

Construction Manager/ Subcontractor/Tradesperson Training Session 4: **Field Training & Mockups**

Since 1972, Steven Winter Associates, Inc. has been providing research, consulting, and advisory services to improve the built environment for private and public sector clients.

Our services include:

- Energy Conservation and Management
- Sustainability Consulting
- Green Building Certification
- Accessibility Consulting

We have over 125 staff across three office locations:
New York, NY | Washington, DC | Norwalk, CT

For more information, visit
www.swinter.com



Steven Winter Associates is a Registered Provider with The American Institute of Architects Continuing Education Systems. Credit earned on completion of this program will be reported to CES Records for AIA members. Certificates of completion for non-AIA members are available on request.

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

This presentation is protected by US and International copyright laws. Reproduction, distribution, display and use of the presentation without written permission of the speaker is prohibited © Steven Winter Associates, Inc. 2019



Upon Completion of Module

You will receive the following items via email:

- AIA Certificate of completion-can also be used for:
  - NYS PE CEUs
- PDF of final presentation
- Link to the webinar recording



Steven Winter Associates, Inc.
Improving the Built Environment Since 1972

Provider #: J827

CONTINUING EDUCATION AIA

CERTIFICATE OF COMPLETION

THIS CERTIFICATE IS TO CERTIFY THAT
Katie Zoppo

PARTICIPATED IN
Module 1: Overview of PH/Net Zero Building Concepts, Techniques and Benefits

COURSE NUMBER
M1OOPHNZBCTAB

ON
February 11th, 2020

LOCATION
New Paltz, NY

EARNING
4 AIA CES Learning Unit/HSW

Lois B. Arena, PE
Director, Passive House Services
Steven Winter Associates, Inc.

Steven Winter Associates, Inc.
61 Washington Street
Norwalk, CT 06854
203.857.0200

Learning Objectives



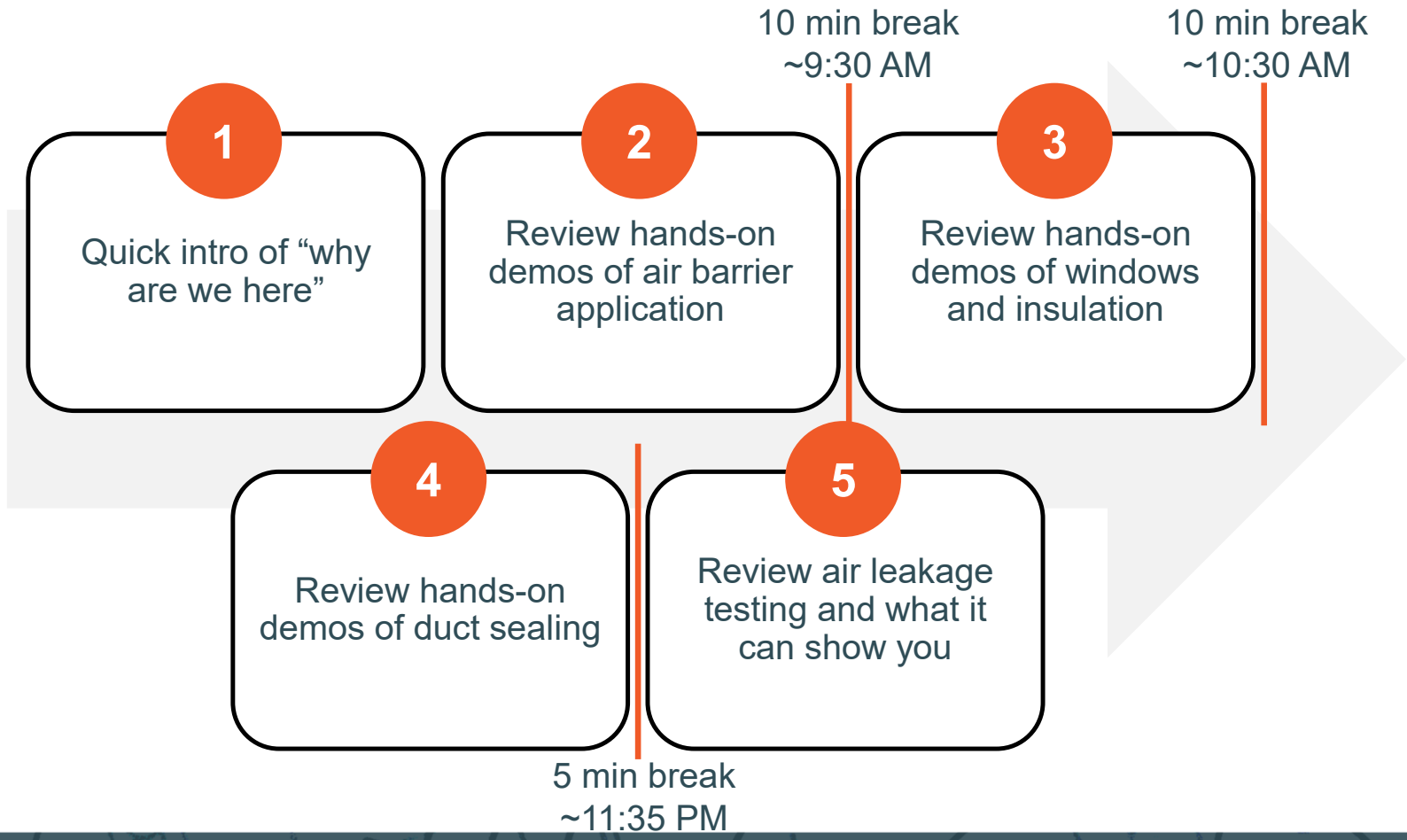
Understand net zero carbon goals for SUNY

Review wall mockups for building envelope and windows

Examine duct testing mockups and sealing

Look at air leakage testing and finding air leaks

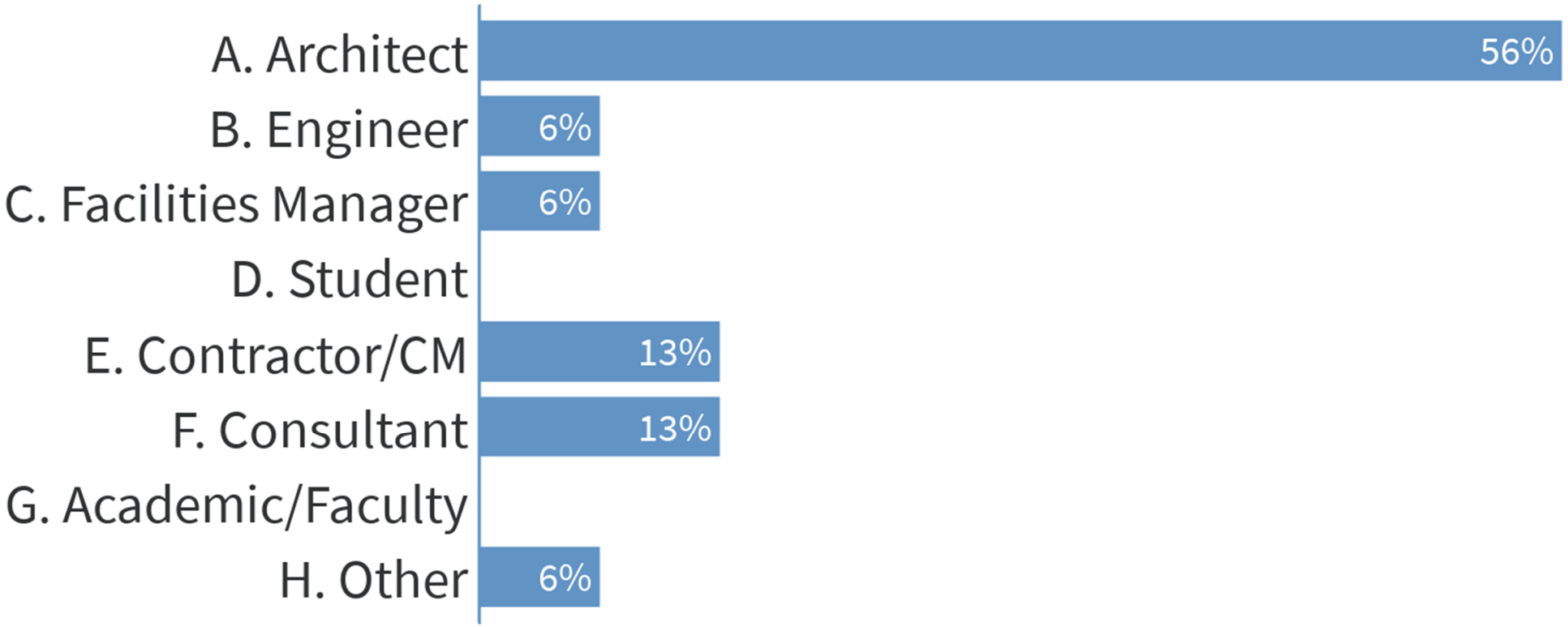
Overview of Presentation



When poll is active, respond at **PollEv.com/swa335**

Text **SWA335** to **22333** once to join

What is your profession?



When poll is active, respond at **PollEv.com/swa335**

Text **SWA335** to **22333** once to join

What is the one thing you were hoping to learn about today?





Coykendall Science Building

Why we are here: **Directive 1B-2**

- 2018 Chancellor calls for all new buildings to be zero-net-carbon & deep energy retrofits for existing buildings
- 2018 SUCF issued Directive 1B-2
  - Purpose: define and identify goals for Net Zero Carbon (NZC) new buildings and Deep Energy Retrofits (DER) of existing buildings.
  - Function: outlines the project target goals and provides direction for project designs.
  - Metrics: Site Energy as the measure of performance and energy consumption.

Why we are here: **Directive 1B-2**

- Design and construct highly energy efficient buildings which significantly reduce energy consumed below an energy code standard for new buildings or energy usage for an existing building.
- In the case of insufficient project funding, the design goal will be to design the building as NZC “capable” where: the design achieves the energy use intensity (EUI) limit using HVAC equipment and systems that can be electrically powered from renewable energy sources.

New Building Performance goals:
Site Energy Use Intensity (EUI) limits

Classroom building	50 kBTU/ft2/year
Office building	50 kBTU/ft2/year
Laboratory building	150 kBTU/ft2/year
Residence Hall	32 kBTU/ft2/year

These **Trainings**

- **Module 1:** Overview of PH and Net Zero
- **Module 2:** Construction Methods and High-Performance Products and Details
- **Module 3:** Air Barrier Development & Implementation
- **Module 4:** Net Zero HVAC Strategies and Controls + DHW
- **Module 5:** Construction Documents and Bidding
- **Module 6:** Deep Energy Retrofits
- **Module 7:** Refrigerant Management in Design, Construction, and Operations
- **Module 8.1:** Building Envelope
- **Module 8.2:** Net Zero Mechanical, Electrical, and Plumbing
- **Module 8.3:** QA/QC Techniques for Ensuring Success
- **Module 8.4:** Field Training & Mockups

Clarifications

We may use Passive House and Net-Zero interchangeably

Passive House principles are a great pathway to achieving Net-Zero

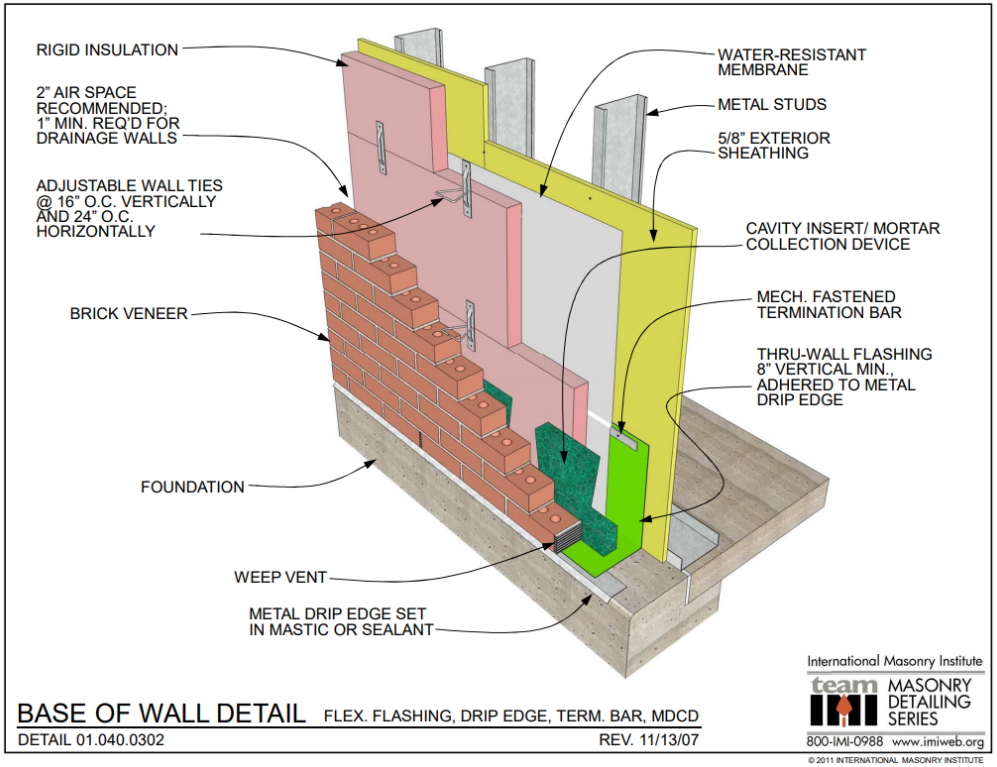
Questions?



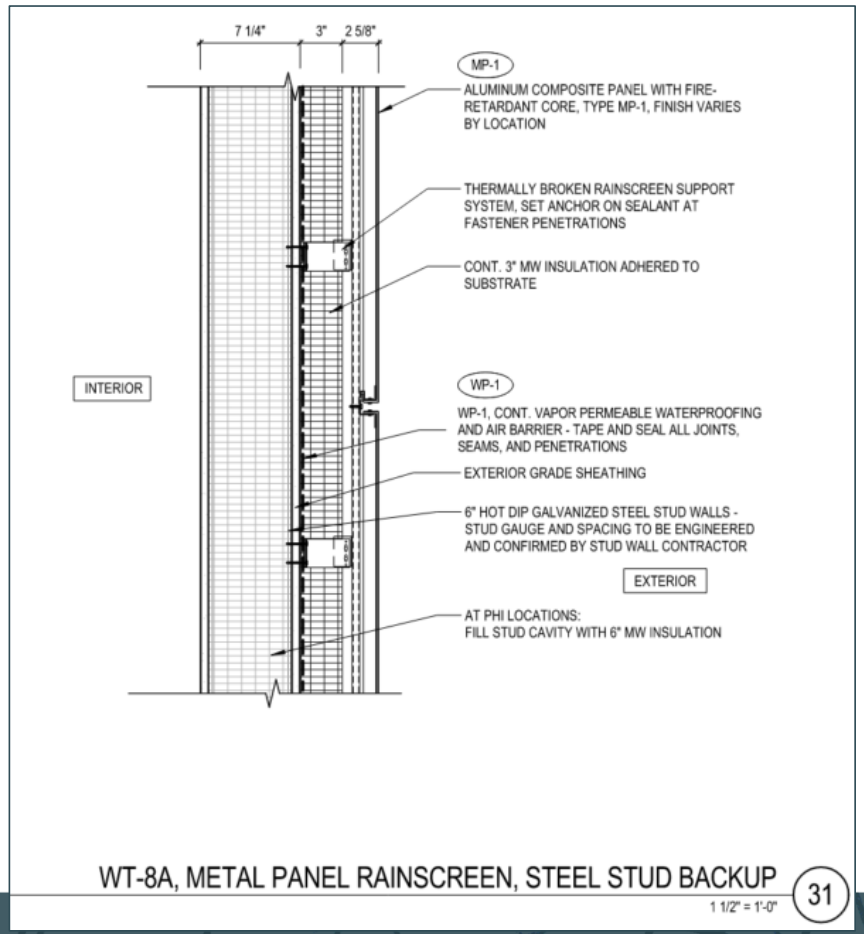
Wall Mockups (Building Envelope)

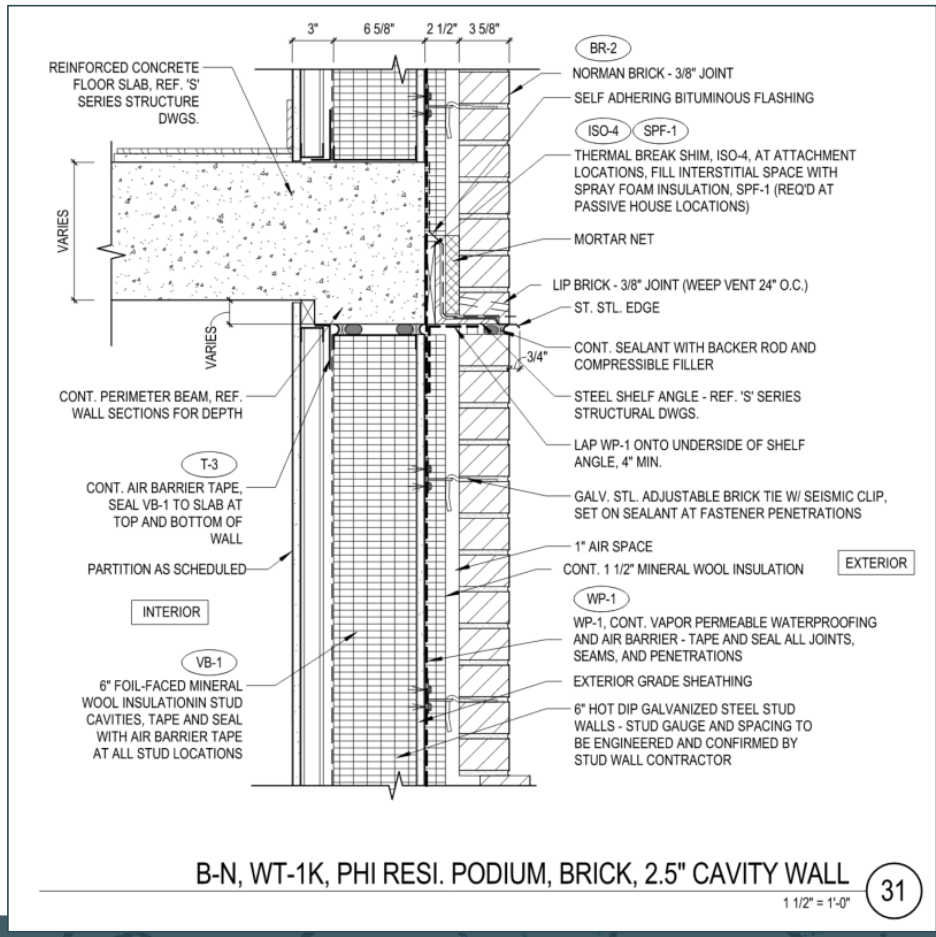
Construction Type – **Steel Studs**

- Despite steel studs thermally conductive properties, they are still used on some high-performance buildings
- Steel studs are a back up wall alternative to CMU in large buildings
- It is possible to reach Passive House insulation levels with steel studs



Typical Construction Types – **Steel Studs**





Air Barrier for Brick, Rain Screen, Metal Panel, Etc.





EIFS System





Table of Uncommon Tools

- Wet film thickness gauge
- Counter roller
- Tape application tool
- Plastic taping knife set
- Putty knife
- Caulking spatulas

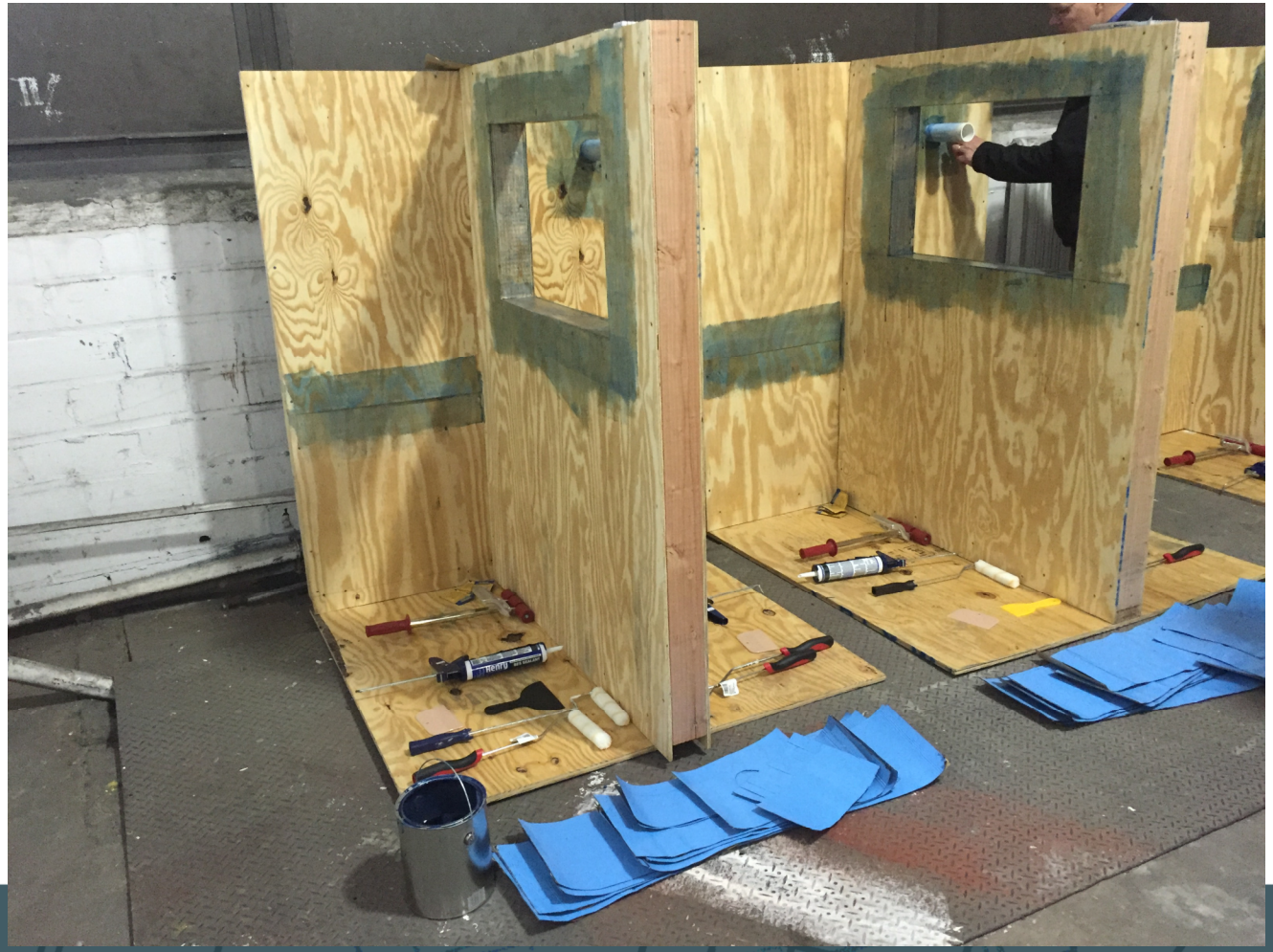








Table of Uncommon Tools







Air Barrier Instructions (Joints) – Rain Screen

Substrate Preparation

Surfaces shall be clean of oil, dust, dry, and sound with no excess mortar droppings. Concrete Masonry Joints shall be free of voids and shall be tooled or struck flush. Gaps from ¼" to 1" wide shall be fitted with backer rod. Joints receiving backer rod shall provide a sealant depth of at least a ¼" but not more than ½". Acceptable substrates include Concrete Masonry Units, mortar/grout, concrete, exterior grade gypsum board, plywood, OSB, wood, aluminum, galvanized metal, and anodized aluminum. Any damaged gypsum sheathing should be replaced. Voids or irregularities in concrete or masonry substrates should be patched using a cementitious patching compound as needed.

Membrane Thickness: CCW AVB & Applications: 40 mils		40 mils wet/ 38 mils dry

Detailing Sealant Applications (Sheathing Joints, Dissimilar Substrates, Non-Moving Cracks, Termination Mastic):

Elastomeric Joint Sealant Application (Expansion/Control Joints, Window-Rough Opening Joint):

Liquid Flashing Application (Rough Openings, Pipe/Duct Penetrations, Inside/Outside Corners)

Apply BarriBond in serpentine beads over the substrate. Spread BarriBond using a squeegee or a trowel to provide full, uniform coverage over the substrate. Apply to openings, pipe/duct penetrations and inside/outside corners as shown in the respective CCW air barrier system standard details. Apply BarriBond at a uniform wet mil thickness of 40 mils (0.040 inch), continuously monitoring thickness with a CCW Wet Mil Thickness Gauge to assure adequate coverage. BarriBond can be applied in a single coat. To facilitate installation, joints and gaps between dissimilar substrates may be treated with BarriBond and allowed to cure firm before proceeding with trowel coverage of the liquid flashing area. Also, the raw edge of gypsum sheathing can be treated with CCW-702, 702 LV, or 702 WB to consolidate this substrate and facilitate coverage with BarriBond. In liquid flashing applications, BarriBond shall tie into the main CCW Air Barrier Membrane with a minimum 2 inch lap. CCW BarriBond can be applied over all CCW Air Barrier Membranes, or the CCW membranes can be applied over BarriBond, depending on construction progression.



Air Barrier Instructions (Field of Wall) – Rain Screen

Installation

In sheathing over stud construction, sheathing joints shall be detailed with either of the following methods: 1) 2" width x 40 mil thickness ribbon of Barribond centered over joint; 2) 4" DCH reinforcing fabric centered over joint and imbedded in Barritech VP. Window openings, inside-outside corners, base of wall, roofline, control joints and other transitions shall be covered with CCW self-adhered flashing, CCW liquid flashing or imbedded reinforcement as shown in Barritech VP details. P/S Elastoform may be used to detail expansion joints and window wall transitions.

Apply Barritech VP over surfaces at minimum 0.060" (60 mils) wet in a single or multiple coats through approved spray equipment. Recommended spray tip sizes are GHD 635 for high coverage and GHD 429 for detail coat. Please consult CCW's Spray Equipment Brochure for detailed information. Theoretical application rate is 25 ft^2/gal in one coat. Barritech VP may also be applied with a paint roller. For roller application, apply a minimum of two 0.030" (30 mils) wet thickness coats. Theoretical application rate is 50 ft^2/gal for each coat. For roller application, allow Barritech VP to dry firm between coats.

Air Barrier Instructions (Joints) Option 1 – EIFS

Surface Preparation

Surfaces must be clean, dry, and free of frost, damage and all bond-inhibiting materials, including dirt, efflorescence, form oil and other foreign matter. Damaged sheathing must be removed and replaced. Avoid application over irregular surfaces.

Substrate to be coated must be continuous without joints, holes, etc. exceeding 1/32" (0.8 mm) in size. Sheathing must be properly installed as required by applicable building codes or sheathing manufacturer.

Mixing

Mix with a clean, rust-free electric drill and paddle to a uniform consistency.

PRODUCT MUST NOT BE THINNED OR DILUTED

Application

Apply only to sound and clean, dry, properly prepared, frost-free surfaces.

Installation over Sheathed Wall Construction:
Place minimum 4 inch (101 mm) wide mesh at sheathing joints and minimum 9 inch (152 mm) wide mesh at rough openings and inside and outside corners (refer to Sto details. Immediately apply Sto Gold Fill by spray or trowel over the mesh and trowel smooth. Protect from rain and freezing until dry. Spot fasteners, knots, or other voids in sheathing surface with Sto Gold Fill.
For waterproofing, apply one of the StoGuard air and moisture barrier options to the sheathing and to the Gold Fill. See StoGuard specifications and product bulletins for application instructions and limitations

Material Storage

Keep containers covered to protect from skinning. If skin forms, remove the skinned material from container; remaining material is unaffected by skinned material.

Curing/Drying

Sto Gold Fill is dry to touch and can be over coated within 4 hours under normal [70°F (21°C), 50% RH] conditions. Final drying varies depending on temperature/humidity and surface conditions.
Final drying time varies depending on temperature/humidity and surface conditions.
Protect from rain and freezing until completely dry.

Clean Up

Clean tools and equipment with water immediately after use. Dried material can only be removed mechanically.

Air Barrier Instructions (Joints) Option 2 – EIFS

Approximate Coverage

Gypsum Sheathing Joints-applied at 20-30 WFT at 2 inch (51mm) width:
60-90 lf (18-27 m) / cartridge
40-60 lf (12-18 m) / sausage

Rough Openings-applied at 12-20 WFT
2 x 4 framing
30-50 lf (9.1-15 m) / cartridge
21-34 lf (6.4-10.4 m) / sausage
2 x 6 Framing
22-35 lf (6.7-10.7 m) / cartridge
15-24 lf (4.6-7.3 m) / sausage

Coverage may vary depending on substrate conditions, sheathing joint gap, application technique, waste factor, and final film thickness.

Application

Sto RapidGuard may be applied over or under any of the Sto air and moisture barrier coatings: Sto Gold Coat, Sto Gold Coat-TA, Sto AirSeal, Sto EmeraldCoat, and Sto VaporSeal. Apply with a caulking gun. Spread with a dry joint knife, trowel or spatula while material is still wet, usually within 2-3 minutes of gun application. Seal voids or pinholes with additional material. Do not use soapy water when spreading. IMPORTANT: top coat with Sto air and moisture barrier coating when dry to touch or within 48 hours of drying for best adhesion.

Rough Opening Protection: apply a fillet bead of material at interior corners inside the opening to seal jamb/sill and jamb/head seams. Apply material in a zig-zag pattern along sill, jambs, and head to form a generous bead of material along the surface to be covered. Spread the material to a uniform thickness of 12-20 mils (0.3-0.5 mm) before the material skins. Treat the entire rough opening surface in this manner and overlap onto the face of the sheathing 2 inches (51 mm) minimum all the way around.

Sheathing Joints: apply a thick bead of Sto RapidGuard with a caulking gun along sheathing joints, or apply in a zig-zag pattern across and down the joints. Spread to a uniform thickness of 20-30 mils (0.5-0.8 mm) in a 2 inch (51 mm) width centered over the joints before the material skins. Follow the same procedure for inside and outside corners.

Flashing Shiplap Detailing: Apply a thick bead of Sto RapidGuard across the flashing leg/wall surface seam or apply in a zig- zag pattern across the seam. Spread to create a seamless counter-flashing that covers fastener penetrations and directs water away from the wall. Flashing may also be bedded in Sto RapidGuard and then counter-flashed.

Through Wall Penetrations (e.g., pipe, electrical box, and scupper penetrations): penetrations must be fitted snug against abutting wall surfaces. Apply a fillet bead of Sto RapidGuard around the penetration and spread onto both surfaces (wall surface and penetration). Create a bead profile that directs water away from the wall penetration with 1 inch (25 mm) minimum on the wall surface and ½ - 1 inch (13-25 mm) on the penetrating element.

Fasteners and Masonry Ties: spot fasteners to seal fastener penetrations. Bed masonry ties or apply from flange of masonry tie to the wall surface around the tie.

IMPORTANT: Sto RapidGuard fills static joints up to ½ inch (13 mm) wide. If larger gaps exist between sheathing joints, or between the penetration and the sheathing, alternative transition detailing may be used, or other steps may be necessary to correct the deficient condition. Refer to Sto details.

Curing and Drying: Product cures with moisture in the atmosphere. Full cure occurs within 24 hours and final physical characteristics at 7 days when installed at standard conditions (50% RH and 70°F [21°C]). Drying time and full cure time is slower with low temperature/low humidity and faster with high temperature/high humidity.

Clean Up: Clean tools by removing wet material with a rag before the material cures. Cured material can be removed with a citrus solvent, xylene or mineral spirits. Exercise care when handling cleansing agents and follow precautions on packaging.

Air Barrier Instructions (Field of Wall) – EIFS

Approximate Coverage

Glass Mat Gypsum: 450-550 ft² (42-51m²) per pail when applied at 10-12 wet mils (5-7 mil DFT)

Plywood: 550-600 ft² (51-56m²) when applied at 10-12 wet mils (5-7 mil DFT)

OSB: 350-550 ft² (32-51m²) when applied at 12-16 wet mils (8-10 mil DFT)

CMU: 100-300 ft² (9.3-28m² when applied in 2 coats at 10-30 wet mils (7-19 mil DFT) per coat

Coverage may vary depending on substrate condition, application technique, waste factor, and final film thickness. CMU substrates will generally be on the lower end of the coverage range.

Construct a mock-up under actual conditions of use to verify proper surface preparation, number of coats required, coverage, and method of application, for approval by the appropriate authority.

Application

For best results apply between 40° and 100°F (4° and 38°C) during application and drying period. Apply only to fully cured, structurally sound, clean, dry, properly prepared, frost-free surfaces.

Special Instruction for Cold Temperature Application

Sto Gold Coat has built-in weather protection that enables it to be applied at temperatures less than 40° down to 25°F (4° down to -3.8°C), provided certain conditions are met:

1. Material is pre-conditioned to 65°-75°F (18°-24°C)
2. Substrate and ambient temperatures are minimum 25°F (-3.8°C) and rising at the time of application and do not fall below 25°F (-3.8°C) until material is fully dry.
3. Materials are installed over standard sheathing substrates – glass mat gypsum, plywood, or OSB.
4. Substrate surfaces are frost-free, dry and remain dry.
5. Materials are installed at the recommended wet film thickness of 10-12 (5-7 DFT).
6. Materials are installed with StoGuard Fabric for joint and rough opening treatments.
7. Materials are installed in dry weather and protected from rain or other precipitation for at least 24 hours and relative humidity (RH) remains at or below 50%.

IMPORTANT: Final water barrier and air barrier properties, and film toughness, depend on temperatures rising above freezing.

Application

Exterior Gypsum Sheathing, Glass-Mat Sheathing, Exterior Plywood and Oriented Strand Board (OSB): apply Sto Gold Coat to the prepared substrate using a ½ inch (13mm) nap roller or airless spray equipment that supports minimum 1 gallon (3.8 L) per minute. Suggested tip size is .031. Pressure and tip size may vary depending on equipment used. Apply uniformly at recommended wet mil thickness. CMU surfaces: apply minimum 2 coats uniformly by airless spray at 10-30 wet mils per coat, allowing the first coat to set slightly, then doubling back with a second coat. Alternatively allow the 1st coat to fully dry before applying the 2nd coat. CMU surfaces may require back rolling of the first pass with a ¾ or 1 inch (19 or 25 mm) synthetic nap roller depending on porosity, joint profile, trueness of the wall surface, and other variables that may exist. IMPORTANT: OSB substrates may require touch-up. CMU substrates may require more than 2 coats depending on joint profile, CMU porosity, unit weight, and other variables that may exist. For "rough" CMU wall surfaces skim coat the entire wall surface with one of Sto's cementitious levelers, then apply 1 coat of Sto Gold Coat. Achieve a VOID and PINHOLE FREE surface on all substrates.

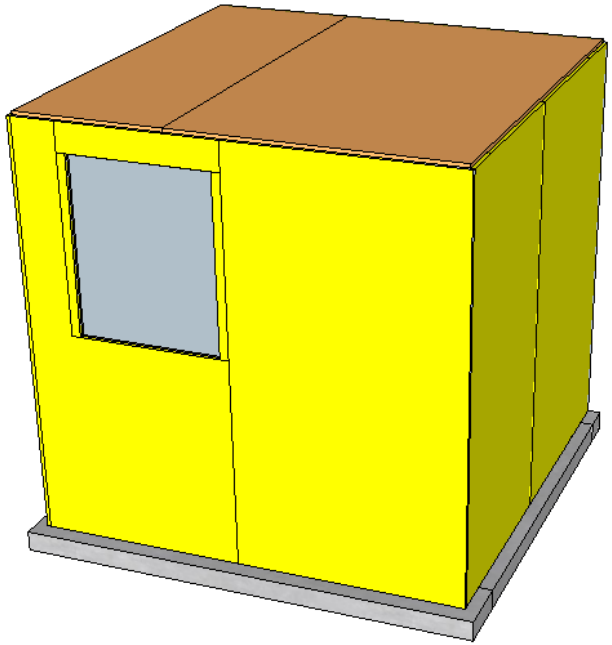
Clean Up

Clean tools and equipment with water immediately after use. Dried material can only be removed mechanically.

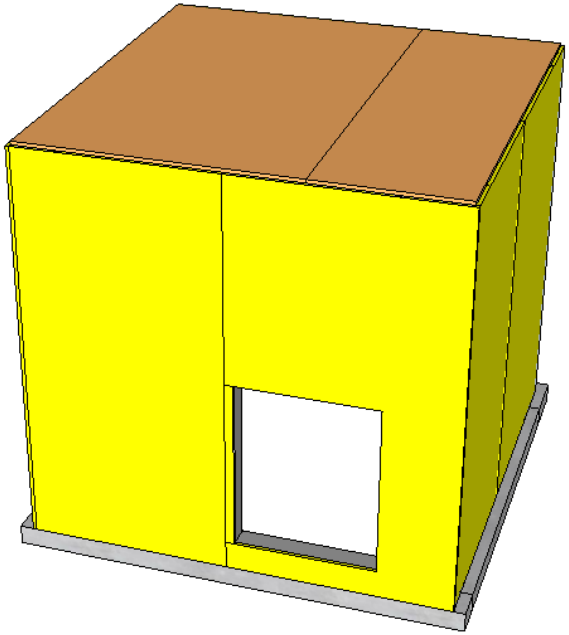
Drying

Product dries in 24 hours under normal drying conditions [70°F (21°C), 50% RH]. Final dry time varies depending on temperature/humidity, thickness of application, and surface conditions. Cold weather and/or damp conditions prolong drying. Protect from rain and temperatures less than 25°F (-3.8°C) until completely dry. If temporary heaters are used ventilate to the exterior to prevent water vapor from accumulating on or within the wall assembly components.

Mockup Schematic



Window side



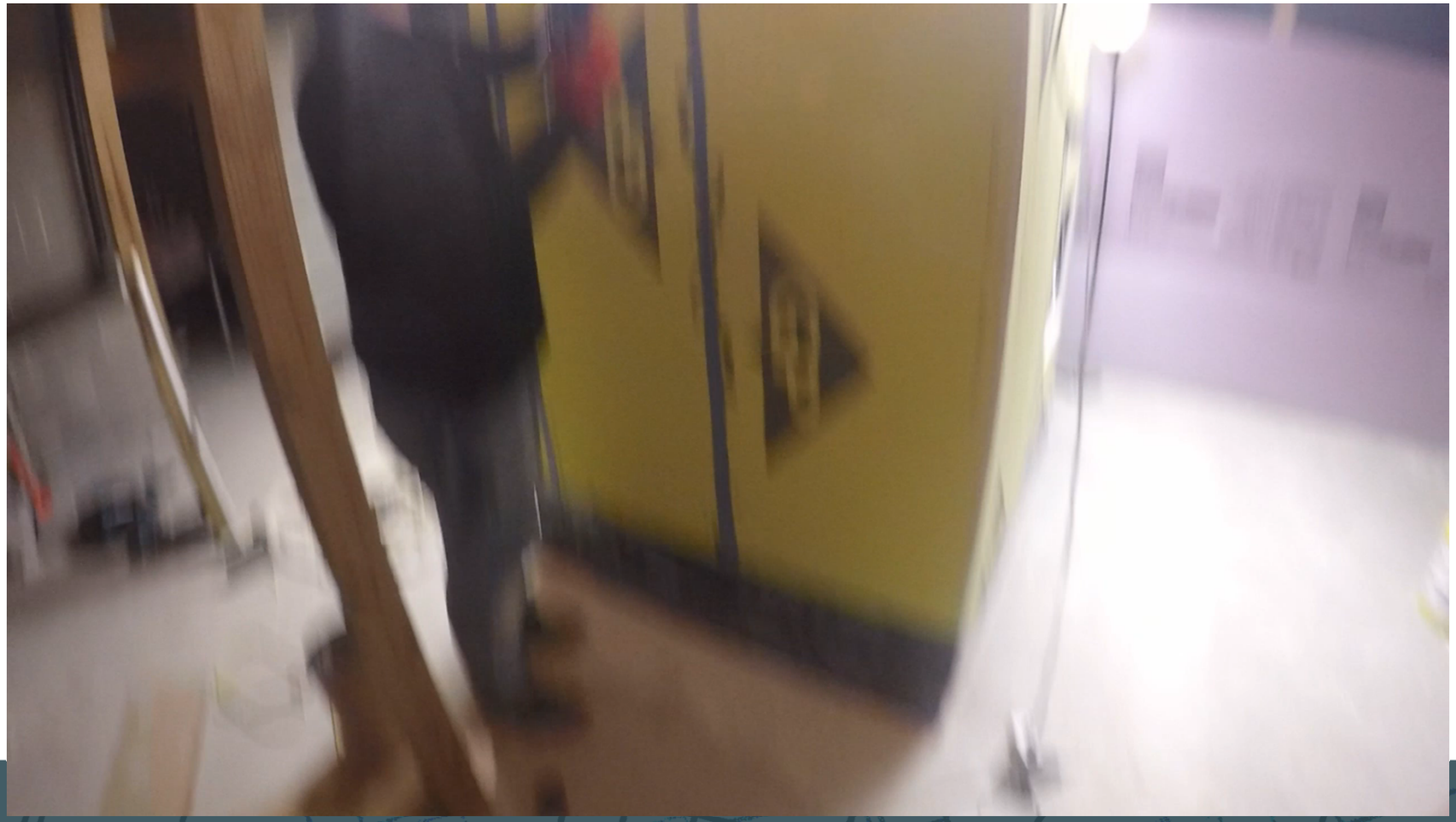
Blower door fan side

Steel Stud Mockup Walkaround



Rain Screen Air Barrier Videos

Exterior Sheathing Seams



Rough Opening – Joint Treatment



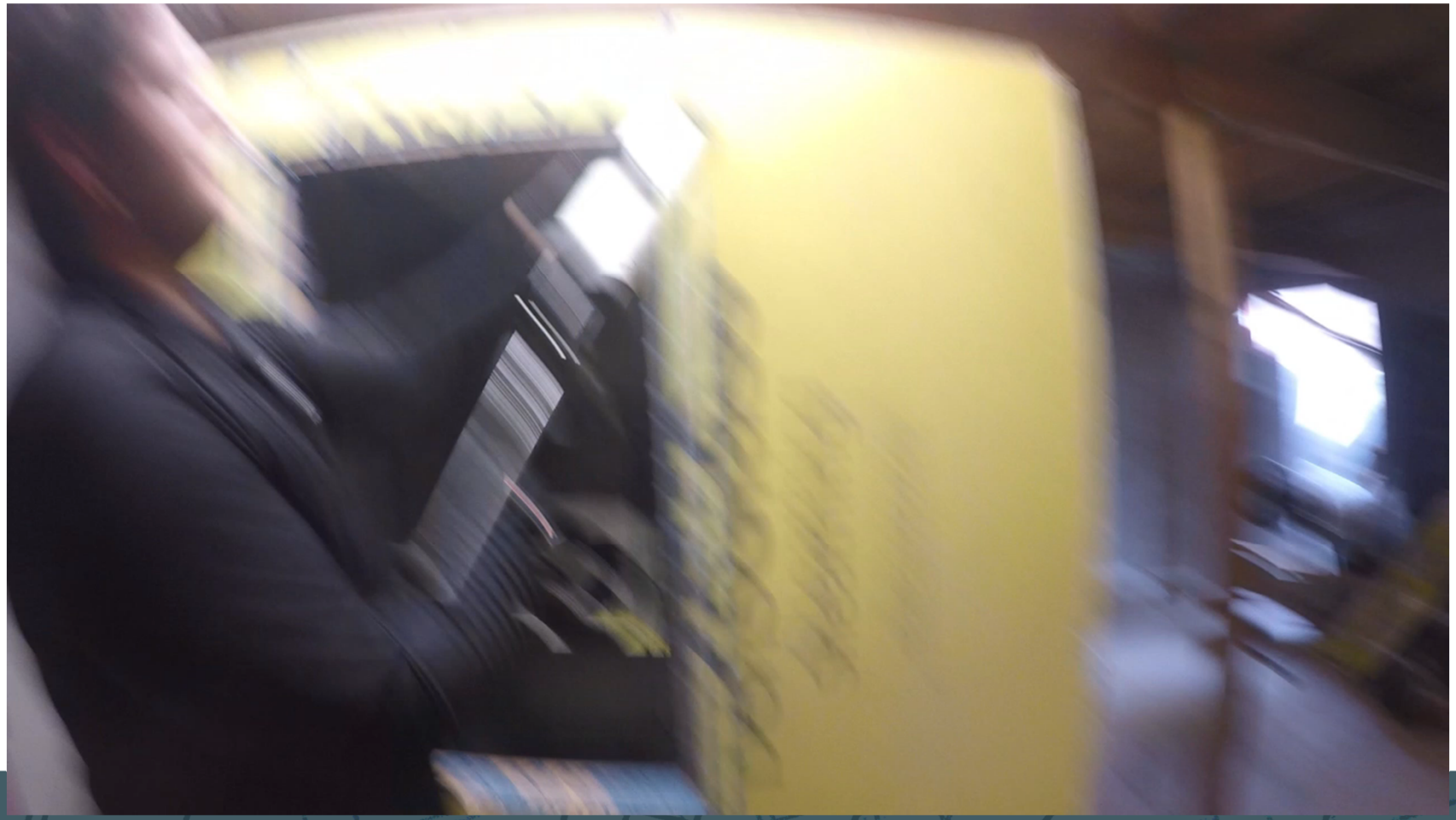
Rough Opening – Serpentine Inside & Screwheads



Rough Opening – Serpentine Inside Continued



Rough Opening – Serpentine Outside



Rough Opening Spread



Rough Opening Mil Gauge



Fluid Applied Air Barrier – 1st Coat



Fluid Applied Air Barrier – 2nd Coat



EIFS Air Barrier Videos

Reinforcing Mesh



Reinforcing Mesh Outside Corner



Fill Over Mesh



Alternative Seam Treatment Option



Fluid Applied Air Barrier



Final Views After Curing





EIFS on CMU – Part 1



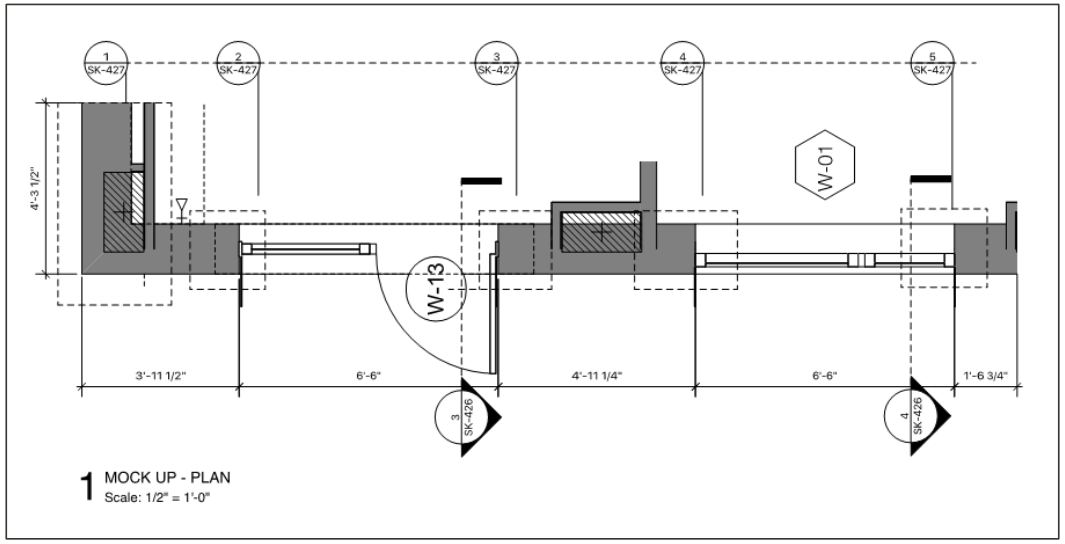
EIFS on CMU – Part 2



EIFS on CMU – Part 3



Mockups – In Real Life

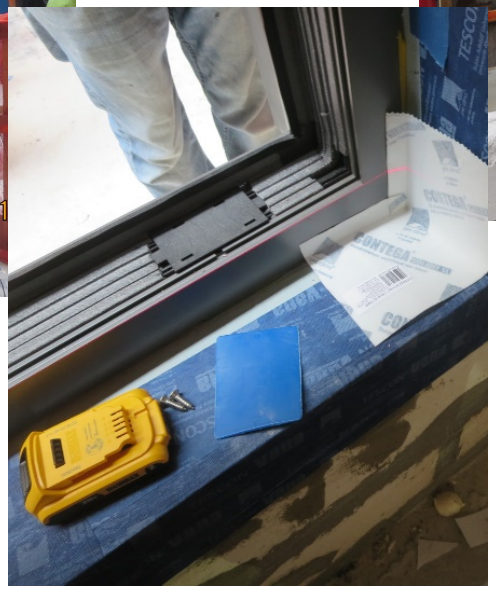


211 W 29th Street - Mockup Vendor Contact List

COMPONENT	CONTACT	NOTES
Cladding: Taktl Panels	Katherine Lynn Design + Applications Consultant, Northeast katherine.lynn@taktl-llc.com T 646·789·5626 | M 609·462·0173 175 Varick Street | New York, NY 10014 taktl-llc.com	Taktl Standard in Platinum - 2 textures, 2 finishes (4 types total)
Rainscreen Attachment: NVELOPE	Dave Sommer (206) 226-2311 cell international@nvelope.us dave@interra-facade.com	NV-1 System
Back Up Wall: Hebel AAC	Ricardo Gomez Director of Operations Telefon +1-2104023223 Mobil +1-2108658620 ricardo.gomez@xella.com Xella Aircrete North America, Inc Sales 900 Schneider Dr. US78108 Cibolo, Texas www.hebel-usa.com	6" Cored AAC and U Block
Sunshade: DAMS Inc	Shawn Bowman, CSI | National Director of Sales and Marketing DAMS Incorporated - D. Architectural Metal Solutions Incorporated 5919 W. 118th St. | Alsip, IL 60803 office: 708-224-4311 | fax: 708-388-9392 | mobile: 708-793-9107 shawn.bowman@damsinc.com | damsinc.com	Custom Extrusion and Flat Plate Aluminum
Windows & Doors: Fentrend	Sean Kennedy, CPHC Supplier/Client Manager sean@fentrend.com // 646.665.1478	One of Three options: Schuco AWS 90SI Zola Alu 90 Aluprof MB104
Door Sill: Alumat	Frank Hegan fhegan@ct-sol.com	Alumat MFAT
Insulation: Roxul (or Thermafiber)	SHAWN TORBERT, LEED AP, CPHD, CSI NY METRO SPECIFICATIONS MANAGER | ROXUL INC. Cell: (732) 887-4079 www.roxul.com	Cavity Rock DD and Comfort Batt

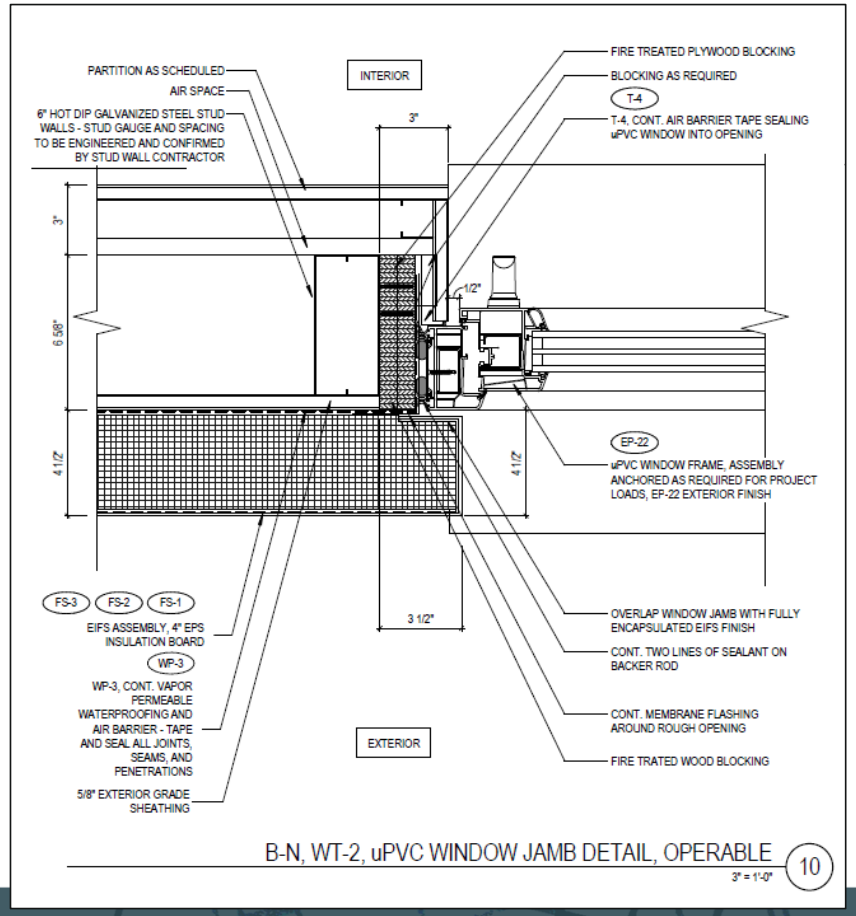
Mock Ups are Critical







Windows – Steel Stud





Windows – Steel Stud





Do This



- Follow the manufacturer data sheets
- Reach out to the product reps for help if needed
- Ensure you have the proper tools needed for a quality installation
- Ensure someone is checking the air barrier after each application to ensure no areas are missed

Questions?



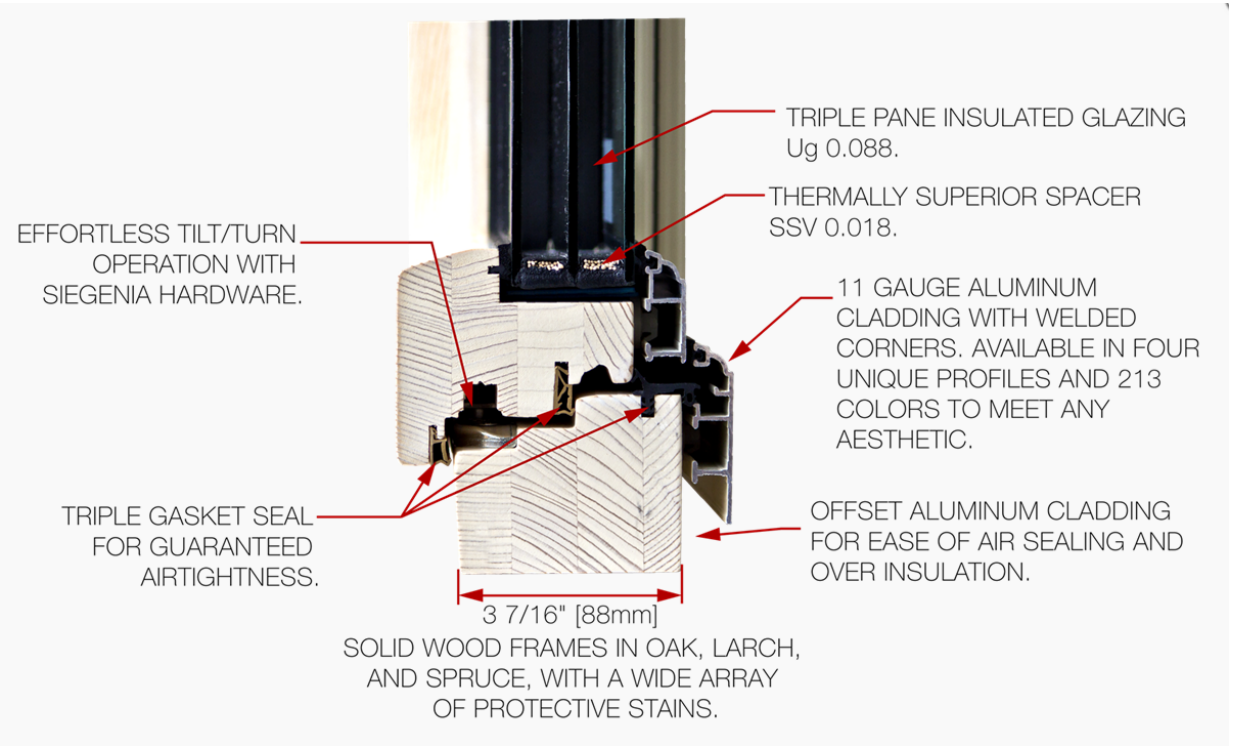
10 Minute Break

Wall Mockups (Windows, Insulation, Carpentry)

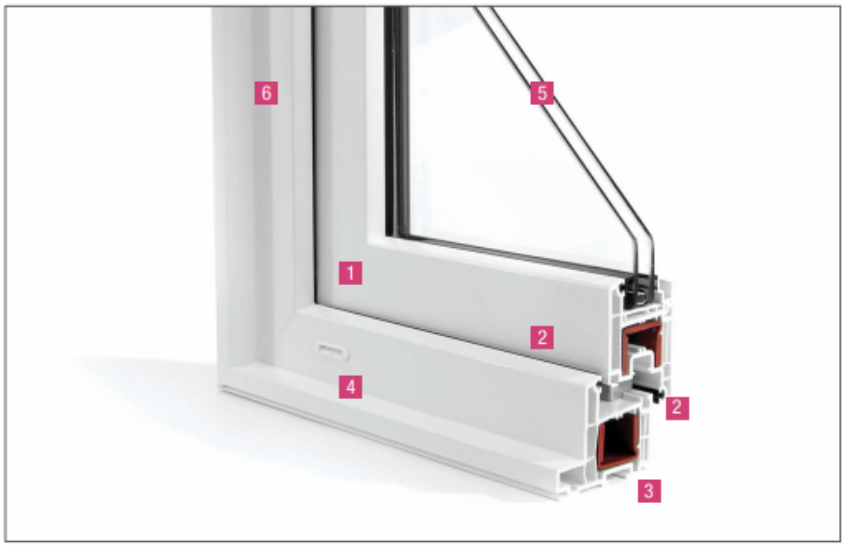
PH Windows & Doors

- U-value of glass as low as U-0.088 (R-11)
- U-value of frame 0.15 (R-6.7)
- Installation considerations (typical):
  - Thermal bridge free installation: frames covered with insulation (typically)
  - Airtightness of the window
  - Airtight installation
- Passive House doors, where applicable

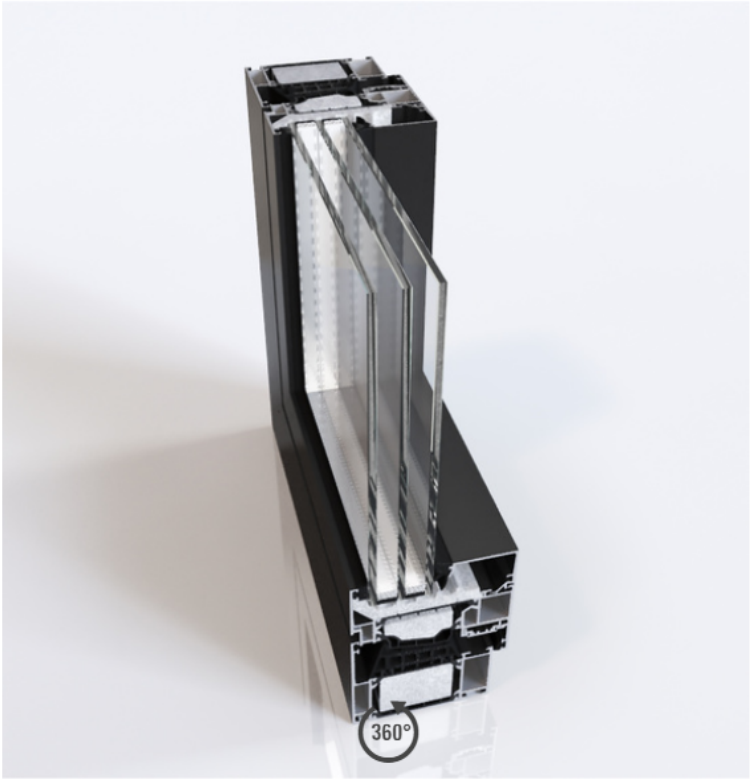
PH Windows


TRIPLE PANE INSULATED GLAZING
Ug 0.088.
THERMALLY SUPERIOR SPACER
SSV 0.018.
EFFORTLESS TILT/TURN
OPERATION WITH
SIEGENIA HARDWARE.
11 GAUGE ALUMINUM
CLADDING WITH WELDED
CORNERS. AVAILABLE IN FOUR
UNIQUE PROFILES AND 213
COLORS TO MEET ANY
AESTHETIC.
TRIPLE GASKET SEAL
FOR GUARANTEED
AIRTIGHTNESS.
OFFSET ALUMINUM CLADDING
FOR EASE OF AIR SEALING AND
OVER INSULATION.
3 7/16" [88mm]
SOLID WOOD FRAMES IN OAK, LARCH,
AND SPRUCE, WITH A WIDE ARRAY
OF PROTECTIVE STAINS.

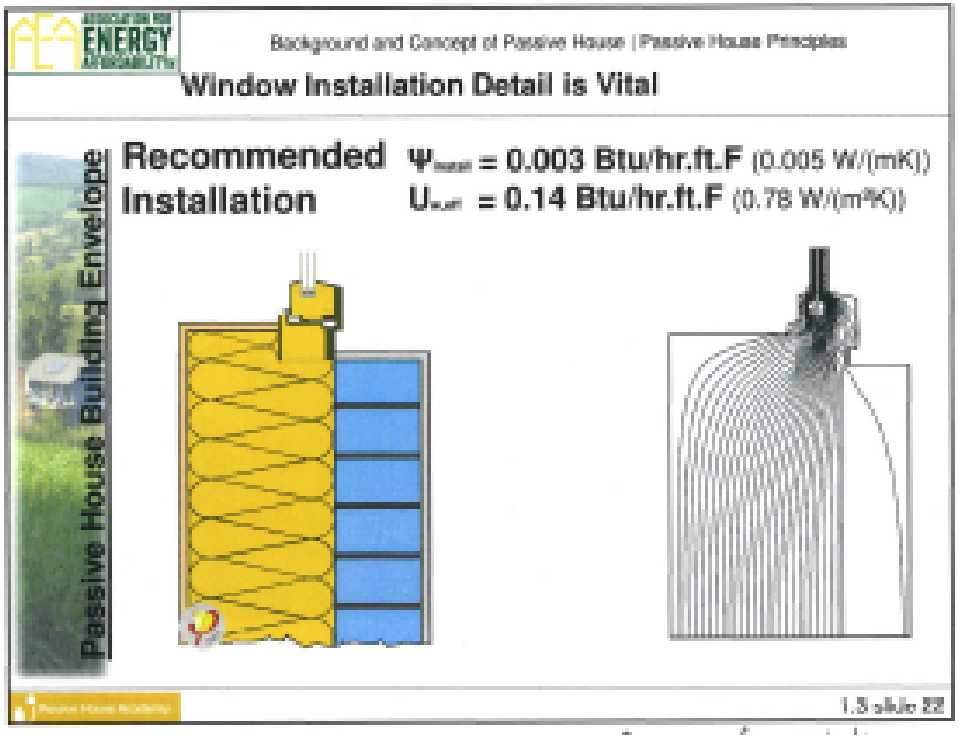
PH Windows



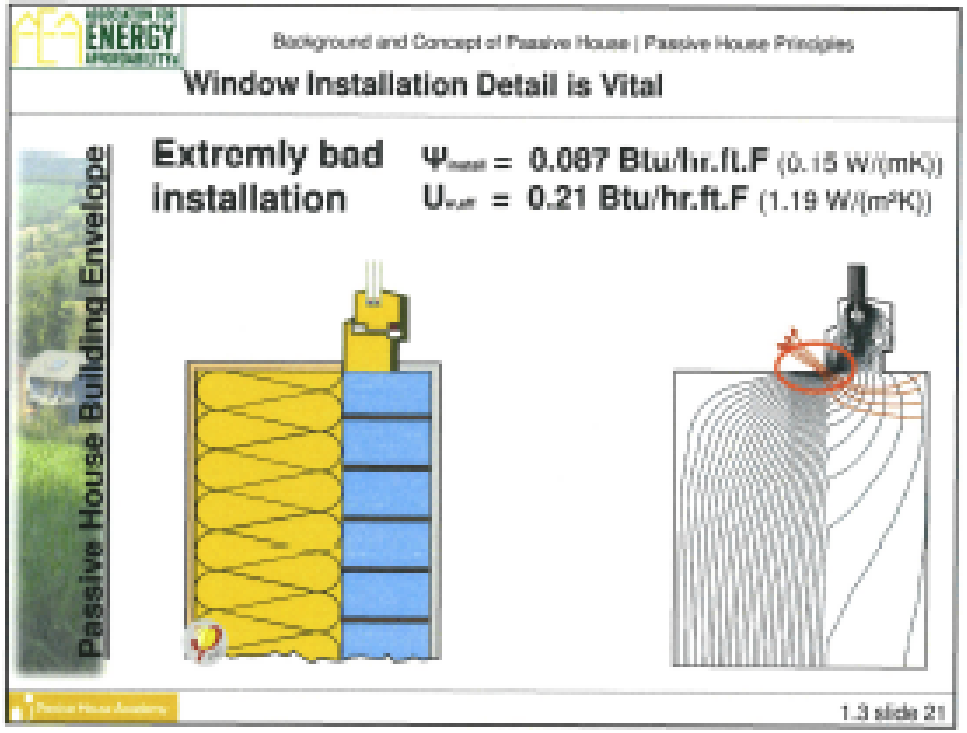
1. **Unique tilt-turn hardware** operates in both top-venting and inward-swinging positions
2. **Multiple locking points and dual weather seals** provide optimal air and water tightness
3. **Large chambers** accommodate reinforcements required for large openings in heavy commercial applications
4. **Accessory groove** accepts a variety of accessories such as brickmolds, extension jambs and for profiles to couple window elements
5. **Up to 1 3/8 in (35 mm) glass** increases energy efficiency and acoustical properties
6. **3 1/4 in (83 mm) North American frame depth** allows for hassle-free replacement installation; we also offer the 2 3/8 in (60 mm) European frame



Install Conditions

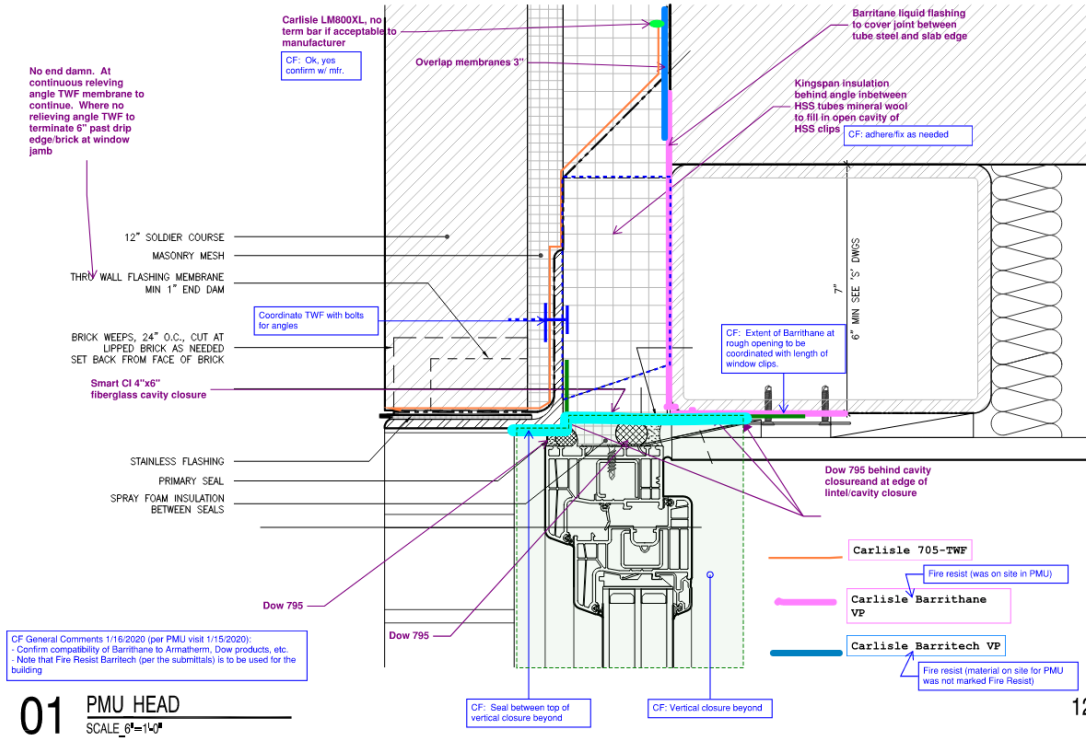


Good Install

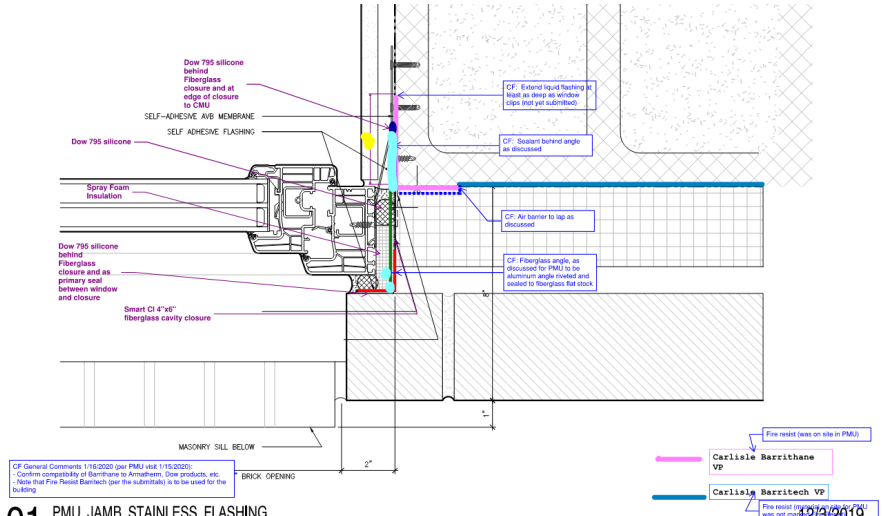


Bad Install

Window Shop Drawings

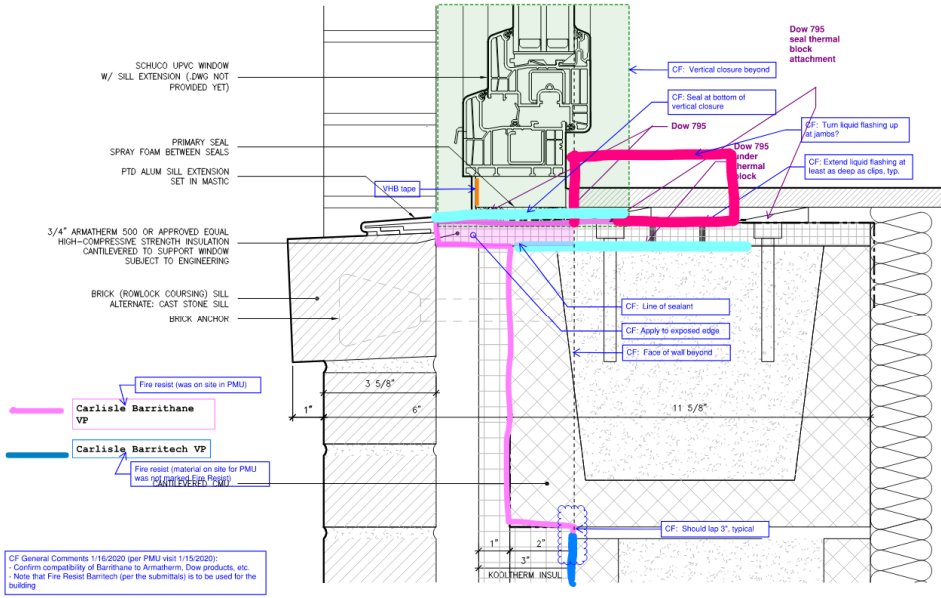


01 PMU HEAD
SCALE 6"=1'-0"



01 PMU JAMB STAINLESS FLASHING
SCALE 6"=1'-0"

12/3/2019



01 PMU SILL: THERMAL BLOCKING A

Window Installation







Window Air sealing







Windows – Taping





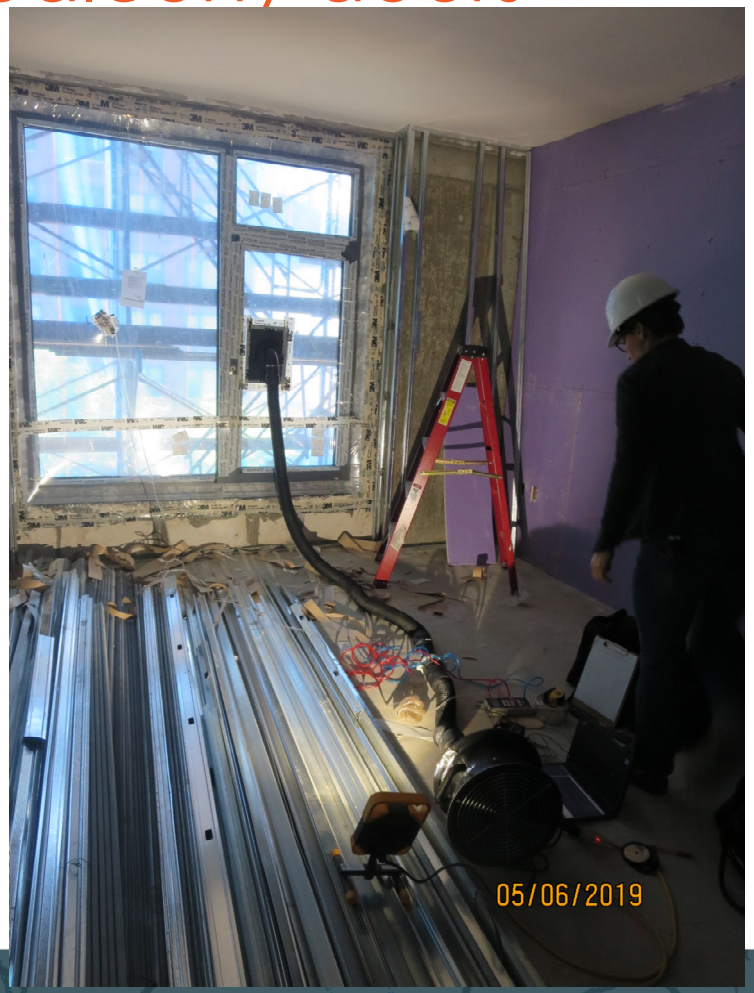
Windows – Mock Ups (AAC & CMU)





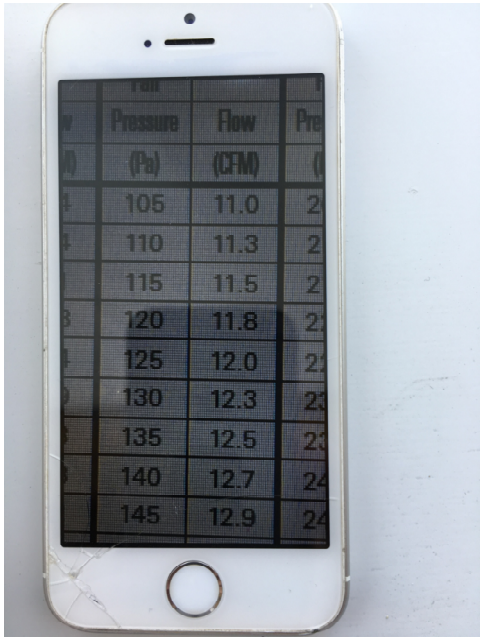
Windows – AAC (511) and balcony doors





Windows – Existing Buildings





Exterior Window Backer Rod



Exterior Window Caulking



Mineral Wool at Rough Opening Around Window





Interior Window Taping



Interior Window Caulking



Insulation





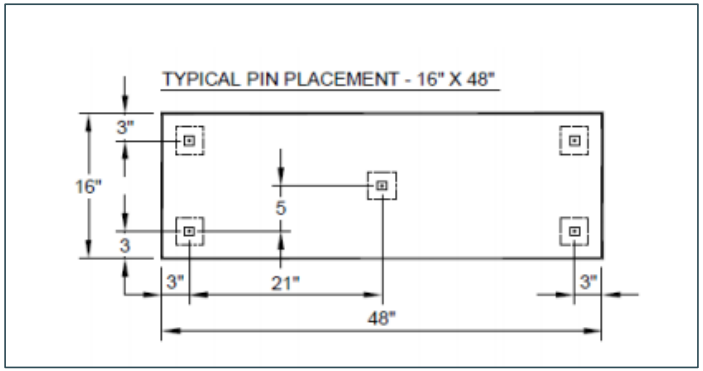
Rain Screen







Insulation Fastener Guidelines





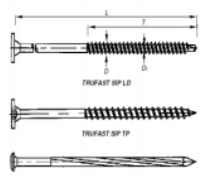
Plastic Cap Nails

Recommended for temporarily holding insulation and fastening insulation to wood and wood based substrates.



Metal Fasteners

Recommended for use with metal frame construction. Anti-unwinding fasteners (or other precautions) should be used with metal frame construction.



Regular

Wood Screws
Concrete Screws
Concrete Nails

Must be right type for the substrate and suitable for outside use if not being used inside.



Dual-Thread Fasteners
e.g. Heco-Topix

Recommended for use with wood strapping to reduce risk of compression deflection.



wool insulation boards Fastener should be appropriate type for the substrate.



Clip & Z-Girt
e.g. CASCADIA CLIPS

Recommended for thick exterior insulation (over 3").
Follow manufacturers recommendations for use.



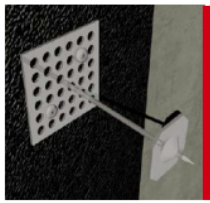
Insulation Fasteners
e.g. RAMSET INSULFAST

Recommended for fastening insulation to concrete, masonry block and through gypsum sheathing (steel stud).



Brick-Tie & Wedge

Wedges or clips used with masonry ties can be used to attach CAVITYROCK® insulation.



Impaling Pin

Mechanically attached or bonded to structure. Recommended for use with all types of ROCKWOOL stone wool insulation boards. Adhesive "stick" pins should be avoided.

Exterior Mineral Wool – Part 1



Exterior Mineral Wool – Part 2



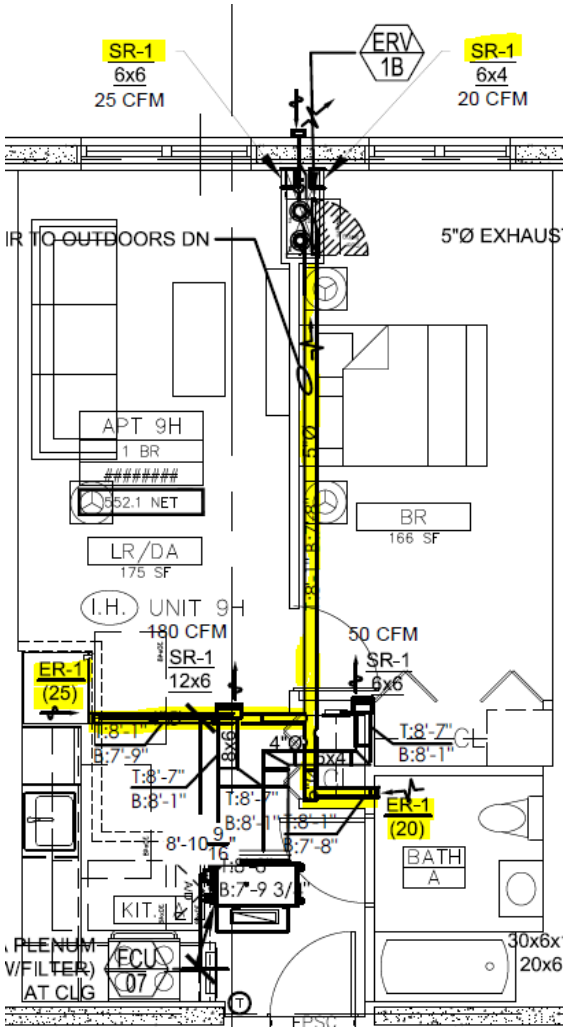
Interior Mineral Wool



Mechanical Penetrations

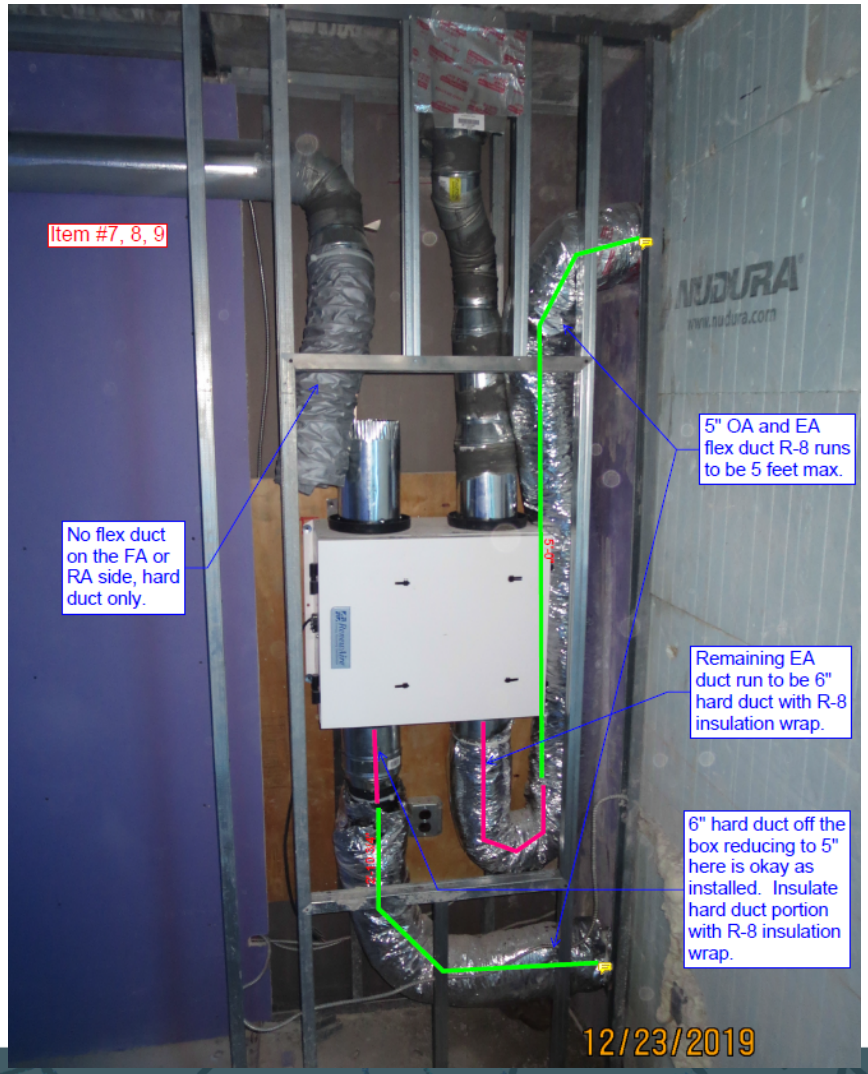
- Individual Ventilation





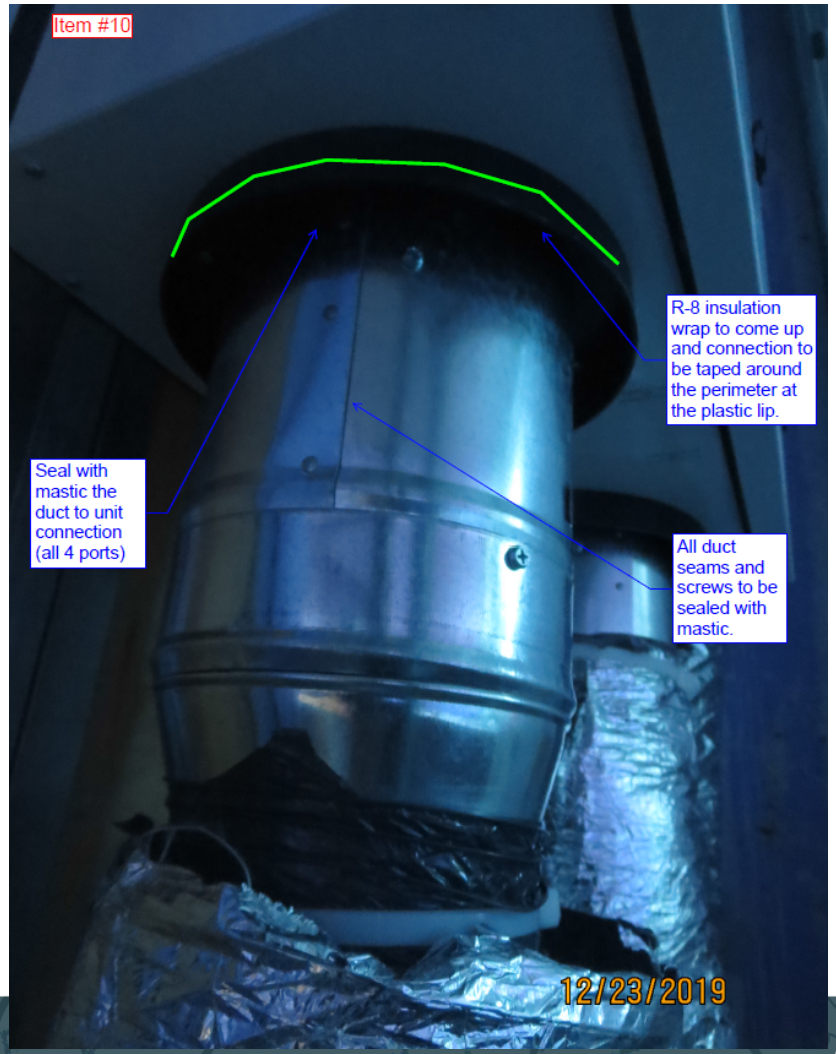
Mechanical Penetrations

- Individual Ventilation Concerns
  - Cramped ERV closets
  - Difficulty in properly insulating and air sealing exterior wall connections
  - 2x wall penetrations per apartment
  - Future maintenance (filter changes)



Mechanical Penetrations





Additional Support - When Needed

Steven Winter Associates, Inc.
Improving the Built Environment Since 1972

307 7TH AVENUE, SUITE 1701, NEW YORK, NY 10001

MEMO

Date: 12/23/2019

To: [redacted]

From: Mike O'Donnell (SWA)

Re: ERV and VRF Installation Practices for Project Success - [redacted]

ERV Systems

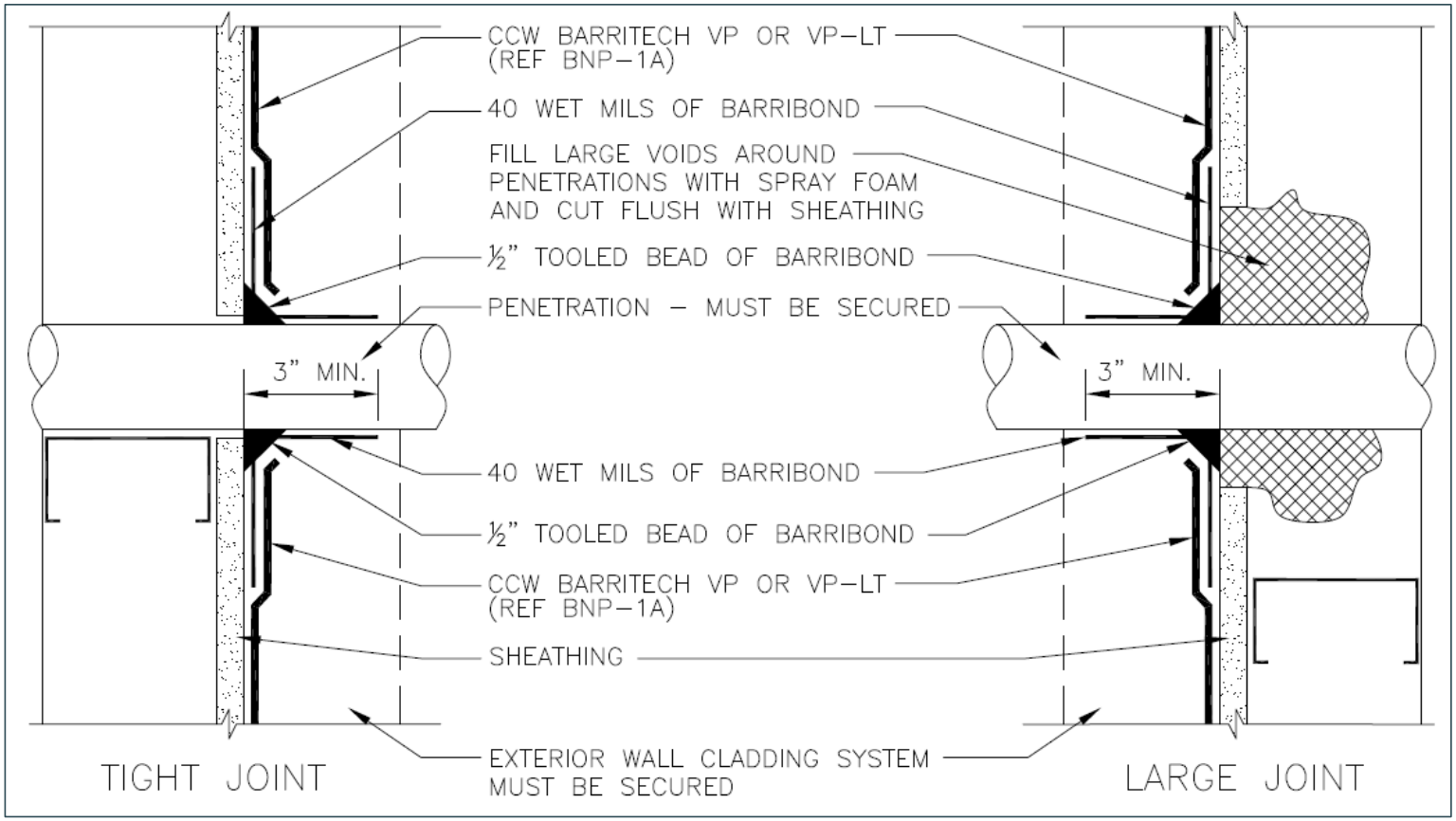
1. Seiho exterior vent cap hoods to have a short run of ductwork attached, with duct seam sealed and duct to vent cap connection sealed with mastic. These will be given to the EIFS contractor for installation from the outside. See photo, page 3.
2. Install spray foam in the entire gap space between the duct and the cored holes after hoods with duct are installed. Caulk the hood on the exterior (EIFS contractor).
3. **General duct sealing:** All joints, seams, branch connections, taps, screw heads, and duct connections to equipment are to be fully sealed with mastic at all locations.
4. Per clarification from the engineer, no backdraft dampers need to be installed.
5. Connect 5" flex duct, with R-8 insulation jacket, where the duct stubs through the cored wall hole at the OA and EA locations. Zip tie to hold in place, then seal with mastic at the seam between the flex duct and the hard duct. See example photo, page 4.
6. Pull the insulation silver jacket to drywall, and tape around the entire perimeter using short strips of tape. The tape needs to be fully flat against both the insulation jacket and drywall. See photo, page 5. https://www.energyconscious.com/3m-all-weather-flashing-tape-tan-slit-liner-3-in-x-75-ft-16266.html
7. Limit the 5" flex duct to 5 feet. For the OA connection, this should not be an issue as this is a short duct run. Come off the ERV unit with 6" hard duct, reduce down to 5" and then connect flex duct. Seal joint between the flex duct and the hard duct, similar to #4. See photo, page 6.
8. For the EA connection, make the section closest to the exterior wall 5" flex with the remaining duct run in hard duct. Utilize 6" hard duct for a long as possible. See photo, page 6.
9. Insulate the remaining portions of the OA and EA hard duct with R-8 foil faced insulation wrap, with all seams of the insulation taped. See photo, page 6.
10. At the ERV unit, pull the insulation jackets up and tape the connection between the plastic lip on the unit and the silver foil face of the insulation. See photo, page 7.
11. On the FA (supply side), each register box to get its own CAR damper. Utilize wye connections as needed to ensure each box is separate from any other boxes. See photo, page 8. All duct work to be hard duct on FA and RA sides (no flex).
12. On the RA (exhaust side), note the following:
    A. Kitchen register locations need to be 6' distance away from the center of the stove
    B. Kitchen registers are to have MERV 4 washable filters installed. Cut to size as needed. See photo, page 9. https://www.hardwareworld.com/prnh75m/True-Blue-Budget-Washable-Air-Filter-Approx-20-x-30-x-1
13. Duct to sheetrock connections to be sealed with caulking or tape prior to installation of final grilles. See photo, page 10.
14. Car dampers to go right inside the register box, typical for all locations. See photo, page 10.

Steven Winter Associates, Inc.
Improving the Built Environment Since 1972

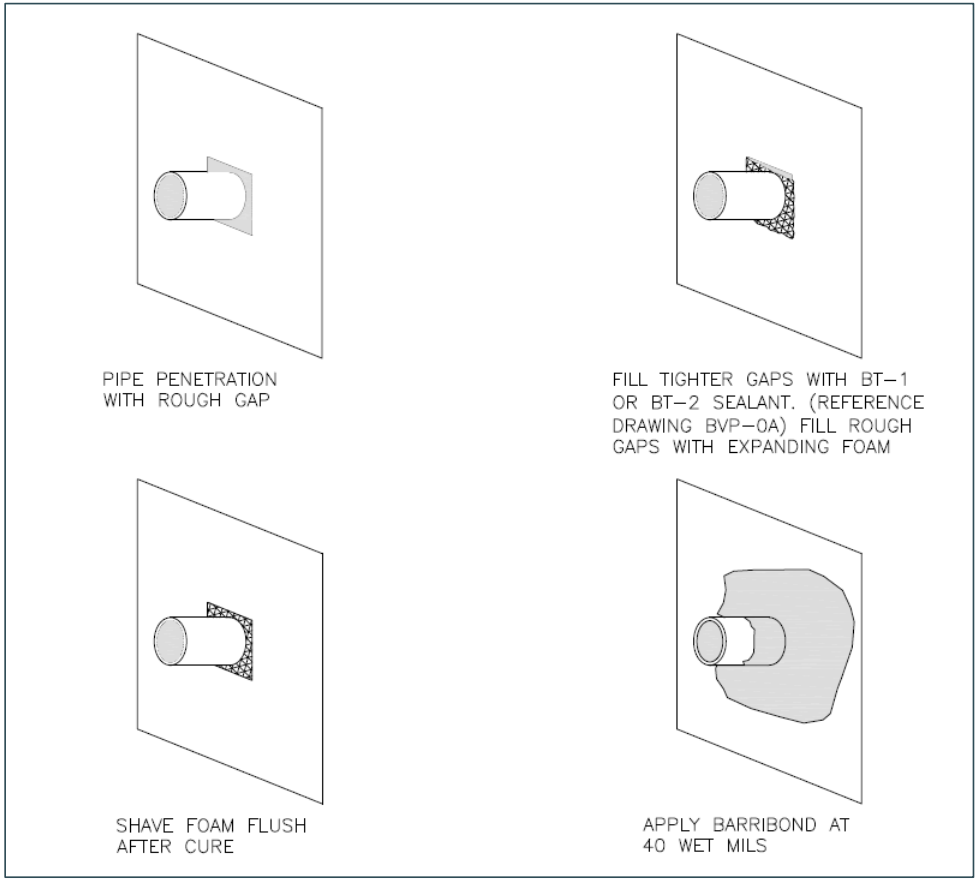
VRF Systems

1. The KoolDuct systems of ductwork look to be well sealed. However, note the following locations to be sealed as these were found to be leaky during preliminary duct testing:
    a. Connection from the KoolDuct to the flexible fabric connection (supply side)
    b. Connection from the flexible fabric connection to the air handler unit (supply side)
    c. Connection from the hard-ducted return to the air handler unit (return side)
2. It was noted in some apartments on 12/6/19 that the KoolDuct only had the main trunk and one branch but was missing one or more additional branch connections to bedrooms. It was discussed that these would be added with flex duct.
    a. Please ensure flex duct selections align with pressure drop and original duct size assumptions from the engineer.
3. All duct to sheetrock connections (supplies and return) to be sealed with caulking or tape prior to installation of final grilles.
4. SWA needs to test the duct work at rough-in stage for VRF systems, when all supply branches and returns installed as required by PHIUS.
5. MERV 8 filters and face grilles with balancing to be installed at final.

Pipe Penetrations



Pipe Penetrations



Do This



- Understand window install details and full install sequence
- Make sure insulation wraps the frame if called for and any insulation between window and rough opening is installed
- Test installed windows throughout construction to ensure project is on track for whole building BD test
- Keep insulation to Grade I quality, exterior and interior

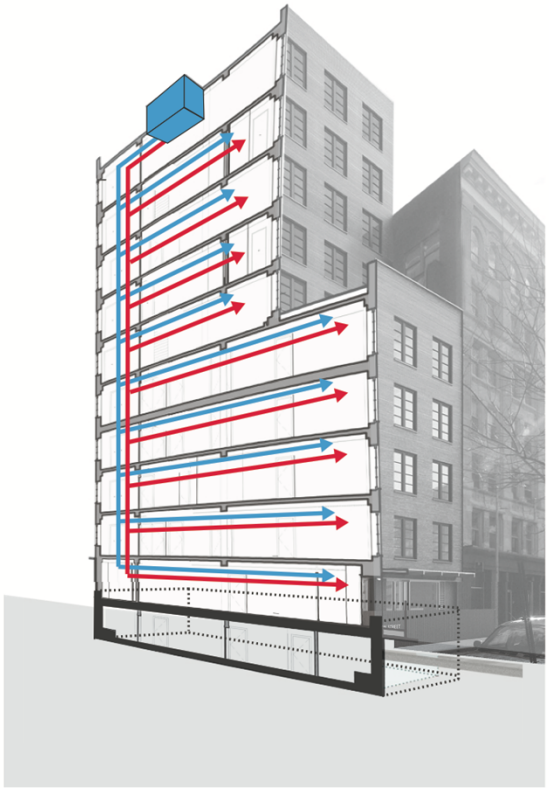
Questions?



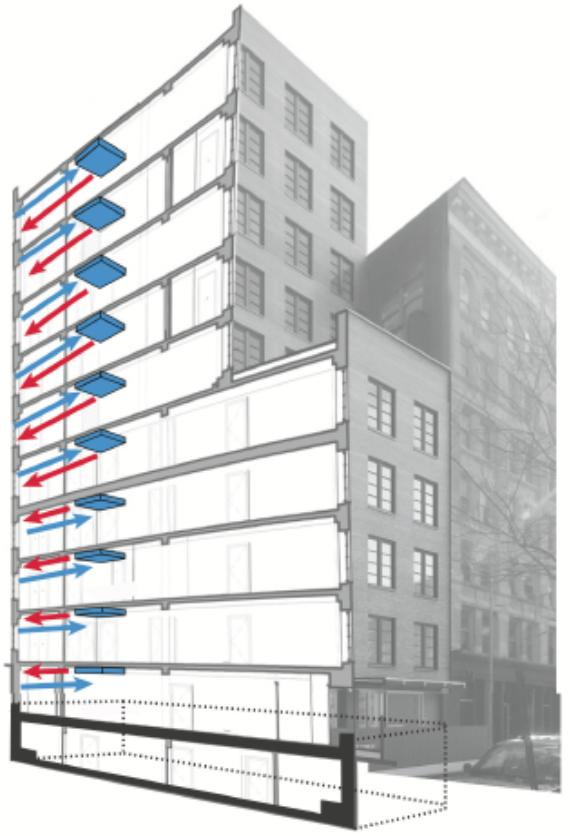
10 Minute Break

Duct Mockups

Ventilation – Balanced



- Central ERV



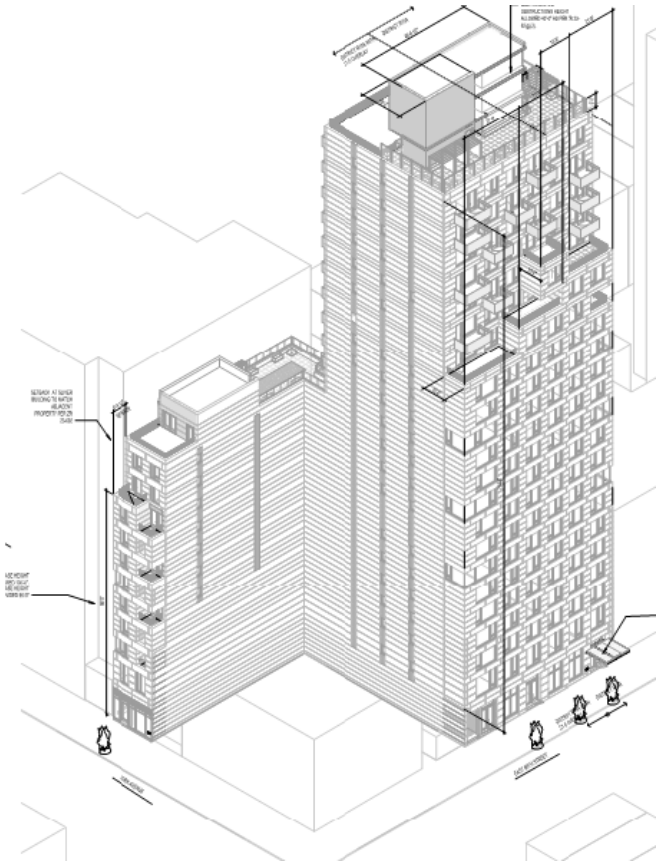
- Individual ERVs

Ventilation (211)

- Central Ventilation
  - Swegon Gold RX 35 on main roof serving apartment floors
  - Swegon Gold RX 5 on mechanical mezzanine serving retail, lobby and lower amenities
  - Demand control ventilation (DCV) utilized in exercise space with CO2 sensors
  - DX coil added to ERV supply to help with pre-conditioning and dehumidification



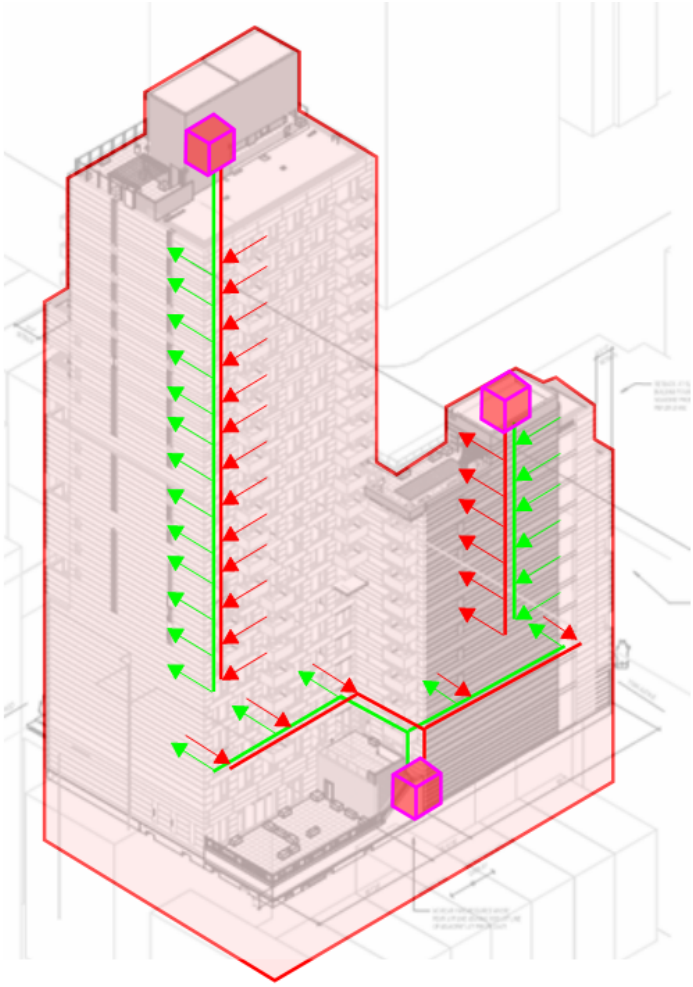
Ventilation (511)





Ventilation (511)

- Central Ventilation
  - Swegon Gold RX50 on main roof serving apartment spaces in main tower
  - 2x Ventacity VS1000 on roof of “sliver” building serving apartment spaces
  - Swegon Gold RX25 in cellar serving commercial space and lower amenities
  - DCV in main amenity spaces tied to occupancy sensors



Ventilation

IF YOU REMEMBER ANYTHING, REMEMBER THIS LIST

- Ductwork must be Aerosealed in order to achieve balancing and ALL DUCTWORK SHOULD BE INSTALLED
- Constant airflow regulating (CAR) dampers must be used at all registers and must be ACCESSIBLE
- Ductwork behind registers must be CLEARLY connected to drywall
- Do not combine AHU and ERV ductwork
- Account for buffer on top of design flowrate in energy model



CAR Damper: CAR dampers must be used at all registers to achieve proper balancing. Make sure to use CAR dampers like the one pictured here, with a set screw to adjust the flap. https://eflowusa.net/product/constant-air-flow-regulators-3/



Well sealed ductwork to drywall: If ductwork is not properly sealed to drywall behind registers, air will dump into ceiling or wall cavities, drastically increasing total fan power required to achieve proper balancing.

Ventilation

Aeroseal at 511 E. 86th Street

Dates of Sealing: 2/24/20 thru 3/5/20

Summary

Despite excessive leakage conditions, all risers at 511 E. 86th Street have now been sealed. Multiple days were spent troubleshooting large holes or disconnected sections of the ductwork.

Duct Identifier	Initial Leakage (CFM)	Final Leakage (CFM)	Reduction
TX-RR-12	862.5	21.4	97.5%
TX-RR2-12	946.9	27.6	97.1%
TX-RL12	1145.0	35.9	96.9%
TX-RL2-12	639.2	24.1	96.2%
TX-R3	998.1	33.1	96.7%
TX-R2	737.4	31.7	95.7%
TX-1	762.4	91.8	88.0%
Cellar Return	1140.4	48.3	95.8%
Cellar Supply	568.1	36.9	93.5%

B&L Manpower Onsite Most Days

Ryan Oakey – Lead Technician

Romario Auguste – Project Technician

Raashid Weeks – Project Technician

All staff onsite from 7 AM – 3 PM most days

Findings & Recommendations for Future Sealing Events

- Multiple duct termination points were found to be open to atmosphere. Ducts should be prepared in the same manner as would be for duct pressurization testing
- Multiple risers had disconnections or holes that were greater than 5/8". Aeroseal duct sealing is effective only for holes < 5/8", ductwork should be inspected prior to beginning Aeroseal services so extensive troubleshooting efforts are mitigated

Ventilation

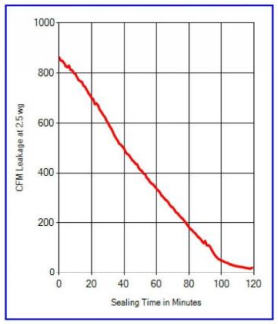
Aeroseal at 511 E. 86th Street Dates of Sealing: 2/24/20 thru 3/5/20

B&L Testing & Balancing

Certificate of Completion

Duct Sealing Performed For:

511 East 86th St
511 East 86th St
New York, NY 10028



Overall Sealing Results

When we arrived,
YOUR DUCTS HAD:
862.5 CFM of Leakage, equivalent to a
23.6 Square Inch Hole

After we finished,
YOUR DUCTS HAVE:
21.4 CFM of Leakage, equivalent to a
0.6 Square Inch Hole

This corresponds to a 97.5% Reduction in Duct Leakage.

Note: Duct Leakage results are calculated in Cubic Feet per Minute (CFM) measured at a standard OPERATING PRESSURE of 2.5 wg.

Aeroseal Technician	RO
Aeroseal Case ID	3427
Date of Seal	3/4/2020
System Description	TX-RR-12
Seal Description	Seal 1
Hardware	Gen2

AEROSEAL Duct Sealing From The Inside

Duct Sealing Performed By:

B&L Testing and Balancing
2735 Academy Street
Brooklyn, NY 11572
Phone: 917.359.3810

B&L Testing and Balancing, LLC
516.724.3630

2735 Academy Street, Oceanside, NY 11572
info@bltab.com

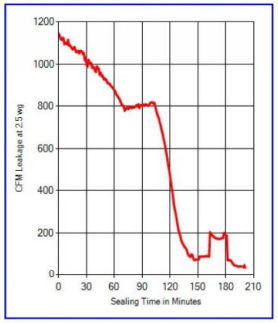
Aeroseal at 511 E. 86th Street Dates of Sealing: 2/24/20 thru 3/5/20

B&L Testing & Balancing

Certificate of Completion

Duct Sealing Performed For:

511 East 86th St
511 East 86th St
New York, NY 10028



Overall Sealing Results

When we arrived,
YOUR DUCTS HAD:
1145.0 CFM of Leakage, equivalent to a
31.4 Square Inch Hole

After we finished,
YOUR DUCTS HAVE:
35.9 CFM of Leakage, equivalent to a
1.0 Square Inch Hole

This corresponds to a 96.9% Reduction in Duct Leakage.

Note: Duct Leakage results are calculated in Cubic Feet per Minute (CFM) measured at a standard OPERATING PRESSURE of 2.5 wg.

Aeroseal Technician	RO
Aeroseal Case ID	3427
Date of Seal	3/3/2020
System Description	TX-RL 12
Seal Description	Seal 1
Hardware	Gen2

AEROSEAL Duct Sealing From The Inside

Duct Sealing Performed By:

B&L Testing and Balancing
2735 Academy Street
Brooklyn, NY 11572
Phone: 917.359.3810

B&L Testing and Balancing, LLC
516.724.3630

2735 Academy Street, Oceanside, NY 11572
info@bltab.com

Aeroseal Too Early





Duct Leakage Testing



Duct Testing



Duct Testing – Result (No Seams Sealed)



2020-10-13_Duct Unsealed ...

Total Flow: 45.9 (1 of 1 devices)

Env Pressure: 49.9
on 1 channel

		Average
☑	Pr	49.9
☑	Flow	215.6
☐	Disk ▽	Disk 1
☐	Flow	45.9

Duct Sealing



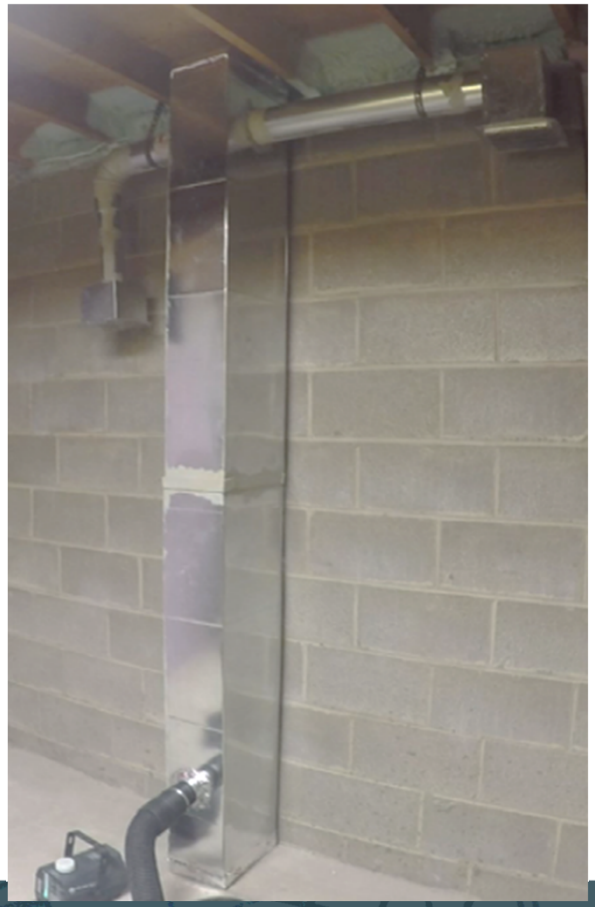
Duct Leaks After Sealing - Overview



Duct Leaks After Sealing – Closer View



Duct Testing – Result (Seams Sealed, no back seam)



2020-10-17_Final Duct Tes...

Total Flow: 23.5 (1 of 1 devices)

Env Pressure: 50.0
on 1 channel

		Average
☑	Pr	50.0
☑	Flow	54.4
☐	Disk ☐	Disk 1
☐	Flow	23.5

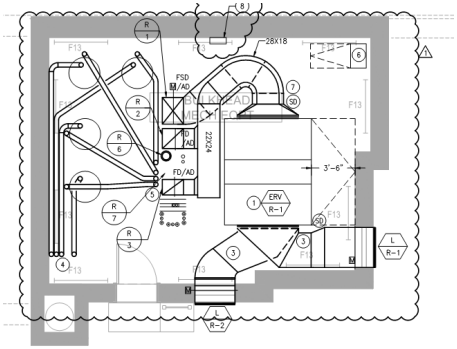
Duct Sealing - Ventilation

211 West 29th Street

Obstacle 1: Timing of Aeroseal
Obstacle 2: Final balancing
Obstacle 3: Initial design much higher than mechanical code



Obstacle 1: Due to the sequencing of the project, it is very difficult to schedule Aeroseal at a time when all riser and branch ductwork has been installed. Scheduling of Aeroseal should be coordinated with HVAC contractor early in construction.



Obstacle 2: During balancing, the total CFM measured at the unit will likely be higher than the design CFM because of leakage in ductwork and higher static to overcome tight mechanical rooms. To minimize this, sharp turns in ductwork should be reduced when possible and extra fan power should be accounted for in energy models.

TABLE 403.3—continued
MINIMUM VENTILATION RATES

OCCUPANCY CLASSIFICATION	OCCUPANT DENSITY #/1000 FT²[a]	PEOPLE OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_p CFM/PERSON	AREA OUTDOOR AIRFLOW RATE IN BREATHING ZONE, R_a CFM/FT²[a]	EXHAUST AIRFLOW RATE CFM/FT²[a]
Private dwellings, single and multiple				
Garages, common for multiple units[b]	—	—	—	0.75
Garages, separate for each dwelling[b]	—	—	—	100 cfm per car
Kitchens[b]	—	—	—	25/100[f]
Living areas[c]	Based upon number of bedrooms. First bedroom, 2; each additional bedroom, 1	0.35 ACH but not less than 15 cfm/person	—	—
Toilet rooms and bathrooms[g]	—	—	—	20/50[f]
Public spaces				
Corridors	—	—	0.06	—
Elevator car	—	—	—	1.0
Shower room (per shower head)[g]	—	—	—	50/20[f]
Smoking lounges[h]	70	60	—	—
Toilet rooms — public[g]	—	—	—	50/70[f]

Obstacle 3: The initial ventilation design included rates in BOH and amenity spaces that were much higher than required by the IMC. This results in unnecessary fan energy use.

Aeroseal

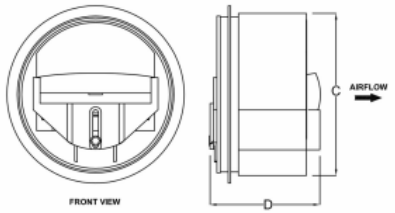


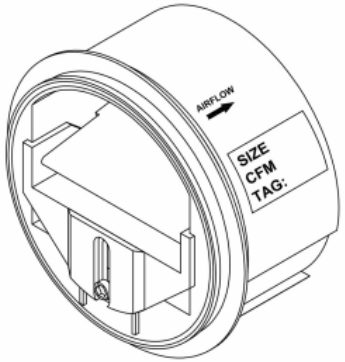
Constant Airflow Regulator

SUBMITTAL DATA
eFlow-Constant Airflow Regulator (CAR)

Application and Design

eFlow-CAR is factory set Constant Airflow Regulator designed to save significant amount of energy and money by precisely controlling airflow into or out of space, regardless of static pressure, and all along providing high Indoor Air Quality (IAQ). eFlow CAR is composed of fire resistant ABS plastic. It contains a self regulating aero-wing and spring piston design to maintain a factory preset air flow. These CAR's are designed to operate in pressure range Low Pressure (.08"-.4"w.c.), Standard Pressure (0.2"-1" w.c) and High Pressure (0.6"-2.4" w.c). They automatically adjust for variable duct pressures caused by building pressure, thermal stack effect, dust build up and other variable factors. This Constant Airflow Regulator creates cost effective answer to balancing air systems for HVAC and ventilation in high rise buildings, without the requirement for on-site balancing, electrical/pneumatic controls or sensors. eFlow-CAR may contribute to meeting USGBC LEED Building and Passive House Certification. eFlow CAR requires no maintenance under normal conditions.





Standard Construction

eFlow-CAR: Classified UL R38307 / UL-2043 for heat release rate and smoke optical density.

Damper (nominal)	C	D
☐ 3 (76)	3.0 (76)	2.2 (55)
☐ 4 (101.6)	3.8 (96.5)	2.8 (70)
☐ 5 (127)	4.8 (121.9)	3.4 (86)
☐ 6 (152.4)	5.8 (147.2)	3.6 (91)
☐ 8 (203.2)	7.7 (195)	3.6 (91)
☐ 10 (254)	9.6 (245)	4.7 (120)

**Size in inches(millimeters)

☐ Low Pressure Range of Operation Static Pressure	
Minimum	.08" w.c.
Maximum	0.4" w.c.

☐ Standard Pressure Range of Operation Static Pressure	
Minimum	0.2" w.c.
Maximum	1.0" w.c.

☐ High Pressure Range of Operation Static Pressure	
Minimum	0.6" w.c.
Maximum	2.4" w.c.

Job Name:	☐ eFlow-Constant Airflow Regulator(CAR) (Supply, Exhaust)
Location:	
Architect:	
Engineer:	
Contractor:	

DRAWN BY:	DATE:	REV. DATE:	REV. NO.	APPROVED BY:	DWG. NO.
IL	12-08-2018	02-15-2019		EL	

eFlow USA, LLC,184 S. Livingston Avenue, STE 9107, Livingston, NJ 07039, www.eFlowUSA.net, 1-833-FLOW-USA

eFlow-Constant Airflow Regular CFM Range

Available in Standard Pressure (0.2" w.c.-1.0" w.c.)

	CAR Diameter	CAR Diameter	CAR Diameter	CAR Diameter	CAR Diameter	CAR Diameter
eFlow-CAR	3"	4"	5"	6"	8"	10"
CFM Range	10-30 CFM	10-30 CFM	10-30 CFM	10-30 CFM	10-30 CFM	10-30 CFM
CFM Range		30-60 CFM	30-60 CFM	30-60 CFM	30-60 CFM	30-60 CFM
CFM Range			60-105 CFM	60-105 CFM	60-105 CFM	60-105 CFM
CFM Range				105-175 CFM	105-175 CFM	105-175 CFM
CFM Range					175-295 CFM	175-295 CFM
CFM Range						265-470 CFM

**blue highlighted CFM Range = standard ***yellow highlighted CFM Range = can be accomidated by special order

Special Configuration Available in High Pressure (0.6" w.c.-2.4" w.c.)

	CAR Diameter	CAR Diameter	CAR Diameter	CAR Diameter	CAR Diameter	CAR Diameter
eFlow-CAR	3"	4"	5"	6"	8"	10"
CFM Range	15-53 CFM	15-53 CFM	15-53 CFM	15-53 CFM	15-53 CFM	15-53 CFM
CFM Range		53-100 CFM	53-100 CFM	53-100 CFM	53-100 CFM	53-100 CFM
CFM Range			105- 176 CFM	105- 176 CFM	105- 176 CFM	105- 176 CFM
CFM Range				176-295 CFM	176-295 CFM	176-295 CFM
CFM Range					295-500 CFM	295-500 CFM
CFM Range						500-765 CFM

**blue highlighted CFM Range = standard ***yellow highlighted CFM Range = can be accomidated by special order

Special Configuration Available in Low Pressure (0.08" w.c.- 0.4" w.c.)

	CAR Diameter	CAR Diameter	CAR Diameter	CAR Diameter	CAR Diameter	CAR Diameter
eFlow-CAR	3"	4"	5"	6"	8"	10"
CFM Range	5-18 CFM	5-18 CFM	5-18 CFM	5-18 CFM	5-18 CFM	5-18 CFM
CFM Range		18-35 CFM	18-35 CFM	18-35 CFM	18-35 CFM	18-35 CFM
CFM Range			35-70 CFM	35-70 CFM	35-70 CFM	35-70 CFM

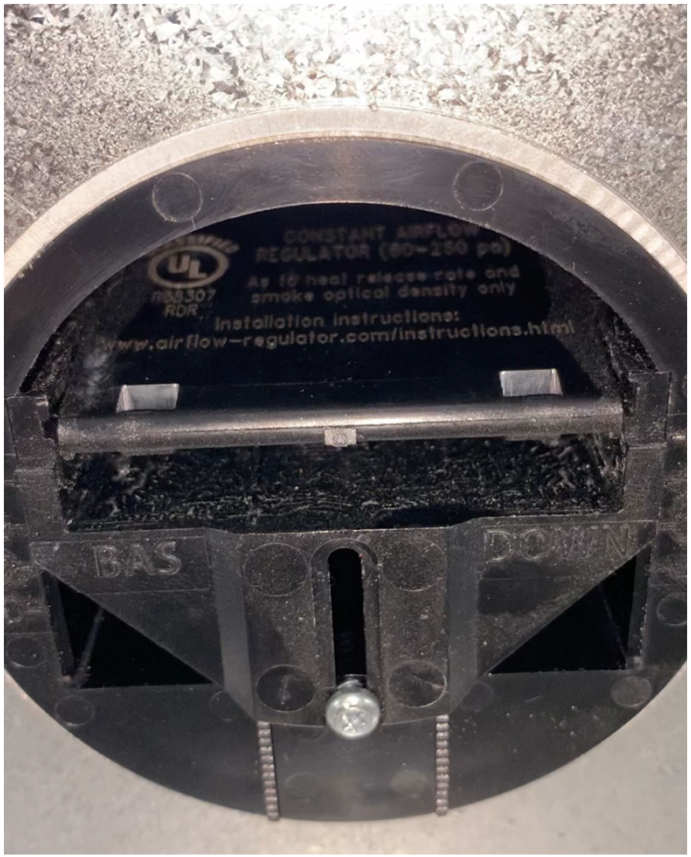
**blue highlighted CFM Range = standard ***yellow highlighted CFM Range = can be accomidated by special order

Job Name:	☐ eFlow-Constant Airflow Regulator(CAR) (Supply, Exhaust)
Location:	
Architect:	
Engineer:	
Contractor:	

DRAWN BY:	DATE:	REV. DATE:	REV. NO.	APPROVED BY:	DWG. NO.
IL	12-21-2019			EL	

eFlow USA, LLC,184 S. Livingston Avenue, STE 9107, Livingston, NJ 07039, www.eFlowUSA.net, 1-833-FLOW-USA

CAR Dampers


CONSTANT AIRFLOW
REGULATOR (80~250 pa)
As to heat release rate and
smoke optical density only
Installation instructions:
www.airflow-regulator.com/instructions.html
BAS
DOWN

Heating & Cooling – Duct Sealing







Duct Sealing & Testing

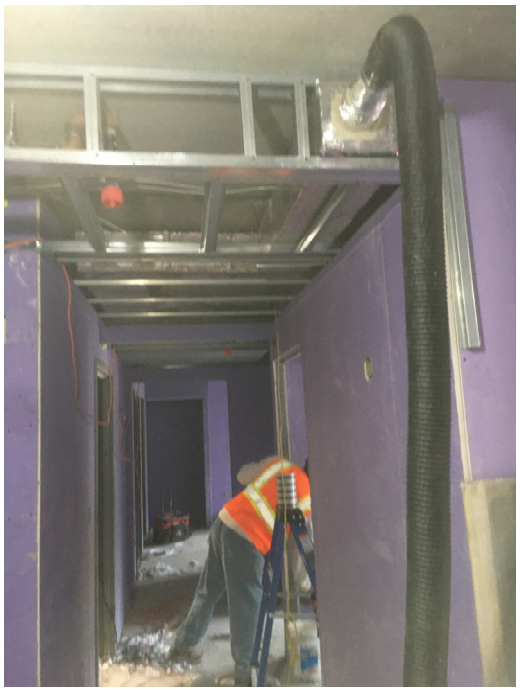
- In unit duct testing required by PHIUS

Heating & Cooling - Ductwork

- The Kingspan KoolDuct System is an advanced and innovative pre-insulated rectangular HVAC ductwork system, which is installed in a single fix.



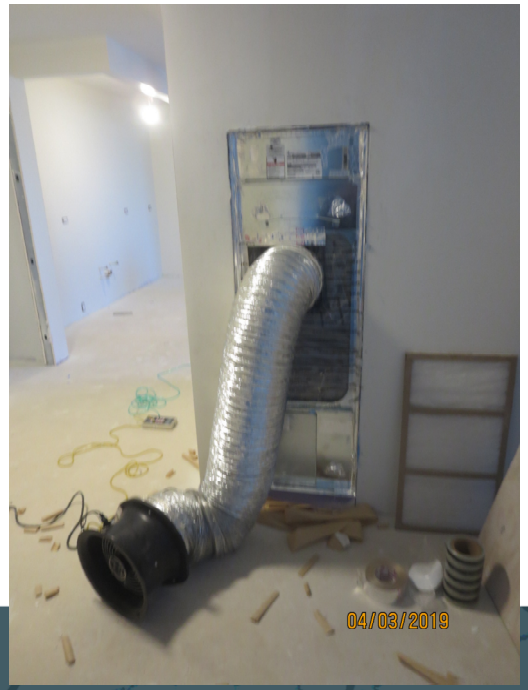




Ductwork - Sealing

- Duct work sealing is critical for both heating/cooling and ERV system operations and achieving the desired air flows
- PHIUS requires in-unit duct testing of heating and cooling systems





Heating & Cooling – Testing at Rough in or Final





Do This



- Ensure CAR dampers are apart of the design
- Ensure Aeroseal is included in the specs and discuss when it needs to take place during the construction process
- Provide a duct mockup of in unit heating/cooling duct work and ventilation duct work early in the project for review
- Commissioning of ventilation systems is crucial to proper performance

Questions?



5 Minute Break

Air Leakage Testing

Blower Door Testing

- Basic Components
  - Gauge (manometer)
  - Shroud
  - Frame
  - Fan



Whole Building Blower Door Test



Air Tightness

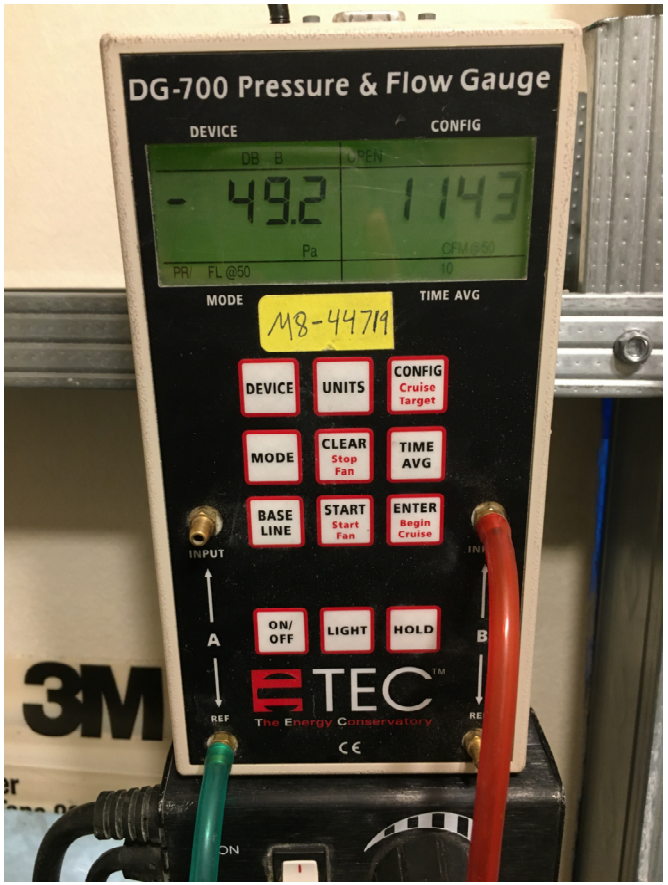
- Requirement: < 0.6 ACH@50 or 0.08 CFM/SF enclosure (PHIUS large bldgs)
- What does this mean?
  - @50 refers to 50 pascals pressure difference between indoors and out during a blower door test, ≈ 20mph wind on all sides of house
  - 0.6 ACH50 = 5 times tighter than ENERGY STAR®
- Method A and Method B Testing
  - A: Configures building to operation during the heating and cooling seasons
  - B: Any intentional openings in the building envelope are sealed



Blower Door – Initial Test

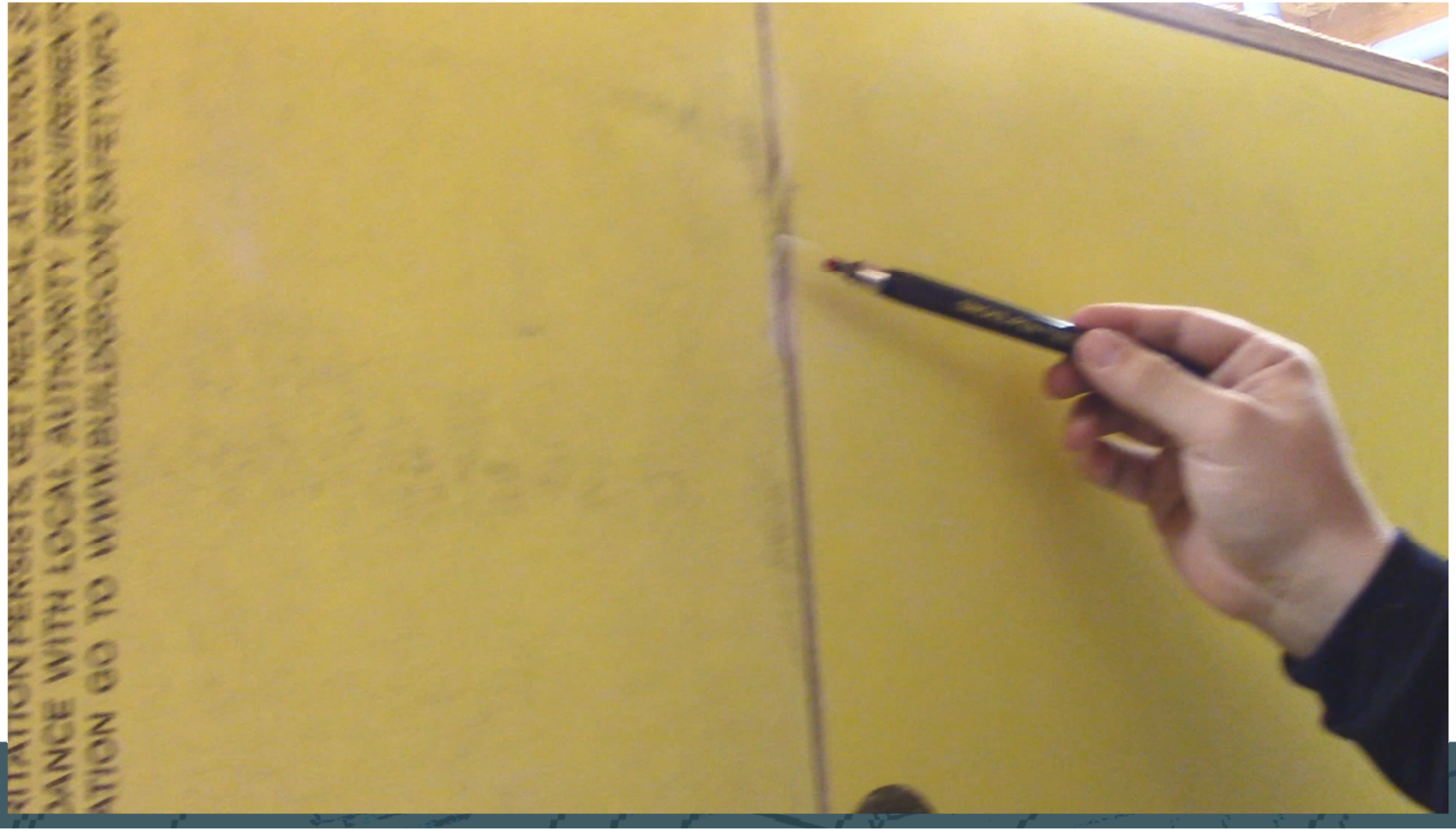


Blower Door – Initial Test Result





Blower Door – Searching for Air Leaks 1



Blower Door – Searching for Air Leaks 2



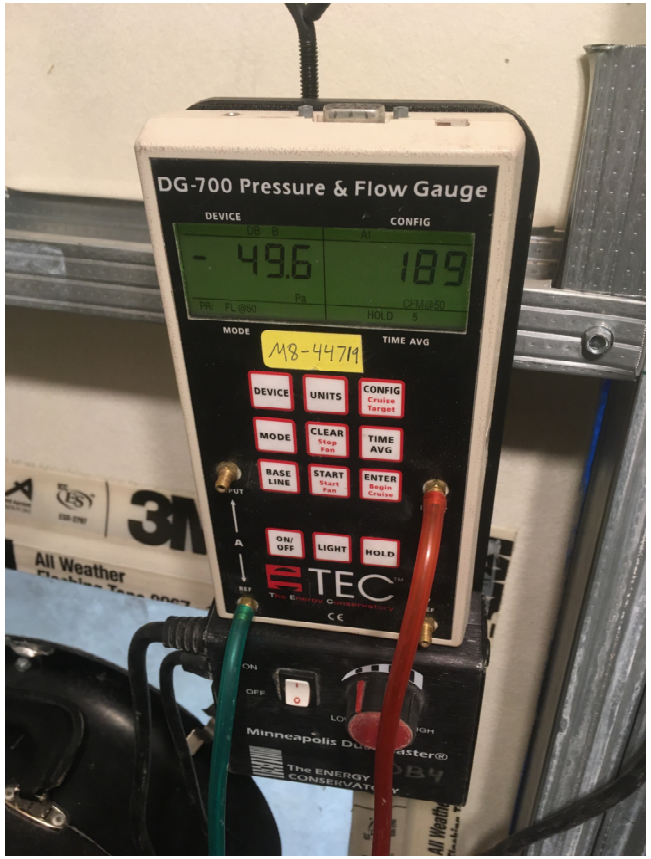
Blower Door – Searching for Air Leaks 3



Walkaround (Seam Sealing Only)

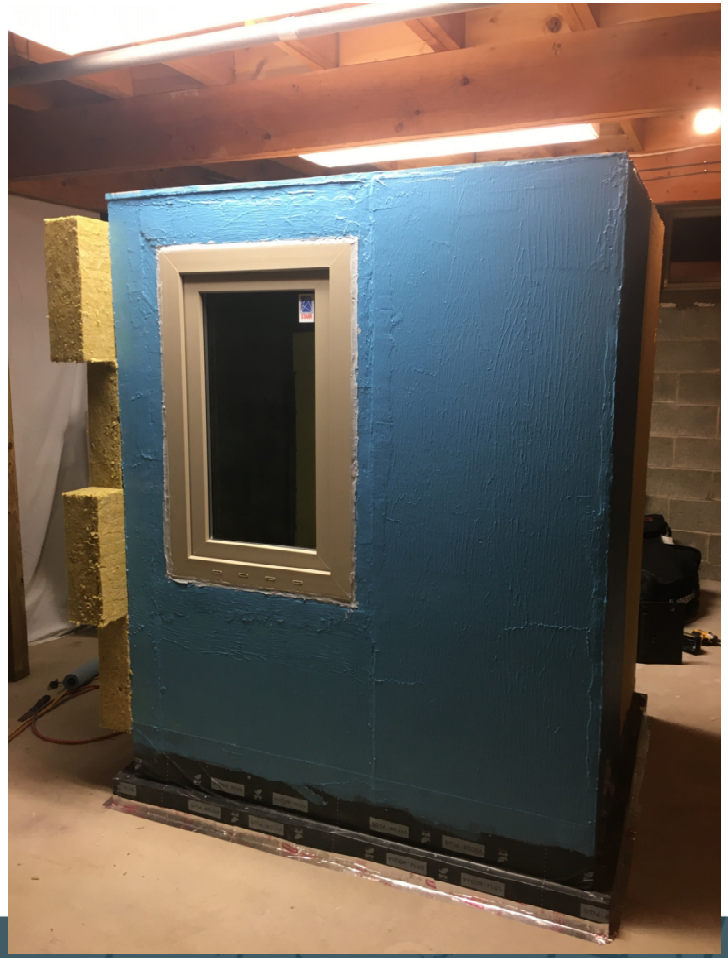


Blower Door – Test (Seam Sealing Only)



getting better

Final Conditions





Final Conditions





Blower Door – Test (Final)

2020-10-17_BD Hut Final T...

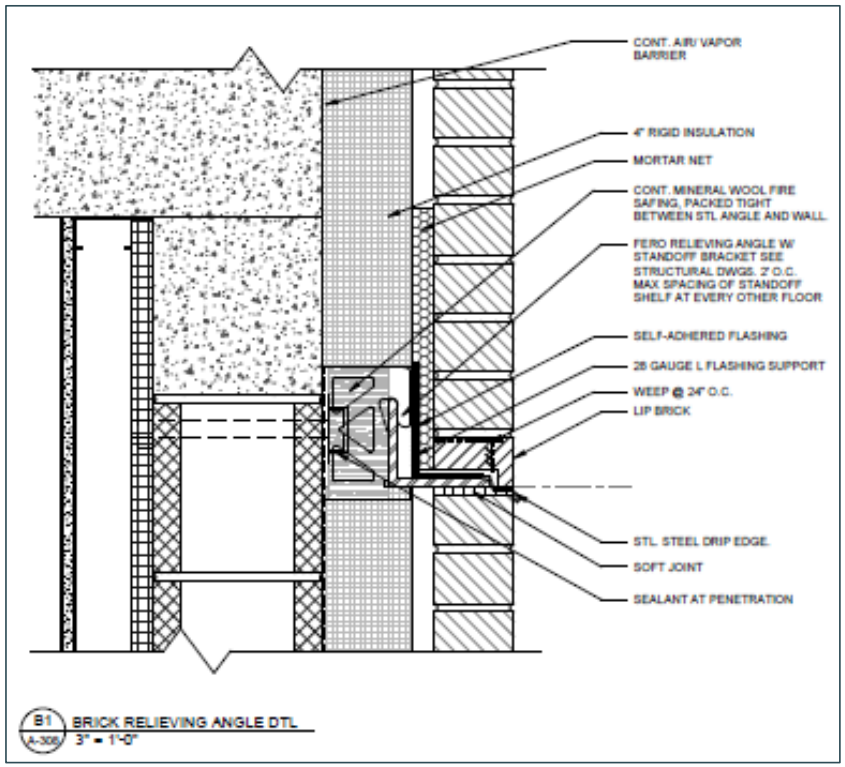
Total Flow: 3.7 (1 of 1 fans)

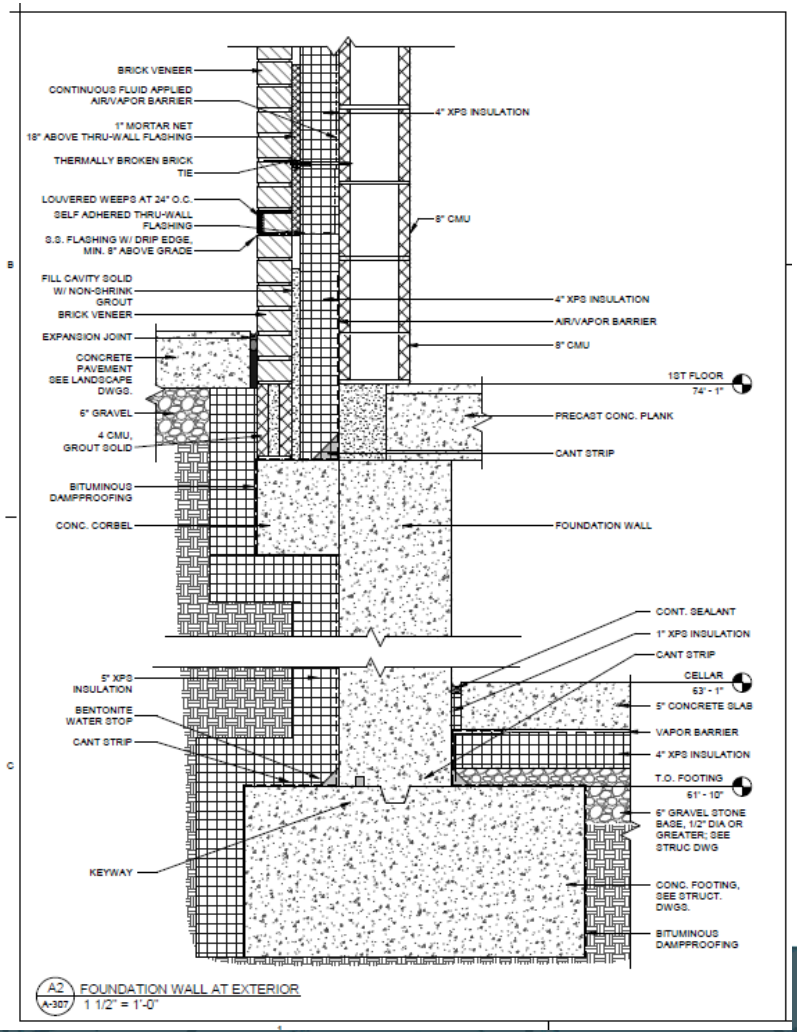
Env Pressure: -49.9
on 1 channel

		Average
☑	Pr	-49.9
☑	Flow	-12
☐	Ring ▽	Ring 4
☐	Flow	3.7



Test on CMU


CONT. AIR/ VAPOR BARRIER
4" RIGID INSULATION
MORTAR NET
CONT. MINERAL WOOL FIRE SAFING, PACKED TIGHT BETWEEN STL ANGLE AND WALL.
FERO RELIEVING ANGLE W/ STANDOFF BRACKET SEE STRUCTURAL DWGS. 2' O.C. MAX SPACING OF STANDOFF SHELF AT EVERY OTHER FLOOR
SELF-ADHERED FLASHING
26 GAUGE L FLASHING SUPPORT
WEEP @ 24" O.C.
LIP BRICK
STL. STEEL DRIP EDGE.
SOFT JOINT
SEALANT AT PENETRATION
B1
A-308
BRICK RELIEVING ANGLE DTL
3" = 1'-0"


BRICK VENEER
CONTINUOUS FLUID APPLIED AIR/VAPOR BARRIER
1" MORTAR NET
18" ABOVE THRU-WALL FLASHING
THERMALLY BROKEN BRICK TIE
LOUVERED WEEPS AT 24" O.C.
SELF ADHERED THRU-WALL FLASHING
G.S. FLASHING W/ DRIP EDGE, MIN. 8" ABOVE GRADE
FILL CAVITY SOLID W/ NON-SHRINK GROUT
BRICK VENEER
EXPANSION JOINT
CONCRETE PAVEMENT SEE LANDSCAPE DWGS.
6" GRAVEL
4 CMU, GROUT SOLID
BITUMINOUS DAMPPROOFING
CONC. CORBEL
4" XPS INSULATION
8" CMU
4" XPS INSULATION
AIR/VAPOR BARRIER
8" CMU
1ST FLOOR
74' - 1"
PRECAST CONC. PLANK
CANT STRIP
FOUNDATION WALL
CONT. SEALANT
1" XPS INSULATION
CANT STRIP
CELLAR
63' - 1"
5" CONCRETE SLAB
VAPOR BARRIER
4" XPS INSULATION
T.O. FOOTING
61' - 10"
5" XPS INSULATION
BENTONITE WATER STOP
CANT STRIP
KEYWAY
5" GRAVEL STONE BASE, 1/2" DIA OR GREATER; SEE STRUC DWG
CONC. FOOTING, SEE STRUCT. DWGS.
BITUMINOUS DAMPPROOFING
A2
A-307
FOUNDATION WALL AT EXTERIOR
1 1/2" = 1'-0"

Test on CMU – Unsealed





Test on CMU – Unsealed Video



Test on CMU – Unsealed Result

2020-10-17_CMU Test Unsea...

Total Flow: 2.9 (1 of 1 devices)

Env Pressure: 50.0
on 1 channel

		Average
☑	Pr	50.0
☑	Flow	26.5
☐	Disk ▽	Disk 2
☐	Flow	2.88



Test on CMU – After One Coat





Test on CMU – Sealed Result

2020-10-17_CMU Test Seale...

Total Flow: 0.1 (1 of 1 devices)

Env Pressure: 50.2
on 1 channel

		Average
☑	Pr	50.2
☑	Flow	15.8
☐	Disk ▽	Disk 4
☐	Flow	0.103



Importance of Interim Testing

Windows – AAC (211)





Windows – AAC (211)



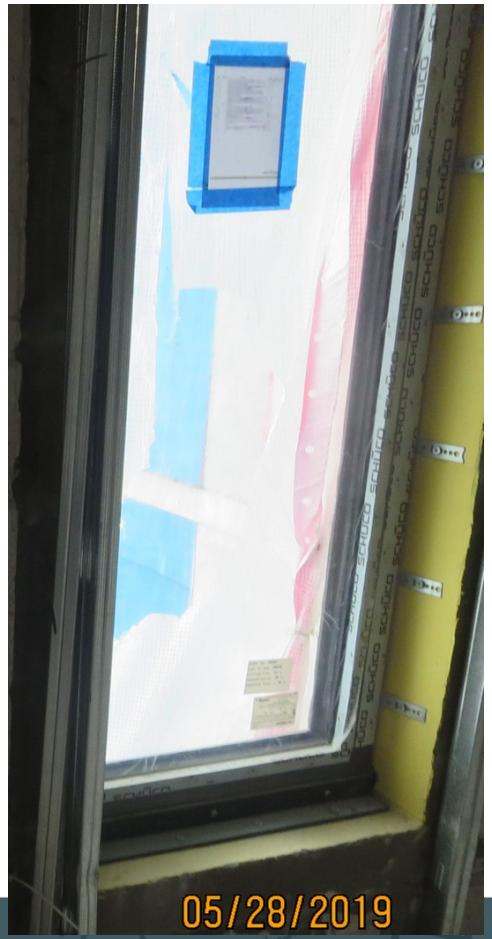


Windows – AAC (211)





Windows – AAC (511) and balcony doors

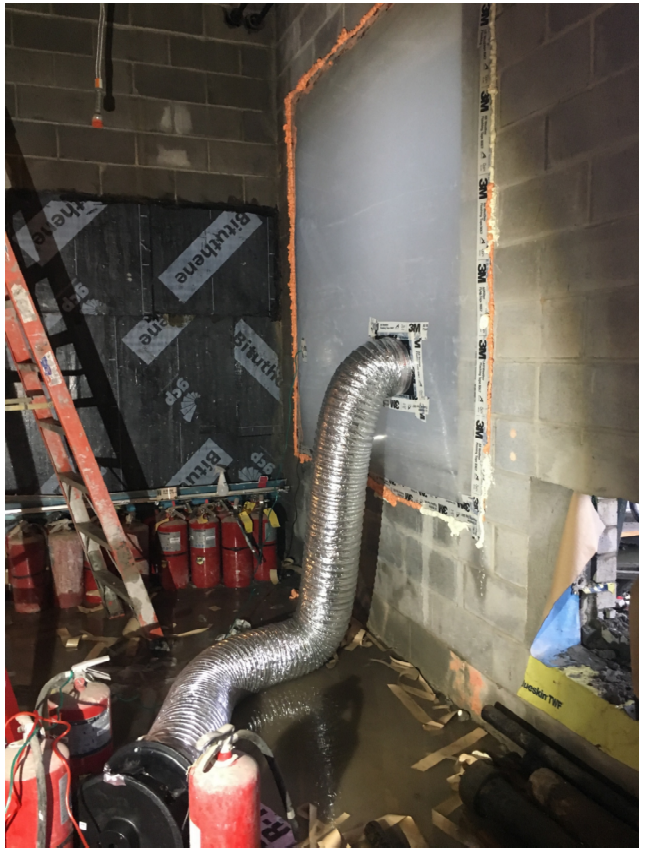




Windows – Testing and More Testing







Blower Door Test Conditions

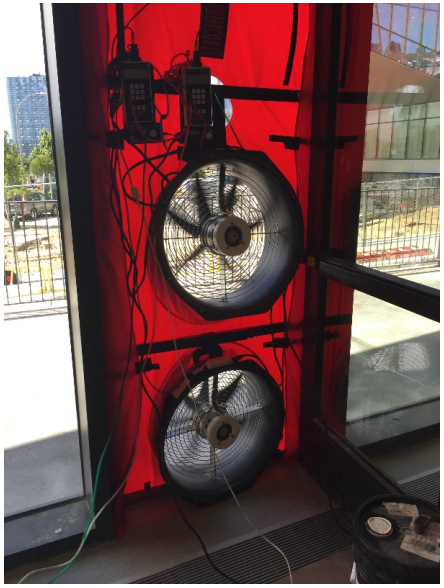


Key: HVAC Contractor; Plumber; GC / Builder

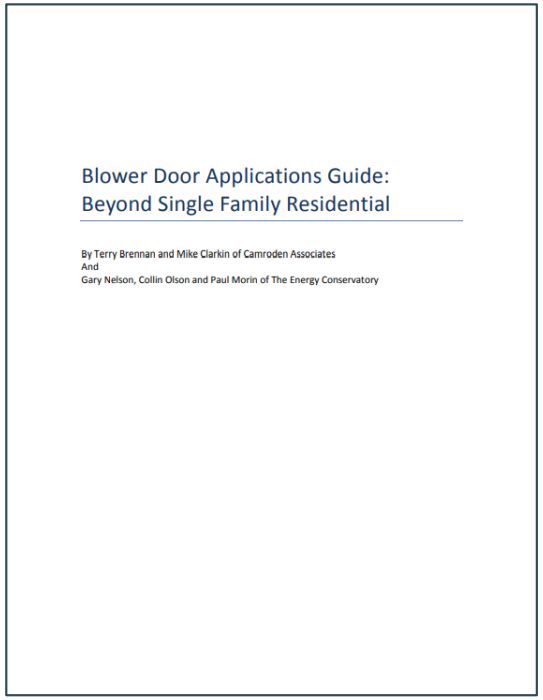
Intentional Opening	Test Setting	Notes
Windows, doors, skylights in the building enclosure	Closed and latched	
Doors and operable windows inside the test enclosure	Open	Use stairways to connect all zones of the building
Fire dampers	Remain as found	
Dryer doors	Closed and latched	
Gas meter room	Door to gas meter room closed and weather stripped	
Waste handling system	Trash chute termination at roof taped off. Door to trash rooms closed.	
ERVs (apartments)	Fan off, any dampers closed. Ducts to the outside sealed inside the ERV cabinet in each apartment.	Ventilation is continuous, so can remain taped off
Motorized dampers: ERV-4 (cellar)	Fan off, dampers closed. Taped off from the exterior	Ventilation is continuous, so dampers closed and sealed off
Motorized dampers: ERV-5 (1st floor)	Fan off, dampers closed. Taped off from the exterior	Ventilation is continuous, so dampers closed and sealed off
Motorized dampers: ERV-2A (1st floor)	Fan off, dampers closed. Taped off from the exterior	Ventilation is continuous, so dampers closed and sealed off
Motorized damper: Laundry Room (2nd floor)	Fan off, dampers closed. Taped off from the exterior	Untaped for Method A test
Motorized damper: ERV-2 (2nd floor)	Fan off, dampers closed. Taped off from the exterior	Ventilation is continuous, so dampers closed and sealed
Motorized dampers: EMR (1st floor), Stair A, Star B, Elevator, Boiler Room (roof)	Taped off from the exterior	Untaped for Method A test
ERV-3 (roof)	Fan off, dampers closed	Ventilation is continuous, so

Whole Building Test Logistics and Execution

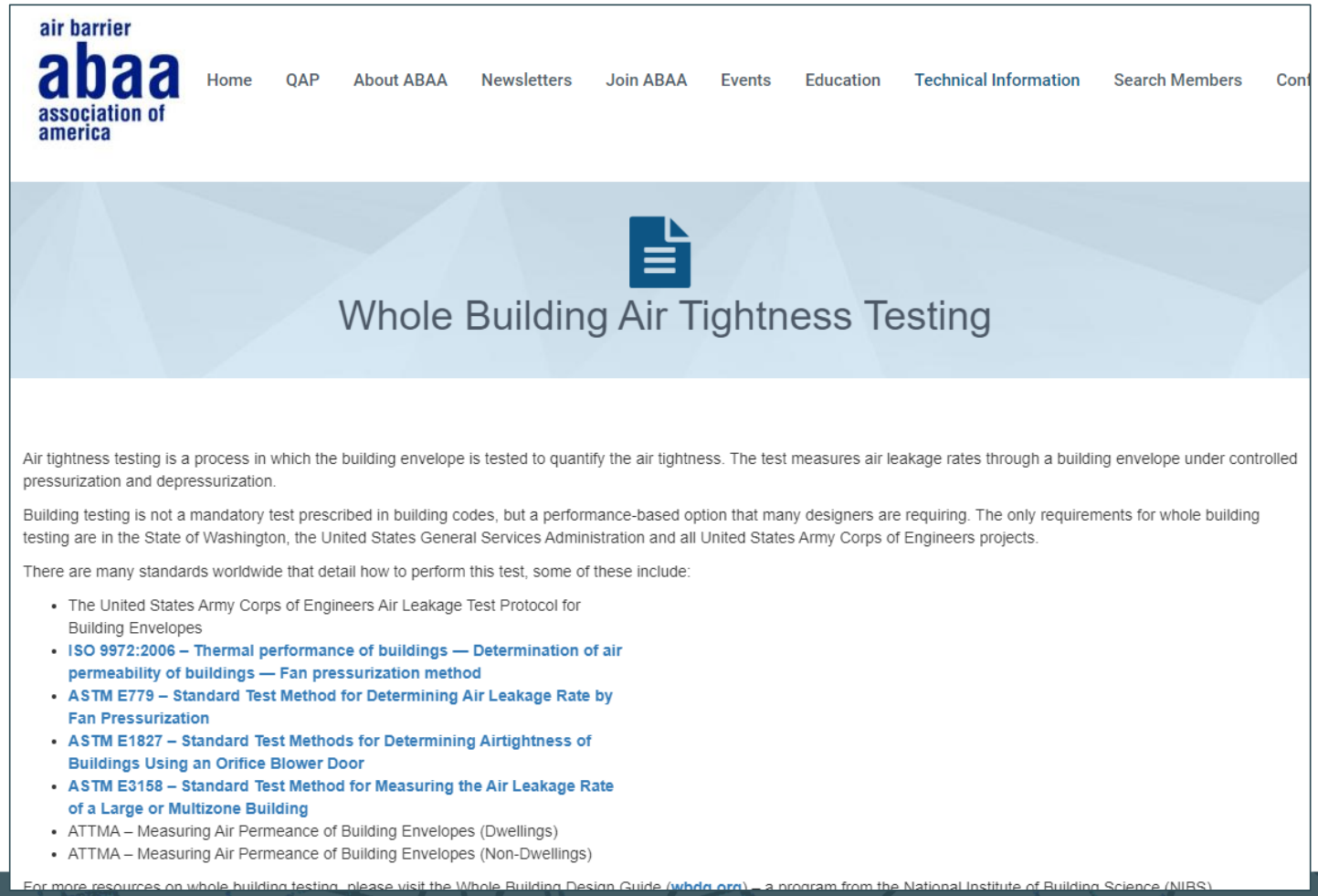
- A great resource is **Blower Door Applications Guide: Beyond Single Family Residential** PDF (Brennan, Clarkin, Nelson, Olson, Morin)







Whole Building Test Resources



air barrier abaa association of america

Home QAP About ABAA Newsletters Join ABAA Events Education Technical Information Search Members Cont

Whole Building Air Tightness Testing

Air tightness testing is a process in which the building envelope is tested to quantify the air tightness. The test measures air leakage rates through a building envelope under controlled pressurization and depressurization.

Building testing is not a mandatory test prescribed in building codes, but a performance-based option that many designers are requiring. The only requirements for whole building testing are in the State of Washington, the United States General Services Administration and all United States Army Corps of Engineers projects.

There are many standards worldwide that detail how to perform this test, some of these include:

- The United States Army Corps of Engineers Air Leakage Test Protocol for Building Envelopes
- **ISO 9972:2006 – Thermal performance of buildings — Determination of air permeability of buildings — Fan pressurization method**
- **ASTM E779 – Standard Test Method for Determining Air Leakage Rate by Fan Pressurization**
- **ASTM E1827 – Standard Test Methods for Determining Airtightness of Buildings Using an Orifice Blower Door**
- **ASTM E3158 – Standard Test Method for Measuring the Air Leakage Rate of a Large or Multizone Building**
- ATTMA – Measuring Air Permeance of Building Envelopes (Dwellings)
- ATTMA – Measuring Air Permeance of Building Envelopes (Non-Dwellings)

For more resources on whole building testing, please visit the Whole Building Design Guide (**wbdg.org**) – a program from the National Institute of Building Science (NIBS)

- https://www.airbarrier.org/technical-information/whole-building-air-tightness-testing-2/

Questions?



Product Donations – Thank You!

CARLISLE COATINGS & WATERPROOFING

sto Building with conscience.

ROCKWOOL

STARR WINDOWS/DOORS

eFlowUSA ECONOMICAL | EFFICIENT | EASY

SIGA 1966

When poll is active, respond at **PollEv.com/swa335**

Text **SWA335** to **22333** once to join

What are your final thoughts and takeaways from the presentation today?



Questions & Final Discussion



Contact Us

Steven Winter Associates, Inc.
307 7th Ave., New York, NY 10001

Michael O'Donnell
Senior Building Systems Consultant | CEM, BPI MFBA
modonnell@swinter.com
212.564.5800 x1360
www.swinter.com



Resources

- https://www.imiweb.org/masonry-detailing-series-3/masonry-detailing-series-main-list/
- https://www.airbarrier.org/technical-information/whole-building-air-tightness-testing-2/