A CASE STUDY – LARGE SCALE SUB-SLAB VAPOUR INTRUSION SYSTEM

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AGENDA

- Introductions - Pinchin and GFL
- What is Vapour Intrusion and Contaminants of Concern
- Project Site and History
- Solutions for Soil Vapour Intrusion - Case Study

PRESENTERS

Devin Rosnak

Business Development Manager

GFL Infrastructure

Frank Schlaefli

Team Lead & Practice Specialist

Pinchin Limited

PINCHIN

LOCAL RESOURCES, NATIONAL EXPERTS

- ✓ Hazardous Building Materials
- ✓ Environmental Science
- ✓ Indoor Environmental Quality
- ✓ Occupational Health & Safety
- ✓ Building Science & Sustainability
- ✓ Construction and Project Management
- ✓ Emissions Reduction & Compliance
- ✓ Environmental Due Diligence & Remediation
- ✓ Geotechnical Engineering
- ✓ Environmental Laboratory Services
- ✓ Mechanical Engineering & Design
- ✓ Training Seminars & Courses in all aspects of these fields

900
total staff

42
Offices*

1981
Est.

GFEC → SERVICES OFFERED

Bulk Excavation, Remediation & Restoration	Mass Excavation & Shoring	Interior/Industrial Site Remediation
Stormwater Management Pond Cleanouts & Creek Restoration	Bulk Materials Screening, Grinding & Crushes	Fuel Station Decommissioning
Underground Storage Tank Removals	Cutoff walls, slurry walls & Permeable Reactive Barriers	Facility Demolition & Decommissioning
In-Situ/Ex-Situ Remediation Services (Including Drilling)	**Water/Wastewater Treatment Systems**	Sub-Slab Vapour Intrusion Mitigation System Installation

PINCHIN

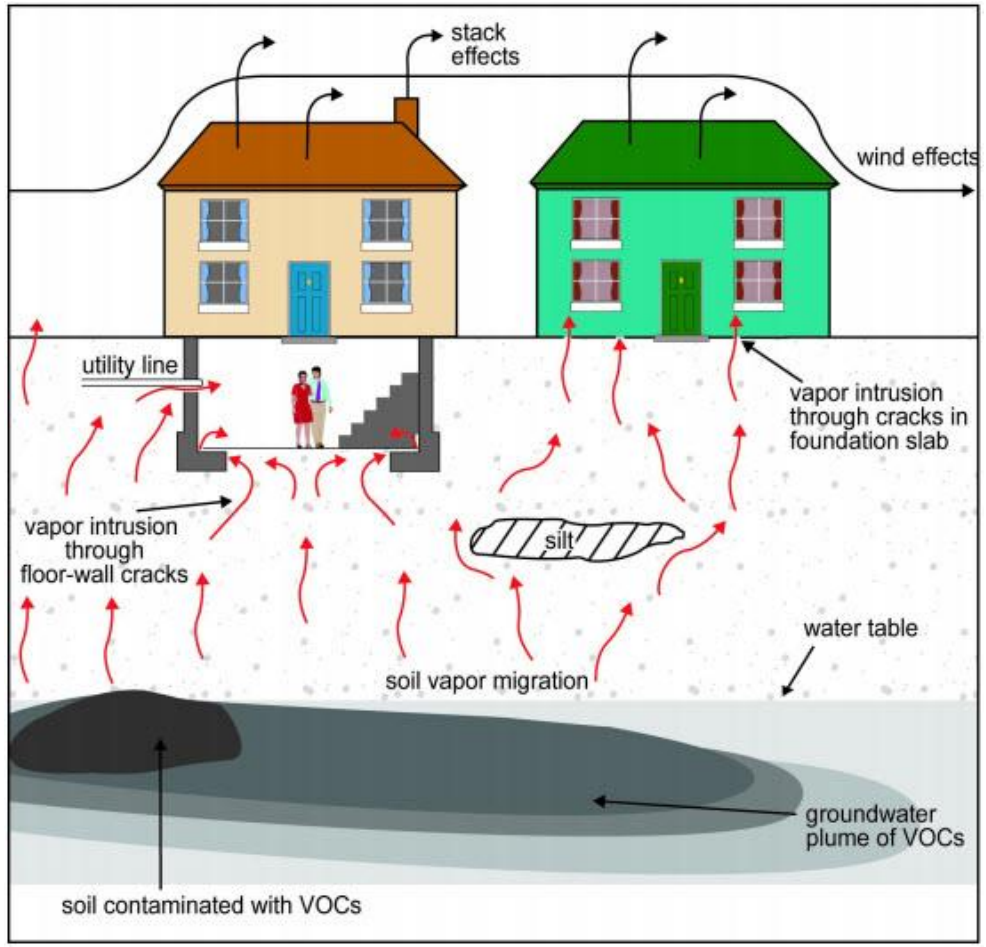
GFL infrastructure

GROUND FORCE ENVIRONMENTAL • A GFL COMPANY

SOIL VAPOUR INTRUSION

- Migration of volatile or semi-volatile chemicals from contaminated soil and groundwater into overlying buildings.

- Involuntary exposure to toxic and/or carcinogenic compounds via the indoor air inhalation pathway



WHY ARE WE SEEING AN INCREASE IN PROJECTS REQUIRING VAPOUR MITIGATION?

- Regulatory changes
- Acceptance to Risk Assessments by lenders, insurance, and property owners
- Increased testing of indoor air quality and soil vapour quality compared to the past
- More brownfield sites are being redeveloped - residential, commercial, and industrial. Unimpacted land is scarce.
- Costs relating to full remedial excavation are going up
  - Regulatory Standards are getting stringent
  - Remedial projects are getting more complex (combined remedy solutions)
  - Soil disposal costs and soil management is becoming costly and challenging
  - Driving more cases of Risk Assessment
- Geotechnical changes
- Ground improvement – leaving soil in place

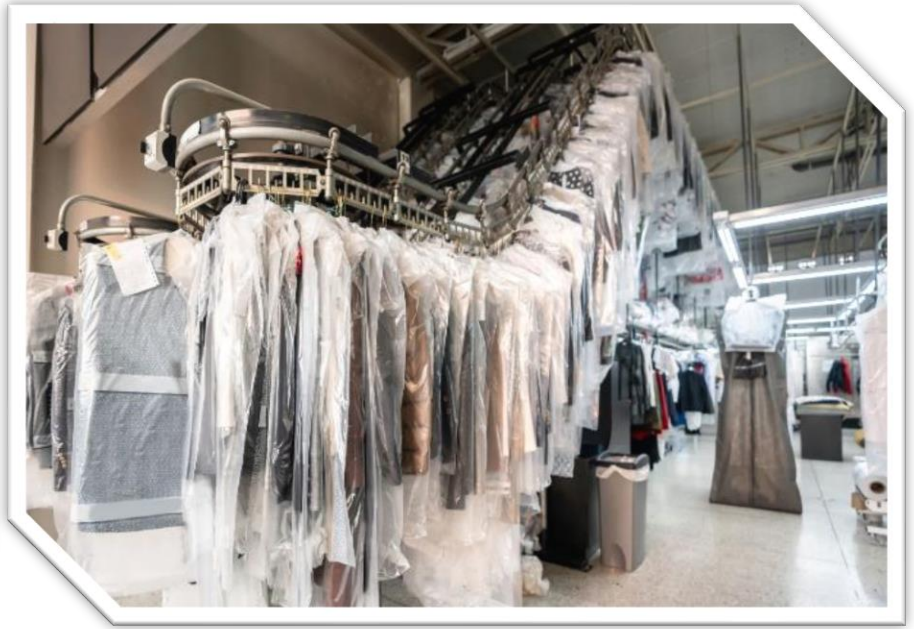
CONTAMINANTS OF CONCERN - ENVIRONMENTAL

Petroleum Hydrocarbons

BTEX, PHC F1 and F2

Semi-Volatiles

Select Polycyclic aromatic hydrocarbons (PAHs)

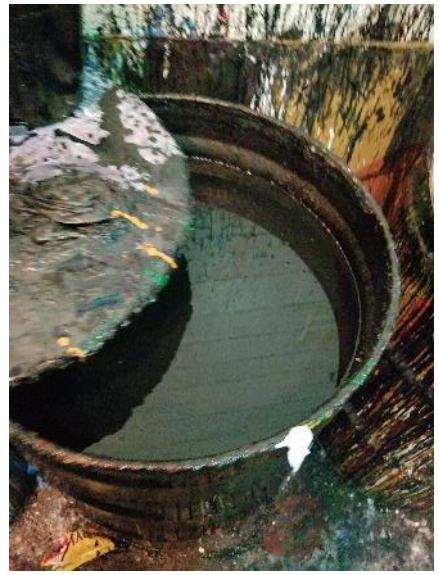


Chlorinated Volatile Organic Compounds

Tetrachloroethylene (PCE) and Trichloroethylene (TCE) and more

SITE HISTORY

- A manufacturer of water-based and solvent-based coatings since 1967
- Operations ceased in 2009 and all the on-Site above grade structures were demolished by December 2011
- A Risk Assessment (RA) was completed in 2018. The RA included several risk management measures (RMMs) to mitigate the potential human exposure to impacts present in soil vapour, soil and groundwater at the Site



SITE HISTORY

- Certificate of Property Use (CPU) in August 2018
- CPU Requirements:
  - Long-term groundwater monitoring and sampling
  - Installation of a sub-slab soil vapour intrusion mitigation system (SVIMS)
  - Other controls such as H&S Plan, Planting Restriction, etc.
- Redevelopment of large commercial/industrial building for one of the largest e-commerce operations
- Pinchin was retained to design the SVIMS
- Ground Force Environmental was awarded with the project and we started our journey

PROJECT SITE

CASE STUDY – LARGE SVIMS INSTALLATION

Client Name: Confidential

Consultant: Pinchin Limited

Project Location: Toronto/GTA

Project Value: $1,600,000+

Slab Footprint: 300,000 sq ft.

General Scope:

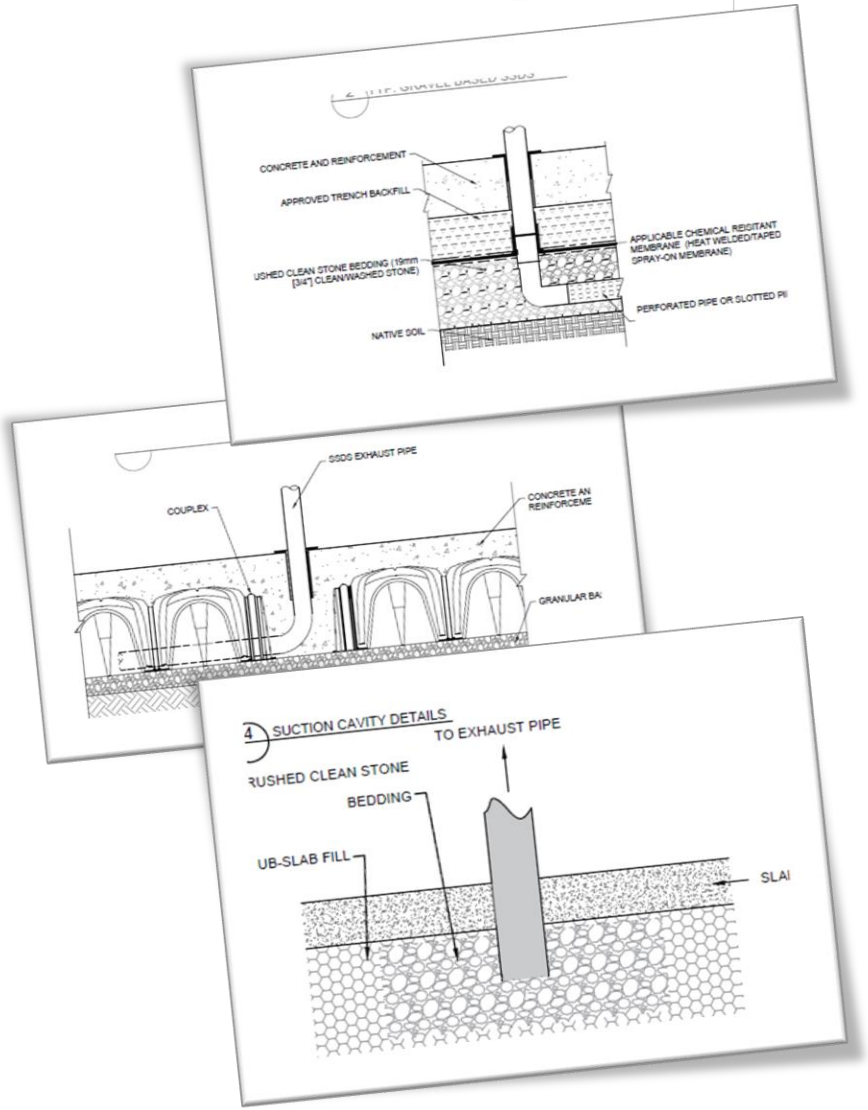
- Install 2,300 linear metres of 4” PVC Piping (Nested in granular sub-base)
- Install approximately 300,000 sq ft of E. Performance composite liner
- Seal off more than 300 utility penetrations
- Smoke test seal off any identified leaks – retest
- Install multiple vapour extraction points & inline fans

SOIL VAPOUR MITIGATION

Project Timeline

TYPICAL OPTIONS EVALUATION

- HVAC upgrades
- Vapour barrier/Floor Sealing
- Active/Passive SVIMS
  - **Pipe & gravel**
  - Void form based ventilated floor



CONSTRUCTION TIMELINE

DESIGN CALCULATIONS AND CONCEPTUAL DRAWINGS

Selected Barrier Membrane

- Chemical resistant membrane
- Seamless vs. welded/tapped
- Thickness
- Permeance strength and puncture resistance

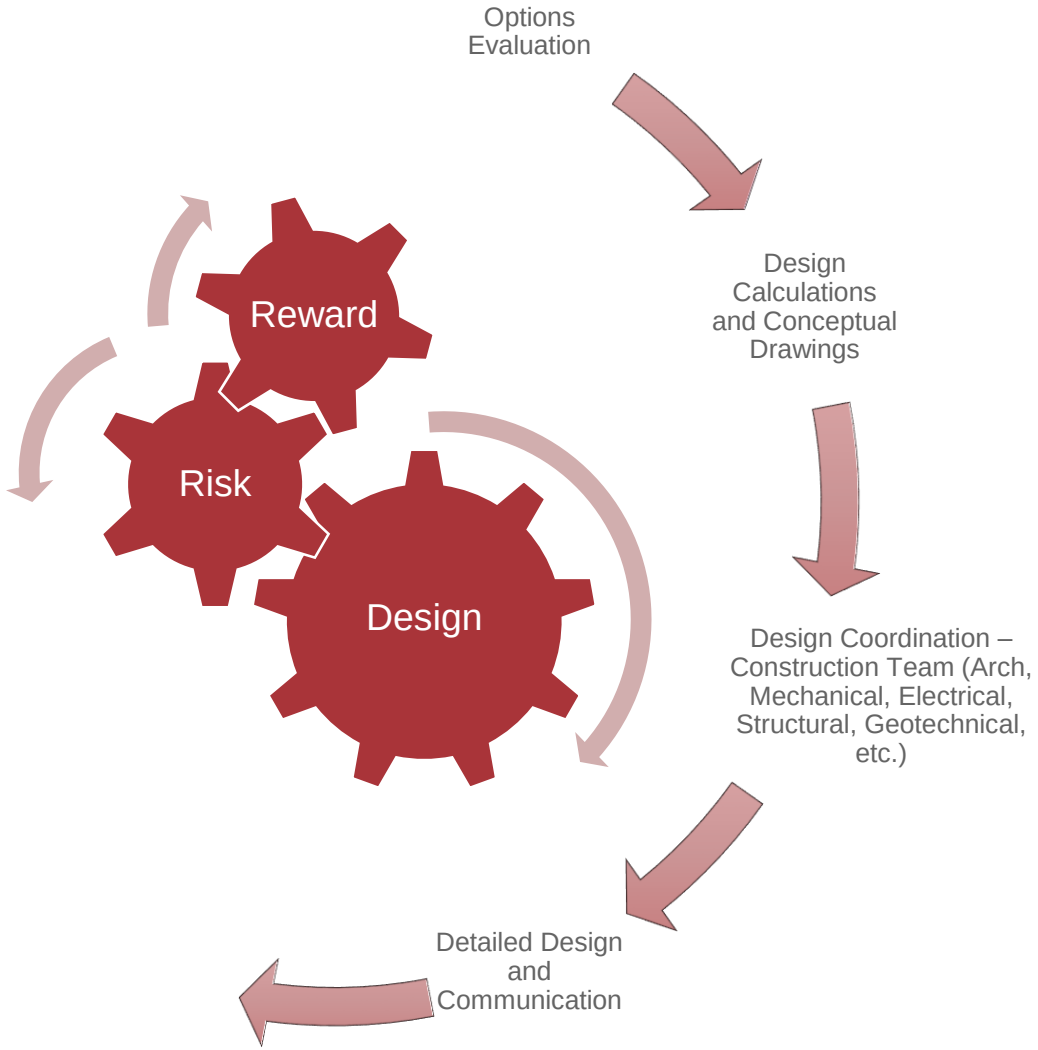
E. Performance from EPRO Inc. polymer modified asphalt

CONSTRUCTION TIMELINE

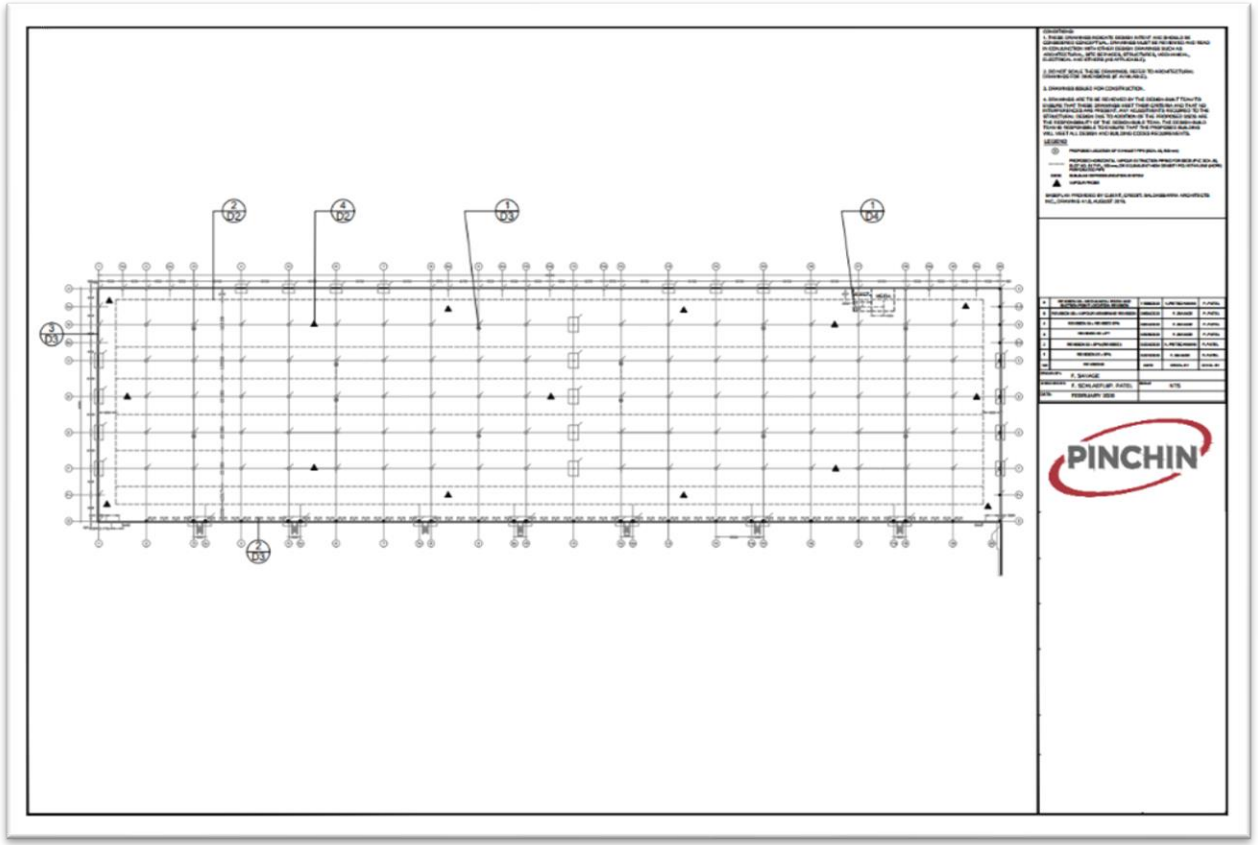
DESIGN COORDINATION – CONSTRUCTION TEAM

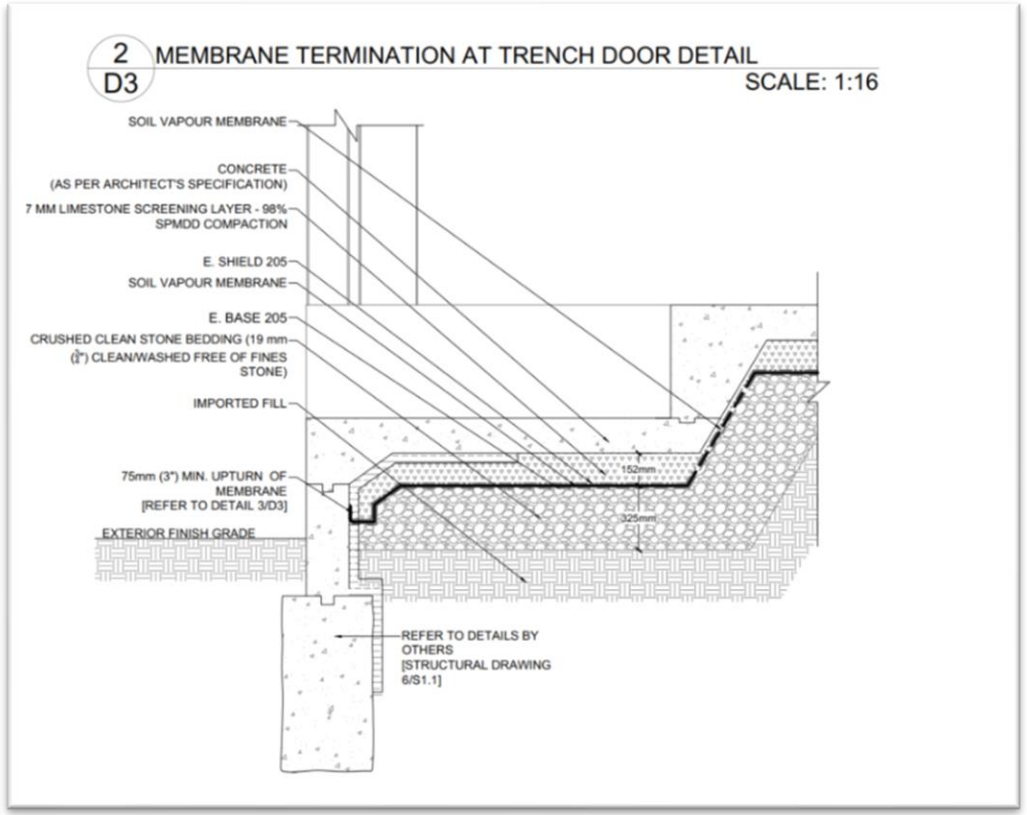
- Architect – Where are we allowed to locate the suction points. Concealed, utility shafts?
- Mechanical – Back drafting
- Electrical – Power requirements
- Structural – Load bearing capacity/constructability
- Civil – Subsurface infrastructure conflicts (utilities)
- Geotechnical – Footing design
- General Contractor

CONSTRUCTION TIMELINE

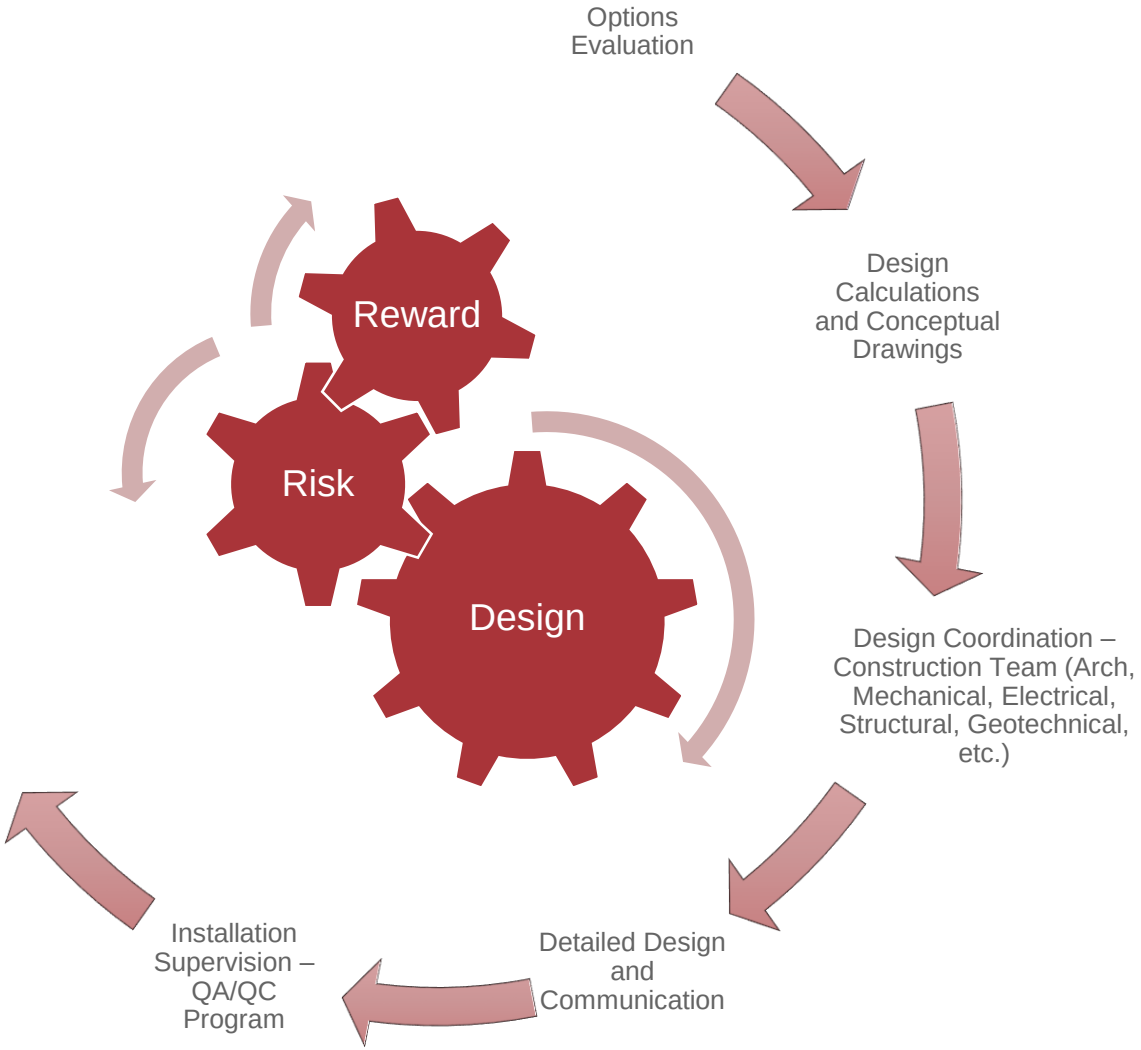


DETAILED DESIGN





CONSTRUCTION TIMELINE

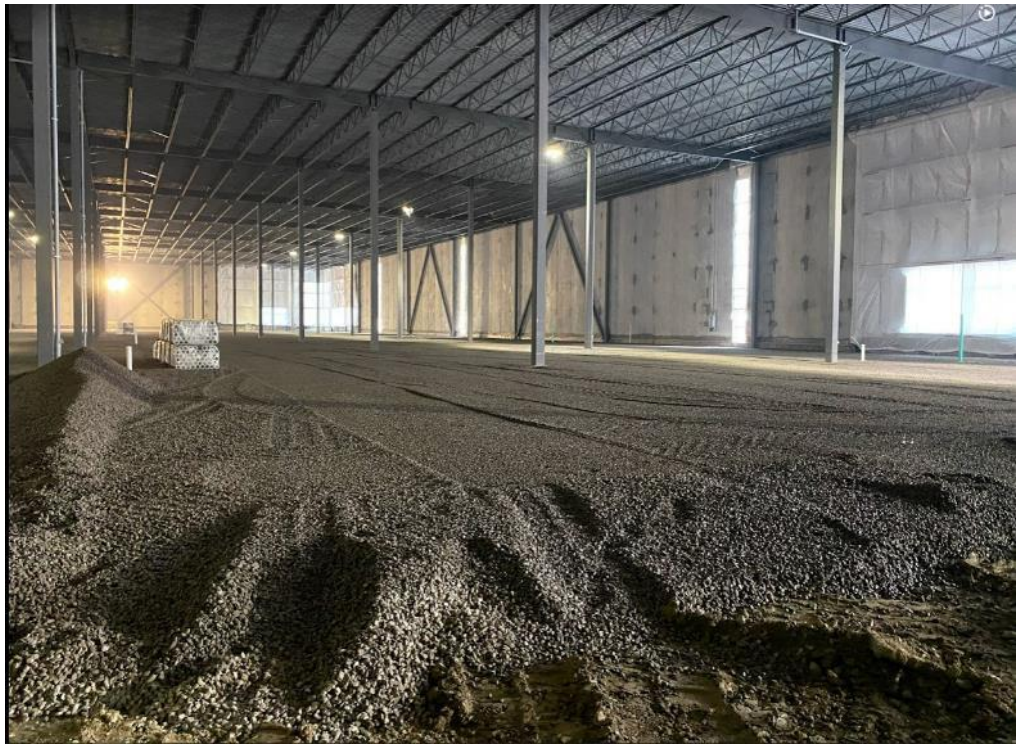


INSTALLATION SUPERVISION & QA/QC PROGRAM

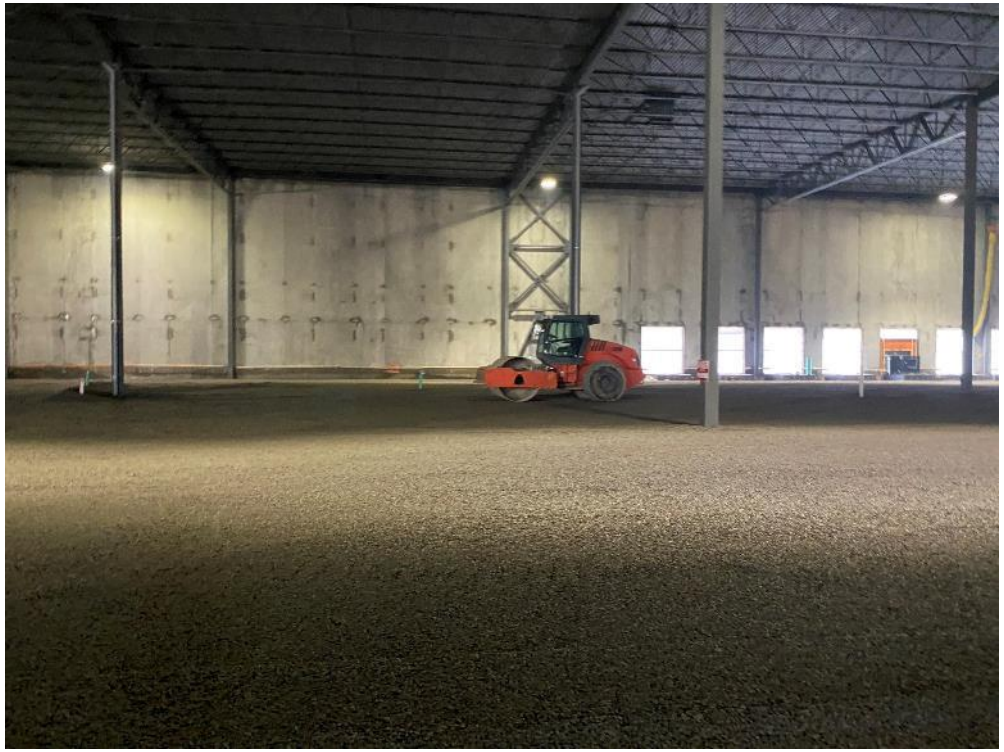
Gravel approval

Closer view

INSTALLATION SUPERVISION & QA/QC PROGRAM

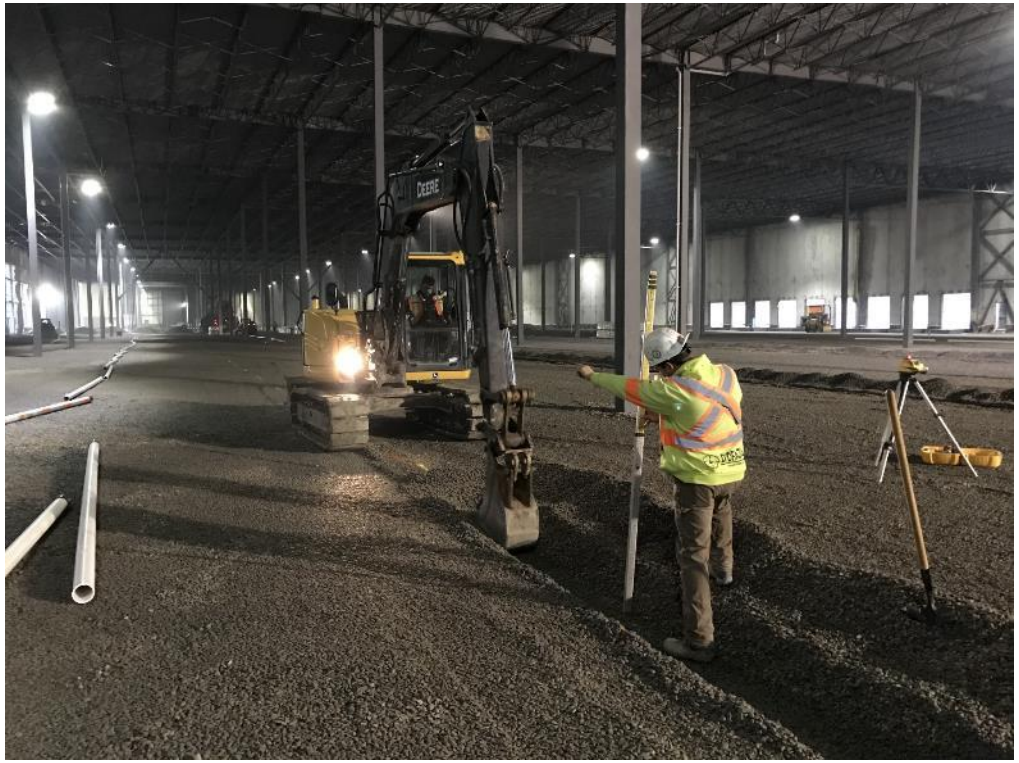


Gravel layer grading



Venting layer compaction

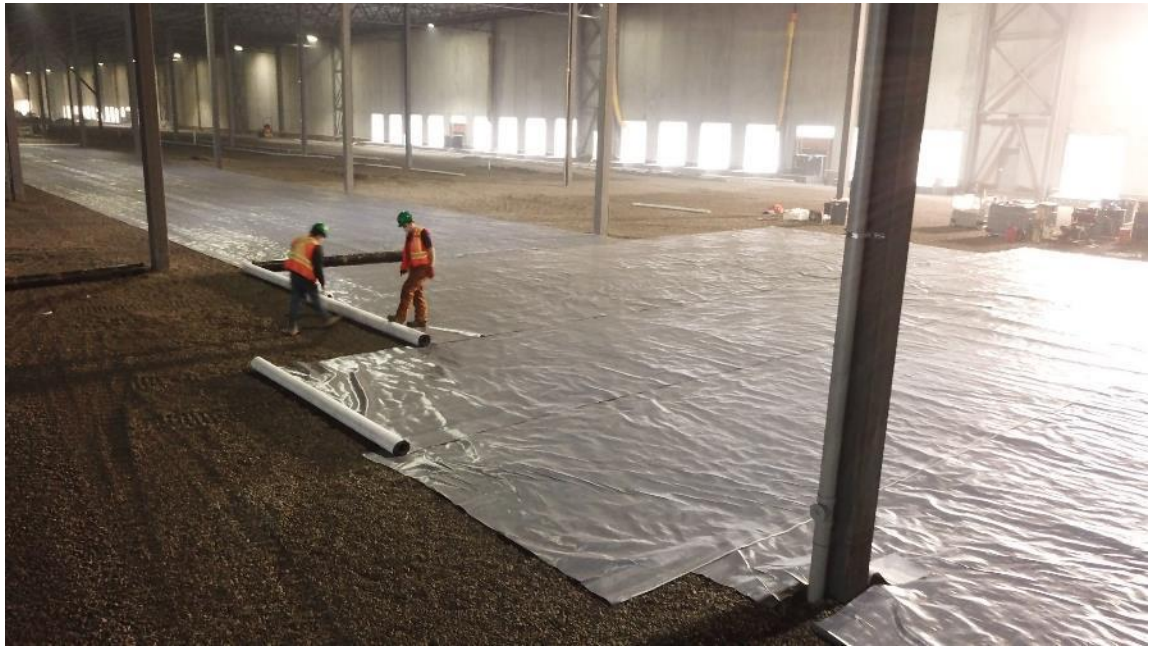
INSTALLATION SUPERVISION & QA/QC PROGRAM



Pipe Elevation Checks

Slotted Pipe Installation

INSTALLATION SUPERVISION & QA/QC PROGRAM



Base Fabric Installation

INSTALLATION SUPERVISION & QA/QC PROGRAM

INSTALLATION SUPERVISION & QA/QC PROGRAM

Smoke Testing – QA/QC

INSTALLATION SUPERVISION & QA/QC PROGRAM

Shield fabric installation

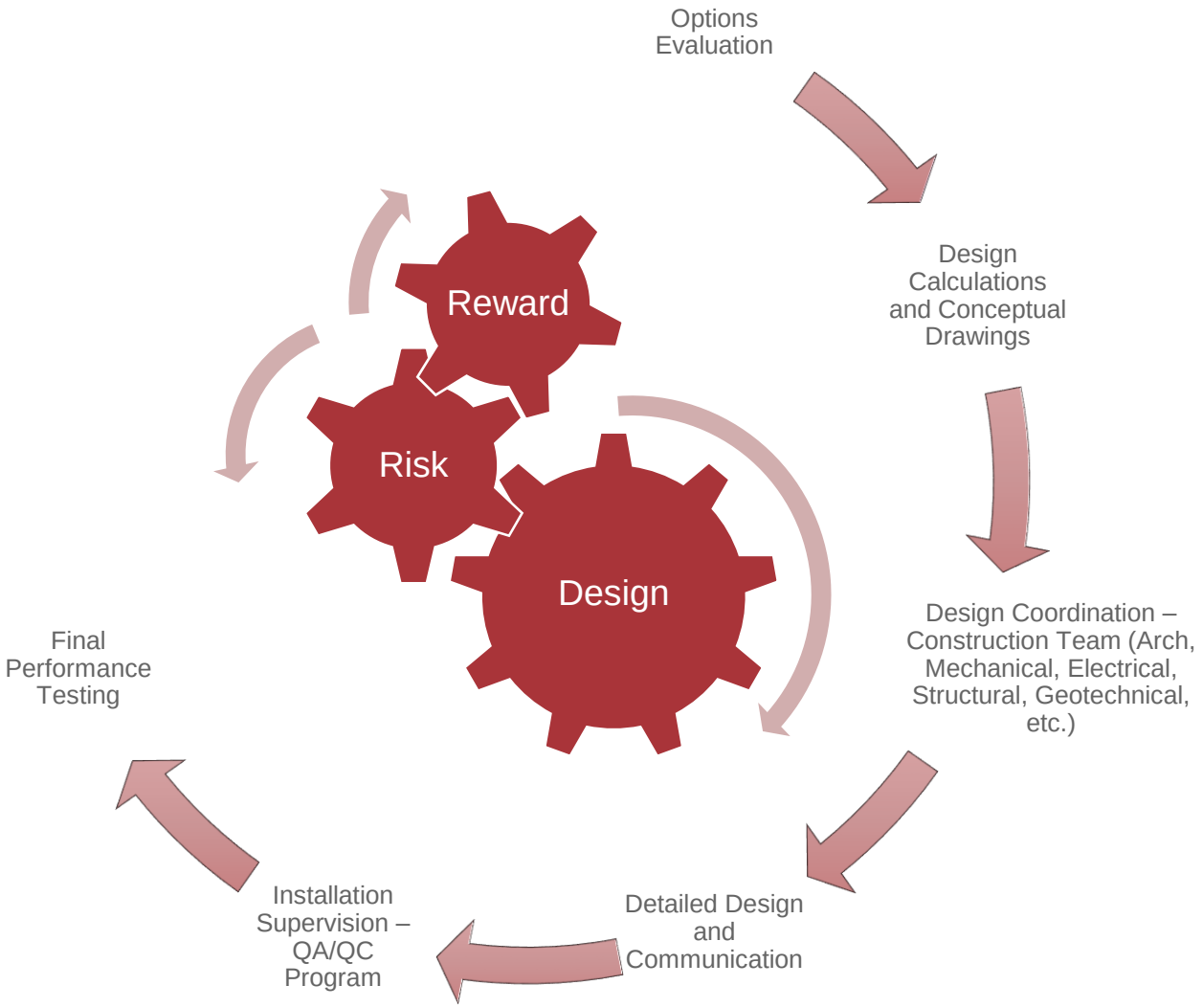
INSTALLATION SUPERVISION & QA/QC PROGRAM

Limestone Screening Layer

INSTALLATION SUPERVISION & QA/QC PROGRAM

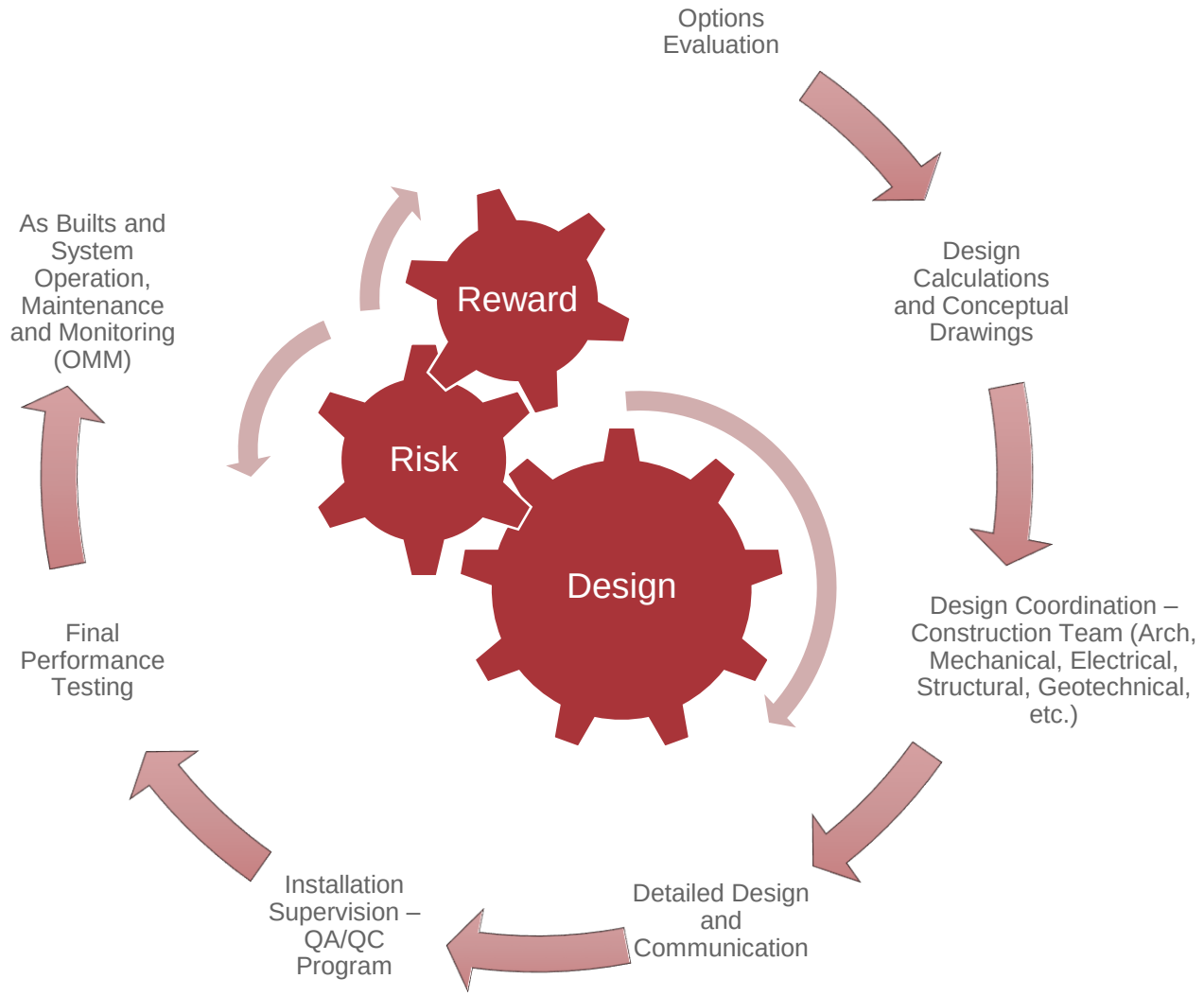
Concrete work

PROJECT TIMELINE

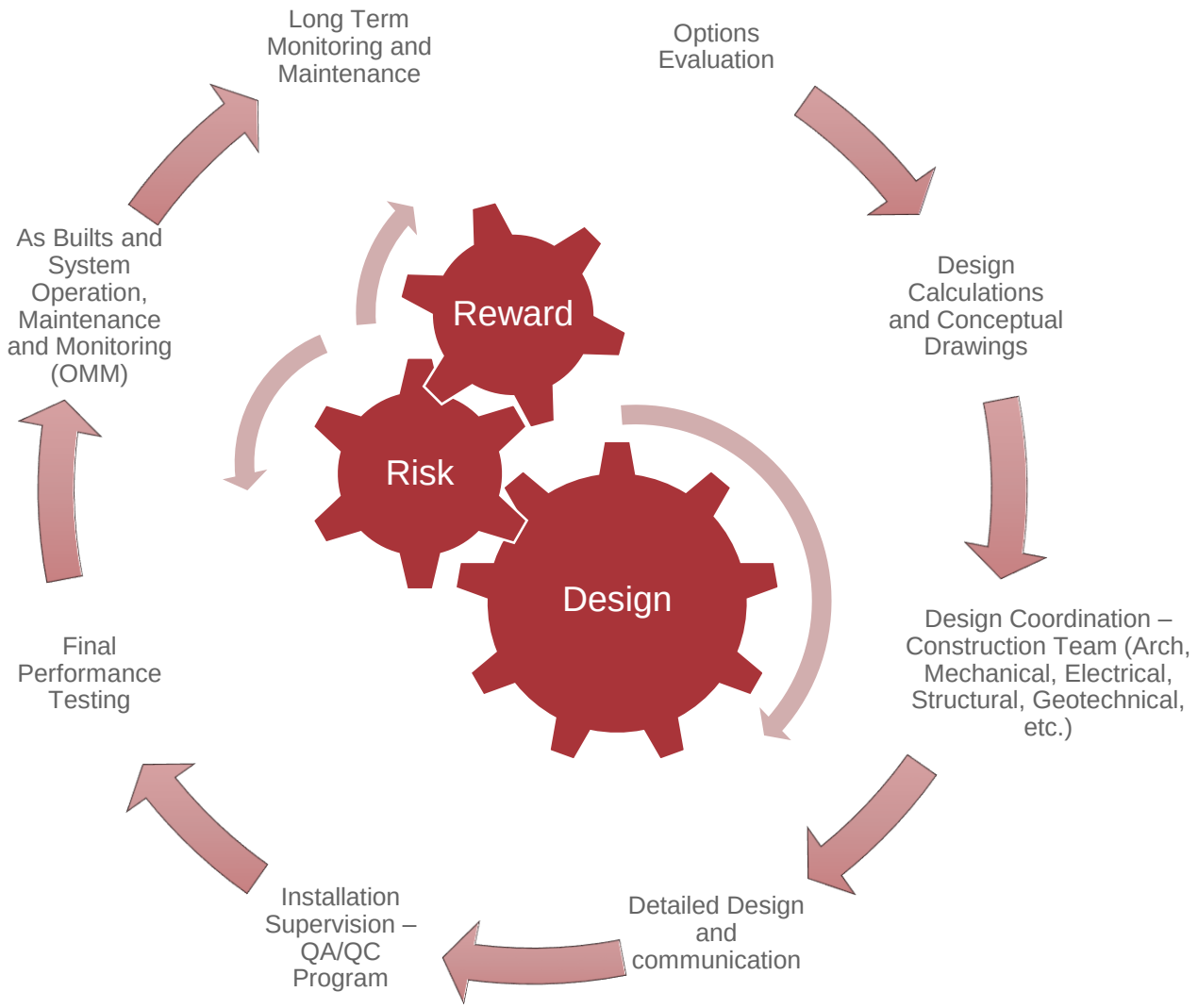


FAN INSTALLATION

PROJECT TIMELINE

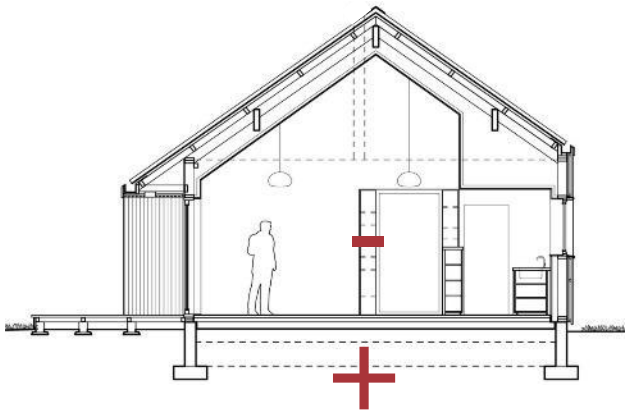


PROJECT TIMELINE – THE END

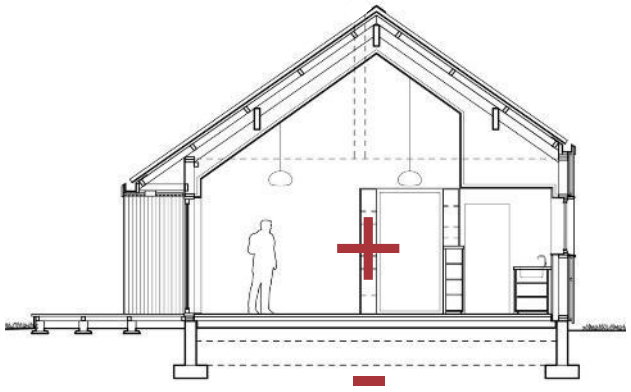


MAIN OBJECTIVE

BEFORE



AFTER



Meeting the Applicable Criteria

PROJECT CHALLENGES

- Ability to protect the membrane while heavy machinery was around
- Meeting the compaction requirements and protecting the membrane
- Ensure that utility elevations are maintained below the SVIMS and penetrations are sealed properly

PROJECT CHALLENGES

- Changing the daily routine to accommodate other parties working on Site
- QA/QC issues and ability to respond quickly to maintain project schedule
- Safe access for trucks to pour concrete and screening while protecting the newly installed membrane

SCOPE **BUDGET**

SCHEDULE

KEY CONSIDERATIONS – HOW CAN I ENSURE MY SUB-SLAB VAPOUR INTRUSION PROJECT GOES SMOOTHLY?

- Pre-qualify your contractor
  - Limit your risk
  - Work with experienced contractors to level playing field
  - Less potential for unexpected change orders or additional project cost
- Communicate impacts of the project with existing tenants
- Ensure power requirements are identified and supply is accessible
- Work with sub-trades (Plumber, electrical, granular, concrete)

THE TEAM - PINCHIN

Scott Mather

Client Liaison

Paresh Patel

Remediation Business Lead

Frank Schlaefli

Project Lead and Practice Specialist

Kushan Gandhi

Project Supervisor

THE TEAM - GFL

Devin Rosnak

Business Development Manager

GFL Infrastructure

Jesse Hutton

Site Supervision

GFL Infrastructure


QUESTIONS?