Sustainable Buildings and Green Materials

Past, Present and Future

Brendan Trayner, Ph.D.

February 25, 2014

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AUMA – Edmonton
1st LEED Certified

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Who are we?

St. John's Ambulance – Edmonton
1st LEED Silver

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Who are we?

Greenstone Building – Yellowknife
1st LEED Gold

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Who are we?

The Road to Net-Zero

NEW buildings – annual energy consumption targets for an office building in Alberta

Conventional Office building **[1.8 GJ/m2]**

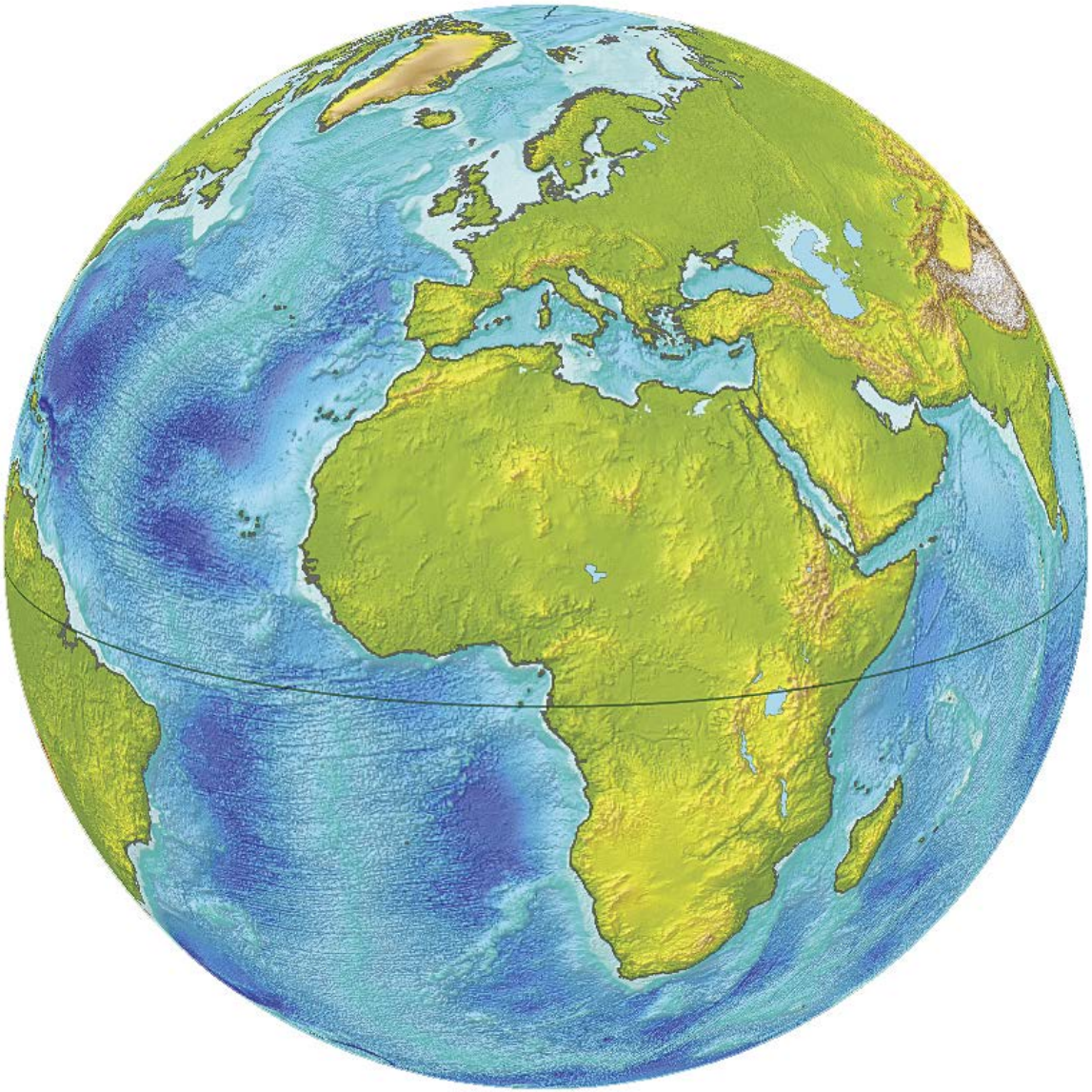
70% by 2015 **[.54 GJ/m2]**

80% by 2020**[.36 GJ/m2]**

90% by 2025 **[.18 GJ/m2]**

Carbon Neutral by 2030 [no fossil fuel energy to operate]

- 5,000 m2 at 1.8 GJ/m2 = 9000 GJ = 270,000 L of Gasoline , 414,000 kilos of coal to generate the ernergy required



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Why?

EPCOR Water

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Current Office/Laboratory Projects

Gilead Labs

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Current Office/Laboratory Projects

PCL Building One

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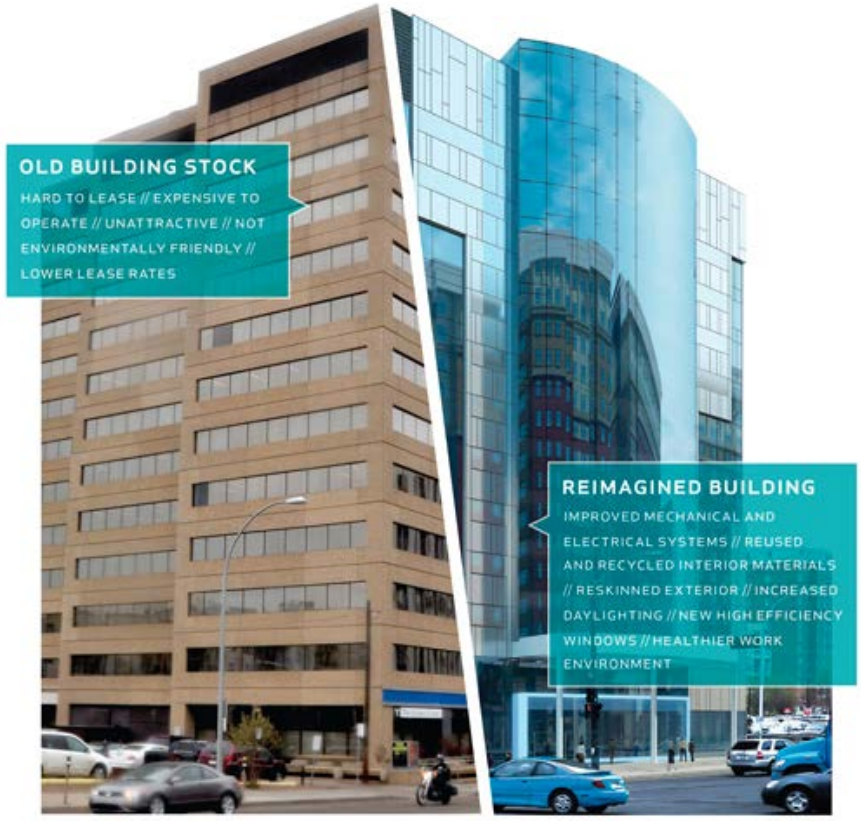
Current Office Projects

What are some of our approaches?



1. Building Form and Orientation
2. High-performance envelope
3. Shading the South
4. Opening the North
5. Operable Windows
6. Green Walls / Green Roofs
7. Daylit Workplaces
8. Low-energy vertical circulation
9. Re-using Existing Buildings
10. **Good Material Selections**

What is the take home message?

- We firmly believe that sustainability should be integrated at every level of design.
- To do this we need products and materials that:
  - Have low embodied energy.
  - Do not contain potentially hazardous materials in the final product or use them during manufacturing.
  - Are socially ethical.
  - Are manufactured locally and sustainably.
- We make thousands of decisions on each project- Make it **easy** for us to want to choose your products.

How are we classifying sustainable buildings in North America?

- Leadership in Energy and Environmental Design (**LEED**)

- Living Building Challenge – Full and Petal Certification

LIVING BUILDING CHALLENGE™

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What is LEED?

- LEED is the “Esperanto” of the Green Building World.
- A language that many have learned across our industry.
- LEED has more and more have become a set of “minimum” standards.
- **The future goes beyond LEED.**

Living Building Challenge

- Developed by **the International Living Future Institute**. Most advanced measurement of sustainability in the built environment.
- **The LBC acts to diminish the gap between current limits and ideal solutions.**
- 7 petals – Site, Water, Energy, Health, Materials, Equity and Beauty.

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LIVING BUILDING CHALLENGE™ 2.0

Canadian Example

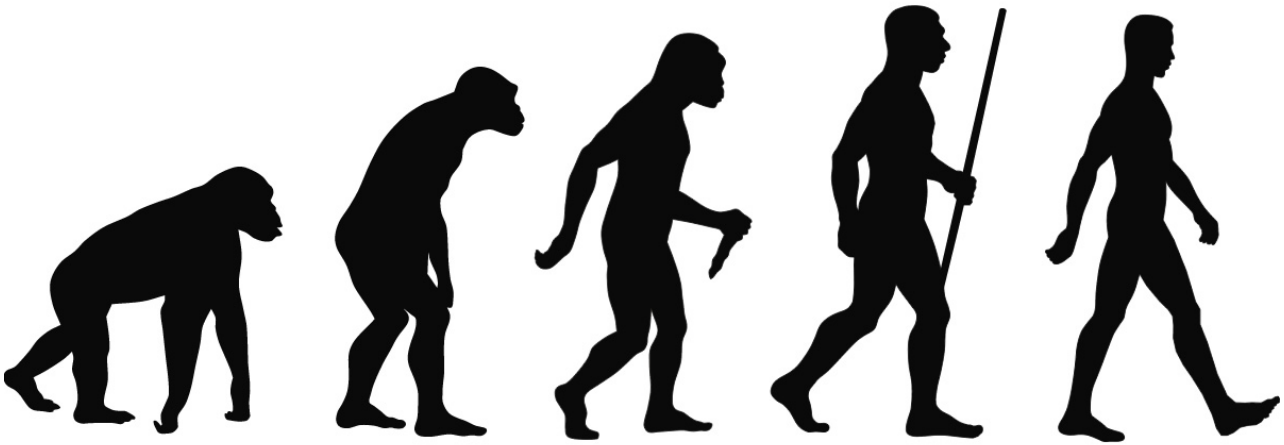
Jim Pattison Centre of Excellence in Sustainable Building Technologies and Renewable Energy Conservation – Penticton , BC

LIVING BUILDING CHALLENGE™ 2.0

Mosaic Centre for Conscious Community and Commerce

LIVING BUILDING CHALLENGE™ 2.0

We're evolving!



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Let’s Talk Material Rating

LEED: Building Material and Sustainability Classifications

- Indoor Environmental Quality (IEQ) credits.
  - Low volatile organic compounds emitting materials
    - adhesives and sealants
    - paints and coatings
    - flooring systems
- Rapidly Renewable materials.
- Certified Wood.
- Recycled Content

LBC Material Petal Requirements

- RED LIST compounds
- Embodied Carbon Footprint
- Responsible Industry
- Appropriate Sourcing
- Conservation + Reuse

Responsible Industry

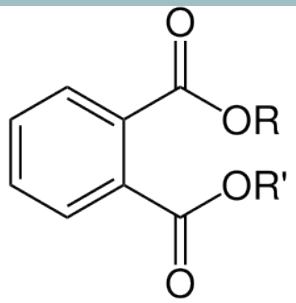
- We must advocate through our design and specifications for the creation and adoption of third-party certified standards for sustainable resource extraction and fair labour practices.

- Applicable raw materials include stone and rock, metal, minerals, and timber.

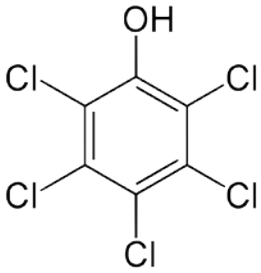
Conservation + Reuse

- Material conservation Management Plan:
  - The goal is to reduce or eliminate the production of waste during four phases - **design, construction, operation, and end of life** in order to conserve natural resources.

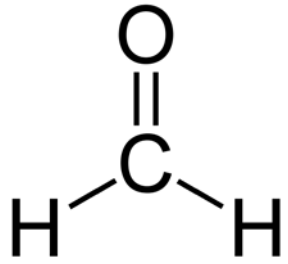
Material	Minimum Diverted/Weight[67]
Metals	95%
Paper and Cardboard	95%
Soil, and biomass	100%
Rigid Foam, carpet & insulation	90%
All others - combined weighted average[68]	80%



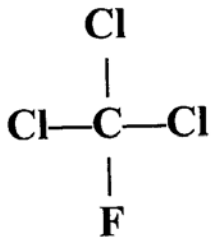
Phthalates



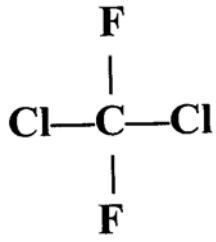
Pentachlorophenol



Formaldehyde



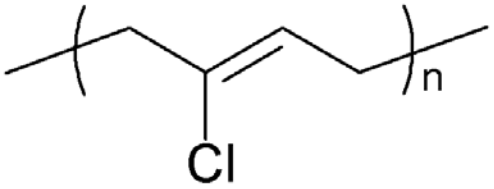
Freon-11



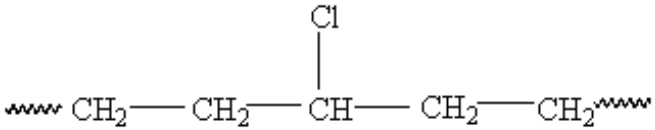
Freon-12

CFCs

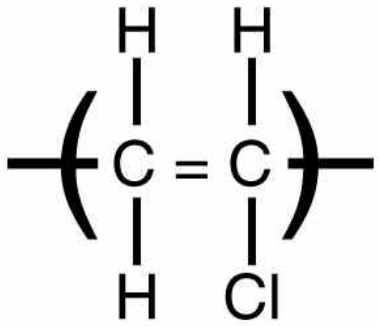
- LBC - Red List
  - Asbestos
  - Halogenated Flame Retardant
  - Petrochemical Fertilizers and Pesticides
  - Wood treatments containing Creosote



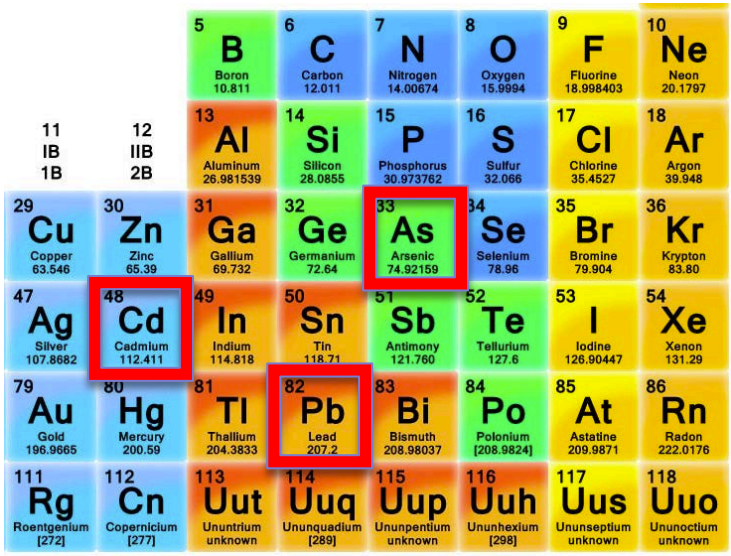
Neoprene



Chlorinated Polyethylene



PVC

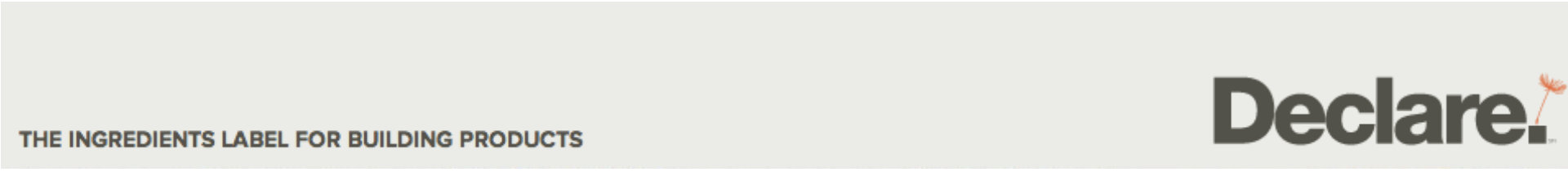


Appropriate Sourcing

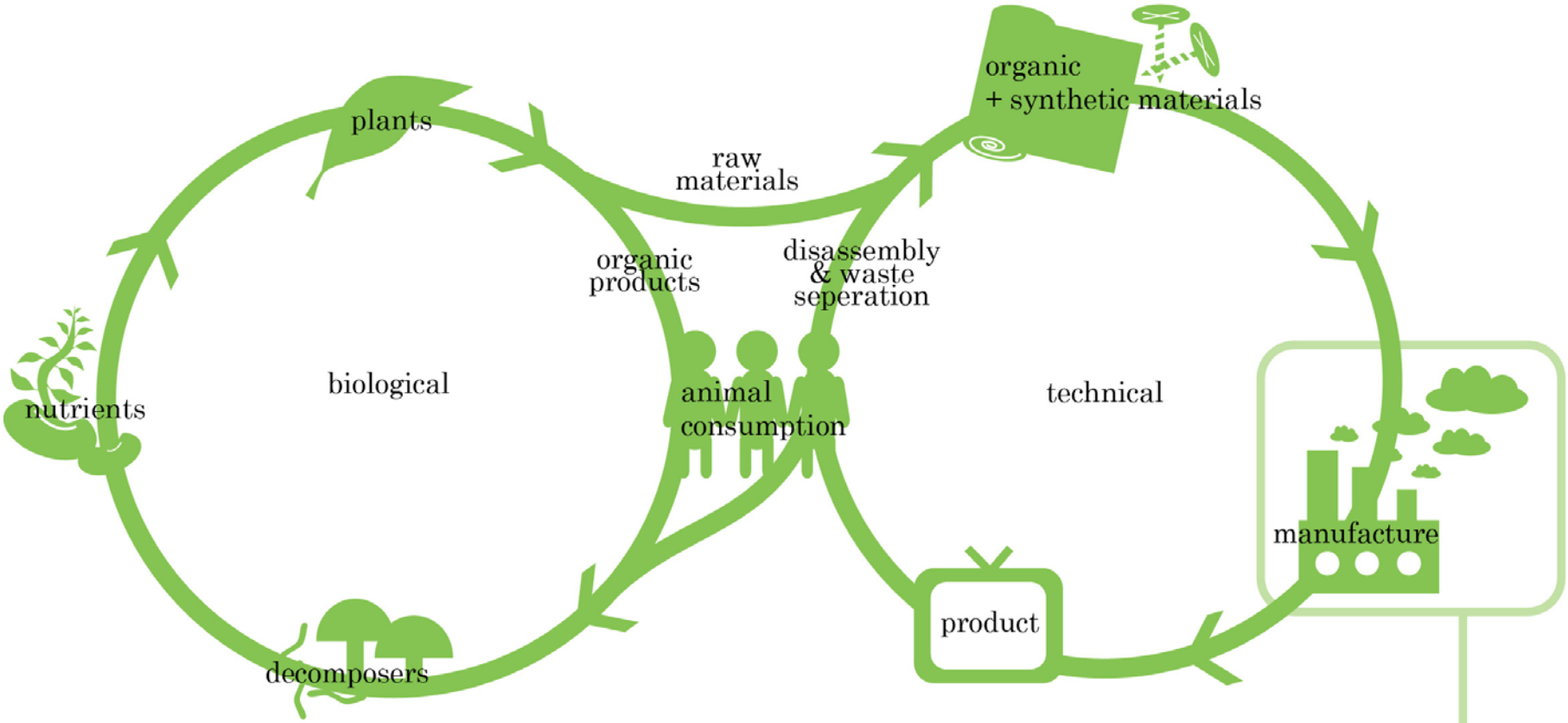
Zone	Max. Distance	Materials or Services	MasterFormat 2012 Classification[52]
7	20,004 km	Ideas	-
6	15,000 km	Renewable Technologies[53]	Divisions: 42[54], 48
5	5,000 km	Assemblies that actively contribute to project performance[55] and adaptable reuse once installed	Divisions: 08 (all exterior products), 14*, 22[56], 23*, 26*, 33*, 44*, 46* Sections: 07 33 00[57], 07 50 00*, 10 22 00*, 10 70 00*, 44 40 00*
4	2,500 km	Consultant Travel[58]	-
3[59]	2,000 km	Light or low-density materials	Sections: 07 31 00, 07 40 00, 09 50 00, 09 60 00
2	1,000 km	Medium weight and density materials	Divisions: 06[60], 08 (all interior products) Sections: 07 32 00, 09 20 00, 09 30 00, 12 30 00
1	500 km	Heavy or high-density materials	Divisions: 03, 04, 05*[61], 31[62], 32[63]

How can we get past the “Greenwash”?

- A few rating systems are available...



Cradle to Cradle Certification



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CERTIFIED CM
cradletocradle

5 criteria

1 100% Renewable Energy Use
2 Water Stewardship clean water output
3 Social Responsibility positive impact on community
4 Material Reutilization recyclability / compostability
5 Material Health impact on human & environmental

Mosaic Centre - Challenges

- Materials Petal?

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LIVING BUILDING CHALLENGE™

2.0


Example - Linoleum

Linoleum

- **Marmoleum™**
- More local suppliers/manufacturers?

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Up and coming bio-materials

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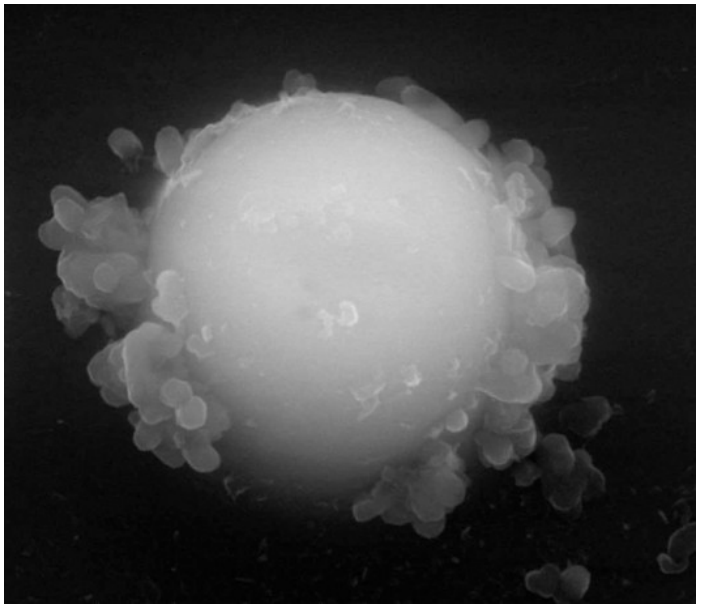
Self-healing Concrete

Bricks Grown from Bacteria

- Can be grown in ambient temperatures.
- Water used is in a close loops system and reused in the manufacturing process – can use seawater!



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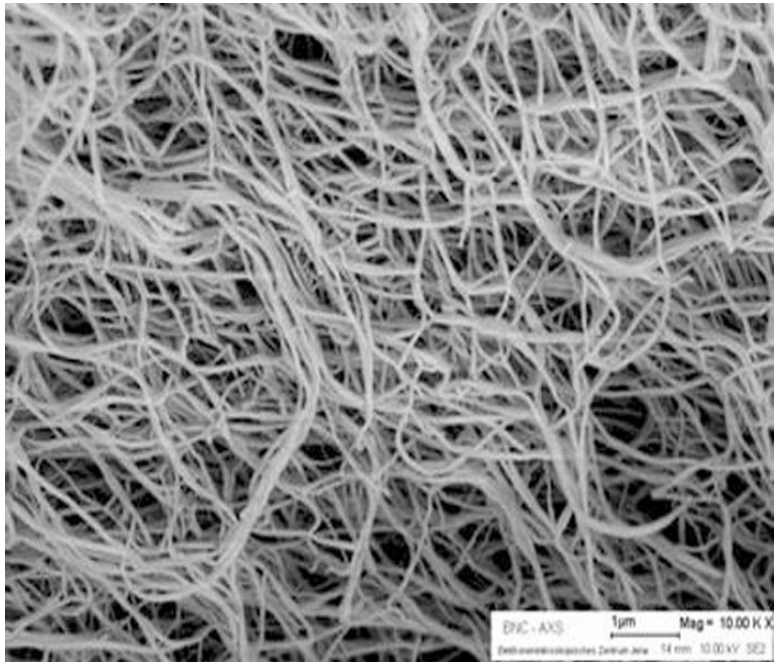
Questions?

- Brendan Trayner
- btrayner@manascisaac.com
- www.manascisaac.com

Nanocellulose

- Transparent
- Absorbative.
- Strong.

- Structural elements, insulation (biofoam), glass.



Algae bioreactor façade

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Banff Town Hall – Banff C2000

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Who are we?

Afexa Life Sciences (Formally CVT)

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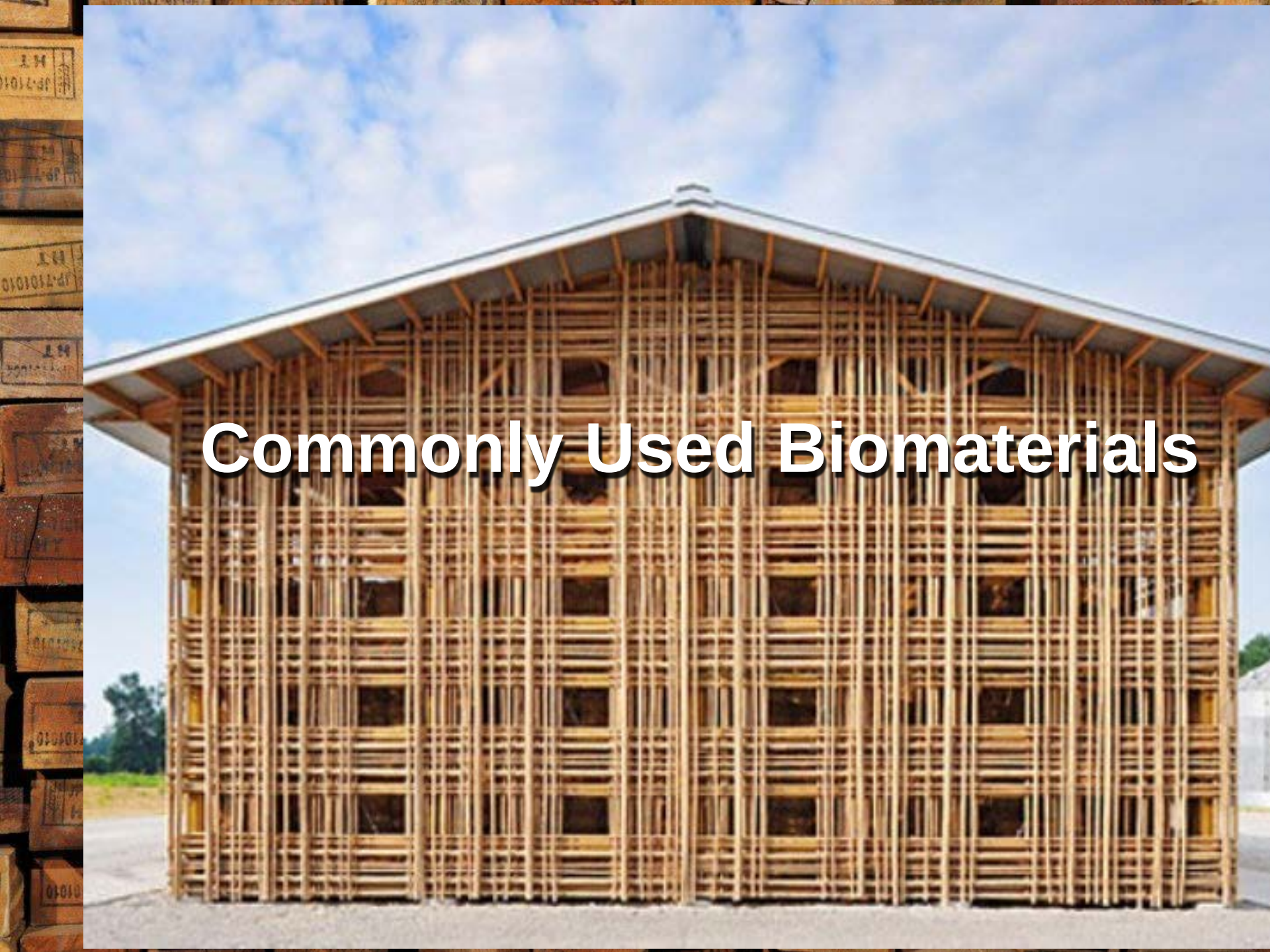
Recent Laboratory Projects

Canadian Examples

VanDusen Botanical Garden Visitors Center – Vancouver, BC


Commonly Used Biomaterials