SSD System Design Integration

Proper Planning for New Construction

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Presentation Goals

• Present industry standard design and installation procedures
• Present examples of designs that do not meet industry standards and how they can affect the overall scope and budget
Engage a Design Firm Early

- Budgetary estimates can be prepared based on conceptual site plans and geotechnical report
- Design of mitigation system begins at 50% progress set
- Initial design is submitted to architect for review before 80% progress set is submitted for project budgeting

Deliverables include:
- System layout
- Necessary detail drawings
- Project specifications
- Cut sheets for major components
- Operation, maintenance and monitoring plan
- Activation plan for future use, if necessary
Determine Proper System Design

By evaluating the COC data, deed restrictions, regulatory requirements, geotechnical report and conceptual site plan, the design firm can determine the proper system design.

Passive System with Activation Plan - Any SSD system design that requires additional sampling before adding an attached electric fan assembly.

Active System - SSD system with an attached electric fan assembly.
Passive SSD systems are the minimum scope of work for an SSD system that must be installed during construction:

- The Vapor Collection Plenum is installed beneath the concrete slab.
- All conveyance piping is installed inside walls or mechanical rooms.
- Optional sample ports for long term monitoring
- Conveyance pipes are terminated on the roof
- Activation plan is prepared which includes fan assembly specifications, electrical requirements for the fans and provisions for a monitoring system.

SSD systems are initially installed as passive systems to minimize costs.

Many passive SSD systems are installed as a precautionary measure to minimize a potential risk.
Active SSD systems, whether converted from an existing passive system or designed to be active, utilize fan assemblies to create a negative pressure field in the vapor collection plenum beneath the ground floor slab and the indoor air. In addition to the passive system scope of work, these systems include:

- Fan assemblies and associated electrical connections
- A system to monitor fan operation
- Pressure and flow gages
- Sample ports for calculating mass discharge
- Gate or ball valves for system balancing
Choose Correct Installation Standard

Mitigation Standards have existed for SSD systems for over 20 years!

- ANSI/AARST Consortium
  - CC-1000 - Large Building New Construction
  - CC-AH - Residential New Construction
- American Society for Testing Materials (ASTM)
  - ASTM E2121 - Low Rise Building Mitigation

Standards are beneficial to everyone involved!

- Design professionals rely on them as a guide to proper installations
- Regulators use them as a ruler to measure proper design
- Clients use them to ensure they are getting the proper solution to their problem
Create Construction Documents

Construction documents are generated and added to the project drawings and specifications.
Set Accurate Metrics of Successful Installation

- **Vapor Barrier Integrity Confirmation** - Colored smoke is injected beneath the barrier to verify it is installed correctly and no leaks are present.

- **PFE Measurements** - Pressure differential between indoor air and the sub lab can be measured on active systems.

- **Mass Discharge Calculations** - Sample of discharge air is gathered and sent to a lab where it is analyzed. The resulting value is multiplied by the flow rate of the system to determine the total amount discharged.

- **Indoor Air Measurements** - Indoor air measurements are made directly before and during occupancy.
The following common design mistakes raise installation and operating costs.
1. Post Hoc Ergo Proctor Hoc

• The Latin phrase “Post Hoc Ergo Proctor Hoc” translates roughly to “After this, therefore because of this”

• A portion of SSD systems that are installed may not have been necessary due to the lack of preferential pathway between the plume and the new building.

• In these cases, all design characteristics of the passive system, even the incorrect ones, are not related to the lack of COCs in the indoor air.

• Failure to recognize this disconnect has led to the reinforcement of poor design choices.

• “I knew we were going to pass the IAQ tests because I wore my lucky socks when I deployed the sampling devices.”
2. Stand Alone Vapor Barriers

- In a passive system, the riser piping acts as a pressure relief valve for the vapor barrier. Without this component, the barrier will eventually fail. Installing riser piping after the building is complete is very expensive compared to the cost to install during construction.
3. Stand Alone Passive Systems

- No system design is complete without an activation plan.
4. Incorrect Performance Metrics

• Sub Slab PFE Benchmark for Passive Systems - Passive systems DO NOT move sufficient amounts of air to maintain a measurable pressure field beneath the slab, even if there is a turbine on the exhaust.

• Operating Pressure and Flow of Fan assembly. These measurements are important, but they do not directly correlate to successful mitigation.
5. Overcomplicated Design

- The following items are generally not required for effective system design:
  - Gate valves
  - Excessive sub slab piping
  - Collocated riser piping
  - Exhaust turbines
Typical Overcomplicated Design

14 SYSTEMS
1,400' VENT MAT
3,100' UNDERGROUND PIPE
Simple Effective Design
Thank You!

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