (VOCs) that can migrate upward into the building. Occupants of the building can be at risk from the inhalation of the VOCs.

Vapor intrusion concerns are becoming more widely identified and some state regulations are changing to respond to the growing

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knowledge pool regarding potential risks. The status of federal vapor intrusion regulation is in flux. The Occupational Safety and Health Administration (OSHA) typically governs the regulation of indoor air. The U.S. EPA typically governs environmental risk. There is a controversy over who governs indoor air environmental risk.

OSHA standards are less stringent because OSHA can direct employers to inform and train workers as a means of protecting the worker from undue risks. The EPA argues that visitors to a building or unsuspecting residents are not subject to direction or training and are at potentially greater risk. Therefore, the

EPA suggests more stringent cleanup levels to protect the unsuspecting persons.

Managing vapor intrusion issues in existing buildings is completed through various environmental construction activities. The process is relatively simple and is based on methods similar to managing naturally occurring radon gas. The overall remediation concept is to reduce vapor levels to acceptable risk levels, which can be done by preventing vapor intrusion into the building or removing the vapors after or prior to entry.

Many buildings act like chimneys, drawing air from the ground and into the building. That kind of stack effect is caused by a variety of processes, such as the rising of warm air in the building (especially in colder climates), the active use of heating, ventilating and air-conditioning (HVAC) systems or even processes as simple as the active venting of clothes dryers. In addition, the various vapors can migrate from soil into buildings through foundation cracks, porous cinder block walls, slab-to-wall joints and utility penetrations in the slab.

Choosing a design for the remediation of vapor intrusion issues should take into consideration:

- Existing airflow processes;

- Building contact with the ground ;
- Ground water levels;
- Soil types;
- Types and volatility of the potential contaminants; and
- Types and elevations of footings and foundations.

Buildings may be placed directly on the soil (slab on grade), have a "crawl" space or have a basement. Recent investigations by the EPA have suggested that in buildings that have water sump systems to prevent flooded basements, the sumps are the primary intrusion pathway for contaminants, through a direct water interface to the building's indoor air.

The design of a remediation system for each pathway is different. The most typical procedures for managing vapor intrusion include some of the following:

- Sealing soil gas entry routes, including sumps. Paint-on or spray-on liquid sealing products can be applied from the inside to floors and slabs on grade.
- Passive vapor barriers. Passive barriers such as plastic sheets placed under floor slabs.
- Building depressurization systems. Systems using fans and blowers to remove vapors can be quite effective for buildings with crawl spaces or slab on grade construction where a porous stone base exists under the slab.
- Passive and active absorption systems.
- Active soil depressurization. This type of remediation can be effective when placed within the soil contamination plume area, but it requires maintenance and regular operation. Active systems are typically more effective than passive systems.

Concerns related to vapor intrusion during redevelopment can be identified, managed and resolved. Cost estimates to address vapor intrusion should be part of the redevelopment budgets along with other aspects of the transaction. ■