HomebuildersCAN: Official Launch

April 3, 2024

Today's Speakers

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Why focus on embodied carbon?

Emissions from materials for new homes in the United States is equivalent to the total emissions from entire countries.

2023 RMI Report 'Hidden Climate Impact of Residential Construction'

Decarbonization of buildings a national priority:

Increase building energy efficiency
Reduce on-site energy use intensity in buildings 35% by 2035 and 50% by 2050 vs. 2005

Accelerate on-site emissions reductions
Reduce on-site GHG emissions in buildings 25% by 2035 and 75% by 2050 vs. 2005

Transform the grid edge
Reduce electrical infrastructure costs by tripling demand flexibility potential by 2050 vs. 2020

Minimize embodied life cycle emissions
Reduce embodied emissions from building materials and construction 90% by 2050 vs. 2005

https://www.energy.gov/eere/articles/decarbonizing-us-economy-2050

Solution:

Homebuilders take the lead in *understanding, measuring, reporting & acting strategically* to adopt and scale profitable, low-embodied carbon building practices

HomebuildersCAN will support homebuilders to:

INCREASE PERFORMANCE

Increase embodied carbon performance and share your successes

- Learn how to measure embodied carbon using standards and tools
- Identify and analyze embodied carbon hotspots and reduction opportunities
- Develop reporting strategies that demonstrate embodied carbon improvements
- Highlight your commitments and let buyers know about high-value features

PROFITABLE PRACTICES

Adopt and scale profitable low-carbon building practices

- Discover emerging low-carbon materials and advanced construction techniques
- Access leading building decarbonization research and resources
- Consult with experts for prototypes and demonstration projects
- Create data and reports suitable for sustainability reporting

SECTOR ALIGNMENT

Advocate for alignment across the residential building sector

- Develop approaches for integrating embodied carbon into energy efficiency & green building programs
- Standardize approaches and reporting for integrating embodied carbon into incentive programs, regulator needs, and sustainability reporting
- Advocate for the inclusion of embodied carbon performance in financing mechanisms

HomebuildersCAN Events Calendar

April 3, 2024	**HomebuildersCAN Launch (Public)**
April 24, 2024	**Featured Case Studies**
May 8, 2024	**Climate Disclosure for Homebuilders (Public)**
May 29, 2024	**How to Measure Embodied Carbon: BEAM training**
June 5, 2024	**ABC Collective Manufacturers Showcase**
June 10, 2024	**Valley of the Sun Deconstruction & Reuse Panel (Public)**
June 19, 2024	**How to Benchmark for Embodied Carbon**
July 3, 2024	**Embodied Carbon Market Incentives**
August 7, 2024	**All About Concrete**
September 4, 2024	**Materials Showcase (Public)**
October 1, 2024	**HomebuildersCAN Summit at EEBA (In-Person)**
October 16, 2024	**The RESNET/ANSI 1550 Standard (Public)**
November 6, 2024	**Embodied Carbon in Energy Efficiency Programs**
December 4, 2024	**Featured Case Studies (Public)**
December 11, 2024	**Making Commitments: First Cohort of Commitment Program**

HomebuildersCAN Resources

Custom Consultation

Case Studies

Training

Templates (Reporting, Requesting EPDs)

Reports, *and more!*

Breakthrough Energy

Early supporters of HomebuildersCAN

Airtightness Study

Efficiency & embodied carbon: NOT in opposition

Win-Win scenarios address both issues

Improvements in energy efficiency and operational emissions

Improvements in embodied carbon performance

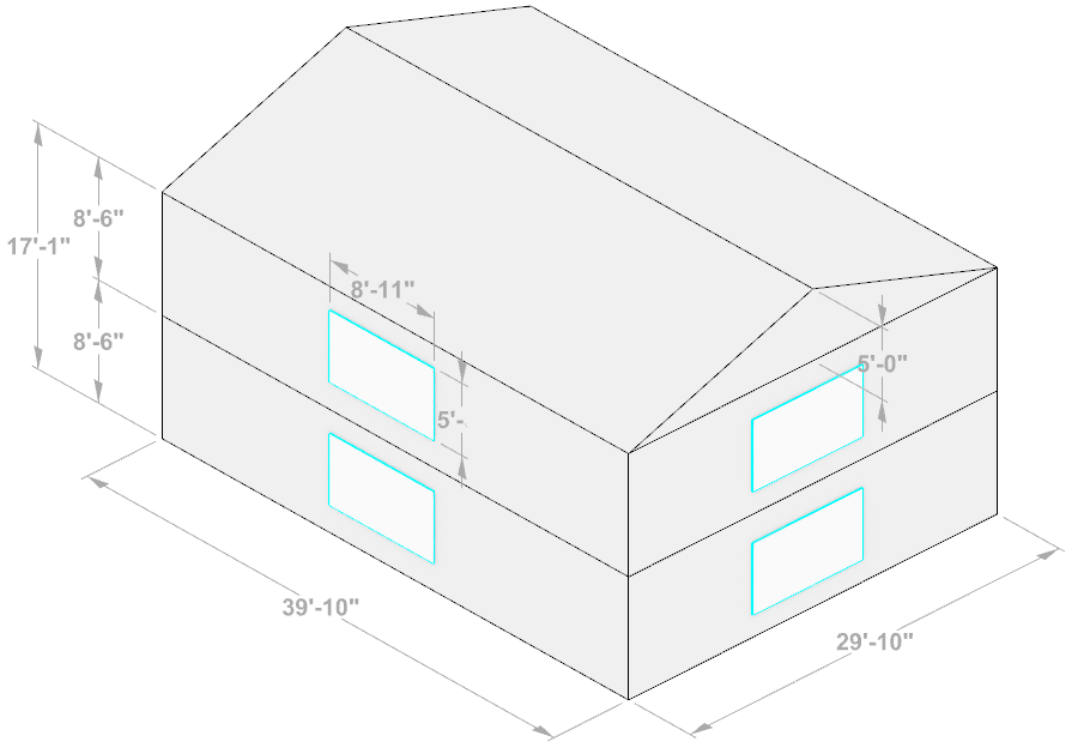
Airtightness Improvements: A Win-Win Solution

Airtight construction is an effective strategy for both **improved energy efficiency** with relatively **low embodied carbon impacts.**

DOE Study: Building Model Overview

Key Specifications:

- 2-story single-family home
- Gross floor area: 2,376 sq-ft
- 8 windows (U-factor: 0.35, SHGC: 0.25)
- Gable roof
- Wood stud framing
- Gas furnace heating
- R20 wall cavity insulation
- R49 roof cavity insulation



DOE Energy Code Models: https://www.energycodes.gov/prototype-building-models#Residential

Report: *Kunwar, Niraj, Shrestha, Som, Desjarlais, Andre Omer, Accawi, Gina, Ng, Lisa, and Dalgleish, Laverne. Online Calculator to Evaluate the Impact of Airtightness on Residential Building Energy Consumption and Moisture Transfer. United States: N. p., 2022. Web.*

DOE Study: Energy Model Results

Climate Zone 3A (Dallas, TX)			
Air tightness	**No air barrier (13 ACH50)**	**IECC min. (5 ACH50)**	**Passive House (0.6 ACH50)**
Electricity (kWh)	4,164	3,906 **6.2% reduction** from no barrier	3,763 **3.7% reduction** from IECC min.
Natural Gas (kBTu)	42,839	29,630 **31% reduction** from no barrier	22,069 **26% reduction** from IECC min.

Note: *% reductions shown are based on annual energy consumption, not operational carbon*

DOE Study: Energy Model Results

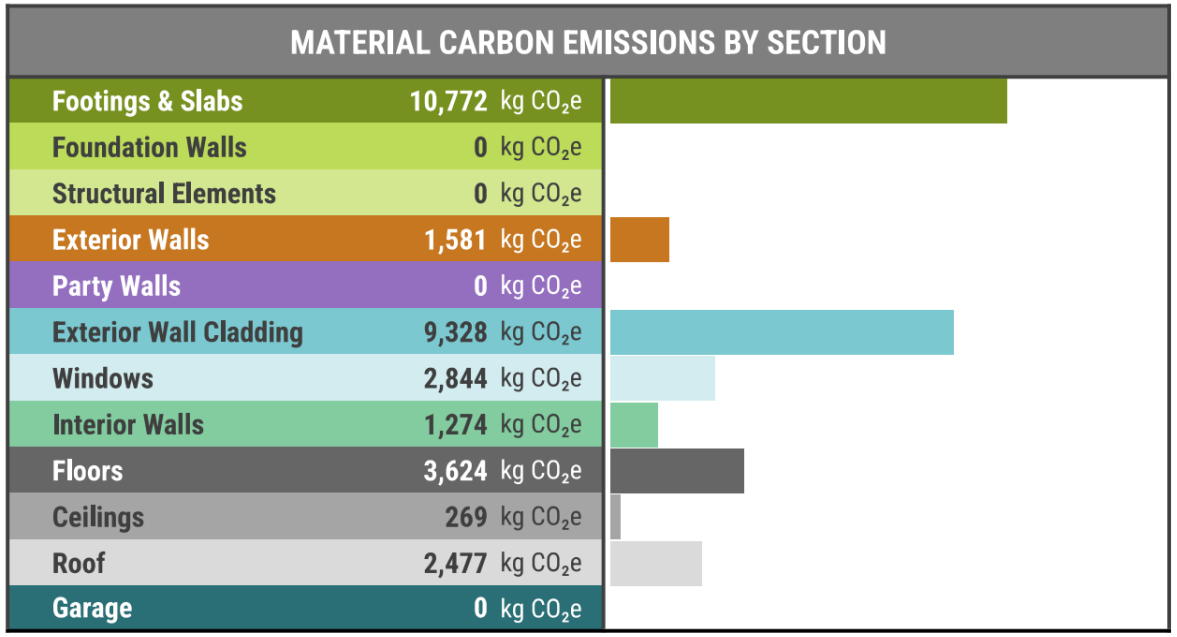
Climate Zone 5B (Pittsfield, MA)			
Air tightness	**No air barrier (13 ACH50)**	**IECC min. (5 ACH50)**	**Passive House (0.6 ACH50)**
Electricity (kWh)	4,025	3,944 **2.0% reduction** from no barrier	3,919 **0.6% reduction** from IECC min.
Natural Gas (kBTu)	66,077	48,037 **27% reduction** from no barrier	37,178 **23% reduction** from IECC min.

Note: *% reductions shown are based on annual energy consumption, not operational carbon*

DOE Study: Cradle-to-Gate Embodied Emissions

Total Embodied Emissions:
32,171 kg CO2e

Emissions Intensity:
146 kg CO2e/m²



Assuming typical construction materials, like industry average concrete, fiberglass batt cavity insulation, brick cladding, double-glazed windows, carpet, light wood I-joist floor framing, and asphalt roof shingles.

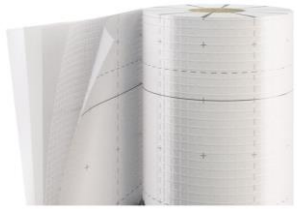
Note: *Results are from BEAM estimator tool from Builders for Climate Action*

DOE Study: EC Impact of Interventions

No air barrier
(13 ACH)

27-31%
energy usage reduction

IECC minimum
(5ACH)



Adding a membrane:

+2.3% of cradle-to-gate EC

Total EC added: +738 kgCO2e

DOE Study: EC Impact of Interventions

IECC minimum
(5ACH)

23-26%
energy usage reduction

Passive house
(0.6ACH)

Tighter construction:

+~0% of cradle-to-gate EC

Negligible additional material
Primarily onsite installation interventions

HERS Models: Summary of Models

6 energy models of homes in Massachusetts (Climate Zone 5)

Model	Area (sq-ft)	Typology	HERS Score	Embodied Carbon*	Operational Carbon
01	1,003	Apartment	43	130 kgCO2/m^2	Heating: 0.41 tons/yr Cooling: 0.0 tons/yr
02	1,156	Single family	-28	358 kgCO2/m^2	Heating: 0.42 tons/yr Cooling: 0.0 tons/yr
03	2,017	Single family	48	222 kgCO2/m^2	Heating: 2.41 tons/yr Cooling: 0.10 tons/yr
04	1,508	Single family	48	403 kgCO2/m^2	Heating: 2.81 tons/yr Cooling: 0.03 tons/yr
05	1,000	Single family	45	207 kgCO2/m^2	Heating: 0.52 tons/yr Cooling: 0.0 tons/yr
06	710	Townhouse	53	214 kgCO2/m^2	Heating: 0.70 tons/yr Cooling: 0.01 tons/yr

** Results are from BEAM estimator tool from Builders for Climate Action*

HERS Models: Operational Carbon Scenario Modelling

Keeping the climate variables constant and varying the airtightness performance from 5 ACH to Passive House (0.6 ACH), **notable savings in Annual Heating Operational Carbon are observed.**

IECC code min. for Climate Zones 1 and 2

IECC code min. for Climate Zones 3 thru 8

5ACH to 3ACH

13%

Avg. % Reduction in Annual Operational Carbon (6%-22%)

5ACH to 1ACH

25%

Avg. % Reduction in Annual Operational Carbon (10%-43%)

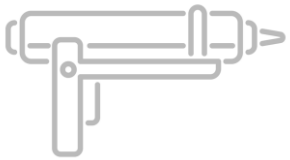
5ACH to PH (0.6ACH)

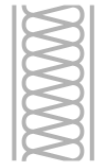
27%

Avg. % Reduction in Annual Operational Carbon (10%-47%)

*A special thank you to **Andy Buccino** (Stephens & Company, Inc.), **Patrick Nachlas** (Ekotrope), and **Jacob Bodah** (Energy Code Help) for their analysis support and expertise!*

HERS Models: Operational Savings Compared





Strategy	More airtight construction (5ACH to 3ACH)	Much more airtight construction (5ACH to 1ACH)	Upgrade from double- to triple-paned windows	Doubling exterior wall insulation thickness
% Reduction in Annual Operational Carbon	13%	25%	~10%	~8%
Embodied Carbon Impact	Negligible.	Negligible.	+2-8% in A1-A3 Embodied Carbon	+6-30% in A1-A3 Embodied Carbon

Summary: A Win-Win for Embodied & Operational Carbon

Improving air tightness is the **best improvement in operating emissions** for the **least increase in embodied emissions**

ADDED AIR BARRIER (13ACH to 5ACH)

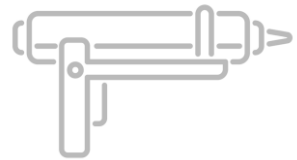
+31%

Building energy performance improvement

+2%

Added embodied carbon

TIGHTER CONSTRUCTION (5ACH to 0.6ACH)



+27%

Building energy performance improvement

+0%

Added embodied carbon

Panel Discussion

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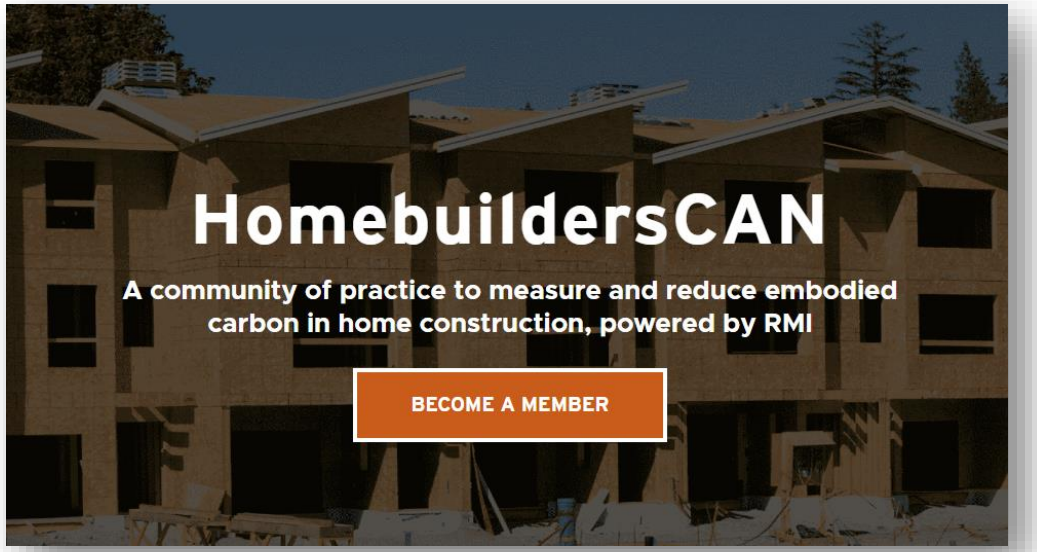
Thank You

The recording will be available on the **event page** within 24 hours.

Sign up as a member or subscribe:

rmi.org/HomebuildersCAN



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