Vapor Intrusion Mitigation: Strategies and Lessons Learned – Residential Sites

NEWMOA Webinar

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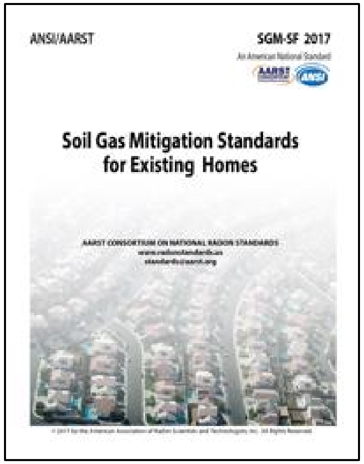
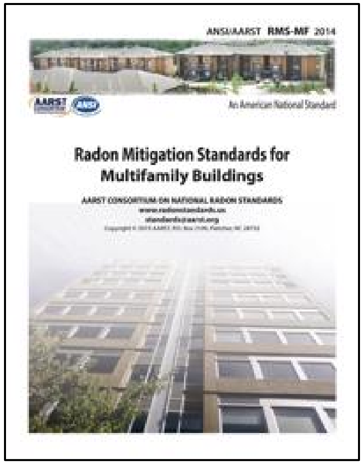
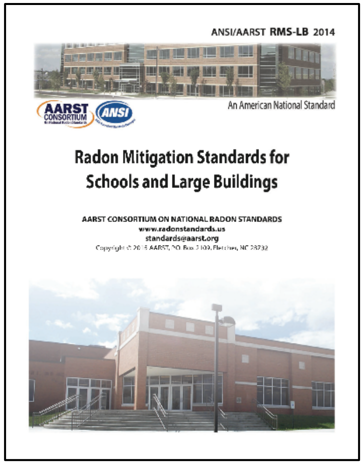
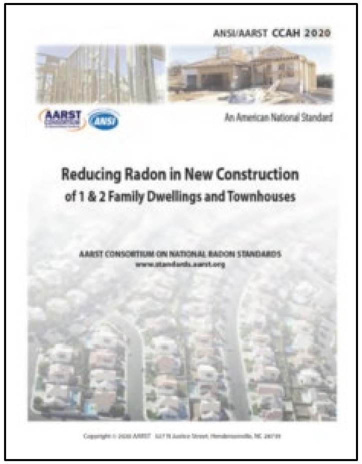
Core Concepts – Presentation

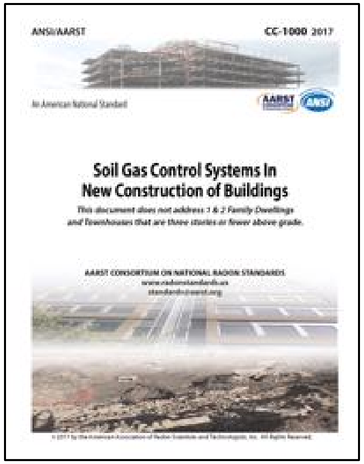
- Remediation eliminates or reduces the source – mitigation protects occupants from exposure to the source
- Residential sites include single family, multifamily, and residential care buildings
- Systems must meet the minimum requirements of the applicable ANSI/AARST standard (standards.aarst.org)
- This presentation focuses on Active Soil Depressurization (ASD)











Mitigation Design Considerations

- Stakeholders
- Regulatory, standards of practice
- Site access/scheduling
- Contaminant, concentrations
- Diagnostic (litigation)
- Environmental (LBP/asbestos)
- Mechanical (HVAC/other)
- Construction type – new, existing
- Building size, location, use
- Foundation type(s), condition
- Soil conditions, permeability
- Water table, water intrusion considerations
- Building characteristics
- Ongoing OMM considerations
- Budget considerations
- Safety considerations

The goal is to mitigate occupant exposure to the source using the most efficient and effective system design that satisfies the project requirements

New Construction – Vapor Safe Buildings

- Utilize strategies to minimize or prevent vapor intrusion in new construction
- Supported by EPA, especially when utilized for Brownfield redevelopment
- Emerging method for eliminating vapor encroachment condition in real estate transaction (ASTM E2600)
- Potential certification points on sustainable building projects
- Provides a mechanism for consultants and RP's to effectively manage long-term risk and liability
- Applicable ANSI/AARST Standards:
  - ANSI/AARST CCAH (2020) – single family buildings
  - ANSI/AARST CC-1000 (2020) – multifamily and residential care buildings

New Construction – Design/Installation

- Vapor Mat – low-profile, trenchless sub-slab system
- Alternative gas-permeable layer, eliminates gravel
- Manages soil vapor and moisture intrusion
- More efficient and economical during construction
- Long-term protection – can be activated, if needed
- Cost-effective – material and labor

Do passive soil gas control systems work?

New Construction – Design/Installation Deficiencies

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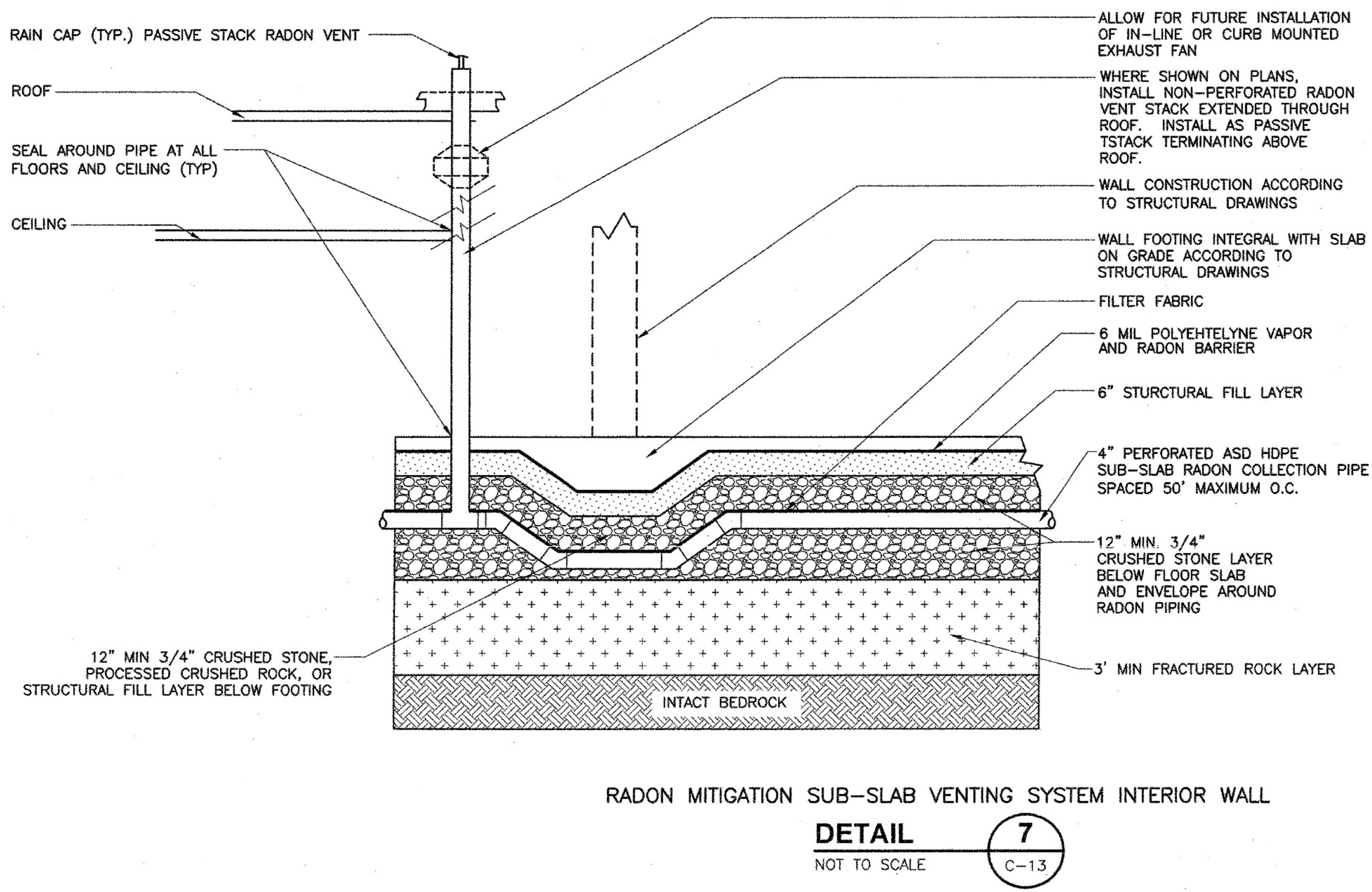
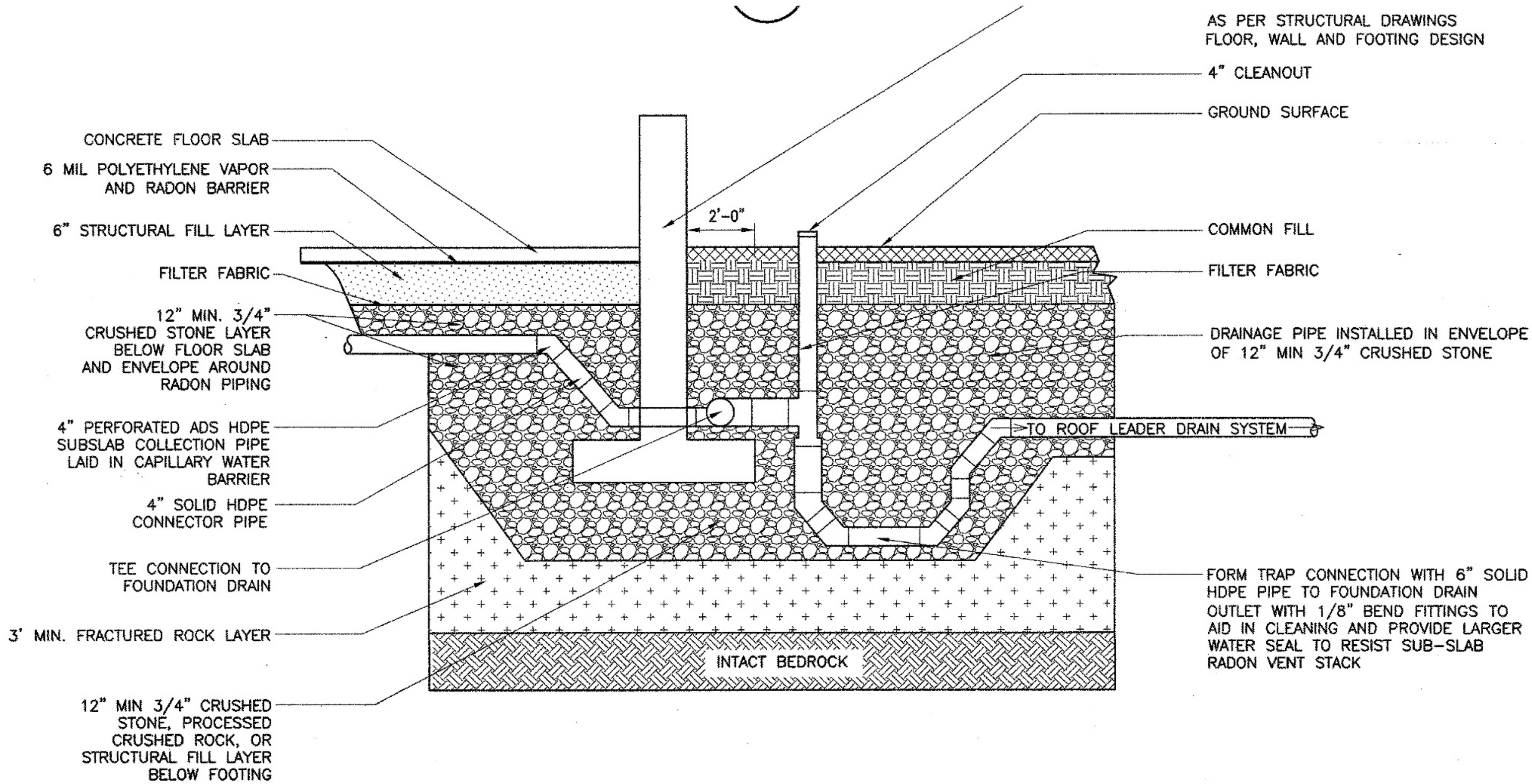


New Construction – Design/Installation Deficiencies



RADON MITIGATION SUB–SLAB VENTING SYSTEM USING FOUNDATION DRAINS

DETAIL 9
NOT TO SCALE C–13

New Construction – Design/Installation Deficiencies

New Construction – Design/Installation Deficiencies

New Construction – Design/Install Deficiencies

1.0 pCi/L (+/-)

27.0 pCi/L (+/-)

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“Mitigation is nothing more than a pipe and a fan.”

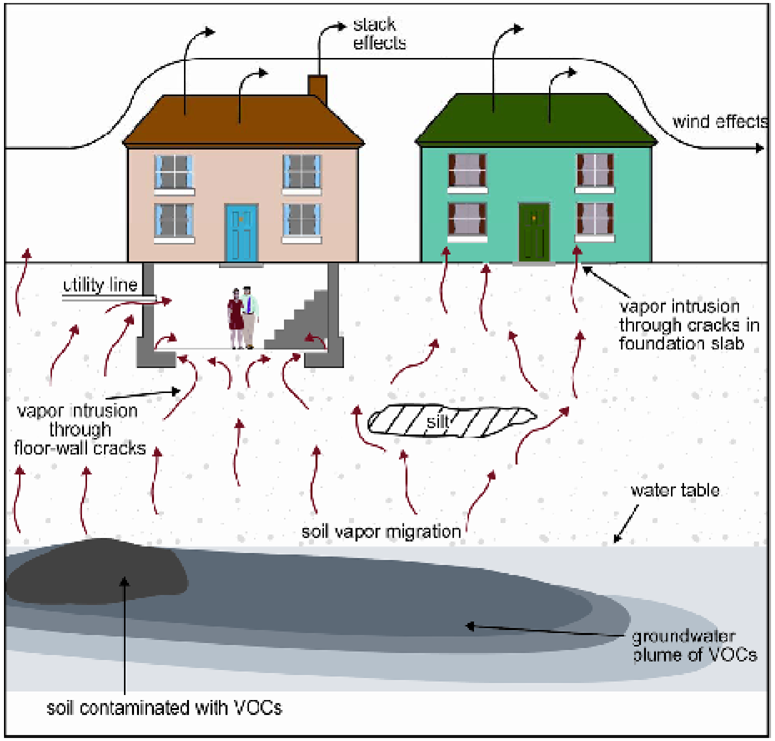
ASD Mitigation – Basics

- Pressure, Resistance, Vacuum – negative pressure differential (sub-slab w reference to indoor air environment)
- Extension of the pressure field throughout the target mitigation area is essential (-.010” w.c. pressure)
- Seasonal variance and building operating conditions must be considered during system design
- Ongoing OM+M is required to ensure strategy is effective and meet LTS obligations
- Applicable ANSI/AARST standards
  - ANSI/AARST SGM-SF (2017) – single family buildings
  - ANSI/AARST RMS-MF (2020) – multifamily buildings
  - ANSI/AARST RMS-LB (2020) – residential care buildings

Alternative mitigation strategies exist when ASD is not an appropriate method.

ASD Mitigation – Typical Process

- Work Plan Development, Research
- Site Evaluation
- **Pilot Test and Building Evaluation**
- Mitigation Design, Installation
- Post-Mitigation Verification
- Final Mitigation Report
- Consultant Liaison
- Ongoing OM+M, LTS Obligations



ASD Mitigation – Pilot Test and Building Evaluation

- Necessary for development of effective and efficient ASD system
- Evaluates sub-slab conditions for blower selection (-.010” w.c. pressure)
- Evaluates building for system routing options, other design impacts
- Procedure: deadhead, measure resistance, measure PFE at known pressures, known building conditions
- Greatly reduces over/under-engineering and long-term ownership cost creep (data-driven approach versus SWAG)

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ASD Mitigation – Design and Installation Deficiencies

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ASD Mitigation – OM+M Components

Operation and Maintenance:

- Visual inspection – building
- Visual inspection – impact area
- Visual inspection – system
- Visual inspection – electrical
- Confirmation – alarm
- Routine maintenance
- Non-routine maintenance

O+M frequency = annually

Monitoring:

- Confirmation – operating pressure
- Sampling – IA/SS
- PFE verification – target mitigation area

Monitoring frequency = determined on site specific basis, regulatory guidance, mitigation system type

ASD Mitigation – Operational Challenges

- Seasonal Variability
- Environmental Variability
- Building Pressure Variability
- Soil Condition Changes
- Onsite Inspection Requirements
- Ongoing IA/SS Sampling Requirements

Changing conditions are constant, and typical mitigation systems do not possess the capability to adapt to these changes – excessive vacuum, excessive expense OR the system fails to meet its operational benchmarks

ASD Mitigation – Operational Challenges

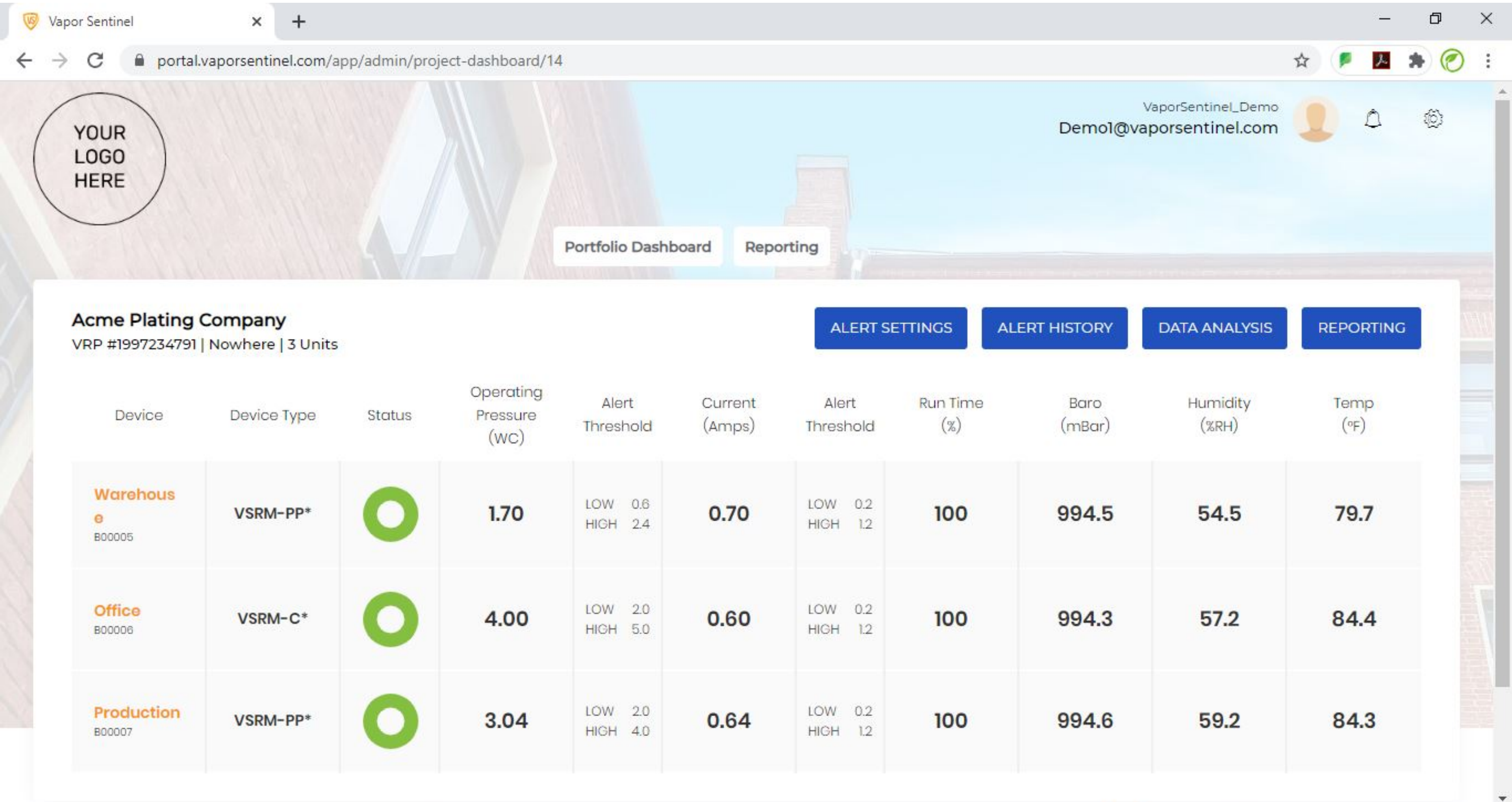
- Dynamic controls for dynamic conditions – stabilize changes, perform to predefined operational benchmarks, create a more effective and efficient system
- Remote monitoring for system performance, system adjustments and system alerts / notifications – provide real-time monitoring, automate reporting, potentially eliminate onsite inspections and IA/SS sampling
- Dynamic controls and remote monitoring:
  - Save money
  - Conserve resources
  - Manage liability
  - Meet regulatory requirements
  - **Protect building occupants**

ASD Mitigation – Remote Monitoring

<u>Remote Monitoring:</u>

- Real-time pressure and power monitoring
- Loss of connection, high/low pressure, voltage alarms
- Scalable from one monitoring unit to ~300 inputs on one data stream
- Ambient Conditions – barometric pressure, temperature, humidity
- Cloud-based secure data storage
- Dynamic controls

ASD Mitigation – Remote Monitoring


Vapor Sentinel

portal.vaporsentinel.com/app/admin/project-dashboard/14

YOUR LOGO HERE

VaporSentinel_Demo
Demo1@vaporsentinel.com

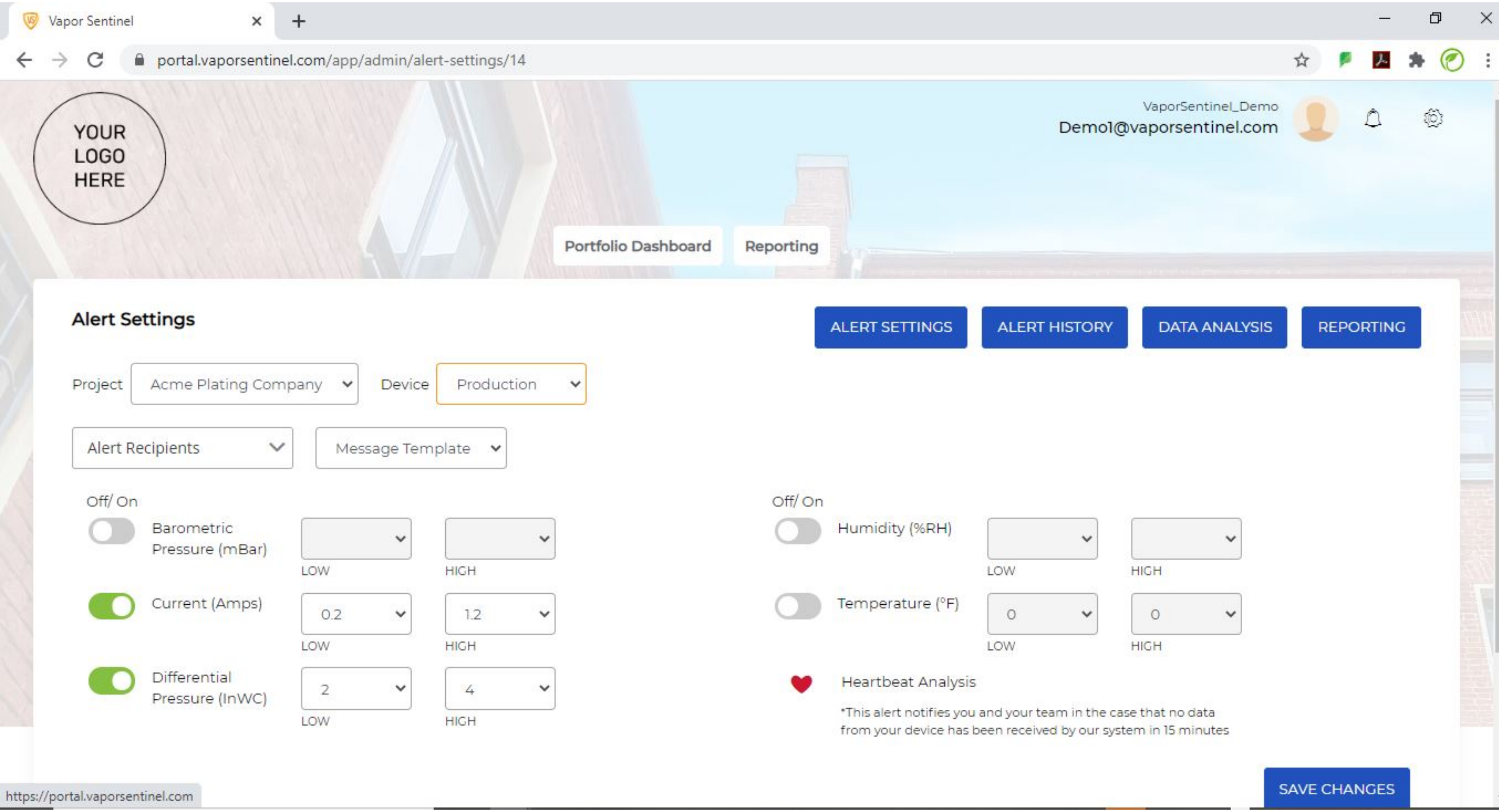
Portfolio Dashboard | Reporting

Acme Plating Company
VRP #1997234791 | Nowhere | 3 Units

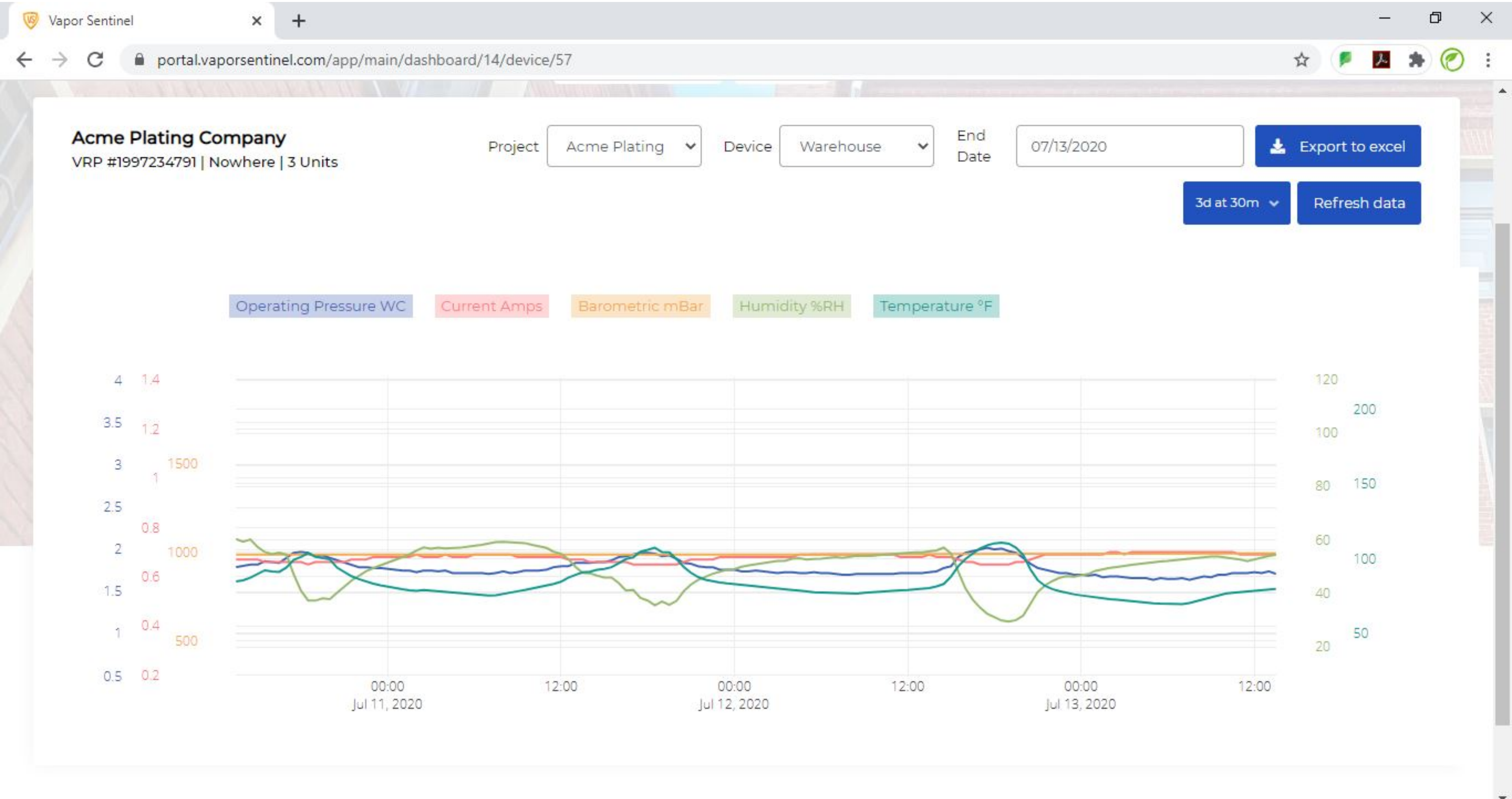
ALERT SETTINGS | ALERT HISTORY | DATA ANALYSIS | REPORTING

Device	Device Type	Status	Operating Pressure (WC)	Alert Threshold	Current (Amps)	Alert Threshold	Run Time (%)	Baro (mBar)	Humidity (%RH)	Temp (ºF)
Warehouse B00005	VSRM-PP*		1.70	LOW 0.6 HIGH 2.4	0.70	LOW 0.2 HIGH 1.2	100	994.5	54.5	79.7
Office B00006	VSRM-C*		4.00	LOW 2.0 HIGH 5.0	0.60	LOW 0.2 HIGH 1.2	100	994.3	57.2	84.4
Production B00007	VSRM-PP*		3.04	LOW 2.0 HIGH 4.0	0.64	LOW 0.2 HIGH 1.2	100	994.6	59.2	84.3

ASD Mitigation – Remote Monitoring



ASD Mitigation – Remote Monitoring



ASD Mitigation – Remote Monitoring

Summary – Lessons Learned

- Mitigation is mitigation, remediation is remediation
- Work with qualified design and installation professionals
- Follow the standards – they exist for a reason
- ASD is typically the most efficient and effective method
- A good pilot test is essential in developing a system that doesn't over/under perform
- Trust, but verify, all design and operational data
- Seasonal variability and building operating conditions can wreak havoc
- Remote monitoring can greatly reduce long-term cost of ownership, reduce liability, and provide better protection for building occupants

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