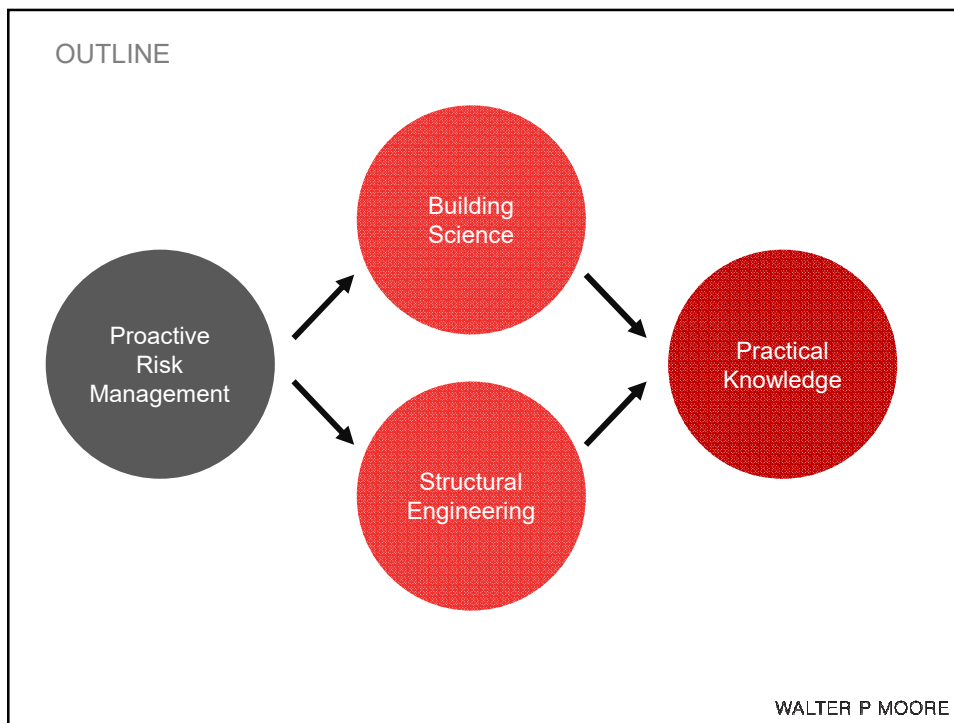


LEARNING OBJECTIVES

- Understand the building science fundamentals of rainwater management, vapor diffusion and air leakage control.
- Understand the use of hygrothermal evaluation of building enclosure assemblies in developing climate appropriate enclosure assemblies.
- Review case studies and understand how small oversights can lead to large failures
- Learn how to evaluate the continuity and detailing of building enclosure control layers
- Understand key risk management steps from design through construction

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PROACTIVE RISK MANAGEMENT

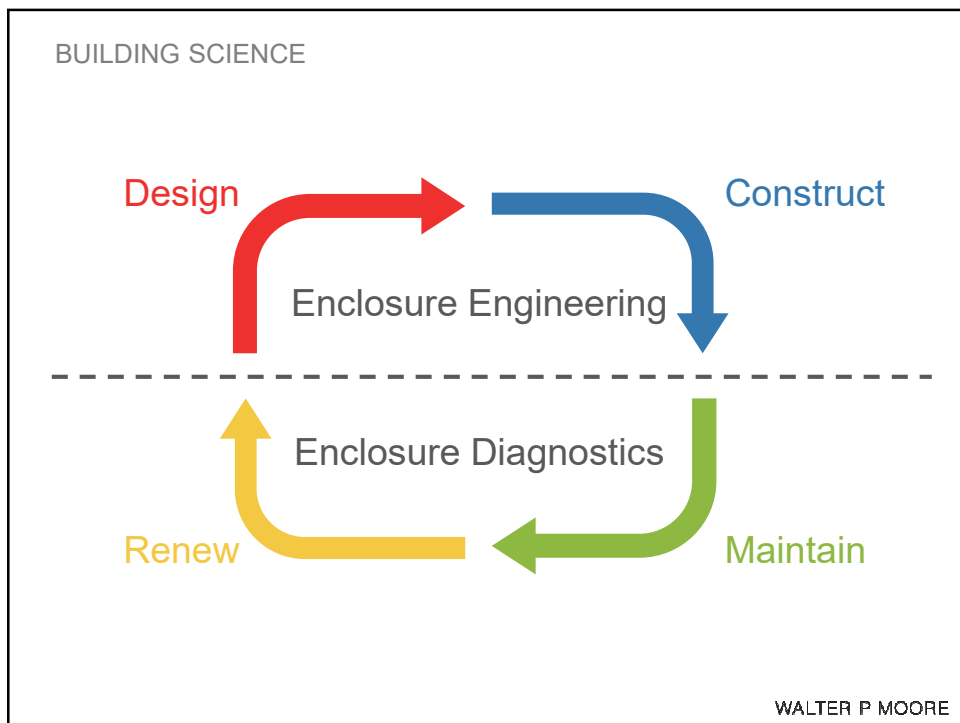
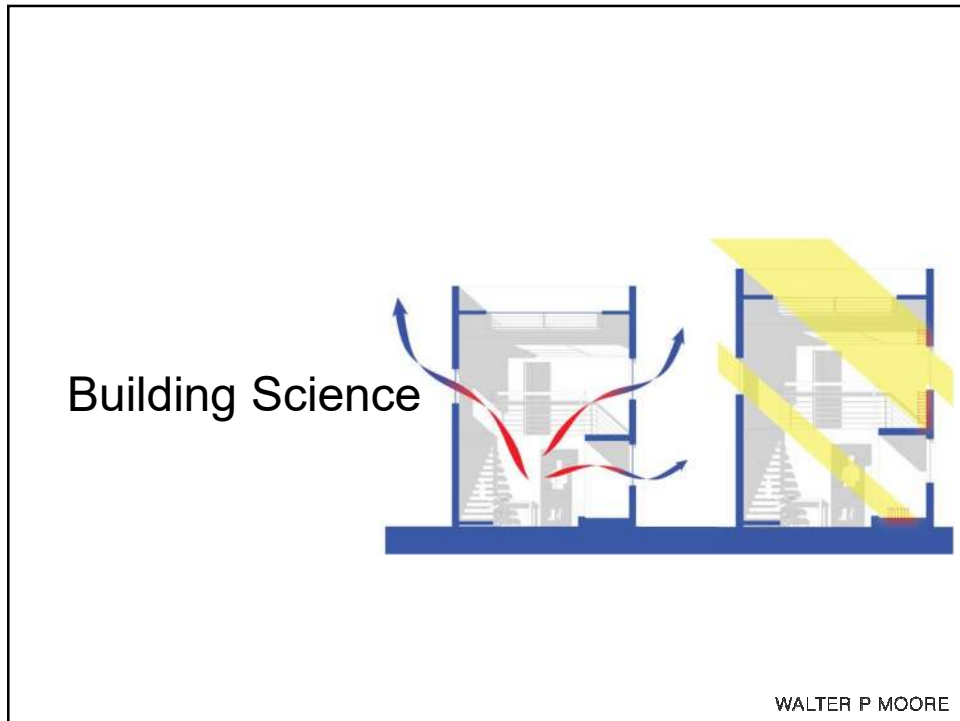
What does this mean?

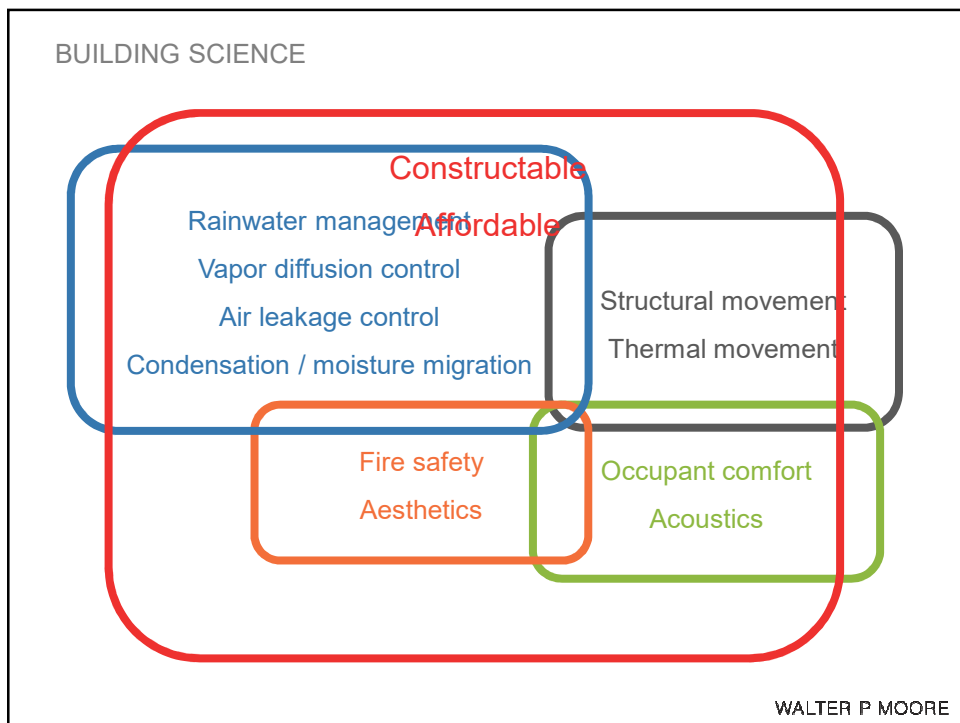
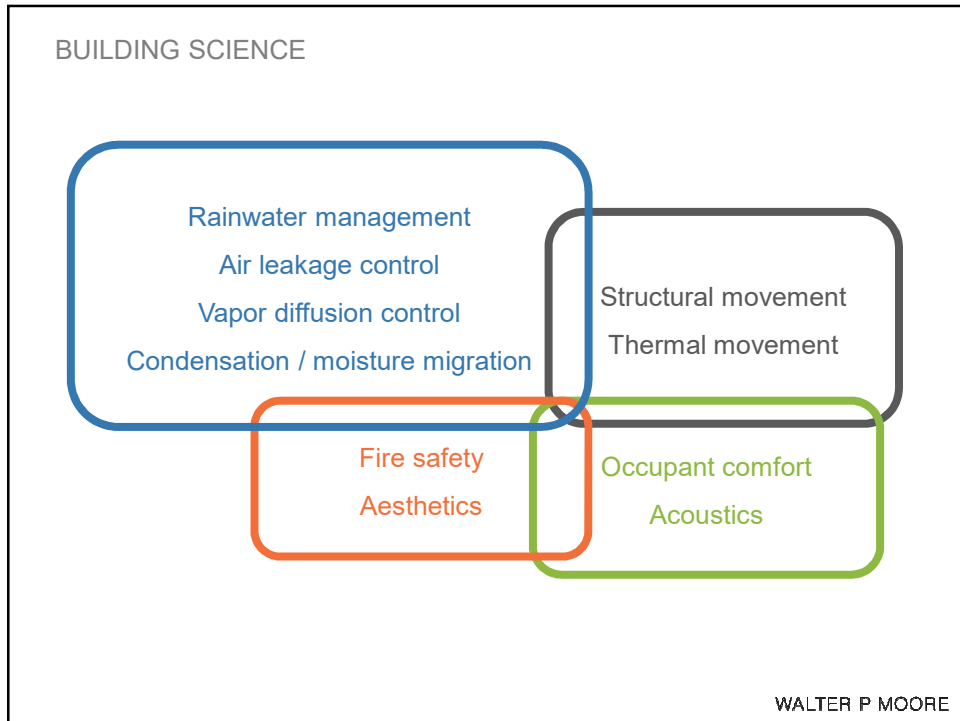
Proactive risk management

Controlling or reducing the likelihood of a risk event to shift organization with the odds in our favor

- probability
- consequence

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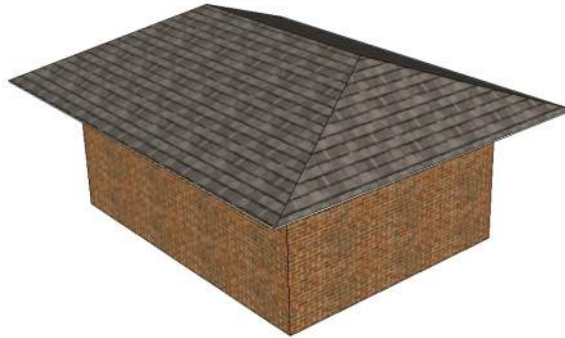




BUILDING SCIENCE

4Ds of Rainwater Management

1. Deflection
2. Drainage
3. Drying
4. Durability

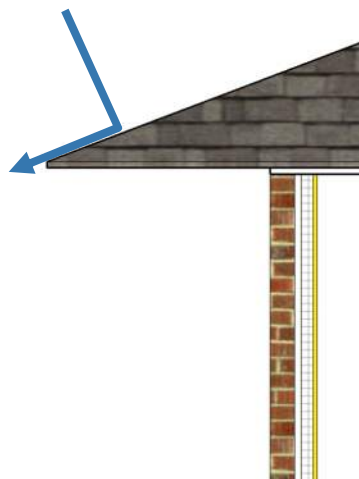


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BUILDING SCIENCE

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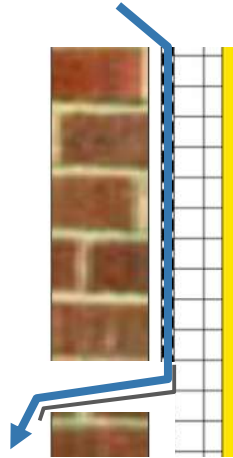


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BUILDING SCIENCE

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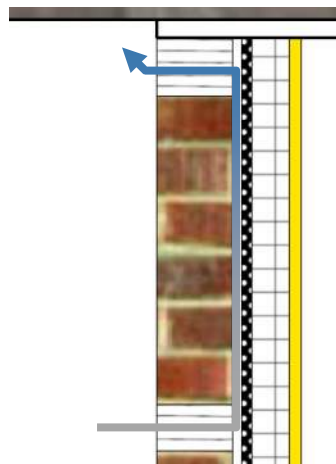


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BUILDING SCIENCE

4Ds of Rainwater Management

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BUILDING SCIENCE

4Ds of Rainwater Management

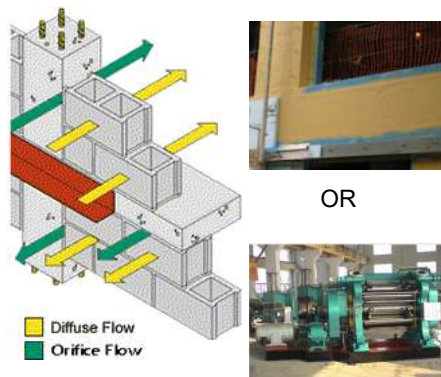
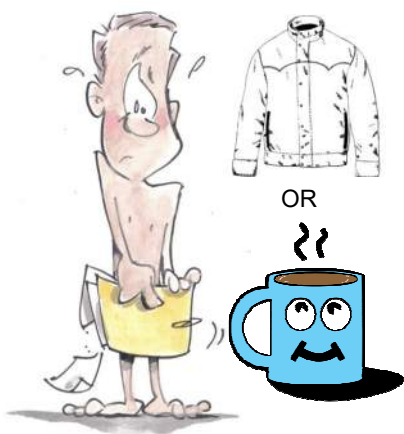
1. Deflection
2. Drainage
3. Drying
4. Durability

“No wrong materials...
Just materials used for
the wrong applications”

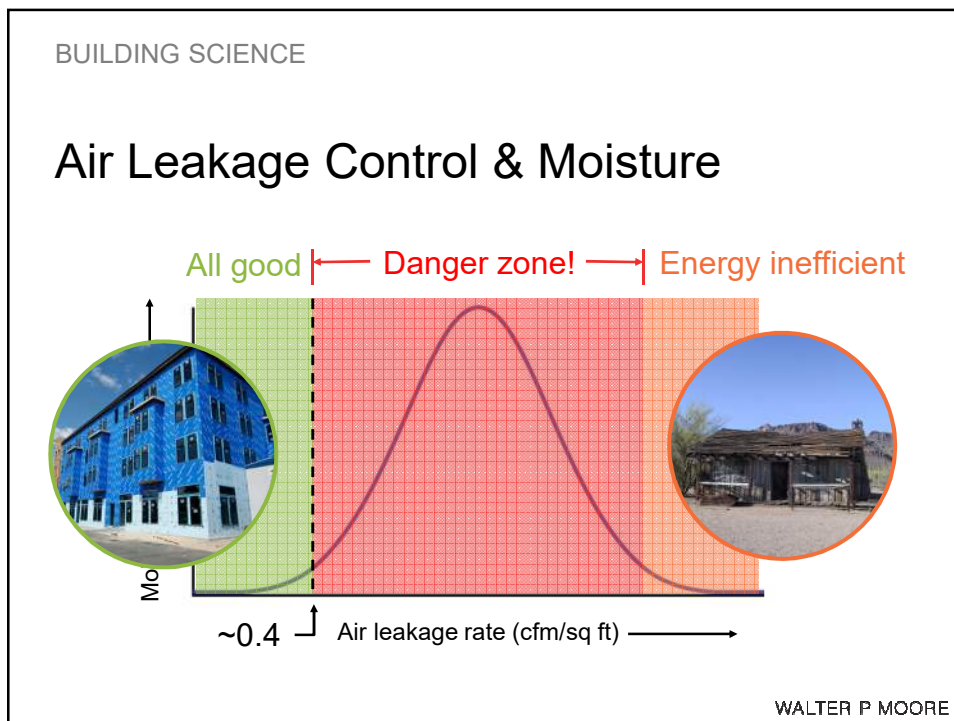
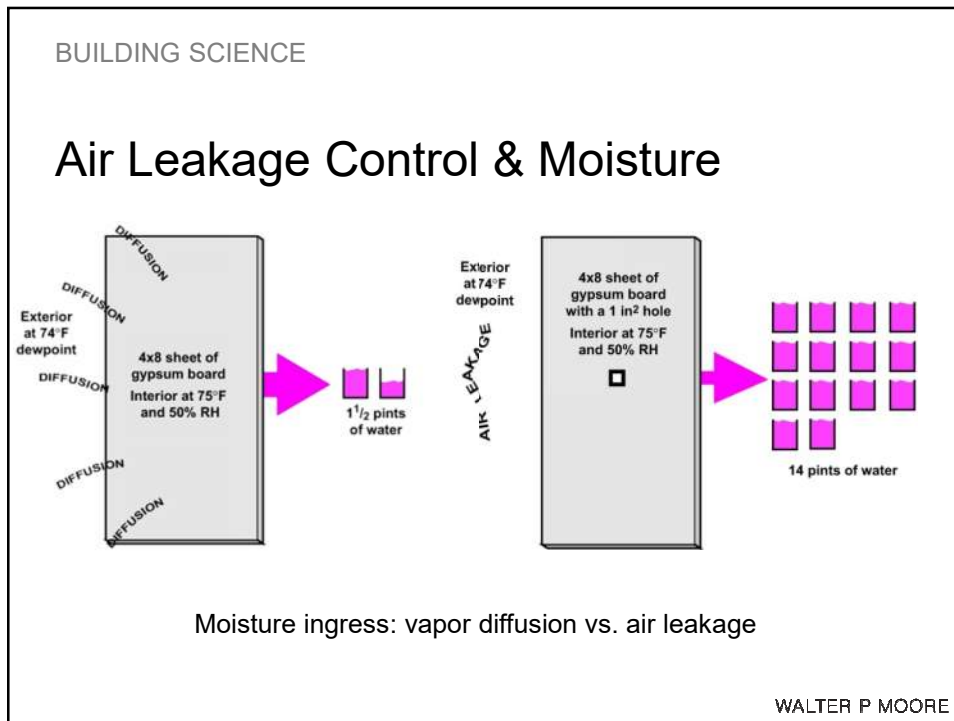
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BUILDING SCIENCE

Air Leakage Control



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Priorities



Rainwater management



Air leakage control



Vapor diffusion

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Thermal Movement



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Case Studies

When things go wrong



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CASE STUDIES

Parkridge Building Re-Cladding

Investigation

Using our diagnostics toolbox



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CASE STUDIES – PARKRIDGE BUILDING RE-CLADDING

Investigation Toolbox

- Document review
- Facility management interviews



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CASE STUDIES – PARKRIDGE BUILDING RE-CLADDING

Investigation Toolbox

- Document review
- Facility management interviews
- Visual survey of interior & exterior

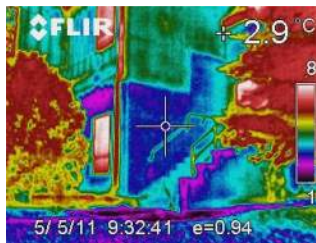


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CASE STUDIES – PARKRIDGE BUILDING RE-CLADDING

Investigation Toolbox

- Document review
- Facility management interviews
- Visual survey of interior & exterior
- Nondestructive evaluation



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CASE STUDIES – PARKRIDGE BUILDING RE-CLADDING

Investigation Toolbox

- Document review
- Facility management interviews
- Visual survey of interior & exterior
- Nondestructive evaluation
- Destructive testing & exploratory openings



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CASE STUDIES – PARKRIDGE BUILDING RE-CLADDING

Investigation Toolbox

- Document review
- Facility management interviews
- Visual survey of interior & exterior
- Nondestructive evaluation
- Destructive testing & exploratory openings
- **Water testing**



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CASE STUDIES – PARKRIDGE BUILDING RE-CLADDING

Investigation Toolbox

- Document review
- Facility management interviews
- Visual survey of interior & exterior
- Nondestructive evaluation
- Destructive testing & exploratory openings
- Water testing
- **Indoor environmental conditions testing**

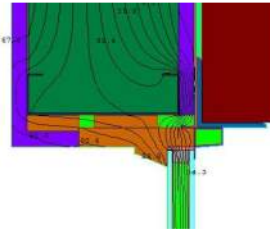
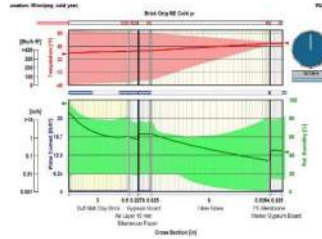


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CASE STUDIES – PARKRIDGE BUILDING RE-CLADDING

Investigation Toolbox

- Document review
- Facility management interviews
- Visual survey of interior & exterior
- Nondestructive evaluation
- Destructive testing & exploratory openings
- Water testing
- Indoor environmental conditions testing
- Building envelope analysis



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CASE STUDIES – PARKRIDGE BUILDING RE-CLADDING



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CASE STUDIES

University of Texas Medical Building

Recladding

Brick, curtain wall, metal rain screen panels, cast stone



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CASE STUDIES – UTMB

What's Wrong Here?

Failure at concrete beam

Distress at sloped brick sills

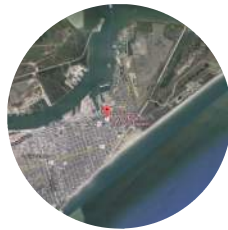
Outward displacement of brick veneer



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CASE STUDIES – UTMB

What's Wrong Here?



Coastal Environment

Corroded

- reinforcement steel
- shelf angles and lintels
- brick ties

→ Failure

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CASE STUDIES – UTMB

How To Fix It?

1. Brick demolition
 2. Backup wall remediation
 3. Air/water/vapor barrier
 4. New cladding
- Unreinforced CMU is structurally deficient
 - Cannot anchor new cladding to unreinforced CMU
 - New exterior aluminum structure anchored to existing floor slabs

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CASE STUDIES – UTMB

How To Fix It?



Replace brick veneer & install air/water barrier

Metal cladding with exterior aluminum frame

Partial infill & curtain wall

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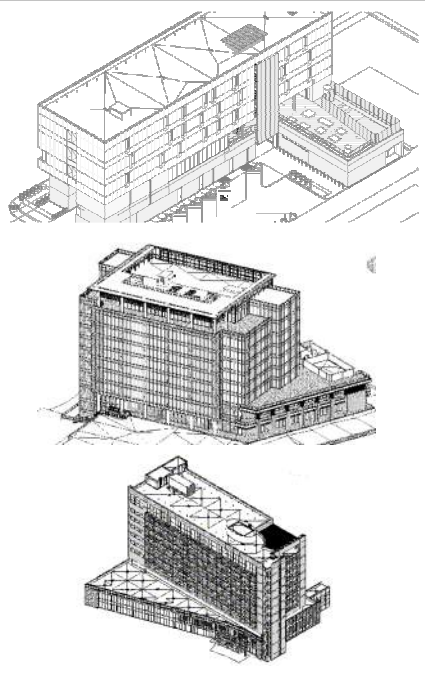
CASE STUDIES – UTMB



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Case Studies

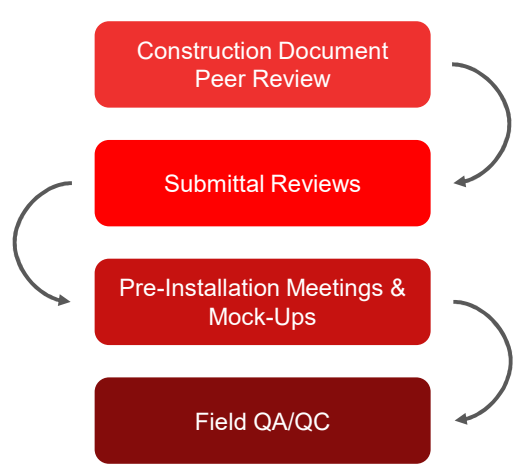
Pro-Active Diagnostics
Solve problems before they become problems



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CASE STUDIES

How To Do It Right?



Construction Document Peer Review

Submittal Reviews

Pre-Installation Meetings & Mock-Ups

Field QA/QC

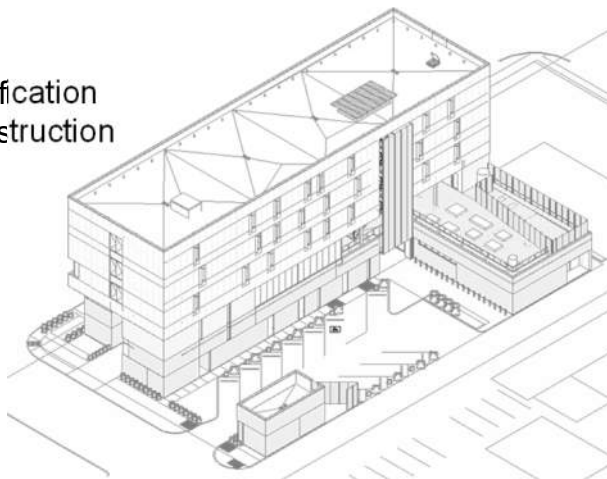
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CASE STUDIES

Men's Center

Peer Review

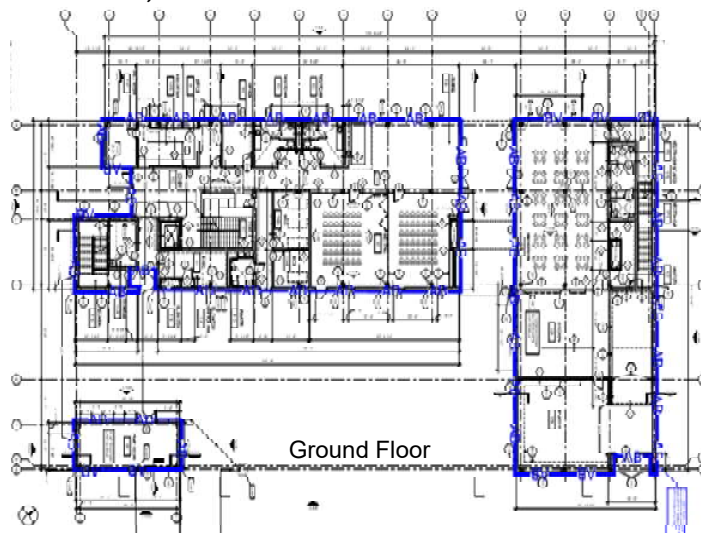
Drawing and specification review prior to construction



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CASE STUDIES – MEN'S CENTER

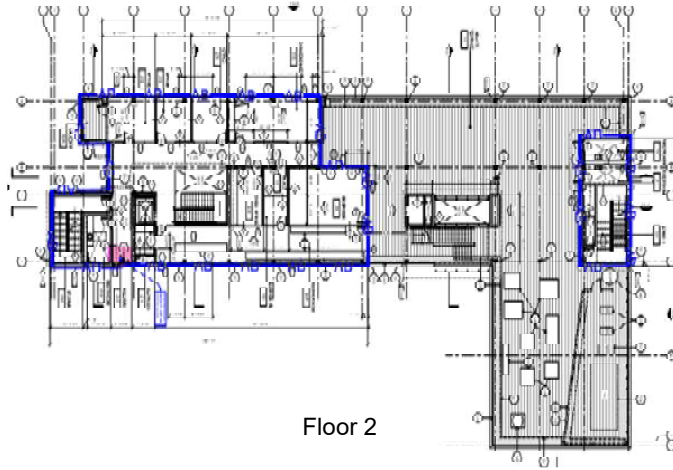
What's Inside, What's Outside?



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CASE STUDIES – MEN'S CENTER

What's Inside, What's Outside?

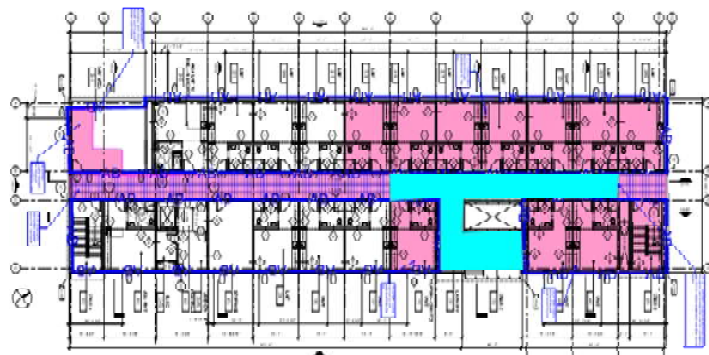


Floor 2

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CASE STUDIES – MEN'S CENTER

What's Inside, What's Outside?

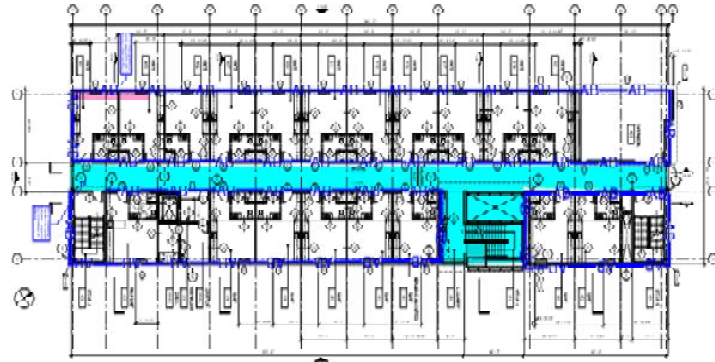


Floor 3

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CASE STUDIES – MEN'S CENTER

What's Inside, What's Outside?

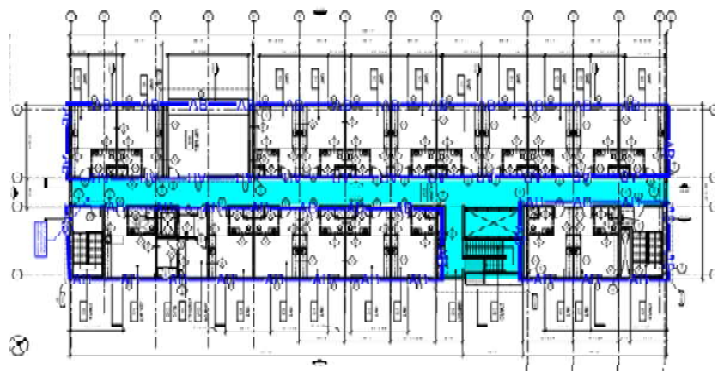


Floor 4

WALTER P MOORE

CASE STUDIES – MEN'S CENTER

What's Inside, What's Outside?

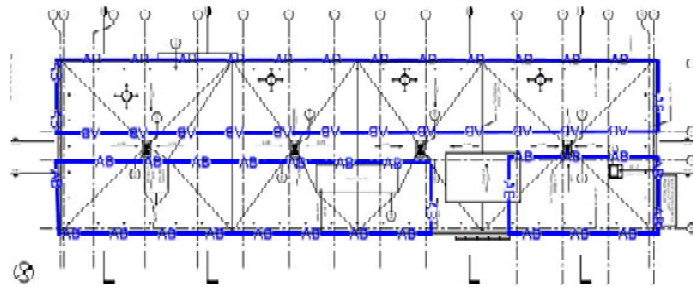


Floor 5

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CASE STUDIES – MEN'S CENTER

What's Inside, What's Outside?

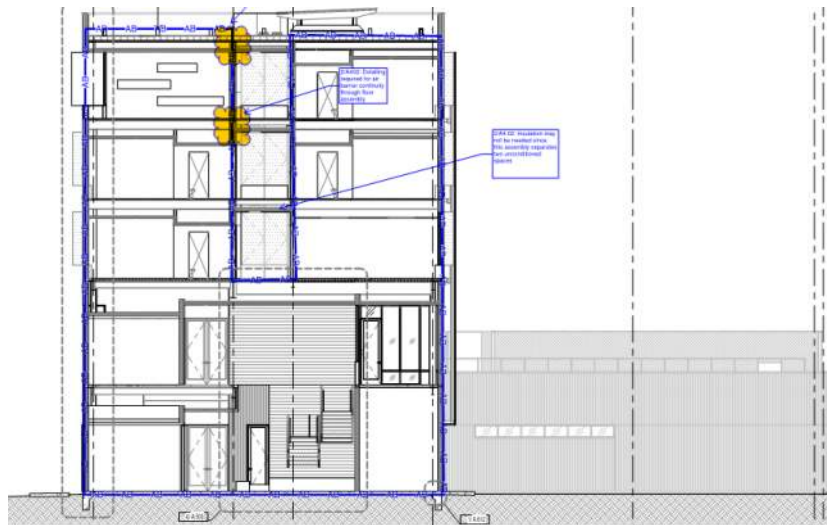


Roof

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CASE STUDIES – MEN'S CENTER

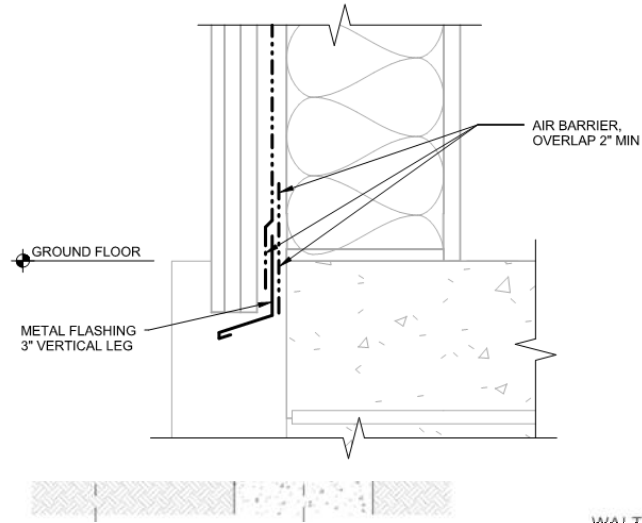
Connect the Dots



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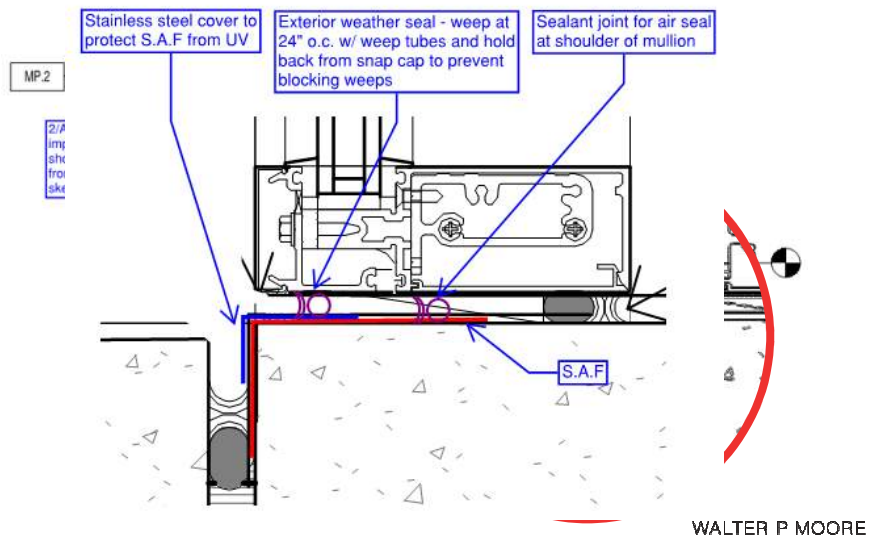
CASE STUDIES – MEN'S CENTER

Connect the Dots



CASE STUDIES – MEN'S CENTER

Connect the Dots



CASE STUDIES

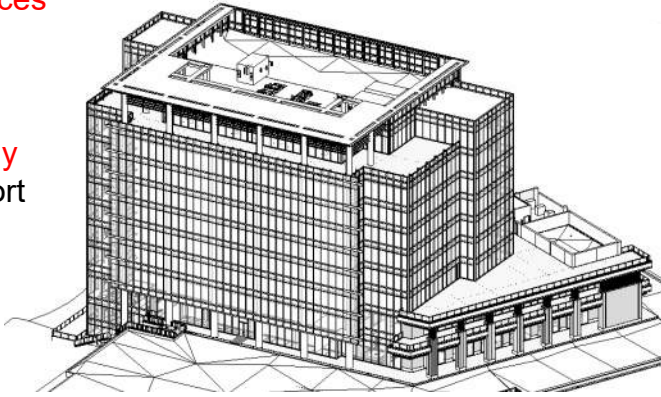
One Braves Plaza

Complex interfaces

Office tower
Shotcrete wall

Reflectivity Study

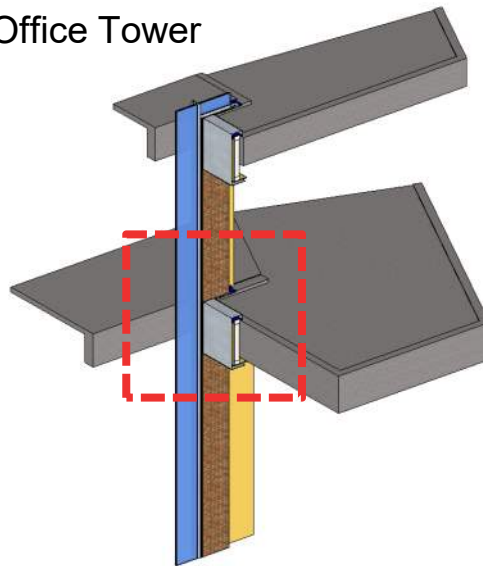
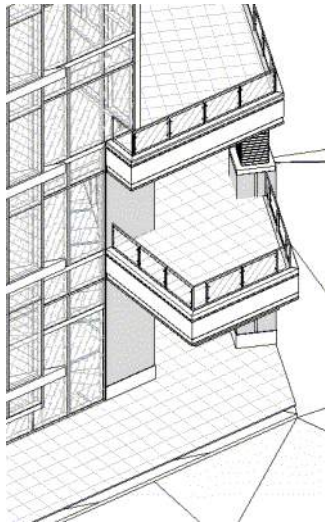
Occupant comfort



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CASE STUDIES – ONE BRAVES PLAZA

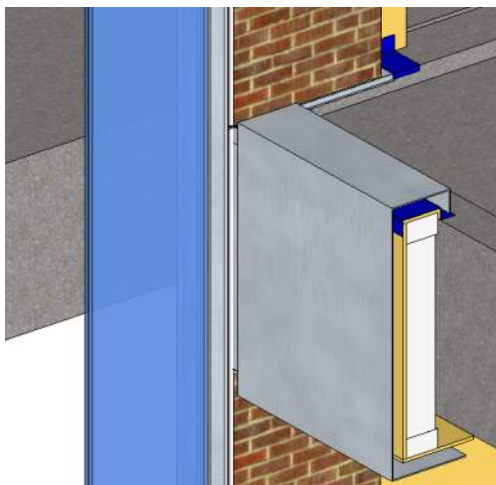
Complex Interfaces – Office Tower



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CASE STUDIES – ONE BRAVES PLAZA

Complex Interfaces – Office Tower

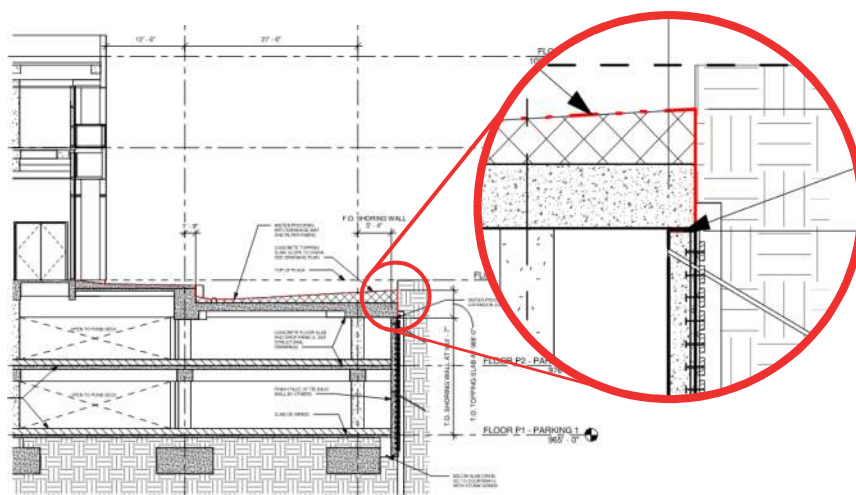


Virtual Mockup

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CASE STUDIES – ONE BRAVES PLAZA

Complex Interfaces – CIP deck and shotcrete wall

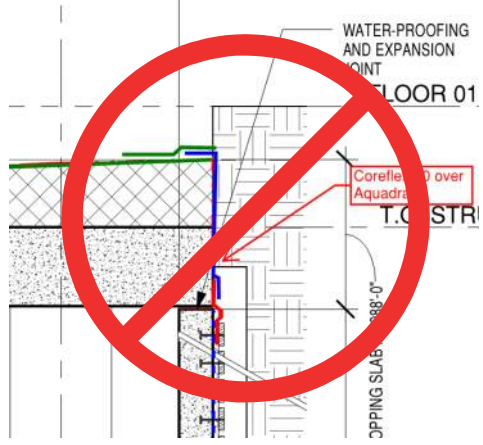


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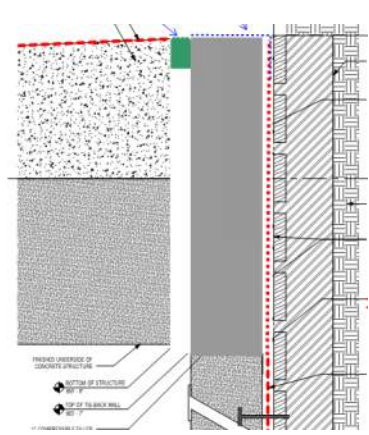
CASE STUDIES – ONE BRAVES PLAZA

Complex Interfaces – Shotcrete Wall

Vertical Expansion Joint



Redefine the Problem

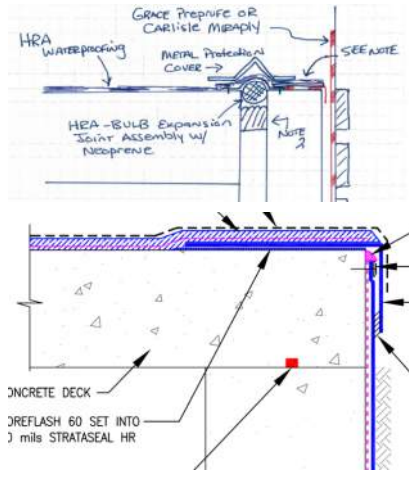


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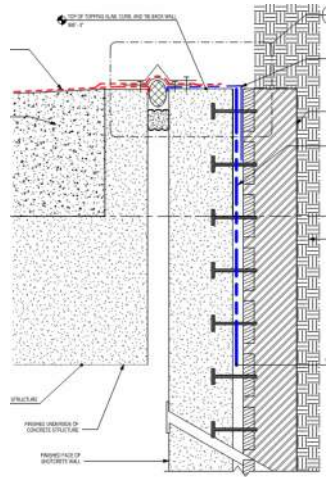
CASE STUDIES – ONE BRAVES PLAZA

Complex Interfaces – Shotcrete Wall

Collaboration



Solution



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CASE STUDIES – ONE BRAVES PLAZA

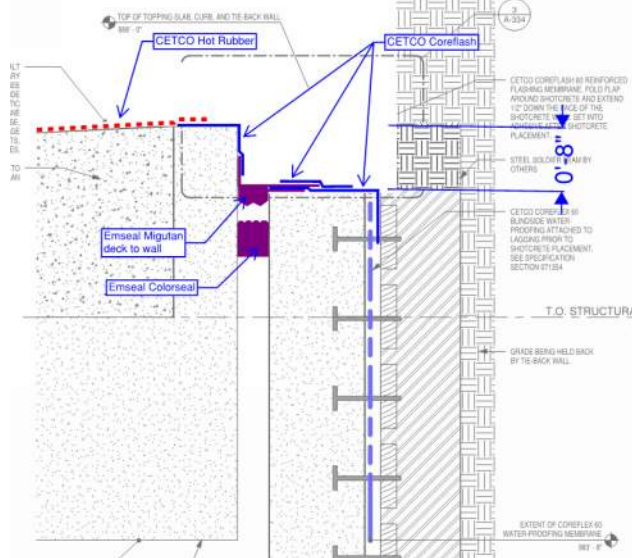
Complex Interfaces – Shotcrete Wall



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CASE STUDIES – ONE BRAVES PLAZA

Complex Interfaces – Shotcrete Wall



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CASE STUDIES – ONE BRAVES PLAZA

Reflectivity Study

Walter P Moore - Diagnostics
Solar Reflectivity Analysis

Site Location,
ATLANTA, GA, USA,
33.65, !Latitude
-84.43, !Longitude
-5.0, !Time Zone
315.0, !Elevation



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CASE STUDIES

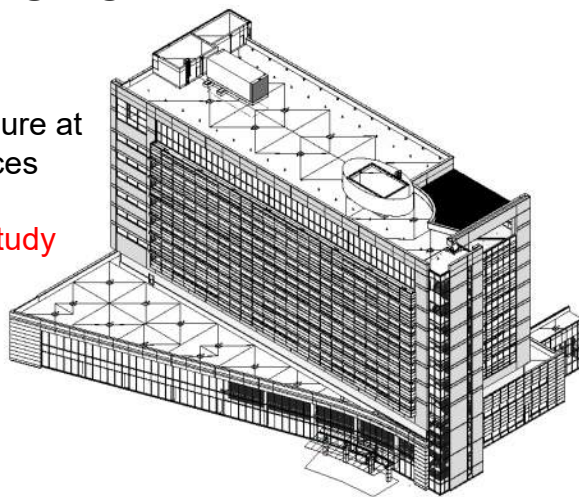
Jersey Shore UMC

Detailing

Continuity of enclosure at
complex 3D interfaces

Thermal Bridging Study

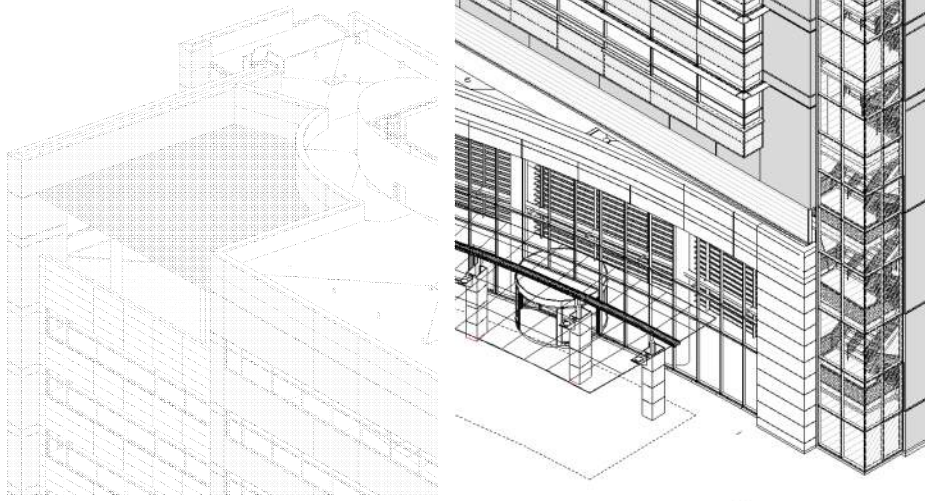
Occupant comfort



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CASE STUDIES – JERSEY SHORE UMC

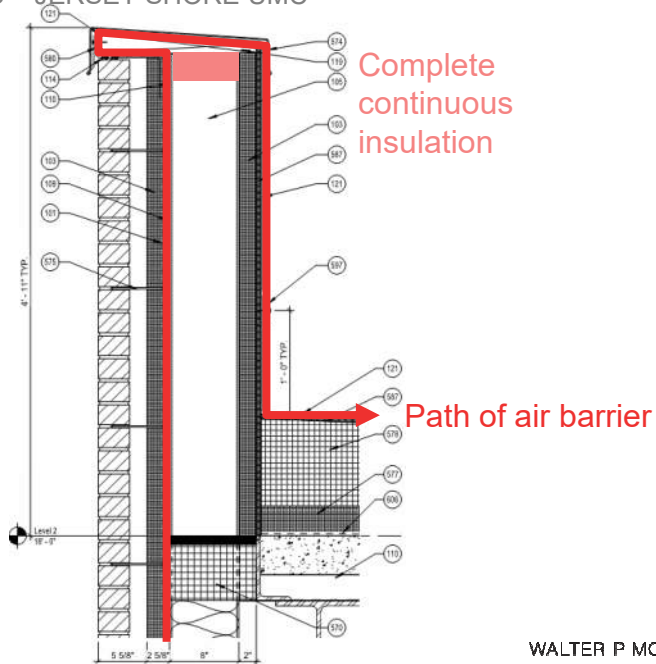
Challenges



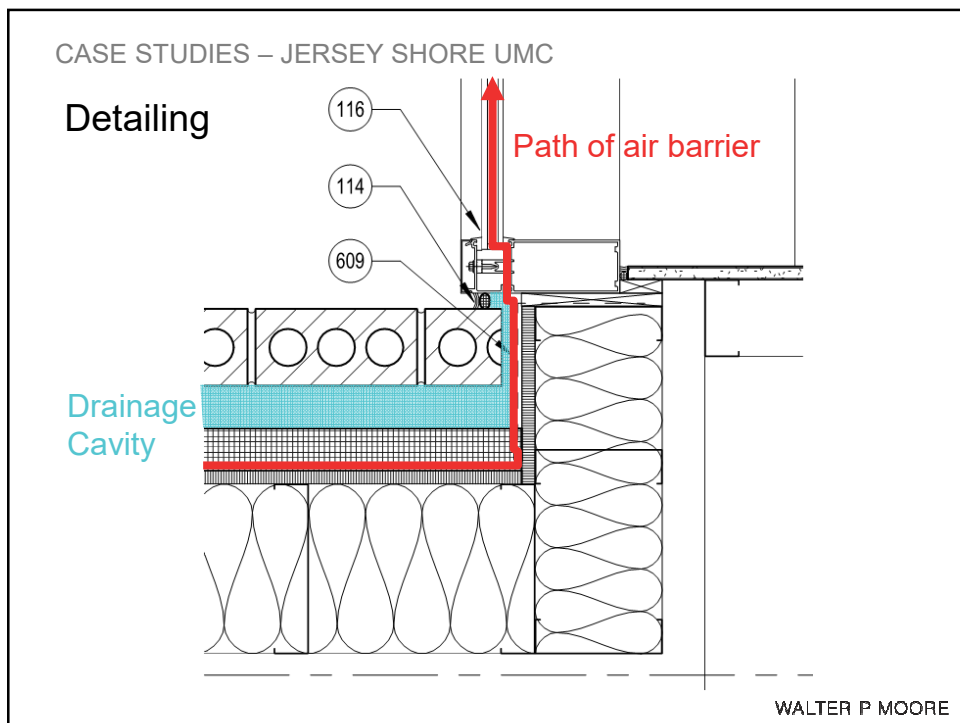
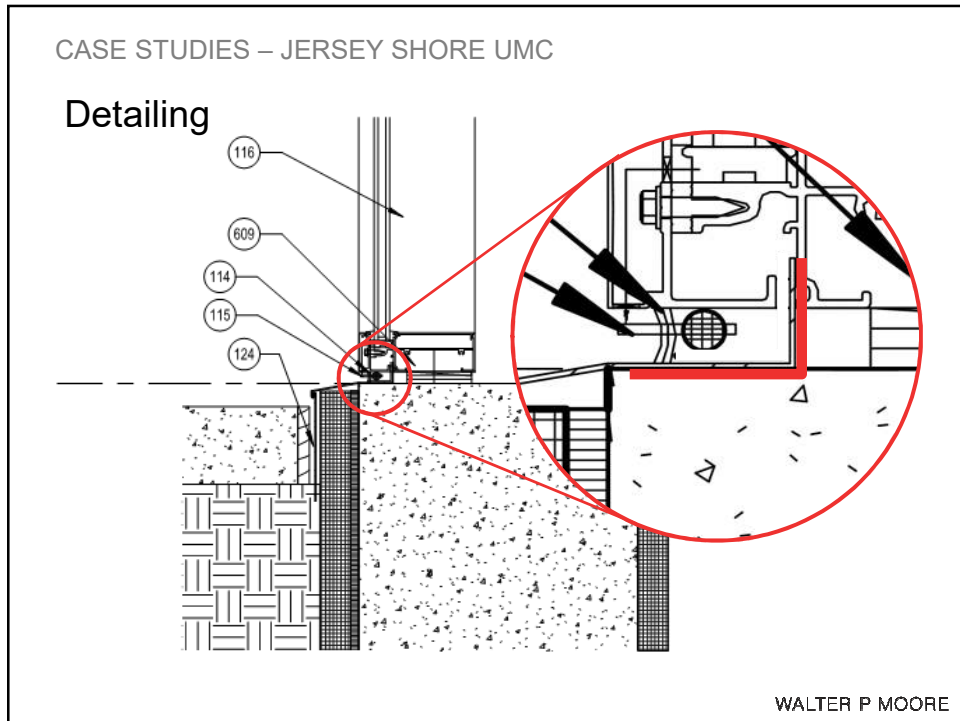
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CASE STUDIES – JERSEY SHORE UMC

Detailing



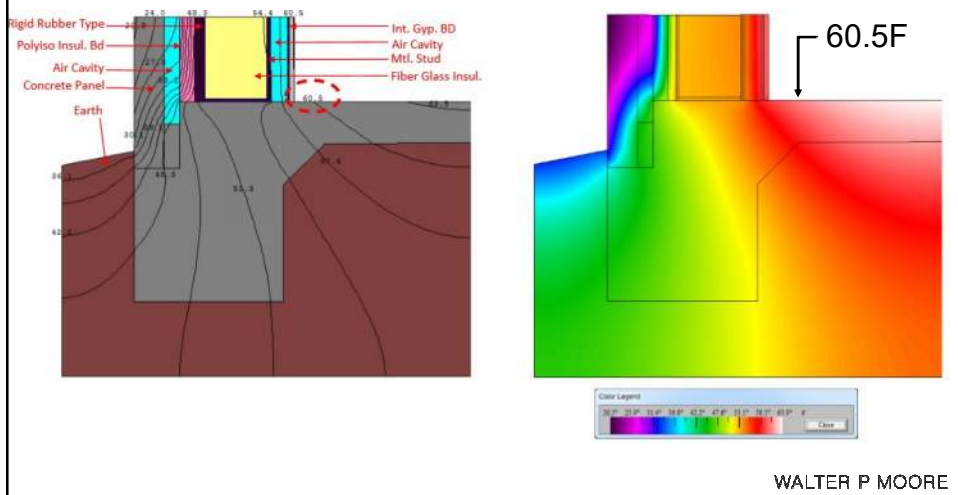
WALTER P MOORE



CASE STUDIES – JERSEY SHORE UMC

Thermal Bridging Study

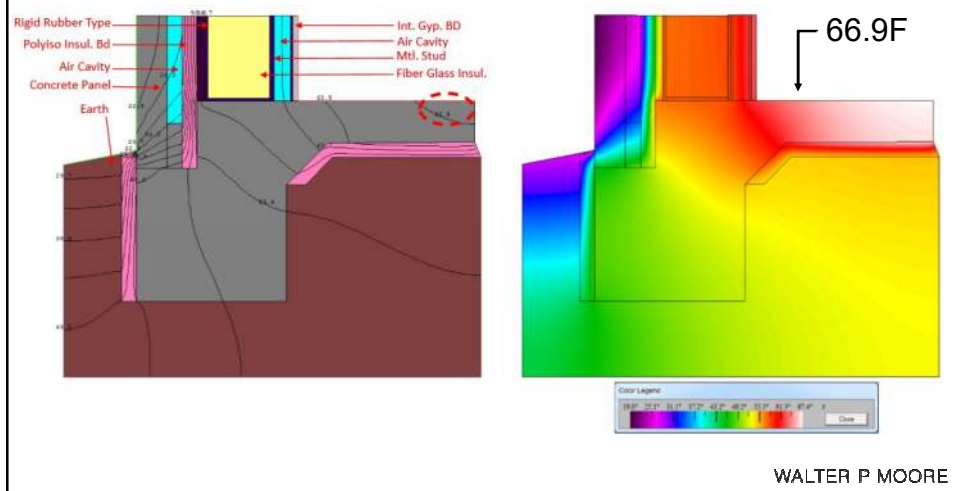
Original Detail



CASE STUDIES – JERSEY SHORE UMC

Thermal Bridging Study

Modified Foundation & Insulation



QUALITY ASSURANCE TESTING

Water Testing



AAMA 501.2
Nozzle Test



ASTM E1105
Spray Rack Test

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Summary

SUMMARY

MIND THE GAP

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SUMMARY

Indoor Environmental Quality Credit:
Enhanced Indoor Air Quality Strategies

“Increase breathing zone outdoor air ventilation rates to all occupied spaces by at least 30% above the minimum rates as determined in EQ Prerequisite Minimum Indoor Air Quality Performance.

= a recipe for disaster in humid climate



The road to hell is paved with good intentions

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