air barrier association of america ONEERENCE **'RADE SHOW** \_ 18\_20 RIER EDUCATION TRACKS FOR THE CONSTRUCTION INDUSTRY

# Air Barrier and shelf angle design, detailing, and lessons learned

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Pepper Construction Company



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#### <u>Air Barrier and shelf angle design, detailing,</u> <u>and lessons learned</u>

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Questions related to specific materials, methods, and services will be addressed at the conclusion of this presentation.

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#### **Course Description**

There are many different ways to design and install a shelf angle. The design of the shelf angle should be integrated with the air barrier continuity in the early stages of the building design. The team must collaborate with the structural engineer and design a system that will work with the exterior sheathing, CMU, or other substrates, and the air barrier installation. Detailing the shelf angle with an understanding of the installation as a whole, making sure that the air barrier system has continuity, constructability, and good detailing practices will facilitate a successful installation.





#### Learning Objectives

- 1. Understand what is needed for proper detailing for an air barrier installation and shelf angle design.
- 2. Review several different types of shelf angle designs and what the pitfalls are with Each shelf angle type.
- 3. Identify and understand how the shelf angle could be installed to accommodate the Air barrier detailing and prevent constructability issues before construction.
  - 4. Learn how to review the shelf angle in preconstruction to make the installation of the air barrier constructible and continuous on the elevation.





## <u>Air Barrier and shelf angle design,</u> <u>detailing, and lessons learned :</u>

- Preplanning & Design Considerations
- Building Envelope Meeting
- Pre-Installation Meeting
- Mock-ups/ Virtual Mock-up
- Construction Concerns, QA/QC &
  - Lessons Learned

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#### Quality plan

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# Go through the process to fully understand the complexities

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#### **PRE-PLANNING & Design Considerations:**

- **M** Type of system being installed
- More when is the system installed?
- Mont trade will be installing?
- M What trade will be making final location / attachment?
- Adjustability of system
- Location of sheathing, insulation, and Air/Vapor Barrier(AVB)?
- Mathematical Type of AVB is to be installed
- Continuation of AVB system at wall and openings
- air barrier M Floor control or expansion joint locations

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#### **Design Considerations:**

# Type of system





Type of system installed? Dovetail type system set in the edge of slab



# Type of system installed? Hanging type system from the structural steel





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#### Type of system installed? Edge of Slab – Knife Connections



# **Type of system installed? Structural steel support – one way adjustment**



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#### <u>Type of system installed?</u> Structural steel support – Welded only



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#### <u>Type of system installed?</u> **Two way adjustment – Wrong Plane**



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#### **Type of system installed? Type of System installed? Type of System installed?**



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#### Type of system installed? No Adjustment - Shims





#### Type of system installed? One Way Adjustment & Closed Head



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#### Type of system installed? One Way Adjustment & Closed Head



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#### Type of system installed? Double Angle

**Design Considerations:** 

# When is the system installed and what trade is involved



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#### When is the system installed?

Timing of instaurae of George and a second secon

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#### What trade is involved?

What trade installs there no play show Concrete Contractor **Steel Contractor** Mason Contractor Trade will be make a just Steel Contractor Mason Contracto Steel & Mason Co

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**Design Considerations:** 

# Adjustability of the system



#### **IS THE SYSTEM ADJUSTABLE?**

System adjustability:
 Up / Down
 In / Out

What systems do not allow for adjustment?

**Design Considerations:** 

# Location of sheathing, insulation, and Air/Vapor Barrier(AVB)?

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## LOCATION OF CONNECTIONS...



### LOCATION OF CONNECTIONS...

+ components are designed to accommodate sheathing, insulation and work space



Room to work Must seal all steel edges and bolts

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+ Room to work...if
 components are
 designed to
 accommodate
 + Do not need to seal
 extra components



+ Room to work
- Must seal all steel edges


#### LOCATION OF SHEATHING...



#### LOCATION OF SHEATHING...

+ Do not need to seal extra components
- No Room to work

#### BEST LOCATION OF SHEATHING & SHELF ANGLE DESIGN...

+ Room to work when components are designed to accommodate
+ Do not need to seal extra components **Design Considerations:** 

# Type of AVB to be installed...does it make sense?

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### **Penetrations?**



## **Knife Connections**



### Plate interruptions / Inset

# **Bolt & Plate interruptions**

### Membranes require bridging\_\_\_it can typically only span to 14 maximum.

# Review with the manufacturer installation instructions



### Self Adhered Membrane?



# Liquid Membrane?



**Design Considerations:** 

# Continuation of AVB system at wall and openings



### Make sure insulation is full



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### 1 Piece or 2 Pieces? (or More)

# Account for Special SS Shapes



**Design Considerations:** 

# Floor control or expansion joint location





Are we installing on a CFMF and sheathing... does the CFMF go floor to floor or fly by?

If floor to floor installation, we will need an expansion joint detail at each floor level (typically on the bottom)



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**Design Considerations:** 

# **Building Envelope Meeting**

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#### No preconceived ideas

The team must be open to understanding the requirements, sometimes new, for the exact product that is being installed <u>or</u> being installed <u>or</u>

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#### Who is needed at a Building Envelope Meeting?

#### Design

• Architect

#### Contractor

- General Contractor
- General Contractor Quality

#### Trades

- Concrete
- CFMF / Sheathing (if used)
- Masonry
- Air Barrier
- Exterior Skin Contractor (Metal Panel, EIFS, Etc.)
- Curtainwall / Window
- Roofing
- Wood Blocking / General Trades

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# Review the job specific details

**Design Considerations:** 

### **Pre-Installation Meeting**



#### expectations

The air barrier is one of the most important items on any building – The installation and process must reflect the importance

# Who/What is needed for a Pre-installation Meeting?

- >>>> Expectations
- **Specifications**
- >>>> Drawings
- **Building Envelope Meeting Minutes**
- >>> Subcontractor Scope of Work
- >>>>Submittals

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- Testing Criteria
- Minimum time allotted 2-3 hours

#### Design

- Architect
- Field observer

#### Contractor

- General Contractor
- General Contractor Quality
- Sub Contractor FOREMAN A MUST
- Manufacturer(s)

#### Owner

- Owner
- Testing Agency

#### **Quality Assurance**

This is our chance to discuss the Quality expectations by the team to the installers & office...

identifying lessons learned prior to the start of installation will help assure a better overall product.

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# **Review** Scope






#### Review Compatibility of all products

#### Discuss timing of material installation

Obtain compatibility letters from EACH manufacture of EACH product being installed in the cavity. Obtain sign-offs from both of the products that are adjacent to each other:			
SS Drip Edge & Sealant under drip edge & Masonry	1	Flashing & Air Barrier	
Air Barrier & ETA	$\checkmark$	Flashing & ETA	w.
Flashing & Insulation	1	Insulation & Glue(Product: ) & Air Barrier	$\overline{\mathbf{Z}}$
Flashing & Mastic or Sealant		Insulation & Glue(Product: ) & Flashing	1
Air Barrier & Mastic or Sealant	$\checkmark$	Insulation & Glue(Product: ) & ETA	V
ETA & Air Barrier Mastic or Sealant	1	ETA & Flashing Mastic or Sealant	
Drainage Mat. & Air Barrier Mastic or Air Barrier Sealant	1	Drainage Mat. & Flashing Mastic or Flashing Sealant	<u></u>
Insulation & Flashing Mastic or Flashing Sealant	1	Insulation & ETA Mastic or ETA Sealant	
Air Barrier & Roofing	1	Air Barrier & Roofing VB	
	<		1
	1		

# Review Testing Requirements



Have Testing company discuss their successes and procedures



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#### A successful preinstallation meeting will produce:

- Clear understanding of the Construction Documents and expectations
- Mock-Up description (Destructive) with building envelope trades
- First Work in-place review guidelines
- Job site review and verification (QC) procedures

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**Design Considerations:** 

#### **Mock-Ups**



Purpose Size/Configuration Sequence Constructability Inspections Visual or Destructive

Produce a construction checklist

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# Part of System Mock-up



#### Virtual Mock-Up

**Design Considerations:** 

#### Construction Concerns, QA/QC, and Lessons Learned



Are we planning on using steel as part of the air barrier system?

We need to discuss who will seal the steel at 8'-0"o.c. or similar to create a continuous air barrier membrane.

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#### **Review** clearances





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#### Type of system installed? Construction tolerance - Alignment



# Tube Concerns – Air – Int/Ext



#### **Construction Tolerance**



#### **Curtainwall / Storefront Attachment**



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#### **Curtainwall / Storefront Attachment**

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#### **Concrete Consolidation**

# Final Setting of Shelf Angle (2/3 support)



#### Make sure the Dimensions add up



#### Sheathing Cut to Accommodate Angle



#### End Damming



#### **Proper Pitch**



#### Is AVB install possible?



#### Welding & Insulation



#### Welding & Membrane



#### **Full SPF Installation**



#### Sheet Membrane & Primer



#### **Correct Torque Installation**



#### **Bolt Detailing**



#### **Maximum Shim Distance**



#### **No Plastic Shims**



#### Full Depth Metal Shims (Same Material) or potentially, fiberglass



#### **Torching of Holes**



# Torching of Angles (Hole Placement?)



### Angle Alignment

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#### Angle Alignment @ Corners

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# **Proper Backing**

### When steel is part of AVB System

# 21255

### **Sheathing Cut-outs**

6 0





### Watch Out for Fish Mouths



# **Proper Detailing**

If we plan on installing membrane on the underside,

Have a discussion on what will be required, what materials are best, and long term solutions.





### Membrane @ Underside of Angle

### **Holes for Galvanization Process**



### Its about Teamwork...

## Stress open discussions

Don't let this happen on your project...







Problems/ concerns might initially appear very large in the beginning of the conversation...

At the end of the meeting, the concerns are typically small and manageable

It's all about perspective, openness to conversation, and mutual problem solving...





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# **ThankYou!**





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