



**bamboo
products**

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Date: October 2017
Subject: MOSO and LEEDv4 certification

MOSO products may contribute to certification under the U.S. Green Building Council's [LEED](#) Rating System. This memo deals with LEED [version 4](#), for LEED version 2009 we refer to the document "memo MOSO and LEEDv2009", which can be requested through sustainability@moso.eu. Specification of MOSO products can contribute to the following credits for the most applicable rating system - Building Design & Construction (BD+C)¹ for LEED v4:

- MR Credit 1 - Building life-cycle impact reduction (all solid MOSO products)
- MR Credit 2 - Building product disclosure and optimization - environmental product declarations (all solid MOSO products)
- MR Credit 3 - Building product disclosure and optimization – sourcing of raw materials (MOSO materials requested with FSC certification)
- EQ Credit 2 - Low Emitting Materials (all MOSO products applied for flooring, walls, ceiling or as substitute for wood composite materials)
- SS Credit 7 – Heat Island Reduction (MOSO Bamboo X-treme)



The mark of
responsible forestry



It is important to understand that LEED credits can be earned on building level so this means that bamboo materials can contribute to making the credit a reality, however often in combination with other green building materials for other building elements to reach the cut off value for the criterion. More information of the possible contribution of MOSO materials on each of the criteria mentioned is provided below, including a copy of the relevant selection of the actual text from the LEED criteria document (full text available online through [this link](#)).

¹ Several of the BD+C credits also apply to the LEED Interior Design & Construction (ID+C) rating system.



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MR CREDIT: BUILDING LIFE-CYCLE IMPACT REDUCTION

BD&C

2–6 points

This credit applies to

- New Construction (2–5 points)
- Core & Shell (2–6 points)
- Schools (2–5 points)
- Retail (2–5 points)
- Data Centers (2–5 points)
- Warehouses & Distribution Centers (2–5 points)
- Hospitality (2–5 points)
- Healthcare (2–5 points)

Intent

To encourage adaptive reuse and optimize the environmental performance of products and materials.

Option 4. Whole-Building Life-Cycle Assessment (3 points)

For new construction (buildings or portions of buildings), conduct a life-cycle assessment of the project's structure and enclosure that demonstrates a minimum of 10% reduction, compared with a baseline building, in at least three of the six impact categories listed below, one of which must be global warming potential. No impact category assessed as part of the life-cycle assessment may increase by more than 5% compared with the baseline building.

The baseline and proposed buildings must be of comparable size, function, orientation, and operating energy performance as defined in EA Prerequisite Minimum Energy Performance. The service life of the baseline and proposed buildings must be the same and at least 60 years to fully account for maintenance and replacement. Use the same life-cycle assessment software tools and data sets to evaluate both the baseline building and the proposed building, and report all listed impact categories. Data sets must be compliant with ISO 14044.

Select at least three of the following impact categories for reduction:

- global warming potential (greenhouse gases), in CO₂e;
- depletion of the stratospheric ozone layer, in kg CFC-11;
- acidification of land and water sources, in moles H⁺ or kg SO₂;
- eutrophication, in kg nitrogen or kg phosphate;
- formation of tropospheric ozone, in kg NO_x, kg O₃ eq, or kg ethene; and
- depletion of nonrenewable energy resources, in MJ.

Comment MOSO: Delft University of Technology was commissioned by MOSO in 2014 to develop a cradle to grave Life Cycle Assessment including carbon footprint. The study was updated and presented during the Climate Conference COP 21 in Paris in 2015² and reveals that in terms of eco-costs³ and global warming potential all solid MOSO bamboo materials have a significantly lower

² P. van der Lugt, J.G. Vogtländer. The Environmental Impact of Industrial Bamboo Products - Life-cycle Assessment and Carbon Sequestration. INBAR Technical Report 35. INBAR, Beijing, China. ISBN: 978-92-95098-89-3 (printed version) and 978-92-95098-90-9 (webversion). Available via www.moso.eu/lca.

³ Single indicator consisting of the midpoint impact categories mentioned in this LEED credit, for more information please refer to www.ecocostsvalue.com. For a more detailed division in environmental impact categories for the MOSO products is referred to the data in the TU Delft Idemat 2016 database, available on this [webpage](#) (data entry "Plywood Bamboo").



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environmental impact (CO₂ neutral over full life cycle) compared to commonly used building materials such as FSC certified tropical hardwood, plastics (PVC) and metals (steel, aluminium). Therefore, application of MOSO bamboo materials can help in achieving the required 10% environmental impact reduction compared to the baseline building.

MR CREDIT: BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION— ENVIRONMENTAL PRODUCT DECLARATIONS

BD&C

1–2 points

This credit applies to

- New Construction (1–2 points)
- Core & Shell (1–2 points)
- Schools (1–2 points)
- Retail (1–2 points)
- Data Centers (1–2 points)
- Warehouses & Distribution Centers (1–2 points)
- Hospitality (1–2 points)
- Healthcare (1–2 points)

Intent

To encourage the use of products and materials for which life-cycle information is available and that have environmentally, economically, and socially preferable life-cycle impacts. To reward project teams for selecting products from manufacturers who have verified improved environmental life-cycle impacts.

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

Use at least 20 different permanently installed products sourced from at least five different manufacturers that meet one of the disclosure criteria below.

- Product-specific declaration.
 - Products with a publicly available, critically reviewed life-cycle assessment conforming to ISO 14044 that have at least a cradle to gate scope are valued as one quarter (1/4) of a product for the purposes of credit achievement calculation.
- Environmental Product Declarations which conform to ISO 14025, 14040, 14044, and EN 15804 or ISO 21930 and have at least a cradle to gate scope.
 - Industry-wide (generic) EPD -- Products with third-party certification (Type III), including external verification, in which the manufacturer is explicitly recognized as a participant by the program operator are valued as one half (1/2) of a product for purposes of credit achievement calculation.
 - Product-specific Type III EPD -- Products with third-party certification (Type III), including external verification in which the manufacturer is explicitly recognized as the participant by the program operator are valued as one whole product for purposes of credit achievement calculation.



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Option 2. Multi-Attribute Optimization (1 point)

Use products that comply with one of the criteria below for 50%, by cost, of the total value of permanently installed products in the project. Products will be valued as below.

- Third party certified products that demonstrate impact reduction below industry average in at least three of the following categories are valued at 100% of their cost for credit achievement calculations.
 - global warming potential (greenhouse gases), in CO₂e;
 - depletion of the stratospheric ozone layer, in kg CFC-11;
 - acidification of land and water sources, in moles H⁺ or kg SO₂;
 - eutrophication, in kg nitrogen or kg phosphate;
 - formation of tropospheric ozone, in kg NO_x, kg O₃ eq, or kg ethene; and depletion of nonrenewable energy resources, in MJ.

Comment MOSO: The Life Cycle Assessment (LCA) including carbon footprint following ISO 14040/44 by Delft University of Technology, applicable to all solid MOSO bamboo products (for details see previous credit), facilitates compliance of MOSO products both for option 1 (disclosure environmental impact – valued for ¼ of product value) and option 2 (reduction of environmental impact below industry average).

In 2016 MOSO released various product-specific Type III EPDs (EN 15804) for its solid products range which even attributes to the full (1/1) product value through option 1. The EPDs are available through www.moso.eu/epd.



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MR CREDIT: BUILDING PRODUCT DISCLOSURE AND OPTIMIZATION – SOURCING OF RAW MATERIALS

BD&C

1–2 points

This credit applies to

- New Construction (1–2 points)
- Core & Shell (1–2 points)
- Schools (1–2 points)
- Retail (1–2 points)
- Data Centers (1–2 points)
- Warehouses & Distribution Centers (1–2 points)
- Hospitality (1–2 points)
- Healthcare (1–2 points)

Intent

To encourage the use of products and materials for which life cycle information is available and that have environmentally, economically, and socially preferable life cycle impacts. To reward project teams for selecting products verified to have been extracted or sourced in a responsible manner.

Option 2. Leadership Extraction Practices (1 point)

Use products that meet at least one of the responsible extraction criteria below for at least 25%, by cost, of the total value of permanently installed building products in the project.

- *Wood products.* Wood products must be certified by the Forest Stewardship Council or USGBC-approved equivalent. Products meeting wood products criteria are valued at 100% of their cost for the purposes of credit achievement calculation.

Comment MOSO: As a company, MOSO is FSC certified and several MOSO products are available with FSC certification (FSC 100%), either on request or already on stock (MOSO bamboo panels and veneer, MOSO Bamboo Supreme, MOSO Bamboo Industriale, MOSO Bamboo X-treme, etc). The MOSO FSC Chain of Custody certificate is available on request. For FSC products our invoices contain the required data following the FSC standards, to trace the material back to the source (Chain of Custody).



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EQ CREDIT: LOW-EMITTING MATERIALS

BD&C

1–3 points

This credit applies to

- New Construction (1–3 points)
- Core & Shell (1–3 points)
- Schools (1–3 points)
- Retail (1–3 points)
- Data Centers (1–3 points)
- Warehouses & Distribution Centers (1–3 points)
- Hospitality (1–3 points)
- Healthcare (1–3 points)

Intent

To reduce concentrations of chemical contaminants that can damage air quality, human health, productivity, and the environment.

Comment MOSO: The full criterion text is too elaborate to paste here (full criteria available via [this link](#)), but it relates to emissions of Volatile Organic Compounds (VOC) in the indoor environment. If MOSO bamboo products are used as flooring, walls or ceiling they can contribute to this criterion when the indoor emissions criteria regarding maximum VOC emissions - as mentioned in the California Department of Public Health (CDPH), the German AgBB/DIBt testing method or French legislation on VOC emission class labelling - are met. All MOSO bamboo flooring has been tested on VOCs by the Bremer Umwelt Institut, based on both AgBB/DIBt requirements and French legislation on VOCs labelling following ISO 16000-9. The official test reports (available on request) have shown that MOSO bamboo flooring complies with the LEED requirements. Furthermore, if MOSO bamboo panels or veneer are used as substitute for composite wood (e.g. MDF, OSB, etc) in the building they may contribute to this criterion when produced with special adhesives with ultra-low-emitting formaldehyde or no added formaldehyde (complying with E0 emission class), such as EPI glues. This option is available on demand for MOSO bamboo veneer (tested following ASTM E 1333-96, test report available on request) and for MOSO bamboo panels.



SS CREDIT: HEAT ISLAND REDUCTION

BD&C

1–2 points

This credit applies to

- New Construction (2 points)
- Core & Shell (2 points)
- Schools (2 points)
- Retail (2 points)
- Data Centers (2 points)
- Warehouses & Distribution Centers (2 points)
- Hospitality (2 points)
- Healthcare (1 point)

Intent

To minimize effects on microclimates and human and wildlife habitats by reducing heat islands.

Option 1. Nonroof and Roof (2 points except Healthcare, 1 point Healthcare)

Meet the following criterion:

$$\frac{\text{Area of Nonroof Measures}}{0.5} + \frac{\text{Area of High-Reflectance Roof}}{0.75} + \frac{\text{Area of Vegetated Roof}}{0.75} \geq \frac{\text{Total Site Paving Area}}{\text{Total Roof Area}}$$

Comment MOSO: The full criterion text is too elaborate to paste here (full criteria available via [this link](#)), but it relates to solar reflectance of materials to reduce heating up of surfaces under sun exposure, also known as the Heat Island Effect.

MOSO Bamboo X-treme outdoor products (three year aged) have a Solar Reflectance (SR) value of 0.32 following ASTM E1980-11 which meets the threshold value of 0.28 for three year aged material. Therefore it can contribute as a Nonroof measure to reduce the heat island effect. Official test report by Intertek available on request.



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INNOVATION (IN)

IN CREDIT: INNOVATION

BD&C

1–5 points

This credit applies to

- New Construction (1–5 points)
- Core & Shell (1–5 points)
- Schools (1–5 points)
- Retail (1–5 points)
- Data Centers (1–5 points)
- Warehouses & Distribution Centers (1–5 points)
- Hospitality (1–5 points)
- Healthcare (1–5 points)

Intent

To encourage projects to achieve exceptional or innovative performance.

Option 1. Innovation (1 point)

Achieve significant, measurable environmental performance using a strategy not addressed in the LEED green building rating system.

Identify the following:

- the intent of the proposed innovation credit;
- proposed requirements for compliance;
- proposed submittals to demonstrate compliance; and
- the design approach or strategies used to meet the requirements.

AND/OR

Option 3. Additional Strategies

- **Innovation (1-3 points)**
Defined in Option 1 above.
- **Pilot (1-3 points)**
Meet the requirements of Option 2.
- **Exemplary Performance (1–2 points)**
Achieve exemplary performance in an existing LEED v4 prerequisite or credit that allows exemplary performance, as specified in the LEED Reference Guide, v4 edition. An exemplary performance point is typically earned for achieving double the credit requirements or the next incremental percentage threshold.

Comment MOSO: Several MOSO bamboo materials are being developed for new applications, where bamboo was never used before, such as in window- and doorframes, structural components, carports and cladding. As such they may substitute several commonly used building materials with higher environmental impact (contribution through innovation – option 1).

An additional innovation credit (exemplary performance – option 3) can be reached if a LEED credit is achieved with a score of at least twice as high as the criteria limit. For example, because of the low environmental impact of MOSO bamboo materials, application could help in meeting the exemplary performance limits for example for credits MR 1 and MR 2 (see also above).



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Indirect contribution

Besides the credits mentioned above, where specification of MOSO bamboo materials can provide a direct contribution to a higher LEED rating, there are some credits where application of MOSO materials can provide an indirect contribution:

- EQ Credit 6 - Interior Lighting: Application of MOSO bamboo products in the extra light “natural” colour can help meet the surface reflectance thresholds for flooring, walls, ceilings and work tops.
- EQ Credit 9 - Acoustic performance: MOSO bamboo panels are available as acoustic panels (e.g. through MOSO partner Bamboo Acoustics) and therefore can help meet the sound transmission thresholds as specified in this credit.

Additional information - evidence

For LEED professionals a package with additional proof (certificates, testing reports, etc) is available to support compliance with the several LEEDv4 credits. For this and other information please contact Dr. Pablo van der Lugt, sustainability expert of MOSO International through sustainability@moso.eu