LEED® v4 and Low Carbon and Renewable Building Materials: An overview of the benefits of using low carbon and renewable building materials in LEED v4 BD+C projects

Light House Sustainable Building Centre

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About Us

We are a social enterprise dedicated to advancing green buildings, thriving communities and resource-efficient cities.

- Health and Wellbeing
- Eco-Business Solutions
- Building Performance
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Introduction

Various initiatives, globally and locally, now focusing on the embodied carbon of building materials:

• City of Vancouver’s Green Buildings Policy for Rezonings (2017)

Other organizations focusing on embodied carbon in building materials:

• UK Green Building Council
• Architecture 2030
Embodied Carbon of Building Materials

- Extraction of raw materials
- Transportation
- Manufacturing
- Transportation to building site
- Construction
Examples of Low Carbon Building Materials

- Wood products
- Portland-limestone cement (PLC)
- Concrete products using supplementary cementing materials (SCM), e.g. fly ash
- Rammed earth
- Biofiber
- Straw bale
- Hempcrete
Introduction to LEED

Leadership in Energy and Environmental Design

- Established in 1998 by the US Green Building Council (USGBC)
- Adapted for the Canadian market in 2004 with the release of LEED Canada New Construction + Major Renovations v1.0
- Most widely used building rating system in the US and Canada
  - Over 6,000 projects in Canada
- November 1, 2016 – all new projects must register under the USGBC’s LEED v4 system
- LEED v4 directly rewards the use of low-carbon building materials
- All BC public sector buildings must achieve LEED Gold or equivalent certification
LEED v4 and Low Carbon Building Materials

- In LEED v4 Building Design and Construction (BD+C), there are nine LEED credits that benefit from using low carbon building materials
  - Most rating systems, including New Construction: 24 points
  - Core + Shell: 25 points
  - Healthcare: 26 points
- Additional credits may indirectly benefit from using low carbon building materials
- Focus today will be on five credits in the Materials and Resources category
LEED v4 and Low Carbon Building Materials - Resources

- Developed by Light House, Equilibrium Consulting, Kapow Creative, and BC Ministry of the Environment and Climate Change Strategy
- Available online
## LEED v4 Credits

<table>
<thead>
<tr>
<th>Category</th>
<th>Credit</th>
<th>Points</th>
<th>Wood</th>
<th>PLC</th>
<th>SCM</th>
<th>Bio</th>
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<tr>
<td>Materials and Resources</td>
<td>Building Life-Cycle Impact Reduction</td>
<td>2-5 points</td>
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<td>X</td>
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<tr>
<td></td>
<td>Building Product Disclosure and Optimization - Environmental</td>
<td>1-2 points</td>
<td>X</td>
<td>X</td>
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<td></td>
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<td>Raw Materials</td>
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<td></td>
<td>Furniture and Medical Furnishings (Healthcare Only)</td>
<td>1-2 points</td>
<td>X</td>
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</tr>
</tbody>
</table>
Credit Intent

- Promote the re-use of materials and buildings
- Consider the impact of materials through a building’s life-cycle

Possible points for BD+C (except CS): 2-5
Possible points for CS: 2-6
Option 4: Whole-Building Life-Cycle Assessment

- 10% reduction in at least three of the six impact categories
- No impact category can increase by more than 5% compared with the baseline model

Impact Categories:

- Global warming potential (\(\text{CO}_2\text{e}\))
- Depletion of stratospheric ozone (kg CFC-11)
- Acidification of land and water sources (moles H+ or kg SO\(_2\))
- Eutrophication (kg nitrogen or phosphate)
- Formation of tropospheric ozone (kg NO\(_x\), O\(_3\) or ethane)
- Depletion of non-renewable energy resources (MJ)
Credit Intent

- Promote use materials from manufacturers who are being transparent with the material life-cycle information
- Promote use of materials with reduced environmental, social, and economic impacts

Possible points for BD+C: 1-2

Note: **BPDO** is Building Product Disclosure and Optimization
Materials and Resources Credit: BPDO – Sourcing of Raw Materials

Credit Intent

• Reward the use of materials that are responsibly extracted and manufactured

Possible points for BD+C: 1-2

MR credit Building Product Disclosure and Optimization - Sourcing of Raw Materials

Option 1
(1 point)
Raw Material Source and Extraction Reporting

AND/OR

Option 2
(1 point)
Leadership Extraction Practices
Option 1: Raw Material Source and Extraction Reporting

- Use a minimum of 20 products, from at least five different manufacturers who issue an annual third-party standard corporate responsibility report.
- Acceptable third-party standards include:
  - Global Reporting Initiative (GRI) Sustainability Report
  - Organisation for Economic Co-Operation and Development (OECD) Guidelines for Multinational Enterprises
  - UN Global Compact: Communications of Progress
  - ISO 26000: 2010 Guidance on Social Responsibility
Option 2: Leadership Extraction Practices

- Rewards projects that use products that reduce manufacturing impacts.
- Includes older LEED credits that focused on recycled content, regional materials, FSC certified wood and salvaged or refurbished materials.
- Also now includes Sustainable Agriculture Network’s Sustainable Agriculture Standard-certification for bio-based materials.
- 25% of total cost of permanently installed building materials must meet one of the above criteria, with a maximum of 30% from structural materials.
Materials and Resources Credit: BPDO
– Material Ingredients

Credit Intent
• Increase transparency in chemicals used in products
• Reduce the use of products with harmful substances
• Encourage design teams and manufacturers to consider life-cycle impacts of raw materials

Possible points for NC: 1-2
Option 1: Material Ingredient Reporting

• Use a minimum of at least 20 products from five manufacturers that use a manufacturer inventory framework that reports all ingredients up to 0.1%

Existing frameworks include:

• Chemical Abstract Service Registration Number (CASRN)
• Health Product Declaration (HPD)
• Cradle to Cradle (C2C) certification
• Declare
Option 2: Material Ingredient Optimization

• 25% of permanently installed materials by cost must meet product certification criteria below

• Cradle to Cradle
  • V2 Gold and v3 Silver are valued at 100% of product cost
  • V2 Platinum and v3 Gold are valued at 150% of product cost

• GreenScreen v1.2 Benchmark List
  • Translator – 100% of product cost
  • Assessment – 150% of product cost

• International Alternative Compliance Path – REACH Optimization, Authorization or Candidate
  • 100% of product cost
Materials and Resources Credit: BPDO – Material Ingredients

Option 3: Product Manufacturer Supply Chain Optimization

- 25% of permanently installed materials by cost must originate from manufacturers who meet the requirements below
- Rewards manufacturers who follow a list of supply chain best practices including:
  - Programs and processes addressing health, safety, hazards and risks
  - GHS Category 2 criteria for hazard screening for:
    - Carcinogens
    - Mutagens
    - Reproductive toxicants
    - Skin irritants
  - Self-declared or third party validated EHS management system for 99% of all ingredients
Materials and Resources Credit: Furniture and Medical Furnishings

Credit Intent

• Encourage project teams to use furniture and medical furnishings that have reduced environmental impacts and improved human health benefits

Possible points for NC: 1-2

Note: For Healthcare projects only

• Each option can be achieved by 30% (1 point) or 40% (2 points) by cost of the total cost of all furniture and medical furnishings
Option 1: Minimal Chemical Content

- All furniture or furnishing comprising at least 5% of the total product (by weight) contain less than 100 ppm of four of the five chemicals below:
  - Urea formaldehyde
  - Heavy metals: mercury, cadmium, antimony
  - Hexavalent chromium in plated finishes
  - Perfluorinated compounds (PFCs), including perfluorooctanoic acid (PFOA)
  - Added microbial treatments

MR credit - Furniture and Medical Furnishings

Option 1
(1-2 points)
Minimal Chemical Content

AND/OR

Option 2
(1-2 points)
Testing and Modelling of Chemical Content

AND/OR

Option 3
(1-2 points)
Multi-Attribute Assessment of Products
Option 2: Testing and Modelling of Chemical Content

- Products meet Option 1 for two of five chemicals

Note: Salvaged or reused furniture must be at least 1 year old to qualify.
Materials and Resources Credit:
Furniture and Medical Furnishings

Option 3: Multi-Attribute Assessment of Products

- Provides credit for products meeting various sustainability criteria
- Requires compliance with one or more of the following:
  - Generic EPDs, valued at 0.5
  - Product-specific EPDs, valued at 1
  - Reused, salvaged or refurbished
  - Recycled content
  - Extended producer responsibility
  - Sustainable Agriculture Network’s Sustainable Agriculture Standard certification for bio-based materials
  - FSC-certification for wood products
  - Regionally manufactured within 100 miles or 160 km of project site
• Locally and globally, more emphasis is being put on embodied carbon
• LEED v4 rewards the use of low carbon building materials such as wood and PLC
• There are nine credits in LEED that may directly benefit from using low carbon building materials – today we reviewed five from the Materials and Resources category
• Other credits may indirectly benefit from using low carbon building materials
• LEED v4 and low carbon building materials comprehensive and PSO guides
THANK YOU!

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