The Sponsors of Energize Connecticut, and in partnership with Connecticut Passive House, are pleased to offer *Passive House & All-Electric Homes Initiative* to support workforce development and help transform the energy efficiency and building construction industries in Connecticut.

For more information, please visit EnergizeCT.com/passive-house or email PassiveHouseTrainingCT@icf.com
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)

<table>
<thead>
<tr>
<th>Incentive Timing</th>
<th>Activity</th>
<th>Incentive Amount</th>
<th>Max Incentive (Per Unit)</th>
<th>Max Incentive (Per Project)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pre-Construction</td>
<td>Feasibility Study¹</td>
<td>Up to 100% of Feasibility Study Costs</td>
<td>N/A</td>
<td>$5,000.00</td>
</tr>
<tr>
<td></td>
<td>Energy Modeling²</td>
<td>75% of Energy Modeling Costs (Before 90% Design Drawings)</td>
<td>$500.00</td>
<td>$30,000.00</td>
</tr>
<tr>
<td></td>
<td></td>
<td>50% of Energy Modeling Costs (90% Design/50% Construction)</td>
<td>$250.00</td>
<td>$15,000.00</td>
</tr>
<tr>
<td>Post Construction</td>
<td>Certification³</td>
<td>Up to 100% of Certification Costs</td>
<td>$1,500.00</td>
<td>$60,000.00</td>
</tr>
</tbody>
</table>

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.
The future of high-performance, all-electric homes starts here.
<table>
<thead>
<tr>
<th></th>
<th>Level 1</th>
<th>Level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Single Family (Detached Dwellings)</td>
<td>Multifamily (Attached Dwellings)</td>
</tr>
<tr>
<td>Total UA Alternative Compliance or HERS Index Score</td>
<td>Total UA ≥ 75% better than 2021 IECC or HERS Index Score ≤ 55</td>
<td>Total UA ≥ 15% better than 2021 IECC or HERS Index Score ≤ 45</td>
</tr>
<tr>
<td>Heat pump for space heating</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Space Conditioning Connectivity &amp; Controls</td>
<td>Optional</td>
<td>Optional</td>
</tr>
<tr>
<td>Heat pump for water heating</td>
<td>Required</td>
<td>Optional</td>
</tr>
<tr>
<td>Hot Water Distribution</td>
<td>Required</td>
<td>Required</td>
</tr>
<tr>
<td>Envelope Infiltration Rate (ACH)</td>
<td>ACH50 ≤ 2.5</td>
<td>CFA &gt; 850Hz: ACH50 &lt; 4.0</td>
</tr>
<tr>
<td>Duct Leakage Rate (CFM)</td>
<td>2021 IECC code minimum requirements</td>
<td>All ductwork must be located in conditioned space</td>
</tr>
<tr>
<td>Balanced Ventilation Systems</td>
<td>Optional</td>
<td>Required</td>
</tr>
<tr>
<td>Induction Cooking</td>
<td>Optional</td>
<td>Required</td>
</tr>
<tr>
<td>Electric Vehicle Readiness</td>
<td>Required</td>
<td>Required</td>
</tr>
</tbody>
</table>

**ALL-ELECTRIC HOME INCENTIVE STRUCTURE**

<table>
<thead>
<tr>
<th></th>
<th>Level 1</th>
<th>Level 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Family</td>
<td>$7,500</td>
<td>$10,000</td>
</tr>
<tr>
<td>Single Family Attached</td>
<td>$1,500</td>
<td>$5,000</td>
</tr>
<tr>
<td>Multifamily</td>
<td>$1,500</td>
<td>$2,500</td>
</tr>
</tbody>
</table>

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Brought to you by Eversource

Proud sponsors of Energize Connecticut

Part of the AVANGRID Family
Compartmentalization Air Sealing – Masonry / Steel Stud
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](http://www.swinter.com)
Why air seal?
Air Seal to...Save Energy.

Credit: greenbuildingadvisor.com
Air Seal to...Overcome Stack Effect
Air Seal to... Overcome Stack Effect

Credit: VEIC
Air Seal to...Reduce Moisture Drive

4x8 sheet of gypsum board
Interior at 70°F and 40% RH

1/3 quart of water

4x8 sheet of gypsum board with a 1 in² hole
Interior at 70°F and 40% RH

30 quarts of water

Credit: Southface
Air Seal to...Control Sound / Smell Transfer
Air Seal to...Stop Flame/Smoke Spread
Air Seal to...Improve Occupant Comfort
Air Seal to...Stop Pest Migration
Air Seal to...Satisfy Code / Certifications
How and where does air leakage occur?
How Does Air Leakage Occur?

Air leakage requires 2 things:

1. An opening
   - Cracks
   - Small holes
   - Large holes
   - Permeable material

2. A driving force
   - Wind
   - Stack effect
   - Mechanicals
Where Does Air Leakage Occur?

All of these areas!
How can we control leakage and provide sufficient air sealing?
Where Leakage Occurs... Ambient vs. Adiabatic

Detached: ~100% ambient exposure

Attached: 16% ambient exposure

All air leakage matters!
How to control leakage… Minimize enclosure area

Testing metric:
Volume (ACH50) vs. Enclosure area (CFM50/SF)

Equal volume & floor area

9% more enclosure area
Simplify enclosure area

18 corners

4 corners
Know the priorities
Know the approach
Think Like Water
Seal Drywall Enclosure

A. Seal perimeter of panel to drywall
B. Install foam tape on panel door

A. Seal plumbing penetrations through drywall/subfloor

A. Seal screw holes & unused knock-outs
B. Seal box to drywall
C. Seal wire penetrations

A. Box-out cavity on all 5 sides
B. Seal every seam and hole

A. Seal duct to drywall

A. Seal millwork to drywall
B. Seal between diffuser/ register and drywall

A. Install pre-rock
B. Seal all seams

A. Seal sleeve to framing
B. Seal sleeve to drywall
Drawings / Specifications

• Choose details/specs specific to each project
• Max. 0.30 cfm/SF of enclosure - or as required by compliance path
• Be specific
  • Gaps <1/4” - use caulk; gaps >1/4” use – foam (with some caution)
  • Use appropriate sealants (e.g. low-VOCs, high-temp, low-expanding, fire-rated, etc.)
  • Clean out cracks before applying sealant (e.g. compressed air, vacuum, damp cloth, etc.)
• Consider ‘new’ products (high performance tapes, Aerobarrier)
Take Responsibility on Site – “Air Boss”

• The more eyes on the air barrier system, the better.
• Need dedicated person on site from the GC, essentially an envelope super to stay on top of the Air Barrier system
• The installers will be “graded” at the end through blower door testing
Design Exercise
Define the Enclosure

- Exterior Wall
- Corners
- Interior partitions
- Zeroing in on any / all drywall penetrations
Seal Bottom of Wall – Masonry / Steel Stud

EXTerior WALL - BOTTOM

Notes:
A. Intent: reduce leakage between wall cavity and apartment
B. Option: self-leveling subfloor (i.e. gypcrete)
- Seal any remaining gaps between self-leveling subfloor and drywall with caulk

Responsibilities:
Drywall: A
Envelope: B

Steven Winter Associates, Inc.
Seal Middle of Wall – Masonry / Steel Stud
Seal Top of Wall – Masonry / Steel Stud

**Notes:**
A. B. Intent: reduce leakage between the exterior and the wall cavity
C. D. Intent: reduce leakage between the wall cavity and the interior
A. Seal exterior sheathing at all seams and penetrations with manufacturer recommended products
D. Typically drywall

**Responsibilities:**
Envelope: A
Framing: B
Drywall: C, D

**Notes:**
A. Typically fluid-applied or adhesive membrane on CIMUs (e.g. Grace / Henry products)
B. Intent: reduce leakage between wall cavity and apartment
C. Typically drywall

**Responsibilities:**
Envelope: A
Drywall: B, C
Seal Top of Wall – Masonry / Steel Stud
Windows – Masonry / Steel Stud
Isolate Partitions – Masonry
Isolate Partitions – Steel Stud

A. Leave gap between framing members to fit drywall

B. Seal drywall to sheathing and plank/slab

C. Seal penetrations

EXTERIOR

(APR VIEW)
Isolate Partitions

Units typically aren’t simple rectangles

Trace out perimeter drywall for continuity during design phase and review sequencing with drywall installer.

Red = sealed air barrier layer.
Blue = finished sheetrock that does not maintain an air barrier.
Ceiling – Top of Apartment Unit

(SECTION VIEW)

EXTERIOR / CORRIDOR

A. SEAL PENETRATIONS

B. SELF-LEVELING SUBFLOOR

C. SEAL DRYWALL TO PLANK
Seal Penetrations

A. Seal perimeter of panel to drywall

B. Install foam Katherine Itripping on panel door

A. Seal plumbing penetrations through drywall/subfloor

C. Seal wire penetrations

A. Seal screw holes & unused knock-outs

B. Seal box to drywall

A. Box-out cavity on all 5 sides

B. Seal every seam and hole

A. Seal duct to drywall

B. Seal between diffuser/ register and drywall

A. Seal millwork to drywall

A. Install pre-rock

B. Seal all seams

A. Seal sleeve to framing

B. Seal sleeve to drywall
Air Sealing Details in Drawings Set

- Air Barrier Continuity Diagrams & Associated Details
  - Both in Plan and Section
  - Clearly address complicated air barrier application areas
Air Sealing Details in Drawings Set

- Air Sealing Details
  - For whole building as well as compartmentalization
  - SWA Air Sealing Guide – focused on compartmentalization
Evaluate Air Sealing During Construction
Field Evaluation of Air Sealing

1. Pre-drywall
   - Visual inspection (diagnostic tools if necessary, but not typical)

2. Final
   - Blower door & visual inspection
Pre-Drywall Visual Inspection
Use Checklists

2. Quality-Installed Insulation
2.1. Insulation in walls, attic spaces, roof areas, and basements
2.2. Insulation in attics
2.3. Insulation in ceilings
2.4. Insulation in floors
2.5. Insulation in windows

3. Air Sealing
3.1. Inspect密封 in all conditioned spaces
3.2. Inspect密封 around doors
3.3. Inspect密封 around windows
3.4. Inspect密封 around ducts
3.5. Inspect密封 around plumbing
3.6. Inspect密封 around electrical
3.7. Inspect密封 around mechanical

4. Use Checklists
4.1. Checklist for wall insulation
4.2. Checklist for attic insulation
4.3. Checklist for ceiling insulation
4.4. Checklist for floor insulation
4.5. Checklist for window insulation
4.6. Checklist for door insulation
4.7. Checklist for duct insulation
4.8. Checklist for plumbing insulation
4.9. Checklist for electrical insulation
4.10. Checklist for mechanical insulation

TABLE 4.1: AIR SEALING, AIR SEALING AND INSULATION INSTALLATION

<table>
<thead>
<tr>
<th>Component</th>
<th>Air Sealing/Covering</th>
</tr>
</thead>
<tbody>
<tr>
<td>General</td>
<td>Air-sealed air spaces must be installed in the building envelope.</td>
</tr>
<tr>
<td>Ceiling</td>
<td>The air-sealed area must be insulated with insulation and any gaps in the air barrier should be sealed.</td>
</tr>
<tr>
<td>Walls</td>
<td>The air-sealed area must be insulated with insulation and any gaps in the air barrier should be sealed.</td>
</tr>
<tr>
<td>Doors</td>
<td>The air-sealed area must be insulated with insulation and any gaps in the air barrier should be sealed.</td>
</tr>
<tr>
<td>Windows</td>
<td>The air-sealed area must be insulated with insulation and any gaps in the air barrier should be sealed.</td>
</tr>
</tbody>
</table>

Air sealing and insulation must be installed in all conditioned spaces.
Prelim / Mock-up Blower Door Test

• Basic Components
  • Gauge (manometer)

• Shroud

• Frame

• Fan
Finding Air Leaks During Testing

- Intuition (eyes, brain)
- Sound (ears)
- Your hands
- Theatrical fog / hand foggers
- IR (if conditions allow and have basic IR training)
Corrective Measures
Examples
Air Sealing – Good and Bad
Air Sealing – Good and Bad
Air Sealing – Good and Bad
Air Sealing – Good and Bad

• Seal these abandoned penetrations before framing is installed over them
Air Sealing – Good and Bad
Air Sealing – Good and Bad
Air Sealing – Good and Bad
Air Sealing – Good and Bad
Air Sealing – Good and Bad
Air Sealing – Good and Bad
Air Sealing – Good and Bad

Unsealed Toilet penetration

Sealed Toilet penetration with spray foam/caulk

Unsealed Shower penetration

Sealed Shower penetration with caulk
Air Sealing – Good and Bad

Sealed Kitchen sink penetration with spray foam/caulk
Air Sealing – Good and Bad

[Images of poor air sealing]

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Steven Winter Associates, Inc.
Air Sealing – Good and Bad

Unsealed gap between bottom of sill & drywall

Gap between frame of window & drywall
Air Sealing – Good and Bad

Large gap between telecom box & drywall

Large gap at access panel (use gasketing)
Air Sealing – Good and Bad

Unsealed gaps between floor and dry wall/base molding

Sealed thoroughly with caulking/sealant/spray foam
Air Sealing – Good and Bad

Missing bottom sweep

Missing perimeter weather striping
Recap
Summary

• Understand why / how / where
• Know your target limit
• Detail and specify
• Inspect and test
• Communicate
• Succeed!
Resources

Discussion

Contact Us
Steven Winter Associates, Inc.
307 Seventh Avenue, Suite 1701
New York, NY 10001

Mike O’Donnell,
Principal Building Systems Consultant
modonnell@swinter.com
212-564-5800 ext 1360
www.swinter.com
Thank You

For more information, please visit EnergizeCT.com/passive-house or email PassiveHouseTrainingCT@icf.com