Leak-Free Enclosure Process for Construction Managers & General Contractors

SHHHHH – This is part of the Enclosure Commissioning Process ☺

Brian Stroik

American Contractors Insurance Group

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abaa EDUCATION

Presenter: Brian Stroik

- ***Chair – Air Barrier Association of America (ABAA)***
- ***Board of Directors for the Building Enclosure Technology and Environmental Council*** (BETEC / NIBS – Washington DC)
- ***Past Chair - National Building Enclosure Council*** (NBEC)
- Degree in **Psychology**
- **American Contractors Insurance Group**
  - Performance Excellence & Quality Consultant
- **Union Carpenter** / Superintendent
- Previous ***Quality Manager*** for a Billion Dollar Construction Company / CM and Self Perform work
- Residential Construction ***Company Owner***
- Voting Member ASTM E 06 – Building Performance
- Co-Chair BEC WI
- Senior Member of the American Society of Quality (ASQ)
- Member – Off-Site Construction Council (OSCC / NIBS)

Overview

Hundreds of Millions of Dollars are spent every year by construction managers, trade partners, and insurance companies in litigation and for repairing the water and moisture damage caused by construction defects in the Building Enclosure.

WHY?

We know this is an issue, it has been for decades, so is there a way to ensure the construction of high performing enclosures, the answer is YES!!! This presentation will use actual Case Studies from projects around the country to discuss a process that can be put into specifications to ensure Durable, Sustainable and High Performing Enclosures. This process has been practiced for over 20 years and is based upon the industry leading processes of NIBS Guideline 3 and the current ASTM BECx documents.

Learning Objectives

Importance of Detail and Specification review

Importance of Functionally Tested Mockups

&

How to transfer the lessons learned from the mockup to the Tradesmen

Importance of Pre-Construction

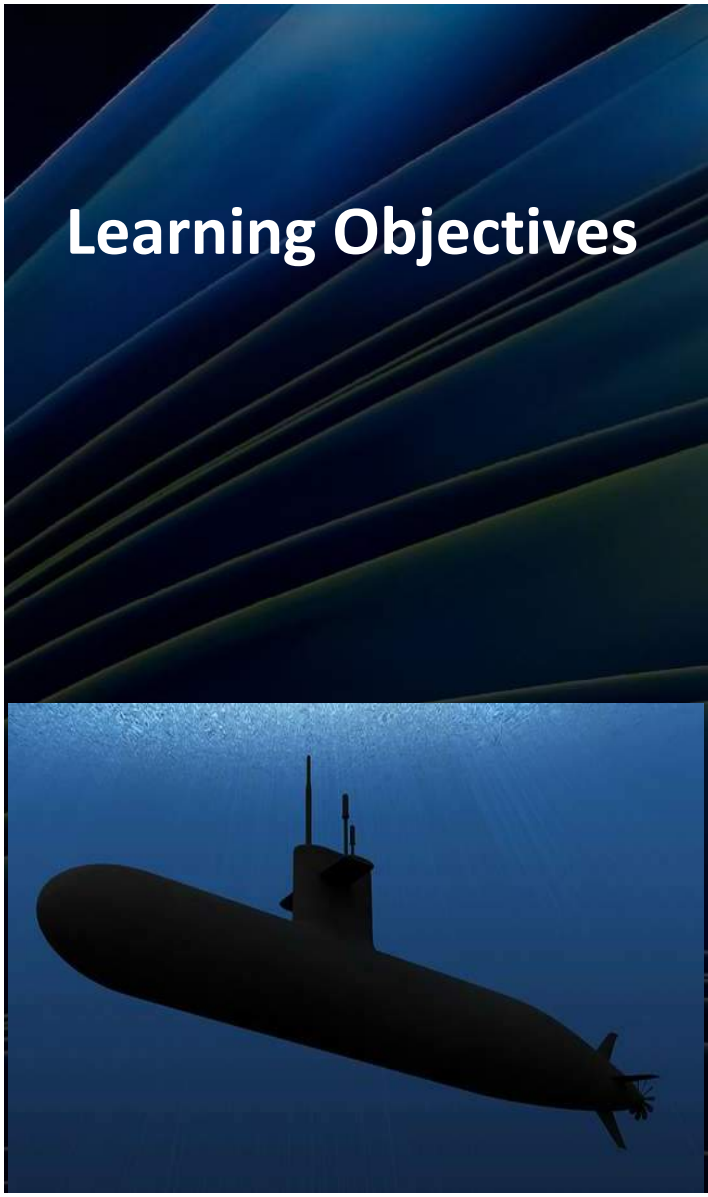
&

Pre-Installation Meetings

Importance of on-site 3rd party inspection of installed materials

&

importance In Situ Testing for Validation of installation



Who is in the Audience?

What is the Building Code?

- Least Safe,
- Least Strong,
- Least Energy Efficient….

Building Allowed by Law

Quote from: Chris Mathis, Mathis Consulting Company

Building Enclosure Failures are a

Multi- Billion Dollar Annual Business

Building Failures is an

Excellent Growth Industry


RISK
PROFIT

Why are We Having so Many Enclosure Issues?

How Many Products?

- 3 Different Types of Back Up Walls
  - Block, OSB, Exterior Sheathing
- 5 Different Types of AVB
  - Fluid, Self Adhered, SPF, Rigid, Mechanically Fastened
- 4 Different Types of Insulation
  - SPF, Extruded Poly, Poly Iso, Mineral Wool
- 4 Different Types of Exterior Cladding
  - Brick, Metal Panel, EFIS, Cement Board

How Many Products?

- ***Over 116* Wall Configurations**

- This **DOES NOT** Consider the **Different Manufacturers** for each Item

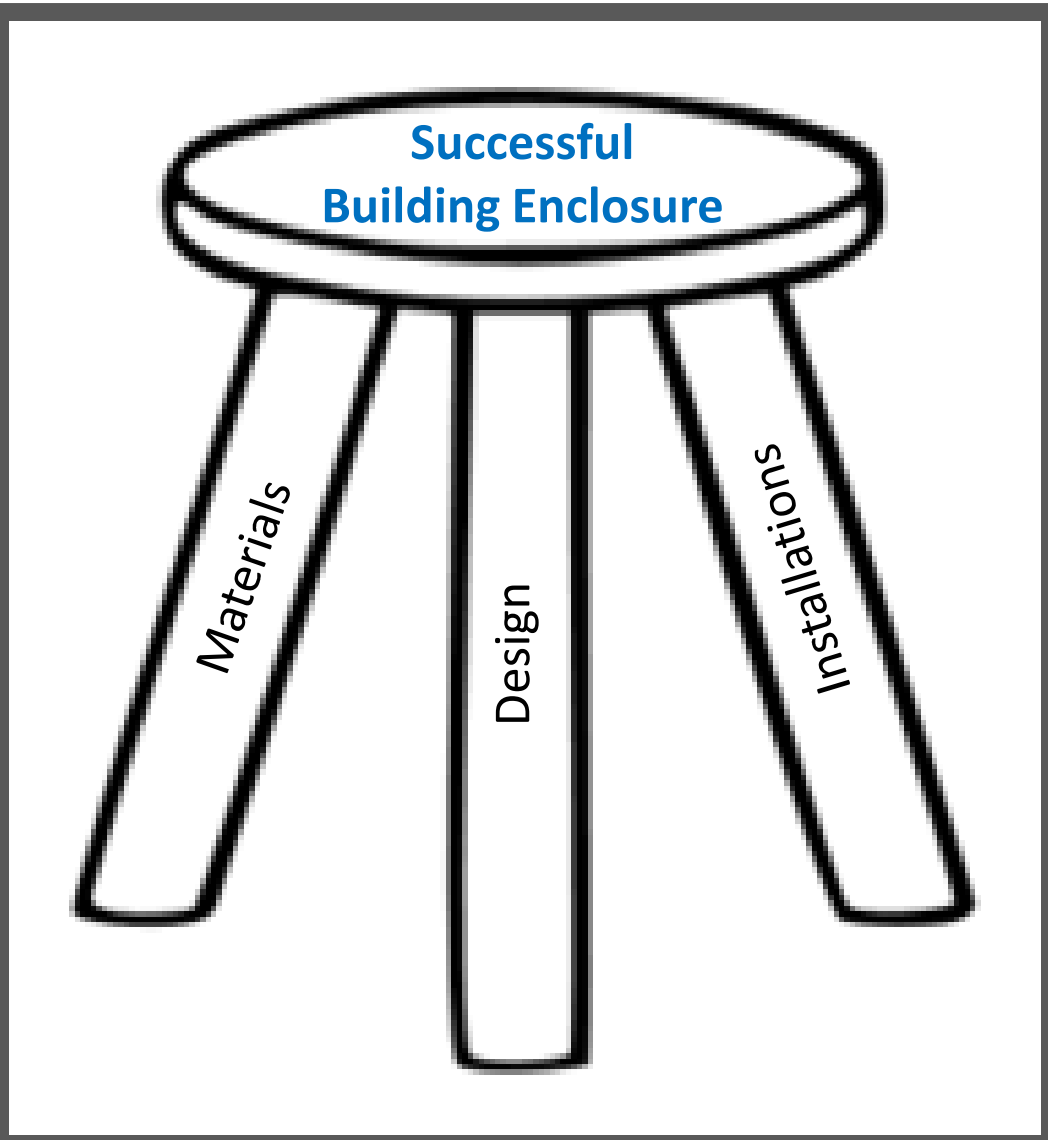
1,000's of
Individual Products

Architects must choose from to Design

Manufacturers must make Properly

Installers must install correctly

Expected to Act As a System

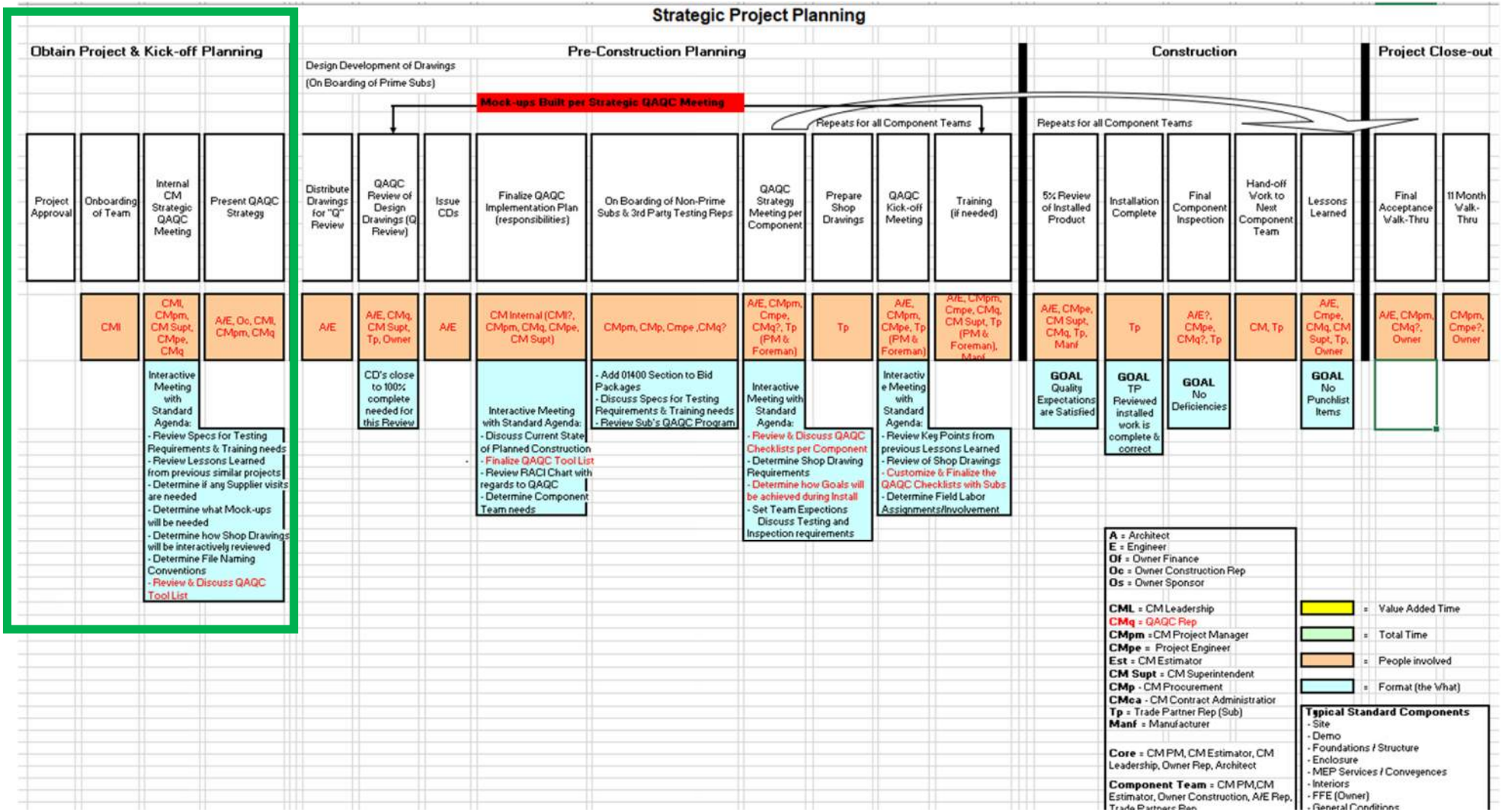

Successful
Building Enclosure
Materials
Design
Installations

Is There a Process for a Construction Manager or General Contractor to Reduce their Risk in Constructing the Building Enclosure?

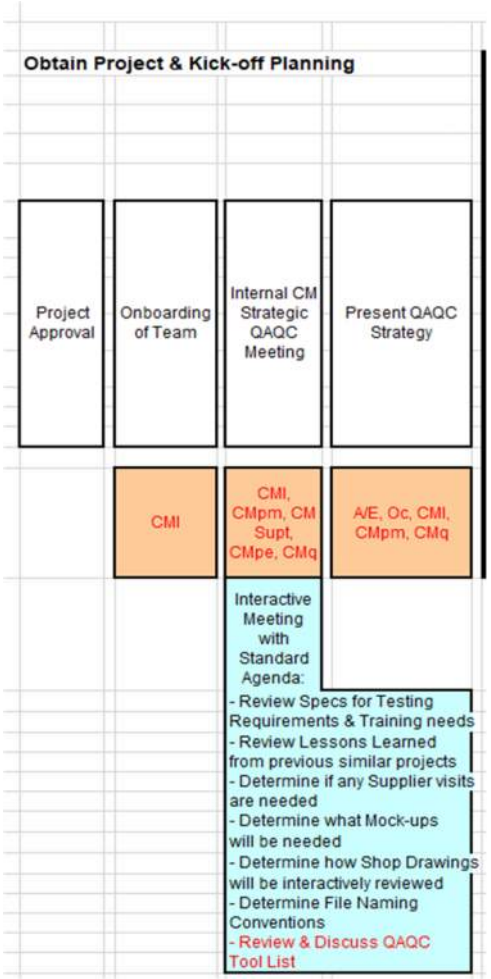
1) Get your house in order

Project Team & QA & Pre-Con - Discussions

1) Project Team/QA/Pre-Con - Discussions



1) Project Team/QA/Pre-Con - Discussions

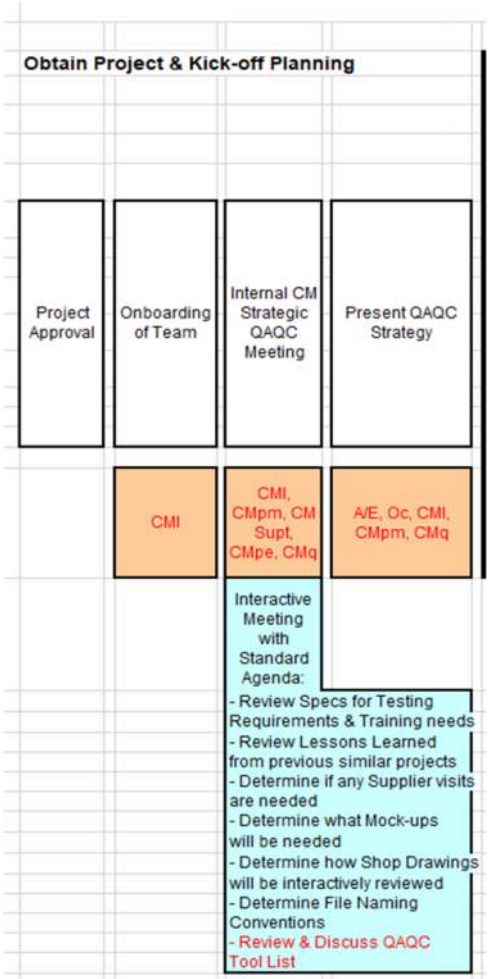


Quality Requirement Checklist

Preconstruction

Project Team Expectations & Discussions	Yes	Date / Initials	NA	Comments
Are you using the Project Planning Process?	☐		☐	
VE options and their *consequences*	☐		☐	
Metrics for a successful project	☐		☐	
Schedule	☐		☐	
RFI Matrix completed	☐		☐	
Submittal Matrix completed	☐		☐	
Drawing requirements (Deadlines, BIM, Revision process)	☐		☐	
Constructability Reviews				
MEP Review including Prefab opportunities	☐		☐	
Site Access, Crane Placement, and general logistics	☐		☐	
Building Enclosure sequence of work	☐		☐	
Temporary Enclosure, Heat and Controls requirements	☐		☐	
General Project PM Review	☐		☐	
General Project Superintendent Review	☐		☐	
MEP Review including hoisting requirements	☐		☐	
Life Safety Drawings – including Rated Walls Matrix	☐		☐	
Door Hardware	☐		☐	
Building Enclosure Details reviewed – Quality Team, Supt?	☐		☐	
PM Review (Finishes)	☐		☐	
Have Mockups / First Run Studies been discussed	☐		☐	
Room Specific	☐		☐	
What is to be reviewed / Quality of Finishes, locations, etc.	☐		☐	
Enclosure Mockups/Field Testing	☐		☐	
Testing requirements, location, schedule, details, ITP developed	☐		☐	
Close-Out Requirements				
Matrix of close-out requirements completed	☐		☐	
MEP Commissioning Requirements matrix completed	☐		☐	
Building Enclosure Commissioning Process	☐		☐	
Format of Close Out Material (Electronic/Traditional)	☐		☐	
Warranties required; Owner/Architect/Specification	☐		☐	
Turn Over Stock Discussed with Owner/Architect	☐		☐	
Occupancy Requirements (Owner/Authority Have Jurisdiction (AHJ) /Architect)	☐		☐	
Team Expectations and Discussions	☐		☐	
CM Responsibility Matrix completed	☐		☐	
Quality Assurance/Control Planning completed	☐		☐	
01400 has been installed in the Front-End docs	☐		☐	
Required testing per specifications reviewed and discussed	☐		☐	
Quality Assurance Lists Developed (Subcontractor Check Lists)	☐		☐	
In-Wall/Above Ceiling Inspections discussed (how managed)	☐		☐	
Specification Review Completed	☐		☐	
Responsibility Matrix for AHJ Inspections developed	☐		☐	
The overall Schedule has been established	☐		☐	
The team has reviewed the schedule (Meeting required)	☐		☐	
Does the schedule have Hold Handoff points?	☐		☐	

1) Project Team/QA/Pre-Con - Discussions



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Preconstruction

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Are you using the Project Planning Process?	☐		☐	
VE options and their *consequences*	☐		☐	
Metrics for a successful project	☐		☐	
Schedule	☐		☐	
RFI Matrix completed	☐		☐	
Submittal Matrix completed	☐		☐	
Drawing requirements (Deadlines, BIM, Revision process)	☐		☐	
Constructability Reviews				
MEP Review including Prefab opportunities	☐		☐	
Site Access, Crane Placement, and general logistics	☐		☐	
Building Enclosure sequence of work	☐		☐	
Temporary Enclosure, Heat and Controls requirements	☐		☐	
General Project PM Review	☐		☐	
General Project Superintendent Review	☐		☐	
MEP Review including hoisting requirements	☐		☐	
Life Safety Drawings – including Rated Walls Matrix	☐		☐	
Door Hardware	☐		☐	
Building Enclosure Details reviewed – Quality Team, Supt?	☐		☐	
PM Review (Finishes)	☐		☐	
Have Mockups / First Run Studies been discussed	☐		☐	
Room Specific	☐		☐	
What is to be reviewed / Quality of Finishes, locations, etc.	☐		☐	
Enclosure Mockups/Field Testing	☐		☐	
Testing requirements, location, schedule, details, ITP developed	☐		☐	
Close-Out Requirements				
Matrix of close-out requirements completed	☐		☐	
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01400 has been installed in the Front-End docs	☐		☐	
Required testing per specifications reviewed and discussed	☐		☐	
Quality Assurance Lists Developed (Subcontractor Check Lists)	☐		☐	
In-Wall/Above Ceiling Inspections discussed (how managed)	☐		☐	
Specification Review Completed	☐		☐	
Responsibility Matrix for AHJ Inspections developed	☐		☐	
The overall Schedule has been established	☐		☐	
The team has reviewed the schedule (Meeting required)	☐		☐	
Does the schedule have Hold Handoff points?	☐		☐	

Quality Requirement Checklist

CM / Subcontractor Requirements	Yes	Date / Initials	NA	Comments
Sub Contractor quality manuals have been reviewed	☐		☐	
Subcontractor scheduling meetings have occurred	☐		☐	
Has the six-week look ahead planner been established	☐		☐	
Post Bid Reviews Completed and Documented	☐		☐	
Required Preinstallation Meetings determined (Matrix)	☐		☐	
Website Training – ProCore, BIM 360, etc. (Owner, Architects, Subcontractors)	☐		☐	
Owner	☐		☐	
Architect	☐		☐	
Subcontractors	☐		☐	
Recycling/Waste Management has been discussed	☐		☐	
Potential Environmental Issues have been discussed	☐		☐	

Construction

	Yes	Date / Initials	NA	Comments
Superintendent meeting w a Subcontractor (Pre-Install)	☐		☐	
Work Rules Discussed	☐		☐	
Specifications and expectations discussed	☐		☐	
Mockup/First Run Study	☐		☐	
Constructed and discussed with the owner	☐		☐	
Final acceptance criteria determined	☐		☐	
Lessons Learned developed	☐		☐	
Training the Workforce	☐		☐	
Lessons Learned (First Run Studies) discussed with tradesmen	☐		☐	
Contractor Specific Training (Rated wall assembly, Firestop)	☐		☐	
Trade Self Verification of work in place (QA lists)	☐		☐	
Site Testing of installed materials				
Hold/Hand Off points being met	☐		☐	
Inspections occurring per schedule (In-wall, above Ceiling)	☐		☐	
Root Cause Analysis for frequent findings occurring	☐		☐	
Field Inspections (Architect, 3rd Party) occurring	☐		☐	

Post Construction

	Yes	Date / Initials	NA	Comments
Field Report items complete	☐		☐	
Punch List items complete	☐		☐	
Close Out Documents Assembled	☐		☐	
Warranties	☐		☐	
O&M's	☐		☐	
Turn over stock turned over	☐		☐	
Commissioning Reports Complete	☐		☐	
Occupancy -	☐		☐	
All AHJ documentation complete (fire marshal, building inspector,)	☐		☐	
Architect final sign off received	☐		☐	
Post Construction Interview Complete	☐		☐	

Construction Team Matrix

1) Project Team/QA/Pre-Con - Discussions

Project Title: Job Name: | Job Number: | Start date / End date | Info. By: / Modified By: | Chart Rev. Date:

Project RACI Chart

R = Responsible, A = Assisting C = Consulted, I = Informed

Location Field ==> | Office ==>

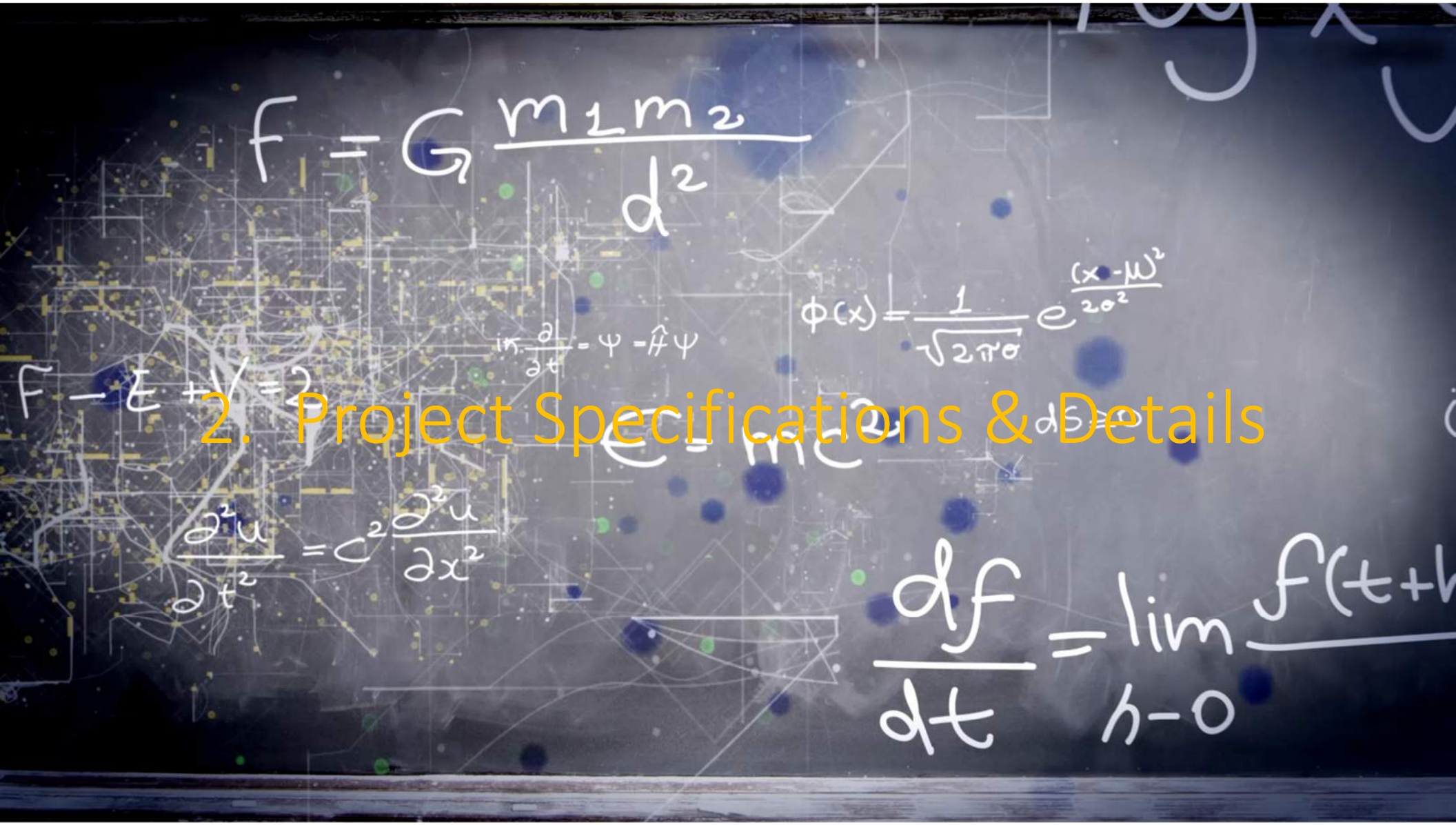
Delivery or Program Oriented Categories or Items ê	Delivery or Program Oriented Categories or Items ê	Field PM	General Supt	Field Engineer	Field Engr	Field Safety Engineer	Admin Team Leader	MEP Field Engineer	Craft Foreman	Sub-contractor Foreman		PM	PM
Estimate		R	C	I	I	I	I	C	I	I			R
Owner Inter-action / Correspondence		R	A	A	A	A	A	A	A	I			R
Monthly Owner Reports		A	C	C	I	I	R	I	I	I			R
Field Daily Reports	Estimate	I	R	I	I	I	I	I	R	R			I
Self-Perform Crew Time Reported	Owner Inter-action / Correspondence	I	I	I	I	R	I	I	R				I
Document Distribution	Monthly Owner Reports	C	C	C	I	I	R	I	I				I
Contracts and PO's - Issue	Field Daily Reports	R	I	I	I	I	A	A	I				C
Contracts and PO's - Invoices		R	I	I	I	I	R	A	I				C
Scope Revision - Contracts and PO's		R	A	A	A	I	A	A	I				C
Scope Revision - Boldt / Owner Contract		R	C	I	I	I	A	I	I				R
Commissiong / Work Closeout	Self-Perform Crew Time Reported	A	R	R	R	A	A	R	R	R			A
Closeout - documents and Manuals	Document Distribution	C	C	R	R	I	R	R	I				C
Safety Program	Contracts and PO's - Issue	R	R	R	R	R	R	R	R	R			R
Safety Site Review	Contracts and PO's - Invoices	R	R	A	A	R	A	A	R	A			R
Project Master Schedule (Strategic and loc	Scope Revision - Contracts and PO's	R	R	C	C	I	I	I	C	C			A
Construction Equipment Schedule	Scope Revision - Boldt / Owner Contract	A	R	I	I	I	I	I	C	C			C
Pull Schedule	Commission / Work Closeout	R	A	C	C	I	I	I	C	C			A
Weekly Last Planner meetings	Closeout - documents and Manuals	C	R	A	A	I	I	I	A	A			C
Boldt Mgmt Daily Huddle		R	A	A	I	I	I	I	A	I			I
Field Daily Huddles at start of work		C	R	I	I	I	I	I	A	A			I
Productivity Targets		R	C	A	A	A	I	I	R	I			C
Productivity Collect & Report		C	C	R	R	A	I	I	A	I			C
Construction Layout, Position Control	Safety Program	C	R	C	C	I	I	I	A	A			C
Temporary Services	Safety Site Review	C	R	A	I	I	I	I	A	C			I
Waste & Recycling	Quality Program	I	R	A	I	I	A	I	A	C			I
Subcontractor Site Coordination	Project Master Schedule (Strategic and lookahead)	C	R	A	I	I	I	A	A	C			C
2. Earthwork, Sitework		A	A	R	I	I	I	I	I	R			C
3. Concrete work	Construction Equipment Schedule	C	A	R	I	I	I	I	A	R			C
4. Masonry work		R	A	A/I	R	I	I	I	R	I			C
5. Steel, Structure	Pull Schedule	A	A	R	I	I	I	I	R	I			C
6. Wood & Plastics, Carpentry		A	A	R	I	A	I	I	R	I			C
7. Thermal & Moisture Protection	Weekly meetings	R	A	A	R	A	I	I	I	R			C
8. Doors & Hardware		A	C	R	A	A	I	I	R	I			C
9. Curtainwall	Daily Huddle	R	A	I	R	I	I	I	I	R			C
9. Finishes - Floors, Walls, Cielings	Field Daily Huddles at start of work	A	A	R	I	I	I	I	A	R			C
10. Specialties		R	C	I	R	I	I	I	R	I			C
14. Conveying Systems	Productivity Targets	R	A	R	I	I	I	I	I	R			C
15. Plumbing, Piping, HVAC		R	A	A	I	I	I	R	I	R			C
16. Electrical	Productivity Collect & Report	R	A	A	I	I	I	R	I	R			C

Project Matrix

Project Name: ___
Project Number:

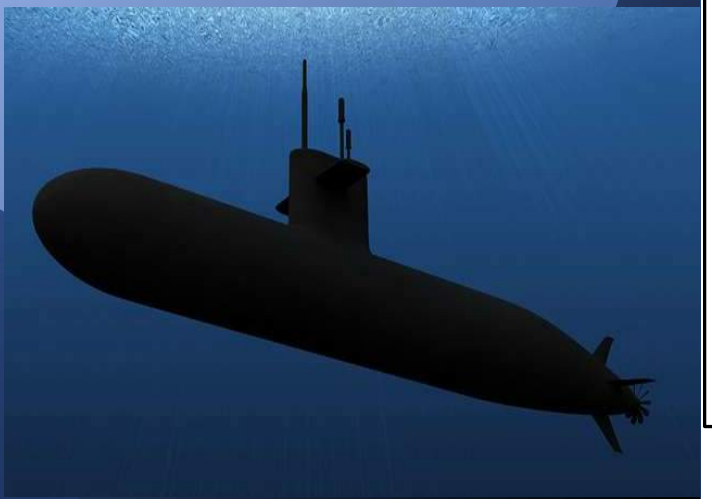
Built-In Quality Linear Responsibility Chart

Phase	Action	Owner	Design Team		CM/GC				Sub Contractors	Suppliers & Vendors	BECx Agent	Jurisdiction Authority	
			Architect	Consultants	PM	FE	Supt	Quality Team				AHJ/ OSPD	Bldg Inspector
	Pre-Construction												
	Define Purpose & Value	R	A		A								
	Document the Design Criteria	R	A	A	A			I	A	A		V	
	Develop Design Drawings & Specifications	A	R	R	A	A		I	A	C	I	I	
	Identify fabrication & installation instructions	I	R	S	A			I	R	R	I	I	
	Recognize preconstruction expectations: Owner & CM	R											
	Continually perform Constructability Design Review (required at @ 50% & 90% complete)	I	S	S	R	I	I	I	R	R	I	I	
	Quality Team reviews specs for special requirements				R	R	I	R	A	S	I	I	
	Request & review contractor's Quality Manuals				S	S		R	S	S	I	I	
	Develop Conditions of Satisfaction list	S	S	S	R	R	I	R			V	I	
	Create Quality Control Requirements Lists				R	A	I	R			R	V	
	Host Project Manager Pre-Construction Meeting to identify and agree on Project Scope		S	S	R	R	A	I	R	S	C	I	
	Develop Hold-Point list for Production Planning	I	I	I	R	R	A	I	A	A	I	I	I
Construction	**Construction**												
	Host Superintendent Pre-Construction Meetings to identify & agree on Conditions of Satisfaction						R	S	A	I			
	Develop Mock-up or First Run In Situ Testing	S	S	S	R	R	S	R	R	S	V	V	
	Review Work Sequence for Constructability		A		R	R	R	S	R				
	Instruct & train trade workers on special requirements and techniques				A	A	I	A	R	R	I	I	
	Trades Self-Inspect work as installed				A	A	A	A	R	S		V	
	Use Task-based Quality Checklist for verification				A	A	A	A	R	S		V	
	Inspect early work to assure compliance with Conditions of Satisfaction		A	R	S	S	S	S	S			V	R
	Perform Hold Point Inspection at Handoff Points: Stud Frame;MEP rough-in;Finishes (In-wall, Above-Ceiling)		S	S	S	R	A	S	R	S	I	V	
	Perform Root Cause Analysis for frequent Findings		C	C	R	R	C	S	R	S	I	I	
	Conduct Indoor-Air-Quality Audit				I	R	S	S	A			V	
	Field Inspections performed and results distributed by A&E, CM, IOR, and Third Party	I	R	R	A	R	A	R	A		I	V	
Post Construction	**Post Construction**												
	Process IOR forms & Statement of Conformance	I	S	S	S	S	S	I	S	S	S	R	
	A&E provide Certificate of Completion	I	R	R	A	A	A	S	S	S	S	S	I
	Obtain Occupancy Permit	S	S	S	S	S	S	I	S	S	S	R	R
	Closeout project; finalize O&M and Turnover documents for Owner				R	R	I	S	A	S	V	V	
	Conduct Post-Construction Interview	R			R								


2. Project Specifications & Details

2. Specifications & Details

01 1400
Quality Control



SECTION 01 1400

QUALITY CONTR

1.00 GENERAL

1.01 Description

A. This Section covers general requirements for quality control of

B. Related work:

1. Specific test procedures to be performed in accordance with t of Divisions 2 through 16 of these Specifications.

2. Testing of materials specified to be tested by other agencies u

3. Trade Contractors shall provide the Construction Manager a notification to proceed with the work. The procedures and rep shall meet or exceed that of the Construction Managers, reports within 24 hours of the report or otherwise agreed upon

C. Definitions and Qualifications:

1. Testing Laboratory or Agency: Licensed testing laboratory the applicable tests and inspections performed, approved by t Agency.

2. Soil Engineer: Registered professional geotechnical engineer

3. Disqualified Material: Any material shipped or delivered to th supply prior to having satisfactorily passed the required test a the Architect that such test and inspection will not be required removed from site at Trade Contractor's expense.

4. Hazardous materials are specifically excluded from this sectio

1.02 General Quality Control Requirements

A. Materials to be furnished under the Contract are subject to Documents.

B. Testing required by the Contract Documents shall be perfo professional engineer, employed by testing laboratory, or Cer required by the Owner.

C. Manufactured articles, materials, and equipment shall be app adjusted, and conditioned in accordance with their manufa restrictive or stringent requirements are specified in the Specif

1. When specified or requested, furnish the Construction Mana Architect's approval prior to introduction of such items.

2. If product manufacturer's instructions are in conflict with the Construction Manager, in writing, and receive approval prior t shall keep a copy of the various product manufacturers' instru

D. Certificates:

1. Where specified, deliver to the Construction Manager for ap and manufactured items stating that such materials and m specified.

2. In lieu of such certifications, the Trade Contractor may subm reputable and recognized testing laboratory.

1.07 Inspections

A. Inspections will be performed by Inspectors employed by the Owner when required by the Contract Documents. Building Code inspections shall be done by the proper State or Local authority.

B. During the course of work under inspection, each Inspector shall submit detailed reports relative to progress and condition of work, including variances from the Contract Documents, and stipulating dates, hours, and locations of the inspections.

C. Work requiring such inspection that is performed or constructed in the absence of the Inspector may be considered defective and may be subject to rejection.

D. Give written notice to the CM at least two (2) working days in advance of the performance of any work requiring inspection. The inspection of material or equipment at the factory or shop will not constitute an acceptance.

E. Certain inspections as specified in the Technical Specifications will be witnessed by the Owner. In such cases notification shall be made to Owner 48 hours prior to the scheduled inspection.

F. All Trade Contractors shall inspect their own work and provide documentation that is equal to or more specific than the Contract Managers inspection forms, for all areas of work performed demonstrating all work has been installed correctly per codes, standards, and manufacturer requirements.

G. A copy of any and all reports shall be provided to the Construction Manager within 24 hours in receipt from any Inspector and or Testing Agency.

1.08 Approval Required by Others

A. If laws, ordinances, rules, regulations, or orders of public agency having jurisdiction require work to be inspected, tested, or approved by some authority other than as required by the Contract Documents, the Trade Contractor shall give required notices and make arrangements, deliver to the Construction Manager the certificates of inspection, test or approval of such public agency, and pay costs therefore unless otherwise provided in the Contract Documents.

1.09 Trade Contractor's Assistance

A. Trade Contractor shall provide access, facilities, and labor necessary for duties to be performed at the site by Testing Laboratory and Inspector, including furnishing ladders, hoist, lighting, water supply and like materials and equipment.

1.10 Verification of Conditions

A. Prior to installation of any product, Trade Contractor shall inspect existing conditions to receive materials to be installed and arrange for correction of defects in the existing workmanship, material or conditions that may adversely affect work to be installed.

B. Installation of materials constitutes acceptance of existing conditions as being in proper condition to receive the materials to be applied and waiver of claim that existing conditions are defective as pertains to warranty requirements.

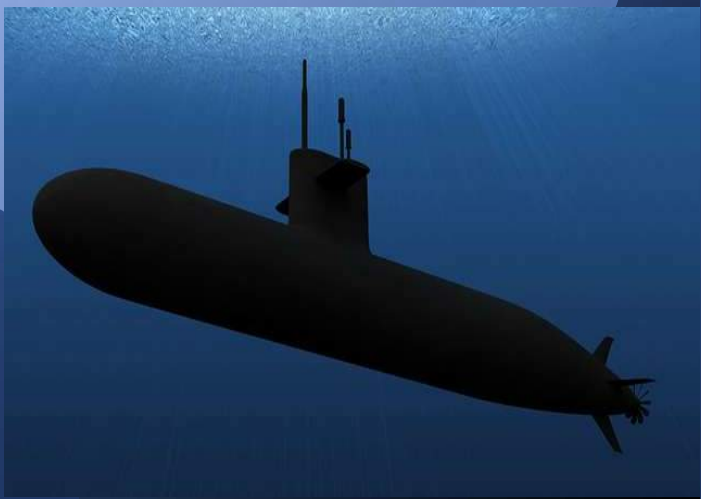
C. Where the Specifications require a material to be installed under the supervision or inspection of the material manufacturer or representative, the Trade Contractor shall arrange for the manufacturer or representative to inspect the work in place and issue a letter of approval to the Construction Manager.

END OF SECTION

2. Specifications & Details

01 8316

Exterior Enclosure Performance Requirements



1. Submit installation training modules to manufacturer for approval.

[ATTACH EXAMPLE CHECKLIST TO SPECIFICATION AND REFERENCE EXAMPLE WHEN AVAILABLE.]

1.11 WARRANTY

A. Warranties will include a single re-inspection/-audit.

B. System and Installation Warranties: In addition to the requirements below, provide warranties for each building enclosure system as required by other Sections.

C. Special Building Enclosure Warranty: Provide an enhanced, whole-building enclosure warranty covering materials and workmanship, including penetrations and transitions between systems, within the specified warranty period.

1. Roofing System Warranty: **[20] [30]** year No Dollar Limit water tightness warranty, non-prorated, covering membrane, roof insulation, and other components and accessories necessary for a complete system.
2. Wall Waterproofing Systems Warranty: Ten (10) year No Dollar Limit water tightness warranty, non-prorated, covering wall air and water-resistive barriers, sealants, flashings and other components and accessories necessary for a complete system.
3. Whole-Building Enclosure Warranty: Ten (10) years from date of Substantial Completion.
4. Warranty may be provided by the following entities:
   a. Contractor.
   b. A single building enclosure systems manufacturer, or a collaboration of manufacturers, offering an integrated whole building enclosure warranty[, **including overburden and cladding removal and replacement**].
5. Warranty Basis of Design:
   a. Manufacturer Warranty: Tremco Envelope System Performance Warranty covering building enclosure system components' air and water penetration resistance.
      (1) Warranty Coverage: Labor and materials, and up to $250,000 removal and replacement of overburden and cladding systems.
      (2) Warranty Eligibility and Requirements: As defined by manufacturer.
         (a) Comply with manufacturer's quality control and quality assurance program.
         (b) Complete manufacturer's required training for installation of each enclosure system.
         (c) Comply with manufacturer's required mock-up and testing requirements.
         (d) Coordinate with Building Enclosure Consultant.
         (e) Coordinate third-party testing, inspection, and review

2. Specifications & Details

01 9119

Envelope Commissioning

Component				
Curtain Wall / Store Front	Air Barrier Assemblies (including Water-Resistive Coatings per Section "XXXXX"	ASTM E1186 (4.2.7) Pass/fail criteria shall be no bubbles observed in the leak detection liquid.		Five (5) locations at seams and or fasteners	5-10% Completion: Ten (10) areas 35-45% Completion: Ten (10) areas 70-80% Completion: Ten (10) areas 95-100% Completion: Ten (10) areas
		N/A			
	System Interfaces	N/A			
		N/A			
Roofing			ASTM D5957 – No water leakage when tested for a minimum of 48 hours	Test completed roof	Test completed roof

D. Water leakage is only acceptable if ALL of the following conditions are satisfied:

1. Water is contained and drained to the exterior.

Where testing indicates that performance requirements are not met, the CM shall repair or replace the failed section and a re-test shall be conducted. All repairs shall be conducted with inspection by the A/E. Re-testing shall be conducted by the BETA. All costs associated with the repair and re-testing shall be the responsibility of the CM.

E. In addition to re-testing, failed tests will typically result in testing of an additional specimen at the discretion of the A/E and Owner and at the cost of the CM. Testing will be concluded only when satisfactory results are achieved.

1. Additional Testing: 5 percent, but not less than 2 locations, of additional testing shall be conducted for each failed test.

F. Installation of related work shall not continue until tests have been successfully completed.

1.11 TEST REQUIREMENTS

A. Mock-up Testing: A building envelope mock-up shall be constructed and tested prior to commencement of installation of building envelope components responsible for providing environmental separation.

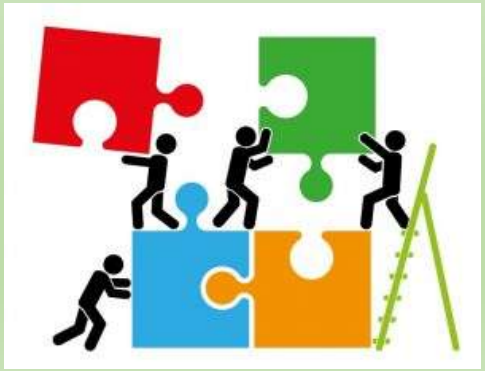
1. Testing shall be conducted on the installed fenestration, air barrier, and any terminations or penetrations through the air barrier such as fasteners but prior to the installation of any exterior claddings.
2. The mock-up area is indicated on Drawings. The mock-up shall include a junction with the roofing membrane, a building corner condition, and foundation wall intersection.
3. Testing sequence shall be approved by Tremco.
4. The coordination, construction and completion of the mock-up construction are the responsibility of the CM.

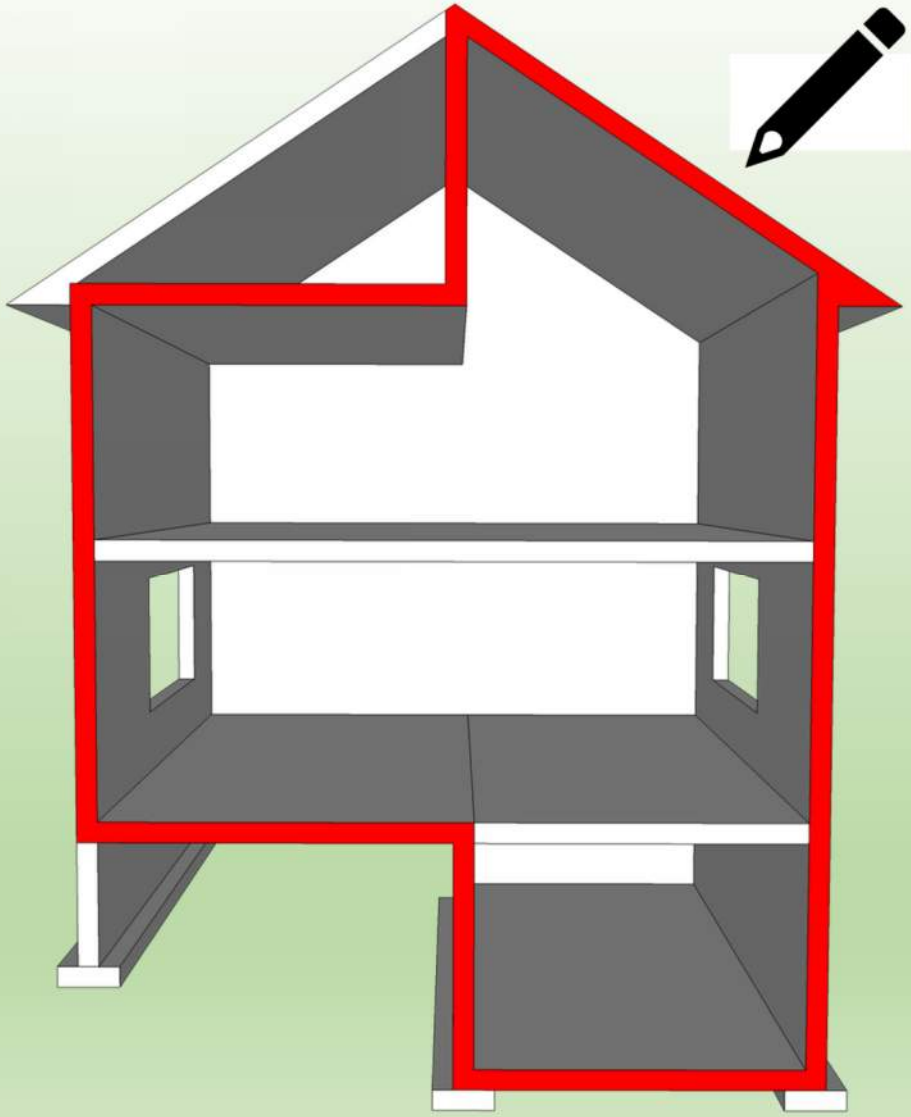
a. The CM shall provide a chamber or closure wall for the mock-up, it is the responsibility of the CM to construct and repair the test chamber as necessary to create an air-tight chamber. Mock-up test chambers are typically constructed of wood or steel framing, exterior sheathing, and a sheet applied air barrier.

3. 3rd Party Consultant & Construction Team Review

3. 3rd Party Consultant & Construction Team Review

CABS
Certified Air Barrier Specialist





3. 3rd Party Consultant & Construction Team Review

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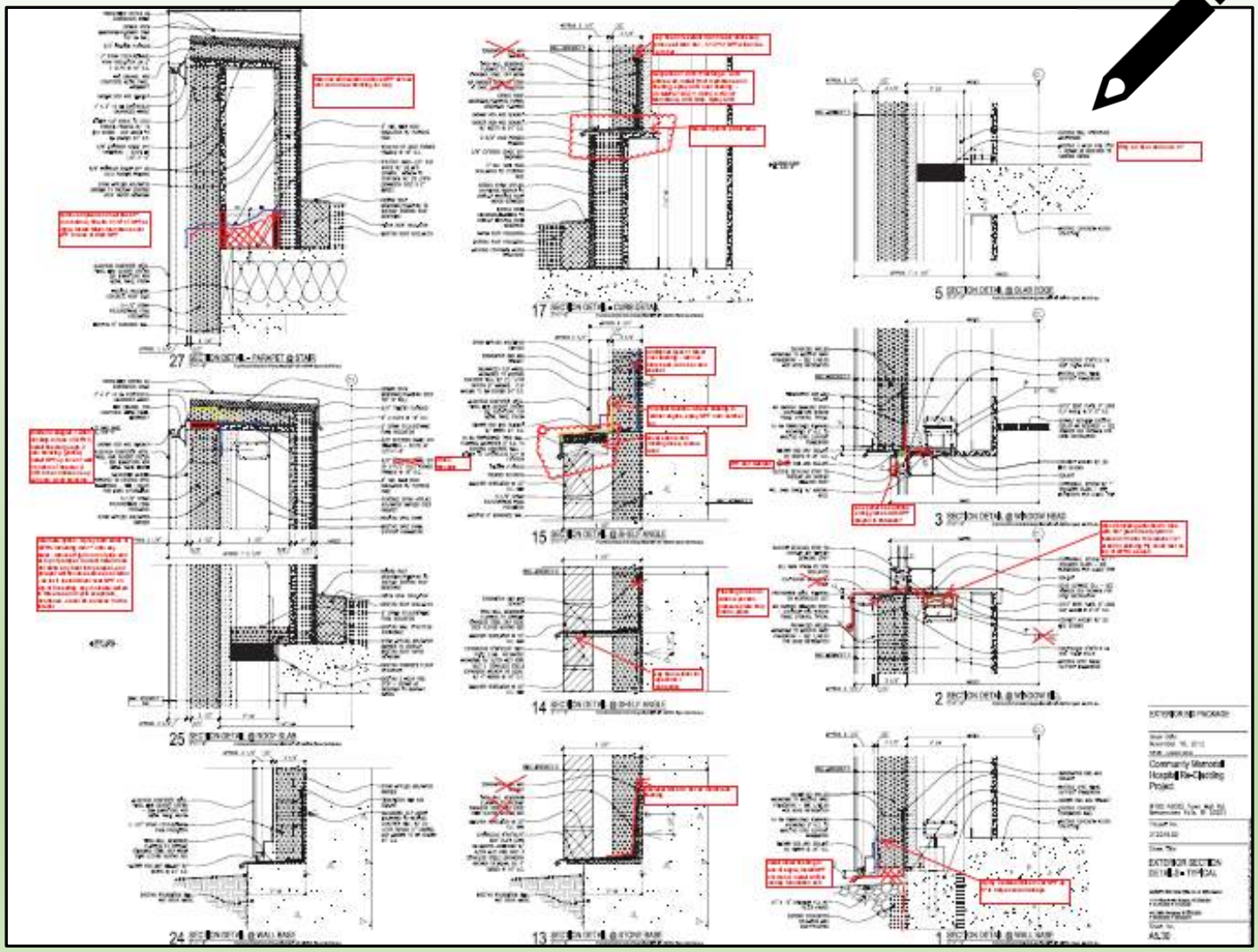

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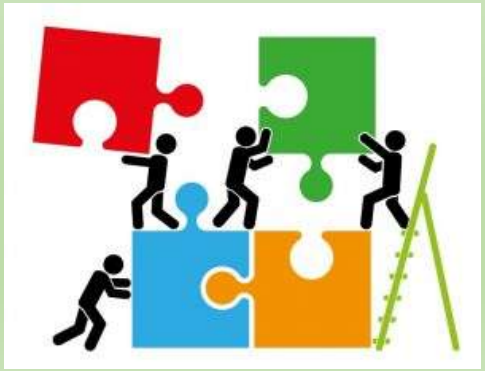
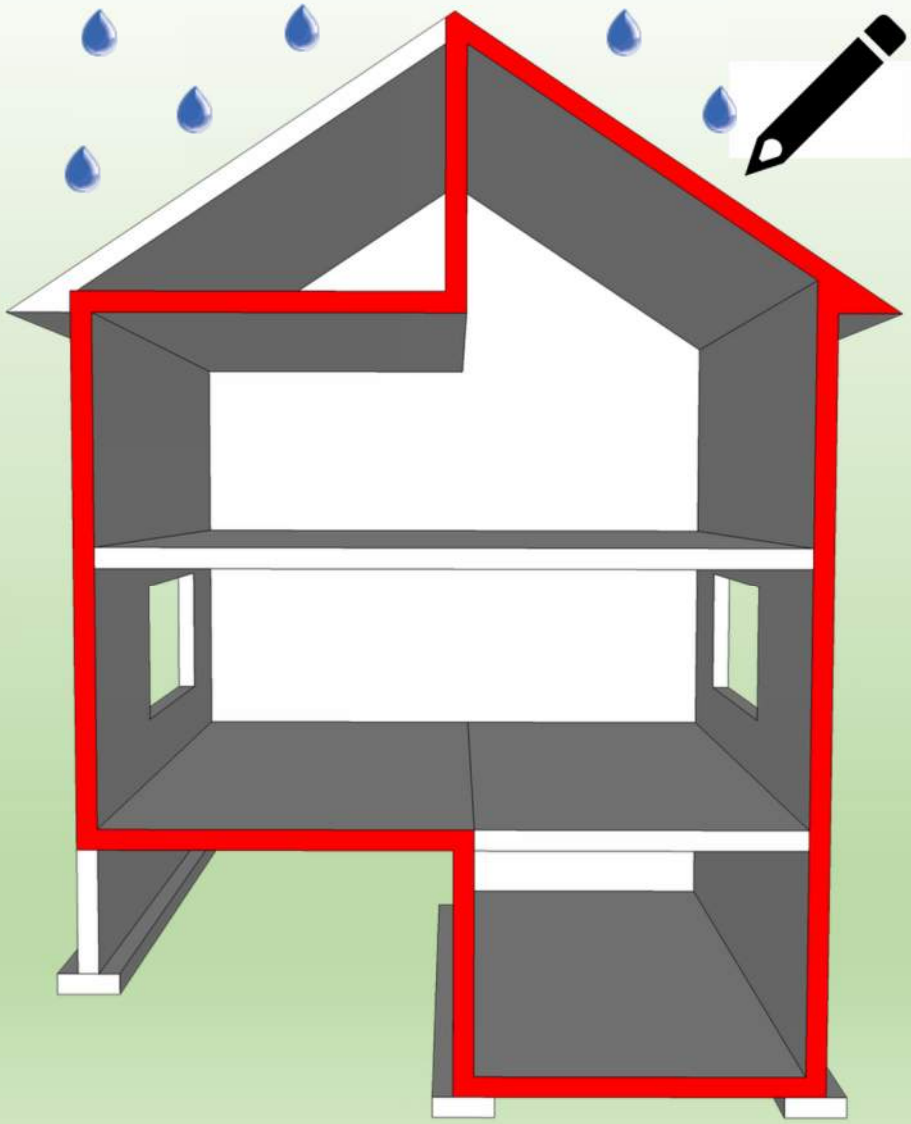


Water



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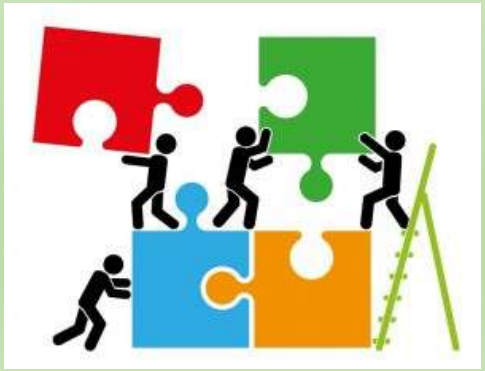
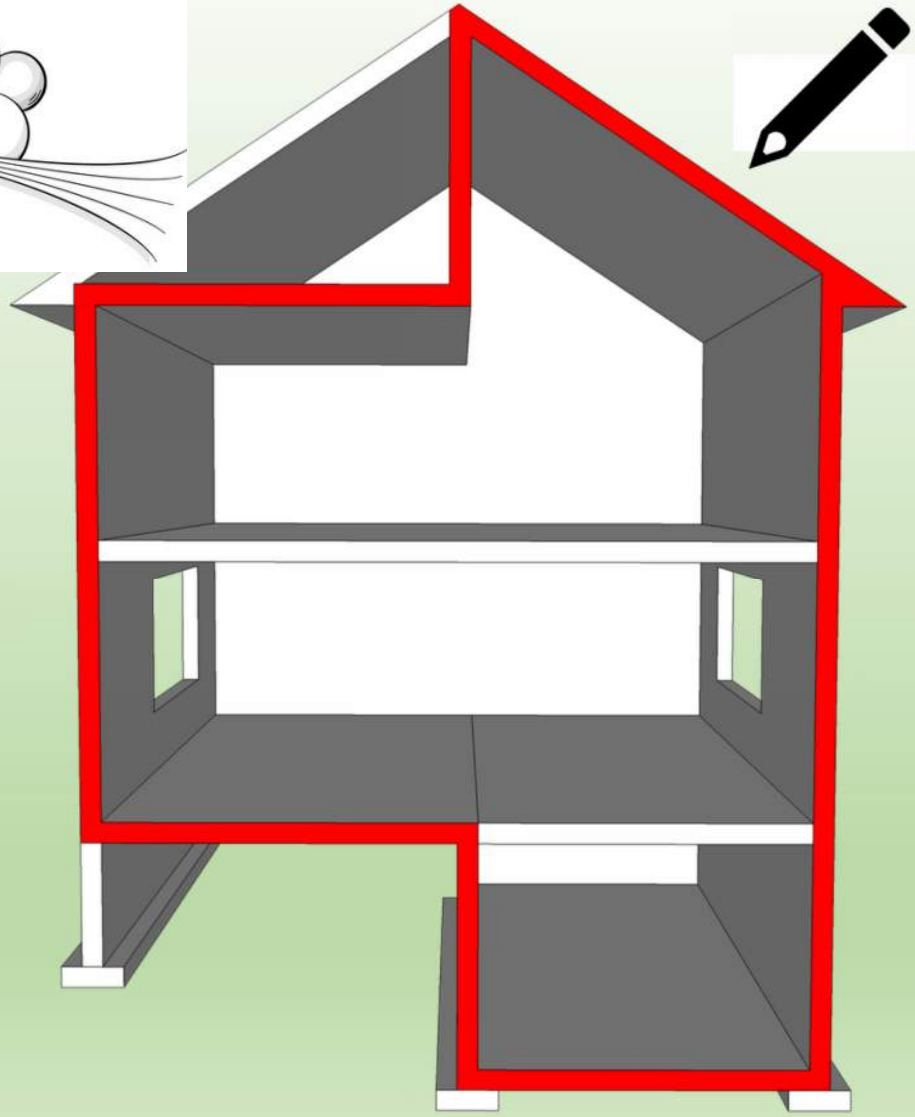


Water

Air



3. 3rd Party Consultant & Construction Team Review

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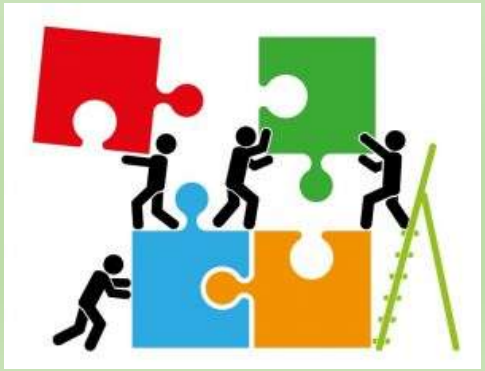
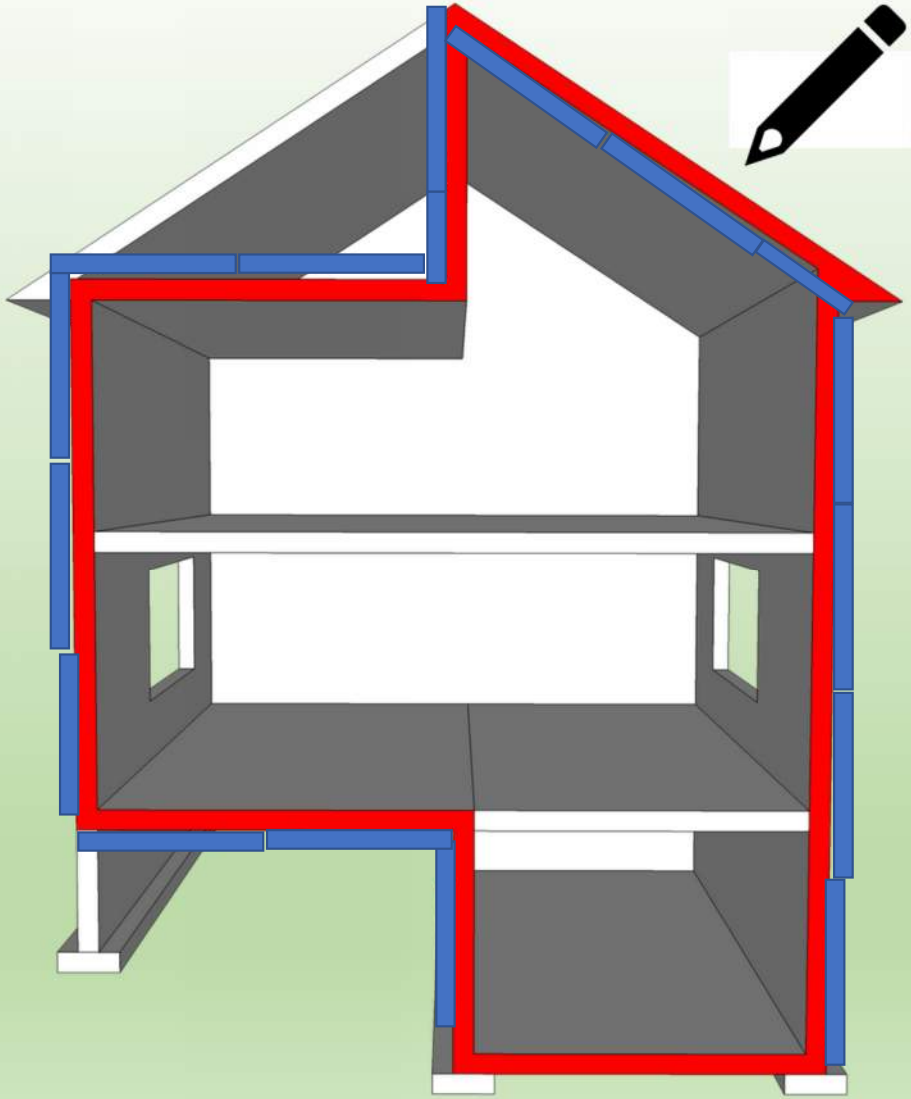


Water

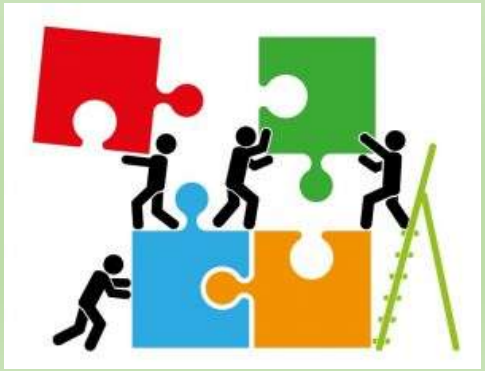
Air

Thermal



2. 3rd Party Consultant & Construction Team Review

CABS
Certified Air Barrier Specialist



Water

Air

Thermal

Vapor

3. 3rd Party Consultant & Construction Team Review

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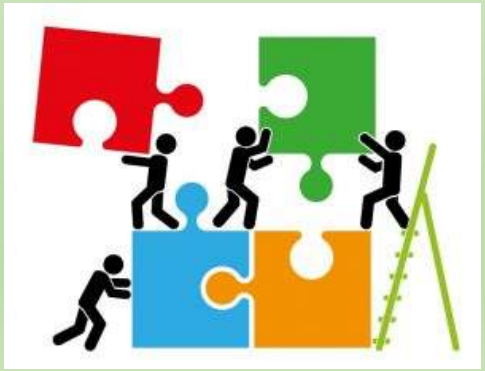
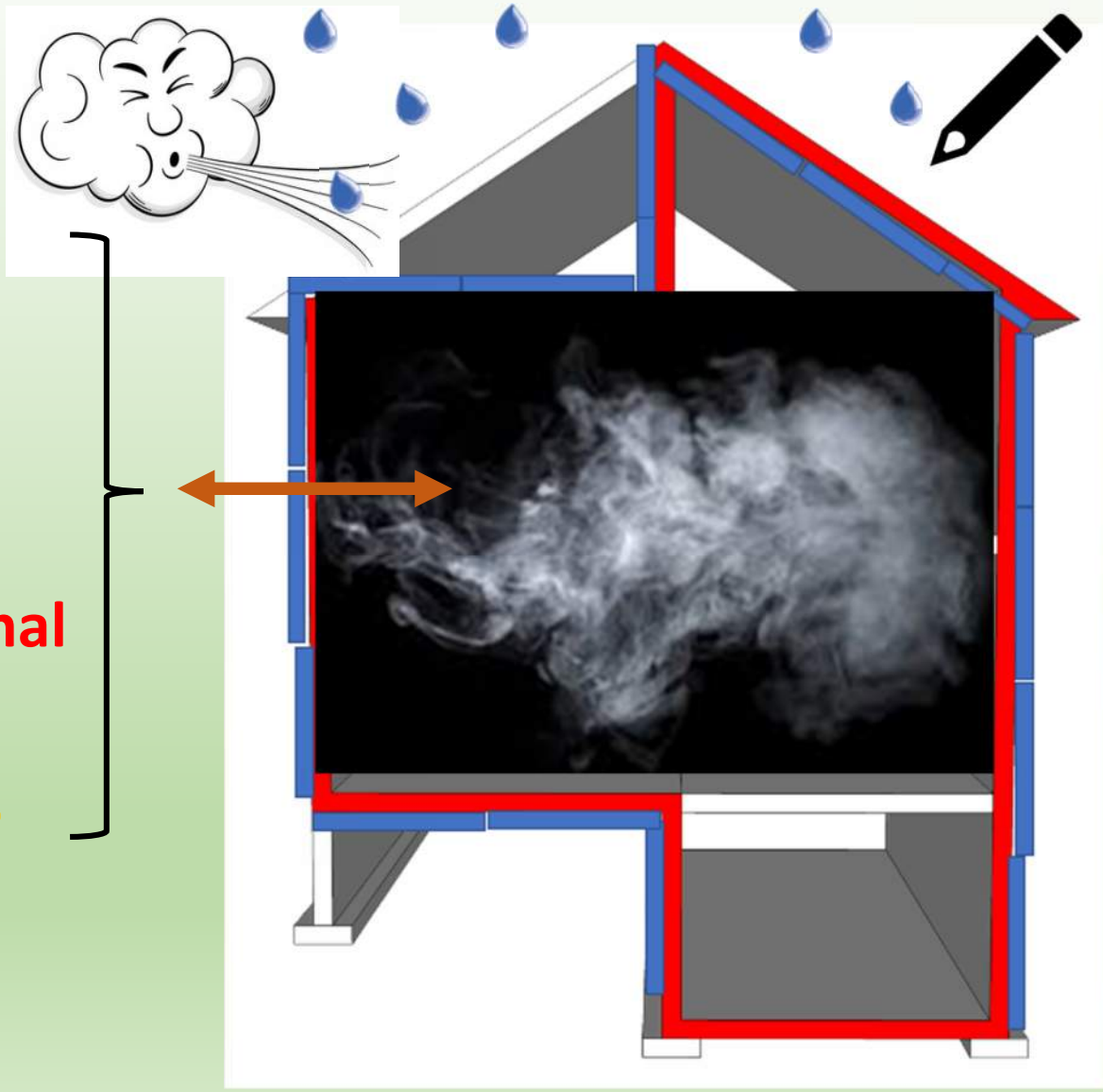


Water

Air

Thermal

Vapor



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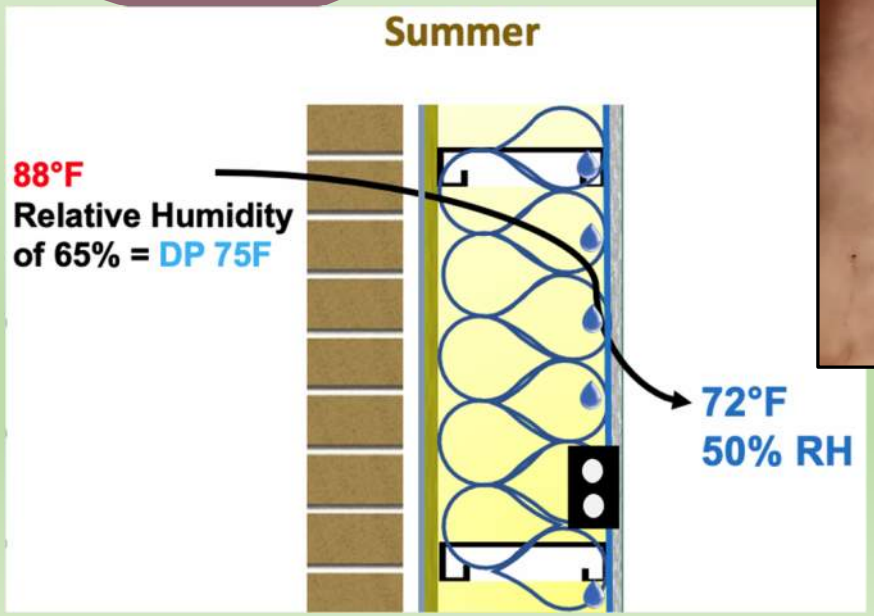

Building Located Milwaukee WI

3. 3rd Party Consultant & Construction Team Review

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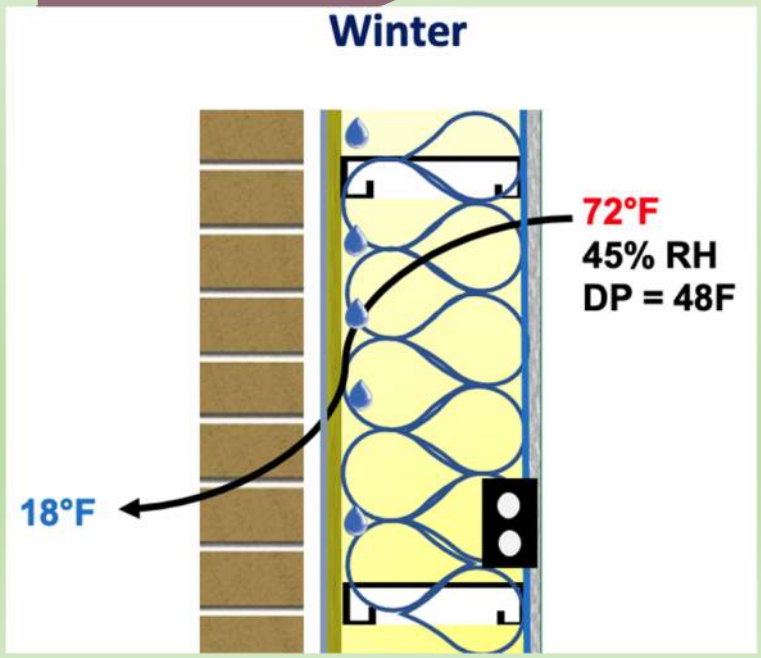
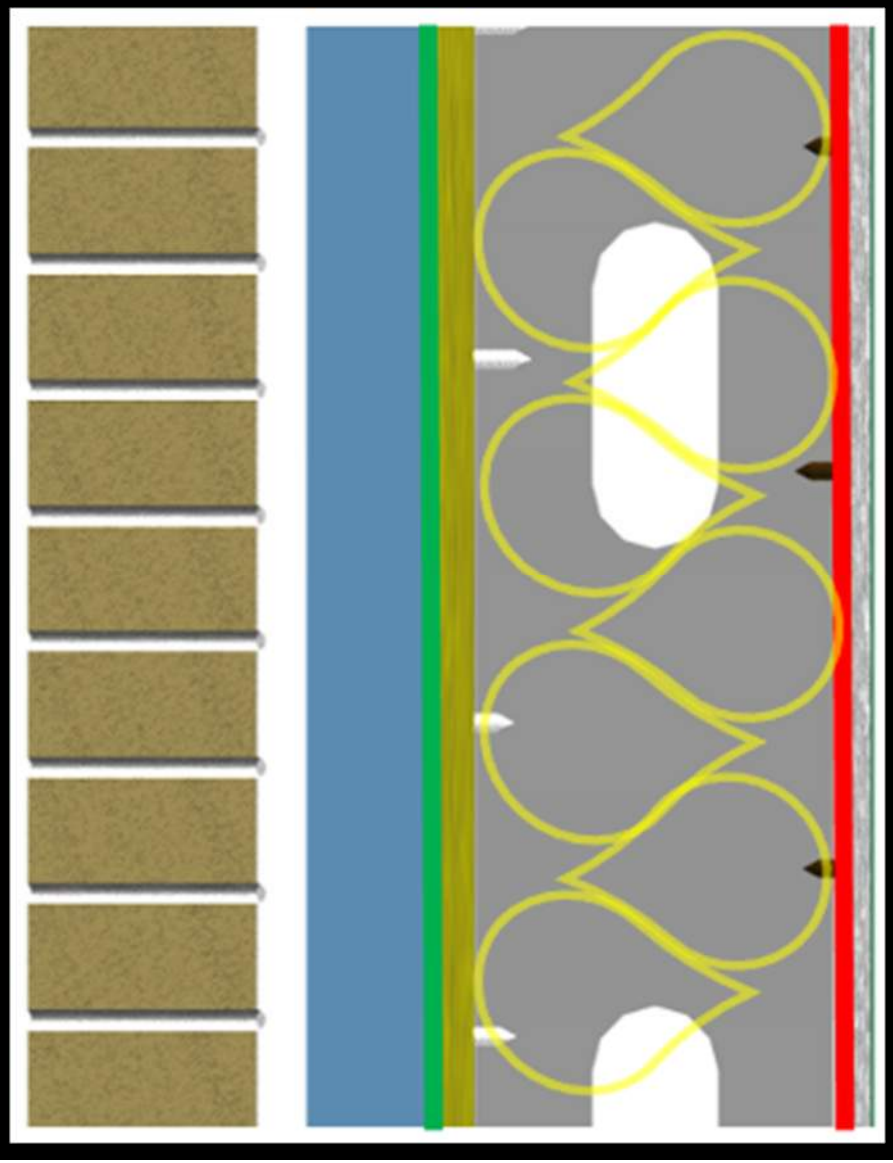
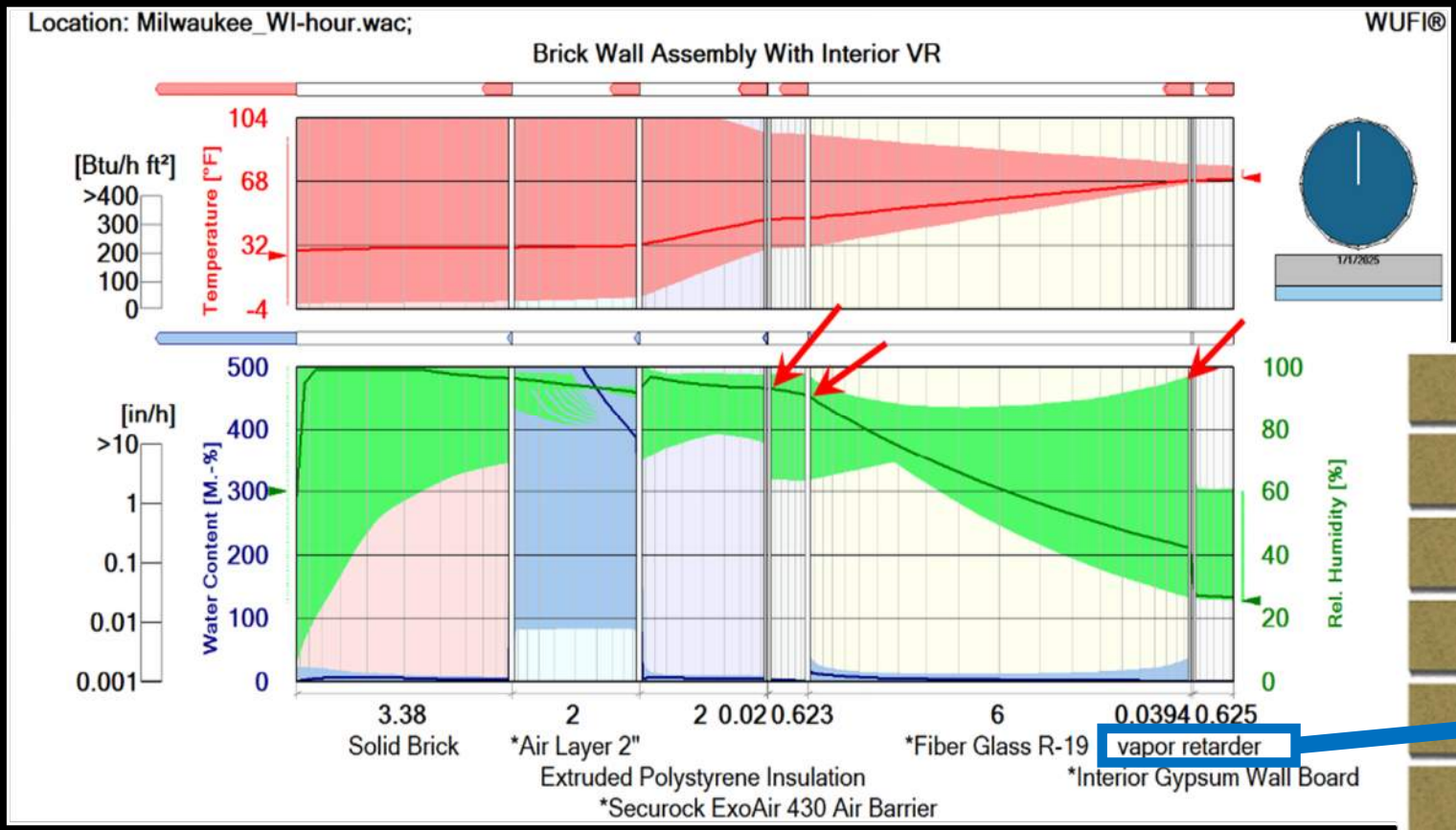


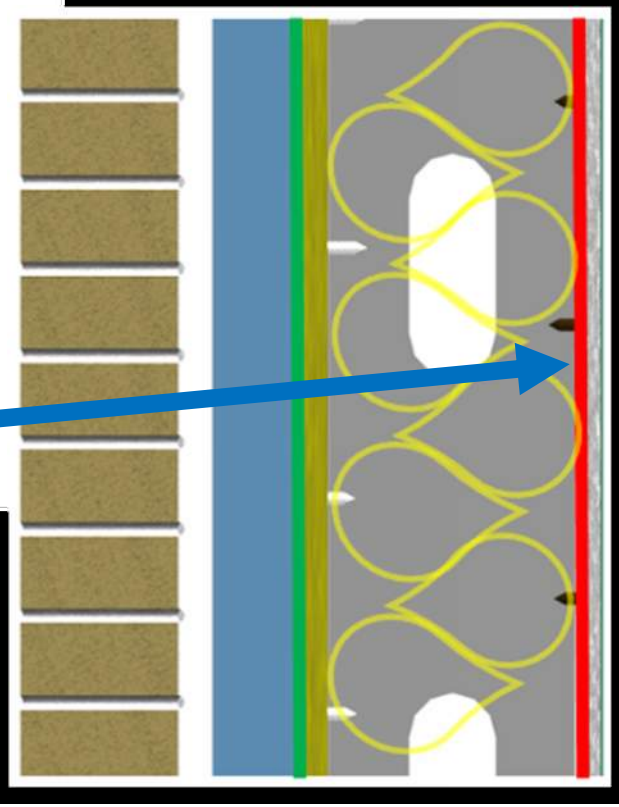
WUFI

Wall Design

Brick
Air Space
Rigid Insulation
Air Barrier
Exterior Sheathing
6” Metal Studs
R19 Batt Insulation
Class 1 Vapor Retarder
Interior Drywall
Latex Paint




Location: Milwaukee_WI-hour.wac;
WUFI®
Brick Wall Assembly With Interior VR
[Btu/h ft²]
>400
300
200
100
0
Temperature [°F]
104
68
32
-4
[in/h]
>10
1
0.1
0.01
0.001
Water Content [M.-%]
500
400
300
200
100
0
Rel. Humidity [%]
100
80
60
40
20
0
3.38
Solid Brick
2
*Air Layer 2"
2
0.02
0.623
Extruded Polystyrene Insulation
*Securock ExoAir 430 Air Barrier
6
*Fiber Glass R-19
0.0394
vapor retarder
0.625
*Interior Gypsum Wall Board



WUFI


Location: Milwaukee_WI-hour.wac;
WUFI®
Brick Wall Assembly
[Btu/h ft²]
>400
300
200
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0
Temperature [°F]
104
68
32
-4
12/31/2019
[in/h]
>10
1
0.1
0.01
0.001
Water Content [M.-%]
500
400
300
200
100
0
Rel. Humidity [%]
100
80
60
40
20
0
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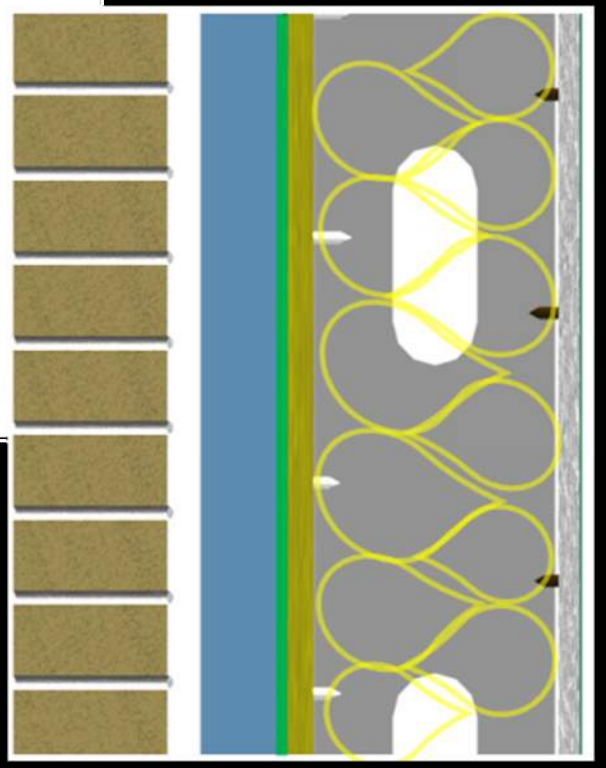


WUFI

WUFI

With 6 Mil Poly Vapor Retarder on Interior

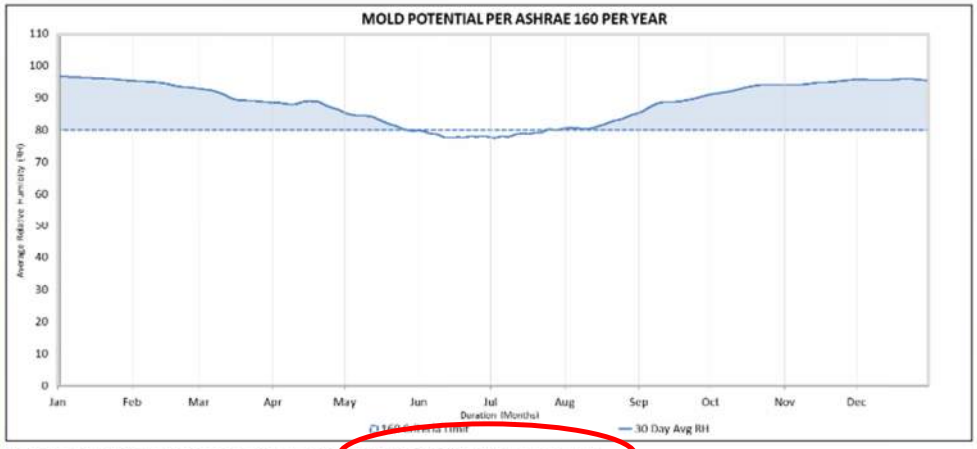


Figure 7: Exterior Gypsum Sheathing ASHRAE 160 Criteria: **Fail**

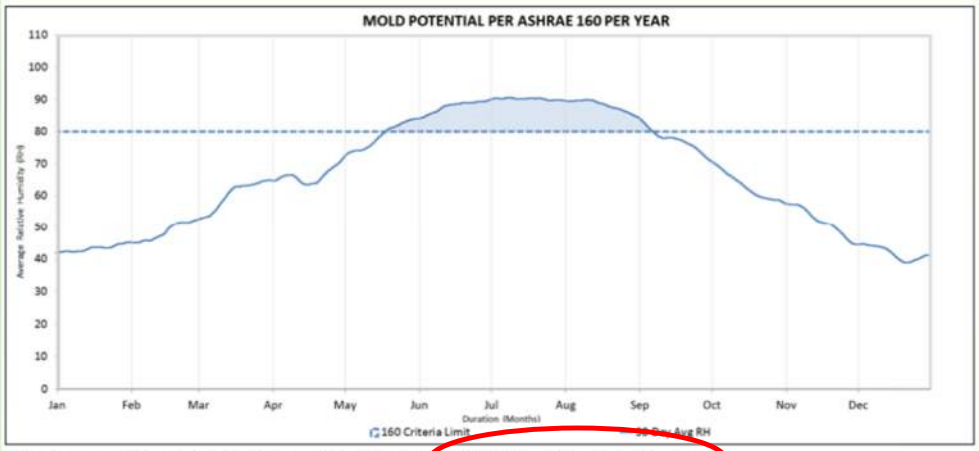


Figure 9: Interior surface of fiberglass Insulation ASHRAE 160 Criteria: **Fail**

Without 6 Mil Poly on Interior

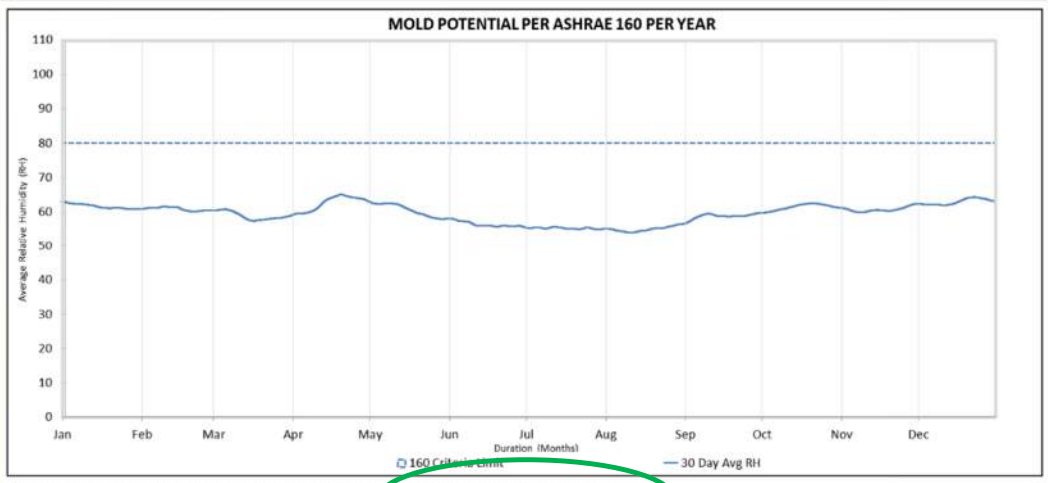


Figure 5: Exterior Gypsum Sheathing ASHRAE 160 Criteria: **Pass**

WUFI Run against ASHRAE 160 criteria

WUFI

2015 IBC

1405.3 Vapor retarders.

Vapor retarders as described in Section 1405.3.3 shall be provided in accordance with Sections 1405.3.1 and 1405.3.2 or an approved design using accepted engineering practice for hygrothermal analysis.

	Wall Type 1
Material	**Thickness**
	Exterior
Extruded Brick*	3 3/8"
Air space	2"
Extruded Polystyrene (Continuous)	2"
WRB (Securock ExoAir 430)	0.02"
Gypsum Sheathing (Securock ExoAir 430)	0.625"
Steel Stud Wall Construction/Fiberglass Batt Insulation	6"
Interior Gypsum Wall Board	5/8"

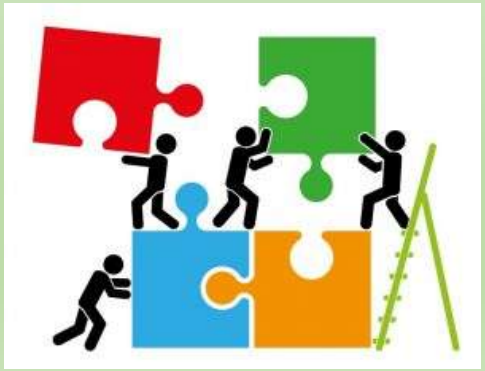
Environmental Conditions

The following are the environmental conditions utilized in the evaluation.

- Interior
  - Temperature: Variable 70°F - 75°F (winter to summer).
  - Relative Humidity: Variable 25%-60% (winter to summer).
- Exterior
  - Climate data is provided by a weather station for Milwaukee, WI.
  - Data from Meteonorm (weather file software).

3. 3rd Party Consultant & Construction Team Review

CABS
Certified Air Barrier Specialist



Compatibility

Flashing	Arcylic LAB	Asphalt LAB	Polyether LAB	Silicone LAB	Peel & Stick Asphalt Membrane	Peel & Stick Butyl Membrane	Spray Polyurethane Foam	Polystyrene board	Polyiso Board
Copper asphalt									
Copper drainage									
Copper fabric (asphalt)									
Copper fabric (non-asphaltic)									
Copper sheet metal									
EPDM									
EPDM SA (asphalt)									
PVC									
PVC Kee									
PVC Kee SA (asphalt)									
Rubberized asphalt peel & stick									
Stainless steel drainage									
Stainless steel fabric									
Stainless steel self-adhered									
Stainless Steel sheet metal									

Not Compatible
Caution
Compatible

abaa EDUCATION

From the ABAA's Flashings and Terminations Committee

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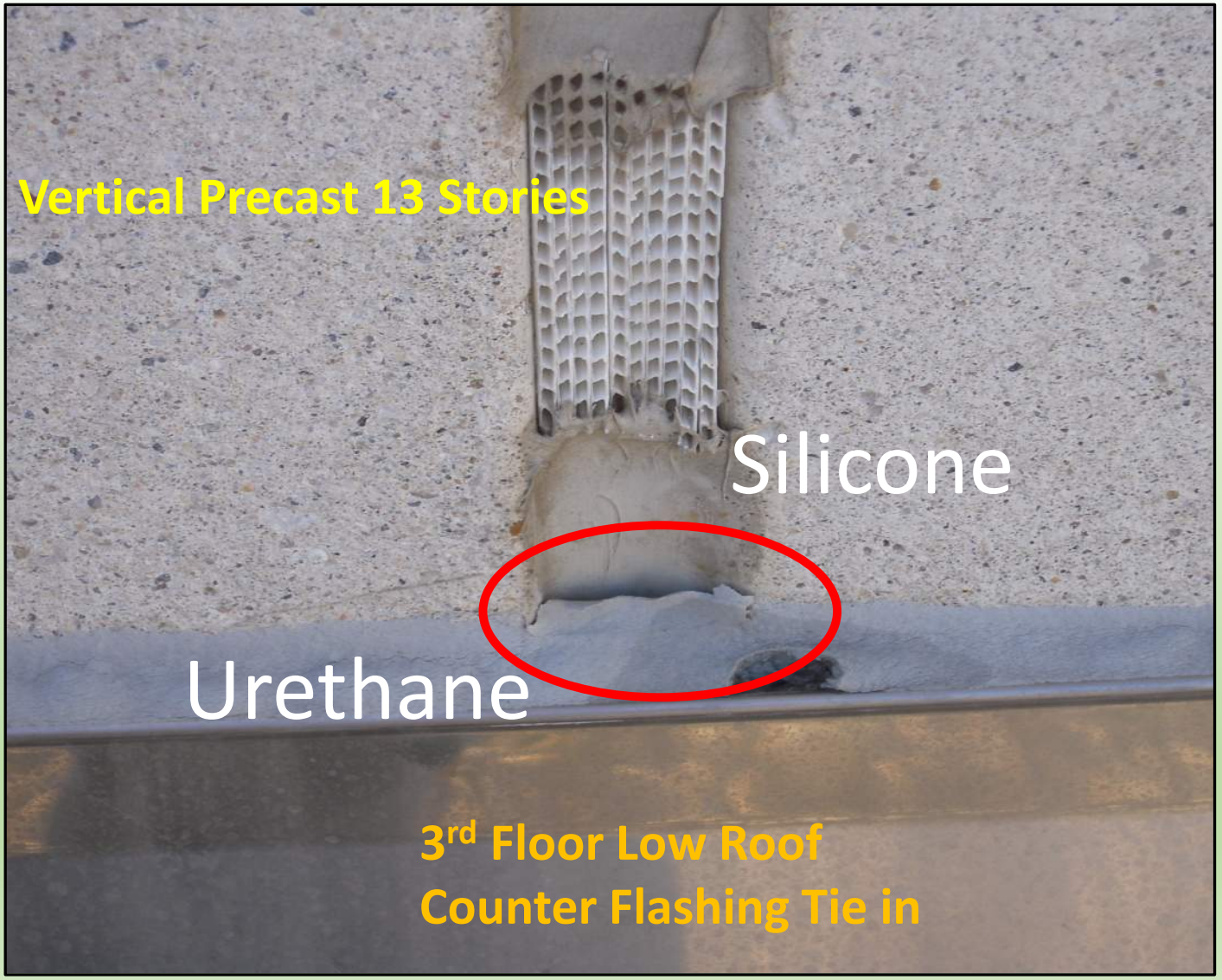

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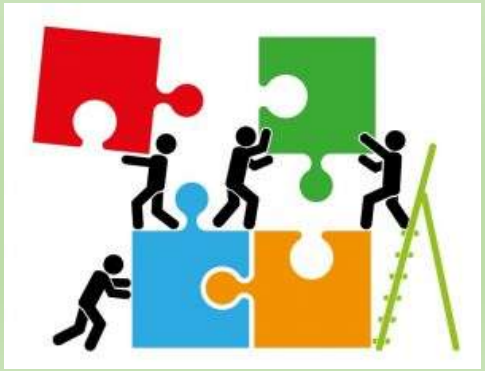
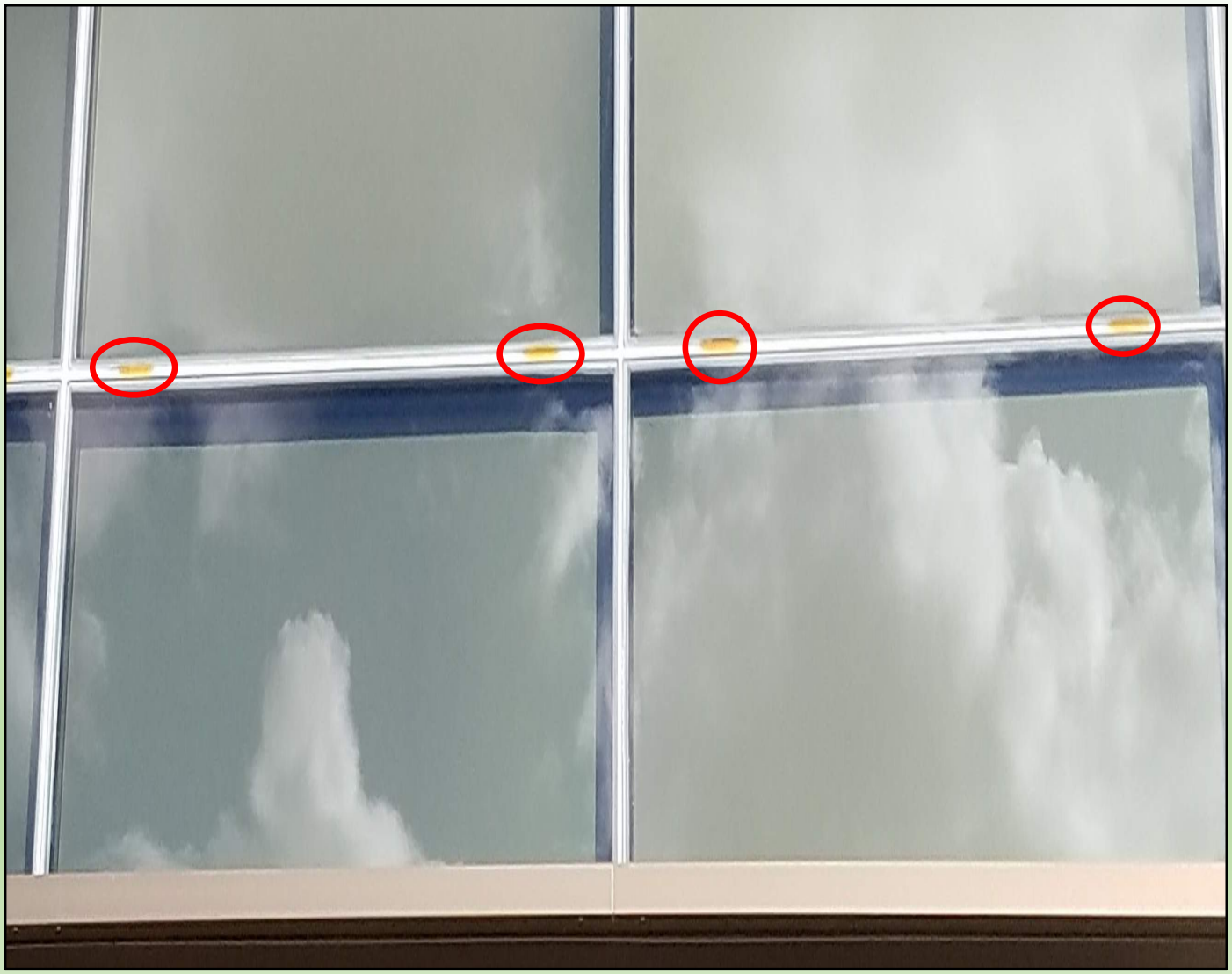
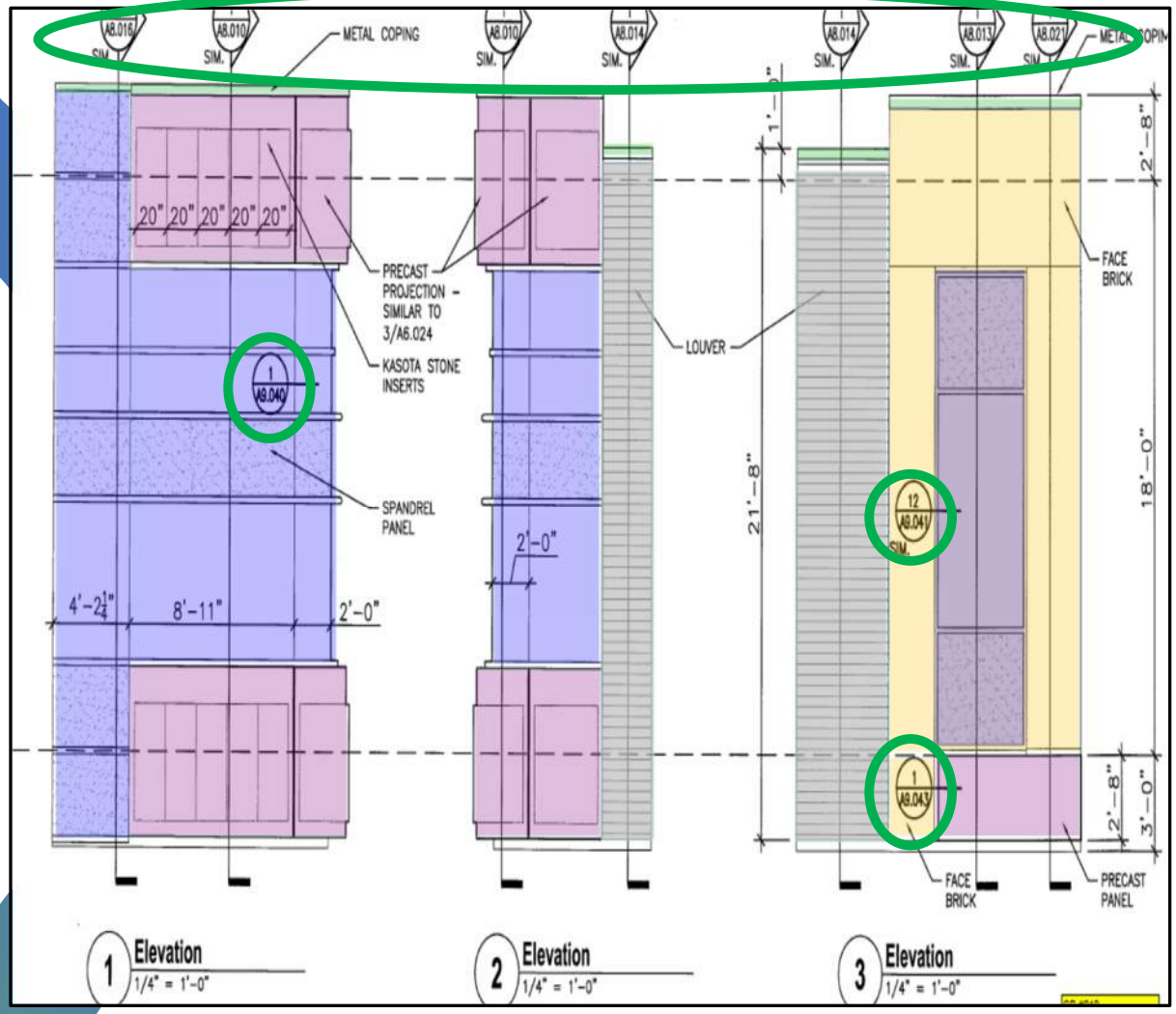




4. Mockup Pre-Construction Meeting

4. Mockup Pre
Construction Meeti



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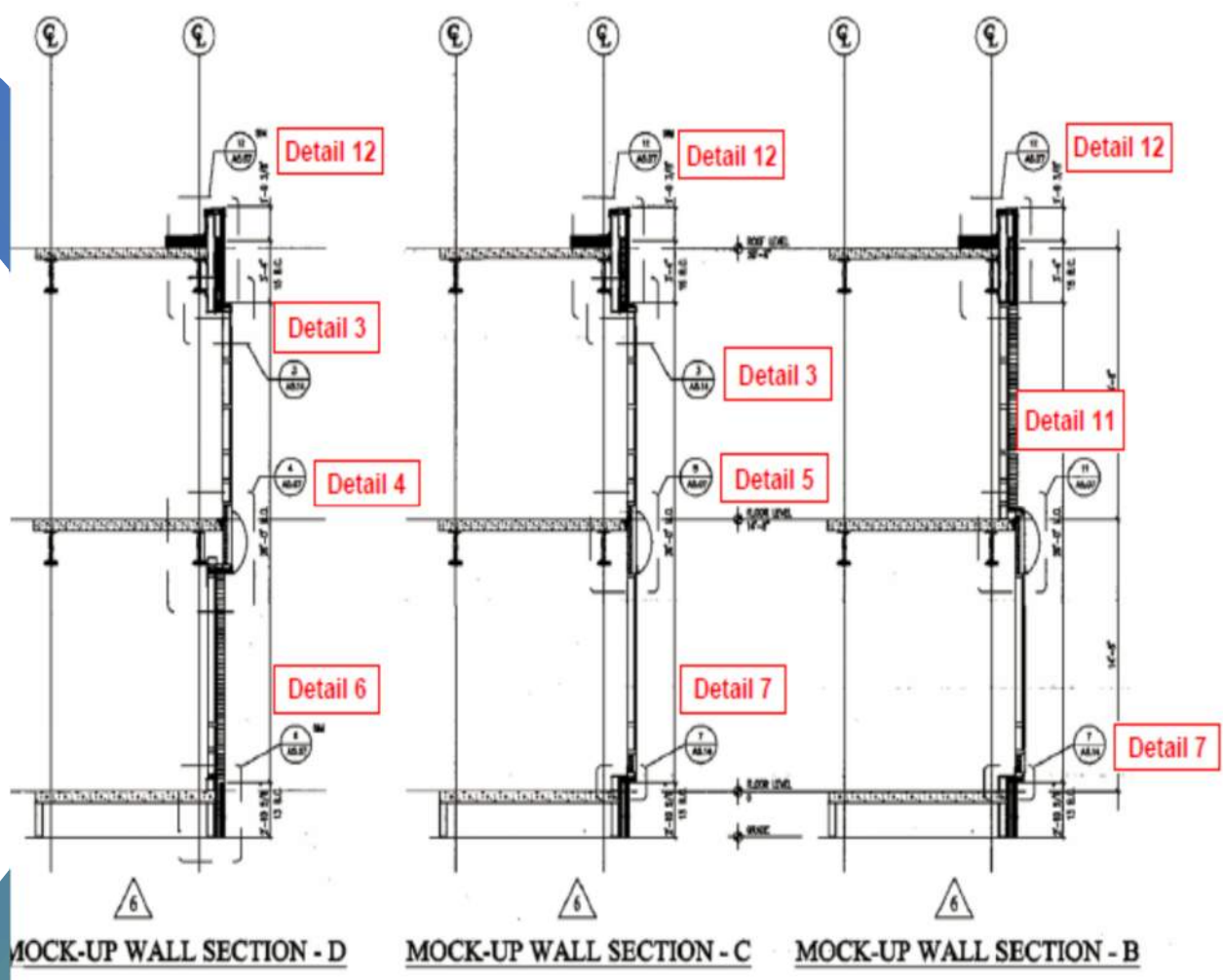
Construction Meeti



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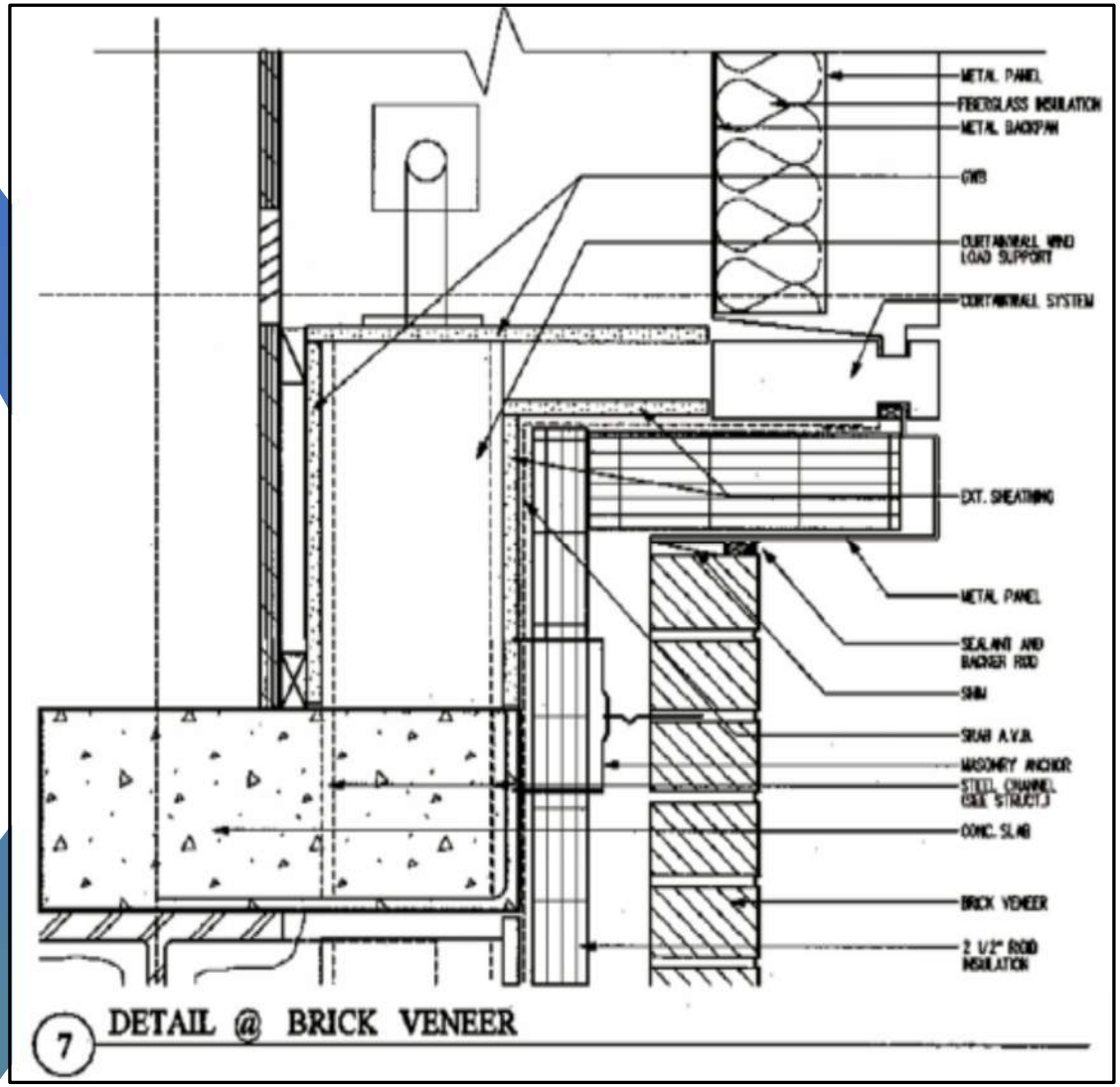
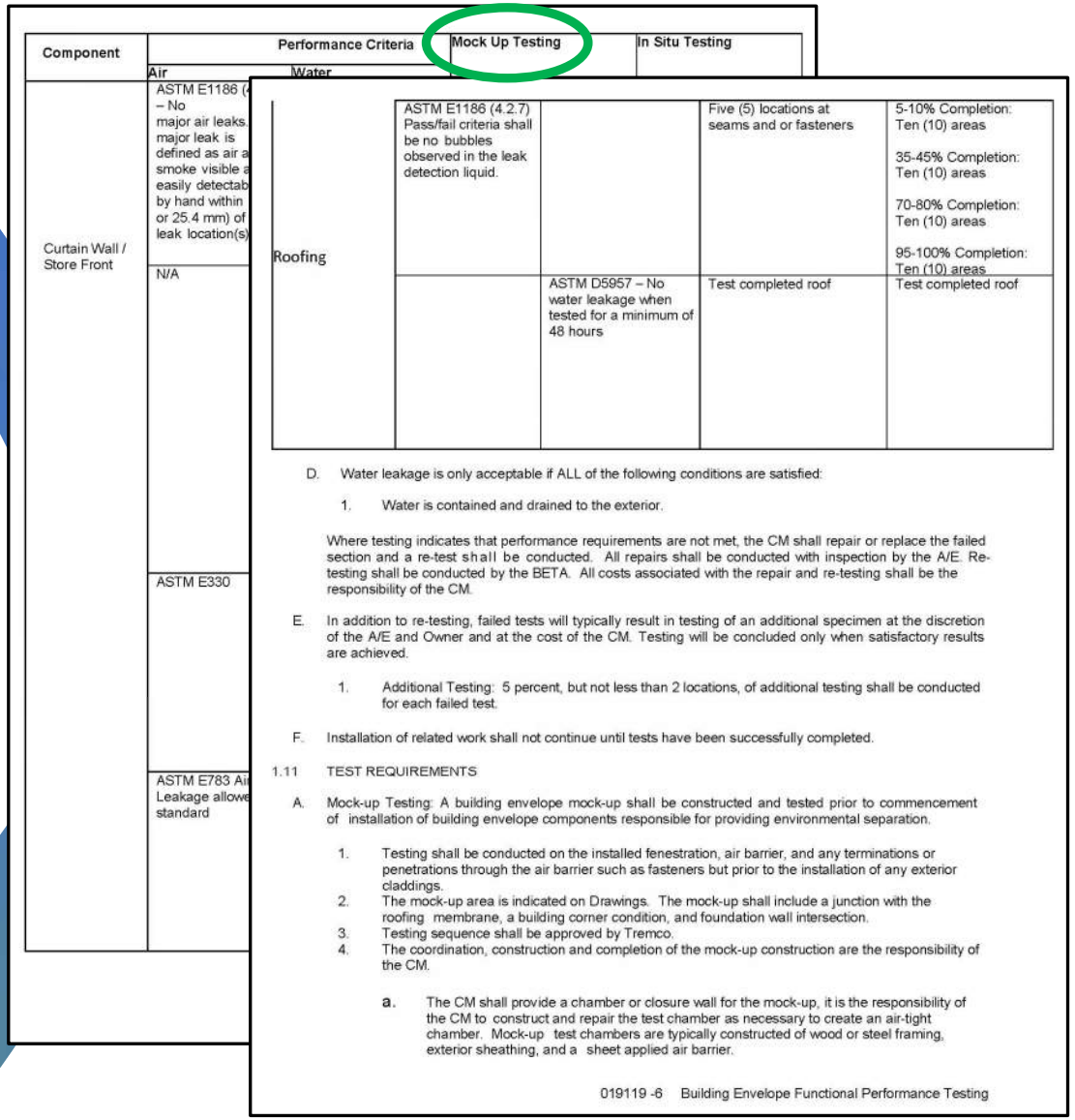
Construction Meeti



4. Mockup Pre
Construction Meeti

4. Mockup Pre
Construction Meeti



Component	Performance Criteria		Mock Up Testing	In Situ Testing
	Air	Water		
Curtain Wall / Store Front	ASTM E1186 (4 – No major air leaks. major leak is defined as air a smoke visible a easily detectab by hand within or 25.4 mm) of leak location(s)			
	N/A			
	ASTM E330			
	ASTM E783 Ai Leakage allowe standard			
Roofing		ASTM E1186 (4.2.7) Pass/fail criteria shall be no bubbles observed in the leak detection liquid.	Five (5) locations at seams and or fasteners	5-10% Completion: Ten (10) areas 35-45% Completion: Ten (10) areas 70-80% Completion: Ten (10) areas 95-100% Completion: Ten (10) areas
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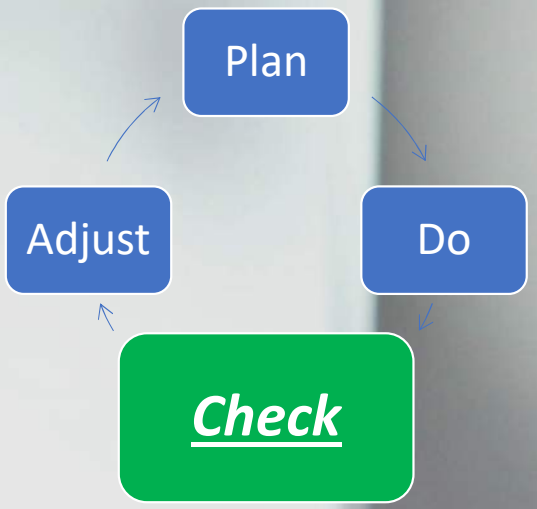
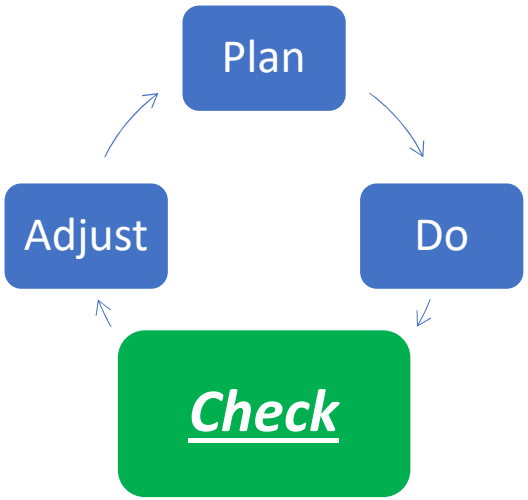
019119 -6 Building Envelope Functional Performance Testing

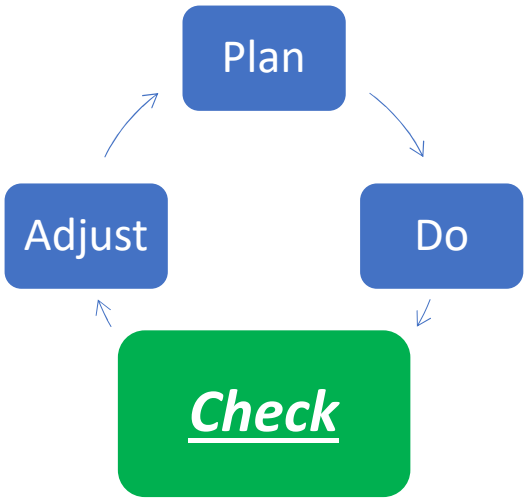
4.1 Mockup - Build / Test / Root Cause / Retest



4.1 Mockup - Build / Test / Root Cause / Retest



4.1 Mockup - Build / Test / Root Cause / Retest



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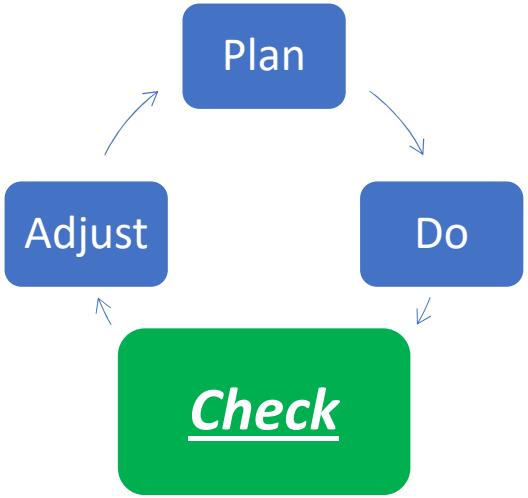
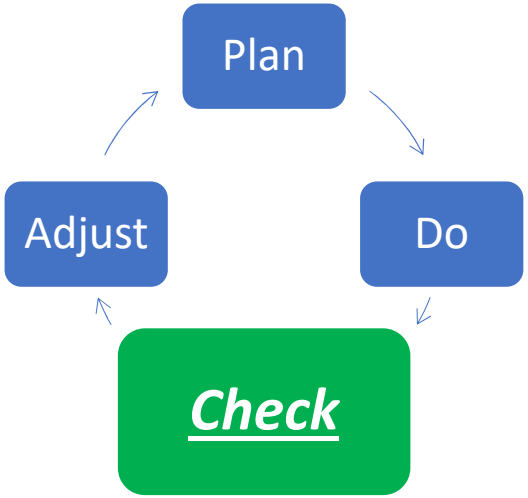
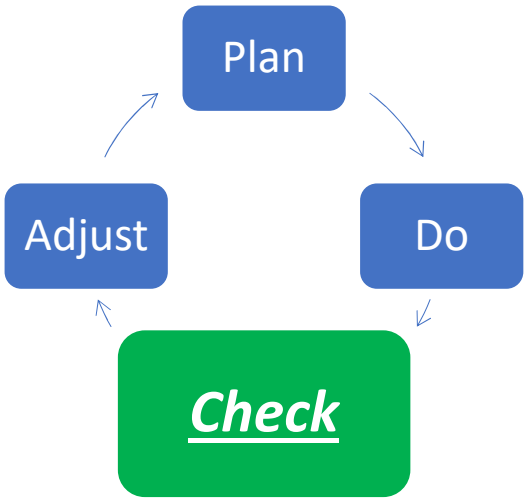


4.1 Mockup - Build / Test / Root Cause / Retest



4.1 Mockup - Build / Test / Root Cause / Retest



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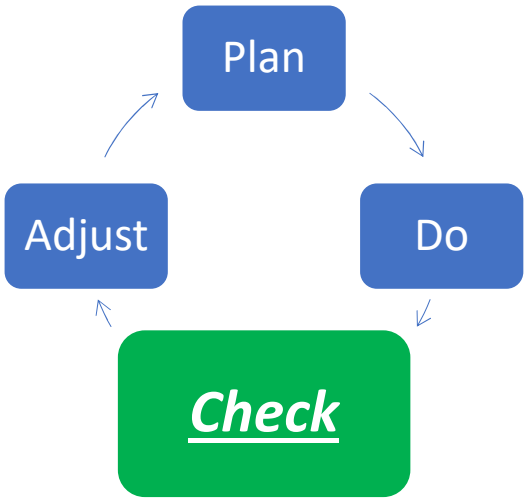

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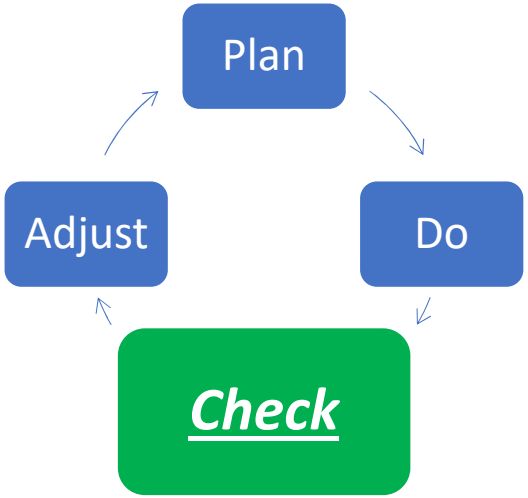

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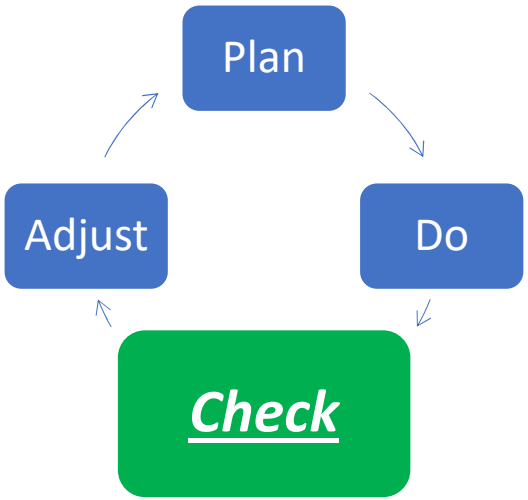

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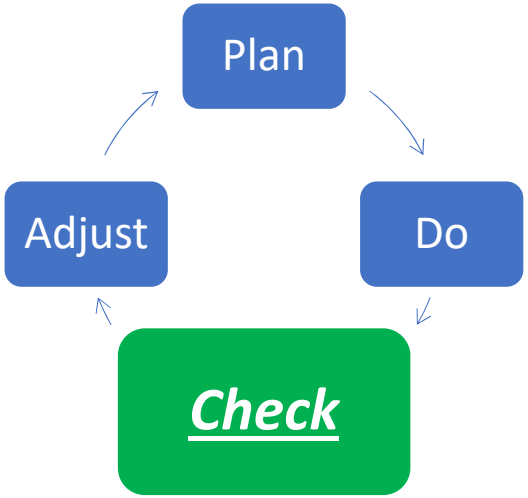

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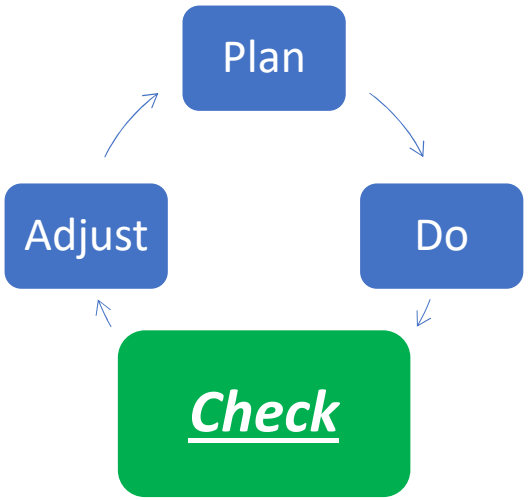

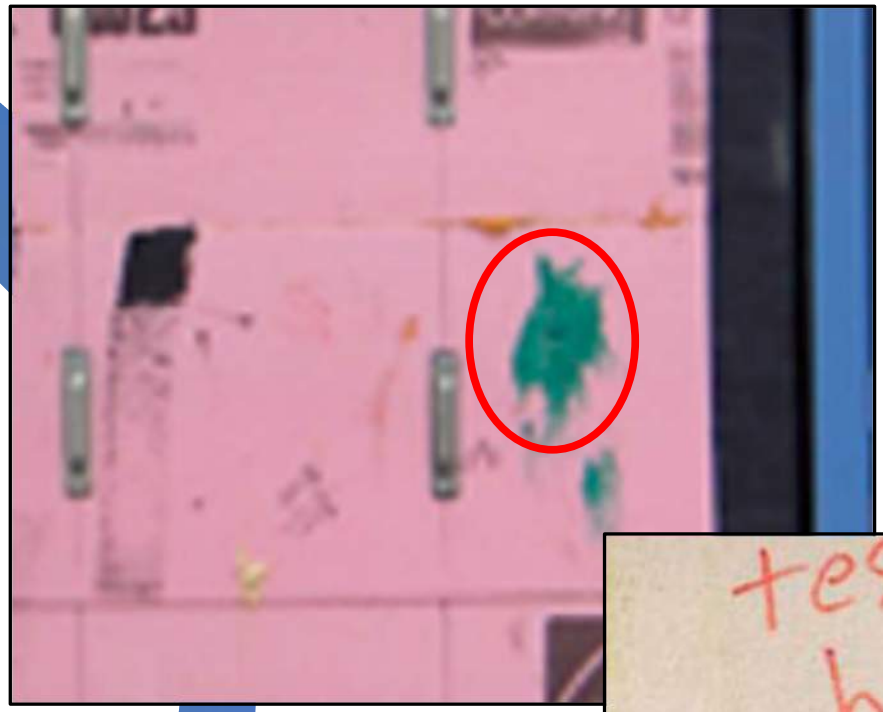

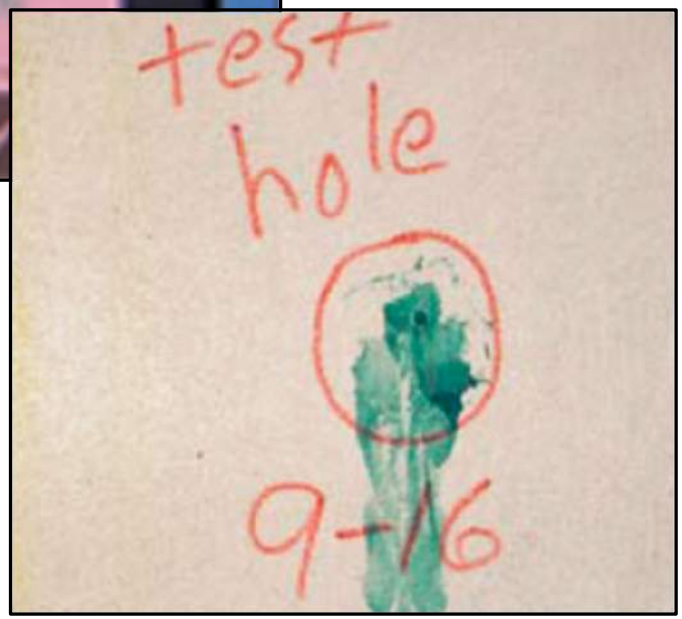

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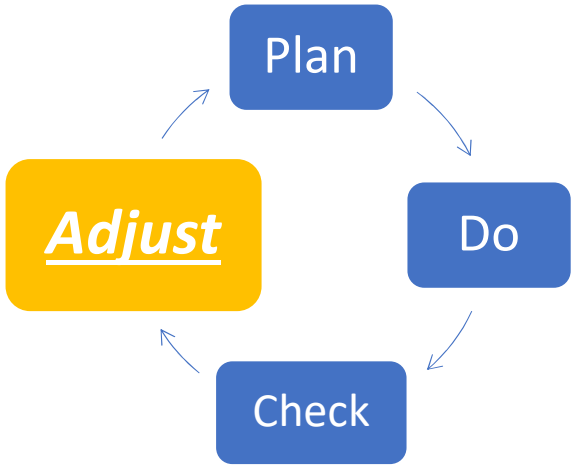

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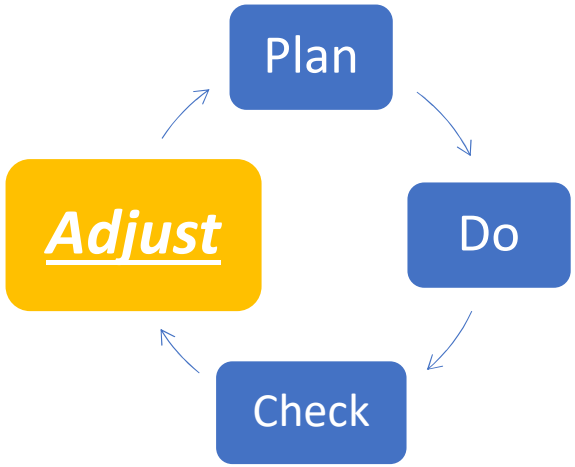

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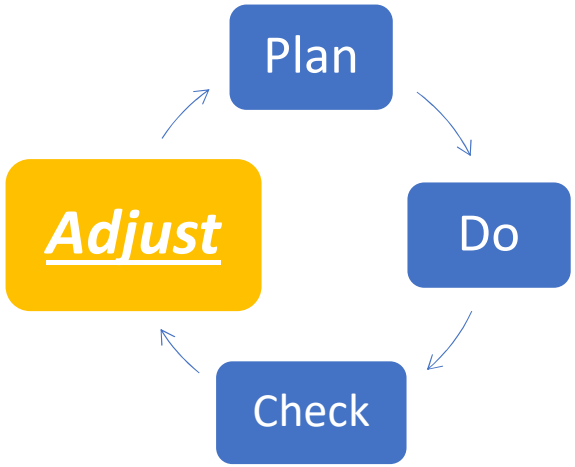

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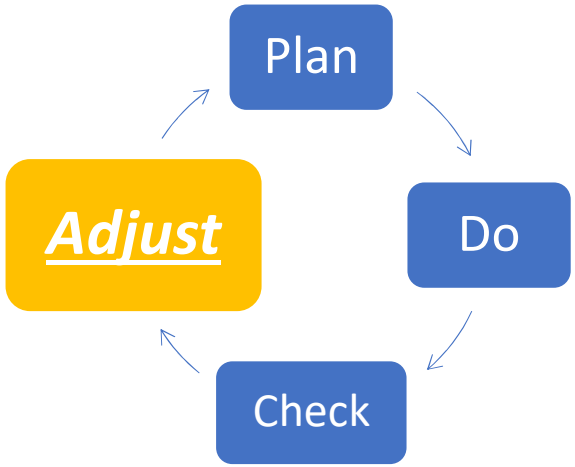
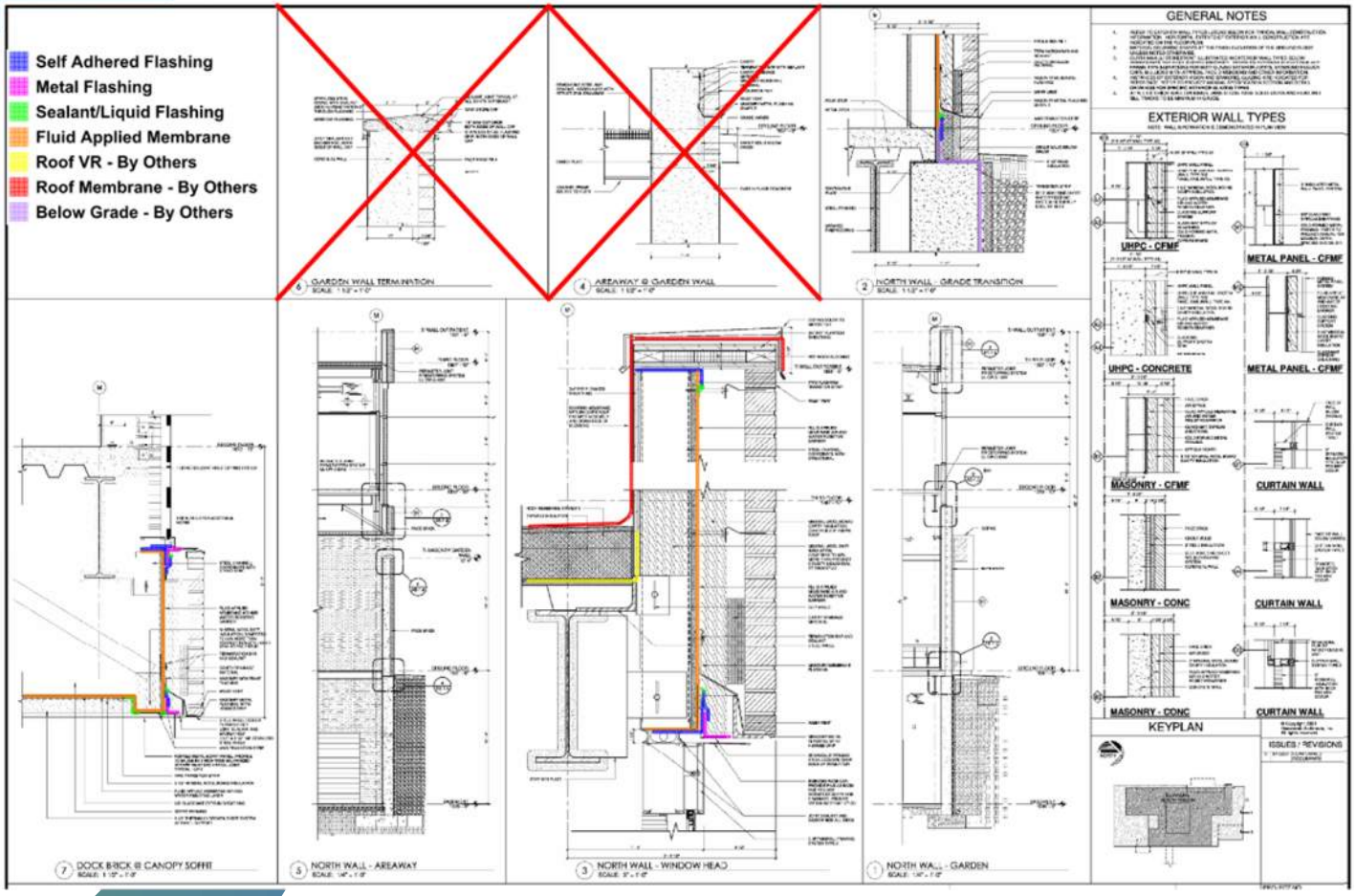
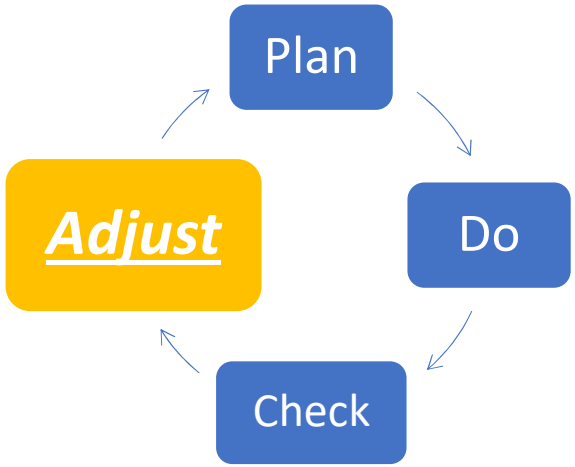
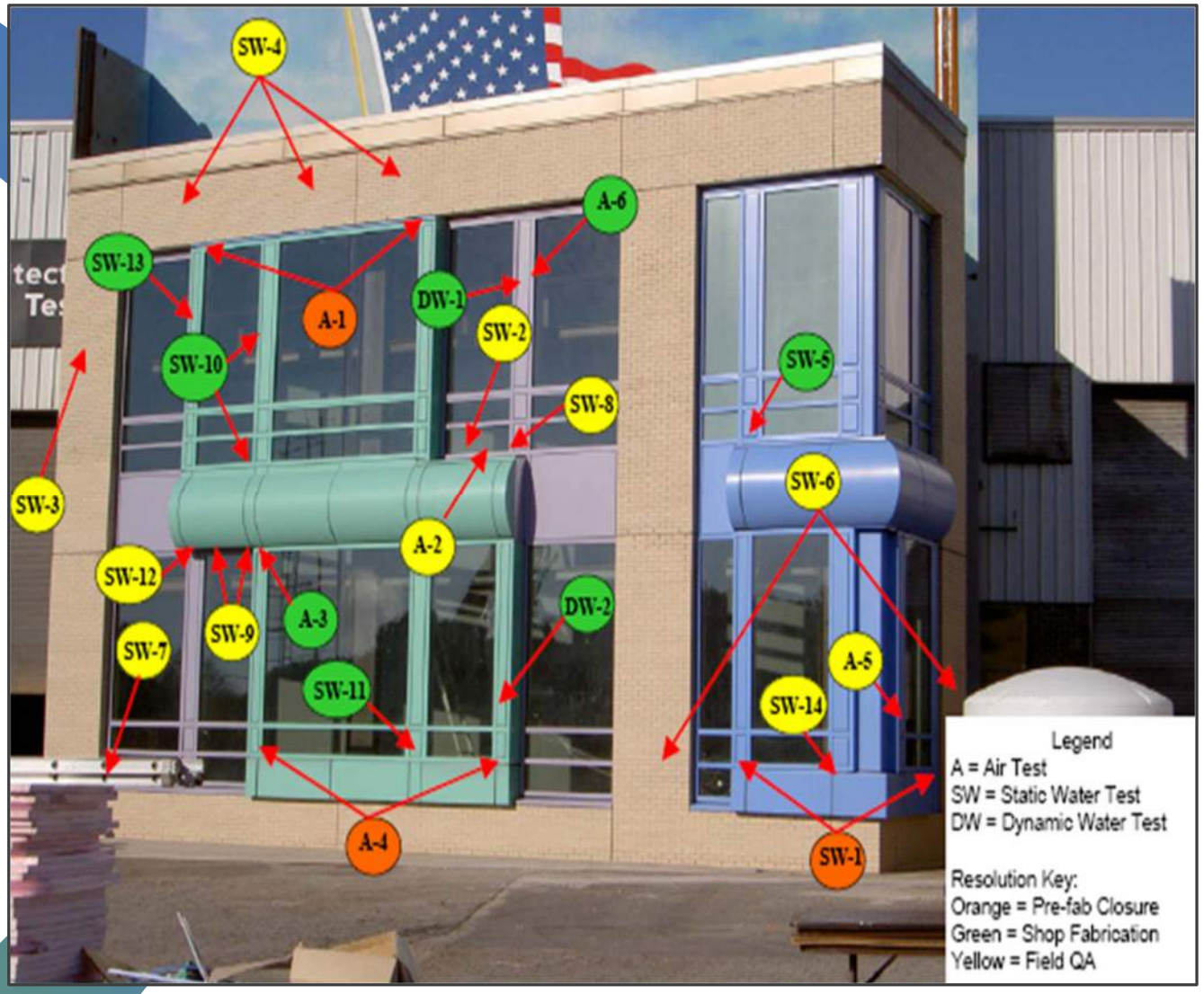




Shop Drawing Curtesy of Matthew Giambrone
OCP Contractors

4.1 Mockup - Build / Test / Root Cause / Retest



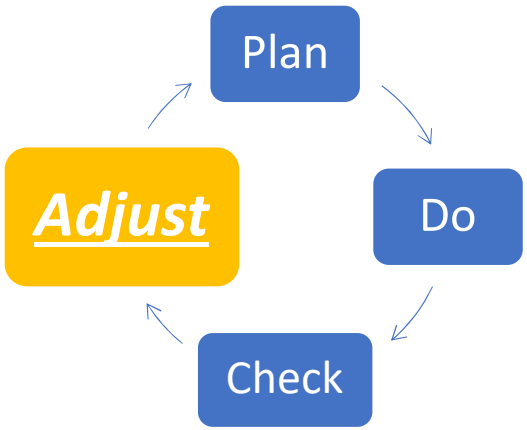


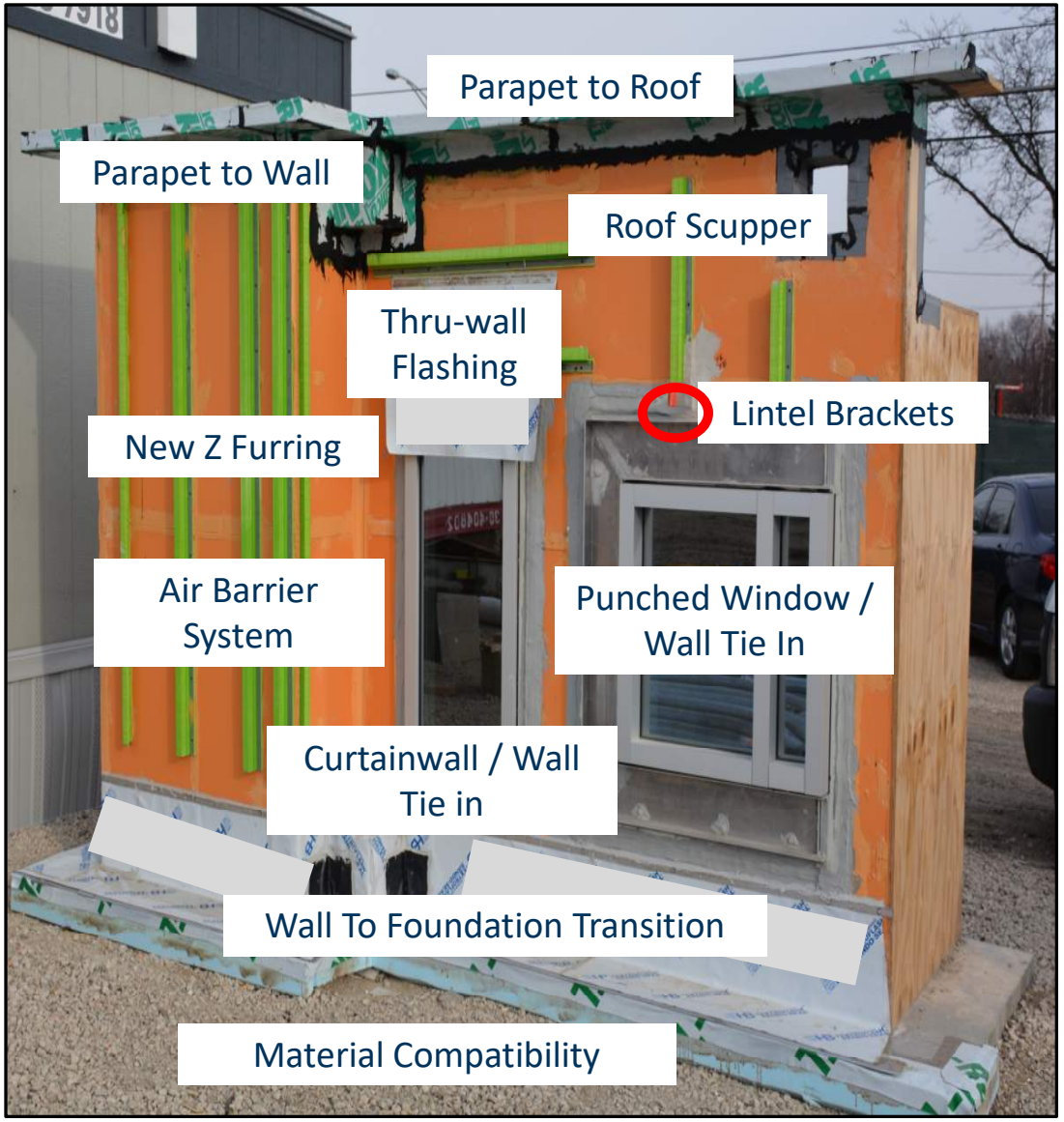
Mockup Costs……..

$14 M Project:
On Site Mockup = $12,500.

SO…Less than 0.1% of Construction Costs:

- **Validate Design**
- **Assist Construction Sequencing**
- **Validate Materials to be Used**
- **Validate Performance**
- **Discover Potential Installation Issues**
- **Template for Custom Training Program**





5. Pre-Construction Team Meeting

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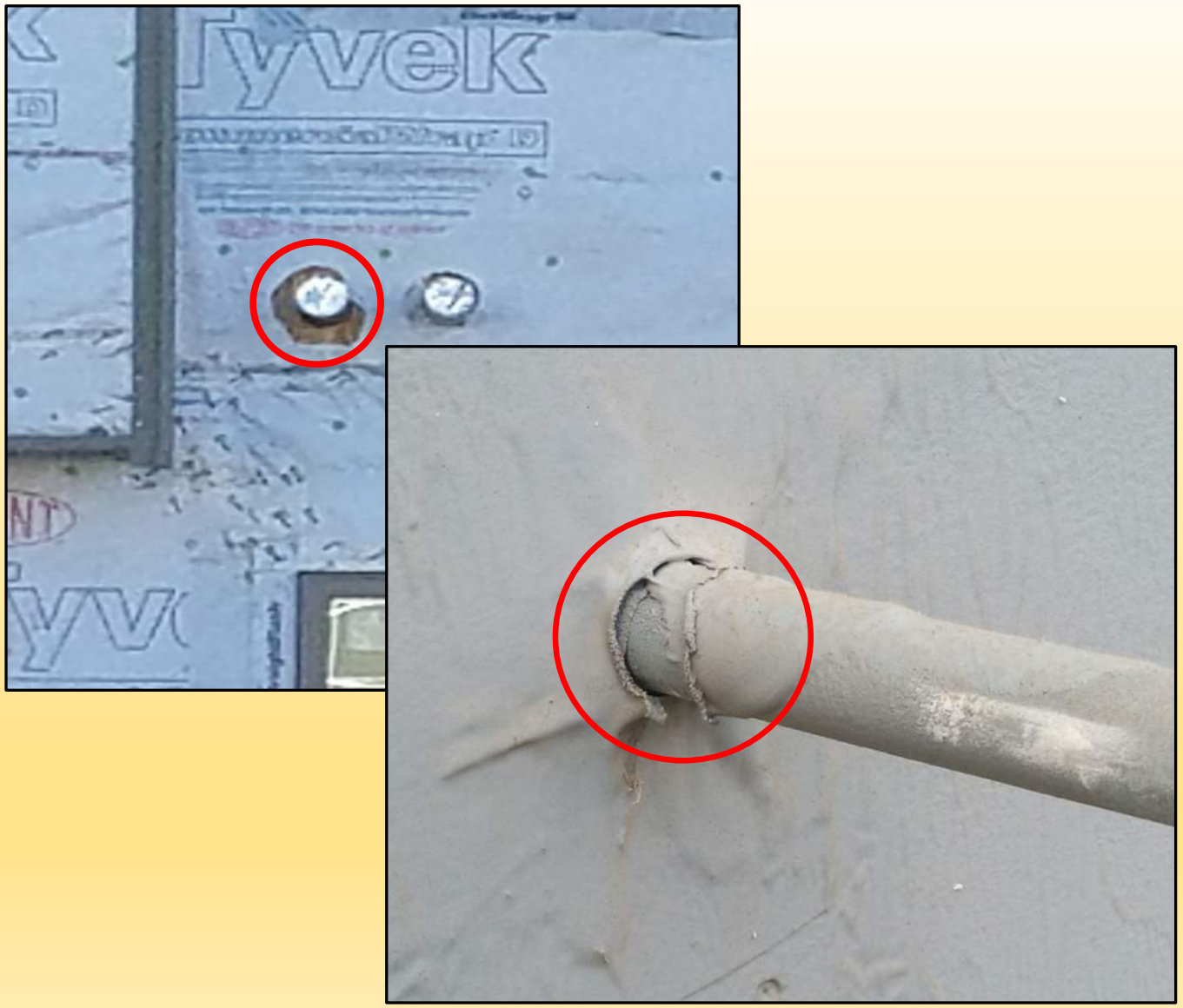

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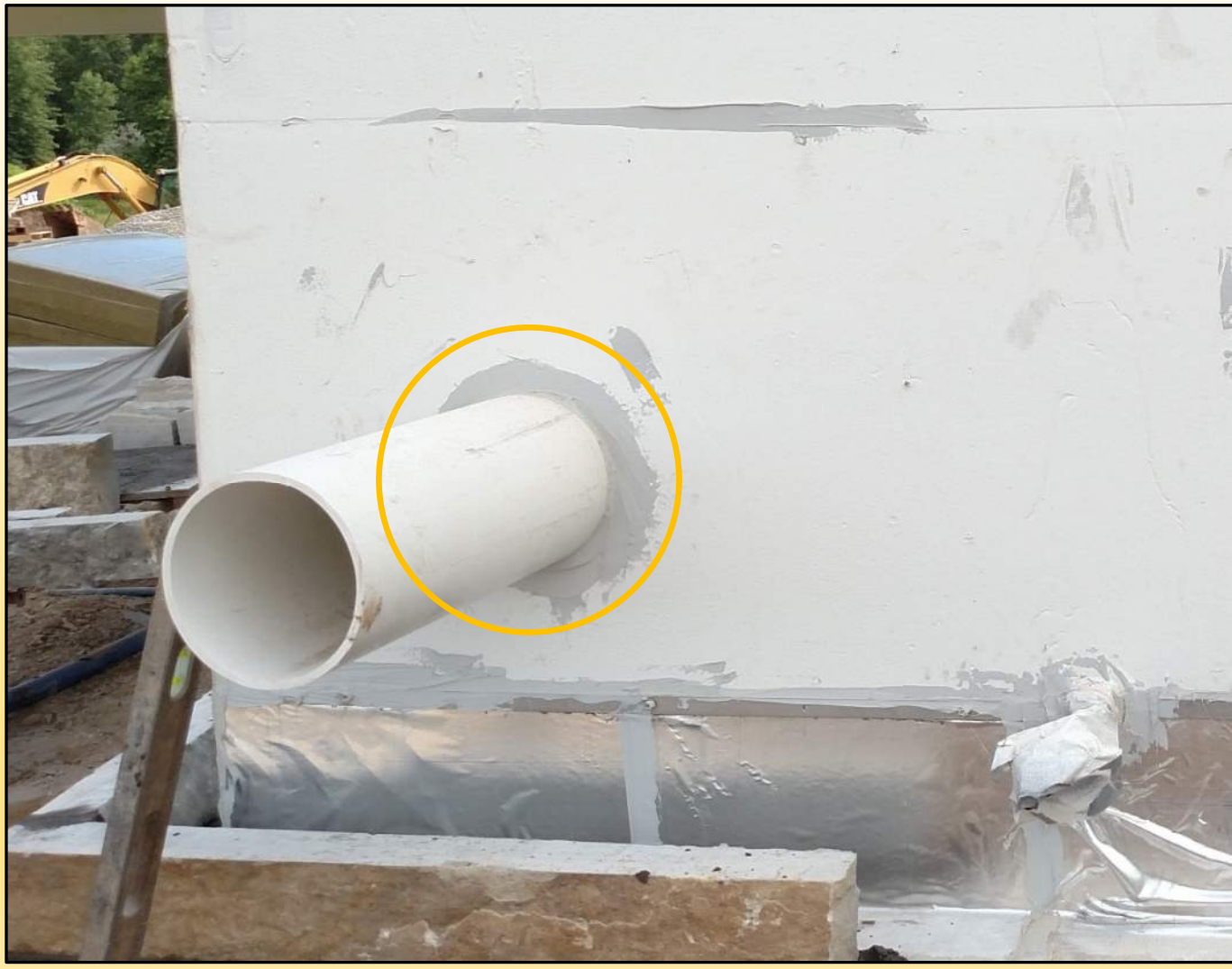


5. Pre-Construction Team Meeting

Above Grade Pre-Construction Meeting

I. Attende

Company/
Air Barrier M
Air Barrier Cor
General Cont
Architec
Owner's R
Insulation Con
Window Cont
Below Gra Waterproof Contracto
Roofing Cont
Masonry Cont
Drywall Cont
Panels/Metal Co
Concrete Cont
Electrica
Plumbing
HVAC /Lou

Above Grade Pre-Construction Meeting

II. Review Air / Vapor Systems Specifications

Componer
Fluid-Applied membrane
Self-adhered membrane
Transition membranes
Self-adhered flashing membra
Primer
Mastic/Termination Sealant
Transition assembly (Silicone
Silicone sealant
Polyurethane sealant

III. Declaring Selected M

Trade
Air barrier manufacturer
Air barrier contractor
Insulation contractor
Window contractor
Waterproofing contractor
Roofing contractor
Masonry contractor
Drywall contractor
Panels/Meal contractor
Concrete contractor

IV. Review Project Dra

Project Drawing
1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

Above Grade Pre-Construction Meeting

V. Review of Construction D

Tie-In Area
Walls to doors & windows
Foundation to walls
Walls to Louvers
Different wall systems
Roofing to walls
Control joints to walls
Wall, floor & roof cross-expansion, joints
Utility pipes and ductwork tying into
Wall & roof over unconditioned spac
Wall to electrical penetrations
Other

Sequencing of the Trades

Work Activity
1.
2.
3.
4.
5.
6.
7.
8.
9.

VI. Other Considerations

A. Substrate primer considerat adhesive primer?

Substrate	No
Glass-Faced Exterior Gypsum	
CMU/Block	
Precast/Concrete	
Metal Panel	
Other	
Other	
Other	

Above Grade Pre-Construction Meeting

B. Substrate Preparation

Type of Joint	Method to be used to close joint	Contractor Responsible for Preparation

Substrate	Contractor Responsible for Preparation
Glass-Faced Exterior Gypsum	
CMU/Block (should be free of voids)	
Precast/Concrete	
Metal Panel	
Other	

C. Monitoring Installation Temperatures

Product/System	Proper Temperature Range	Contractor Responsible for Verification / Tracking Log
Fluid-applied membrane		
Self-adhered membrane		
Self-adhered transition membrane		
Self-adhered flashing membrane		
Glass-Faced Exterior Gypsum		
Silicone sealant		
2-part Polyurethane Sealant		
Other		

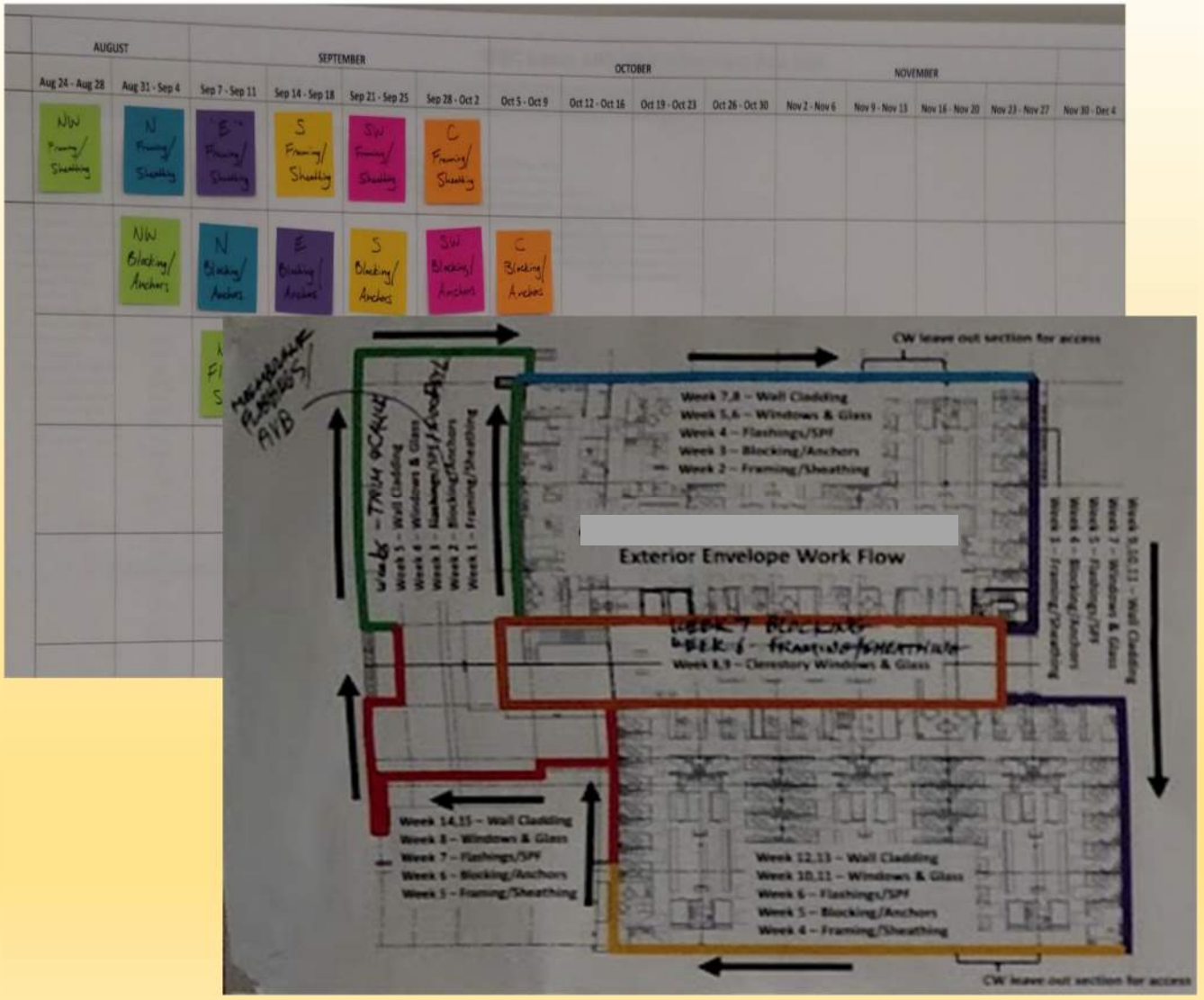
D. Air Barrier Compatibility with Thru-Wall Flashing

Task	Contractor Responsible	By When
Assure compatibility with thru-wall flashing system		
Other		

E. Damage Repair

Component	Product to be Used	Contractor Responsible for Repairs
Fluid-applied membrane		
Self-adhered membrane		
Transition self-adhered membrane		
Self-adhered flashing membrane		
Primer		
Mastic/Termination sealant		
Extruded silicone		
Silicone sealant		
Polyurethane sealant		

5. Pre-Construction Team Meeting



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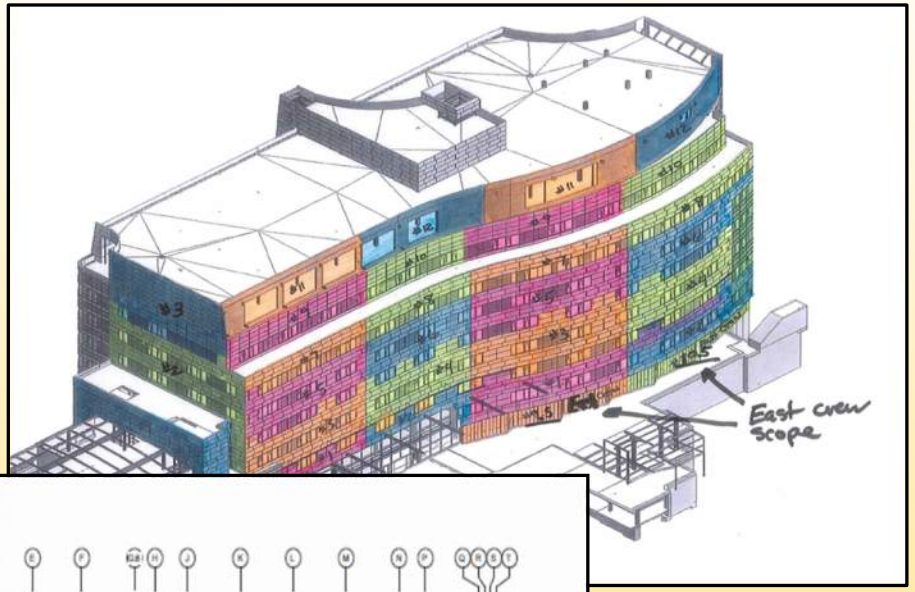

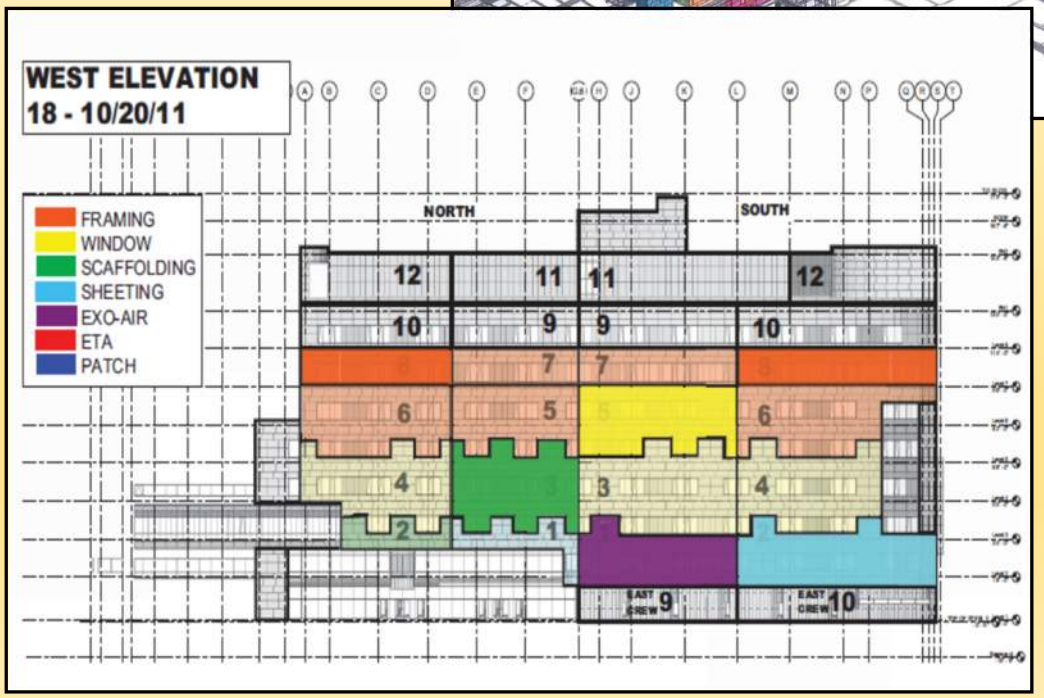

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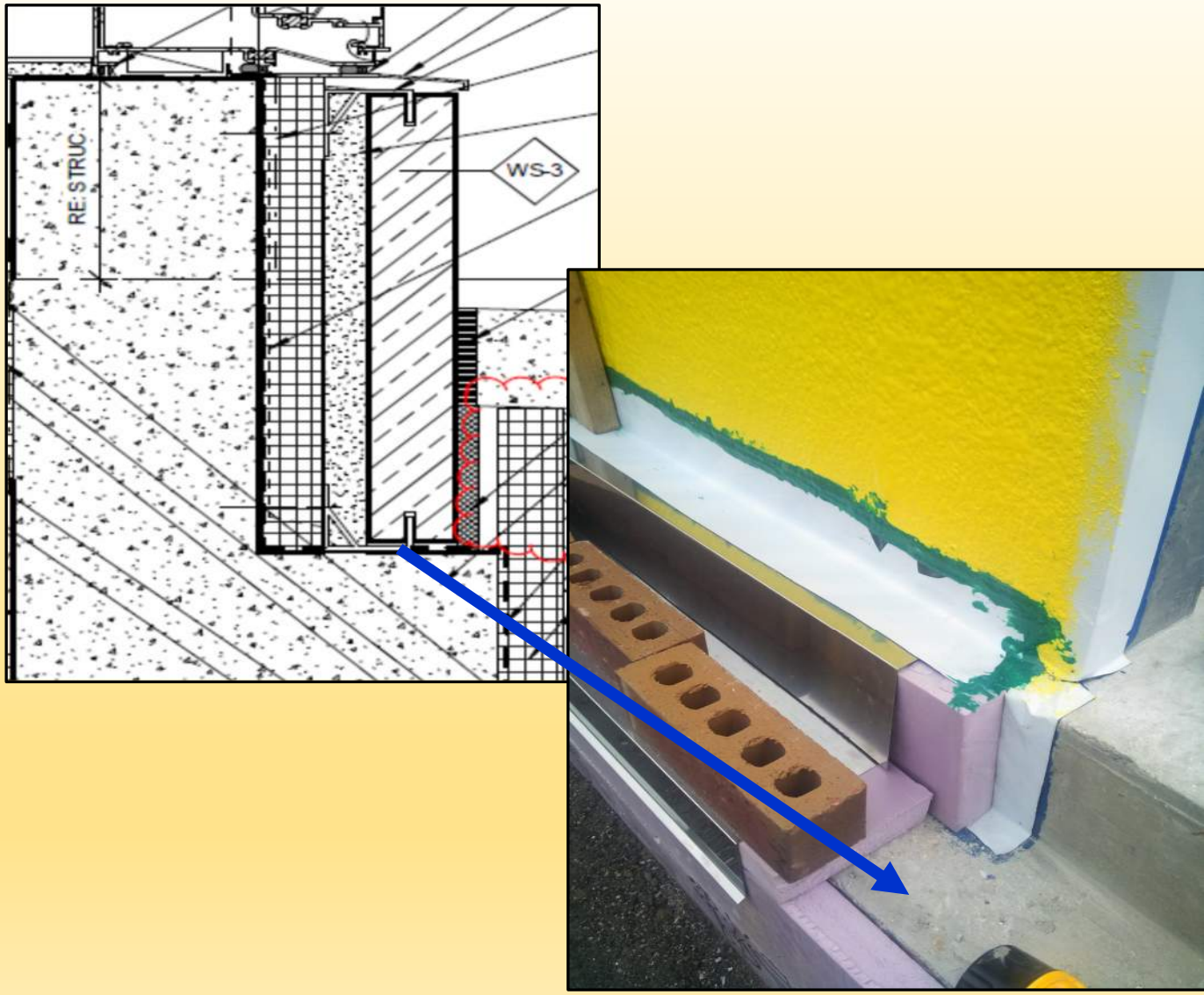


5. Pre-Construction Team Meeting

5. Pre-Construction Team Meeting

air barrier abaa association of america

DAILY JOB SITE REPORT
SELF ADHERED AIR BARRIER ASSEMBLY

866.956.5888 | abaa@airbarrier.org | www.airbarrier.org

Crew # ____ of ____
Job Site Report#_____
Date: _____

PROJECT NAME:_____
AIR BARRIER CONTRACTOR: _____
ABAA CONTRACTOR LICENSE # _____

INSTALLER NAME	CERTIFICATION LE (1, 2, 3)

SUBSTRATE TYPE: _____ SUBST
SUBSTRATE MOISTURE CONTENT: ____ RELATIVE H
SUBSTRATE SURFACE CONDITIONS AND PREPARATION

SUBSTRATE CONDITIONS ACCEPTABLE FOR APPLICATIO

MATE

PROJECT MATERIALS	M
PRIMARY AIR BARRIER (AB)	
AB PRIMER	
MASTIC/SEALANT	
THRU-WALL FLASHING	

ARE ALL MATERIALS BEING INSTALLED LISTED IN PROJEC
IF NO, HAVE ALL MATERIALS BEEN APPROVED FOR USE B
ARE ALL MATERIALS BEING INSTALLED PER MANUFACTUR
ARE ALL MATERIALS BEING INSTALLED COMPATIBLE (PH

INSTALLATI

INSTALLATION LOCATIONS:

# 1 TIME STARTED:	TIME COMPLETED:
On Gridline:	
Between Gridline:	to
Between Elevation:	to
Wall location: North South East We	

Date of Issue: 16/10/2012 F-115-041 Re

Date: 02/20/19 **Project:** New Building
539 Main St, Your Town, WI

BRANDT ENCLOSURE CONSULTING INC
4404 Rib Mountain Dr, #235

Site Visit No: 1

Site Progress: At the time of the site visit there
of the exterior masonry was completed at the ti

Item No.	OBSER
1.1	The exterior air & vapor barrier insta the ground level on the south and pa sheathing joints, exposed sheathing "runs", the fastener holes have not b the perimeter of the windows is not the sheathing leaving a gap or joint b which may allow water entry to the i
1.2	The inside corner south of the south and vapor barrier, a portion of the ea barrier needs to be installed and con insulation and masonry.
1.3	The connection at the west end of th building and the new structure needs membrane. Additionally, the upper to separate interior and exterior env
1.4	The expansion joint at the west end building is not yet installed. With the difficult to effectively install the prim between the backup CMU and the ex access). The condition should be rev Removal of a portion of the exterior install this joint.
1.5	The glass setting blocks installed in th approximately 1" in length. Typical g GANA manual (Glass Association of N 4" long setting blocks. Short setting glass failure or excessive stress on isc breakage. BEC recommends replacin (4") setting blocks.
1.6	Interior drywall is being installed, ho around the storefront windows has r is critical to the overall performance completed. Drywall should be remov installations.

Observations

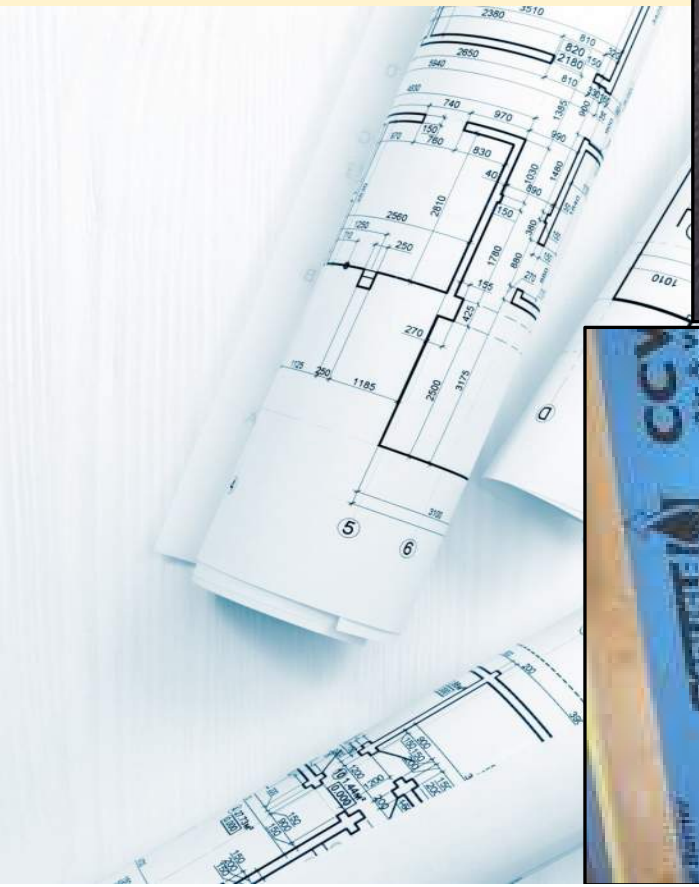
Question	Response	Details
3.0 - SUBSTRATE		
3.1	Observation	Substrate wet. No application occurring during rain event. Quality of CMU substrate/mortar joints was satisfactory for areas observed.
4.0 - MEMBRANE APPLICATION		
4.1	Observation	Areas observed: North Elevation - from 9th floor. Application adhesion and mil thickness is satisfactory.
 Photo 1		
6.0 - TRANSITIONS		
6.1	Observation	PROGLAZE ETA Transitions from window frame to moisture barrier system. Trial area: Sill on 9th floor, North elevation. Overall application was satisfactory. Continuous Spectrem 1 coverage. No buckling or displacement of ETA Membrane.
 Photo 2		
6.2	Observation	Adhesion to frames and barrier satisfactory
 Photo 3  Photo 4		

5. Pre-Construction Team Meeting

Component	Performance Criteria		Mock Up Testing	In Situ Testing
	Air	Water		
Curtain Wall / Store Front	ASTM E1186 (4.2.6) – No major air leaks. A major leak is defined as air and smoke visible and easily detectable by hand within (1" or 25.4 mm) of the leak location(s)	ASTM E1105 - No water leakage when tested under a pressure per project requirements, but not less than required in the standard	1 (one) area as shown on Mock Up drawing	5-10% Completion: Three (3) areas 35-45% Completion: Three (3) areas 70-80% Completion: Three (3) areas 95-100% Completion: Three (3) areas
	N/A	AAMA 501.2 – No water leakage during testing	Five (5) locations of ten lineal feet (10' or 3 M)	5-10% Completion: Three (3) areas of ten lineal feet (10' or 3 M) 35-45% Completion: Three (3) areas of ten lineal feet (10' or 3 M) 70-80% Completion: Three (3) areas of ten lineal feet (10' or 3 M) 95-100% Completion Three (3) areas of ten lineal feet (10' or 3 M)
	ASTM E330		1 (one) area as shown on mock -up drawing	5-10% Completion: Three (3) areas 35-45% Completion: Three (3) areas 70-80% Completion: Three (3) areas 95-100% Completion: Three (3) areas
	ASTM E783 Air Leakage allowed per standard	N/A	One (1) area; as indicated on Drawings.	5-10% Completion: Three (3) areas 35-45% Completion: Three (3) areas 70-80% Completion: Three (3) areas 95-100% Completion: Three (3) areas

019119 -4 Building Envelope Functional Performance Testing

5. Pre-Construction Team Meeting



6. Installer Checklists

6. Installer Checklists

Created with input from the Trade Partner

Quality Assurance Check Lists
Air Vapor Barrier

Company name: Masterfoam
Company Representative: _____
Date: _____
Location of Work Performed: _____

Items	Yes	No	N/A
Sheet - Has the substrate which is to receive the membrane been cleaned, dried, free of frost, and is it above the minimum temperature of 40 degrees F, If between 25 and 40 degrees F use a low temperature membrane	☐	☐	☐
Sheet - Avoid hollows at the corners and along wall intersections. Inside corners received a filet bead of sealant per specifications.	☐	☐	☐
Sheet - At the intersection of sheet membrane to fluid membrane, a transition piece of sheet membrane shall overlap the fluid membrane by 6".	☐	☐	☐
Have all expansion joints been filled with sealant prior to air vapor barrier sheet membrane?	☐	☐	☐
Are all Wall to slab edge expansion joints detailed per ABAA recommendations?	☐	☐	☐
Has all membrane been properly rolled with no "fish mouths" able to be seen and achieve proper adhesion	☐	☐	☐
Is surface ready to receive air vapor barrier material - (concrete) cured long enough?	☐	☐	☐
Have all surfaces to receive primer have the appropriate amount of primer installed?	☐	☐	☐
Has the proper wet film been applied	☐	☐	☐
Have all shelf angles been completely sealed to on all sides including underneath?	☐	☐	☐
Has all Board insulation been properly adhered to substrate?	☐	☐	☐
Have all gaps and board to board joints been filled with SPF to ensure continuity of insulation?	☐	☐	☐

Quality Assurance Check Lists
Curtain Wall Framing

Company name: _____
Company Representative: _____
Date: _____
Location of Work Performed: _____

Items	Yes	No	N/A
Are the mullion elevations per the approved shop drawings, and do they line up with the adjacent materials as per the plans? i.e. The top of a Horizontal Mullion with the top of a Floor Slab, or expansion joints lining up with a Precast joint, etc.	☐	☐	☐
Has all of the required shim space insulation been installed per the plans and specifications? SPF at the jambs and sills, mineral wool at the heads etc...	☐	☐	☐
Have the proper amount of pressure plate screws been installed and set per the manufacturers recommended torque setting? - common 90-100pci	☐	☐	☐
Have all of the mullions been checked to ensure cleanliness after field installation?	☐	☐	☐
After the frame (and prior to glass) was installed, was it checked for plumb and square?	☐	☐	☐
Have all gaskets been cleaned of construction dust etc, and inspected for integrity prior to glass installation? Have they been cut to the proper length per the install directions - allowing for creep?	☐	☐	☐
Have the joint plugs been installed and sealed per installation directions?	☐	☐	☐
Has the CM been notified of any problems regarding the frame's rough opening, i.e. too small, sill out of level, etc.	☐	☐	☐
Has the glass been inspected for any defects prior to installation?	☐	☐	☐
Has the Silicone sheet membrane been properly adhered (roller used) to the curtainwall's primary seal and to the adjacent substrate to created an continuous air vapor barrier?	☐	☐	☐
Have the correct amount of setting blocks been installed in the right locations?	☐	☐	☐
Has the Silicone sheet membrane been properly sealed and "shingled" during installation to create a single silicone sheet - all horizontal and vertical sheet to sheet seams are properly sealed?	☐	☐	☐
Has the exterior cosmetic bead of sealant been installed and is it the proper color per its adjacent material tie in? Ensure it has not plugged any weeps.	☐	☐	☐

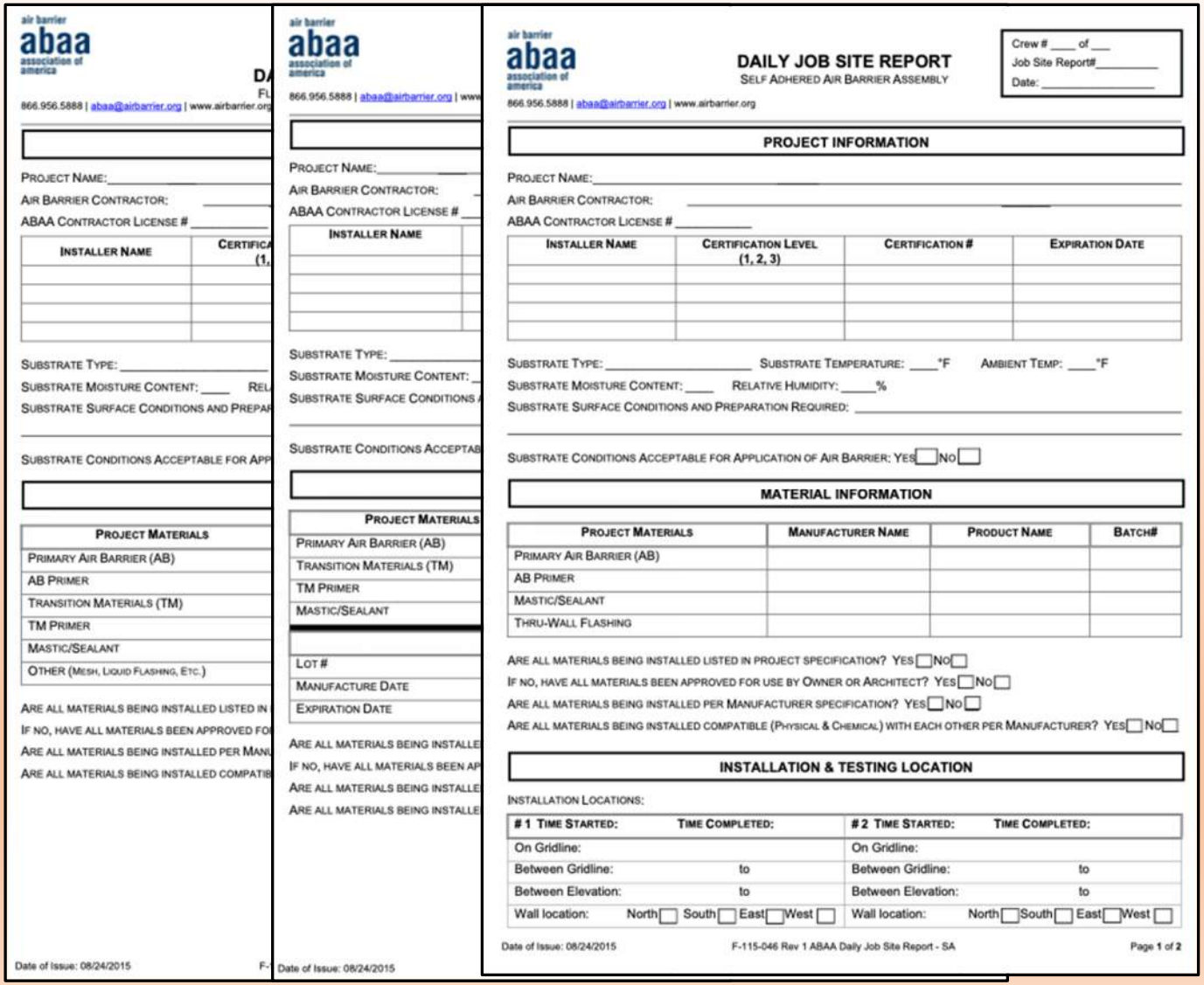
6. Installer Checklists

ABAA - **QAP**

Quality

Assurance

Program



DAILY JOB SITE REPORT

SELF ADHERED AIR BARRIER ASSEMBLY

Crew # ____ of ___

Job Site Report#_____

Date: _____

air barrier abaa association of america

866.956.5888 | abaa@airbarrier.org | www.airbarrier.org

PROJECT INFORMATION

PROJECT NAME:

AIR BARRIER CONTRACTOR:

ABAA CONTRACTOR LICENSE #

INSTALLER NAME	CERTIFICATION LEVEL (1, 2, 3)	CERTIFICATION #	EXPIRATION DATE

SUBSTRATE TYPE: _____ SUBSTRATE TEMPERATURE: ____°F AMBIENT TEMP: ____°F

SUBSTRATE MOISTURE CONTENT: ____ RELATIVE HUMIDITY: _____%

SUBSTRATE SURFACE CONDITIONS AND PREPARATION REQUIRED:

SUBSTRATE CONDITIONS ACCEPTABLE FOR APPLICATION OF AIR BARRIER: YES ☐ NO ☐

MATERIAL INFORMATION

PROJECT MATERIALS	MANUFACTURER NAME	PRODUCT NAME	BATCH#
PRIMARY AIR BARRIER (AB)			
AB PRIMER			
MASTIC/SEALANT			
THRU-WALL FLASHING			

ARE ALL MATERIALS BEING INSTALLED LISTED IN PROJECT SPECIFICATION? YES ☐ NO ☐

IF NO, HAVE ALL MATERIALS BEEN APPROVED FOR USE BY OWNER OR ARCHITECT? YES ☐ NO ☐

ARE ALL MATERIALS BEING INSTALLED PER MANUFACTURER SPECIFICATION? YES ☐ NO ☐

ARE ALL MATERIALS BEING INSTALLED COMPATIBLE (PHYSICAL & CHEMICAL) WITH EACH OTHER PER MANUFACTURER? YES ☐ NO ☐

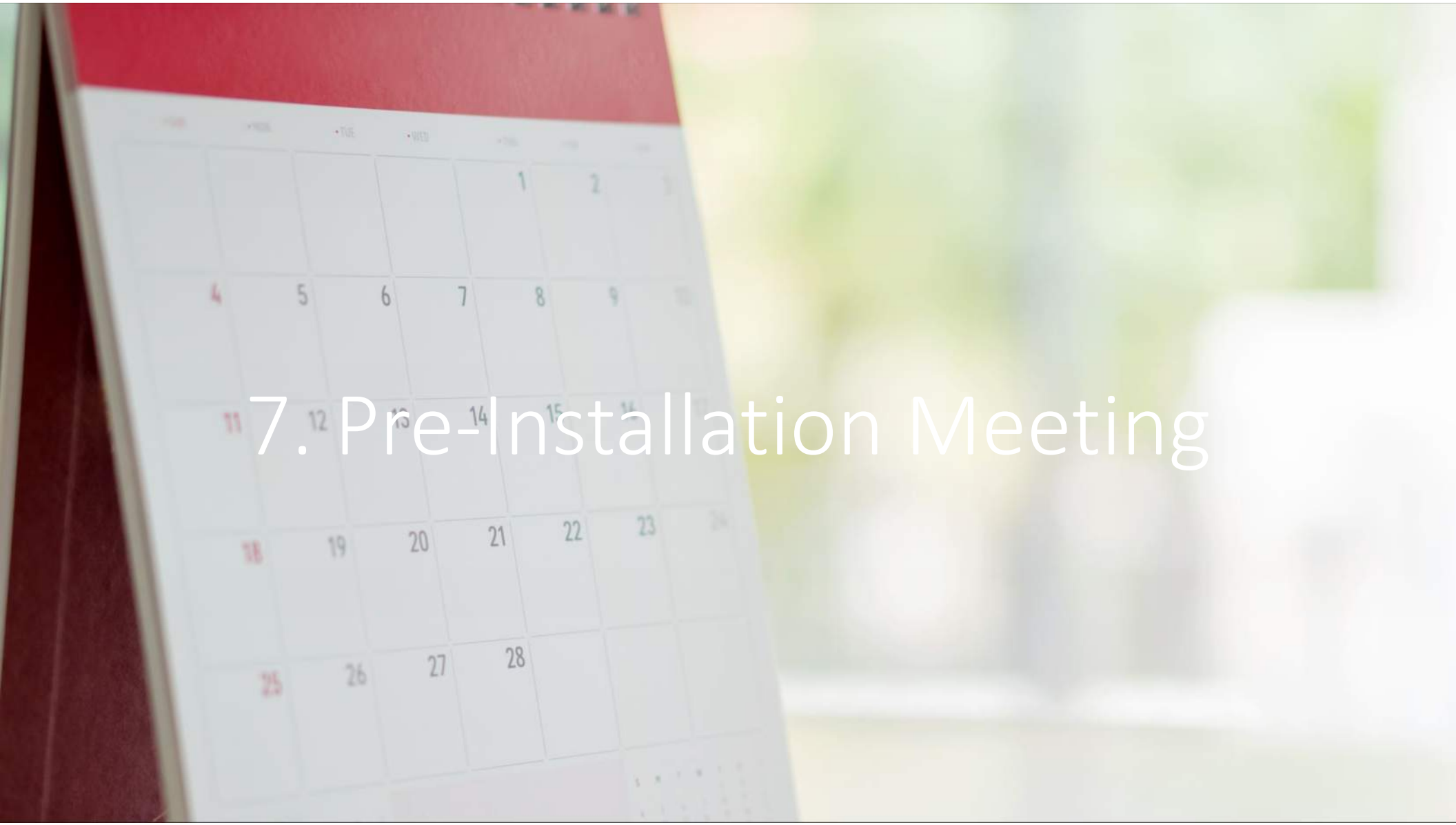
INSTALLATION & TESTING LOCATION

INSTALLATION LOCATIONS:

# 1 TIME STARTED:	TIME COMPLETED:	# 2 TIME STARTED:	TIME COMPLETED:
On Gridline:		On Gridline:	
Between Gridline:	to	Between Gridline:	to
Between Elevation:	to	Between Elevation:	to
Wall location: North ☐ South ☐ East ☐ West ☐		Wall location: North ☐ South ☐ East ☐ West ☐	

Date of Issue: 08/24/2015 F-115-046 Rev 1 ABAA Daily Job Site Report - SA Page 1 of 2

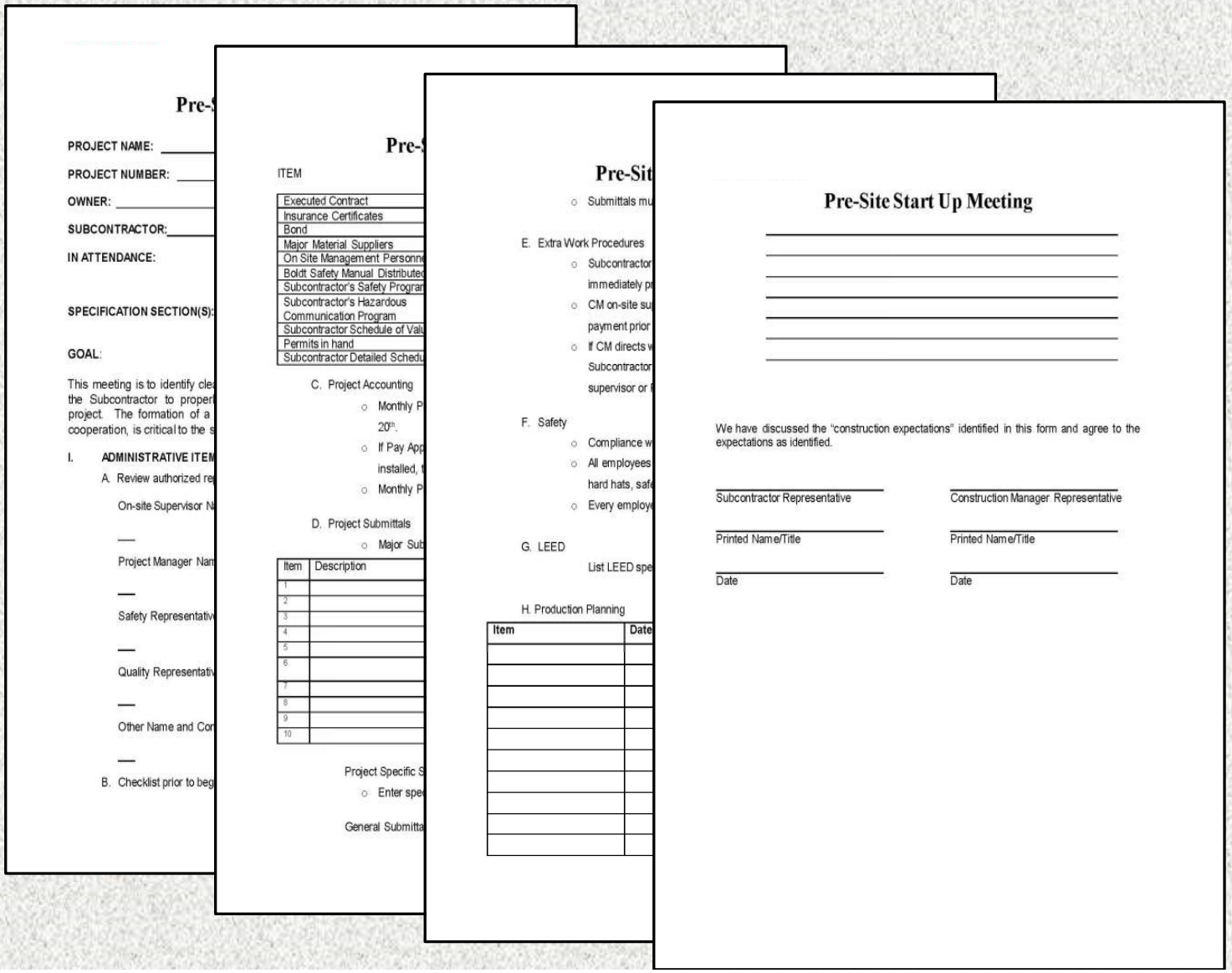
Requirement for
ABAA Quality Assurance Program



7. Pre-Installation Meeting

7. Pre-Installation Meeting

Construction Manager
&
Installing Contractor



Pre-

PROJECT NAME: _____

PROJECT NUMBER: _____

OWNER: _____

SUBCONTRACTOR: _____

IN ATTENDANCE:

SPECIFICATION SECTION(S):

GOAL:

This meeting is to identify cle
the Subcontractor to proper
project. The formation of a
cooperation, is critical to the s

I. ADMINISTRATIVE ITEM

A. Review authorized re

On-site Supervisor N

Project Manager Nam

Safety Representativ

Quality Representati

Other Name and Co

B. Checklist prior to beg

Pre-

ITEM

Executed Contract
Insurance Certificates
Bond
Major Material Suppliers
On Site Management Personne
Boldt Safety Manual Distributed
Subcontractor's Safety Progra
Subcontractor's Hazardous Communication Program
Subcontractor Schedule of Valu
Permits in hand
Subcontractor Detailed Schedu

C. Project Accounting

- Monthly P
- 20th.
- If Pay App
- installed,
- Monthly P

D. Project Submittals

- Major Sub

Item	Description
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	

Project Specific S

- Enter spe

General Submitta

Pre-Sit

- Submittals mu

E. Extra Work Procedures

- Subcontractor
- immediately p
- CM on-site su
- payment prior
- If CM directs w
- Subcontractor
- supervisor or

F. Safety

- Compliance w
- All employees
- hard hats, safe
- Every employe

G. LEED

List LEED spe

H. Production Planning

Item	Date

Pre-Site Start Up Meeting

We have discussed the "construction expectations" identified in this form and agree to the expectations as identified.

Subcontractor Representative	Construction Manager Representative
Printed Name/Title	Printed Name/Title
Date	Date

7. Pre-Installation Meeting

Construction Manager
&
Installing Contractor

SECTION 071700
BENTONITE WATERPROOFING

Reissued SI-002, May 3, 2019

PART 1 GENERAL

1.1 SUMMARY

A. Section Includes:
1. Composite bentonite and HD installation.
2. Bentonite waterproofing acce
3. Installation of waterproofing s
4. Below-grade insulation assoc

B. Related Sections:
1. Section 019115 – Building En
2. Section 033000 - Cast-in-Pla
3. Section 072100 - Thermal Ins
4. Section 334600 - Foundation

1.2 SUBMITTALS

A. Product Data: For each type of p manufacturer's written installation

B. Shop Drawings: Show locations and cracks, sheet flashings, pene waterproofing, termination condi

C. Samples: Submit sample of bent
1. Waterproofing: 6 inches squa
2. Protection Course: 6 inches s
3. Molded-Sheet Drainage Pan

D. Qualification Data: For Installer.

E. Material Certificates: For each ty

F. Warranty: Sample of special war

G. Field quality-control reports.

H. Close-out submittals.

1.3 QUALITY ASSURANCE

A. Installer Qualifications: An autho with a minimum of 5 years' exper

B. Pre-Installation Conference: Cor requirements, including surface p weather conditions, special detail inspection procedures, and prote

1.4 DELIVERY, STORAGE, AND HA

A. Deliver materials to Project site in

B. Store materials in a dry, well-ven

C. Remove and replace bentonite m

1.5 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit bentonite wate instructions and warranty require
1. Do not apply waterproofing bentonite waterproofing mat
2. Do not place bentonite clay practice is approved in writi

1.6 WARRANTY

A. Special Warranty: Manufacturer replace waterproofing compone that fail in materials or workman corrections at no cost to Owner
1. Warrant that installed water failure resulting from substra
2. Manufacturer's warranty cov
3. Applicator's warranty coveri
4. Warranty Period: 5 years fr

PART 2 PRODUCTS

2.1 WATERPROOFING SYSTEMS

A. Provide complete waterproofing recommendations and requirem

B. Source Limitations: Provide ben granules, mastic, drainage comp manufacturer. Provide accesso waterproofing manufacturer.

C. Material Compatibility: Waterpro adjacent work under conditions waterproofing manufacturer base

D. Performance Requirements: Ins movement and exposure to wea installation, or other defects in c

2.2 COMPOSITE HDPE/BENTONIT

A. (WP-2) Composite HDPE/Bento systems as suited for applicatio
1. Composite HDPE/Bentonite 78-mil-thick layer of bentonit
a. Minimum Total Thickne
b. Puncture Resistance, pe
c. Vapor Permeance, per A
d. Product and Manufactur
1) Swelltite by CETCO
2) Paraseal by Tremco
3) TegraTite by TegraS

2.3 MOLDED-SHEET DRAINAGE PANELS

A. Nonwoven-Geotextile-Faced Molded-Sheet Drainage Panels: Composite subsurface drainage panel consisting of studded, nonbiodegradable, molded-plastic-sheet drainage core; with a nonwoven, needle-punched geotextile facing with an apparent opening size not exceeding No. 70 sieve laminated to one side of the core and with a vertical flow rate of 9 to 18 gpm per ft.

2.4 ACCESSORIES

A. Granular Bentonite: Sodium bentonite clay containing a minimum of 90 percent montmorillonite (hydrated aluminum silicate), with a minimum of 90 percent passing a No. 20 sieve.

B. Bentonite Mastic: Trowelable consistency, bentonite compound, specifically formulated for application at joints and penetrations.

C. Termination Bar: Formed stainless-steel Type 304 bars with upper flange to receive sealant, with punched holes for mechanical fasteners, minimum 12 inches on center.

D. Sealants: As recommended in writing by waterproofing manufacturer. Comply with requirements specified in Section 079000 - Joint Protection.

E. Tapes: Waterproofing manufacturer's recommended tape for joints between sheets, membranes, or panels.

PART 3 EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrate preparations affecting performance of bentonite waterproofing.

B. Verify that substrate is complete and that work that will penetrate waterproofing is complete and rigidly installed.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Coordinate work in the vicinity of waterproofing to ensure proper conditions for installing the waterproofing system and to prevent damage to waterproofing after installation.

B. Formed Concrete Surfaces: Remove fins and projections. Fill voids, rock pockets, form-tie holes, and other defects with bentonite mastic or cement grout patching material according to manufacturer's written instructions.

C. Horizontal Concrete Surfaces: Remove debris, standing water, oily substances, mud, and similar substances that could impair the bonding ability of concrete or the effectiveness of waterproofing. Fill voids, cracks greater than 1/8 inch, honeycomb areas, and other defects with bentonite mastic or cement grout patching material according to manufacturer's written instructions.

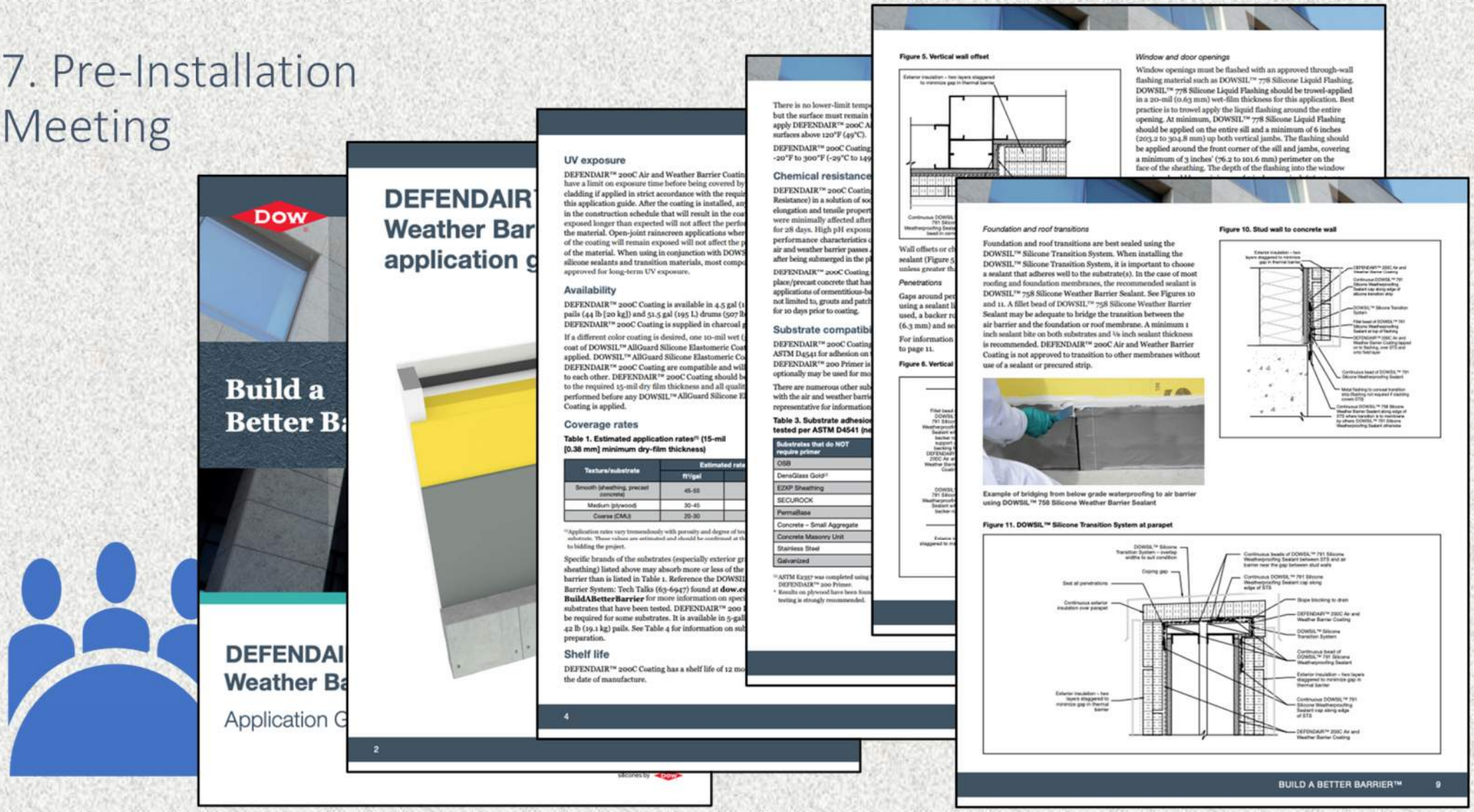
D. Excavation Support and Protection System: If water is seeping, use plastic protection sheets or other suitable means to prevent wetting the bentonite waterproofing. Fill minor gaps and spaces 1/8 inch wide or wider with wood, metal, concrete, or other appropriate filling material. Cover or fill large voids and crevices with cement mortar according to manufacturer's written instructions.

3.3 INSTALLATION, GENERAL

A. Prepare substrates, voids, cracks, and cavities; and install waterproofing and accessories according to manufacturer's written instructions.

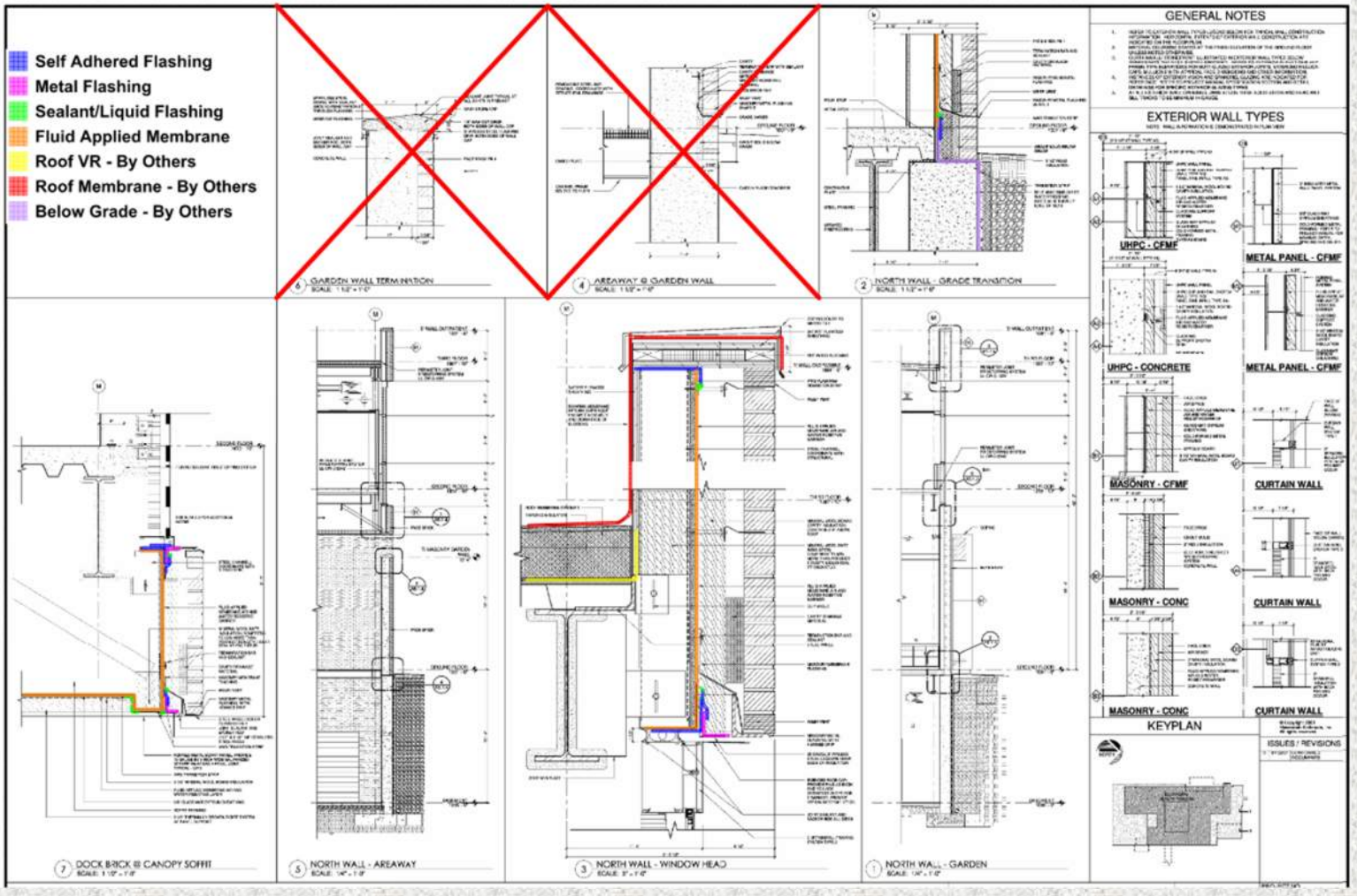
B. Protect waterproofing from damage and wetting before and during subsequent construction operations. Repair punctures, tears, and cuts.

7. Pre-Installation Meeting



7. Pre-Installation Meeting

Construction Manager
&
Installing Contractor



Shop Drawing Curtesy of Matthew Giambrone
OCP Contractors

7. Pre-Installation Meeting

Construction Manager
&
Installing Contractor

7. Pre-Installation Meeting

Did you Review the 01 1400 Specification / Quality Requirements?

1.07 Inspections

A. Inspections will be performed by Inspectors employed by the Owner when required by the Contract Documents. Building Code inspections shall be done by the proper State or Local authority.

B. During the course of work under inspection, each Inspector shall submit detailed reports relative to progress and condition of work, including variances from the Contract Documents, and stipulating dates, hours, and locations of the inspections.

C. Work requiring such inspection that is performed or constructed in the absence of the Inspector may be considered defective and may be subject to rejection.

D. Give written notice to the CM at least two (2) working days in advance of the performance of any work requiring inspection. The inspection of material or equipment at the factory or shop will not constitute an acceptance.

E. Certain inspections as specified in the Technical Specifications will be witnessed by the Owner. In such cases notification shall be made to Owner 48 hours prior to the scheduled inspection.

F. All Trade Contractors shall inspect their own work and provide documentation that is equal to or more specific than the Contract Managers inspection forms, for all areas of work performed demonstrating all work has been installed correctly per codes, standards, and manufacturer requirements.

G. A copy of any and all reports shall be provided to the Construction Manager within 24 hours in receipt from any Inspector and or Testing Agency.

1.08 Approval Required by Others

A. If laws, ordinances, rules, regulations, or orders of public agency having jurisdiction require work to be inspected, tested, or approved by some authority other than as required by the Contract Documents, the Trade Contractor shall give required notices and make arrangements, deliver to the Construction Manager the certificates of inspection, test or approval of such public agency, and pay costs therefore unless otherwise provided in the Contract Documents.

1.09 Trade Contractor's Assistance

A. Trade Contractor shall provide access, facilities, and labor necessary for duties to be performed at the site by Testing Laboratory and Inspector, including furnishing ladders, hoist, lighting, water supply and like materials and equipment.

1.10 Verification of Conditions

A. Prior to installation of any product, Trade Contractor shall inspect existing conditions to receive materials to be installed and arrange for correction of defects in the existing workmanship, material or conditions that may adversely affect work to be installed.

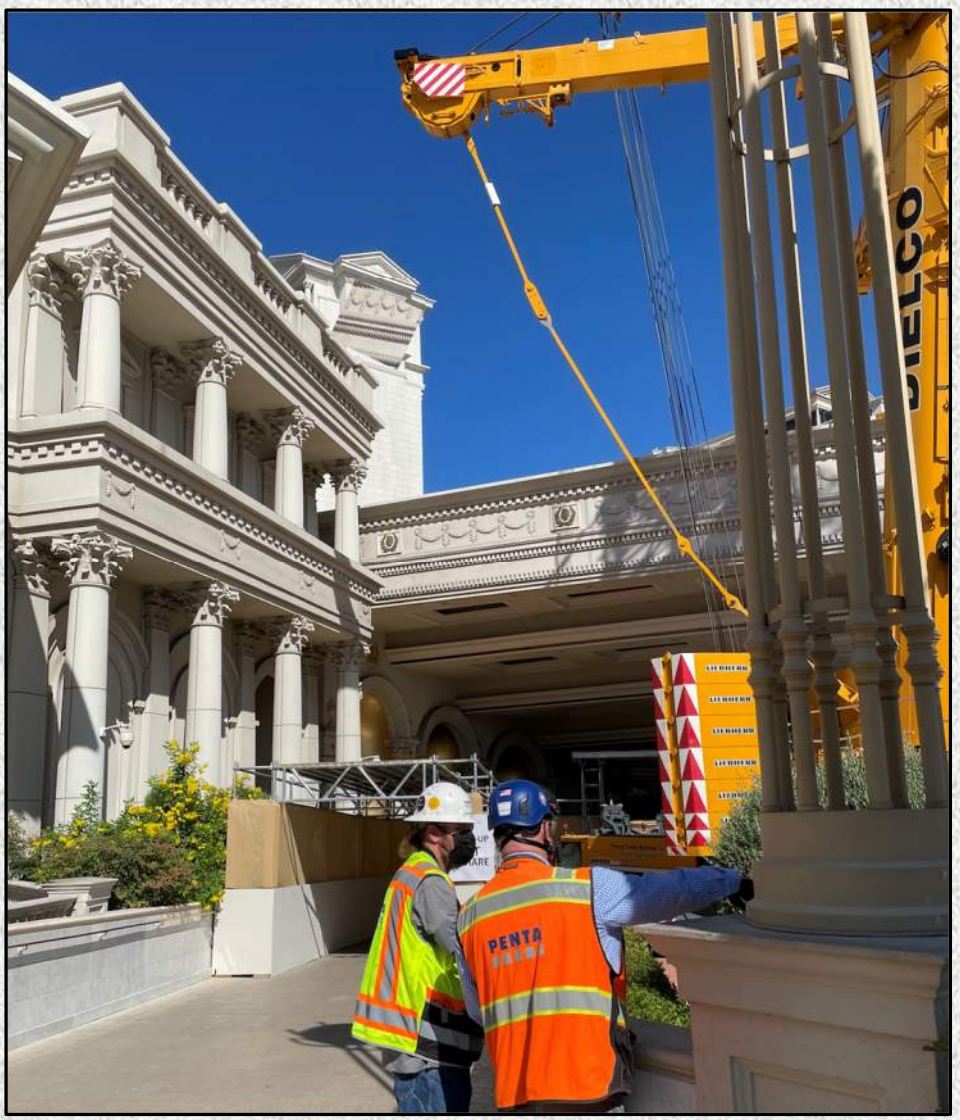
B. Installation of materials constitutes acceptance of existing conditions as being in proper condition to receive the materials to be applied and waiver of claim that existing conditions are defective as pertains to warranty requirements.

C. Where the Specifications require a material to be installed under the supervision or inspection of the material manufacturer or representative, the Trade Contractor shall arrange for the manufacturer or representative to inspect the work in place and issue a letter of approval to the Construction Manager.

END OF SECTION

7. Pre-Installation Meeting

Construction Manager
&
Installing Contractor



7. Pre-Installation Meeting

Construction Manager
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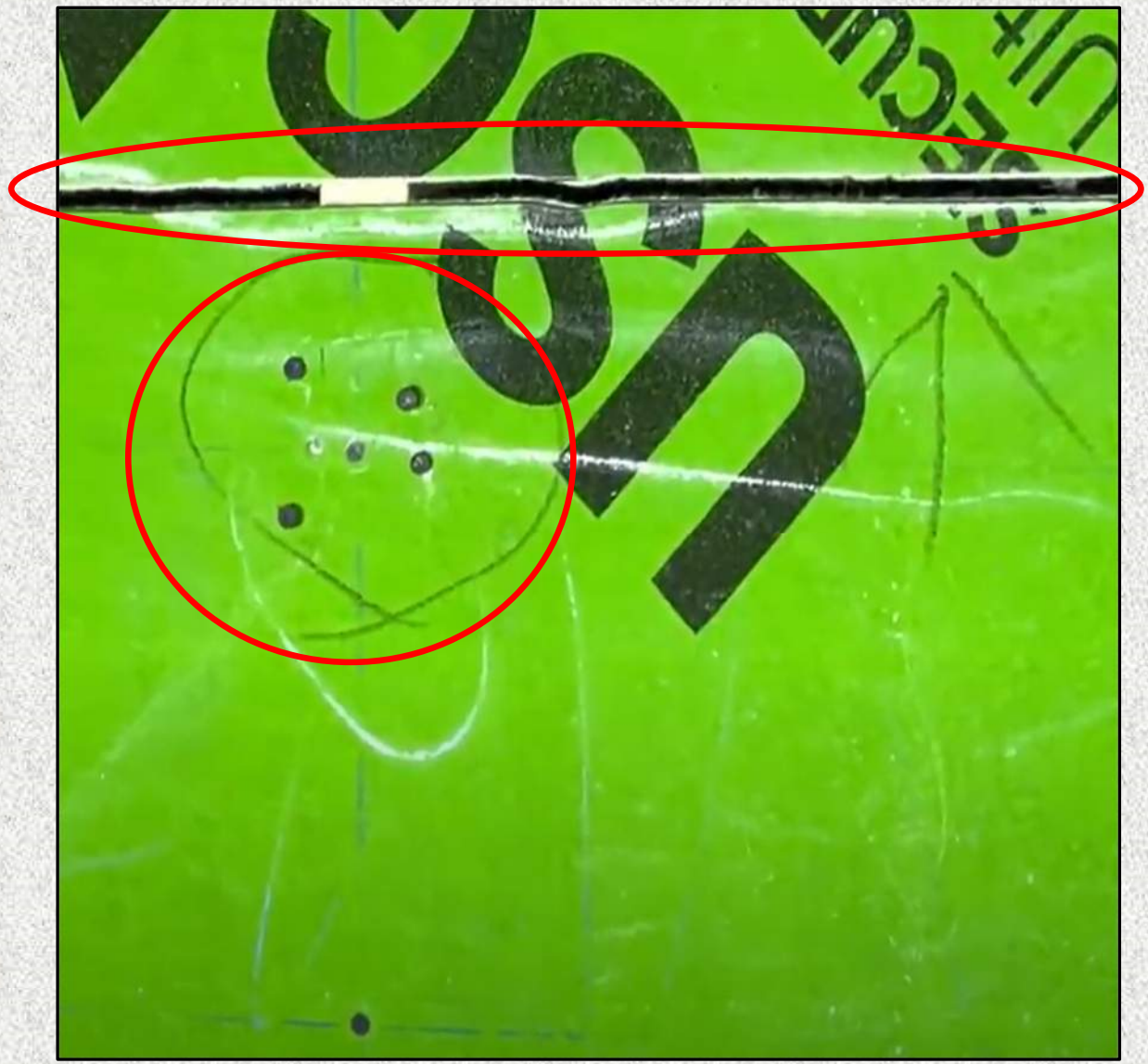
Installing Contractor



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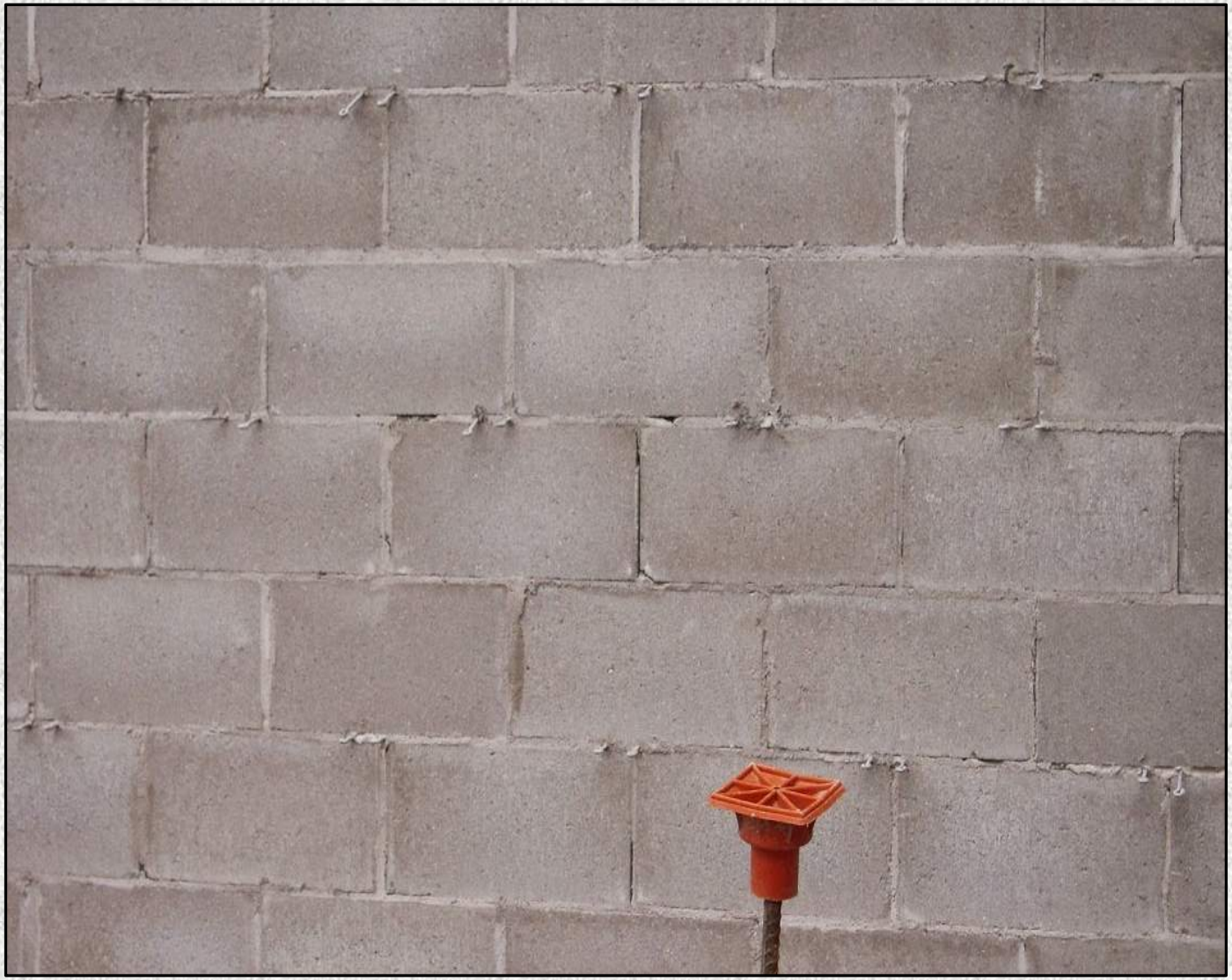

7. Pre-Installation Meeting

Construction Manager
&
Installing Contractor

Who Do You Think is the Most Import Person on a Construction Project?


8. Tra s People
Expectati s Review

8. Trades People Expectations Review

In 2021 **– ABAA had over 2485 Trained Air Barrier Installers** in the U.S. Construction Industry

8. Trades People Expectations Review

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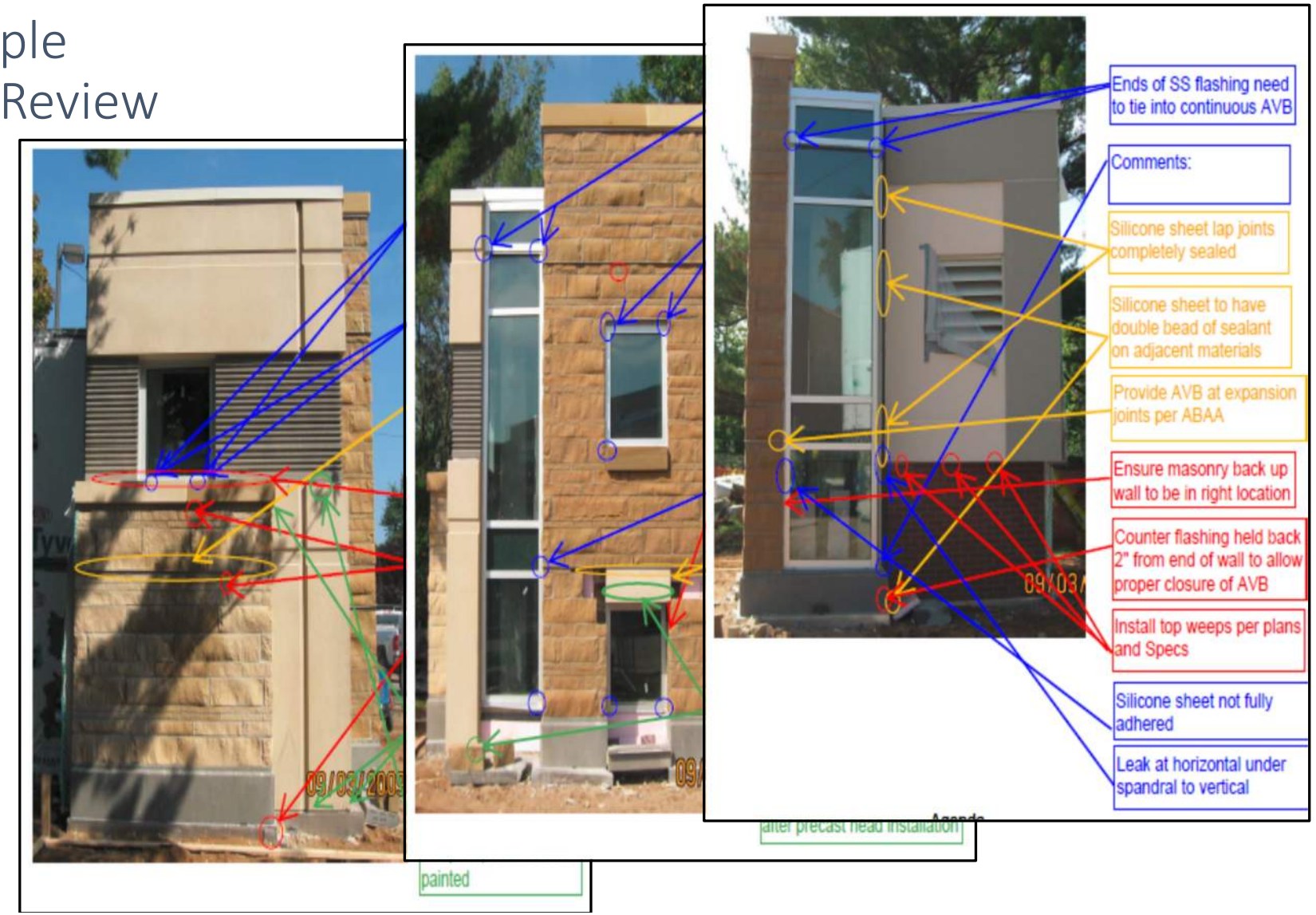

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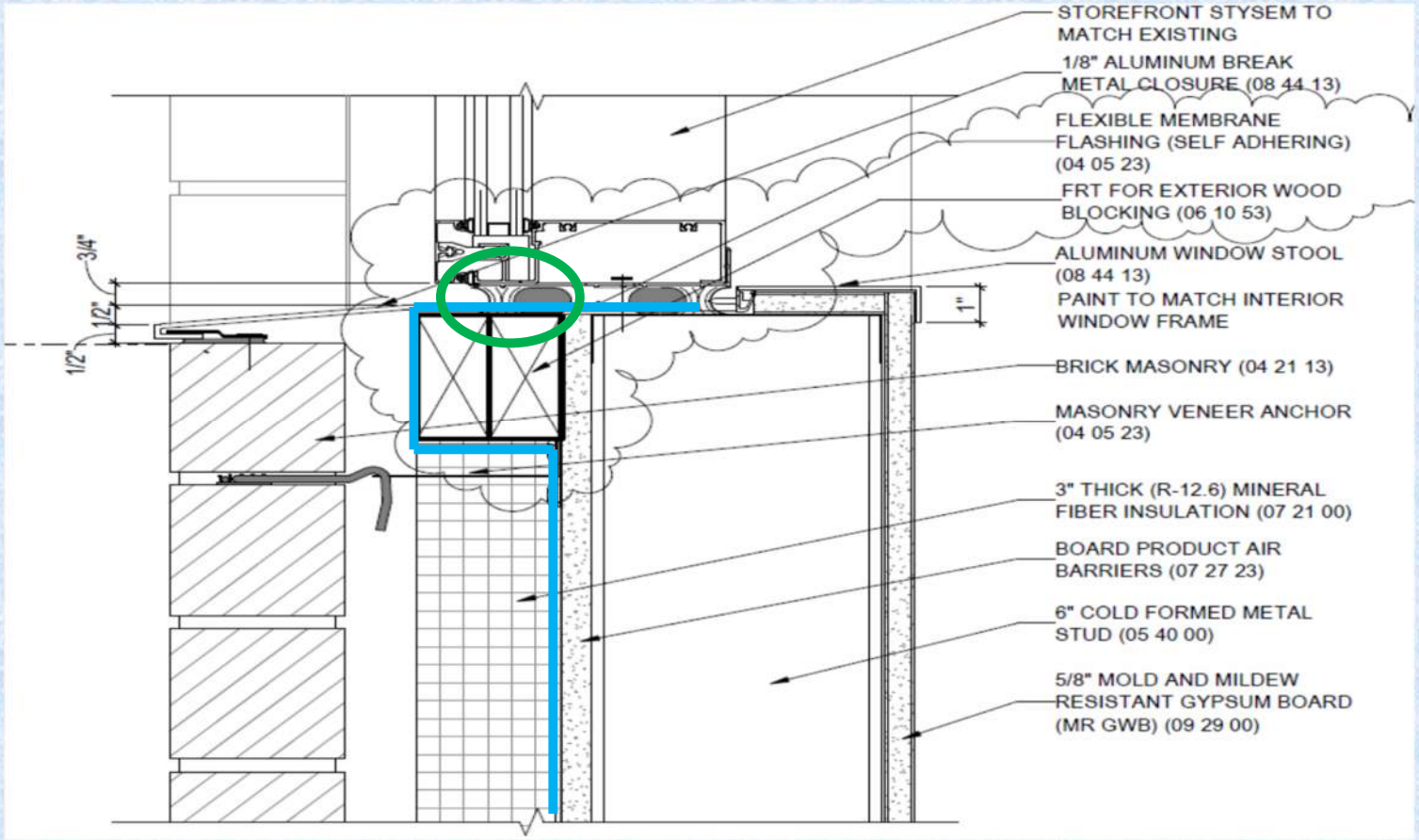

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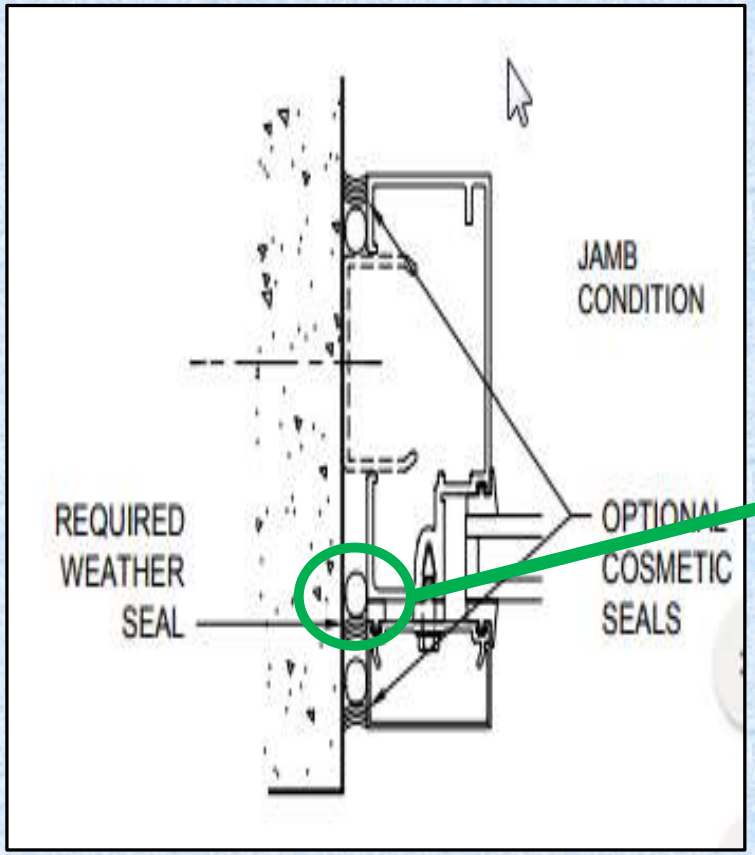

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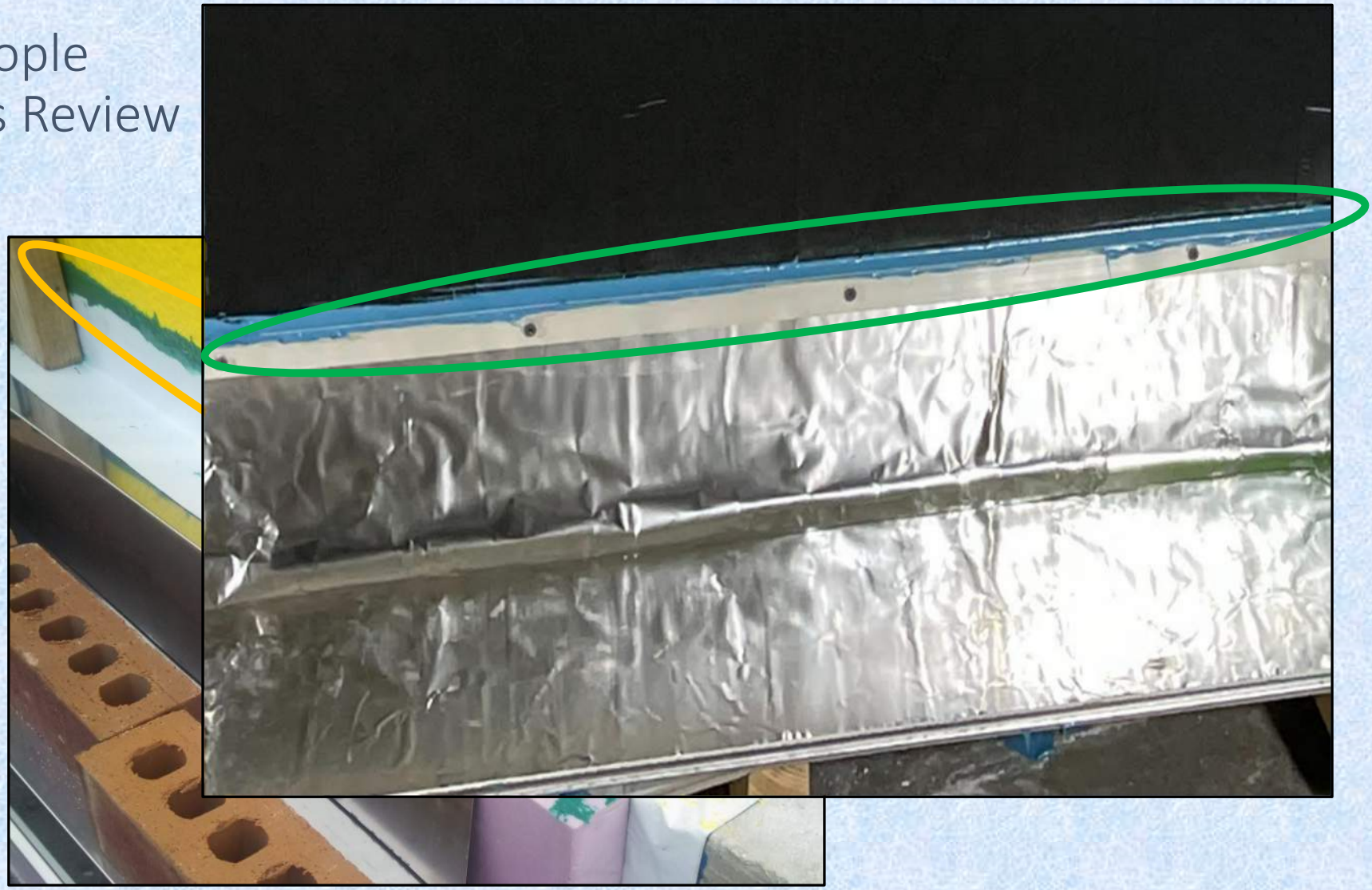
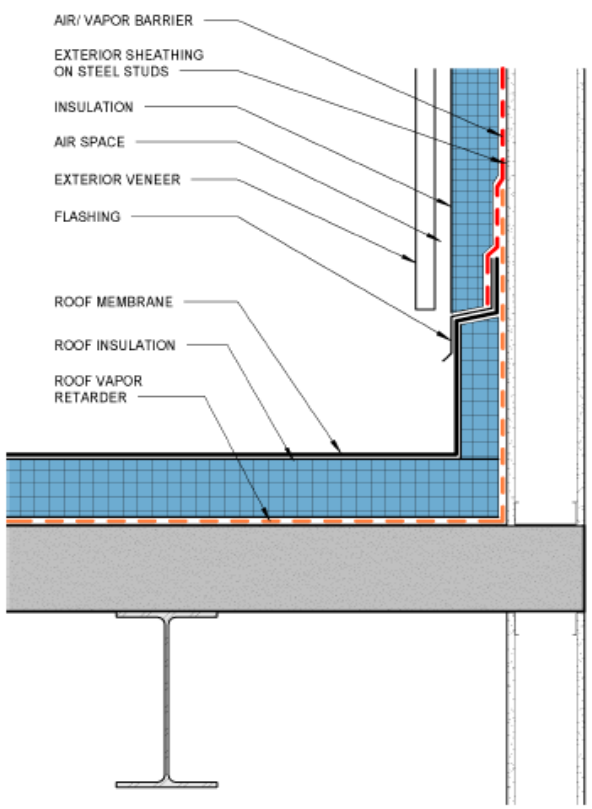


8. Trades People Expectations Review

Was the Right Material Delivered?

8. Trades People Expectations Review

Low Roof / High Wall



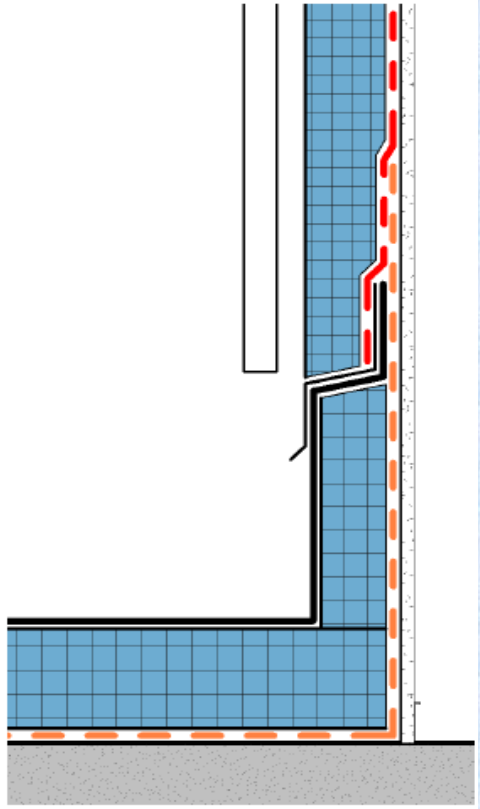
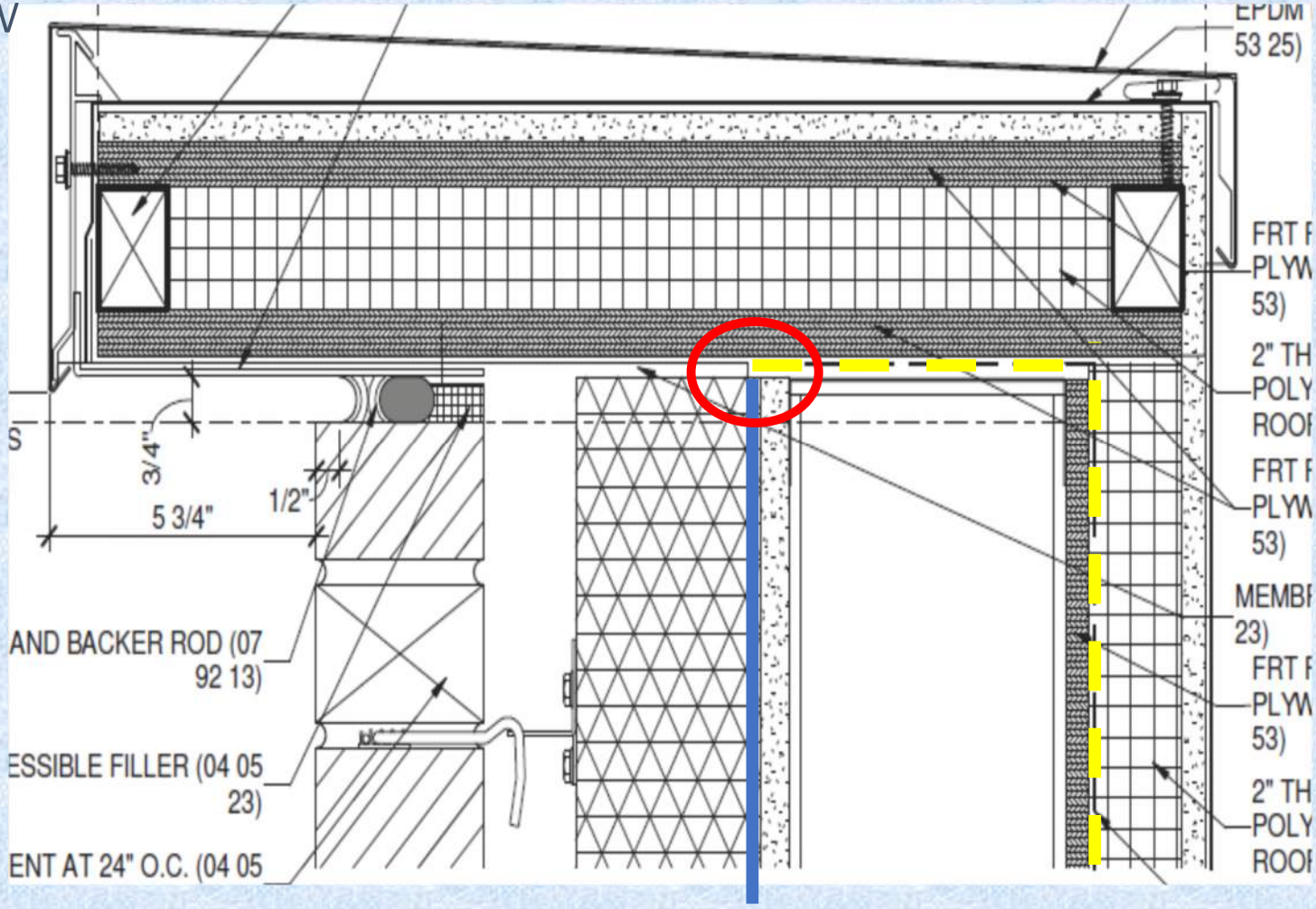


Photo courtesy of Andrew Dunlap, Smith Group

8. Trades People Expectations Review



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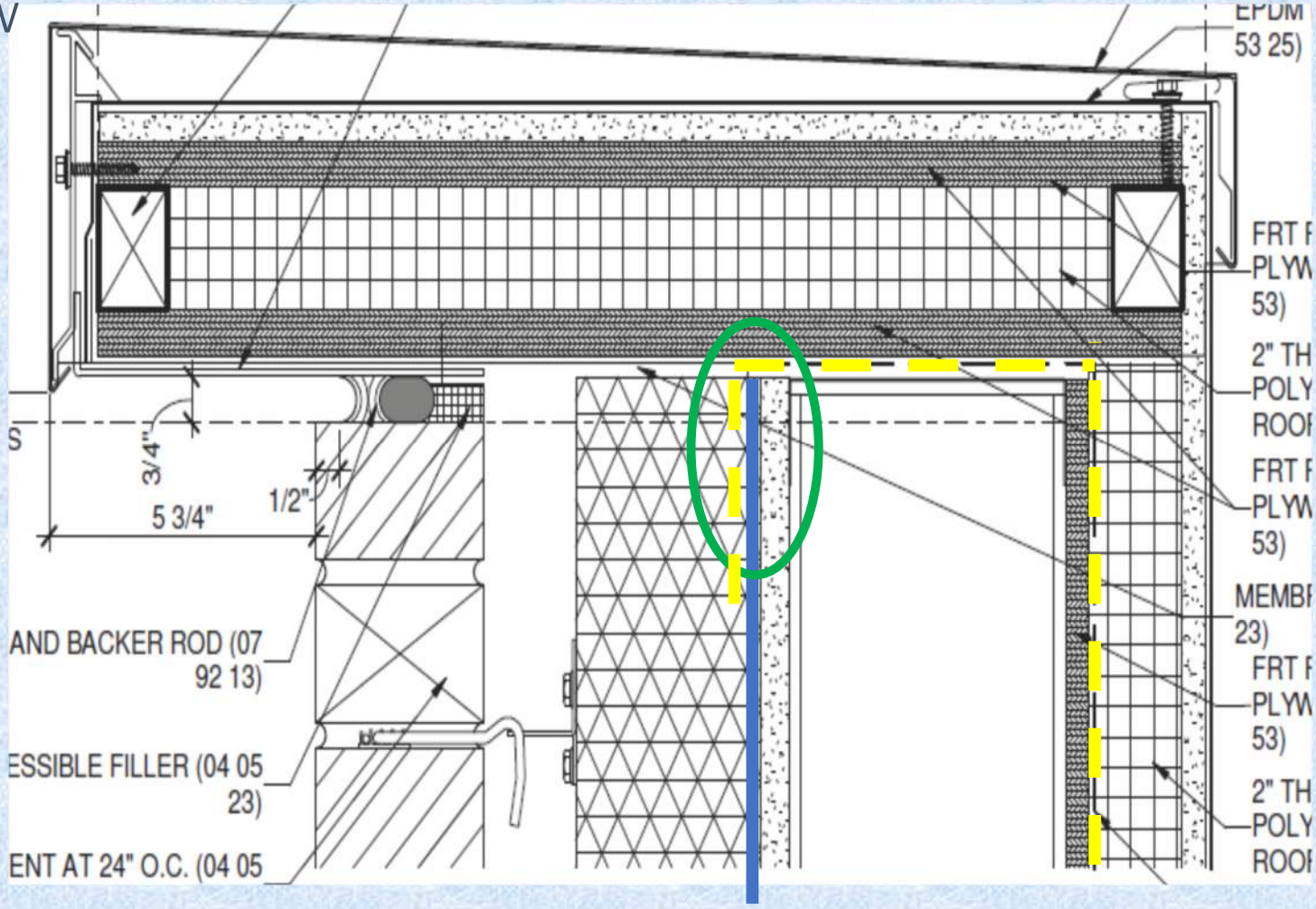


8. Trades People Expectations Review

8. Trades People Expectations Review

Lessons Learned

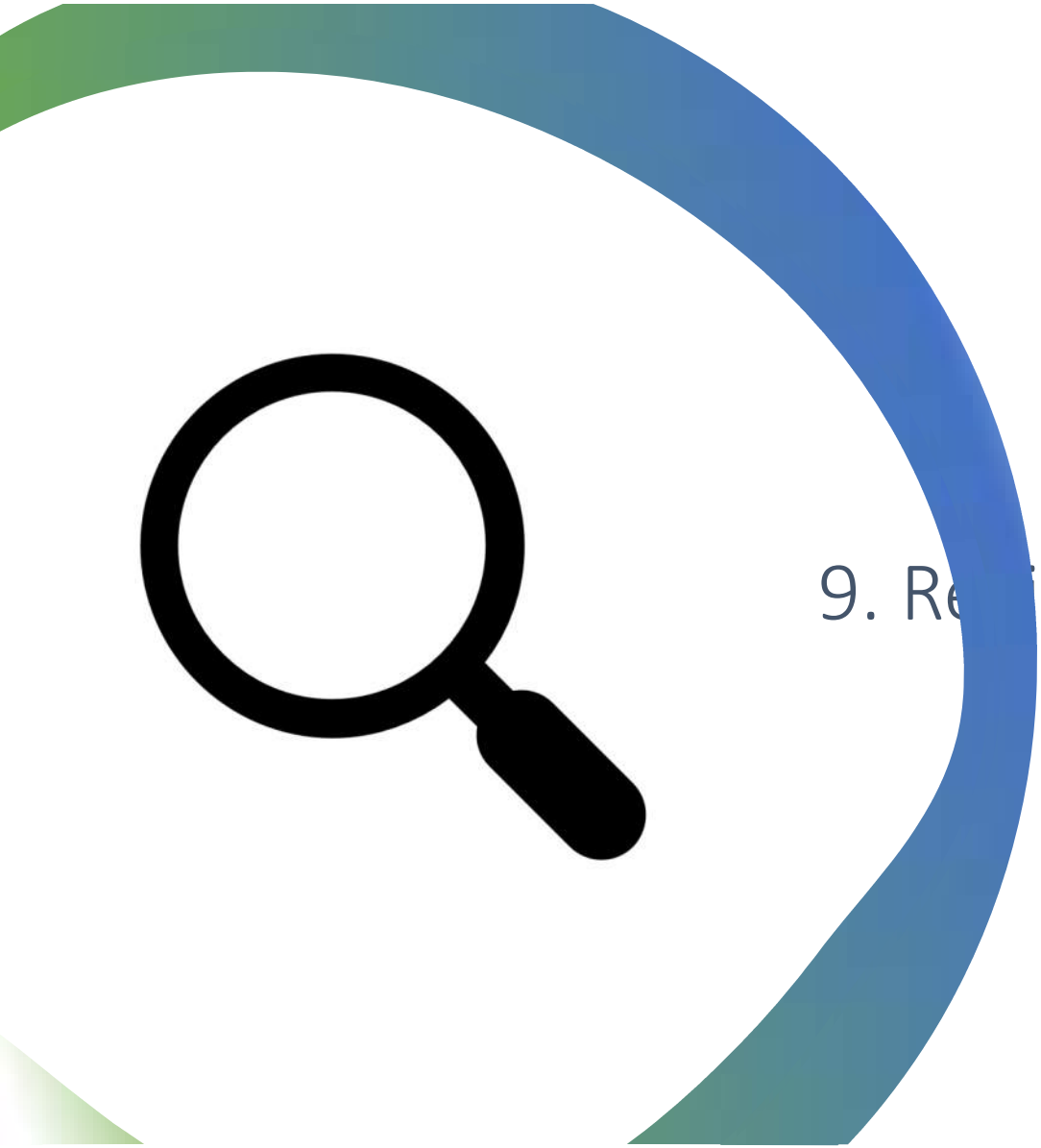
AVB Contractor “XZY”

- Fill all expansion joints with sealant
- Prime all surfaces per manufacturer’s installation directions
- Install SRAB membrane onto all sill and gypsum back up head Z material
- Seal all T joints per Manufacturer’s directions and approved submittal.
- Roll all SRAB – no fish mouths or wrinkles permitted.
- Abide by ABAA rules and regulations. Provide Boldt with a copy of all daily reports – posted directly to Project Website.
- ABAA to provide a minimum of two site visits during the installation period.

Lessons Learned

Glazing Contractor “ABC”

- Install all units vertically so as to avoid damaging adjacent material.
- Install Sealant on framing attachment steel and adjacent vertical mullions as per shop drawings.
- Install Silicone Sealant in reglet and or on vertical mullion so as to receive Silicone Sheet Membrane and ensure an air tight assembly.
- Install Silicone Sheet Membrane Continuous. Pay special attention to inside and outside 90 degree turns.
- Roll all Silicone Sheet Membranes to ensure complete adhesion to sealant and substrate.
- Ensure horizontal cover cap’s spacing is per shop drawings, i.e. not all of the way to one side with a large gap on the other.
- Ensure all pressure plates and cover caps are flat. Mock Up displayed pressure plates which were tilted, creating an uneven plane between the vertical and horizontal covers.
- Daily Clean Up of all crates and used material, i.e. caulk tubes, rags, etc.
- Seal any holes, screw heads etc. that allow air movement from interior space to exterior.



9. Review of Installed Materials

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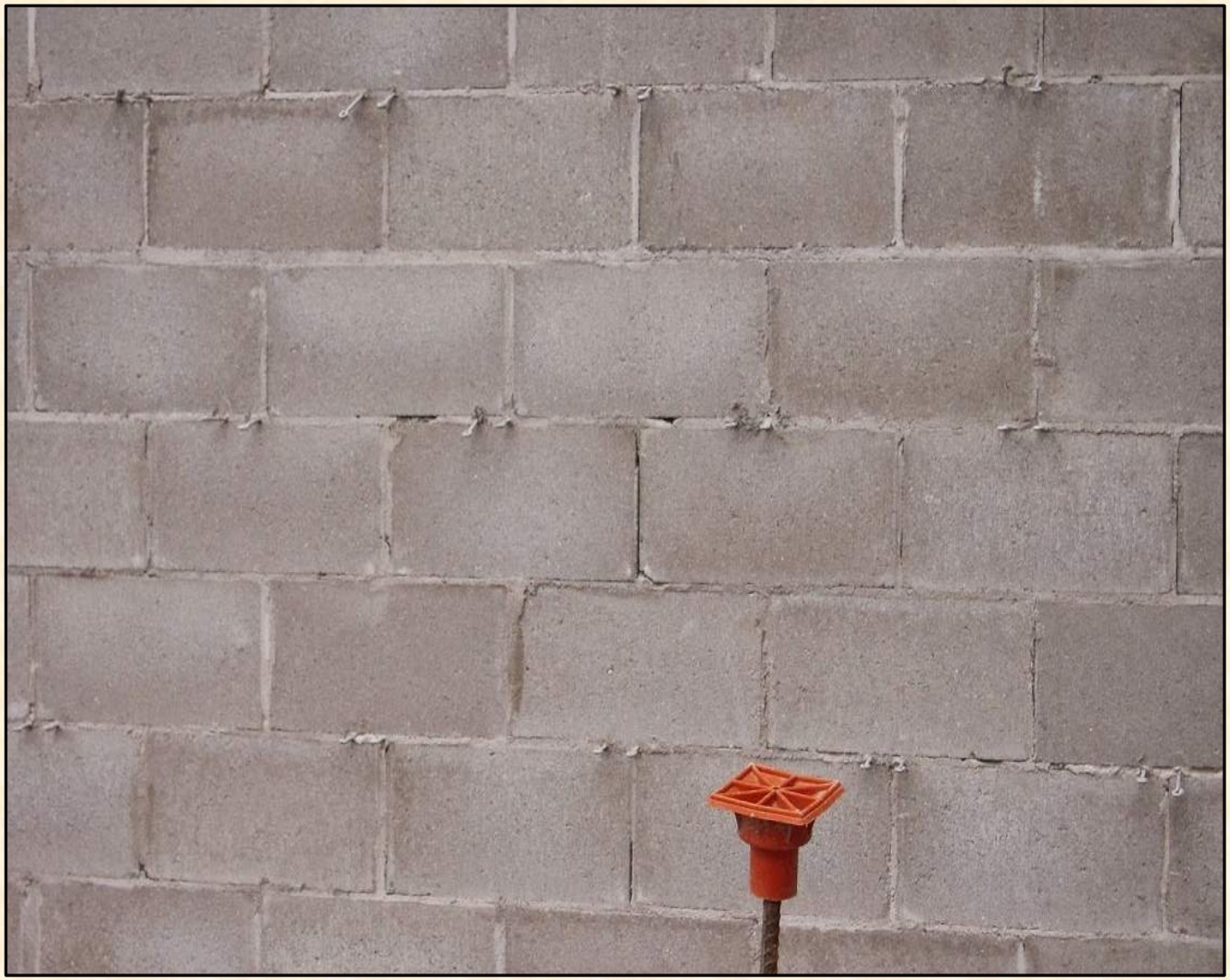

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POSITION PAPER

JULY 2021

air barrier abaa association of america

STOP WATER FROM GETTING INTO YOUR WALLS DURING CONSTRUCTION!

The condition of the substrate that the air barrier material is installed on plays a major role in the long-term success of the air barrier system. Different air barrier materials have different substrate considerations. Substrate considerations typically fall under 4 main categories:

- Moisture content
- Substrate temperature
- Cleanliness
- Surface profile

WHY IS THIS IMPORTANT THAT YOU PROTECT THE TOP OF WALLS?

Each year we see numerous problems and complaints in the air barrier installations across the country due to water entering the wall assemblies. This is primarily due to **no protection at the top of the concrete masonry units during the construction process.**

The resulting damage to some walls has been significant. In many cases, the air barrier is required to be removed where the air barrier materials have delaminated, blistered and lost adhesion. Often it results in the air barrier system being reapplied. The time and materials to remove and replace the system can be enormous.

Proceeding with the installation of the air barrier system with these undesirable circumstances is significant risk.

WHAT HAPPENS?

In many circumstances, a water-based fluid applied system could re-emulsify, blister and delaminate from the substrate. Self adhered systems can also completely delaminate and form blisters from loss of adhesion.

NEXT PAGE FOR EXAMPLES OF TEMPORARY ROOF COVERINGS & SAMPLES OF MOISTURE DAMAGE TO FLUID APPLIED MEMBRANES

WHAT SHOULD YOU DO?

1. **Specifications**
   Ensure that the project specifications require that the walls be properly protected prior to the installation of the air barrier system. It is imperative that the specification be reviewed and adhered to. If it is not clearly outlined in the construction documents, it is important to have this discussion during the bidding process.
2. **Mandatory Pre-Construction Meetings**
   This should be an agenda item to review with the construction team and outline how this is to be executed, responsibilities and on-going review of the substrate.
3. **During Construction:**
   It is recommended that the air barrier contractor, general contractor or roofer seal the tops of the walls with either:
   a. Temporary measures (application of self-adhered membrane or flashing) with long UV exposure
   b. Complete the roof installation in all areas where the air barrier is going to be installed on the wall surfaces below

CONCLUSION

Protecting the walls from moisture during construction is the most effective means in preventing damage to the installed air barrier. Proceeding with the installation of the air barrier assembly when walls have NOT been protected from moisture ingress from above is taking a huge gamble on the performance and durability of the installed system.

ABAA has published a paper on this subject, and you can access it here:

https://www.airbarrier.org/wp-content/uploads/2020/11/Wet-and-Wild-How-Wet-CMU-Can-Screw-Up-Your-Air-Barrier.pdf

***A second position paper dealing with backside parapet conditions will be published by the end of this year.**

9. Review of Installed Materials

9. Review of Installed Materials

Gypsum Association: GA-253-2021

2.5 **Gypsum Sheathing edges and ends shall be Spaced a minimum of ¼”** from concrete or Masonry to prevent moisture from wicking into the panel.

9. Review of Installed Materials

9. Review of Installed Materials

POSITION PAPER

MARCH 2022

air barrier abaa association of america

REQUIREMENTS TO HARD ROLLER SELF-ADHERED AIR BARRIER MATERIALS

WHY IS THIS IMPORTANT THAT YOU HARD ROLLER SELF-ADHERED MEMBRANES?

Products like self-adhered membranes (permeable or non-permeable) for the field of the wall, thru-wall flashing (TWF), window flashing transition membranes, self-adhering stainless steel and other materials that rely on an adhesive bond have excellent adhesive properties, provided that they are properly applied.

The manufacturers' literature clearly states that these products must be hard rolled onto the substrate with a hard rubber roller or a steel roller.

The use of the application technique called "hand pressing", using the back of a knife or a straight edge is not acceptable and does not allow the development of full adhesion.

Figure 1
Unadhered Membrane to Substrate

WHAT HAPPENS?

The air barrier membrane may not adhere as intended. The lack of full adhesion can be exhibited by wrinkles, "tunnel blisters", unadhered membrane to the substrate, or lap seam loss of adhesion to the underlying sheet.

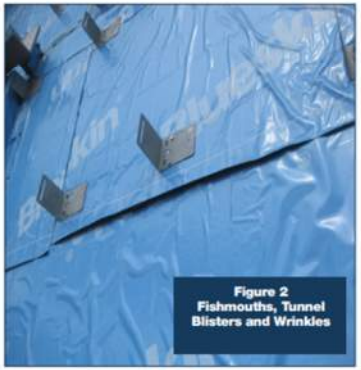


Figure 2
Fishmouths, Tunnel Blisters and Wrinkles

WHY DOES THIS OCCUR?

The pressure sensitive adhesives used with these products are thermoplastic by design. Thermoplastics are deformable by heat and/or pressure. Hard rolling of these materials allows them to be pushed/deformed into both the high points and valleys of the substrate ensuring a very high percentage of adhesion. Hand pressing of these materials only allows adhesion to the top of the irregularities of the substrate, while hard rolling of the material allows the adhesive to be forced into the valleys of the substrate.

The drawing below illustrates this point:

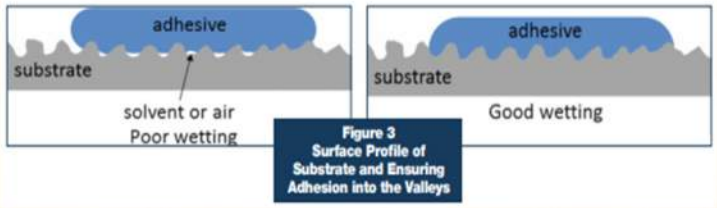


Figure 3
Surface Profile of Substrate and Ensuring Adhesion into the Valleys

9. Review of Installed Materials

9. Review of Installed Materials

9. Review of Installed Materials

9. Review of Installed Materials

1) Construction Manager

Status	ID	Type	Assigned to	Issue owner	Root cause	Created on	Due date
Open	324	Quality > Quality		ryan west Danis Fire Stopping		Apr 25, 2022	

Title	Verify minimum clearance required between penetrations to allow proper Firestopping of both elements
Location	—
Description	—

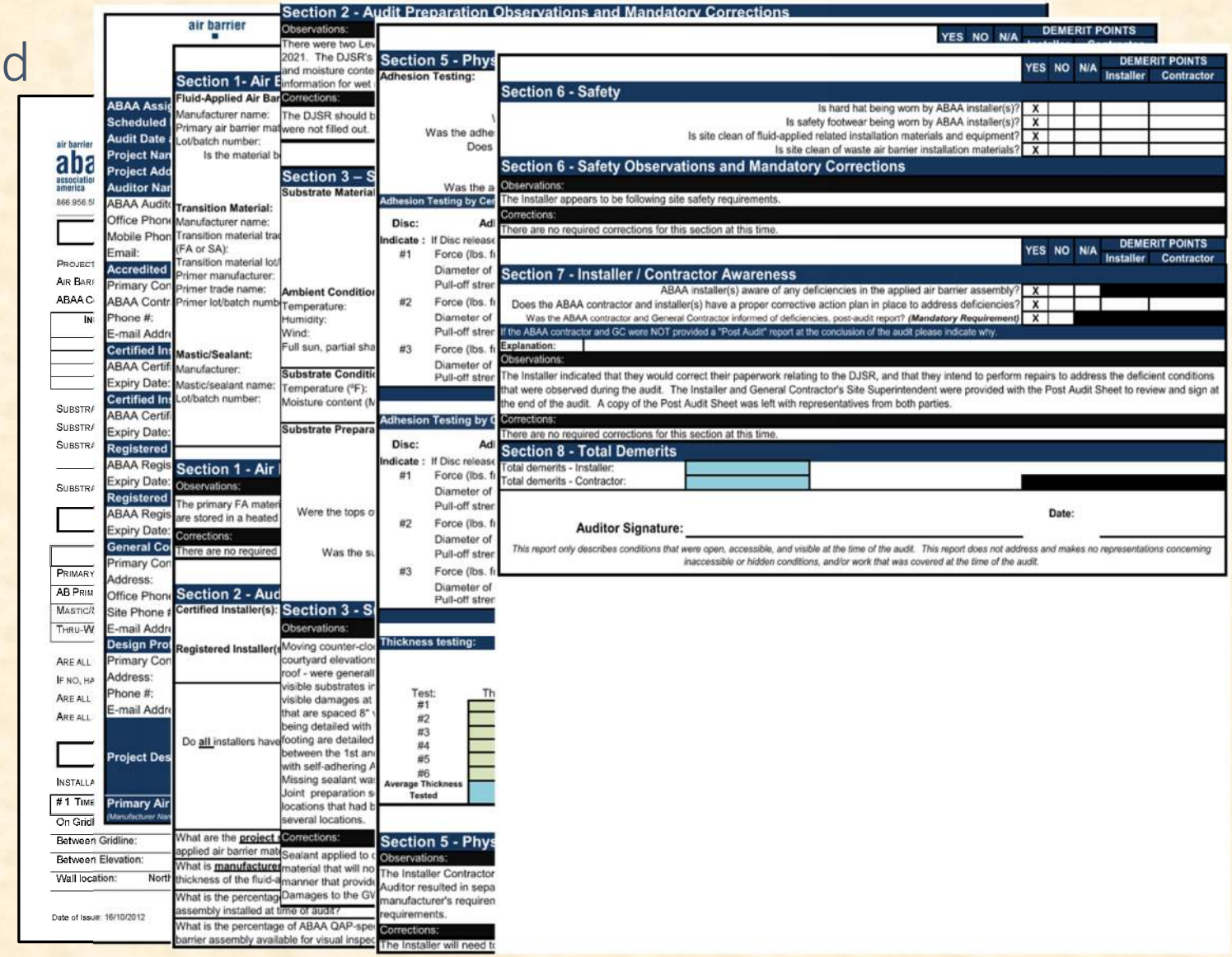
Status	ID	Type	Assigned to	Issue owner	Root cause	Created on	Due date
						2022	

Task No.	Report	Date	Item No.	Item Description	Status	Comments	Responsible	Correction
1	038	2/24/2020	1	Bridge B (EIFS)	No Action Required	General view of ongoing Densglass sheathing installation and air barrier application on the exterior wall under Bridge A.	Anning-Johnson	
2	038	2/24/2020	2	Bridge B (EIFS)	No Action Required	Close up view of installed Densglass sheathing under Bridge B ceiling.	Anning-Johnson	
3	038	2/24/2020	3	Bridge B (EIFS)	No Action Required	General view of ongoing second base coat application over rasped EPS foam.	Anning-Johnson	
4	038	2/24/2020	4	Bridge B (EIFS)	No Action Required	General view of rasped EPS foam on the lower level and ready to receive the first coat of base coating.	Anning-Johnson	
5	038	2/24/2020	5	Bridge B (EIFS)	No Action Required	General view of base coat applied with the primer/finish coat to follow (left photo). General view of wind clip installed (right photo) prior to installation of metal coping.	Anning-Johnson	
6	038	2/24/2020	6	Bridge B	No Action Required	General view of installed roofing system on Bridge B roof.	Commercial Roofers	
7	038	2/24/2020	7	Bridge B	No Action Required	General view of ongoing roofing installation on the east side of Bridge B roof.	Commercial Roofers	
8	038	2/24/2020	8	Platform Roof	No Action Required	General view of ongoing Polyisoboard and roof cover board installation on the Platform roof.	Commercial Roofers	
9	038	2/24/2020	9	Bridge A Roof	No Action Required	General view of installed roofing system on Bridge A roof.	Commercial Roofers	
10	038	2/24/2020	10	Bridge A Roof	Closed	Marked area depicts foreign object buried under the roofing membrane that needs to be taken out and repaired.	Commercial Roofers	Closed per Field Observation Summary Report issued 05/04/20
11	038	2/24/2020	11	Bridge A Roof	Closed	General view of miscellaneous debris on the east side of the roof that needs to be cleaned out prior to high voltage testing	Commercial Roofers	Closed per Field Observation Summary Report issued 05/04/20
12	040	3/16/2020	1	Bridge A Roof	No Action Required	General overview of testing area	Roofers	
13	040	3/16/2020	2	Bridge A Roof	Closed	observed unknown debris buried under the roofing membrane that needs to be removed and repaired.	Commercial Roofers	Closed per Field Observation Summary Report issued 05/04/20
14	040	3/16/2020	3	Bridge A Roof	Closed	General view of fasteners stick out through the roofing membrane.	Commercial Roofers	Closed per Field Observation Summary Report issued 05/04/20
15	040	3/16/2020	4	Bridge A Roof	Closed	Marked area depicts pinholes found after performing high voltage test in the area.	Commercial Roofers	Closed per Field Observation Summary Report issued 05/04/20
16	040	3/16/2020	5	Bridge A Roof	Closed	Marked area depicts pinholes found after performing high voltage test in the area.	Commercial Roofers	Closed per Field Observation Summary Report issued 05/04/20
17	040	3/16/2020	6	Bridge A Roof	Closed	Marked area depicts burned roof membrane due to overheated rhinobond machine.	Commercial Roofers	Closed per Field Observation Summary Report issued 05/04/20
18	040	3/16/2020	7	Bridge A Roof	Closed	Marked area depicts cigarette burn over installed roofing membrane.	Commercial Roofers	Closed per Field Observation Summary Report issued 05/04/20
19	041	3/19/2020	1	Bridge B Roof	No Action Required	General overview of testing area viewed from the east side of the roof.	Commercial Roofers	
20						General overview of testing area viewed from the west	Commercial	

9. Review of Installed Materials

1) Construction Manager

2) ABAA/QAP – Contractor & Auditor



9. Review of Installed Materials

1) Construction Manager

2) ABAA/QAP – Contractor & Auditor

3) BECx Provider or Enclosure Consultant

Date: 02/20/19 **Project:** **New Building**
539 Main St, Your Town, WI

BRANDT
ENCLOSURE CONSULTING INC

4404 Rib Mountain Dr, #235
Wausau, WI 54401

Site Visit No: 1

Site Progress: At the time of the site visit there was no active work on the exterior of the building. A majority of the exterior masonry was completed at the time of the site visit (Photos 1 & 2).

Item No.	OBSERVATIONS	Photo No.
1.1	The exterior air & vapor barrier installed and visible at the upper portion of the ground level on the south and partial east elevation has several gaps at sheathing joints, exposed sheathing where the air & vapor barrier has "runs", the fastener holes have not been treated and the wood blocking at the perimeter of the windows is not effectively sealed or transitioned to the sheathing leaving a gap or joint between the sheathing and blocking which may allow water entry to the interior.	3 through 12
1.2	The inside corner south of the south vestibule has not be wrapped with air and vapor barrier, a portion of the east face is covered with insulation. The barrier needs to be installed and completed prior to installation of insulation and masonry.	13 & 14
1.3	The connection at the west end of the south elevation between the existing building and the new structure needs to be completed with a transition membrane. Additionally, the upper area at the soffit needs to be enclosed to separate interior and exterior environments.	15 & 16
1.4	The expansion joint at the west end of the north elevation to the existing building is not yet installed. With the exterior block installed it will be difficult to effectively install the primary weather seal (expansion joint) between the backup CMU and the existing building (limited physical access). The condition should be reviewed by the installing contractor. Removal of a portion of the exterior block may be required to effectively install this joint.	17-19
1.5	The glass setting blocks installed in the storefront window system are approximately 1" in length. Typical glass manufacture warranty and the GANA manual (Glass Association of North America) require a minimum of 4" long setting blocks. Short setting blocks can lead to premature insulated glass failure or excessive stress on isolated locations which may cause breakage. BEC recommends replacing the 1" setting blocks with full length (4") setting blocks.	20
1.6	Interior drywall is being installed, however the interior perimeter sealant around the storefront windows has not been installed. The interior sealant is critical to the overall performance of the system and should be completed. Drywall should be removed to complete interior sealant installations.	21-22

9. Review of Installed Materials

1) Construction Manager

2) ABAA/QAP – Contractor & Auditor

3) BECx Provider or Enclosure Consultant

4) Manufacturer

Observations

Question	Response	Details
3.0 - SUBSTRATE		
3.1	Observation	Substrate wet. No application occurring during rain event. Quality of CMU substrate/mortar joints was satisfactory for areas observed.
4.0 - MEMBRANE APPLICATION		
4.1	Observation	Areas observed: North Elevation - from 9th floor. Application adhesion and mil thickness is satisfactory.
 Photo 1		
6.0 - TRANSITIONS		
6.1	Observation	PROGLAZE ETA Transitions from window frame to moisture barrier system. Trial area: Sill on 9th floor, North elevation. Overall application was satisfactory. Continuous Spectrem 1 coverage. No buckling or displacement of ETA Membrane.
 Photo 2		
6.2	Observation	Adhesion to frames and barrier satisfactory
 Photo 3  Photo 4		

10. In Situ Testing / Validation

10. In Situ Testing / Validation

10. In Situ Testing / Validation

ABAA – 002-17

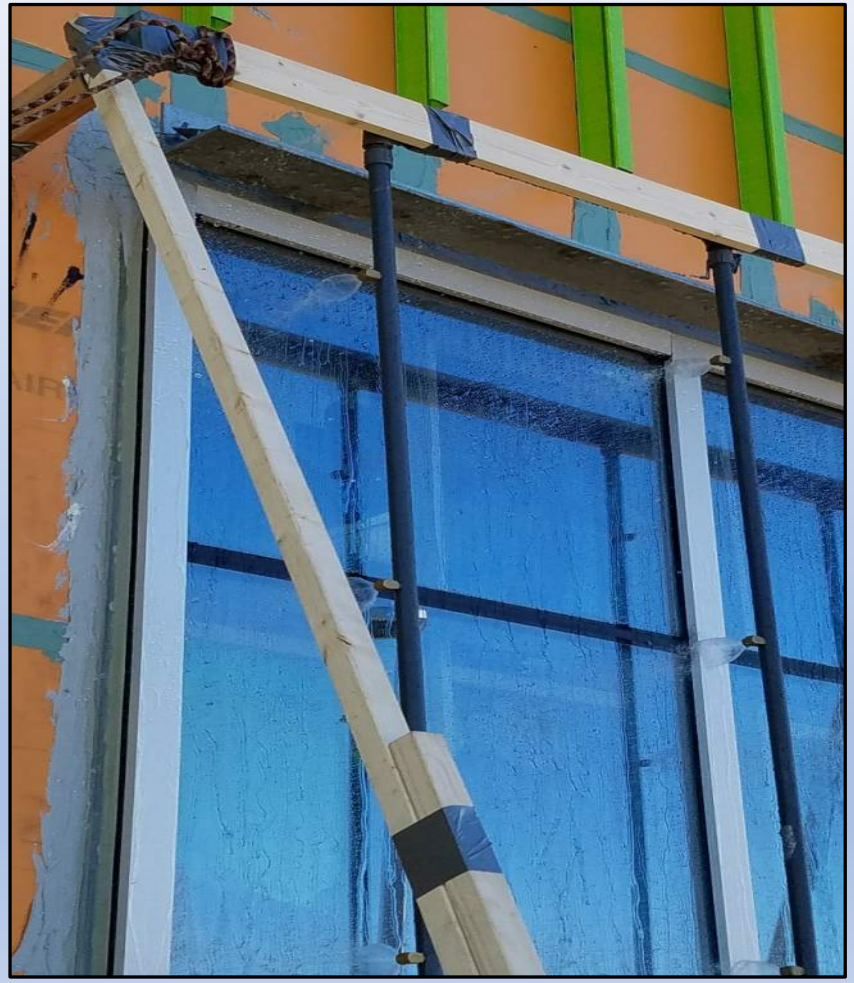
ASTM D 4541

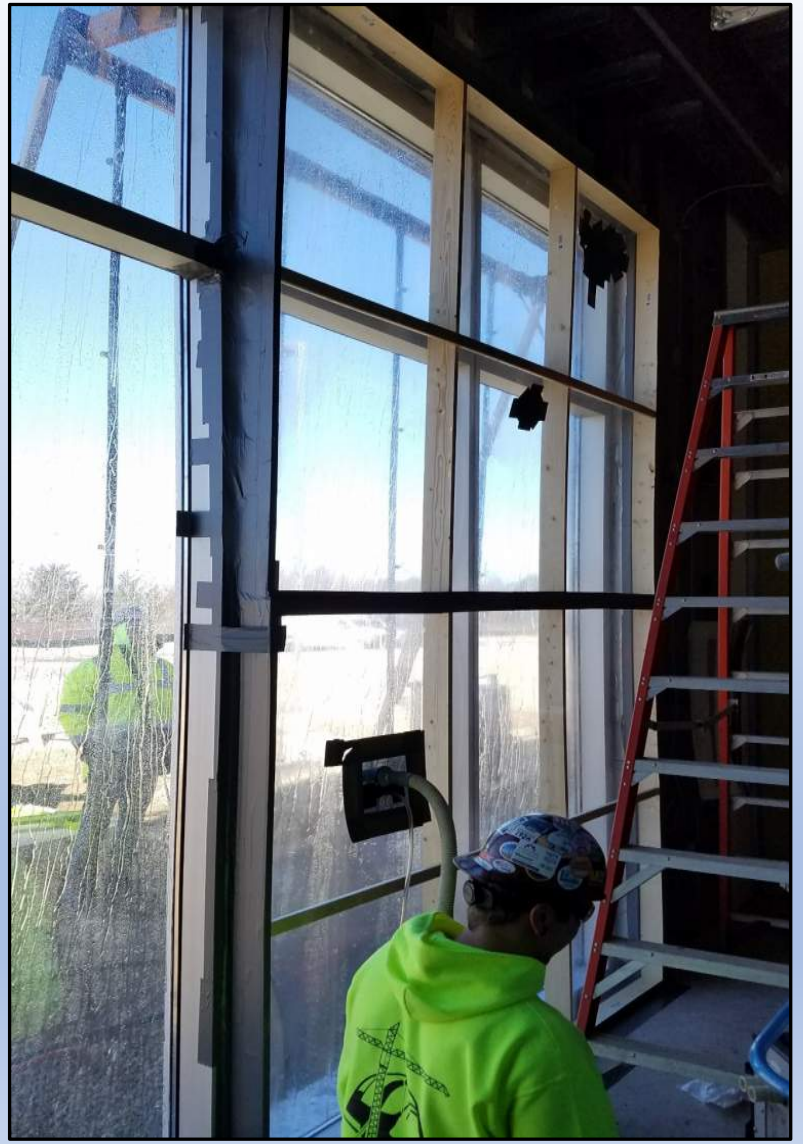
Adhesion

10. In Situ Testing / Validation

ASTM E 1186
Bubble Gun

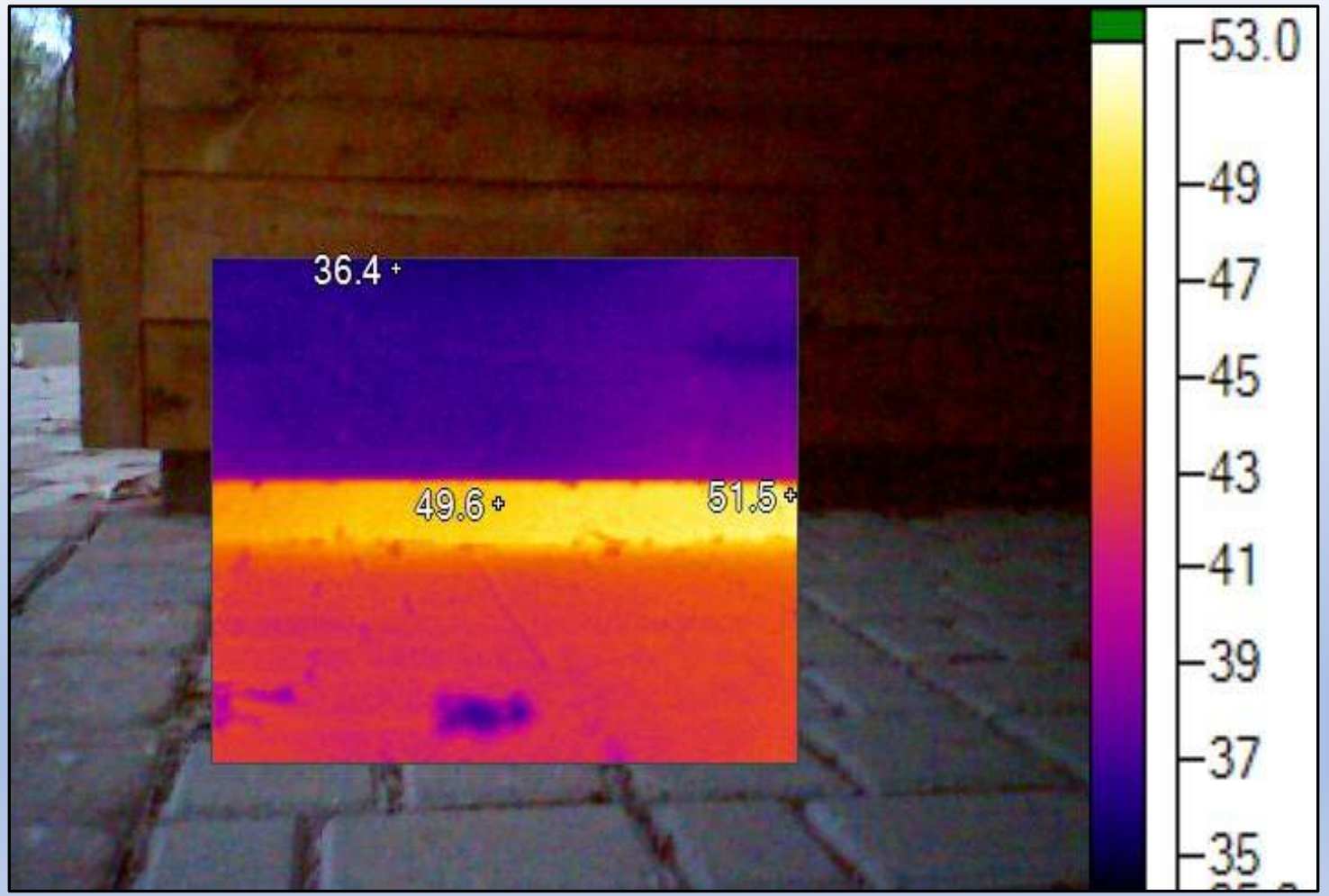
10. In Situ Testing / Validation





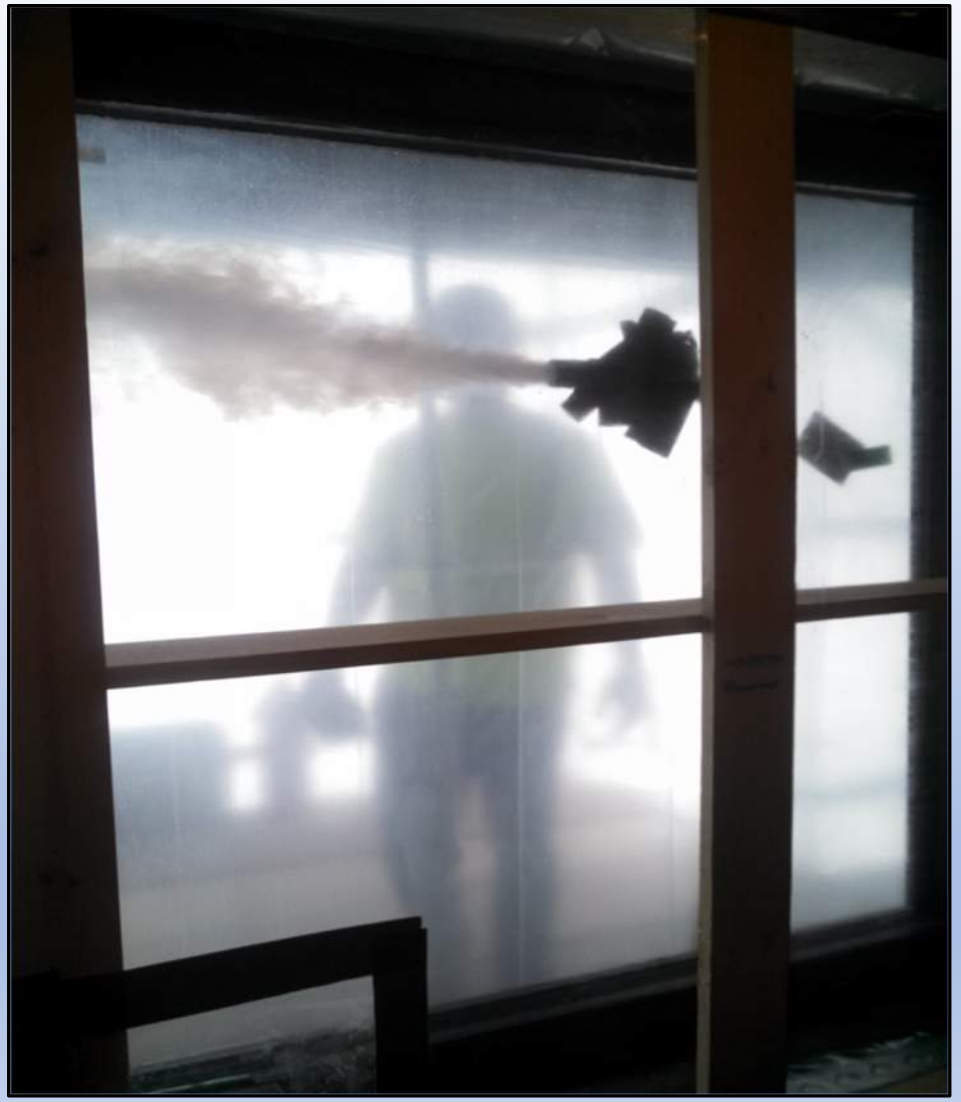
ASTM E 1105
Static Water

10. In Situ Testing / Validation



ASTM E 1186
Thermography

10. In Situ Testing / Validation



ASTM E 1186
Smoke

10. In Situ Testing / Validation

AAMA 501.1 – Dynamic Water

10. In Situ Testing / Validation

April ‘22 ABAA Whole Building Testing Training Class

ASTM E 1827 / E 3158
Whole Building Airtightness

Oh – By the Way….

- As of May 29th, 2020
  - Per the Washington DC Construction Codes (2017 DCMR)

11.3.1.3 Building Envelope Commissioning (BECx). BECx shall comply with one of the following:

a. **Whole building pressurization testing** shall be conducted in accordance with ASTM E779, CAN/CGSB-149.10- M86, CAN/CGSB-149.15-96 or equivalent. The measured air leakage rate of the building **envelope shall not exceed 0.25 cfm/ft2** (1.25 L/s·m2) under a pressure differential of 0.3 in. wc (75 Pa),

b. **A building envelope commissioning authority, (BECxA,) with building envelope commissioning** credentials as approved by the AHJ, shall be contracted by the project owner to conduct building air-barrier commissioning prior to permit for the project. A fundamental envelope commissioning **program consistent with ASTM E2813- 12**

The state of Washington
February 1st, 2021
Requires you

PASS

Whole Building Airtightness Testing to obtain an

Occupancy Permit

2018 WSEC –
C402.5.1.2 – Building Test

- 0.25 cfm/ft^2 to pass
- Between 0.25 cfm/ft^2 and 0.40 cfm/ft^2
  - Require visual inspection and repair
- Above 0.40 cfm/ft^2 = Repair & Retest
  - Above 0.40 cfm/ft^2 = ***NO OCCUPANCY***

ABAA - Whole Building Airtightness Training Course - Seattle Washington

Additional Way for the CM to Reduce Their Risk

Quality
Assurance
Program

1) = Evaluated Materials

2) = Trained/Certified Installers

3) = Trained Licensed Auditors / Field Audits

4) = Independent Review of QAP Final Audit

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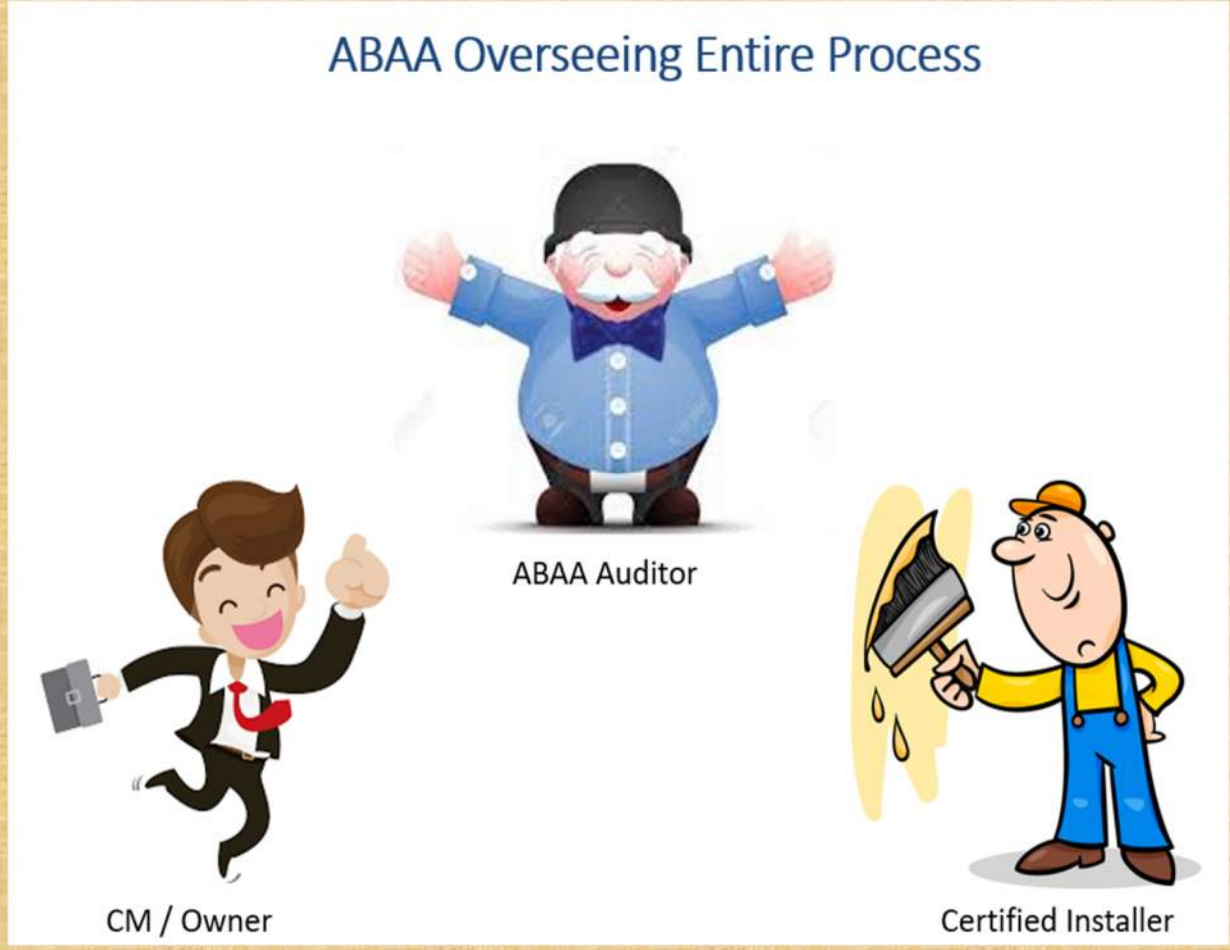

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Quality Assurance Program

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3) = Trained Licensed Auditors / Field Audits

4) = Independent Review of QAP Final Audit

Strip Mall

Building Cost: $6,390,000
ABAA Wall Area: 11,348 sf
QAP Investment: $4,964
Audits: 2

% of Job Cost: .08%

Small Hotel

Building Cost: $17,280,000
ABAA Wall Area: 17,280 sf
QAP Investment: $5,468
Audits: 2

% of Job Cost: .03%

Medium Office

Building Cost: $24,334,400
ABAA Wall Area: 10,975 sf
QAP Investment: $4,932
Audits: 2

% of Job Cost: .02%

Large Hotel

Building Cost: $65,594,884
ABAA Wall Area: 33,849 sf
QAP Investment: $6,877
Audits: 2

% of Job Cost: .01%

Secondary School

Building Cost: $51,037,800
ABAA Wall Area: 27,040 sf
QAP Investment: $6,298
Audits: 2

% of Job Cost: .01%

Large Office

Building Cost: $276,224,400
ABAA Wall Area: 64,480 sf
QAP Investment: $11,480
Audits: 3

% of Job Cost: .004%

Rule of 1-10-100

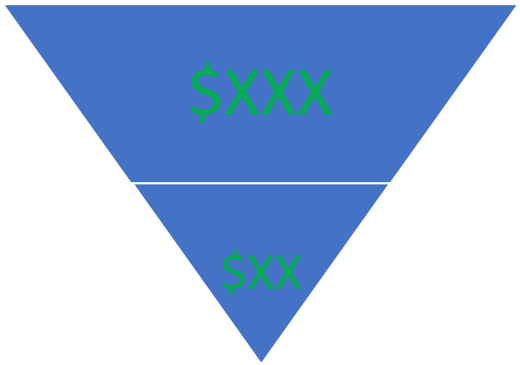
Design Stage (Plan)

Deming's Quality Cycle
Plan – Do - Check – Act (Adjust)

Based on
Philip Crosby (1979) 1 / 10 / 100

Rule of 1-10-100

Preventative Stage (Do)
Installer notices issue & Fixes



Design Stage (Plan)

Deming's Quality Cycle
Plan – Do - Check – Act (Adjust)

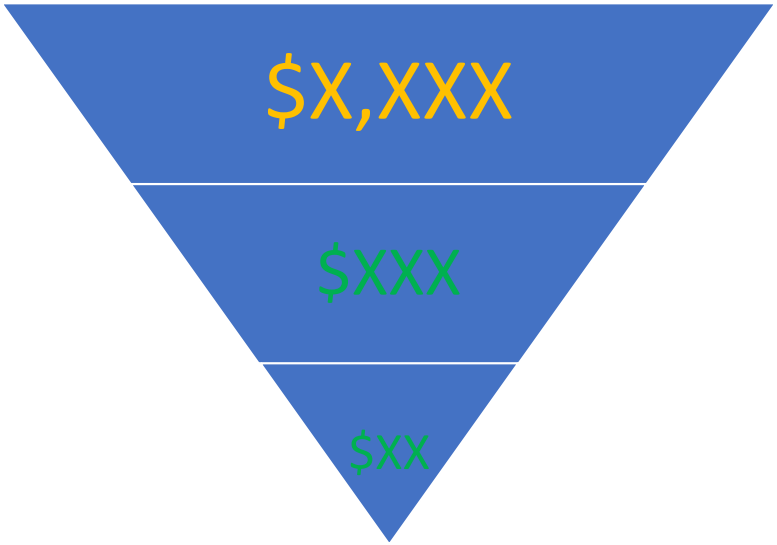
Based on
Philip Crosby (1979) 1 / 10 / 100

Rule of 1-10-100

Inspection Stage (Check)
3rd Party / Architect / QAQC

Preventative Stage (Do)
Installer notices issue & Fixes

Design Stage (Plan)



Deming's Quality Cycle
Plan – Do - Check – Act (Adjust)

Based on
Philip Crosby (1979) 1 / 10 / 100

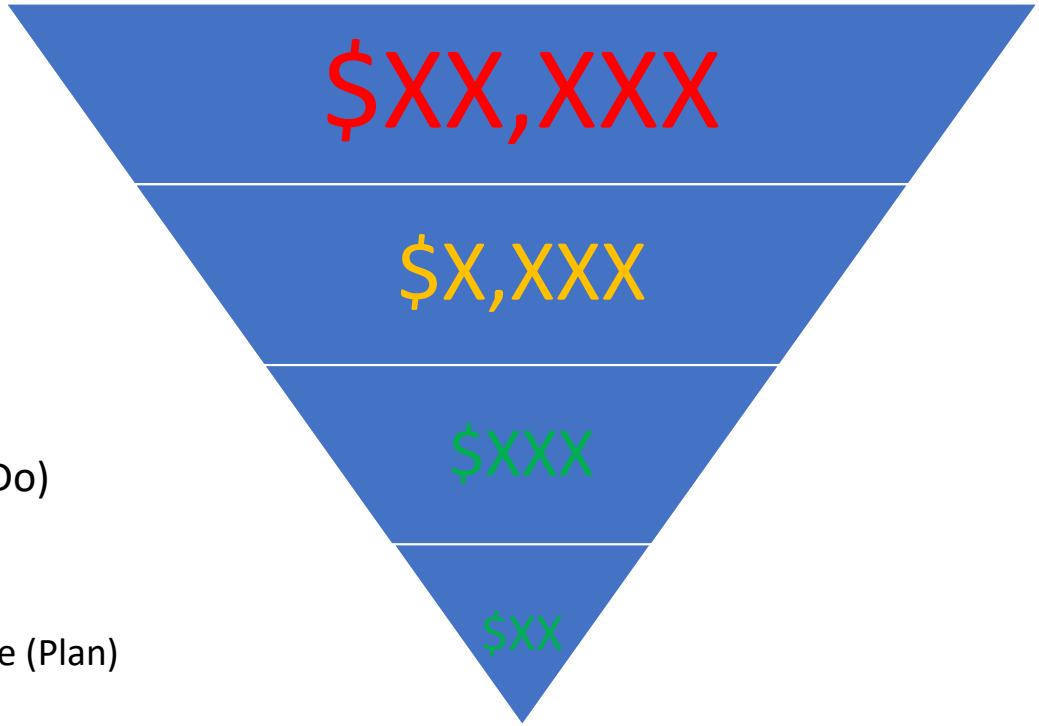
Rule of 1-10-100

Failure Stage (Adjust)

Inspection Stage (Check)
3rd Party / Architect / QAQC

Preventative Stage (Do)
Installer notices issue & Fixes

Design Stage (Plan)



Deming's Quality Cycle
Plan – Do - Check – Act (Adjust)

Based on
Philip Crosby (1979) 1 / 10 / 100

Rule of 1-10-100

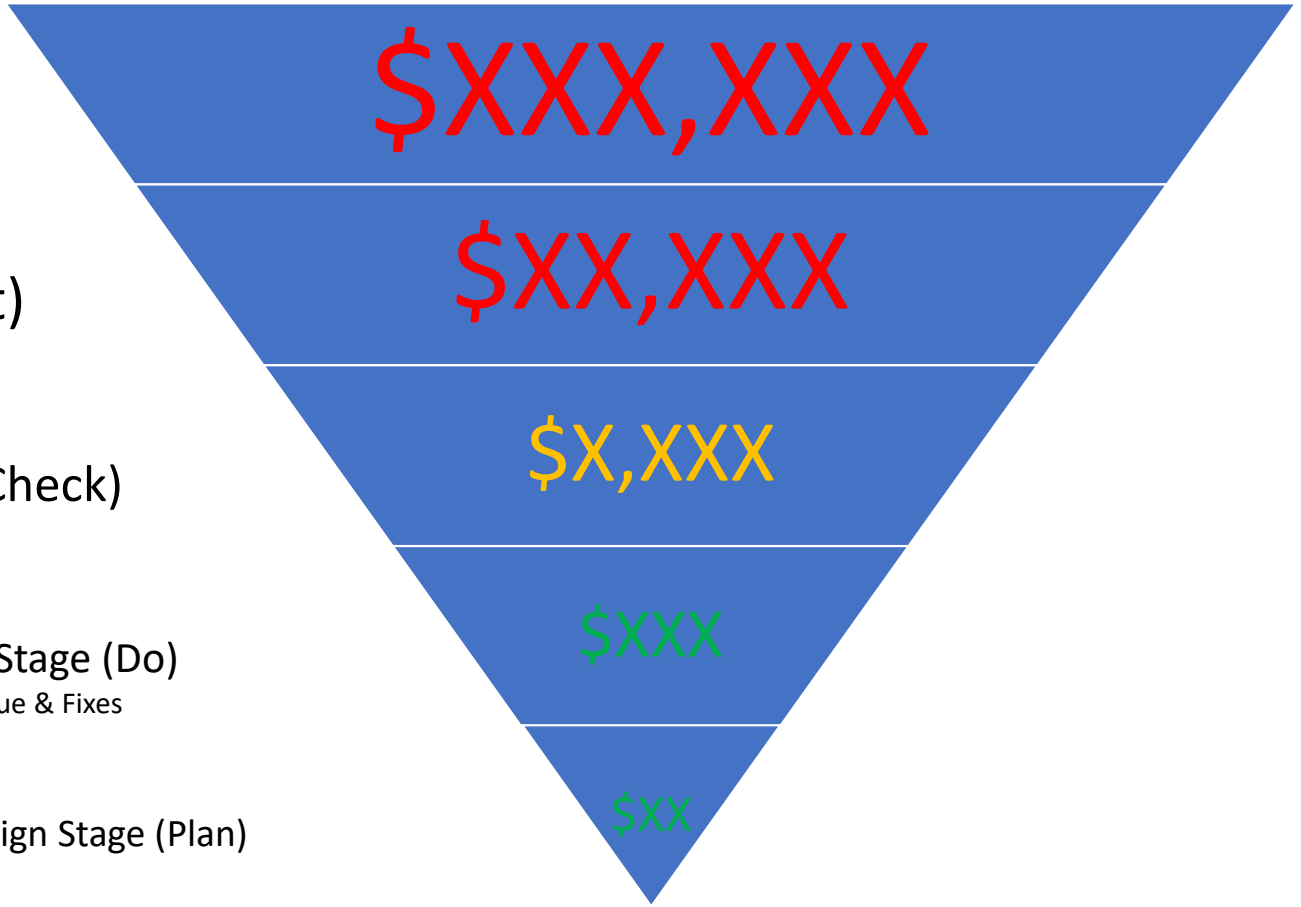
Really Costly Stage

Failure Stage (Adjust)

Inspection Stage (Check)
3rd Party / Architect / QAQC

Preventative Stage (Do)
Installer notices issue & Fixes

Design Stage (Plan)



Deming's Quality Cycle
Plan – Do - Check – Act (Adjust)

Based on
Philip Crosby (1979) 1 / 10 / 100

Rule of 1-10-100

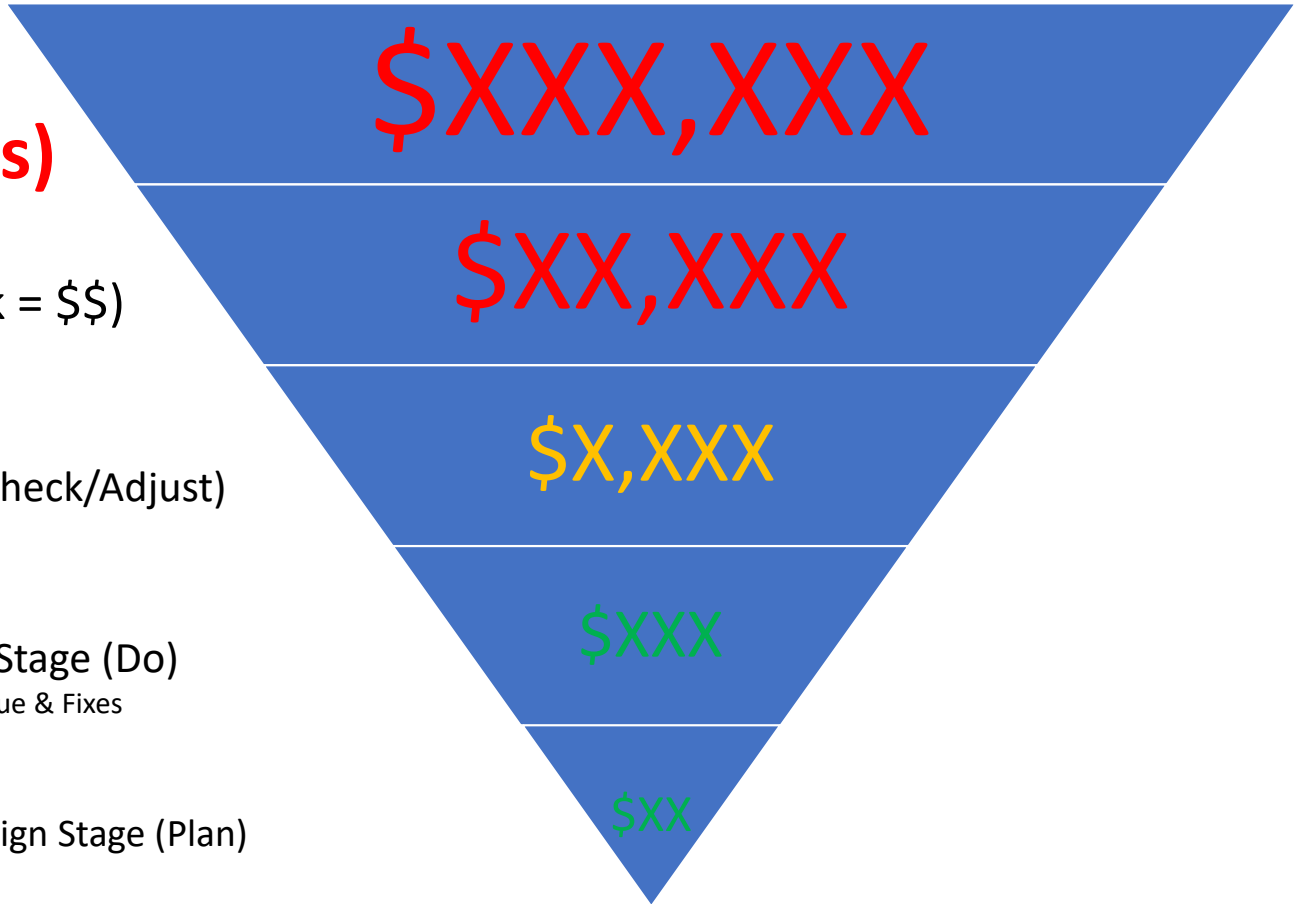
Really Costly Stage
(Oh Crap - Lawyers)

Failure Stage (Rework = $$)

Inspection Stage (Check/Adjust)
3rd Party / Architect / QAQC

Preventative Stage (Do)
Installer notices issue & Fixes

Design Stage (Plan)



Deming's Quality Cycle
Plan – Do - Check – Act (Adjust)

Based on
Philip Crosby (1979) 1 / 10 / 100

Brian Stroik

Chair: ABAA

American Contractors Insurance Group

Performance Excellence & Quality Consultant

414-788-7957

stroikabaa@gmail.com

air barrier abaa association of america BUILDING ENCLOSURE CONFERENCE 2022 RESTON VA

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