

# Vapor Intrusion Mitigation – A Different Spin On HVAC Systems

*Presenter:*

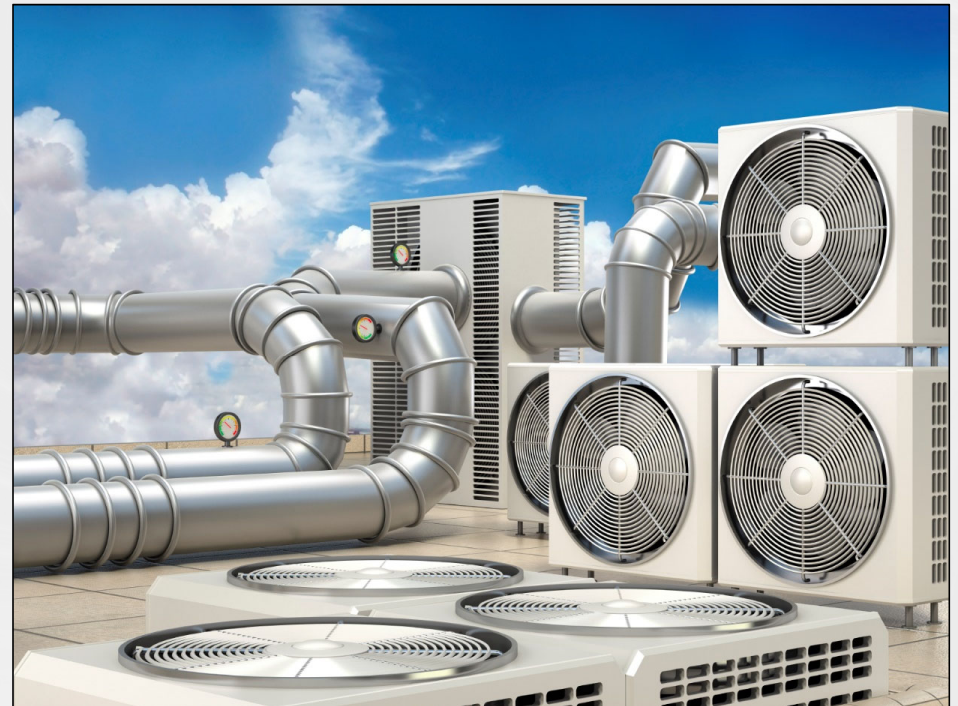
**Matt Ambrusch (Langan Engineering)**

*Project Team:*

**Omer Uppal, Ryan Andersen, Caryn Barnes, Stewart Abrams, Andrew Quinn and Kale Novalis  
(Langan Engineering)**

# Agenda

- Vapor Intrusion Considerations
- HVAC Mitigation
- Site Background
- System Design
- System Operation
- Conclusions

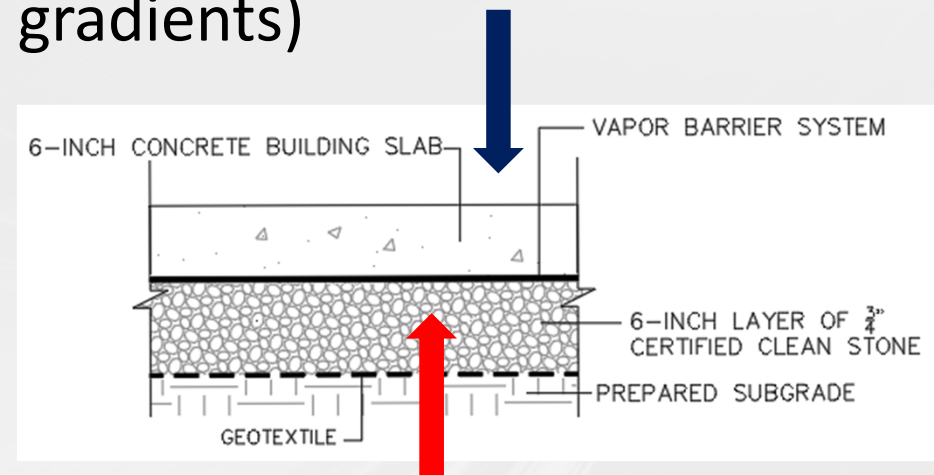


# Vapor Intrusion Considerations

Whether mitigation consists of an passive SSDS, active SSDS, or a modified HVAC system, the following can affect system performance...

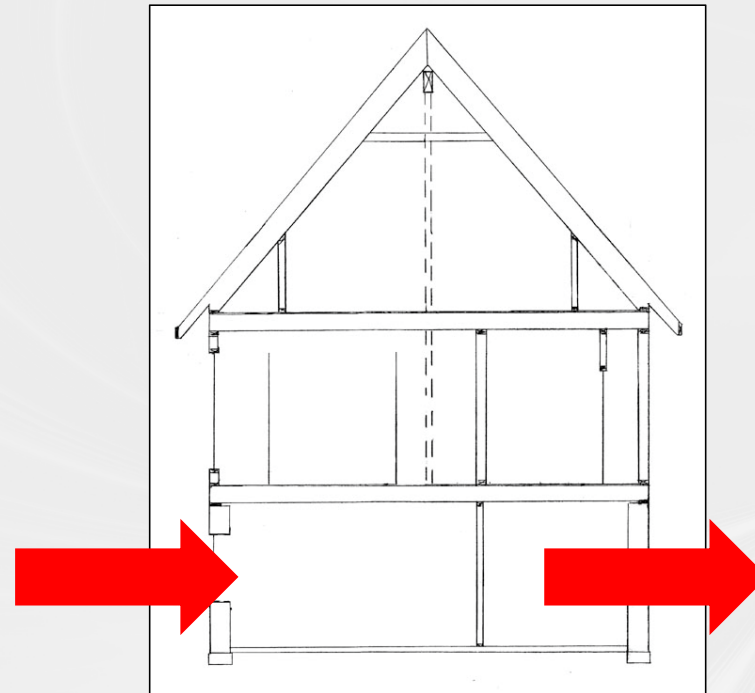
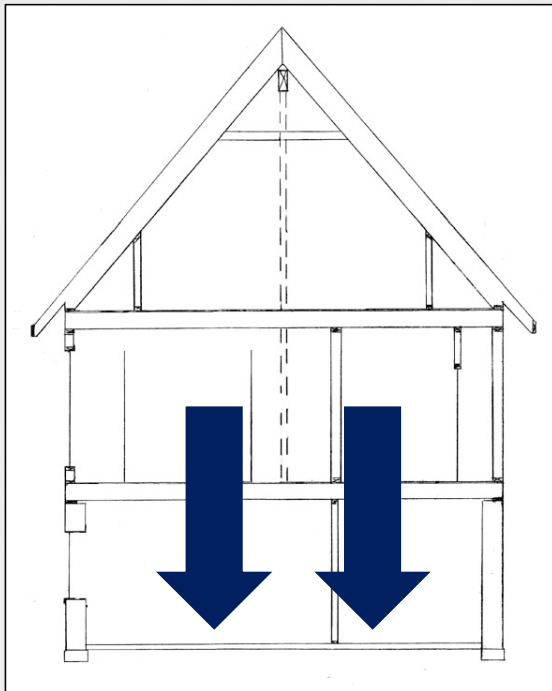
- Temperature
- Barometric Pressure (and resulting gradients)
- Building Use
- Time of Day

**Competing forces on a building slab that are changing throughout the day...**



# HVAC Mitigation

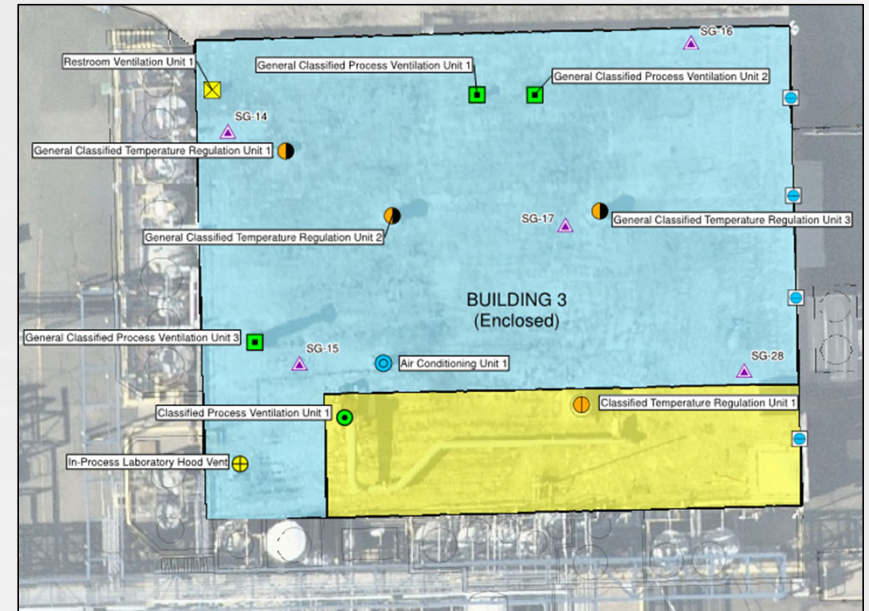
Typically designed to generate a positive pressure...



...what about pore volume flushes?

# Site Background

- Northern, New Jersey
- Active Chemical Packaging Facility – 10,000 sf
- Two Main Areas
  - General Classified
  - Classified
- Elevated Concentrations of TCE
- OSHA PEL Applicable?
- Existing HVAC Infrastructure



# System Design

Unit ID	Rated Flow Rate (scfm)	Static Pressure (IWC)	Room Volume (ft <sup>3</sup> )	Exchange Rate (room volume/hour)	Minimum Flow Rate (scfm)	Design Operation (scfm)
<b>General Classified Area</b>						
Temperature Regulation Unit 1	1,000	2.0	192,000	1	3,200	0
Temperature Regulation Unit 2	7,280	0.5				7,280
Temperature Regulation Unit 3	7,280	0.5				0
<b>Class I, Division 2 Classified Area</b>						
Temperature Regulation Unit 1	6,750	0.4	50,000	1	830	1,500

## Technology Selection Considerations:

- Sub-slab retrofit difficult
- Maintain building pressure difficult
- Minor indoor air exceedances

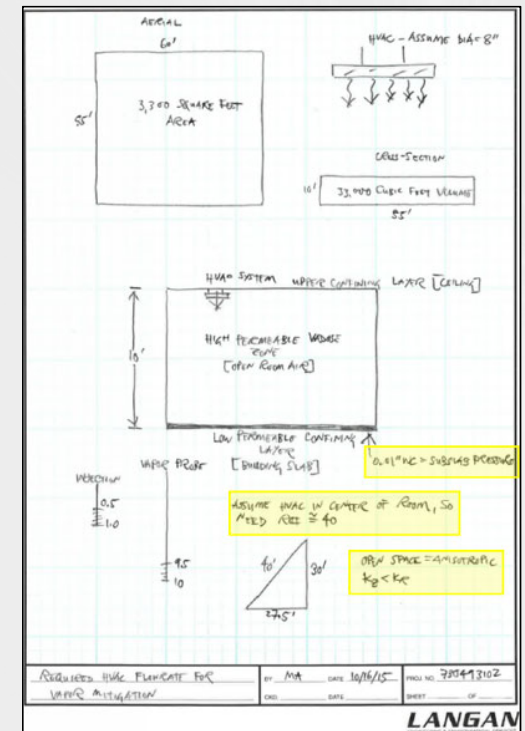
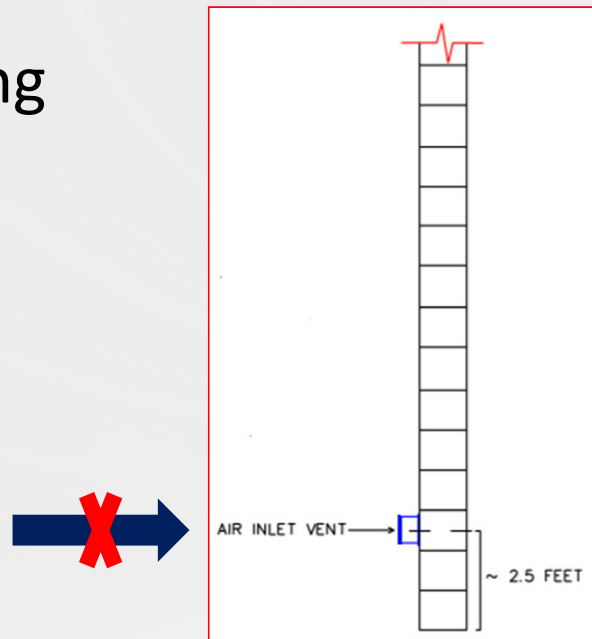


**Pore Volume Flushes**  
(1 per hour)

# System Design

Increase fresh air flushes without generating a vacuum gradient across the building and slab...

- 2D Pneumatic Modeling
- Fresh Air Intakes
- VFD Control
- Interlocks/Controls
- Remote Telemetry



# System Design

## System Monitoring:

- Building Differential Pressure
- Influent Vacuum
- Influent Flow
- Power Status



**GENERAL  
CLASSIFIED**

**CLASSIFIED**



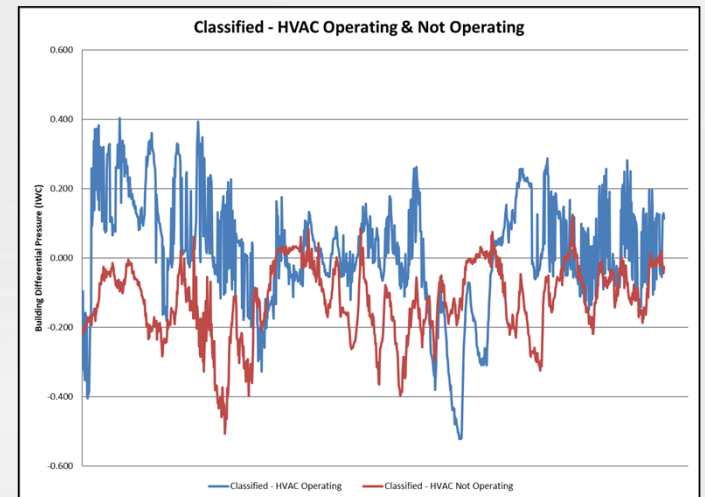
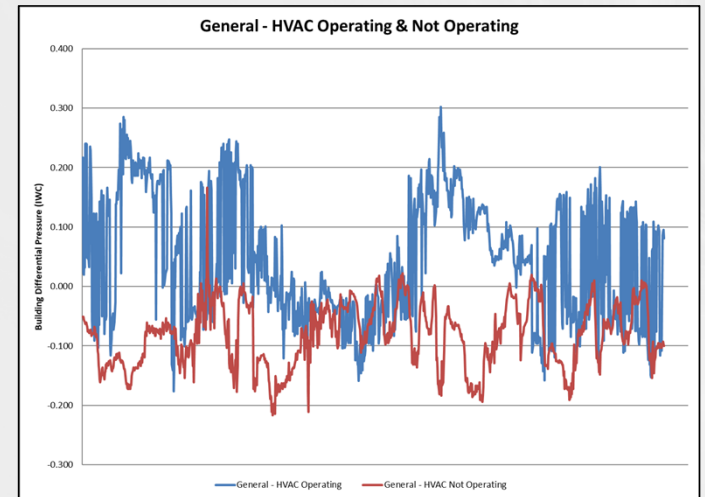


# System Operation

## Findings:

- **Minor** Increase in Building  $\Delta$  Pressure
- **No** Change in Sub-Slab Pressure
- Minimum Air Exchanges **Achieved**
- Indoor Temperature **Concerns**
- **Reductions** in Indoor Air Concentrations

**Is there an indoor source?**



# Conclusions

- HVAC system (fresh air flushes) can be effective mitigation strategy
- Site-Specific Considerations:
  - Site Use
  - Barometric Pressure Fluctuations
  - Temperature Fluctuations



**In an effort to mitigate vapor intrusion, don't exacerbate it!**

**Thank You**



**QUESTIONS?**