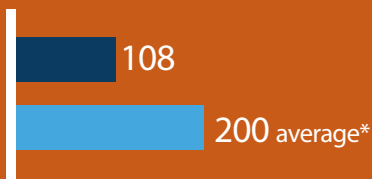


Case Study: Southgate House

A client motivated by principles of self-sufficiency, climate concerns and budget, literally fused earth, wind and fire into a modest yet highly functional, custom single-family abode. Key elements of the development include carbon-sequestering strawbale walls that enhance comfort and beauty while supporting DIY applicability. Resilience guided the choice of fiberglass framed windows and locally sourced metal roofing materials. The outcome is an attainable, long-lasting home that aims to reduce its environmental impact and withstand the test of time.

Embodied Carbon

Cradle-to-gate, kg CO₂e/m²



*Average based on report from 2022.

Reduction Strategies



Optimized ratio of envelope to floorspace



Expanded (rather than extruded) polystyrene below-grade insulation



Natural, mineral based interior paints and floor sealants

Carbon Storage



Strawbale walls crafted from locally grown stock



Blown-in loosefill cellulose attic insulation



FSC certified sustainably harvested



Photos by Evolve Builders Group Inc.



Strawbale walls are labor intensive. This is something we celebrate - human labor is the most renewable of all energies and the labor becomes one of love.

Ben Polley, President, Evolve Builders Group

The hygrothermic properties and insulating qualities of plastered straw walls contribute to a comfortable, constant interior environment, despite daily and seasonal outdoor temperature and humidity fluctuations, thus vastly reducing reliance on summer air conditioning and winter heating. Complementing these natural attributes are modern technologies. An electric air source heat pump (ASHP) domestic hot water tank avoids fossil fuel requirements, while a high-performance heat recovery ventilator (HRV) ensures controlled contributions of fresh air during winter months



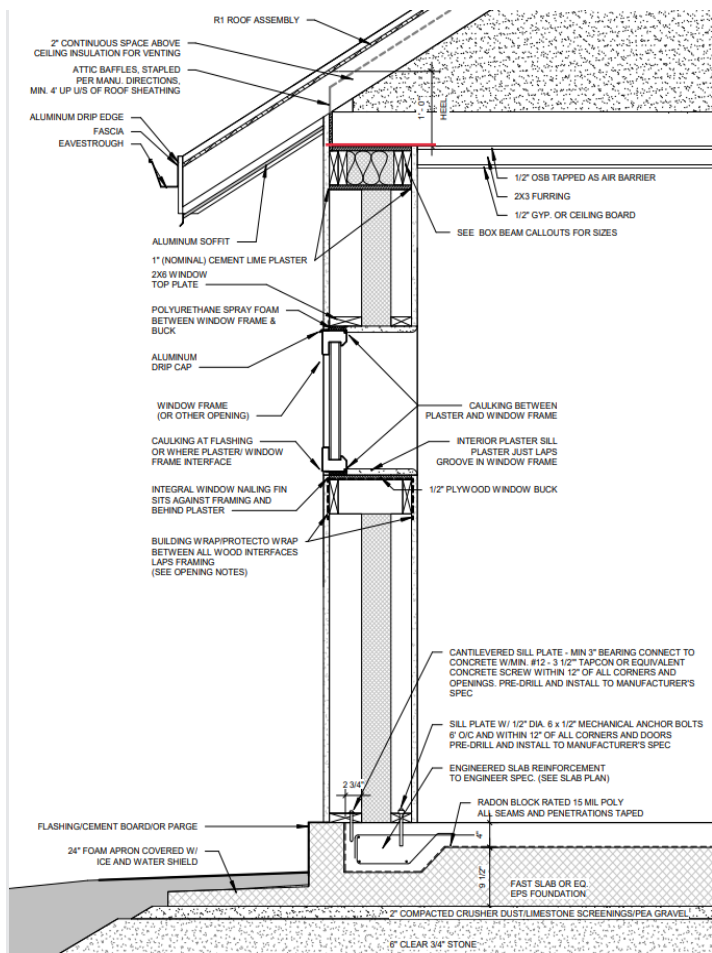
Plastered
Straw Walls



Electric Air Source
Heat Pump



High-Performance Heat
Recovery Ventilator



The strawbale walls are covered with hand-applied plaster, creating a “stressed skin panel” type insulated structural assembly.

Lessons Learned

1. The structural slab-on-grade foundation did not reduce carbon vs conventional frost walls & floating slabs as expected [per BEAM V1.1 analysis].
2. If the team had instead built on helical piles with an appropriately insulated wood floor, this home would approach or achieve net total carbon storage.
3. Natural building methods can meet the operating goals of high-performance homes while also immediately sequestering carbon.
4. Asphalt shingles may have a lower carbon impact than steel at time of install but due to shorter lifespan will net higher as of the first replacement roof.

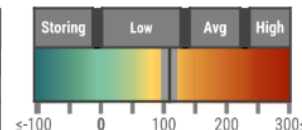
BEAM RESULTS (+/- 10%)

PROJECT EMISSIONS (MCE)

NET EMISSIONS kg CO ₂ e	GROSS EMISSIONS kg CO ₂ e	STORAGE SHORT CYCLE kg CO ₂	STORAGE LONG CYCLE kg CO ₂
12,897	19,865	6,968	0

PROJECT EMISSIONS INTENSITY (MCI)

	Metric kg CO ₂ e/m ²	Imperial lb CO ₂ e/ft ²	
MCI Conditioned Floor Area	108	22	
MCI Total Floor Area	108	22	
MCI Per Bedroom	6,449	14,217	



HIGHEST EMITTING MATERIALS

SECTION	kg CO ₂ e	MATERIAL
Footings & Slabs	3,197	Concrete – 25 MPa, GU / Ontario Concrete RMCAO
Footings & Slabs	2,772	EPS foam board / Type II / R 4.0-inch, 15 psi / EPS
Roof	2,239	Metal Panels - Steel / Canadian Sheet Steel Buildin
Windows	1,410	Window - triple pane / Fiberglass frame / BfCA Stu
Cladding	1,171	Cement "Stucco" Plaster / 1:1:4 mix of Portland, m
Cladding	1,171	Cement "Stucco" Plaster / 1:1:4 mix of Portland, m
Footings & Slabs	1,100	Rebar / Concrete Reinforcing Steel Institute / 98%
Roof	782	Wood roof truss / Gable Roof, Double Howe, 2x6 C
Footings & Slabs	603	Welded wire reinforcement / Insteel Industries / 4"
Interior Walls	534	Drywall 1/2" [BEAM Avg US & CA]

The Southgate development achieved a 9.347 ton reduction in net emissions when compared to the 23.564 tons of net emissions in a by-code project. The greatest net savings came from the strawbale walls which provided 4.85 tons of net carbon storage.

Project Information

Project name: Southgate House

Location: Southgate Township, Ontario, Canada

Builder: Evolve Builders Group Inc. and Harvest Homes

Year built: 2021

Typology: Custom Single-Family Home

Size: 1,286 sq ft