air barrier
abaa
association of
america

# Efforts for providing quality control regarding airtightness

Air Barrier Association of America (ABAA) is a Registered Provider with the American Institute of Architects Continuing Education Systems. Credit earned on completion of this program will be reported to CES Records for AIA members. Certificates of Completion for non-AIA members are available on request.

This program is registered with the AIA/CES for continuing professional education. As such, it does not include content that may be deemed or construed to be an approval or endorsement by the AIA of any material of construction or any method or manner of handling, using, distributing, or dealing in any material or product. Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

CONTINUING EDUCATION AIA

# Copyright Materials



air barrier
abaa
association of america

## Air Barrier Association of America

## PRESENTATION CODE OF ETHICS-

***The Representative, when speaking about Air Barrier technology and using language, information, presentations, logos, or any other communication means that could be reasonably likely to cause the recipient(s) of such information to believe that the communication represents an official ABAA technical viewpoint, shall:***

- Hold themselves out to the public with professionalism and sound ethics by conducting themselves in a way which reflects positively on ABAA and the ABAA members
- Clearly state their affiliation
- Identify their relationship with ABAA
- Declare that they are presenting an official (unmodified) presentation prepared by ABAA
- Indicate whether the presentation is at the official request of ABAA
- This is an AIA Accredited Presentation
- This presentation will not highlight focus or reference to a specific product of manufacturer

## What is Quality ?

- Need to define it first !
  - "**That which the consumer specifies**" – Edward Demming
  - "**Product features that meet customer needs", "freedom from deficiency**" – Joseph Juran
  - **Conformance to requirements** - Phillip Crosby

## What is Quality ?

- It is a methodology of prevention rather than a cure for failures
- Is made up of typically five key ingredients

## What is Quality ?

- 5 key Ingredients:
  - Define quality
  - Define standards and specifications
  - Establishment process for corrective action
  - Train for competency
  - Commit to continuous improvement

## What is Quality ?

- Quality is not:
  - Waiting until there is a defect

# Quality Assurance

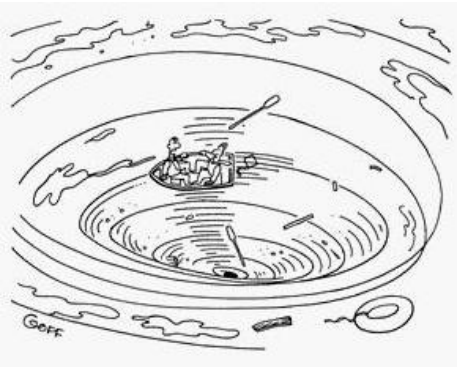
## QUALITY IS NOT... *an "add on" item*


"Now slap a little quality on, and we'll ship this sucker out."

**Quality must be built in not bolted on.**

## What is Quality ?

- Quality is not:
  - A last minute effort to save a program or project




"Deploy the Quality Control!"

## What is Quality Assurance?

- Definition of Quality Assurance
  - The **planned** and **systematic** activities implemented in a quality system so that quality requirements for a product or service will be full filled.

## Quality Assurance

Three categories of Errors – Intent?

1. **Knowledge-based errors (didn't know)**
2. **Skill-based errors (slipped-up)**
3. **Requirement-based errors (applying or misapplying)**

## What is Quality Assurance?

- What is a Quality Assurance System
  - Provides **documented process** by which quality commitments are met
  - It is s**ystematic** and **reproducible**
  - Provides a mean for **continuous improvement**

## What is Quality Assurance?

- Objective of Quality Assurance
  - Provide a means where a consumer is provided a **product and service** which **performs as intended** without undue aggravation
    - Hassle free
    - Owner gets what they paid for
    - Minimal conflicts
    - Consumer protection

## What is Quality Assurance?

- Quality Assurance in Buildings
  - Based on ISO 9001 Quality management systems – requirements
    - Say what you are going to do
    - Do what you say
    - Prove it

## What is Quality Assurance?

- System Thinking
  - Think of a cup of coffee at Starbucks

## Quality Assurance vs. Quality Control

*"Inspection with the aim of finding the bad ones and throwing them out is too late, ineffective and costly"*

*"Quality comes not from inspection but the improvement of the process"*

*Dr. Edward Deming*

## Quality Assurance vs. Quality Control

- Quality assurance vs. Quality control
  - Quality control = inspection
  - Quality assurance = total quality approach to controlling errors and non-conformances and the prevention of quality problems through planned and systematic activities

## Quality Assurance vs. Quality Control

- Quality Assurance vs. Quality Control
  - Inspection: quality is “inspected in”
  - Quality assurance: the quality is “built in”

## Quality Assurance vs. Quality Control

The quality control process results in…..

- Constant Supervision
- Mass Inspections
- Continual Rework

We treat the symptoms…. not the cause !

## Quality Assurance vs. Quality Control

- Quality Assurance vs. Insurance
  - Insurance provides protection for **when things go wrong**
  - Quality assurance tries to **minimize things going wrong**
    - Risk management

## Benefits of Quality Assurance

- Why bother?
  - Satisfied customers
  - Provide consumer confidence
  - Give customer what they are paying for
  - Manage liability
  - Reduce warranty claims
  - Produce durable buildings
  - Level playing field for industry
  - Develop profitable industry ……..

## Benefits of Quality Assurance

- More sustainable building
- Reduced energy use
- Owner's expectations are met
- Reduced liability
- Increased occupant comfort
- Less costly

## Benefits of Quality Assurance

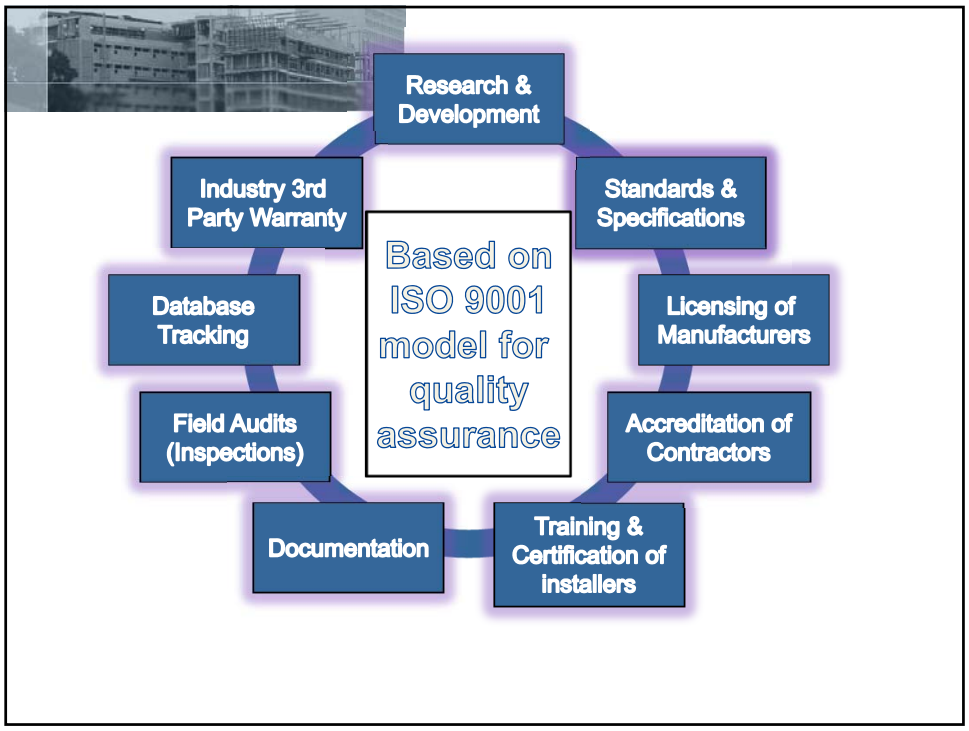
## ABAA Model for Quality Assurance

- Quality Assurance in Buildings
  - Better built buildings require:
    - Proper design
    - Proper selection of materials and equipment
    - Proper installation
    - Commissioning

## Quality Assurance

- Quality Assurance in Buildings
  - Professional quality assurance programs ties the
    - Designer
    - Manufacturer
    - Contractor
    - Installer
    - Auditor / Inspector
    - Owner

    together




## Details and Design Strategies

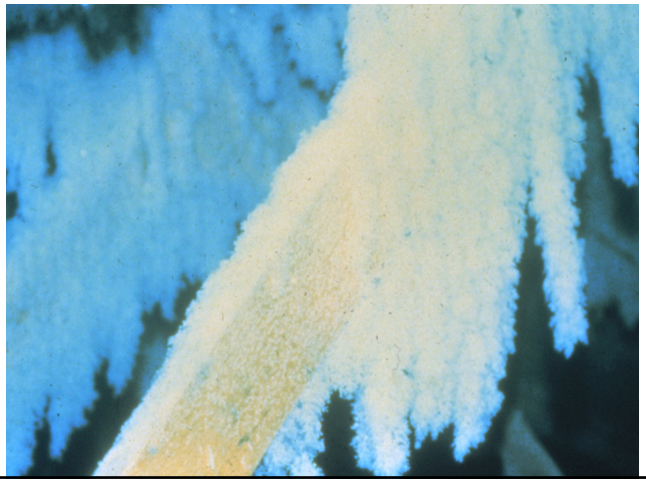
COMMON DESIGN AND INSTALLATION CONSIDERATIONS

## What happens when we do not control air leakage

## What happens when we do not control air leakage

## What happens when we do not control air leakage

What happens when we do not control air leakage



## ABAA Model for Quality Assurance

- All work is a process
- Process fails more than people
- All defects are caused
- All causes can be prevented
- It is better to prevent than correct defects

## ABAA Model of Quality Assurance

- Quality Assurance in Buildings
  - Professional quality assurance programs ties the
    - Designer
    - Manufacturer
    - Contractor
    - Installer
    - Auditor / Inspector

## ABAA Model for Quality Assurance

- Standards and Specification
  - Defining what is acceptable for items such as:
    - Substrate prep
    - Installation
    - Inspection

## ABAA Model for Quality Assurance

- Contractor Accreditation
  - Education
  - Minimum standards
  - Certified trades
  - Code of conduct
  - Corrective action
  - Internal quality control
  - Can be lost

## ABAA Model for Quality Assurance

- Training
  - Designers, Specifiers
  - General Contractors, Construction Managers
  - Air Carrier Contractors
  - Other trades
  - Auditors, Code Officials
  - On-going and continuous

## ABAA Model for Quality Assurance

- Certification of Installers, Auditors
  - Confirmation of knowledge, skills and abilities
  - Continuous improvement
  - Code of conduct
  - Self testing
  - Can be lost

## ABAA Model for Quality Assurance

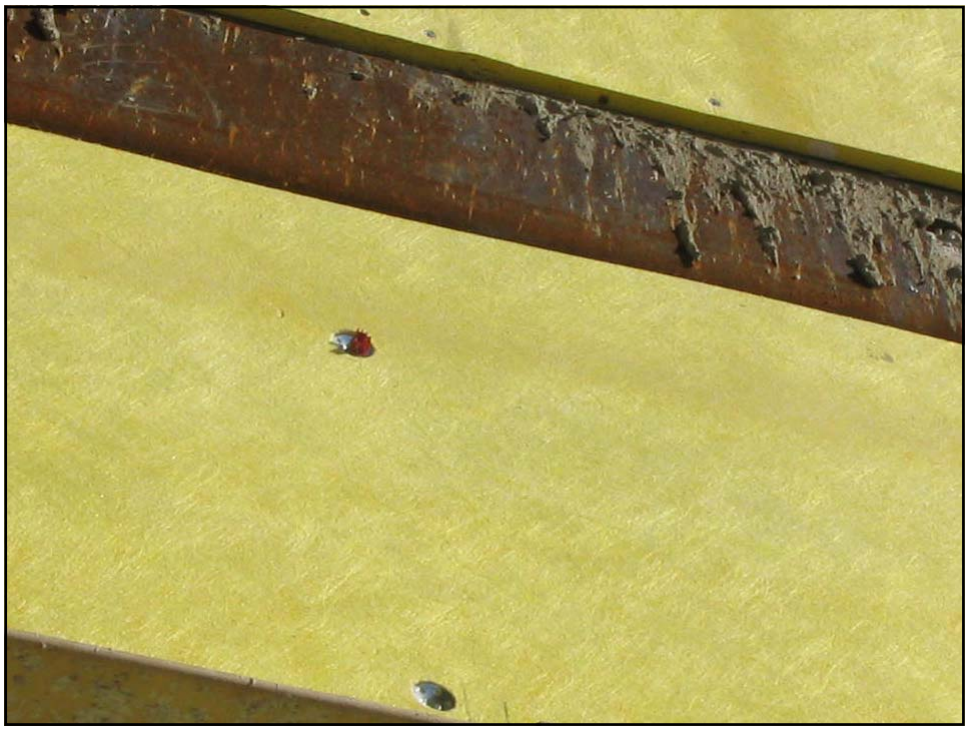
- Documentation
  - Daily job site reports
  - Audit reports
  - Corrective action documents
  - Processes

## ABAA Model for Quality Assurance

- Field Audits
  - Quality Control
  - Intent is to help
  - Identification of field issues which leads to modifying processes if required

## ABAA Model for Quality Assurance

- Information Management
  - Improving of key area's based on actual performance of system
  - Continuos improvement cycle
  - Identification of key metrics




DENSGLASS GOLD
Exterior Sheathing

## Adhesion Test Pad

## Adhesion Test Pad

## Adhesion Test Instrument

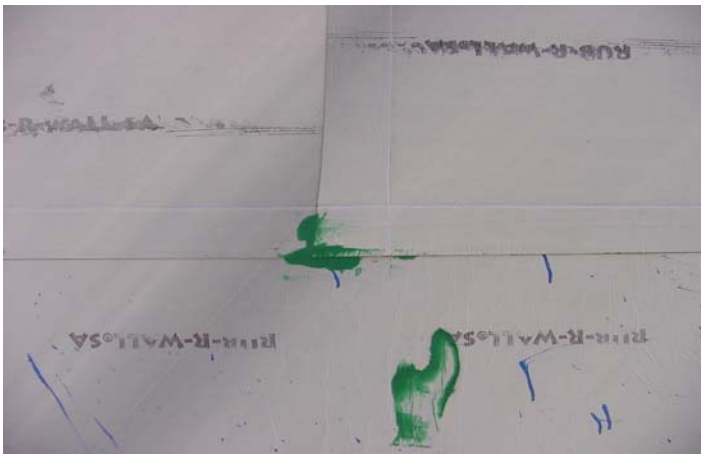
## Air Leakage Test

## AVB Continuity

## Wall Base Tie-In

## Roof – Ready for Tie-In

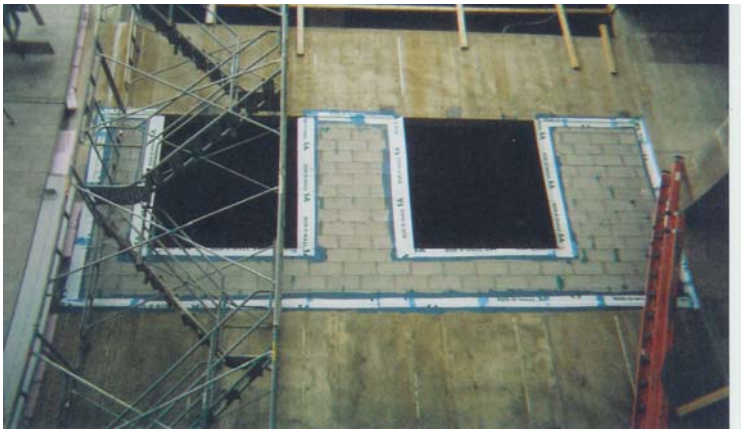
## Correction @ T-Joint



## Details


## Wall Prep

## Wall Prep

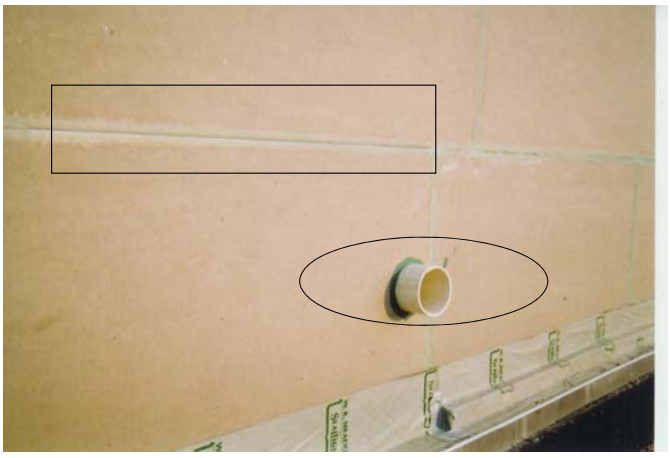


## Wall Prep

## Wall Prep

## Details

## Penetrations



## Penetrations

## Prep Work

## Prep Work

## Prep Work

## Prep Work

## Complicated Detailing

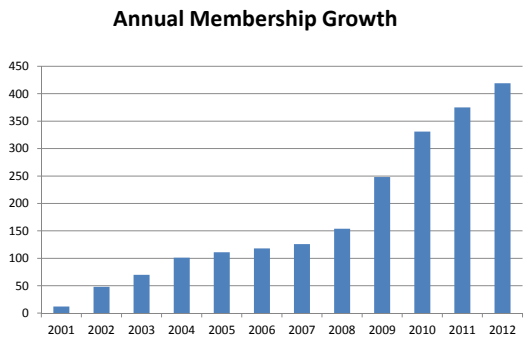
## Complicated Detailing


## Working Together

Air Barrier Industry Update

# ABAA ACTIVITY 2012 AND 2013

# ABAA Membership




2011: 375
2012: 419

## Education and Outreach Committee - 2012

- Continued design professional presentations and industry outreach

- Continued updating of existing AIA presentations
- Online education

## Education and Outreach Committee - 2012

- Tradeshows (Greenbuild, RCI BE Symposium, Army Corps of Engineers Conference, State Energy Codes)



- Social media
- Review potential manufacturer rep credentialing

## Whole Building Air Tightness Committee 2012

- Updated USACE Air Leakage protocol for Building
- Developing ASTM standard for w building air leakage testing
- Liaison with USACE, GSA

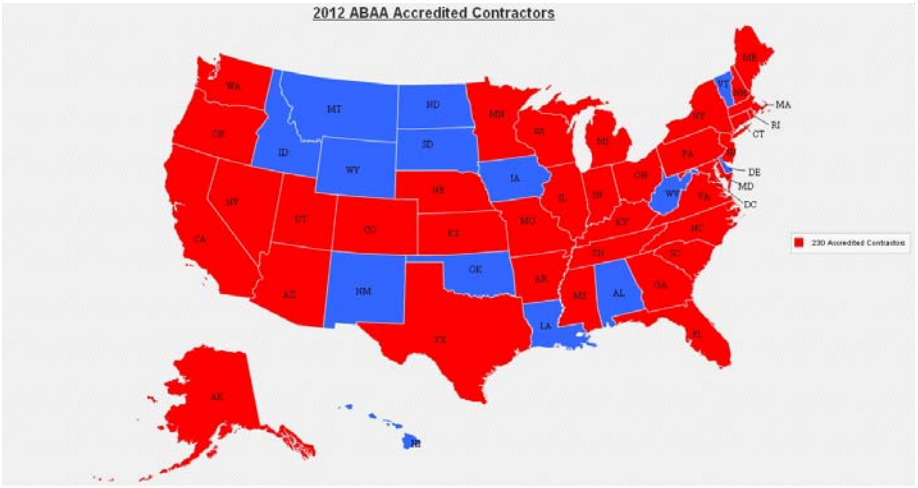

US Army Corps of Engineers
Engineer Research and Development Center

Air Barrier Industry Update

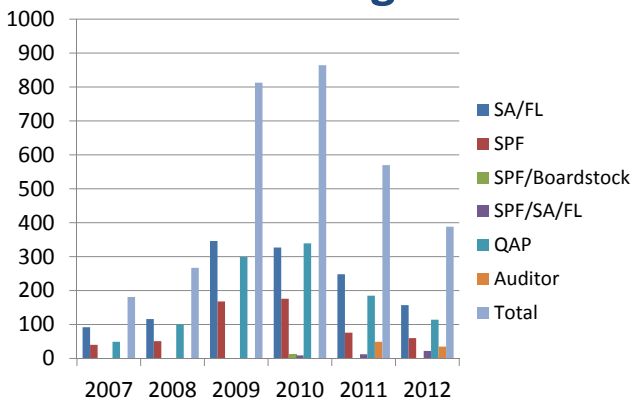
## QUALITY ASSURANCE PROGRAM OVERVIEW STATISTICS

# Statistics on QAP Participation – Air Barrier Contractors

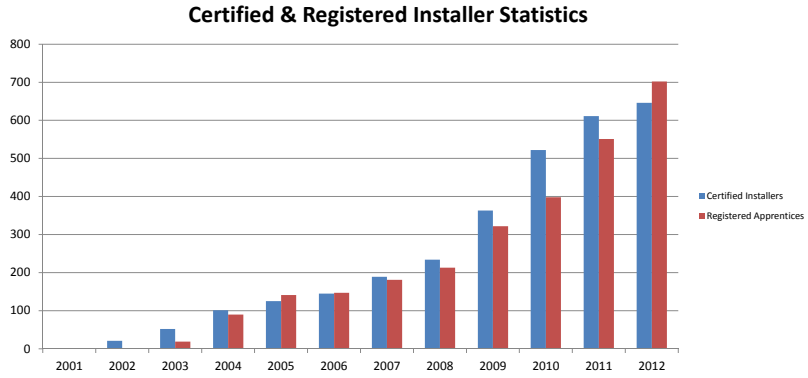
## 230 Accredited Contractors in 2012

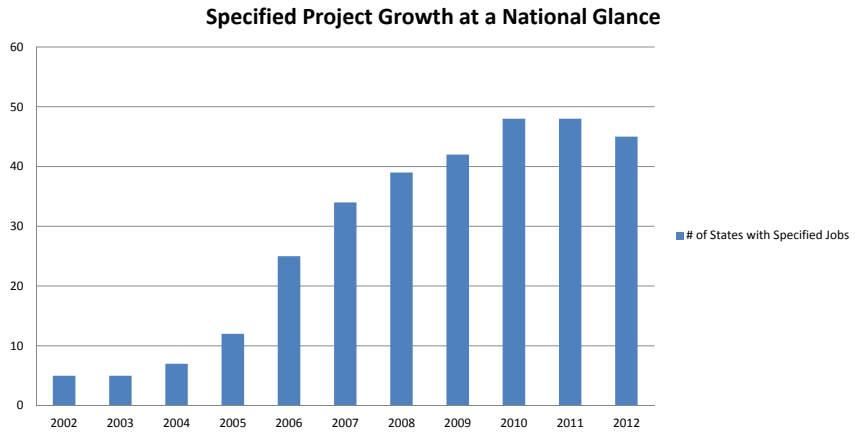
## Statistics on QAP Participation - Training



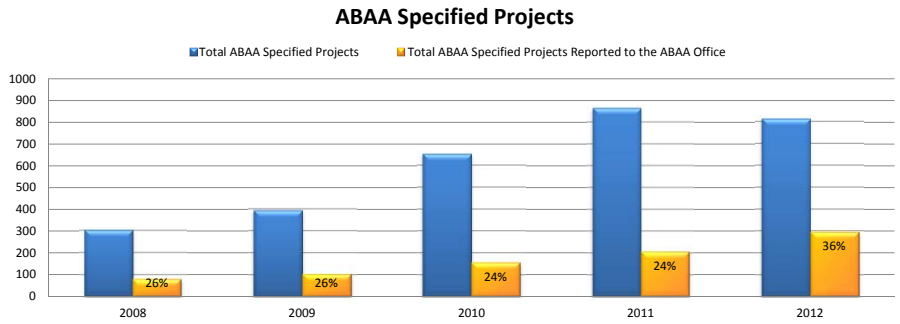

## Statistics on QAP Participation - Installers

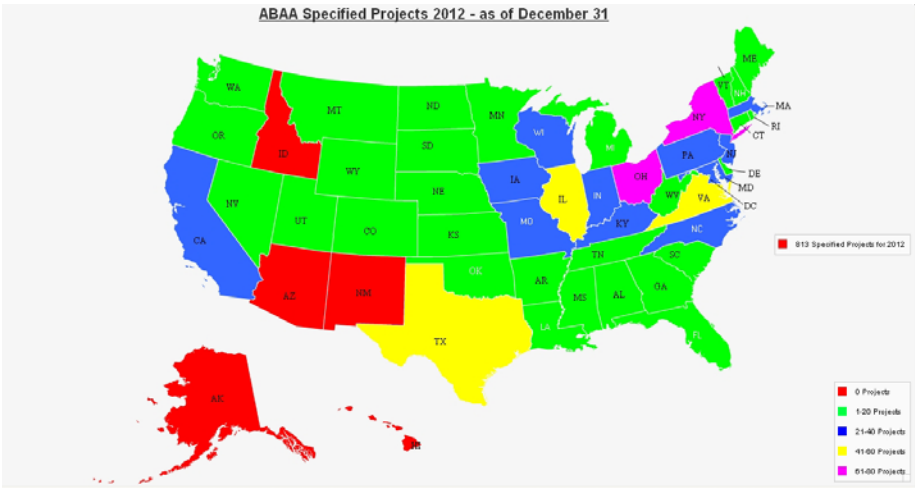


# Statistics on ABAA-Specified Projects



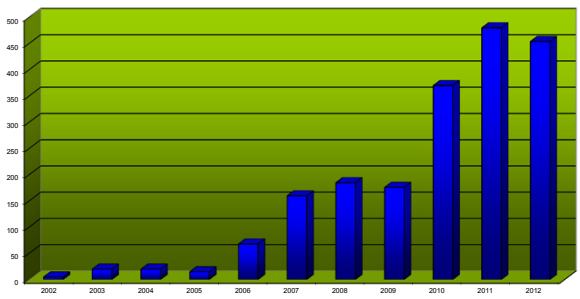

# Statistics on ABAA-Specified Projects






# Statistics on ABAA-Specified Projects

**Architect Firms Specifying Jobs**



Air Barrier Industry Update

# BUILDING CODES

## Code Requirements

- ASHRAE 90.1-2010
- ASHRAE 189.1-2011
- 2012 IECC (International Energy Conservation Code)
- 2012 IRC (International Residential Code)
- 2012 IgCC (International Green Construction Code)
- 2012 IBC (International Building Code)
- State code changes

# Code Requirements

## ASHRAE 90.1-2010

**5.4.3. Air Leakage**

5.4.3.1. Continuous Air Barrier
- requirement for continuous air barrier design and construction

5.4.3.1.1. Air Barrier Design
- requirement for continuous air barrier design, air barrier structural design and documentation on air barrier construction documents.

5.4.3.1.2. Air Barrier Installation
- requirement for air barrier construction details

5.4.3.1.3. Air Barrier Materials and Assemblies
- air permeance compliance requirement for the selection of air barrier materials and assemblies for opaque envelopes.

# Code Requirements

## ASHRAE 189.1-2011

**7.4.2. Building Envelope**

**7.4.2.9. Continuous Air Barrier**
- requirement for air barrier design and construction in a continuous fashion. Air barrier components shall be clearly identified on construction documents and the joints, interconnections, and penetrations of the air barrier components shall be detailed.

**NORMATIVE APPENDIX B –**
**PRESCRIPTIVE CONTINUOUS AIR BARRIER**

**B1. CHARACTERISTICS**
- requirement for air barrier design and installation

**B2. COMPLIANCE**
- air permeance compliance requirement for the selection of air barrier materials and assemblies for opaque envelopes
- requirements for building envelope air leakage testing

# Code Requirements

## 2012 IECC – Commercial Buildings

**Air Barrier.** Material(s) assembled and joined together to provide a barrier to air leakage through the building envelope. And air barrier may be a single material or a combination of materials.

**C402.4 Air leakage (Mandatory)**

– requirement for air leakage of the thermal envelope shall comply with the noted sections of this code.

C402.4.1 Air barriers

– requirement for continuous air barrier in the listed climate zones and with the noted

# Code Requirements

## 2012 IECC – Residential Houses

**R402.4 Air leakage (Mandatory)**

– requirement for air leakage of the thermal envelope shall comply with the noted sections of this code.

R402.4.1 Building thermal envelope

– requirement for sealing between dissimilar materials

R402.4.1.1 Installation

- requirements of the thermal envelope (air barrier) shall be installed as per manufacturer's instructions

R402.4.1.2. Testing

- requirements for building envelope air leakage testing

# Code Requirements

## 2012 IRC

**R703.1.1 Water resistance.**
- requirement for exterior wall envelope to be designed and constructed in a fashion that has a water-resistive barrier.

R703.2 Water-resistive barrier
– requirement and application for a water-resistive barrier

N1102.4 (R402.4) Air Leakage (Mandatory)
– design and construction of the building thermal envelopes to limit air leakage

N1102.4.1.1 (R402.4.1.1)
– installation of the air barrier components with manufacturer's instructions

N1102.4.1.2 (R402.4.1.2)
– requirements for air leakage testing of the building envelope

# Code Requirements

## 2012 IgCC

605.1.2 Air Leakage
– requirement for building envelope to sealed in accordance with section C402.4 of the International Energy Conservation Code and the other sections of the IgCC code.

605.1.2.1 Air barrier
– requirement for building envelope to be designed in buildings in climate zones 1 through 8.

605.1.2. Testing Requirements
- requirements for building envelope air leakage testing

# Code Requirements

2012 IBC

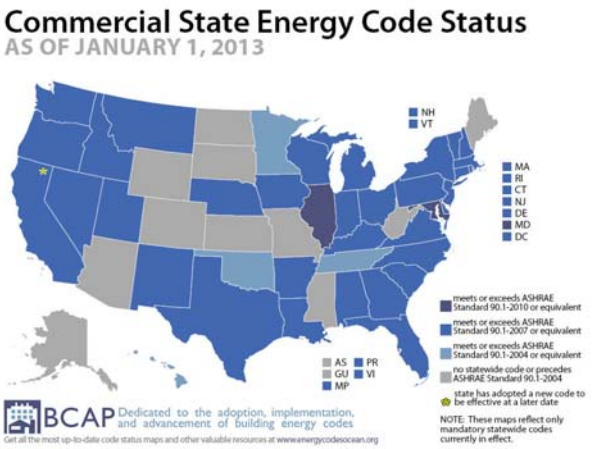
- There are no air barrier requirements in the 2012 International Building Code.

**Water Resistive Barriers**

1404.2 Water-resistive barrier

- requirement for a continuous water-resistive barrier behind exterior wood veneer.

# Code Requirements



# Strategic Planning

- Goals Moving Forward:
  - Ensure continuous improvement and promotion of all education, training/installation, and quality assurance programs.
  - Provide active venues of participation to retain 75% of 375 existing members and grow membership to 700 by 2014
  - Become recognized by the U.S. building construction industry as the authority on all things air barrier by 2014.
  - Adopt, implement and review nonprofit best practices on annual basis, and formalize a new committee structure by 2012.
  - Provide the organization with the financial and administrative resources to fulfill ABAA's strategic goals

Air Barrier Industry Update

# SPECIAL PROJECTS

# Special Projects

- Research Projects
  - 3rd year of ORNL/DOE/Syracuse University Research Project





  - National Research Council Water Drainage research

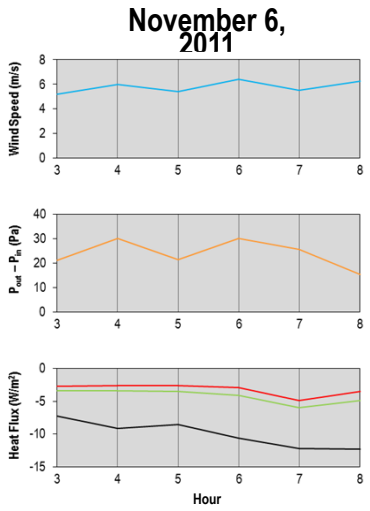
## Phase 2 at Syracuse NET Facility

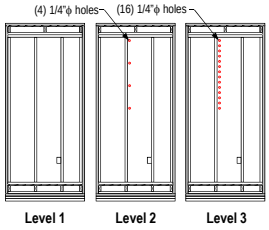
- **Monitor 3 panels per air barrier type**
  - **Level 1 < 0.02 L/(s.m$^2$) (material)**
  - **Level 2 ~ 0.2 L/(s.m$^2$) (assembly)**
  - **Level 3 ~ 1 L/(s.m$^2$) (enclosure)**
- **Simulated imperfections**
- **Evaluating 8 air barrier types**

Interior | Spray-applied foam | Mechanically fastened | Non-insulating board stock | Insulating board stock | Sealers w/ backup structure | Self-adhered | Fluid-applied non-foaming

- **Data collection started on October 2012**

# Phase 2: Preliminary Results



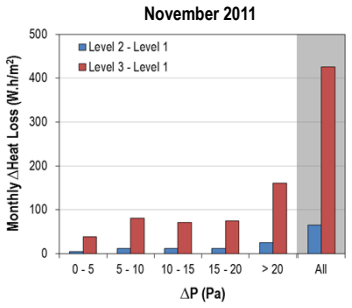



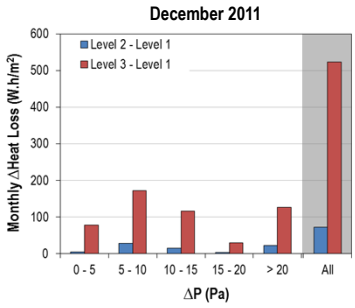

| | Air Leakage [L/(s.m²)] at ΔP = 21.3 Pa | Avg Heat Flux (W/m²) |
|---|---|---|
| Level 1 | < 0.02 | -3.2 |
| Level 2 | ~ 0.11 | -4.2 |
| Level 3 | ~ 0.33 | -10 |



# Phase 2: Preliminary Results

**Quantify effectiveness of different air barriers technologies with field data**

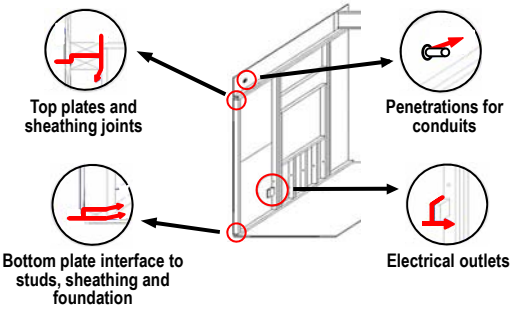



| | Monthly Heat Loss (W.h/m²) | | |
|---|---|---|---|
| Air leakage @ 75 Pa [L/(s.m²)] | Level 1 (< 0.02) | Level 2 ≅ 0.21 | Level 3 ≅ 0.72 |
| November 2011 | 564 | 629 | 990 |
| December 2011 | 983 | 1057 | 1506 |

## Sub-Assembly Tests

- **Use ASTM E 2357 to characterize major air leakage paths in walls**
- **Assess methods to seal significant sources of leakage**
- **Data to define precision of apparatus scheduled for July**




TREMCO



## Special Projects

- ABAA Technical Notes
  - Proposals are under review
    - Scope of project includes Develop of various technical bulletins on:
      - Air Barrier Materials, Types of Air Barrriers
      - Air Barrier Assemblies and Systems
      - Designing air barrier systems
      - Installation requirements for a variety of materials.
      - Testing and Inspection
      - Commissioning Air Barriers

**Thank you for your time!**

# QUESTIONS??

**This concludes The American Institute of Architects Continuing Education Systems Program**

air barrier
abaa
association of
america

1600 Boston-Providence Hwy
Walpole, MA 02081 USA
www.airbarrier.org

## Contact

Laverne Dalgleish
ABAA – Executive Director
ldalgleish@airbarrier.org
1-866-956-5888