



INNOVATION FOR  
**SUSTAINABILITY**

# How an Office Building was Built 4X Tighter than Code



# IECC 2021 Air Barrier Updates

- Continuous Air Barrier still required everywhere except Zone 2B
- Whole Building Air Leakage Testing Requirements Added!!
- ASTM E779, ANSI/RESNET/ICC 380, ASTM E3158 or ASTM E1827
- Group R and I
  - $\leq 0.3 \text{ CFM/ft}^2 @ 0.2" \text{ H}_2\text{O}$  ( $\leq 1.5 \text{ L/s}\cdot\text{m}^2 @ 50 \text{ Pa}$ )
- Non Group R and I
  - $\leq 0.4 \text{ CFM/ft}^2 @ 0.3" \text{ H}_2\text{O}$  ( $\leq 2.0 \text{ L/s}\cdot\text{m}^2 @ 75 \text{ Pa}$ )
- Exemption provided for Zones 2B, 3C and 5C

# Project Background

- Silver Ventures
- Broadway Office Development
- Constructed in 2018-2021
- San Antonio, TX
- 254,000 SQ FT
- Eight story office building + 6 story mixed-use retail
- Joeris General Contractors
- Kirksey Architects



Broadway Office Development in San Antonio, TX

# Owner's Needs

- Owner & Tenant (Credit Human) drove need.
- Sustainable Building – LEED Platinum
- Voiced this need early, often and adamantly
- Return on investment <14yrs
- Building envelope: 2X more thermally efficient & 4X tighter than code.
- Open and flexible space for the tenant



# Learning Objectives



#1 Understand how the project air barrier was planned.



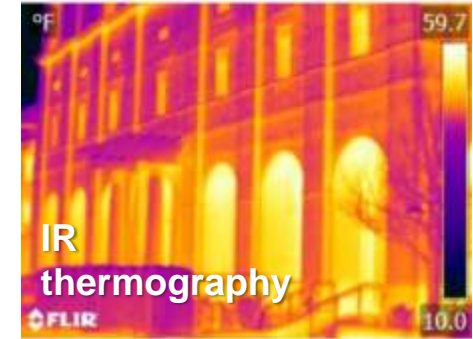
#2 Explain how the air barrier installation was executed.



#3 Understand how the air barrier performance was measured.

# Specifying the Airtight Envelope

- Sec 07 05 23 “Pressure Testing an Air Barrier System for Air Tightness”
- Test method: ASTM E779
- Performance Requirement:  $\leq 0.1$  CFM @ 0.3”wg
- Testing agent qualifications
- What, when and how to test
- IR thermography
- Diagnostics protocol for failed test



# Sec 07 05 23 Whole Building Spec “WBS”

- Section added into specs later
- Related Sections not updated to support WBS
- Affected subcontractors “subs” tasked to meet WBS
  - Extra material and labor
  - Means and methods
- Subs allowed to adjust pricing to meet WBS

# Single-Source WBS

- ***One sub (waterproofer), offered to provide WBS***
- ***Proposed a single-source system:***
  - Foundation waterproofing
  - Wall membrane air barrier
  - Deck waterproofing
  - Joint sealants (incl. seals to fenestration)
- ***Manufacturer partner agreed to provide one site visit per week & report.***



Deck



Below grade

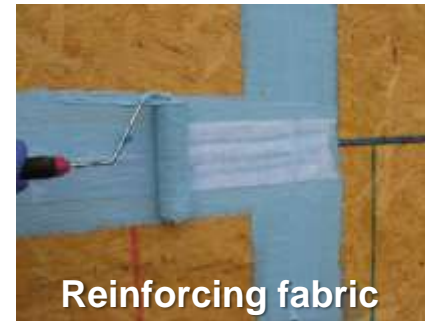


Walls



# Air Barrier Spec for Exterior Walls

- Section 07 27 26 “AVB”
- Fluid-applied, permeable system
- Waterborne acrylic, 40 mils dry
- 6 products in the spec
- Waterproofer made the product selection



# Cold Fluid-Applied Waterproofing Specs

- Waterproofer selected system by same manufacturer as AVB
- Moisture-cure, 1-part STPE
- 120-mil reinforced
- Section 07 14 16 Deck Waterproofing
- Sec 07 76 00 Pedestal Pavers
- Section 07 17 00 Foundation Waterproofing



# Related Specs

- Thermal insulation
    - 4" mineral wool with clip & rail system
  - Joint sealants
    - Exterior joints
    - Seals to fenestration
  - Masonry
    - CMU substrate
    - Brick ties
    - Through-wall flashings
  - Exterior gypsum
    - Substrate
  - Mod bit roofing
    - Tie-in to wall air barrier and waterproofing
  - Flashings
    - Perimeter of roof system
    - Tie-ins
- Direction to maintain air barrier continuity not included in these Sections. Left to installers.***

# Verify Compatibility

- Membranes
- Sealants
- Substrates

<p>GROUP BT-1</p> <p>SEALANTS FOR USE UNDER BARRITECH VP ONLY</p> <p>CCW-LM-800XL DAF ALEX PLUS TITEBOND PAINTERS PLUS</p> <p>PECORA AC-20/AC-20 PLUS OTHERS AS APPROVED BY CARLISLE</p>	
<p>GROUP BT-2</p> <p>SEALANTS FOR USE OVER OR UNDER BARRITECH VP</p> <p>BARRIBOND BARRIBOND XL CCW-201 CARLISLE UNIVERSAL SINGLE PLY SEALANT DYNATROL I OR II SIKAFLEX-1A OR 2C NS</p> <p>CCW-GREENBOND CARLISLE SURE-SEAL LAP SEALANT NOVALINK BY CHEMUNK MASTERSEAL NP1 OR NP2 OTHERS AS APPROVED BY CARLISLE</p>	
<p>GROUP BT-3</p> <p>SILICONE SEALANTS FOR USE OVER BARRITECH VP ONLY</p> <p>DOW CORNING 790, 791, 795, 756, 758 GE SILPRUF, SILPRUF LM</p> <p>PECORA 890, 895 OTHERS AS APPROVED BY CARLISLE</p>	
<p>GROUP BT-A</p> <p>MASTIC TYPE INSULATION ADHESIVES - APPROVED FOR BONDING FOAM BOARD TO CURED BARRITECH VP</p> <p>BARRIBOND BARRIBOND XL P-L 300 FOAMBOARD ADHESIVE BY LOCTITE</p> <p>SONNOBORN PREMIUM ADHESIVE BY BASF CCW-GREENBOND OTHERS AS APPROVED BY CARLISLE</p>	
<p>NOTES:</p> <p>ALLOW SOLVENT-BASED SEALANTS TO CURE BEFORE COVERING WITH BARRITECH VP</p> <p>FOLLOW APPLICATION INSTRUCTIONS BY SEALANT MANUFACTURER</p> <p>DO NOT INSTALL 1 PART SEALANTS INTO JOINTS EXCEEDING 3/8 INCH DEPTH</p>	
BVP-0A	<p>BARRITECH VP APPROVED SEALANTS</p> <p><b>CARLISLE</b> A WATKINS COMPANY © 2016 CARLISLE CORPORATION</p>

# Learning Objectives



#1 Understand how the project air barrier was planned.



#2 Explain how the air barrier installation was executed.



#3 Understand how the air barrier performance was measured.

# Coordination of Work

## Establish Sequence

- Jobsite mockup specified in Div 01
- Substrate construction and quality
- Air barrier materials and installation
- Tie-ins and terminations
- Overburden



# Prep Work and Detailing

- Board joints
- Rough openings
- Irregularities
- Dissimilar substrates



# Coating Surfaces with Liquid Membrane

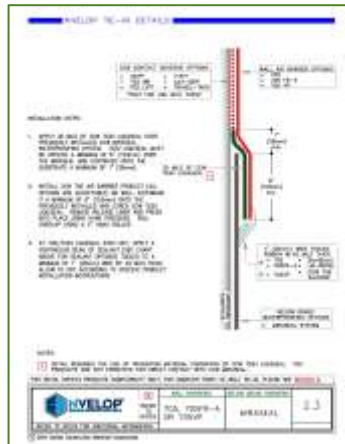
- Roller application
- Spray application
- 60 mils wet, 40 dry
- Mil thickness measurements
- Drying time





# Tie-ins at Roof

- To mod bit system
- To cold fluid waterproofing



# Terminations and Penetrations

- Plaza deck railing
- Beams and columns
- Mechanical/electrical



# Terminations and Penetrations

- Underside of roof deck
- Termination at grade
- Cladding hardware



# Exterior Claddings

- Attachment hardware
- Exterior insulation
- Drainage and flashings



# Fenestration

- Seal on exterior side, ideally before cladding
- Compatible silicone, suitable for window perimeter seal
- Developed a tool to seal where cladding was installed first
- Still very difficult to seal, blind application.



# Learning Objectives



#1 Understand how the project air barrier was planned.



#2 Explain how the air barrier installation was executed.



#3 Understand how the air barrier performance was measured.



# Testing of Window/Wall Interface

- Water Leakage
  - ASTM E1105
  - No leaks after 15 min at 12 PSF
  - Planned testing of 96/458 windows
- Additional 144 windows tested due to failures
- Additional caulking required
- Considerable expense: 240/458 windows tested!



# ASTM E1186 “Bubble Gun”

- Div 07 Air Barrier Spec
- Approx. 40,000 tests (every brick tie)
- “Zero bubbling” requirement
- Lot of additional caulking
- Test and reporting performed by GC





# Manufacturer's Site Visits

- Performed weekly (every Wednesday)
- Walked the job with installer and GC
- Noted installation progress
- Noted deficiencies needing correction
- Required BEFORE overburden – NO EXCEPTIONS!!



# Whole Building Testing (ASTM E779)

- Performed by TSI Energy Solutions\*
- Requirement:  $\leq 0.1$  CFM/ft<sup>2</sup> @ 0.3 WG [75 Pa]
- Floors 1-4 & park deck isolated from the test
- Floors 5-12 tested as a single unit
- Single-fan blower door on the 12<sup>th</sup> floor
- Triple-fan blower door on the 4<sup>th</sup> floor at park deck

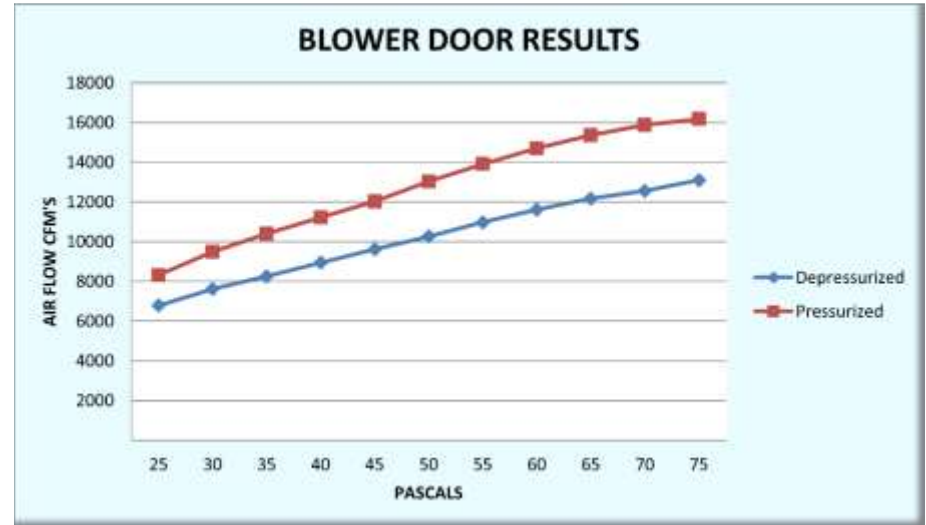
\*A qualified 3<sup>rd</sup> party test agency



# Testing and Inspection

## Whole building testing (ASTM E779)

- Test area determined to be 170,504 ft<sup>2</sup>
- 0.1 CFM/ft<sup>2</sup> allows max 17,050 CFM
- Average air leakage rate was 15,040 CFM (0.088 CFM/ft<sup>2</sup>)
- PASS!



# Conclusion

***Single source responsibility + vigorous inspection and testing*** were instrumental in achieving the air tightness objective





The American  
Institute  
of Architects

Collaboration Partner

This concludes the American Institute of Architects  
Continuing Education Systems Course

**Thank you for participating!**  
**Questions?**

