IT'S NOT A HURDLE – IT'S A VAPOR BARRIER |

OHIO BROWNFIELDS CONFERENCE

APRIL 2014

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ENVIRONMENTAL MANAGEMENT SPECIALISTS EMS

BACKGROUND

- City of Cincinnati Milacron Plant 5 Property (16.3 acres)
- Part of overall "Oakley Station" 74-acre mixed-use development
- COAF Grant – $300,000
- USS Realty, LLC – Development Partner
- Cinemark – End User for 7 acres

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WHY ENGINEERING CONTROLS?

- Risk Assessment Indicates Potential VI Issue
  - VAP screening levels for the volatilization to indoor air exposure pathway developed using USEPA's Version 3.1 of Johnson and Ettinger model
  - Concentrations of COCs in soil and groundwater exceed the VAP standards
- Cleanup vs. Engineering Controls
  - Costs, Timeframe
- Presumptive Remedy
- "Belt-and-Suspenders" Approach

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SELECTING THE RIGHT TECHNOLOGY

- Vapor Barrier
  - Sheet Style (HDPE, LLDPE, etc.)
    - Must be seamed together, batten-bar attachments necessary
  - Spray-Applied, Composite Membranes (Liquid Boot, Geo-Seal)
    - Seamless barrier – superior sealing of cracks, joints
    - Have become cost-competitive with sheet styles
- Venting System
  - Passive vs. Active
  - Traditional PVC slotted pipe network
    - Trenched in beneath slab and vapor barrier
  - Geocomposite vent strips (Geo-Vent, Vapor-Vent)
    - Low profile, trenching not necessary

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DESIGN GUIDELINES

- No definitive standards in place
- USEPA and individual states developing guidance
- Los Angeles Methane Mitigation Standards

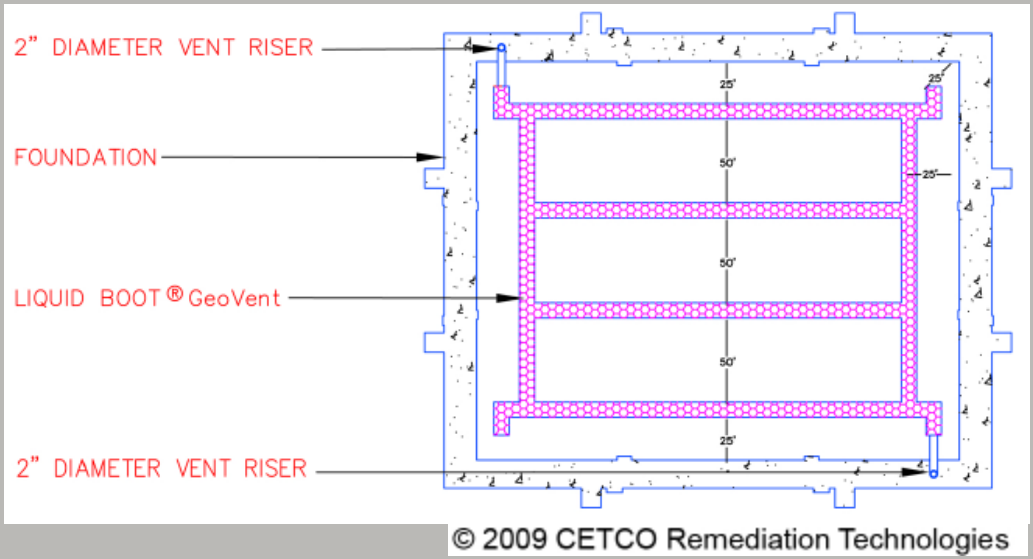

Table 2 - SPACING OF PERFORATED HORIZONTAL PIPES AND NUMBER OF VENT RISERS

MIN. VENT RISERPIPE DIAMETER (inches)	MAX. SUB-SLAB PERFORATED HORIZONTAL PIPE SPACING (feet)	MAX. SUB-SLAB COMBINATION PERFORATED HORIZONTAL PIPE FOR DEWATERING AND VENT SPACING (feet)	NUMBER OF VENT RISER PER BUILDING FOOTPRINT AREA (square feet)
1 1/2	12.5	Not allowed	1/1,250 (min of 2 risers)
2	25	Not allowed	1/2,500 (min of 2 risers)
2 1/2	50	Not allowed	1/5,000 (min of 3 risers)
3	75	Not allowed	1/7,500 (min of 4 risers)
4	100	50	1/10,000 (min of 4 risers)

LADBS *Standard Plan: Methane Hazard Mitigation*, Sheet 4 of 8

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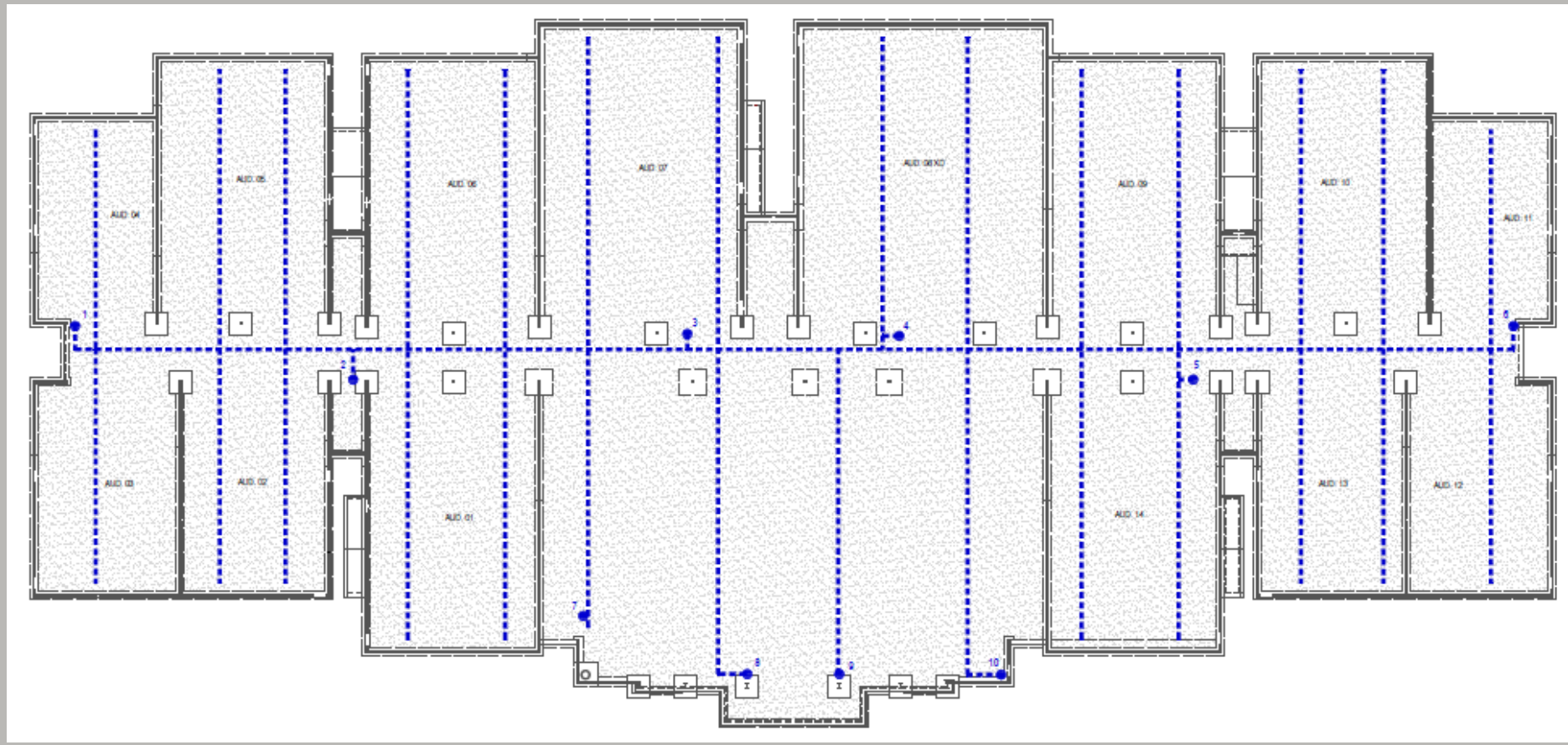
DESIGN COORDINATION

- Start early, but not too early (~75% complete construction plans)
  - Structural foundation design complete – limits venting layout re-design
- Coordinate with architect (no one likes an ugly vent stack)



PREPPING THE SITE

- Construction Challenges
  - Aggressive construction schedule
  - Coordination and sequencing of the liner deployment with other trades and subcontractors
  - Cold weather application
  - Variable elevation changes over the site
  - Sealing of penetrations
  - Liner damage after deployment

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PREPPING THE SITE

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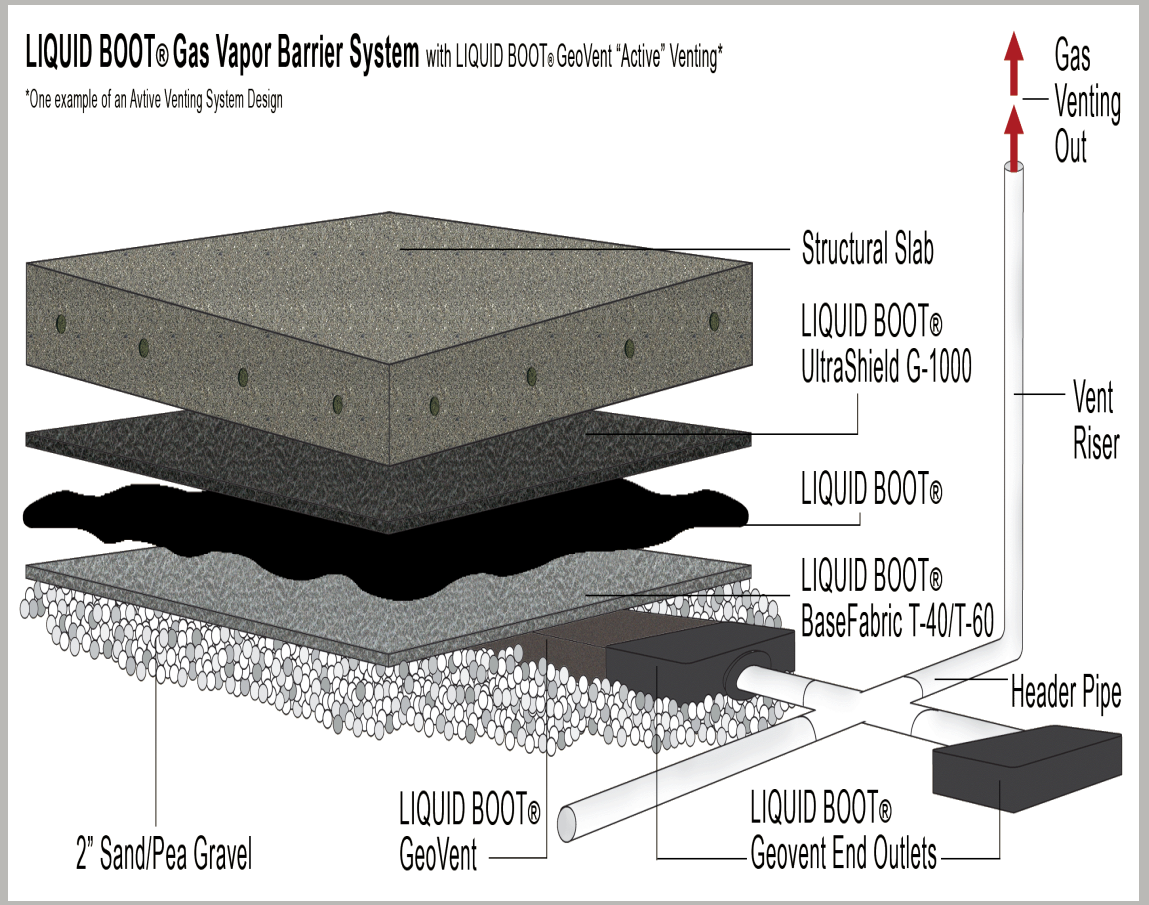
VAPOR BARRIER COMPONENTS & INSTALLATION

- GeoVent – Cost-effective, low-profile pressure relief, trenchless collection venting system
- T-60 Base Fabric – Non-woven base layer that separates the membrane from soil particles
- Liquid Boot – A seamless, spray-applied, water-based membrane containing no VOCs



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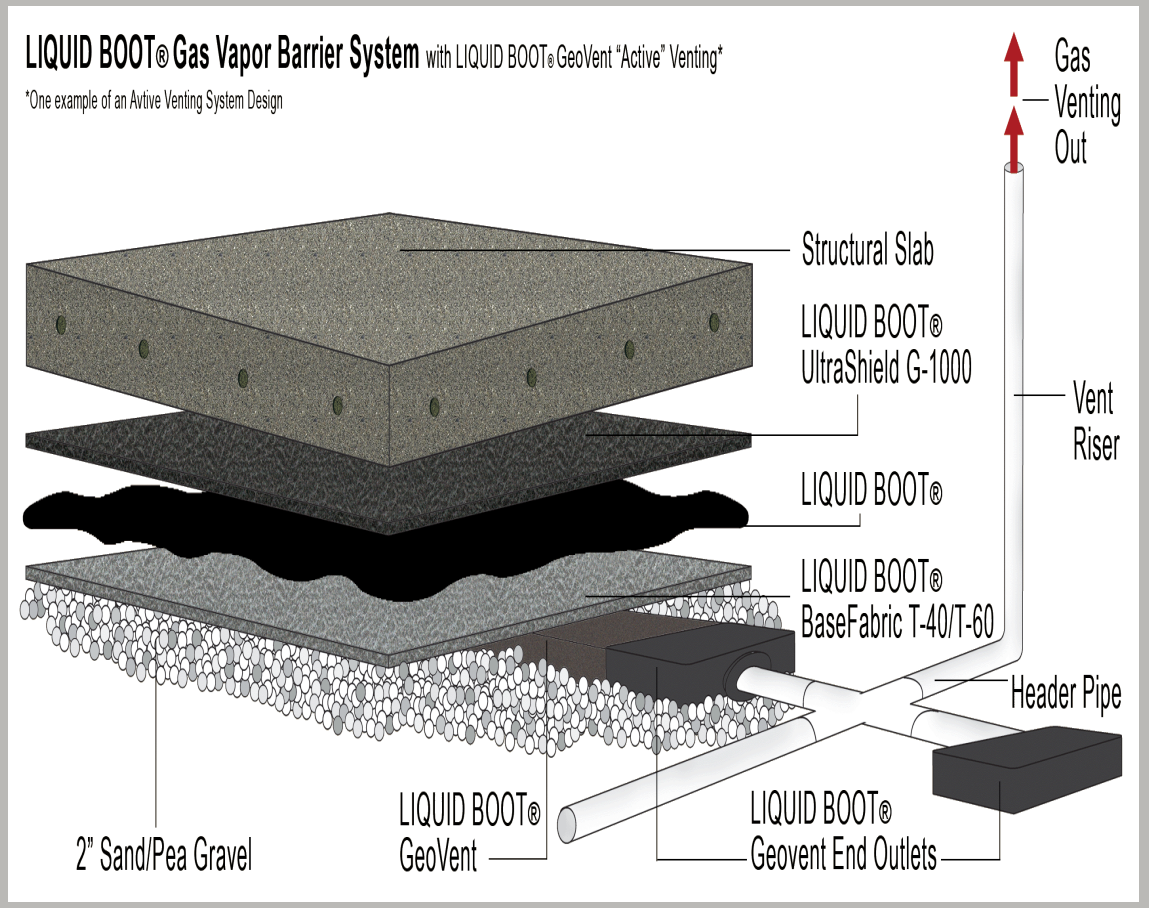
VAPOR BARRIER COMPONENTS & INSTALLATION

- G-1000 – A protection fabric coarse placed over the Liquid Boot sprayed membrane
- QA/QC – Smoke testing/coupon sampling



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QUESTIONS?

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