KARINS ENGINEERING GROUP, INC.

EUCLID CHEMICAL

# Restorative Waterproofing for Below Grade Parking Structures

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Concrete Protection & Restoration
saving the life of concrete®

# Case Study, La Rive Condominium, Underground Parking Garage

## Water problems included

- Ground water infiltration
- Heavy Seasonal rains and a high ground water table
- Hydrostatic pressure
- Vapor drive through floors
- Non-structural cracks in walls
- Poor drainage & standing water

- Global Water Intrusion
- Horizontal, Vertical & Diagonal Cracks in Structural Walls
- Signs of active corrosion of reinforcing steel
- Minor hollow sounding concrete

# ONGOING WATER INTRUSION


The Below grade exterior waterproofing – bentonite type sheets - no longer servicing the building. Landscaping roots had penetrated and dislodged.

A consultant recommended excavating outside foundation. Installing new waterproofing on the positive side.

Estimated cost: $3,000,000.

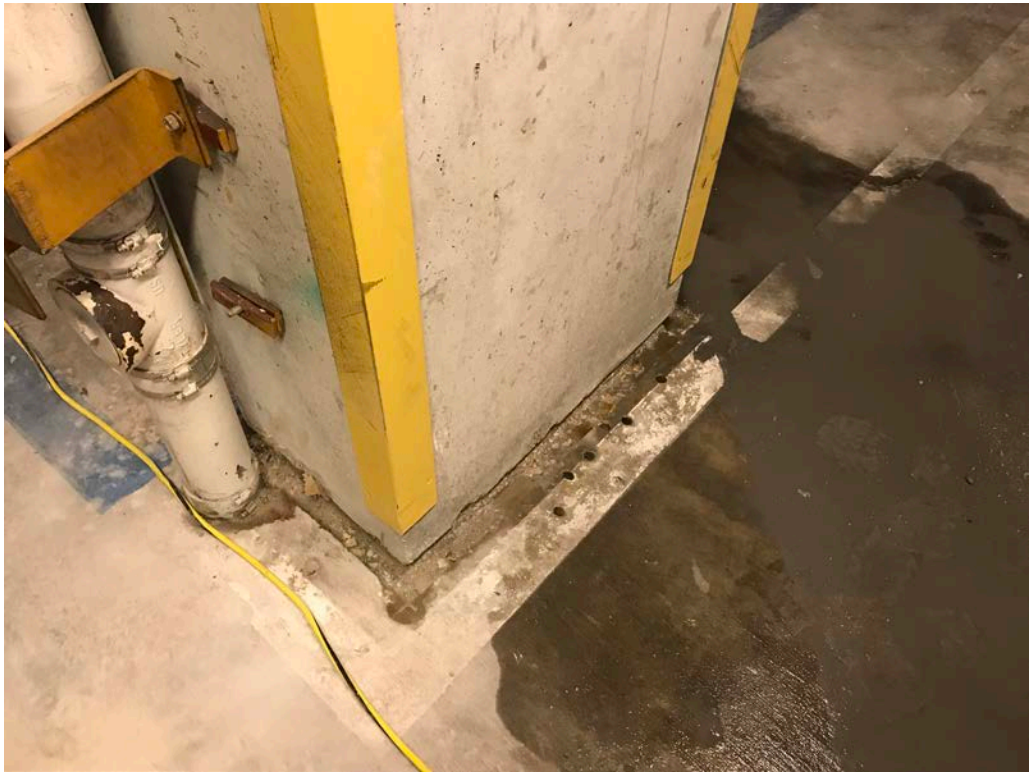
Water,  Water,  Everywhere…
From Above, through the walls and up through the floor.

The owner wanted a global “everything” fix and…
surprise, surprise,  didn’t want to spend millions to do it.

Enter  a partnership of experienced engineering firm
A trusted single source material manufacturer
A contractor that is quality conscious.

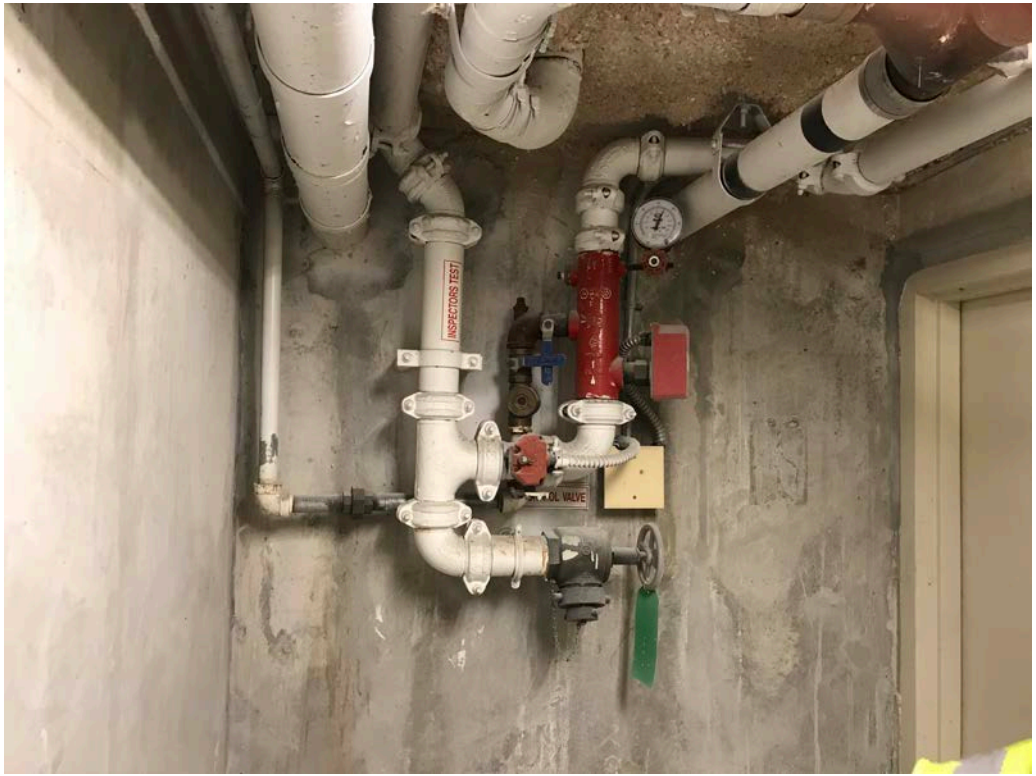
# Always wet, some days were worse than others.


Water coming up and around the edges of the 16 inch thick structural floor presented a unique waterproofing challenge



# Pipe penetrations

When the water table was high they allowed water to weep into the structure.

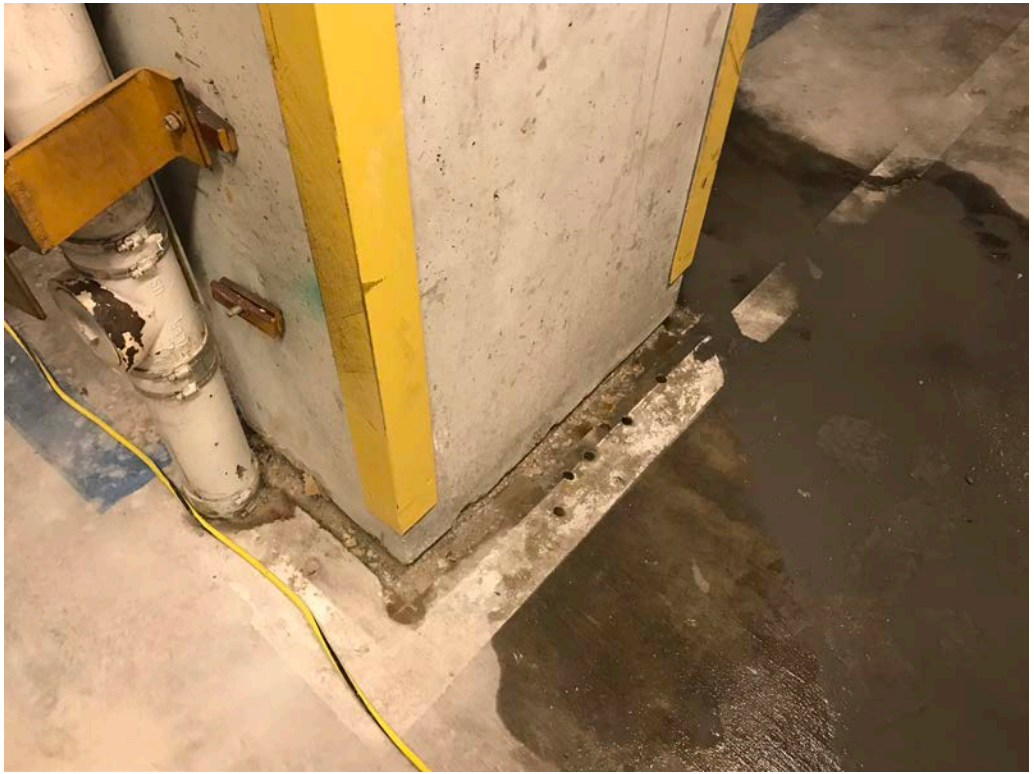


# Wil,  want to talk about one of these?


## At the Floor Wall Interface

Belt & Suspenders solution

1. Urethane injection grouting
2. A new channel of mortar that reacts to water and grows crystals to close off pores
3. A coating of crystalline waterproofing finished with a protective wear resistant decorative coating



# The below grade garage had two distinctly different types of cracks

1. Cracks in structural elements, repaired by epoxy injection.


# The below grade garage had two distinctly different types of cracks

## 2. Leaking water wall cracks along form lines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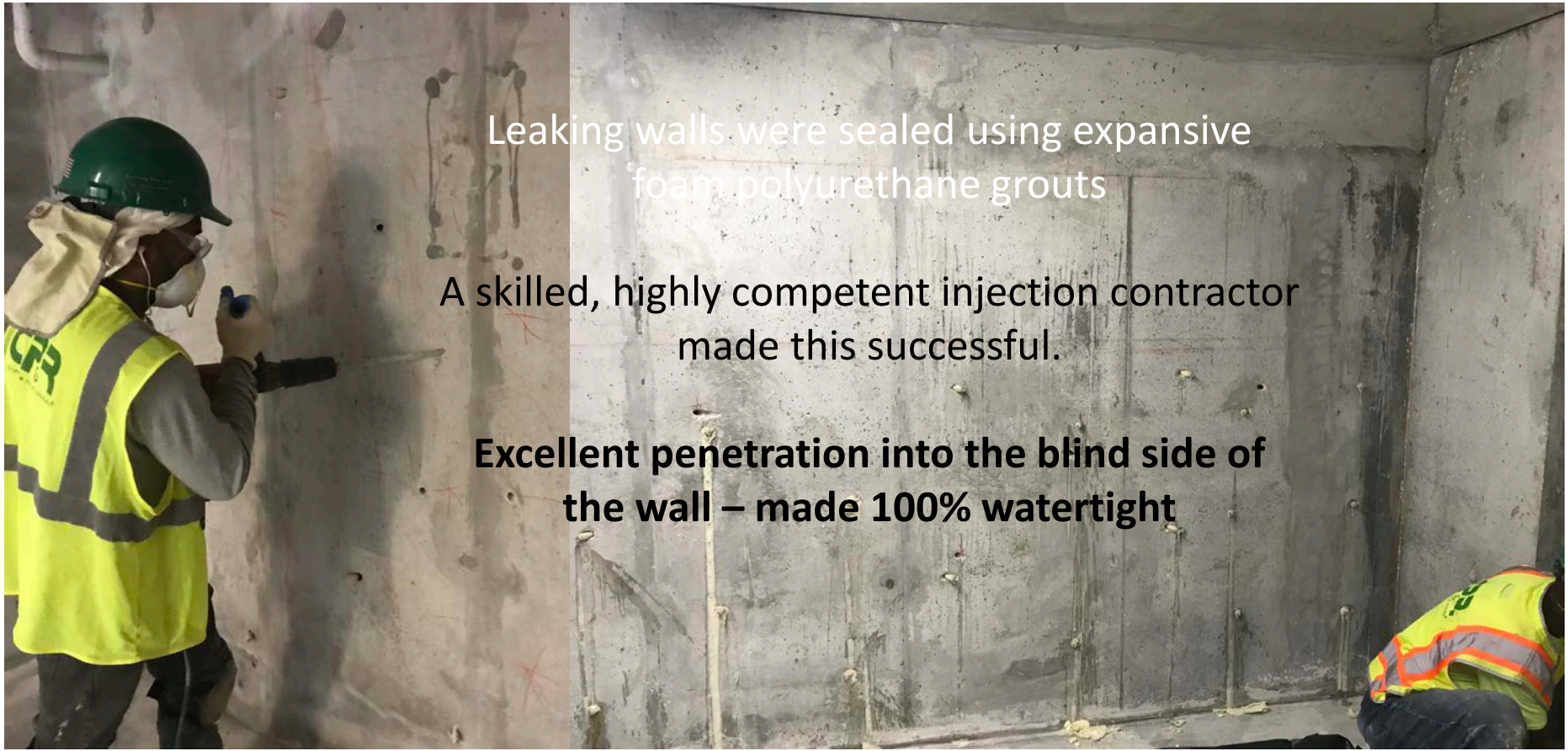

Leaking walls were sealed using expansive foam polyurethane grouts
A skilled, highly competent injection contractor made this successful.
Excellent penetration into the blind side of the wall – made 100% watertight

After polyurethane grout injection:
Injection packer removed, hole cleaned, mix crystalline mortar, trowel into hole

# Leaking wall sealed from the negative side by injection of expansive hydrophobic polyurethane grout


Walls will be waterproofed with a crystalline ‘negative side’ coating.
Surface preparation by sand blast.
Engineering Quality Assurance using ICRI “CSP” Standards

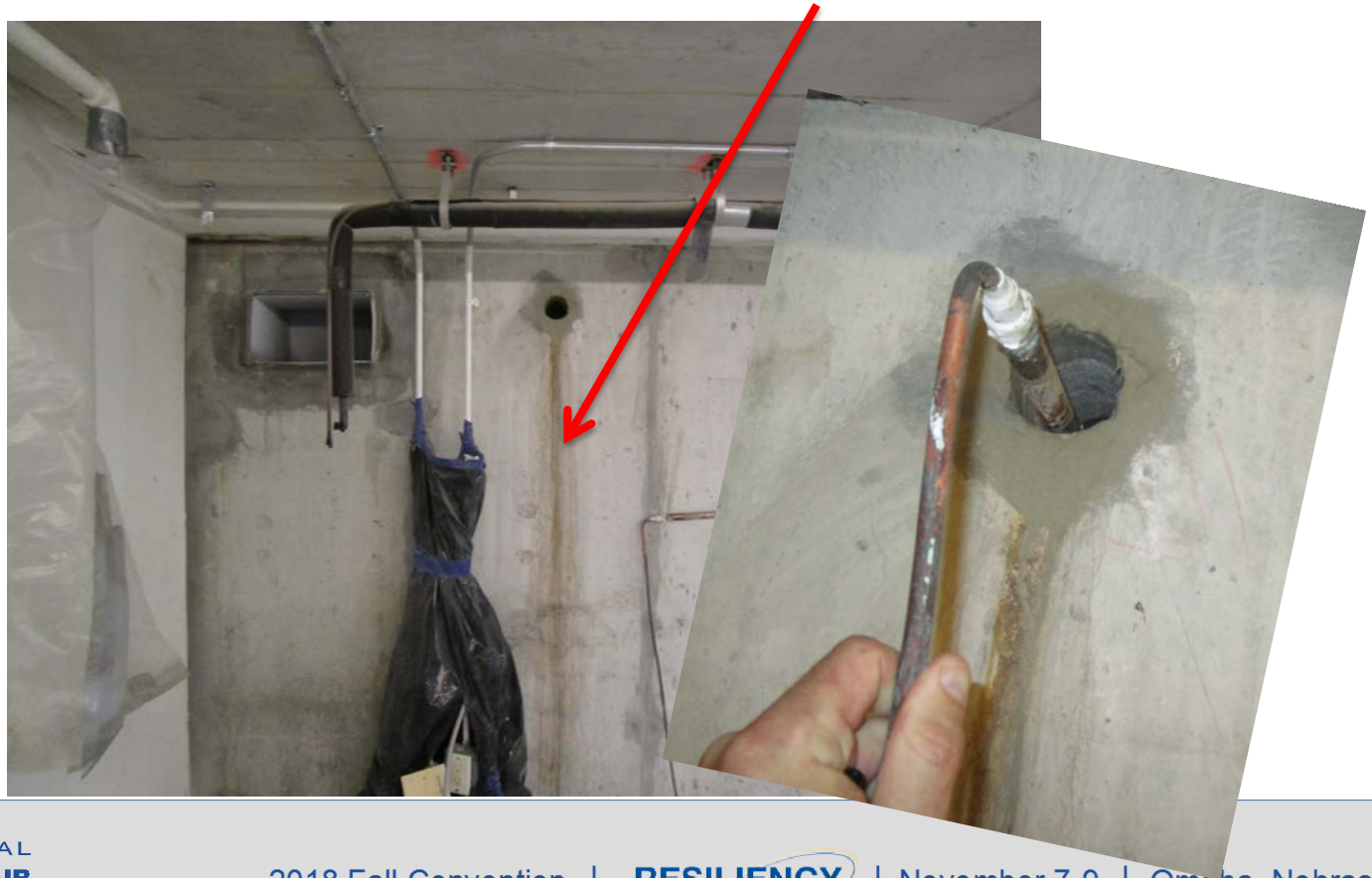
# Walls receive crystalline coating, negative side waterproofing


Fill in the bug holes.  Workers need to know the requirements.

The Cement based crystalline waterproofing grows into the pores of the concrete wall.

A tight integrally bonded surface, Watertight, yet breathable.

# Pipe penetrations - a water infiltration problem



Sealed in a two-step process.

Step one: pack any voids between the pipe and wall with hydraulic cement.

Step two:  inject behind the plug with expansive foam polyurethane grout

A belt and suspenders repair.

If the space between the penetrating pipe and the hole is too tight for installing the cement plug, then just inject the Urethane grout

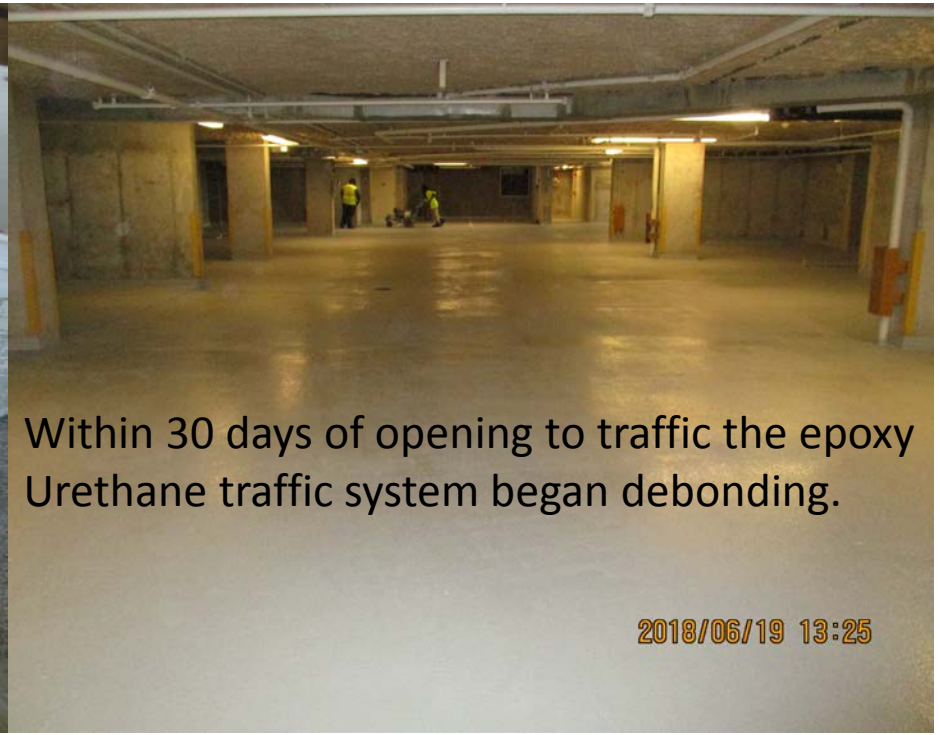
# Pipe penetrations sealed up tight.


# Waterproofing the floor

Surface Preparation Using ICRI Standards

A breathable cement based waterproofing – applied over the floor to be followed by a durable epoxy and urethane traffic system.


**The floor** was waterproof but not moisture vapor proof.




Within 30 days of opening to traffic the epoxy Urethane traffic system began debonding.

# From Project Joy – to despair in four short weeks.

# Vapor drive was blowing the coating off

So who's fault is that?

- The manufacturer recommended the system
- The Engineer specified it
- The contractor installed it.

Let the finger pointing begin!

**We decided to solve the problem instead of assigning blame.**

The contractor, the engineer, the manufacturer came together .

A new system solution was worked out.

The cost was shared.

The customer / owner was taken care of.

A small area of coating system was opened up.

Moisture vapor transmission Testing completed.

The numbers were very high. MVT Rate of 10 to 20 lbs per 1000 sq. ft. That's huge.

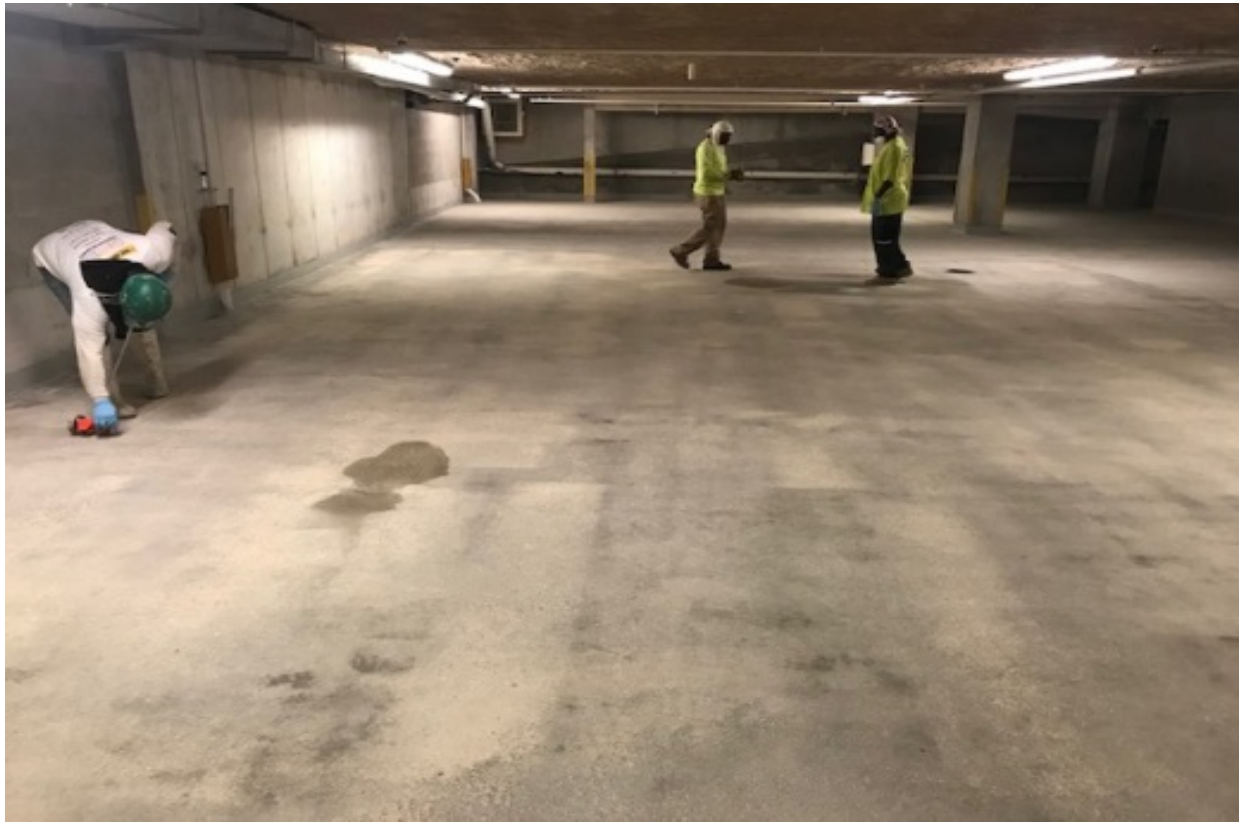
The debonding epoxy / urethane wear coat removed by shotblast

Plan ‘B’.  Work with the floor’s vapor drive
Install a breathable system.  Ship in new materials.


**Cement based Resurfacer**

**Breathable decorative wear coating**

Prepared Surface



Mixing Station

SSD

Application

Finished Application of Resurfacer


**The finished project.**

# Project Challenges

- A failed exterior waterproofing system
- Water coming up from the floor
- Water coming through the walls
- Water coming through penetrations.
- A variable and high ground water level

- Reinstallation of a positive side waterproofing not practical or affordable.

# Project Solutions

- A failed exterior waterproofing system **– work from the building inside**
- Water at Floor Wall Interface – **cut cove interface sealed reactive cements & hyrophobic polyurethane grout.**
- Water through the walls – **Polyurethane injection, Crystalline Coating**
- Water coming through penetrations. – **Water stop grout & Injection**
- Let the floor slab breath – **thin resurfacer & breathable coating.**

**On site frequent engineering review, a quality oriented contractor, an engaged materials manufacturer. A COOPERATIVE TEAM EFFORT**

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