National Environmental Balancing Bureau

Building Envelope Pressure Testing
“The State of the Union”
A Testing Agencies Perspective

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NEBB BET Committee Member
ASNT Level II Thermographer
BS Mechanical Engineering
United States 2005 Energy Policy Act

The 2005 Energy Policy Act requires that Federal facilities be built to achieve at least 30% energy savings over the 2004 ASHARE Standard 90.1-2004
United States Army Corp of Engineers

On October 30, 2009 the United States Army Corp of Engineers (USACE) issued a directive in ECB 2009-29 which required that all new building and those undergoing major renovations shall have an air leakage rate that does not exceed set values when tested in accordance with the US Army Corps of Engineers Air Leakage Test Protocol for Building Envelopes.
United States Army Corp of Engineers

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ASTM E779 Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
Building Envelope Pressure Testing

Codes and Standards

ASHRAE 90.1
ASHRAE 189.1 2011 Appendix B
ASTM (E779 & E1827)
United States Corp of Engineers (USACE)
National Environmental Balancing Bureau (NEBB)
Air Barrier Association of America (ABAA)
Building Envelope Pressure Testing

State Energy Codes

Florida
Maryland
Massachusetts
Minnesota
New York
Rhode Island
Washington & Seattle
(Utah)
Means & Methods

ASTM E779
10 points – one reading per point

ASTM E1827 Two-Point-Method
2 points – five readings per point

ASTM E1827 Repeated Single-Point-Method
1 point – repeated
Means & Methods

**HVAC System Testing**
- Limited by system capacity
- Limited by system layout
- Limited when the test may be performed
- May not be able to test in both directions

**Blower Door Testing**
- Flexibility in Testing
- Test Prior to HVAC Start-up
- Shorter Testing Time
Means & Methods

Equipment
Multiple fans, properly located, properly controlled
(Not seeing single mega fan testing)

New Technologies
Reduced Caballing – single control cable to software
Wi-fi (still experimenting, but successful)
Means & Methods

Testing Method *Consensus*

Perform the building pressurization/depressurization test under the most stable and consistent environment possible.

Perform the test with limited interruptions to ensure the test is being conducted as quickly as possible.
Mockup & Preliminary Whole Building Testing

The Goal of Mockup & Preliminary Whole Building Testing:

- To assist the Design/Construction team in verifying the means and methods of the air barrier installation.
- Enable corrections early.
Mockup & Preliminary Whole Building Testing

The Advantage of Preliminary Whole Building Testing:

- Identify the actual leak locations and correct the actual air barrier failures.
- Provide a rough estimate of the whole building leak performance.
Preliminary Whole Building Testing with Thermal Imaging

Preliminary Testing affords the General Contractor the ability to correct air barrier failures before it’s too late.
Preliminary Whole Building Testing with Thermal Imaging

Building under a negative pressure
Two exterior walls
Two different transition air barrier performance
Education

BET Contractors need to Lead the Industry

Educating Techs
Inspectors
Architects / Consultants
General Contractor / Subcontractors
Building Envelope Testing

**Code Requirement Comparison**

<table>
<thead>
<tr>
<th>Requirement</th>
<th>cfm/ft² @ 75 Pa</th>
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</thead>
<tbody>
<tr>
<td>Washington State / Seattle</td>
<td>0.40</td>
</tr>
<tr>
<td>LEED</td>
<td>0.30</td>
</tr>
<tr>
<td>ASHRAE 90.1 Average</td>
<td>0.30</td>
</tr>
<tr>
<td>US Army</td>
<td>0.25</td>
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<tr>
<td>ASHRAE 90.1 Tight</td>
<td>0.10</td>
</tr>
</tbody>
</table>

**Sample Project**

Highest pressure obtained during a negative pressure test: 39 Pa (fails to meet minimum of 50 Pa)

Actual Leakage @ 75 Pa was 0.57 cfm/ft²

Flow exponent n = 0.685

*Don’t take this lightly*
Air Barrier Plan & Sectional
Air Barrier Plan & Sectional
TYPES OF AIR LEAKS

- **Orifice**: Direct Open Path
- **Diffuse**: Permeates directly through the material
- **Channel**: Migrates following the path of least resistance
THANK YOU FOR YOUR TIME

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