



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
 - ≤ 0.3 CFM/ft² @0.2" H₂O (≤ 1.5 L/s*m² @ 50 Pa)
- Non Group R and I
 - ≤ 0.4 CFM/ft² @0.3" H₂O (≤ 2.0 L/s*m² @ 75 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.



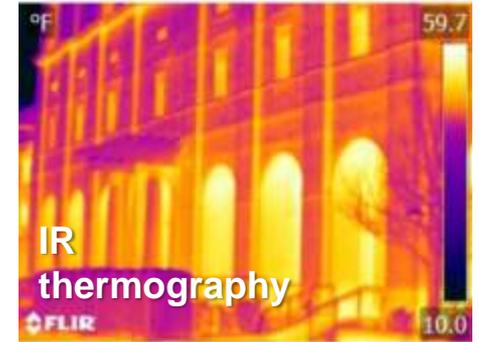
#2 Explain how the air barrier installation was executed.



#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: ≤ 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 SEALANTS FOR USE UNDER BARRITECH VP ONLY</p> <p>CCW-LM-80GXL DAF ALEX PLUS TITEBOND PAINTERS PLUS</p> <p>PECORA AC-20/AC-20 PLUS OTHERS AS APPROVED BY CARLISLE</p>		
<p>GROUP BT-2 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>NOTES: ALLOW SOLVENT-BASED SEALANTS TO CURE BEFORE COVERING WITH BARRITECH VP FOLLOW APPLICATION INSTRUCTIONS BY SEALANT MANUFACTURER DO NOT INSTALL 1 PART SEALANTS INTO JOINTS EXCEEDING 3/8 INCH DEPTH</p>
<p>GROUP BT-3 SILICONE SEALANTS FOR USE OVER BARRITECH VP ONLY</p> <p>DOW CORNING 790, 791, 795, 796, 758 GE SILPRUF, SILPRUF LM</p> <p>PECORA 890, 895 OTHERS AS APPROVED BY CARLISLE</p>		
<p>GROUP BT-A 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>		
BVP-0A	BARRITECH VP APPROVED SEALANTS	 <p><small>© 2016 CARLISLE CORPORATION</small></p>

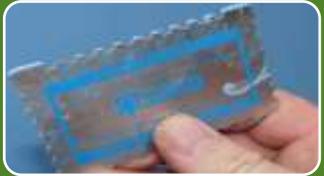
Learning Objectives



#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



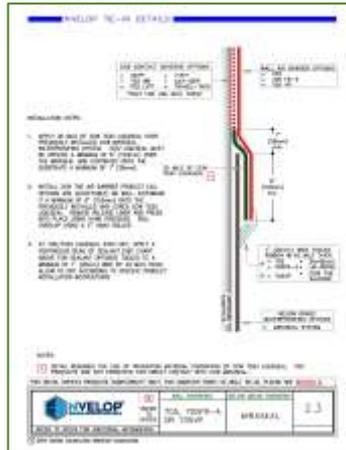
Coating Surfaces with Liquid Membrane

- 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



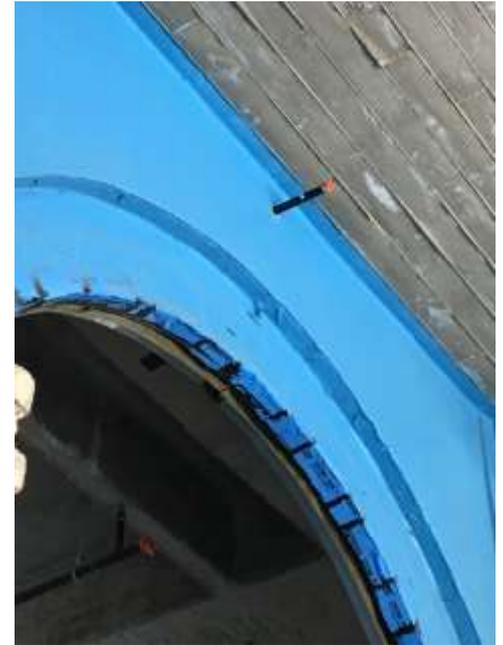
Terminations and Penetrations

- 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.



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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: ≤ 0.1 CFM/ft² @ 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 12th floor
- Triple-fan blower door on the 4th floor at park deck

*A qualified 3rd party test agency



Testing and Inspection

Whole building testing (ASTM E779)

- Test area determined to be 170,504 ft²
- 0.1 CFM/ft² allows max 17,050 CFM
- Average air leakage rate was 15,040 CFM (0.088 CFM/ft²)
- PASS!



Conclusion

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





The American
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Collaboration Partner

This concludes the American Institute of Architects
Continuing Education Systems Course

Thank you for participating!
Questions?

