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Q&A will take place at the end of each segment.



Webinar will be recorded and sent.

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Take energy efficiency to a new level

Residential New Construction Passive House Multi-family buildings with five units or more



PASSIVE HOUSE INCENTIVE STRUCTURE FOR MULTI-FAMILY (5 UNITS OR MORE)				
Incentive Timing	Activity	Incentive Amount	Max Incentive (Per Unit)	Max Incentive (Per Project)
Pre-Construction	Feasibility Study ¹	Up to 100% of Feasibility Study Costs	N/A	\$5,000.00
	Energy Modeling ²	75% of Energy Modeling Costs (Before 90% Design Drawings)	\$500.00	\$30,000.00
		50% of Energy Modeling Costs (90% Design/50% Construction)	\$250.00	\$15,000.00
Post Construction	Certification ³	Up to 100% of Certification Costs	\$1,500.00	\$60,000.00

1. Feasibility Study will require documentation in the form of a Feasibility Study report and invoice from the Passive House Consultant

2. Incentives will only be awarded prior to 50% Construction Drawings for Passive House projects. No incentives will be granted after 50% Construction Drawing set.

3. Certification may be either through PHIUS, PHI, or EnerPHit certification offerings.

Next steps you can take... Contact your Energy Efficiency Representative or

Go to EnergizeCT.com or call 1-877-WISE USE for more details.

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Workshop 1, Part 2 Continuous Insulation









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
- Decarbonization
- Sustainability Consulting
- Green Building Certification
- Accessibility Consulting

Our teams are based across four office locations: New York, NY | Washington, DC | Norwalk, CT | Boston, MA

For more information, visit www.swinter.com



By providing a whole-building approach to design, construction, and operation

Learning Objectives

Summarize the importance of continuous insulation

Identify challenging details and propose solutions to overcome Describe common approaches for continuous insulation of residential projects

Recognize new and innovative insulation components

Overview of Presentation





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What is your profession?

A. Architect

B. Engineer

C. Contractor/CM

D. Consultant

E. Other

What is the one thing that you were hoping to learn about today? (hint: link words with an underscore)

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- Push for Building Electrification (Passive House as a pathway)
- Incentives available
- Benefits
 - Drastically lower energy use and operational cost savings
 - Healthy air quality from ventilation systems
 - Consistent and comfortable room temperatures without air drafts
 - Increased natural lighting and quieter acoustic conditions
 - A more resilient and comfortable building

These Trainings - Each has two parts



- Workshop 1: Continuous Insulation
- Workshop 2: Air Sealing and Insulation for Homes
- Workshop 3: High Performance Ventilation Systems for Homes



High Performance Basics

Goals of High Performance Buildings

- Building durability
- Energy \$ reduction
- Optimal thermal comfort
- Superior indoor air quality
- Carbon emissions reductions







Passive House as a Pathway to High Performance

- Thermal insulation continuity
- Thermal bridge free construction
- Solar control
- Airtightness
- Balanced mechanical ventilation

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www.surehouse.org



Continuous Insulation











Air-Tightness Blower Door Testing



Balanced Ventilation and Heat/Energy Recovery

- Provide fresh, filtered air 24 hours a day
- Heat exchanger +75% Efficient
- Highly insulated and air-sealed ductwork



Questions?





Common Approaches to Insulation

Perfect Wall

- Wood framing is the most common building material for low to mid-rise buildings
- Successful wood framed approaches in achieving high performance:
 - Larsen truss
 - Double stud walls
 - Prefabricated systems (SIPs)
 - 2x Framing
 - 2x Framing with Zip System



THE PERFECT WALL Concept by Building Science Corp

Executed by Risinger Homes & Rauser Design





Larsen Truss

- Used in single family home construction
- Trusses build out the wall cavity to allow for super insulation
- Can be used in an existing building retrofit or new construction





Double Stud Wall

- Used in single family home construction
- Utilizes two separately framed walls to allow for super insulation
 - Thickness varies but 9 ¹/₂" -11" is common
- Can be used in an existing building retrofit or new construction
- Drawback: lumber costs





Prefabricated Walls and SIPs

- Used in single and multifamily construction
- Implements EPS foam insulation sandwiched with OSB
- Continuous insulation mitigates thermal bridging through framing
- Speedy assembly and inherent air tightness



Advanced Framing – 2x6

- Used in single and multifamily construction
- Implements interior cavity insulation and exterior continuous insulation
- Cost effective approach and can achieve higher R-values







Advanced Framing

- Reduces the amount of lumber used and optimizes material use
 - Thus reducing thermal bridging of framing members

Ex: 2x6 framing 24" O.C., Single top and bottom plate, no headers in non-bearing walls, single stud at rough openings



Building Layout

- Complex architecture
- Wall to foundation connection
- Headers
- Window installations
- Roof to wall connection
- Rim Joist
- Heal of truss





Building Layout





Sub-slab Insulation





Below Grade Walls







Below to Above Grade Transition





Below to Above Grade Transition





Below to Above Grade Transition





Zip R







- Zip R: Structural panel with built-in exterior insulation
- Integrated
 moisture, air, and
 thermal protection
- R-values range from R-3 to R-12
- 1) Built in exterior insulation
- 2) Integrated water resistive barrier
- 3) Continuous air barrier
- 4) Structural durability

Zip R







Zip R – Be Careful




Exterior XPS with Furring Strips







Exterior XPS with Furring Strips





Exterior XPS with Furring Strips





Exterior Mineral Wool – Attachments & Spacing









-connection - contra

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



e.g. Heco-Topix Recommended for use with wood strapping to reduce risk of compression deflection.





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.



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

Impaling Pin

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Polyiso Insulation





Interior Batts





Interior Batts – Sample Install





Interior Batt Grading





Interior Batts – Grading, Example 1





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How would you rate this install (example 1)?

A. Grade I: Almost no gaps

B. Grade II: Up to 2% gaps

> C. Grade II: 2-5% gaps

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Interior Batts – Grading, Example 2







When poll is active, respond at pollev.com/swa335
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How would you rate this install (example 2)?

A. Grade I: Almost no gaps

B. Grade II: Up to 2% gaps

> C. Grade II: 2-5% gaps

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Interior Batts – Grading, Example 3







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How would you rate this install (example 3)?

A. Grade I: Almost no gaps

B. Grade II: Up to 2% gaps

> C. Grade II: 2-5% gaps

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Interior Batts – Grading, Example 4





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How would you rate this install (example 4)?

A. Grade I: Almost no gaps

B. Grade II: Up to 2% gaps

C. Grade II: 2-5% gaps

Interior Spray Foam







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Interior Spray Foam





Spray Foam at Rim/Band Joist





Spray Foam at Rim/Band Joist





Roof Insulation – Flat Roof







Roof Insulation – Sloped Roof (Exterior)





Spray Foam – Attic Slope







Spray Foam – Attic Slope







65

Spray Foam – Attic Flat, Interior





Job Oversight





Questions?



5 Minute Break





Innovative Insulation Components





ASHRAE 90.1 - 2019 *continuous insulation (c.i.):* insulation that is uncompressed and continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building envelope.

What types of thermal bridge mitigation strategies have you seen implemented on your projects? (hint: link words with an underscore)

Framing - Thermal Bridges





Credit: Sam Hagerman, Thermal Bridge Free Construction • Example: "R-50" wall with 25% wood framing = R-32







Credit: Fine Homebuilding

Framing - Thermal Bridge Mitigation

- Advanced framing
- Truly continuous exterior insulation
- Zip R sheathing
- Structural thermal break products at
 - Equipment supports
 - Structural steel
 - Balconies / porches
- Planning and mitigation, during the design phase





Advanced Framing





Advanced Framing



Credit: APA Advanced Framing Construction Guide
Advanced Framing



Credit: APA Advanced Framing Construction Guide



Ladder junctions at interior-exterior wall intersections (Figure 5) produce wall cavities that can be easily insulated to help builders earn the ENERGY STAR[®] label for new homes.



California Corner







80

T Stud – R19

- Uses two lumber members, an internal truss system, and a frothed-in-place closed-cell foam
 - Thermal: reduces thermal bridging
 - Structural
 - Wind: 24" o.c. in wind loads 1-5
 - Sound transmission reduction
 - Fire: foam designed to char than melt





T Stud – Barenaked Stud

- Similar benefits to R19 stud, however open web design allows for any type of insulation to be used
 - Blown-in fiberglass, cellulose, mineral wool, or spray foam





Pre-insulated Headers

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3-1/2" width for 2x4 construction	3-1/2" Construction Description
5-1/2" width for 2x6 construction Available in depths of 7-1/4", 9-1/4" & 11-1/4" Value engineered for commercial jobs. Custom depths available (call for details). Full Thermal Break (Foam Core Construction) 3-1/2" ExpressHeader = 87.75	 1-1/4" LVL (Laminated Veneer Lumber) 1" of Expanded Polystyrene (EPS) 1-1/4" LVL (Laminated Veneer Lumber)
5-1/2'' ExpressHeader = R16	5-1/2" Construction Description
Right size every time. No cupping, twisting, or bowing. Less call backs for drywall problems.	 1-1/4" LVL (Laminated Veneer Lumber)
Stock length is 16', custom lengths available.	• 3" of Expanded Polystyrene (EPS)
Bonded with exterior structural adhesive.	• 1-1/4" LVL (Laminated Veneer
One Piece Express Installation.	Lumber)

Continuous Exterior Insulation







5" Comfortboard. Photo Credit: Dan Edeman for Rockwool

Furring Strips Over Continuous Rigid Insulation





Credit: Hammer & Hand hammerandhand.com

Steps:

1. Install first layer of rigid insulation with limited number of nails or screws with washers.

2. Install second layer of rigid insulation with limited number of nails or screws with washers.

3. Fasten furring with screws; spacing and fastener size to be decided by weight of siding material and spacing of furring.

Furring Strips Over Continuous Mineral Wool





Steps for installing furring over mineral wool:

1. Install first layer of mineral wool with limited number of nails or screws with washers.

2. Install second layer of mineral wool with limited number of nails or screws with washers.

3. Align vertical edges of exterior layer to ensure coverage by furring and prevent puckering.

4. Fasten furring with screws: spacing and fastener size to be decided by weight of siding material and spacing of furring. Consult manufacturer, architectural, or structural specifications.

Credit: Hammer & Hand hammerandhand.com

Clip and Rail Systems







Wood Framed – Porches, Balconies







Structural Thermal Breaks

 Armatherm[™] 500 is a high strength, closed cell polyurethane material made in several densities to support a wide range of loading conditions.

Specifications Armatherm [™] 500	500-150	500-200	500-280
Compressive Stress (psi)	560	1100	2150
Compressive modulus (psi)	18,130	29,000	49,300
Thermal Conductivity (BTU in/hr ft2 F)	0.32	0.39	0.53
R value per inch	3.1	2.6	1.9
Operating Temperature		-300F/+175F	





https://www.armatherm.com/wp-content/uploads/2017/03/Armatherm500USA.pdf

Structural Steel





2'x2'x6" - 500-280 ARMATHERM 500 THERMAL INSULATION BLOCK WITH ALLOWABLE COMPRESIVE STRENGTH OF 2150 PSI

Flat Roof - Equipment Supports







Flat Roof







Thermal Break – Concrete Connections









EIFS - Insulation Options

- Typical EPS insulation board in the EIFS system substituted with Neopor GPS insulation board
- GPS graphite polystyrene comprised of small pockets of air within a polymer matrix. Graphite reflects radiant heat energy increasing R-value
- R-value slightly better in cold conditions
- R-3.85 (EPS) vs 4.7 (GPS) per inch







Parapet Insulation Wrap





Insulation Over Window Frame





What are your final thoughts and takeaways from the presentation today? (hint: link words with an underscore)

Questions & Final Discussion

Join Us for More Trainings!



- Workshop 1: Continuous Insulation
- Workshop 2: Air Sealing and Insulation for Homes
- Workshop 3: High Performance Ventilation Systems for Homes

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



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