# Why Air Barrier Failures are Costing Your Clients Money

How you can help protect them from these losses



## **Speaker Information**



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President of Liberty Building Forensics Group, has over 25 years of experience in building forensics, with a focus on mold and moisture issues as well as HVAC and building envelope failures. Mr. DuBose is co-author of three manuals on IAQ and Mold Prevention, which have been used on over \$4B in construction.

## **4 Discussion Points**

- Resolving Opposing Arguments between Arch/MEP/ GC-Facade/Mech about Air Leakage
- 2. Advising Clients about Gaps in PCA relating to Air Barriers Problems
- 3. Emerging COVID driven Ventilation Air Leakage issues in Cold Climates
- 4. Offsite Construction (Modular) and Air Barrier Risks

## Case Study 1: Faculty Housing

Resolving Opposing Arguments between Arch/MEP/ GC-Facade/Mech about Air Leakage

- Architect/Facade Engin: "The Facade was a performance based spec it is not my fault it leaks"
- GC and Facade Subcontractor: "The Facade past all of the air leakage test requirements - this is a design problem".
- Mechanical Engineer: "Those amounts of air are so small they don't matter."
- Mechanical Contractor: "I tested and balanced the system to design tolerances, the pressure problems are not my problem."

#### Case Study 1 Faculty Housing New Campus Middle East

- \$1B USD new campus in Abu Dhabi
- First Year of Operation Air Infiltration Related Mold Problems
- Part of Multiple Party Claims and Counter Claims totalling \$375MM USD











Air Leakage Water Penetration Room Blower Door Testing HVAC Test & Balance Third Party Inspections





## **Energy Recovery Ventilation (Simplified)**





## Pen Test for Walls

- Common
- Identify each wall control layer
- Thermal, Vapor, Air, Water









## Pressure Map for Zones

- NOT common
- Identify each pressure zone
- OA, Rec Air, Exh Air











# What can we do about these issue?

- Peer reviewer should be used and recommended to owner
- Inserts an SME into the process
- Replaces poor D&C feedback system (usually litigation)
  Mirrors healthcare industry second opinion
- Important when issue crosses multiple D&C disciplines
  Breaks down the Silo approach that occurs in D&C process

## Case Study 2: Resort

Gaps in Property Condition Assessments (PCA) and Air Barrier Failures



- PCAs follow ASTM standard which limit the possibility of finding building air barrier issues.
- PCA is a review by checklist and does not use building performance knowledge to assess potential risks for the buyer.
- There is a way to predict if the building you are about to purchase has air barrier issues.
- PCA does not consider seasonal issues that typically reveal air barrier issues.































# What can we do about these issues?

- Apply building performance prediction process to identify if the building the client is about to purchase is at high risk of air barrier failures.
- Supplement the PCA process with consultants that can evaluate the building envelope and HVAC performance.
- Perform performance testing that identifies if there may issues in the opposite season.
- Especially true for senior living, student housing, resorts and hotels, and soldier dormitories.

#### **Case Study 3:**

## Midwestern Medical Facility

Impact of COVID driven increase in ventilation on buildings in cold climates

## **Case Study 3: Thawing a Frosty Relationship**



## **Midwestern Medical Facility**



#### • 50 Bed Facility

- Humidification added for comfort
- Ventilation Increases Causing Drying Conditions



# Frost & Condensation



# Moisture Damage





# Three Issues Come Together

- Improper design assumption on air barrier at boundary condition (envelope)
- Humidification improperly controlled
- HVAC induced positive pressurization (ventilation driven)





## **Repair Attempts Fail to Solve Problem**

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- HVAC Ductwork
- Outdoor Air
- 15-year Battery Life

## Wireless Dataloggers



# **Controlling RH Was Successful**



# What can we do about these issues?

- COVID guidelines are being made by healthcare professionals not building design and construction professionals
- This is not just a cold climate issue but it will also be a warm/hot climate issue this summer
- For newer facilities: Recommend relying on AOR/EOR
- For older facilities: Avoid the FM/PM making the changes, hire separate consultant

#### Case Study 4:

### **Offsite (Modular) Construction**



- Interface between base building and modular unit (box) manufacturer is critical
- D&C of modular box can be independent of base building air barrier performance requirements
- Often uses crawl spaces which further complicate air barrier performance
- Has inherently hidden spaces that make it difficult to control infiltration of outdoor air
- Inspection of modular box is performed at factory, inspection of building is done onsite, in isolation of each other



























# What can we do about these issues?

- Contractually resolve the problem of separation between base building D&C team and the modular box D&C team
- Assure whole building air leakage testing, not just the modular boxes
- Assure cross responsibility of both factory and site inspections and approvals
- Employ a peer review to bridge the technical gap between the factory D&C team and base building D&C team

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