



Building with Biomass

Turning Buildings into Carbon Sinks

Chris Magwood - Builders for Climate Action

Ontario Biomass Producers Cooperative

March 17, 2022

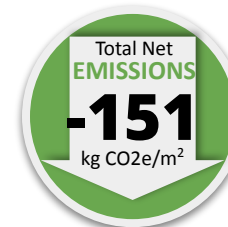
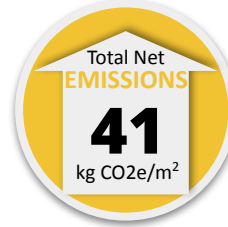
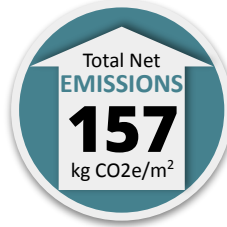
WORST
RESULT

AVERAGE
RESULT

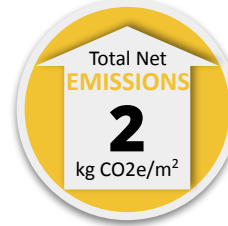
LOWEST
RESULT

OUTSTANDING
RESULT

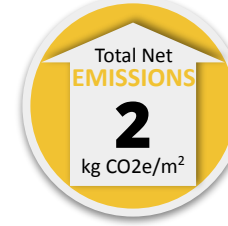
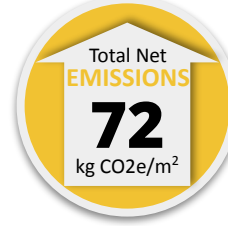
Builders for Climate
Action white paper



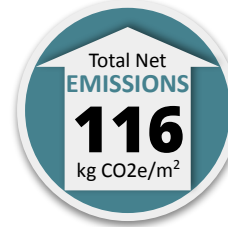
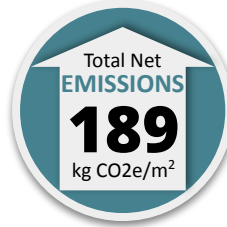
NRCan study
(190 model homes)



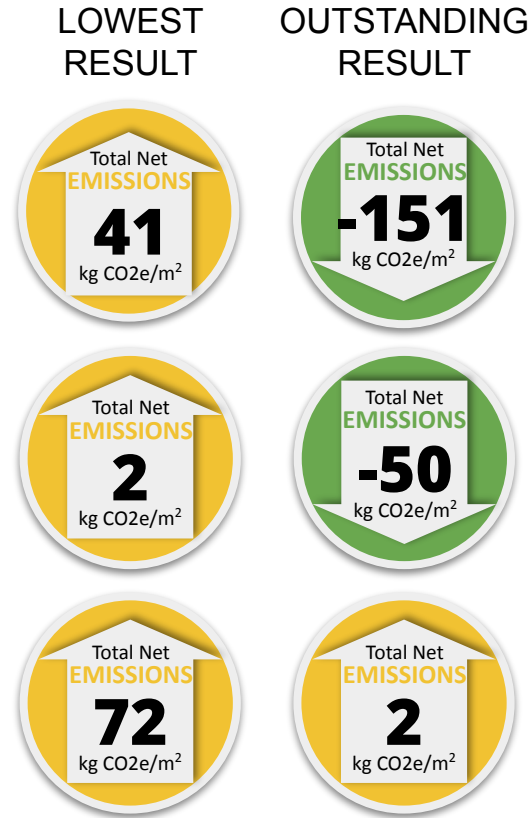
Nelson & Castlegar, BC
34 as-built homes



Toronto region study
503 as-built homes

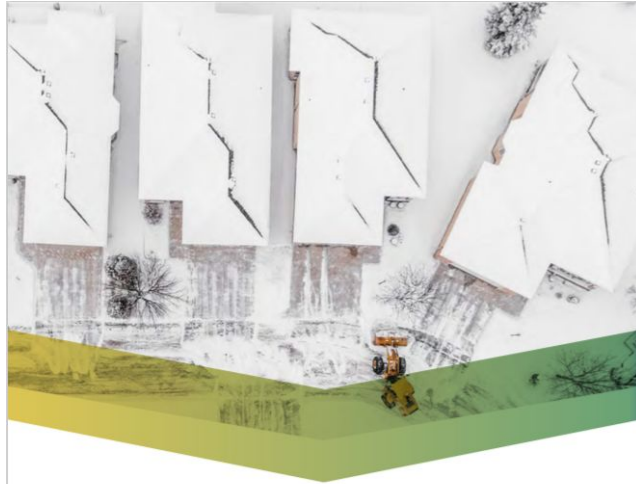


The biggest
factor in these
results is ...



... carbon storage
from biomass
materials

This study makes it clear that carbon storage in building materials can have a drastic impact on net emissions from the homebuilding sector.

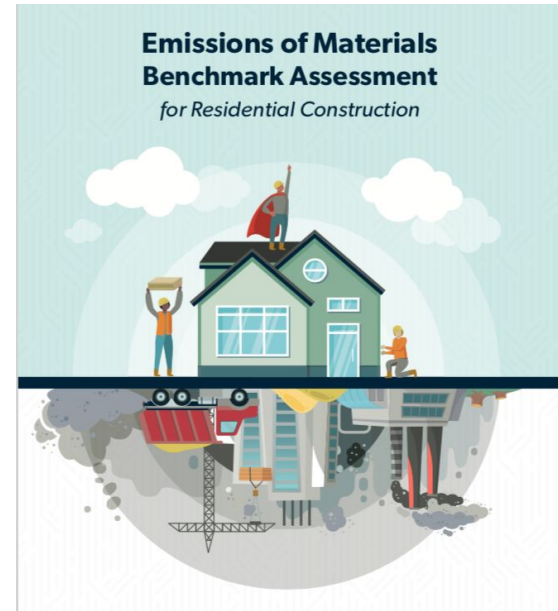


Achieving Real Net-Zero Emission Homes:

Embodied carbon scenario analysis of the upper tiers of performance in the 2020 Canadian National Building Code

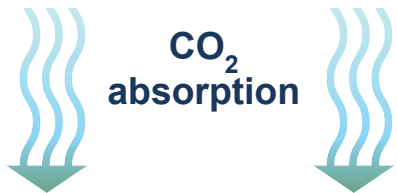


Natural Resources
Canada

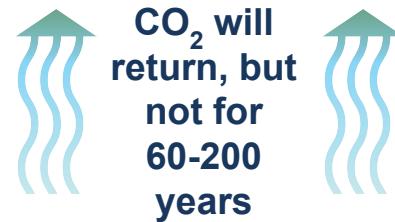
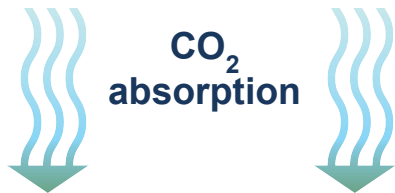


Using the “best possible materials” would result in the reduction of roughly 1,065,000 t CO₂e. In this hypothetical scenario, new Part 9 homes built in the GTHA would pass beyond net zero carbon to store around 225,000 tonnes of carbon from the atmosphere during a single construction year.

Valuing Biomass as Meaningful Storage — Residue & “Waste”



Valuing Biomass as Meaningful Storage — Residue & “Waste”



We know how to put this biomass to use in buildings



**Trent University
Forensic Crime Scene Building**

TRENT
UNIVERSITY



Trent University Forensic Building Material Carbon Emissions (MCE)

Part of building	Base Case kg CO2e	As-Built kg CO2e	As-Built, including timber storage kg CO2e
Footings & Slabs	29,516	13,503	13,503
Foundation walls	13,108	9,866	1,128
Exterior walls	123,900	-6,967	-18,043
Exterior cladding	11,327	6,263	2,861
Windows & doors	3,378	3,378	3,378
Interior walls	6,968	-4,900	-3,580
Floors	858	-15	-679
Ceilings	963	227	227
Roof system	21,138	4,130	-5,624
NET TOTAL	211,156	25,484	-6,829
MCE Reduction		88%	103%
Net Carbon Intensity, kg CO2e/m2	498	60	-16.1



BUILDING EMISSIONS ACCOUNTING FOR MATERIALS

Results from BEAM material carbon estimator



Zero carbon operations + Zero carbon materials
=
Real zero carbon building!

Louise Michel School, Issy-les-Moulineaux, France

CONTRACTOR: SEMADS

ARCHITECT (S): SONIA CORTESSE / BERNARD DUFOURNET

CHARPENTIER: ARBONIS / FARGEOT

TOTAL AMOUNT: Works budget: € 12,211,000 excl.

SURFACE: SHON: 5,238 m² (school group only)

CONDITION: Completed in 2013

Prefabricated straw bale panels



http://bet-gaujard.com/wp/wp-content/uploads/2014/01/proc7_corrAMD3.pdf

De Roomley Sports-Hall, Tilburg, The Netherlands



Identity card

PROJECT TYPE :
Renovation & extension

BUILDING TYPE :
Sports facility

CONTRACTING AUTHORITY :
The Municipality of Tilburg

BUILDING MANAGEMENT :
Real estate department Tilb

STAKEHOLDERS :
• Design : Spacetranslators
• Installation advice : Winst
• Main contractor : Van Der We
• Prefab wood constructions : Bo

DELIVERY YEAR :
2020

NET USABLE AREA :
2.568 m²

COST (total & €/m²):
2.850.000 € - 1.100 €/m²

STRAW CONSTRUCTION TECHNIQUE :
Prefab sections with 32cm b

VOLUME OF STRAW USED IN THE PRO:
260 m³

DISTANCE BETWEEN STRAW SUPPLY A:
2.50 km



Inspire Bradford Business Park, Bradford, UK



Prefabricated
straw
bale panels



<https://modcell.com/projects/inspire-bradford-business-park/>

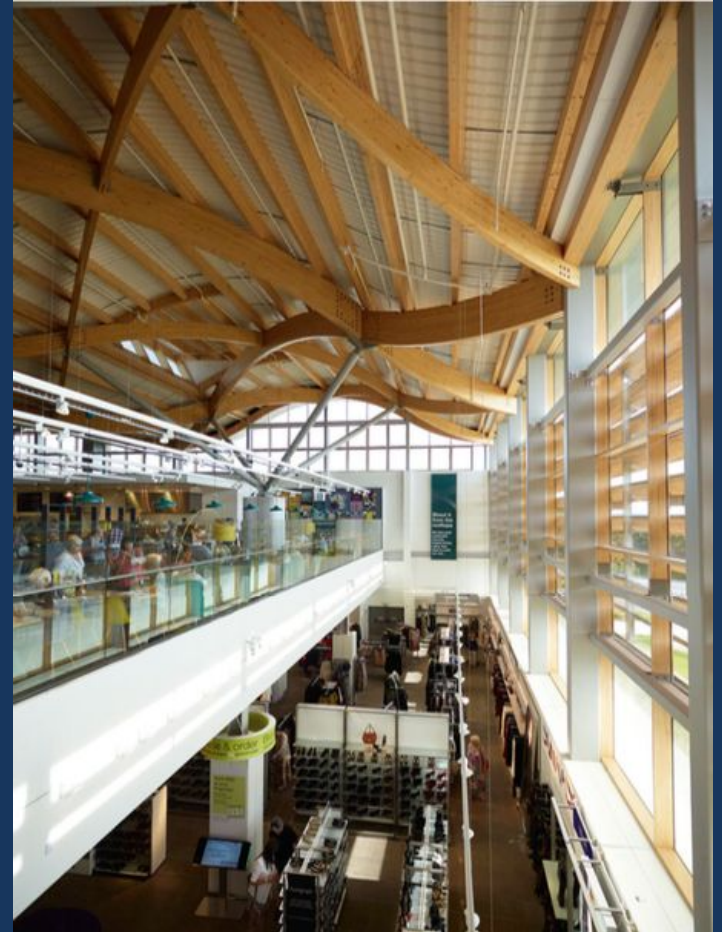
Marks & Spencer Cheshire Oaks, UK



Prefabricated hempcrete panels



<http://www.aukettswanke.com/projects/Marks>



Gateway Building, University of Nottingham, UK



Prefabricated straw bale panels



<https://www.makearchitects.com/projects/the-gateway-building/>

Gateway Building, University of Nottingham, UK

Prefabricated straw bale panels

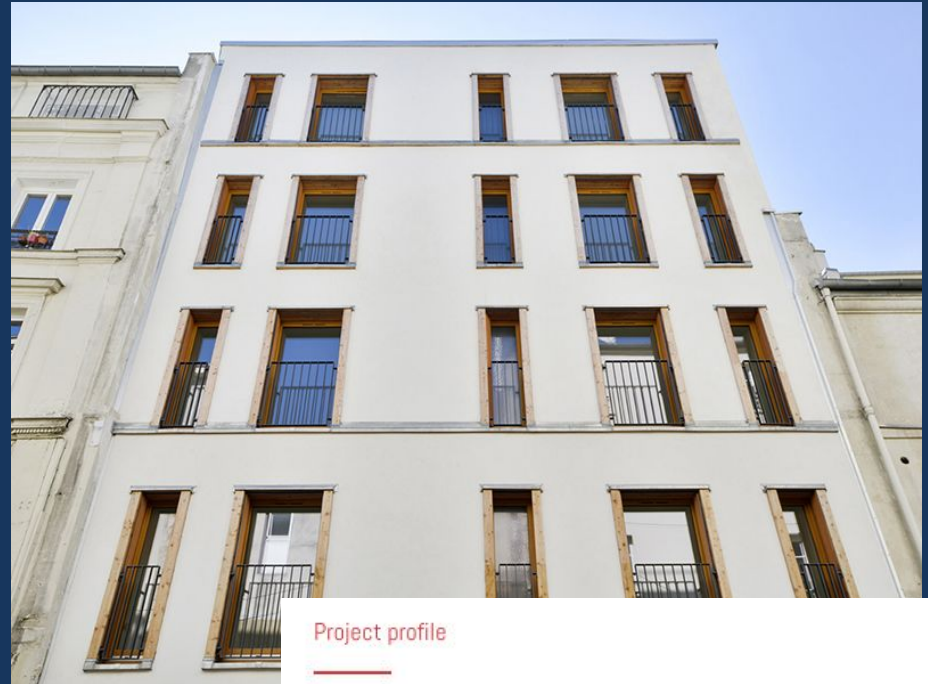


<http://esbg2015.eu/urban-solution-jules-ferry-residence/>



Eco-Construction Apartment Block, Paris

Prefabricated hempcrete panels



Project profile

- Floor area of the building: 570 m² of net floor area (SHON)
- Total floor area of apartments: 345.78 m²
- Height of the building: Ground floor + 5 floors (with setback)

https://www.bcb-tradical.com/en/portfolio_categories/eco-construct-ion-apartment-blocks/

Enterprise Centre, University of East Anglia, UK

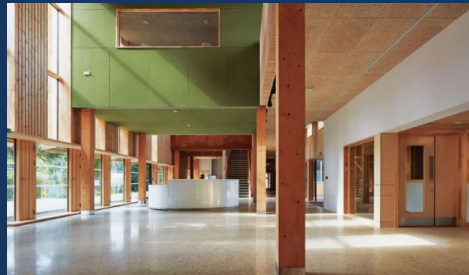
Timber, thatch & straw panels



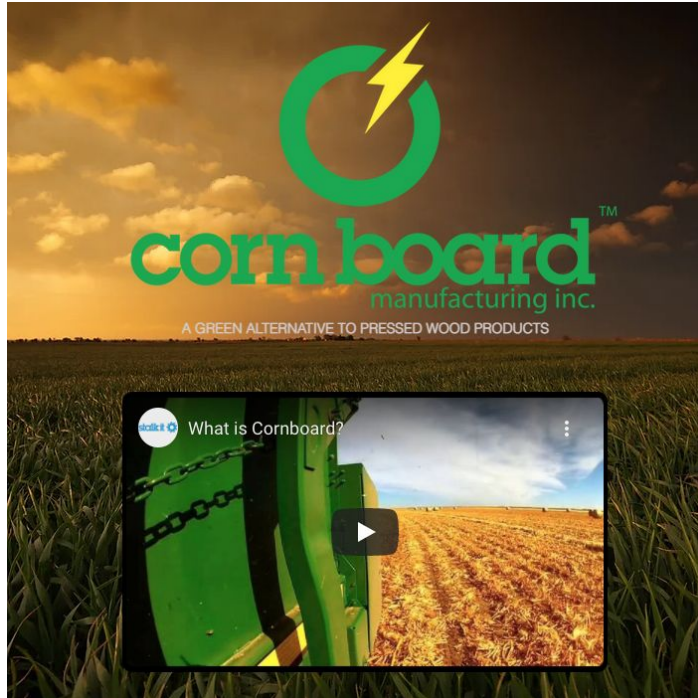
credit: Architype



<https://sites.uea.ac.uk/adapt/the-enterprise-centre>

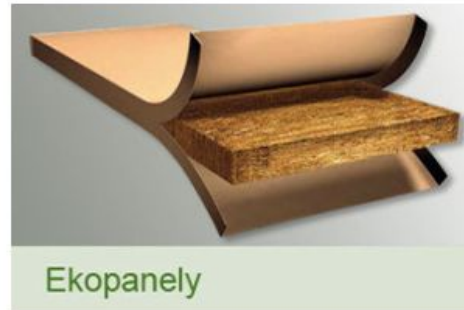


Globally, biomass materials are on the rise



CalPlant Launches Eureka™, The World's First Rice Straw-Based MDF

November 19, 2020



Sorghum's eco-friendly building material

HOME » SORGHUM NEWS AND INFO » SORGHUM'S ECO-FRIENDLY BUILDING MATERIAL



US HEMPCRETE BLOCK

PREFAB HEMP BLOCK MANUFACTURING AND SUPPLY



Best Thermal Mass And Inertia
Moisture Regulation
Carbon Sequestering
Negative Co2 Footprint
Allergy Free Organic Homes



Prevents Dry Rot
Breathable Walls
Maintains A Steady Temperature
Doesn't Shrink, Will Not Get Crack Lines
Lasts For Hundreds Of Years



Gains In Strength Over Time
Termite Proof
Pest Resistant
Mold / Mildew Resistant
Flexible For Hurricanes

Agriboard
INDUSTRIES

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CONSTRUCTION.

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Construction

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International
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Resource Library
FAQ

Energy Efficient

Panels

Features
Factory built in 4-6 weeks, blast resistant, up to 2.5 hour fire rating, Miami-Dade County certified to F5 wind, insect and mold resistant, high thermal mass, 7 times more air-tight than conventional construction.

Performance Capabilities

- Structural tests – ASTM E72-98 and AC-04
- Fire tests – ASTM E199 and ASTM C739 Section 11
- Mold, black mold and fungi resistance – ASTM C379 Section 11
- Corrosiveness – ASTM C739 Section 9
- Blast resistance meeting military standards
- Wind resistance to F5 winds

Materials Used
Compressed wheat straw, Timber Strand sub-frame, Exposure 1 OSB, (7/16-in no urea formaldehyde added.), non-toxic adhesives, fasteners.

Installations
Manufactured in dry, controlled environmental factory conditions; installed on your site in 2-4 days.

Energy Efficient

Faster. Safer. Cost Competitive. Green.

HempWood® Lumber

A Face Grade Alternative for Finishing Hardwoods

BROWSE OUR LUMBER SELECTION

Insulation made from Grass - Gramitherm® - #1000solutions

Watch later Share

GRAMITHERM®
Insulation made from Grass.

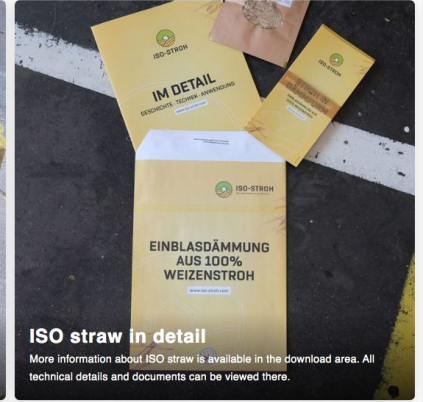
Watch on YouTube

ISO STRAW CURRENT



ISO straw in local shops

A big step towards a sustainably insulated future for do-it-yourselfers. If you are interested in including our product in your range, please contact us at any time.



ISO straw in detail

More information about ISO straw is available in the download area. All technical details and documents can be viewed there.

<p>VestaEco WALL</p>	<p>VestaEco INTERNAL</p>	<p>VestaEco PROTECT</p>
<p>VestaEco LDF</p>	<p>VestaEco LDF UNI</p>	<p>VestaEco CELL</p>

MARGENT FARM

HOME ABOUT SHOP STORIES CONTACT

Hemp Fibre Corrugated Sheets

A hemp fibre based corrugated sheet that can be used for both exterior and interior wall cladding. The fibres sequester carbon, locking it in and stopping it releasing back into the atmosphere, resulting in a very low-carbon product.

The high cellulose content (80 - 70%) of the plant makes it a very strong and durable material.

The sheet is bound with a sugar based resin made entirely from agricultural waste.

Our hemp sheets are a natural alternative to corrugated steel, PVC, bitumen and cement.

The sheets can be used externally to form a rain screen or internally as ceiling or wall linings or other acoustic treatments. The product is natural and like timber exposed to UV the colour will lighten over time.

Investment is happening everywhere... except here



U.S. Department of Energy Announces \$45 Million in Carbon Storage Technologies for Building Materials

Funding Will Help Remove Carbon Dioxide from the Atmosphere During Production and Development of Building Materials

11/08/2021

We have the raw materials

We have the manufacturing know-how

We have the building know-how

Answering the call, globally...

Zero-carbon-ready building energy codes should also target net-zero emissions from material use in buildings. Material efficiency strategies can cut cement and steel demand in the buildings sector by more than a third relative to baseline trends, and embodied emissions can be further reduced by **more robust uptake of bio-sourced and innovative construction materials** (Global ABC Roadmap for Buildings and Construction 2020-2050).

And in Canada...

Achieving net-zero emissions in the Canadian housing sector is possible, but as this study makes clear it will require seriously addressing MCE by **embracing low-carbon and carbon-storing materials** and designs, while recalibrating efforts on the operational side by concentrating on total GHG metrics rather than energy use metrics. Together, these efforts could predictably lead to a zero-emission housing sector in Canada.