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

Contents

Introduction

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

- US Green Building Council through LEED v4, awards points for low carbon building materials (2013)
- Canada Green Building Council through Zero Carbon Building Standard (2017)
- City of Vancouver's Green Buildings Policy for Rezonings (2017)

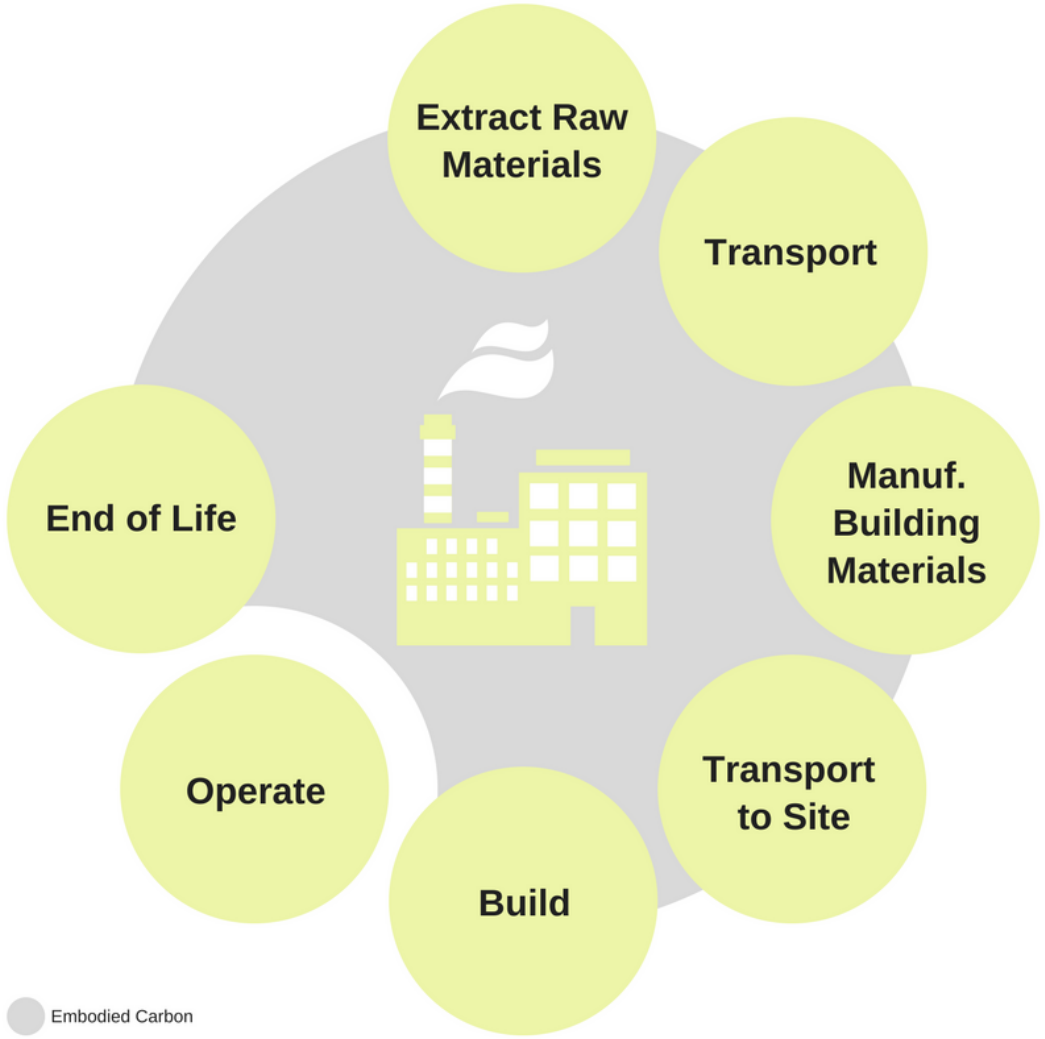
Other organizations focusing on embodied carbon in building materials:

- UK Green Building Council
- Architecture 2030

Embodied Carbon

Embodied Carbon of Building Materials

- Extraction of raw materials
- Transportation
- Manufacturing
- Transportation to building site
- Construction



Low Carbon Building Materials

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

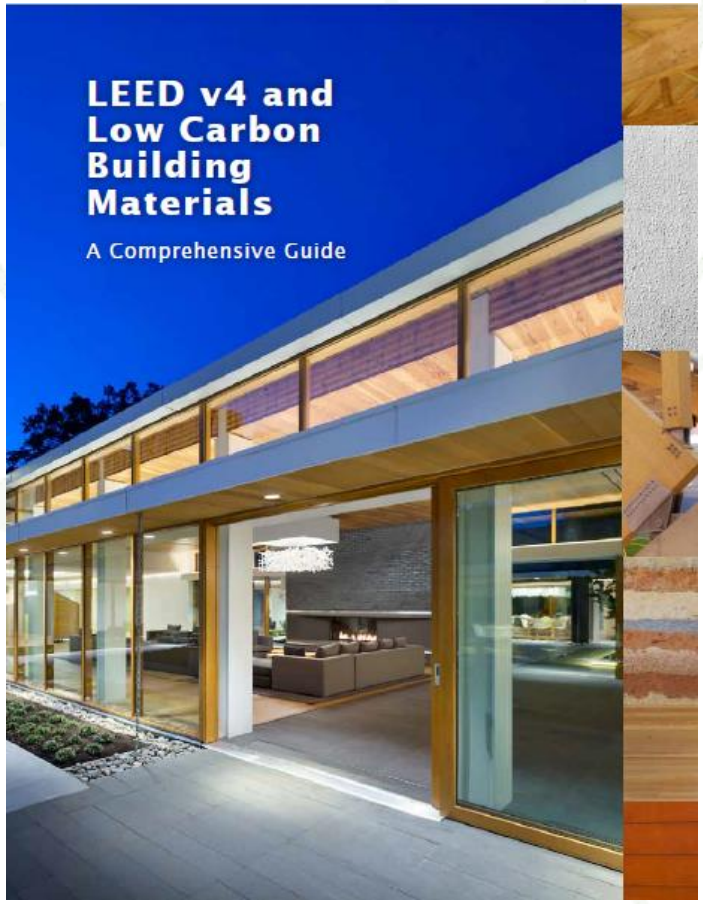
Leadership in Energy and Environmental Design

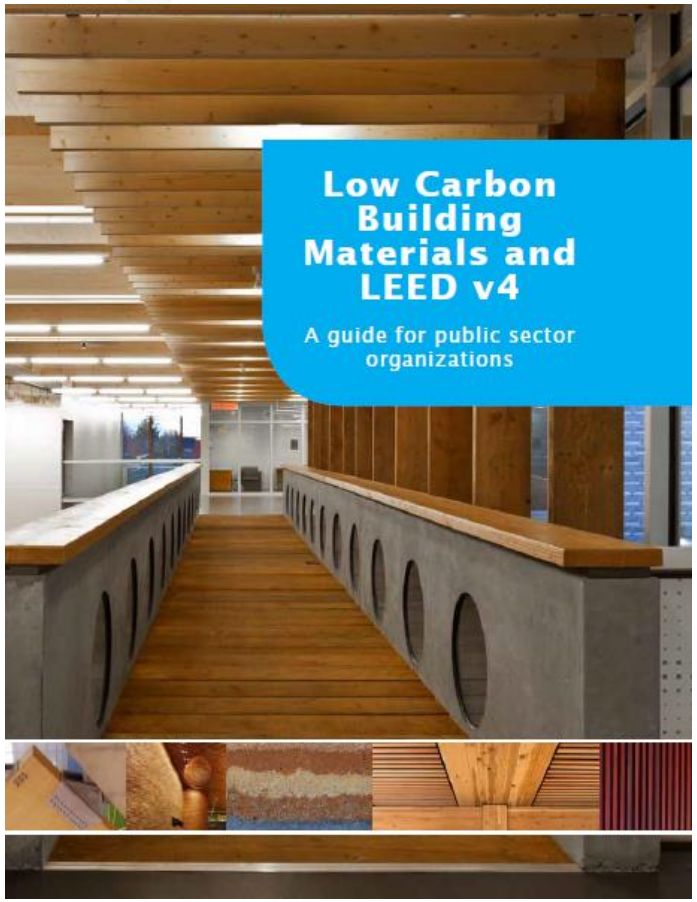
- Established in 1998 by the US Green Building Council (USGBC)
- Adapted for the Canadian market in 2004 with the release of LEED Canada New Construction + Major Renovations v1.0
- Most widely used building rating system in the US and Canada
  - Over 6,000 projects in Canada
- November 1, 2016 – all 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

Category	Credit	Points	Wood	PLC	SCM	Bio
Materials and Resources	Building Life-Cycle Impact Reduction	2-5 points	X	X	X	X
	Building Product Disclosure and Optimization - Environmental Product Declarations	1-2 points	X	X	X	X
	Building Product Disclosure and Optimization - Sourcing of Raw Materials	1-2 points	X	X	X	X
	Building Product Disclosure and Optimization - Material Ingredients	1-2 points	X	X	X	X
	Furniture and Medical Furnishings (Healthcare Only)	1-2 points	X			X

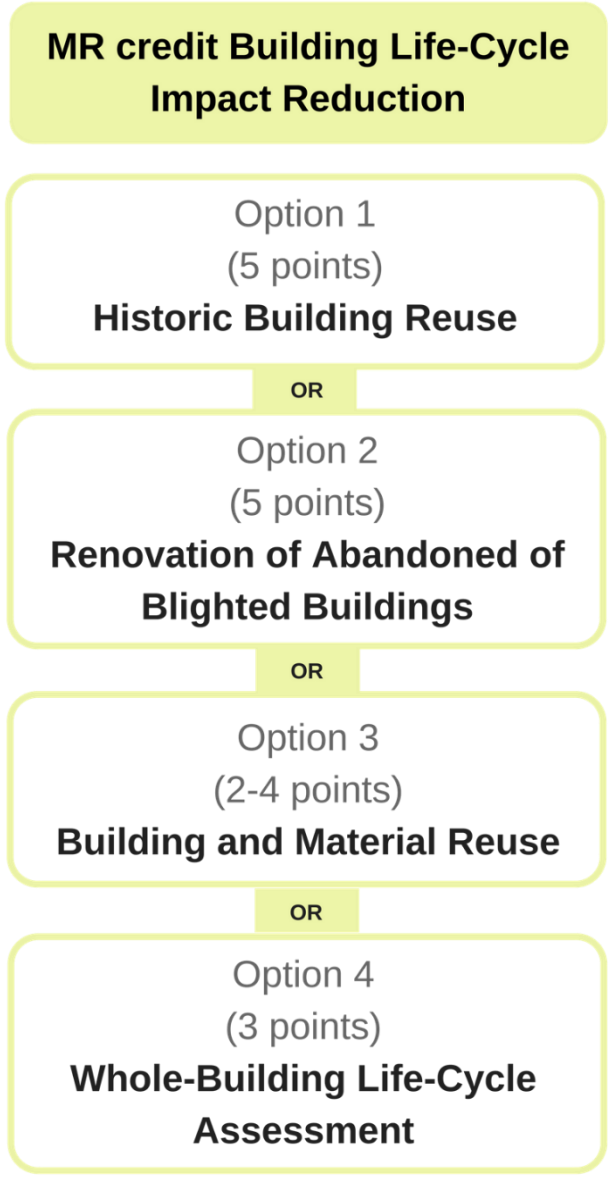
Materials and Resources Credit: Building Life-Cycle Impact Reduction

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



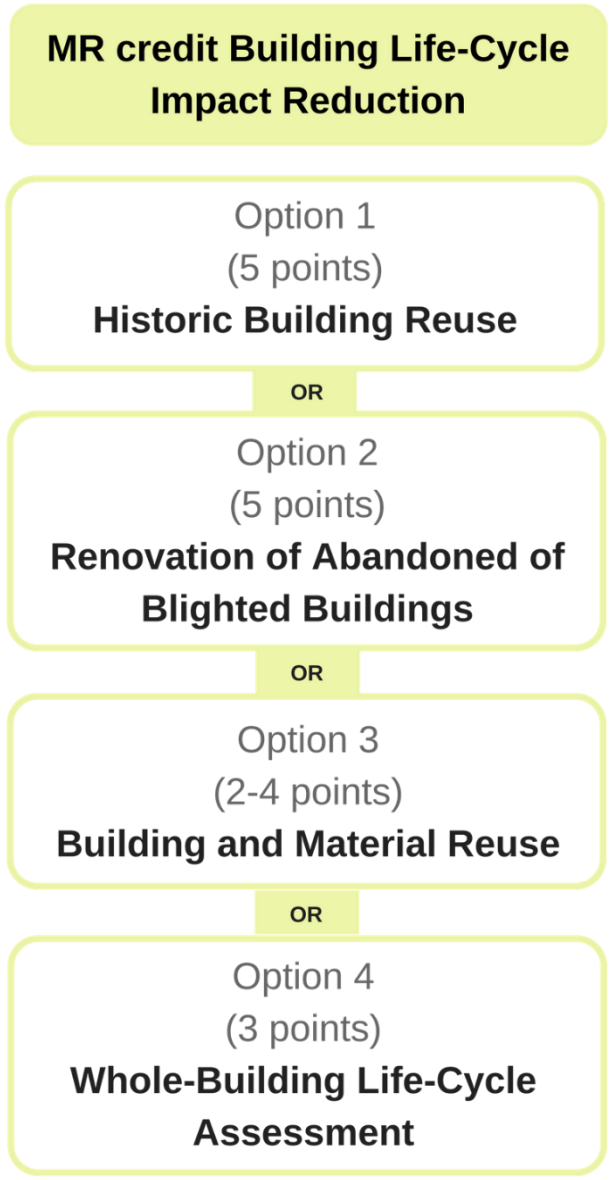
Materials and Resources Credit: Building Life-Cycle Impact Reduction

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 (CO_2e)
- 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)



Materials and Resources Credit: BPDO – Environmental Product Declarations

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

MR credit Building Product Disclosure and Optimization - Environmental Product Declarations

Option 1
(1 point)
Environmental Product Declaration (EPD)

AND/OR

Option 2
(1 point)
Multi-Attribute 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

Materials and Resources Credit: BPDO – Sourcing of Raw Materials

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

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

Materials and Resources Credit: BPDO – Sourcing of Raw Materials

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

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

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

MR credit Building Product Disclosure and Optimization - Materials Ingredients

Option 1
(1 point)
Material Ingredient Reporting

AND/OR

Option 2
(1 point)
Material Ingredient Optimization

AND/OR

Option 3
(1 point)
Product Manufacturer Supply Chain Optimization

Materials and Resources Credit: BPDO – Material Ingredients

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%

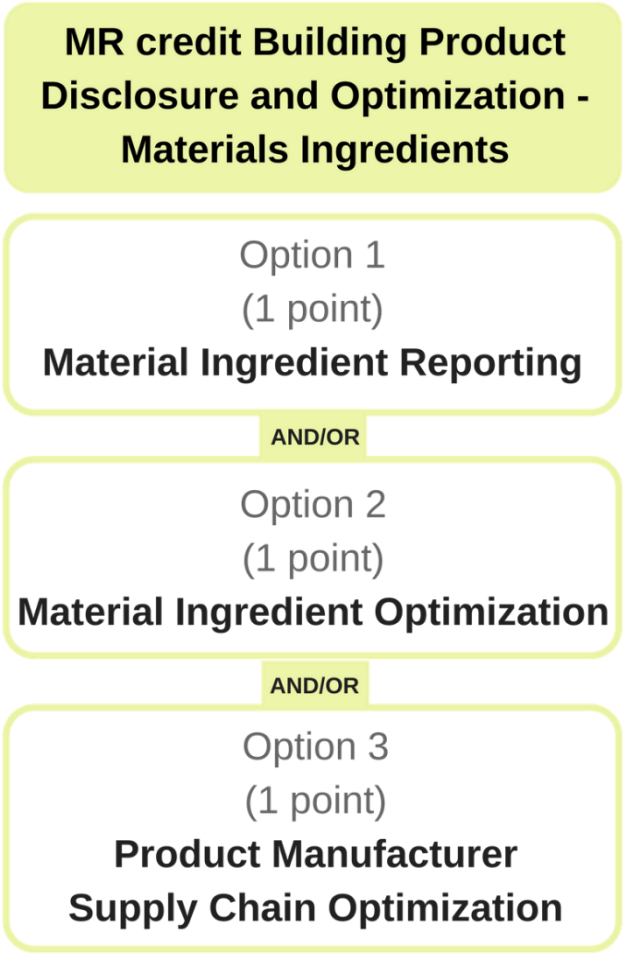
Existing frameworks include:

- Chemical Abstract Service Registration Number (CASRN)
- Health Product Declaration (HPD)
- Cradle to Cradle (C2C) certification
- Declare

Materials and Resources Credit: BPDO – Material Ingredients

Option 2: Material Ingredient Optimization

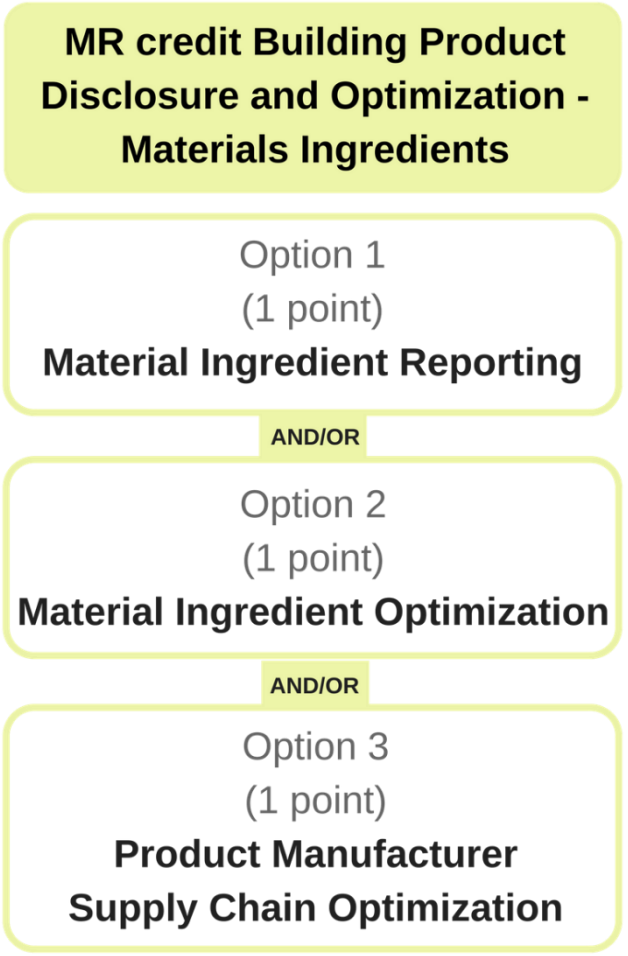
- 25% of permanently installed materials by cost must meet product certification criteria below
- Cradle to Cradle
  - V2 Gold and v3 Silver are valued at 100% of product cost
  - V2 Platinum and v3 Gold are valued at 150% of product cost
- GreenScreen v1.2 Benchmark List
  - Translator – 100% of product 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

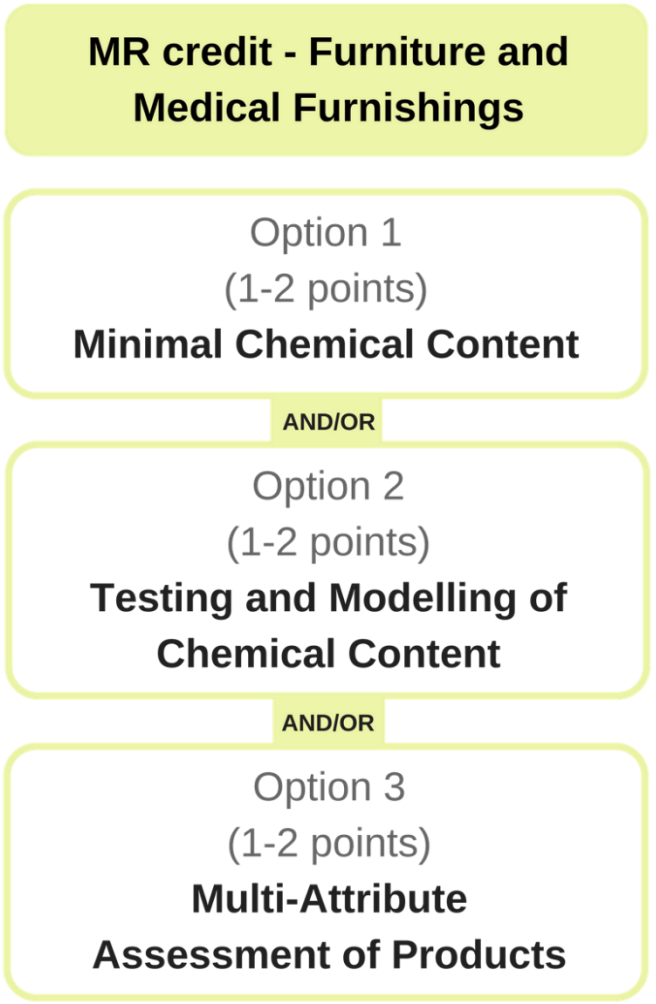
Credit Intent

- 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

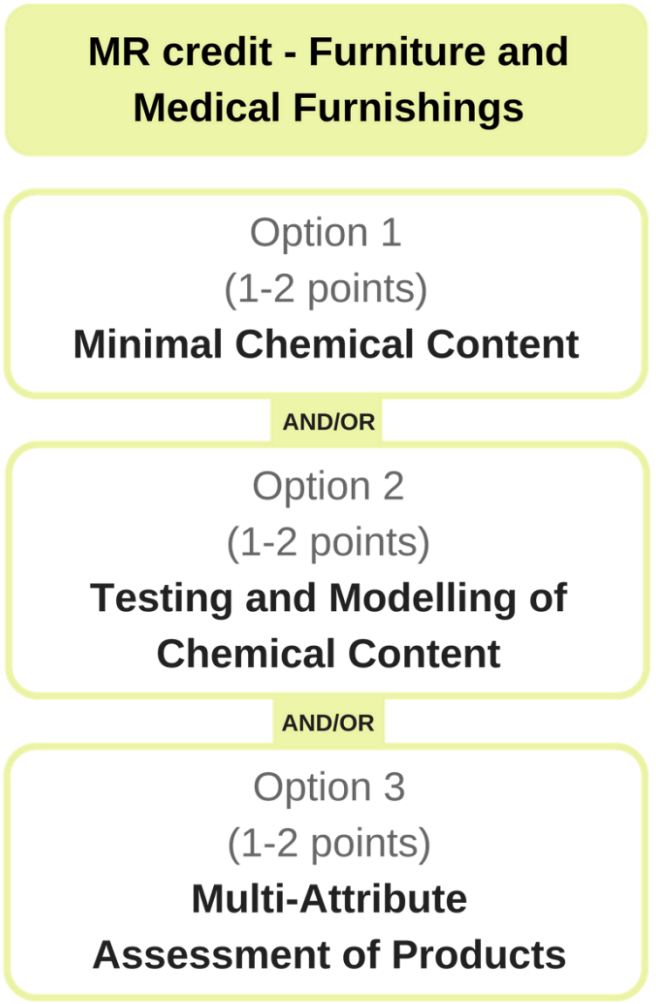
- Each option can be achieved by 30% (1 point) or 40% (2 points) by cost of the total cost of all furniture and medical furnishings



Materials and Resources Credit: 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 perfluorooctnoic acid (PFOA)
  - Added microbial treatments

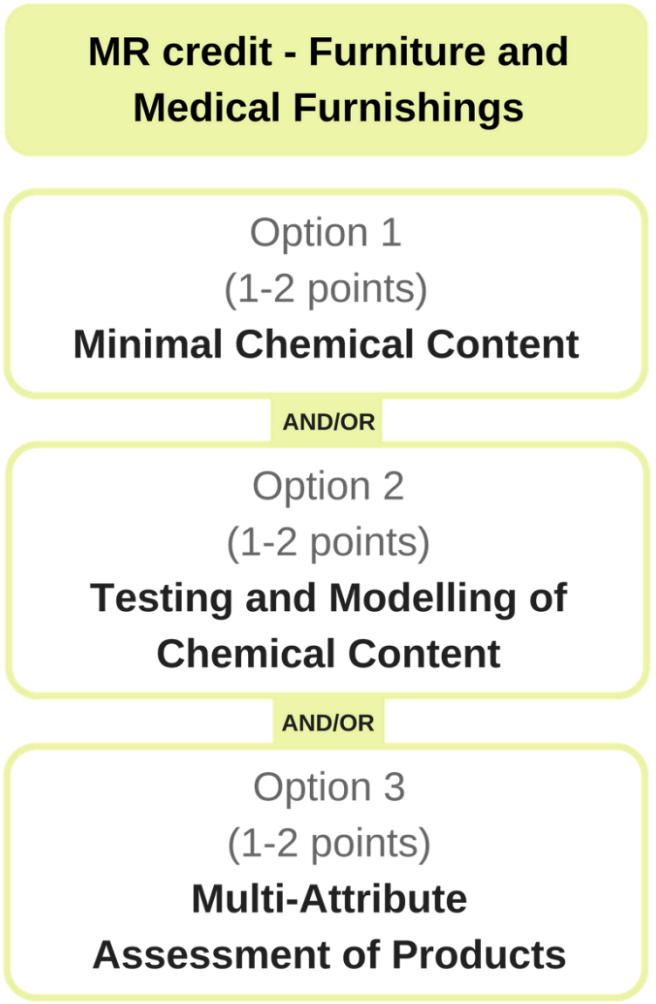


Materials and Resources Credit: Furniture and Medical Furnishings

Option 2: Testing and Modelling of Chemical Content

- Products meet Option 1 for two of five chemicals
- ANSI/BIFMA Standard Method M7.1-2011 and e3-2010 Furniture Sustainability Standard, Sections 7.6.1 and 7.6.2.

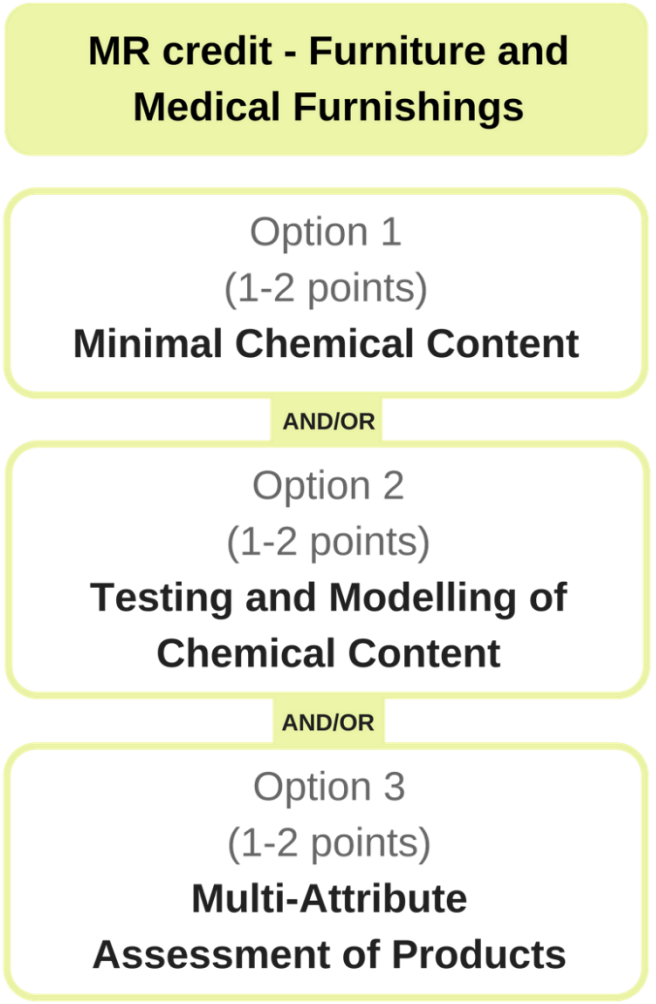
Note: Salvaged or reused furniture must be at least 1 year old to qualify



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



Summary

- 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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