Insulated Composite Panels
Designed for Brick Back-up

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Brick Veneer Steel Stud Wall Systems and Insulated Composite Backup Panels
Barriers Critical to Building Performance

• Water
• Air
• Vapor
• Thermal
Fundamentals of Rainscreen Wall Design
Air Barrier

- Buildings are continuously assaulted by air pressure differentials created by wind, HVAC and stack effects
Water Barrier

Moisture Transport Via Air Pressure

• Air in high pressure moves to lower pressure
• Air will find a path of least resistance, any small breach
• This path can be very circuitous
• Air will carry moisture - liquid or vapor - with it
Vapor Barrier

- Warm humid air exerts pressure toward cooler dryer air
Moisture Transport

- Vapor diffusion can occur through materials depending on the material permeance.
- Vapor barrier’s on interior wall surfaces have many discontinuities.
- Moisture transport can occur where there has been a breach in the vapor barrier.
- Vapor condenses into liquid when it contacts surfaces that are below the dew point.
- Water collects and becomes entrapped inside the wall.
- Moisture transport through diffusion is less than \( \frac{1}{10} \) the moisture transport through air leakage.
Thermal Barrier Current Requirements

Opaque Wall Thermal Requirements for Steel-Framed Walls as Stated in the ASHRAE / IESNA Standards 90.1 - 2007

[Map showing thermal requirements for different zones in the US]
Thermal Barrier Future Requirements

Opaque Wall Thermal Requirements for Steel-Framed Walls as Stated in the ASHRAE / IESNA Standards 90.1 - 2010 (PROPOSED)

<table>
<thead>
<tr>
<th>Zone</th>
<th>Requirements</th>
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<tbody>
<tr>
<td>A</td>
<td>R=27.0</td>
</tr>
<tr>
<td>B</td>
<td>R=23.8</td>
</tr>
<tr>
<td>C</td>
<td>R=15.6</td>
</tr>
</tbody>
</table>
Common Multi-component Wall Assembly

Steel studs framing

- Light weight
- Quick, all-season installation
- Superior fire performance
- Consistent quality
- Mold resistant
Typical Wall Assemblies
MCWS/Glass Fiber

- Vapor barrier
- Steel stud
- Batt insulation
- Exterior sheathing
- Building wrap

Drywall
Potential Problems for Multiple Component Wall Systems

- Air infiltration and vapor diffusion can produce condensation in the wall cavity which can lead to corrosion of the metal studs and reduction of the thermal value of the insulation
- Brick ties penetrate the air barrier at 16” centers
- Thermal short circuits in the metal stud cavity substantially reduce the R-value of the insulation (R21 is actually R7.4)
- Multiple materials, suppliers and installers can lead to greater chance of installation errors
Typical Wall Assemblies
Massachusetts Building Code

- Exterior sheathing and weather resistant barrier
- Steel studs are thermally isolated behind insulation
- Continuous outboard rigid insulation
- Drain plane
Problems with Multiple Component Wall Assemblies – Continuous Design

• IBC Fire Code Issues with expanded plastic insulation
• Thousands of penetrations into the backup wall assembly are still occurring
• Sub framing with board stock insulation creates thermal inefficiencies
• Thermal aging of unfaced foam insulation materials – reductions in R-value from 20% to 30% in 3 years
• Multiple materials, suppliers and installers
Evidence of Discontinuous Air Barriers
Evidence of Entrapped Moisture
Toxic Mold
Insulated Composite Backup Panels

- Continuous air, water, and vapor barrier
- Thermal barrier
- Thermally efficient joinery
- Drain plane

Strong composite that can span 2’ to 4’ and easily take design pressures
First Used as a Finished Wall Assembly
Hospitals
Sports Complexes
Offices
Power
ICB Panels for Brick Veneer
Multi-purpose Panel Clip in Pressure Equalized Joinery

- Concealed multi-function clip attachments
- Clips attach to panel studs
- Panel penetration occur within pressure-equalized joinery so that air and water penetration is avoided
Sealing Techniques

- Sealing
  - Cut ends centered over stud with 4” wide steel plate
  - 3/8” diameter bead of sealant is applied along entire width of panel
  - Marriage bead ties horizontal to vertical seals
Full Perimeter Seal
Ensuring that a Building’s Critical Barriers are in Place

- Ensuring tightness
- Water spray test
- 30-35 psi along 5’ of joinery for 5 minutes
- No visible leakage should occur
- Ready to install rainscreen
“Ten years ago everyone was skeptical of moving the insulation outboard of the studs. That construction now has widespread acceptance. Similarly, I predict in the next few years that the insulated metal composite back-up wall system will be widely accepted and used as a superior solution.”

- Michael Gurevich - Consultant, New York City Brickwork Design Center
Ohio Orthopedic Medical Office
Findlay, Ohio
Architect: Medical Design International

- Two-story building
- Architect wants to avoid mold, mildew and Sick Building Syndrome
- 3-inch insulated composite back-up wall panels are chosen
- Brick veneer rainscreen wall is employed
- Installation took 14 working days to cover 11,000 square feet
- Highly energy-efficient building
Case Study: Architects Perspective

Use of Insulated Composite Back-up Panels (ICBP) as Sheathing for Masonry Clad Medical Office Building

**Project:** Ohio Orthopaedics & Sports Medicine

**Location:** Findlay, Ohio

**Size:** Approx 27,000 GSF on two floors plus 6000 SF Basement

**Cost:** Approx $4,000,000.00 (Approx $145.00/GSF)

**Date Built:** October 08 – November 09
Typical Project Constraints

- Budgets
- Deadlines
- Client Expectations
Performance
Standard of Care?

- Year 2000:
  - ARCHITECTURAL GRAPHIC STANDARDS
  - US GREEN BUILDING COUNCIL

- Year 2010:
  - ARCHITECTURAL GRAPHIC STANDARDS
  - CLIMATE CHANGE
  - LEED
  - #15
  - Got Mold?
  - MOISTURE
  - HEAT
Building Science Boom!
What the Client Wants

Aesthetics

Function

Performance

Fees

Construction Cost

Out of Step

Heavy Triumvirate

Recession Architecture

Architect
We Can Dream:

Start:

Finish:
Masonry Cavity Wall Prior to Use of ICBP’s

**Five major wall components behind brick:**
- Interior Vapor Barrier (Cold Climate)
- Batt Insulation in Stud Cavity
- Exterior Gyp. Sheathing Board
- Air Barrier
- Exterior Insulating Sheathing

**Over A Dozen Accessories:**
- Fasteners for Vapor Barrier
- Clips for Batt Insulation
- Fasteners for Ext. Gyp.
- Fasteners for Air Barrier
- Tape for Air Barrier
- Anchors for Masonry Ties
- Masonry Ties
- Clips for Ext. Insulating Sheathing
- Self Healing Tape for Penetrations
- Flexible Flashing
- Thru wall Flashing
- Termination Bars
- Sealants
- Backer Rods
- Flashing Adhesives and Cleaners
- Mortar Diverter
Masonry Cavity Wall Prior to Use of ICBP’s

Mock-up Panel

Wall in Progress
To Use New Product or Not to Use New Product - That is the Question?

Go Ahead & Jump?

Reliable Company?

Reliable Physics?

Reliable System?

Competitive Cost & Value?
Benefits of ICBP’s Versus MCWS for Cavity Wall

• True R21 in a 3” panel – no massive “effective R” reduction.
• Steel skin provides solid air, moisture, & vapor barrier. System for handling seams, fasteners, masonry anchors, and flashings was in place all through the panel manufacturer rather than through multiple trades.
• Interior vapor barrier never needed with this system since interior vapor cannot drive through skin and reach dew point. (Even if it did it would be outside the stud cavity.)
• Steel skins protects foam from hazards of fire and smoke development.

But how much does it cost versus all those other pieces?
Cost Comparison

Problems:

• Empirical installed cost data on wall components hard to find.
• Available data inconsistent.
• Estimated materials cost from R.S. MEANS and arrived at $3.00/SF premium for panels, but still had no labor data.
## Cost Comparison

<table>
<thead>
<tr>
<th>ICBP’s</th>
<th>Multi-Component Wall</th>
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<tbody>
<tr>
<td>3” Panel - $6.50/sf</td>
<td>5/8” Exterior Gypsum</td>
</tr>
<tr>
<td>3/4” Rigid Insulating Foam Board</td>
<td>Spun Bonded Polyolefin Air Barrier</td>
</tr>
<tr>
<td>Interior Vapor Barrier</td>
<td></td>
</tr>
<tr>
<td>R-21 Unfaced Batt Insulation</td>
<td></td>
</tr>
<tr>
<td><strong>Total:</strong> $3.50/sf</td>
<td></td>
</tr>
</tbody>
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11,000 sf of wall x $3.00/sf premium = $33,000 material premium.

Considering potential labor savings we estimated range of $20,000 - $40,000 premium or .5% to 1% of overall $4,000,000.00 budget.
And the Client Said?

- Aesthetics
- Function
- Performance

Heavy Triumvirate

Recession Architecture

Out of Step

Fees
Construction Cost

Architect
And the Client Said?

We like it. Total No Brainer. Do It!
On to the Details:

Top of Curtain Wall/Parapet

Ours:

- Balloon Framing Allows for Easier Continuity of Both Studs & Wall Panels
- Plan Foundations To Receive Additional Wall Width
- Consider Position of Curtainwall/Storefront Planes Relative to Position of ICB Panel Exterior Face

Top of Basement Wall
On to the Details:

**Theirs:**

- Look for Thorough System Development from Manuf.
  - Technical Literature
  - Specifications
  - Code Compliance
  - Installation Guides
  - Field Training
- Look for Mock-up and Testing Data from Manuf.
On to the Details
On to the Bidding

Proprietary Spec

ICBP was detailed and specified as proprietary since the manuf. had already provided us the unit cost of the materials that would be given to all bidders.

Bid Alternate Just In Case

The wild card would be the labor cost. As a back-up plan we detailed and specified our multi-component wall as an alternate.

Leveling The Playing Field

We had five GC’s bidding on project. The manuf. flew to the project location and met with them and their installers to explain the system, to answer any questions, and to provide support for their scope of work.
Results of Bid Alternate?

How Much Something Costs Is Apparently Complicated!

High End
$ MCWS $20,000.00 vs. ICBP’s

Low End
$ MCWS $20,000.00 vs. ICBP’s

Interpretation:

- Good News: Nobody Exceeded the Premium Estimate We Gave to Our Client

- More Good News: The Overall Low Bidder Figured the ICBP’s to Be Not Only Lower Labor Cost But Material Cost Too!
Finally, Construction!

• On site Training by Manufacturers
• Mock-up and Testing
• 11,000 SF of Panel Installed in 14 days
• Made a Fan Out of Installers
• Made a Fan Out of Masons
• Will Be Considered for All Future Projects
Conclusions

• ICBP’s Were Quickly and Successfully Installed Resulting in a High Quality Wall

• GC Has Called On Manuf. To Investigate Using ICBP’s On Another Project. Use Is Spreading.

• Looking Forward to Day When ICBP’s Are Typical Back-up For Masonry, Metal Panel, Terra Cotta, and Other Claddings.