GROUP 1

BEST PRACTICES FOR QUALITY ASSURANCE - QUALITY CONTROL FOR PASSIVE BARRIER INSTALLATION AT NEW & EXISTING BUILDINGS

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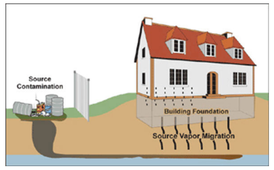
Vapor Intrusion at Existing Buildings

Vapor intrusion occurs when there is migration of vapor-forming chemicals from any subsurface contaminant source into an overlying building. The following building conditions make it possible for vapor intrusion to occur in an existing structure:

- The pervious concrete slab consists of cement, coarse aggregates, sand and water
- Permeability increases with an increase in aggregate size
- A thin concrete slab mixture with a water-to-cement ratio of 0.28 to 0.40 contains 15-25% void content
- Concrete contains cement (made of calcium, which is water soluble) thus creating pores in concrete when exposed to water



Contaminant vapor intrusion occurring at an existing structure.

Building Condition Assessments

There are several steps that need to be taken in order to assess whether any vapor intrusion mitigation (VIM) technology will be a viable option for an existing structure. The following factors must be evaluated in order to assess the viability of any VIM strategy:

- Is the concrete new or old?
- Any laitance should be removed from the concrete
- If there is new concrete, confirm the minimum cure time
- Propose a 40-80 grit concrete profile to ensure the strong mechanical bonding of a VIM coating to the surface
- Research what substrates the concrete has been exposed to, such as oil, chemicals, grease, fats, corrosive fluids, or releasing agents (a core sample may be required)
- Drag a chain across the concrete surface to identify any hollow or delaminating areas
- Avoid applying a VIM coating over existing coating material

Concrete Surface Profile

The surface profile of the concrete will determine the strength of the mechanical bond of the VIM coating material. Mechanical bond refers to the VIM coating product's adhesive qualities and the amount of surface area on the concrete that it can adhere onto. As an illustration:

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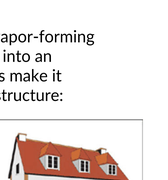
The above sequence of carets has double the amount of surface area that a straight line would in the same space.

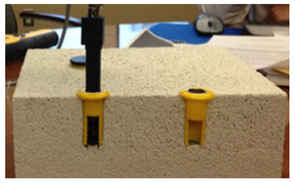

The optimum concrete surface profile is (CSP-3) 80-grit or (CSP-4) 60-grit for a thin membrane application.

Concrete Moisture Vapor Testing

The following tests can be conducted to determine if the moisture level of the concrete will meet a manufacturer's requirements for their vapor barrier.

RH Moisture Test - ASTM F-2170

Measure moisture content (%) at 40% depth of the concrete slab



Calcium Chloride Test -ASTM F-1869

Measure water vapor emission from the top 1/2" of the concrete slab

Passive Barrier - Retro-Coat Installations

The Retro-Coat® Vapor Intrusion Coating System is a product line that consists of chemically resistant materials to properly protect existing structures from the threat of contaminant vapor intrusion. The following are best practices to follow when performing a Retro-Coat installation:

- Apply using a squeegee and back roll.
- Follow the guidelines on the product Technical Data Sheet for mixing ratio, working temperature, membrane thickness and cure time.
- Communicate/manage client expectations on barrier application, performance, number of mobilizations and aesthetic
- Evaluate applicator workmanship, efficiencies and timeliness.
- Measure barrier thickness using a wet mil gauge


A wet mil gauge used to measure barrier thickness.


Retro-Coat being applied to mitigate vapor intrusion at an existing building

Vapor Intrusion at New Buildings

Vapor intrusion at new construction buildings is often evaluated on a case-by-case basis.It is recommended to consider the below evaluation criteria when selecting a VI mitigation solution.

- Chemical Resistance - Contaminants of concern (COCs) and concentrations
- Constructability - Ease of installation, durability, longevity, quality of application, experience of installer
- Cost - Budgetary expectations


Application of vapor barriers from Land Science, a division of REGENESIS.

Building Type Influences VIM Selection & QA/QC

It is recommended to consider below-slab ventilations, foundation layout and type, concrete slab design and pour schedule, building use and size, elevation changes, elevator pits, utility penetrations, COCs and construction weather conditions. These factors can influence vapor mitigation strategy choices when implementing the construction design. Above are two examples where vapor barrier technologies from Land Science, TerraShield and Nitra-Seal, along with low profile venting systems were successfully installed to mitigate CVOCs and BTEX from below-ground plumes.

Quality Control Measures

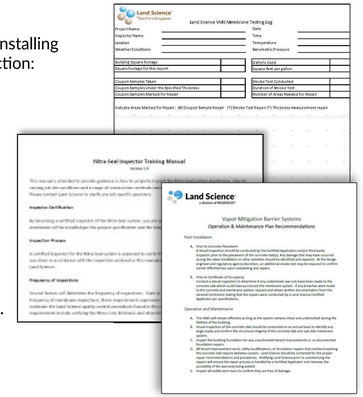
Here are some measures that are taken for quality control when applying a vapor barrier for new building construction:

- Certified applicator installation
- Third-party certified inspector
- Thickness verification
- Smoke testing
- In-field inspection
- Manufacturer peer review on mitigation design
- Manufacturer review of site compatibility

QA/QC Verifications & Reporting

The following are best practices for quality assurance when installing a vapor intrusion mitigation barrier for new building construction:

- A certified applicator must provide pump/spray/smoke testing equipment to perform daily barrier installation and inspection.
- Both a certified applicator and inspector must perform their own thickness verifications via wet mil gauge, caliper, depth gauge in accordance to specified VI mitigation design plans.
- A third-party inspector must document the installation of the vapor barrier in an inspection log and offer guidance/support to repair any damaged or deficient areas.
- A visual "pre-pour" inspection must be implemented after the completion of the vapor barrier installation and prior to concrete placement.
- Follow the recommendations of the O&M plan
- Make sure specified requirements of manufacturer's warranty are followed.



Summary

- Vapor intrusion at existing buildings is primarily due to porosity, aging, and/or damaging of the concrete slab and inefficient building construction. It is recommended to investigate existing concrete slab conditions and previous chemical exposure and identify any potentially damaged areas prior to installing a VIM barrier. Follow the manufacturer's recommended concrete profiling requirements, moisture vapor testing, manufacturer's installation procedures and QA/QC requirements.
- Vapor intrusion at new buildings depends heavily on building specifics and COCs to effectively mitigate vapor intrusion. It is advantageous to consider constructability, barrier durability, quality of application and cost when selecting vapor intrusion mitigation technologies. A successful vapor intrusion mitigation system requires collaboration between applicator, inspector, design engineer, general contractor and manufacturer. Proper QA/QC processes such as thickness verification, smoke testing, visual inspections, and ensuring barrier compatibility with COCs at the site should be followed to ensure successful VIM strategy implementation.

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