

# MOZO<sup>®</sup> Bamboo X-treme<sup>®</sup>

Sustainable and  
certified cladding

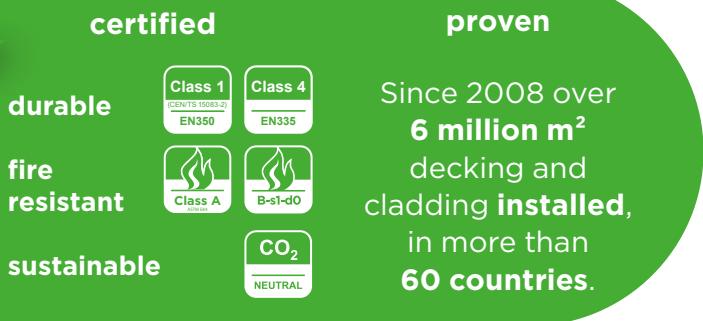


Grotius is a development by Provast, designed by MVRDV, realised by J.P. van Eesteren & Besix, photographed by Daria Scagliola.





# Bamboo: the fastest growing plant in the world



High stability,  
fast installation and  
hidden fasteners

# MOSO®

# Bamboo X-treme®

With Bamboo X-treme®, MOSO® has developed a truly **ecological** and **durable** alternative to increasingly scarce tropical hardwood and non-renewable materials. MOSO® uses a **unique** Thermo-Density® **process** of heat-treatment at 200°C followed by High Density® compression to enhance the **hardness, dimensional stability, fire resistance** and **durability** to a level **superior** to the best tropical hardwood species. MOSO® Bamboo X-treme® can be used not only for **outdoor cladding** but also for **outdoor decking, fencing and outdoor furniture.**

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**Private Residence Buenos Aires**  
(100 m<sup>2</sup>) Buenos Aires, Argentina

# from bamboo to Bamboo X-treme®

The fast growth and abundant availability make bamboo a rapidly renewable resource, and a perfect material for many applications in and around buildings. With good reason, it's often called '**the building material of the future**'. However, bamboo as a raw material cannot be used outdoors without a protective treatment. Due to its high "sugar"-components, bamboo is more susceptible to being attacked by micro-organisms and fungi. Let us explain how we get from the raw bamboo material to the final product, MOSO® Bamboo X-treme®, through a production process called Thermo-Density®.

## stem to strands

After harvesting, the mature bamboo stems are split in a longitudinal direction and the outer and inner skins are removed. The strips are then crushed using a number of incision rollers which create cross linked strands. The untreated strands are a light yellow colour.

## thermal modification

In several steps, the strands are heated up to 200°C in the presence of saturated steam (to protect the wood from charring or burning) and cooled down. During thermal modification, the moisture content changes and the sugar content is removed from the material. Furthermore, this process changes the colour of the bamboo from white/yellow to deep/dark brown.

## from strands to product

The dark bamboo strands are dipped into phenolic glue (< 10% of the weight of the bamboo). After drying, the strands are put into a mould, and are then compressed under high temperature and pressure to cure the glue. The output is a large panel, which is cut into smaller sections (boards or beams). These are then further processed and profiled to become the required shape (for example, for decking: a grooved surface and edge grooves to allow installation with fasteners). As a last step, depending on the customer's request, the boards can be finished.

ready to harvest after  
4-5 years



modifying the bamboo strands  
with a heat-treatment at  
200°C



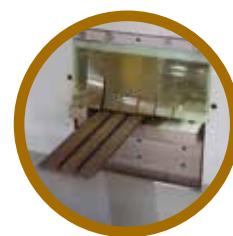
split the Moso  
bamboo stems,  
remove the  
outer skin and  
crush the  
strips into  
strands



compressing  
the strands into  
Thermo-  
Density®  
material



creating the final profile  
and surface



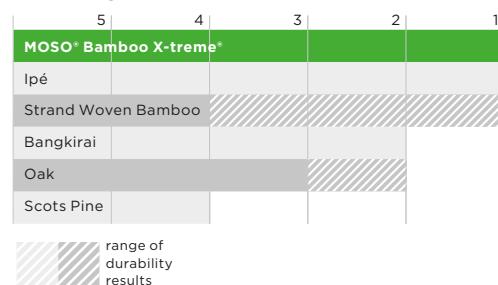
**MOSO® Bamboo X-treme®:** material more stable, harder and stronger than almost any other hardwood in the world!

## Thermo-Density®

We call the combination of compressing and thermally modifying the bamboo strands a Thermo-Density® process. It increases the density from 650-700 kg/m<sup>3</sup> to approx. 1150 kg/m<sup>3</sup> and improves the hardness of this product significantly. After pressing, the material is stronger and harder than almost any other hardwood in the world. At the same time, the dimensional stability of bamboo is improved by approximately 50%.

Besides stability and hardness improvements, the durability is improved to the best durability class possible, from Class 5 to Class 1: Class 1 (EN 350) CEN/TS 15083-2 - simulated graveyard test and Class 1 (EN 350) CEN/TS 15083-1.

## durability class according to EN 350 (CEN/TS 15083-2 / CEN/TS 15083-1)



MOSO® Bamboo X-treme® is also well protected against superficial fungi Class 0 (EN 152), and achieves the use/risk Class 4 according to EN 335.

**Only MOSO® can ensure you have the original, unique Bamboo X-treme® product.** Other products that attempt to copy the original, do not offer the same quality or level of durability, dimensional stability and ecology. With a look-alike product, there is a large risk of claims after installation. **Always ask for the original, certified MOSO® Bamboo X-treme® products!**

# benefits of Bamboo X-treme® Cladding



## hard & durable

- Biological durability Class 1 (EN 350 / CEN/TS 15083-2), simulated graveyard test / Class 1 (EN 350 / CEN/TS 15083-1).
- Use Class 4 in accordance with EN 335.
- Effectiveness against blue stain Class 0 (EN 152).
- Exceptionally hard: Brinell  $\pm$  9.5 kg/mm<sup>2</sup> (harder than any tropical hardwood available).
- MOSO® provides Bamboo X-treme® outdoor products\* with up to 25 years warranty.



## high stability

- Very stable as a result of a unique Thermo-Density® process of heat-treatment combined with High Density® compression.
- Far more stable than tropical hardwoods - enabling an end-match system (tongue & groove on ends).
- Limited tendency to torsion.
- No gap between the ends of the boards necessary.
- Closed profile allows for an installation without space between the boards.



## maintenance-free

- Does not require periodic maintenance.
- Choice between natural greying or retaining the brown colour with an exterior finish.



## fire resistant

- Achieves fire resistance Class B-s1-d0 (EN 13501-1) without use of fire retardants.
- Achieves flame spread index Class A following ASTM E84.
- As a result, MOSO® Bamboo X-treme® can be easily applied in public projects without additional protective measures.



## beautiful appearance

- A beautiful, natural hardwood look.
- Use of hidden MOSO® Fasteners avoids face screwing and plugging.
- Free of knots and natural plant resins.



## endless resource

- Made from bamboo; with a growing speed of up to 1 meter per day it is the fastest growing plant on earth.
- Ready to harvest after 4-5 years (compared to up to 100 years for hardwood species).
- Consisting of approx. 90% natural bamboo.



## CO2 neutral

- Official LCA and carbon footprint studies (EN 15804) confirm that MOSO® Bamboo X-treme® is CO<sub>2</sub> neutral during the product lifespan\*\*.
- No use of fungicide in the production.



## economical

- Simple and fast installation.
- Reduced waste because of the end-matched connection.
- Cost effective transportation because of the fixed 1850 mm length.



Studio Osiris Hertman

Awood

Jurrit van der Waal, the art of living magazine

### Villa by Studio Osiris Hertman The Netherlands



### Showroom Varios Beautiful products

Hoek van Holland, the Netherlands

### Hostel Stayokay

Noordwijk, the Netherlands



Awood

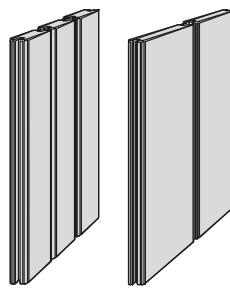
# MOSO® Bamboo X-treme® Varibo Outdoor Cladding

MOSO® Bamboo X-treme® Varibo Cladding are solid boards in various widths for exterior applications. The boards are made from bamboo strips that have been compressed and thermally modified at 200°C. This unique Thermo-Density® process provides MOSO® Bamboo X-treme® with the highest durability class possible in the appropriate EU norms, increases the stability and density, and consequently the hardness. Furthermore, contrary to wood products, this material can achieve fire resistance Class B-s1-d0<sup>1)</sup> (EN 13501-1) without impregnation with expensive and eco-damaging fire retardants. MOSO® Bamboo X-treme® Varibo Cladding is available in various dimensions. The Varibo boards can be fixed with MOSO® Fasteners (18 mm). Like any tropical hardwood species, when exposed to outdoor conditions, Bamboo X-treme® will turn grey over time creating a very natural look.

**Varibo profile**  
100 mm



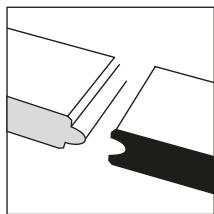
**Varibo Flat boards**



**Varibo**



**End-matched**



Product Code	Finish	Surface	End-matched	Length edges	End edges	Effective width (mm)*	Dimensions (mm)
BO-DTHT187G	Unfinished	Flat	Yes	R3	2 mm x 45°	65	1850x65x18
BO-DTHT186G	Unfinished	Flat	Yes	R3	2 mm x 45°	100	1850x100x18
BO-DTHT185G	Unfinished	Flat	Yes	R3	2 mm x 45°	137	1850x137x18
BO-DTHT218G	Unfinished	Flat	Yes	R3	2 mm x 45°	178	1850x178x18
BO-DTHT387G	Unfinished	Flat	Yes	R3	2 mm x 45°	65	1850x65x30
BO-DTHT386G	Unfinished	Flat	Yes	R3	2 mm x 45°	100	1850x100x30

\*) Effective width without gap between the boards, recommended gap 6 mm.

## Installation

- MOSO® guarantees the bamboo material and the mounting materials (fastener/screw) it supplies but does not guarantee the connection with other materials (such as sub frame joist/battens). It is the responsibility of the installer to make sure the used screw matches such materials during the full lifetime of the product.
- For installation with fasteners, the MOSO® Fasteners CLIP-SCREW-BX09 with screws and MOSO® Fasteners CLIP-BX09 without screws are available. More information about the MOSO® Fasteners can be found: ► [www.moso-bamboo.com/x-treme/accessories](http://www.moso-bamboo.com/x-treme/accessories)
- Store in a cool and dry place away from direct sunlight, and protected from weather influences, dirt and dust.
- Full version available at: ► [www.moso-bamboo.com/varibo](http://www.moso-bamboo.com/varibo)

## technical characteristics and certifications

- Density: ± 1150 kg/m<sup>3</sup>
- Dimensional stability: length: + 0.1%; width: + 0.9% (24 hours in water 20°C)
- Resistance to Indentation - Brinell Hardness: ± 9.5 kg/mm<sup>2</sup> (average value - EN 1534)
- Reaction to fire: Class B-s1-d0 (EN 13501-1)<sup>1)</sup>
- Flame spread index: Class A (ASTM E84)
- Thermal emittance: 0.81 (ASTM C1371)<sup>2)</sup>
- Solar Reflectance (SR): 0.32 (ASTM C1549)<sup>2)</sup>
- Solar Reflectance Index (SRI): Low 27, Medium 30, High 33 (ASTM E1980)<sup>2)</sup>
- Modulus of Elasticity: 13565 N/mm<sup>2</sup> (mean value - EN 408)
- Bending strength: 54.4 N/mm<sup>2</sup> (characteristic value - EN 408)
- Biological durability: Class 1 (EN 350 / CEN/TS 15083-2), simulated graveyard test / Class 1 (EN 350 / CEN/TS 15083-1)
- Effectiveness against Blue Stain: Class O (EN 152)
- Effectiveness against European Termites: Class M (EN 350 / EN 117 - Coptotermes gestroi)
- Use Class: Class 4 (EN 335)
- CO<sub>2</sub> neutral: LCA report TU Delft (ISO 14040/44) ([www.moso-bamboo.com/lca](http://www.moso-bamboo.com/lca))
- Environmental Product Declaration - EPD (EN 15804) ([www.moso-bamboo.com/epd](http://www.moso-bamboo.com/epd))
- FSC®: Products available with FSC® certification on request.
- Contribution LEED BD+C - v4: MR 1, MR 2, MR 3 (FSC®), SS 7 v2009: MR 6, MR 7 (FSC®)
- Contribution BREEAM: MAT 1, MAT 3 (FSC®), MAT 5 (HD)
- Guarantee: 25 years

<sup>1)</sup> Tested on 18 mm thickness, without gaps between boards, with ventilation space behind boards.

<sup>2)</sup> Tested on 3 years weathered MOSO® Bamboo X-treme®.



Also available with  
FSC® certification.



The mark of  
responsible forestry  
FSC® C002063



breeam

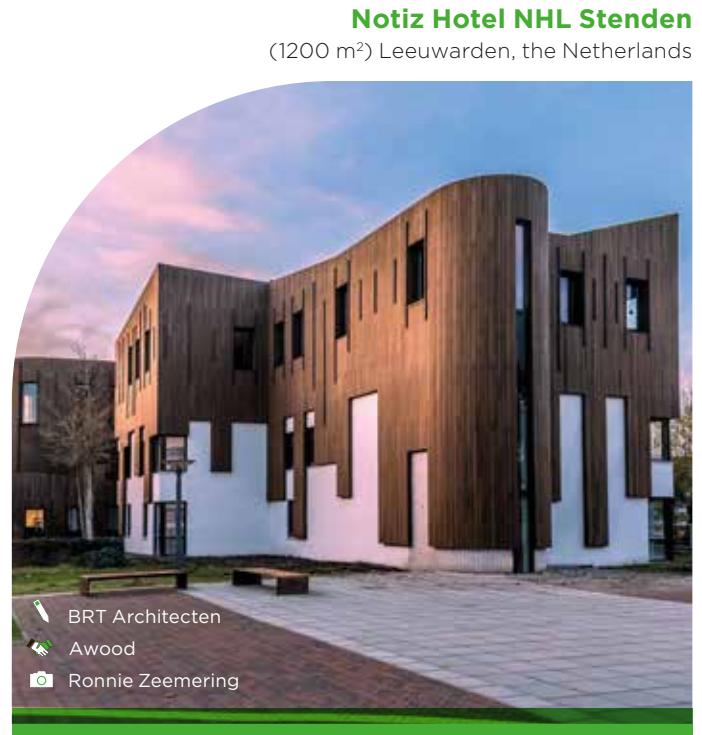


Grotius is a development by Provast, designed by MVRDV, realised by J.P. van Eesteren & Besix, photographed by Daria Scagliola.

#### **Grotius residential Towers** (2200 m<sup>2</sup>) The Hague, the Netherlands



**Water Authority Limburg**  
(600 m<sup>2</sup>) Roermond, the Netherlands



**Notiz Hotel NHL Stenden**  
(1200 m<sup>2</sup>) Leeuwarden, the Netherlands

BRT Architecten  
 Awood  
 Ronnie Zeemering

# MOSO® Bamboo X-treme® Varibo Outdoor Cladding

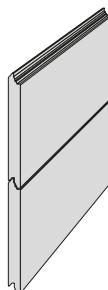
## Closed profile

MOSO® Bamboo X-treme® Closed Cladding are solid boards in various widths for exterior applications. The boards are made from bamboo strips that have been compressed and thermally modified at 200°C. This unique Thermo-Density® process provides MOSO® Bamboo X-treme® with the highest durability class possible in the appropriate EU norms, increases the stability and density, and consequently the hardness. Furthermore, contrary to wood products, this material achieves fire resistance Class B-s1-d0<sup>1)</sup> (EN 13501-1) without impregnation with expensive and eco-damaging fire retardants. MOSO® Bamboo X-treme® Cladding with the Closed profile is developed to meet the highest fire requirements and is installed with a hidden screw. A closed profile is also available for fast and easy installation with the GRAD® system\*. Like any tropical hardwood species, when exposed to outdoor conditions, Bamboo X-treme® will turn grey over time creating a very natural look.

**Closed profile**  
65 mm



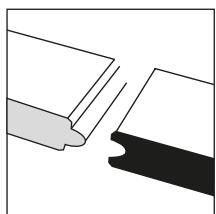
**Closed profile**  
137 mm



**Varibo Closed profile**



**End-matched**



Product Code	Shape	Finish	Surface	End-matched	Length edges	End edges	Effective width (mm)	Dimensions (mm)
BO-DTHT537	Closed	Unfinished	Flat	Yes	R1	2 mm x 45°	52,5	1850x65x18
BO-DTHT536	Closed	Unfinished	Flat	Yes	R1	2 mm x 45°	87,5	1850x100x18
BO-DTHT530	Closed	Unfinished	Flat	Yes	R1	2 mm x 45°	124,5	1850x137x18
BO-DTHT538	Closed	Unfinished	Flat	Yes	R1	2 mm x 45°	142,5	1850x155x18
BO-DTHT538-2	Closed	Unfinished	Flat with false groove	Yes	R1	2 mm x 45°	142,5	1850x155x18

### Installation

- MOSO® guarantees the bamboo material and the mounting materials (screw) it supplies but does not guarantee the connection with other materials (such as sub frame joist/battens). It is the responsibility of the installer to make sure the screw used matches such materials during the full lifetime of the product.
- Store in a cool and dry place away from direct sunlight, and protected from weather influences, dirt and dust.
- Full version available at: ► [www.moso-bamboo.com/closed](http://www.moso-bamboo.com/closed)

For more information about the GRAD® system please see the product datasheet Bamboo X-treme® Outdoor Cladding GRAD® profile or check our website:  
► [www.moso-bamboo.com/cladding/grad](http://www.moso-bamboo.com/cladding/grad)

### technical characteristics and certifications

- Density: ± 1150 kg/m<sup>3</sup>
- Dimensional stability: length: + 0.1%; width: + 0.9% (24 hours in water 20°C)
- Resistance to Indentation - Brinell Hardness: ± 9.5 kg/mm<sup>2</sup> (average value - EN 1534)
- Reaction to fire: Class B-s1-d0 (EN 13501-1)<sup>1)</sup>
- Flame spread index: Class A (ASTM E84)
- Thermal emittance: 0.81 (ASTM C1371)<sup>2)</sup>
- Solar Reflectance (SR): 0.32 (ASTM C1549)<sup>2)</sup>
- Solar Reflectance Index (SRI): Low 27, Medium 30, High 33 (ASTM E1980)<sup>2)</sup>
- Modulus of Elasticity: 13565 N/mm<sup>2</sup> (mean value - EN 408)
- Bending strength: 54.4 N/mm<sup>2</sup> (characteristic value - EN 408)
- Biological durability: Class 1 (EN 350 / CEN/TS 15083-2), simulated graveyard test / Class 1 (EN 350 / CEN/TS 15083-1)
- Effectiveness against Blue Stain: Class O (EN 152)
- Effectiveness against European Termites: Class M (EN 350 / EN 117 - Coptotermes gestroi)
- Use Class: Class 4 (EN 335)
- CO<sub>2</sub> neutral: LCA report TU Delft (ISO 14040/44) ([www.moso-bamboo.com/lca](http://www.moso-bamboo.com/lca))
- Environmental Product Declaration - EPD (EN 15804) ([www.moso-bamboo.com/epd](http://www.moso-bamboo.com/epd))
- FSC®: Products available with FSC® certification on request.
- Contribution LEED BD+C - v4: MR 1, MR 2, MR 3 (FSC®), SS 7  
v2009: MR 6, MR 7 (FSC®)
- Contribution BREEAM: MAT 1, MAT 3 (FSC®), MAT 5 (HD)
- Guarantee: 25 years

<sup>1)</sup> Tested on Bamboo X-treme® Closed profile 137x18 mm, with ventilation space behind the boards.

<sup>2)</sup> Tested on 3 years weathered MOSO® Bamboo X-treme®.



Also available with  
FSC® certification.



The mark of  
responsible forestry  
FSC® C002063



breeam



❖ A3GM Arquitectos  
📷 Javier Bravo

### Leisure Space Burgos Villacienzo, Burgos, Spain



**Garden House by Wouter Bink**  
(60 m<sup>2</sup>) Amersfoort, the Netherlands

### Public Elementary School "IKC"

(320 m<sup>2</sup>) Amsterdam, The Netherlands



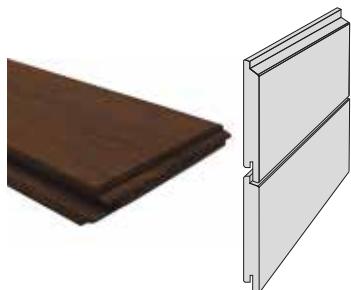
❖ Moke Architects  
📷 MOSO\*

# MOSO® Bamboo X-treme® Outdoor Cladding

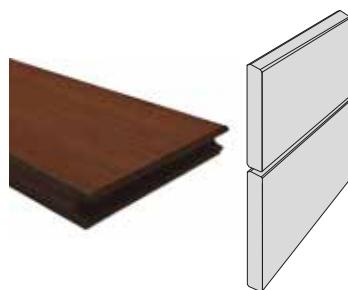
## Rebated & Trapezium profile

MOSO® Bamboo X-treme® Outdoor Cladding are solid boards in various widths for exterior applications. The boards are made from bamboo strips that have been compressed and thermally modified at 200°C. This unique Thermo-Density® process provides MOSO® Bamboo X-treme® with the highest durability class possible in the appropriate EU norms, increases the stability and density, and consequently the hardness. Furthermore, contrary to other wood products, this material can achieve fire resistance Class B-s1-d0<sup>1)</sup> (EN 13501-1) without impregnation with expensive and eco-damaging fire retardants. Bamboo X-treme® Cladding with the Rebated profile is made for installation with MOSO® Fasteners (18 mm) and screws and the Trapezium profile is made for installation with screws. Like any tropical hardwood species, when exposed to outdoor conditions, MOSO® Bamboo X-treme® will turn grey over time creating a natural look.

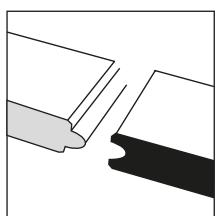
Rebated profile



Trapezium profile



End-matched



Product Code	Shape	Finish	Surface	End-matched	Length edges	End edges	Effective width (mm)*	Dimensions (mm)
BO-DTHT500G	Rebated profile	Unfinished	Flat	Yes	R3	2 mm x 45°	125	1850x137x18
BO-DTHT505G	Rebated profile	Unfinished	Flat	Yes	R3	2 mm x 45°	63	1850x75x18
BO-DTHT510	Trapezium profile	Unfinished	Flat	Yes	R3	2 mm x 45°	132	1850x137x18
BO-DTHT515	Trapezium profile	Unfinished	Flat	Yes	R3	2 mm x 45°	70	1850x75x18
BO-DTHT525	Trapezium profile	Unfinished	Flat	No	R1	1.5 mm x 45°	70	1850x75x12

\*) Effective width without gap between the boards, recommended gap 6 mm.

### Installation

- MOSO® guarantees the bamboo material and the mounting materials (fastener/screw) it supplies but does not guarantee the connection with other materials (such as sub frame joist/battens). It is the responsibility of the installer to make sure the used screw matches such materials during the full lifetime of the product.
- For installation with fasteners, the MOSO® Fasteners CLIP-SCREW-BX09 with screws and MOSO® Fasteners CLIP-BX09 without screws are available. More information about the MOSO® Fasteners can be found: ► [www.moso-bamboo.com/x-treme/accessories](http://www.moso-bamboo.com/x-treme/accessories)
- Store in a cool and dry place away from direct sunlight, and protected from weather influences, dirt and dust.
- Full version available at: ► [www.moso-bamboo.com/x-treme/cladding](http://www.moso-bamboo.com/x-treme/cladding)

### technical characteristics and certifications

- Density:  $\pm 1150 \text{ kg/m}^3$
- Dimensional stability: length:  $\pm 0.1\%$ ; width:  $\pm 0.9\%$  (24 hours in water 20°C)
- Resistance to Indentation - Brinell Hardness:  $\pm 9.5 \text{ kg/mm}^2$  (average value - EN 1534)
- Reaction to fire: Class B-s1-d0 (EN 13501-1)<sup>1)</sup>
- Flame spread index: Class A (ASTM E84)
- Thermal emittance: 0.81 (ASTM C1371)<sup>2)</sup>
- Solar Reflectance (SR): 0.32 (ASTM C1549)<sup>2)</sup>
- Solar Reflectance Index (SRI): Low 27, Medium 30, High 33 (ASTM E1980)<sup>2)</sup>
- Modulus of Elasticity: 13565 N/mm<sup>2</sup> (mean value - EN 408)
- Bending strength: 54.4 N/mm<sup>2</sup> (characteristic value - EN 408)
- Biological durability: Class 1 (EN 350 / CEN/TS 15083-2), simulated graveyard test / Class 1 (EN 350 / CEN/TS 15083-1)
- Effectiveness against Blue Stain: Class O (EN 152)
- Effectiveness against European Termites: Class M (EN 350 / EN 117 - Coptotermes gestroi)
- Use Class: Class 4 (EN 335)
- CO<sub>2</sub> neutral: LCA report TU Delft (ISO 14040/44) ([www.moso-bamboo.com/lca](http://www.moso-bamboo.com/lca))
- Environmental Product Declaration - EPD (EN 15804) ([www.moso-bamboo.com/epd](http://www.moso-bamboo.com/epd))
- FSC®: Products available with FSC® certification on request.
- Contribution LEED BD+C - v4: MR1, MR 2, MR 3 (FSC®), SS 7 v2009: MR 6, MR 7 (FSC®)
- Contribution BREEAM: MAT 1, MAT 3 (FSC®), MAT 5 (HD)
- Guarantee: 25 years

<sup>1)</sup> Tested on 18 mm thickness, without gaps between boards, with ventilation space behind boards.

<sup>2)</sup> Tested on 3 years weathered MOSO® Bamboo X-treme®.



Also available with FSC® certification.



The mark of responsible forestry  
FSC® C002063



breeam



Briga Company  
Lior Teitler

**Briga Towers Penthouses & Apartments** (10.000 m<sup>2</sup>) Netanya, Israel



**Private residence Del Mar**  
California, United States of America

**Apartments De Drie Hofsteden**  
(20.000 m<sup>2</sup>) Courtrai, Belgium

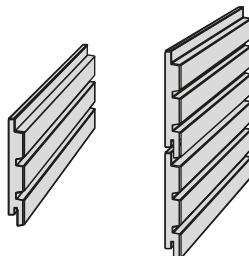


# MOSO® Bamboo X-treme® Outdoor Cladding

## Rhombus profile

MOSO® Bamboo X-treme® Rhombus Outdoor Cladding is a range of solid, Thermo-Density® exterior boards, made from compressed bamboo strips. A special, unique heat-treatment process at 200°C provides MOSO® Bamboo X-treme® with the highest durability class possible in the appropriate EU norms, increases the stability and density, and consequently the hardness. Furthermore, contrary to other wood products, this material can achieve fire resistance Class B-s1-d0<sup>1)</sup> (EN 13501-1) without impregnation with expensive and eco-damaging fire retardants. MOSO® Bamboo X-treme® Cladding with Rhombus profile can be fixed with MOSO® Fasteners (18 mm). Like any tropical hardwood species, when exposed to outdoor conditions, Bamboo X-treme® will turn grey over time creating a very natural look.

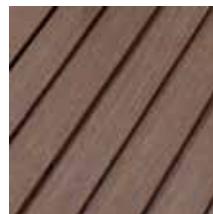
Triple Rhombus profile



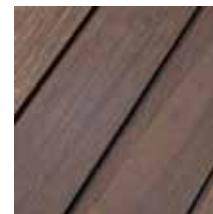
Triple Rhombus



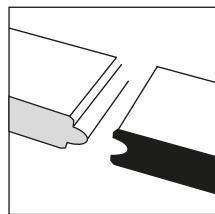
Double Rhombus



Single Rhombus



End-matched



Product Code	Shape	Finish	Surface	End-matched	Length edges	End edges	Effective width (mm)*	Dimensions (mm)
BO-DTHT520G	Triple Rhombus	Unfinished	Flat with 2 grooves	Yes	R1	2 mm x 45°	129	1850x137x20
BO-DTHT520G-2	Double Rhombus	Unfinished	Flat with 1 groove	Yes	R1	2 mm x 45°	129	1850x137x20
BO-DTHT520G-1	Single Rhombus	Unfinished	Flat	Yes	R1	2 mm x 45°	129	1850x137x20

\* Effective width without gap between the boards, recommended gap 6 mm.

### Installation

- MOSO® guarantees the bamboo material and the mounting materials (fastener/screw) it supplies but does not guarantee the connection with other materials (such as sub frame joist/battens). It is the responsibility of the installer to make sure the used screw matches such materials during the full lifetime of the product.
- For installation with fasteners, the MOSO® Fasteners CLIP-SCREW-BX09 with screws and MOSO® Fasteners CLIP-BX09 without screws are available. More information about the MOSO® Fasteners can be found: ► [www.moso-bamboo.com/x-treme/accessories](http://www.moso-bamboo.com/x-treme/accessories)
- Store in a cool and dry place away from direct sunlight, and protected from weather influences, dirt and dust.
- Full version available at: ► [www.moso-bamboo.com/rhombus](http://www.moso-bamboo.com/rhombus)

### technical characteristics and certifications

- Density: ± 1150 kg/m<sup>3</sup>
- Dimensional stability: length: + 0.1%; width: + 0.9% (24 hours in water 20°C)
- Resistance to Indentation - Brinell Hardness: ± 9.5 kg/mm<sup>2</sup> (average value - EN 1534)
- Reaction to fire: Class B-s1-d0 (EN 13501-1)<sup>1)</sup>
- Flame spread index: Class A (ASTM E84)
- Thermal emittance: 0.81 (ASTM C1371)<sup>2)</sup>
- Solar Reflectance (SR): 0.32 (ASTM C1549)<sup>2)</sup>
- Solar Reflectance Index (SRI): Low 27, Medium 30, High 33 (ASTM E1980)<sup>2)</sup>
- Modulus of Elasticity: 13565 N/mm<sup>2</sup> (mean value - EN 408)
- Bending strength: 54.4 N/mm<sup>2</sup> (characteristic value - EN 408)
- Biological durability: Class 1 (EN 350 / CEN/TS 15083-2), simulated graveyard test / Class 1 (EN 350 / CEN/TS 15083-1)
- Effectiveness against Blue Stain: Class O (EN 152)
- Effectiveness against European Termites: Class M (EN 350 / EN 117 - Coptotermes gestroi)
- Use Class: Class 4 (EN 335)
- CO<sub>2</sub> neutral: LCA report TU Delft (ISO 14040/44) ([www.moso-bamboo.com/lca](http://www.moso-bamboo.com/lca))
- Environmental Product Declaration - EPD (EN 15804) ([www.moso-bamboo.com/epd](http://www.moso-bamboo.com/epd))
- FSC®: Products available with FSC® certification on request.
- Contribution LEED BD+C - v4: MR 1, MR 2, MR 3 (FSC®), SS 7 v2009: MR 6, MR 7 (FSC®)
- Contribution BREEAM: MAT 1, MAT 3 (FSC®), MAT 5 (HD)
- Guarantee: 25 years

<sup>1)</sup> Tested on 18 mm thickness, without gaps between boards, with ventilation space behind boards.

<sup>2)</sup> Tested on 3 years weathered MOSO® Bamboo X-treme®.



Also available with  
FSC® certification.



The mark of  
responsible forestry  
FSC® C002063



breeam



TIM Exclusive Gardens  
 Awood  
 Olivr

**Luxurious garden with a touch of Bali** Arnhem, the Netherlands



**SPEEHUIS**  
(10.000 m<sup>2</sup>) Oisterwijk, the Netherlands



Restauro Architecten  
 Awood

**Oker Meeting Venue**  
(125 m<sup>2</sup>) Schipluiden, the Netherlands

# MOSO® Bamboo X-treme® Varibo Outdoor Cladding GRAD® profile

MOSO® Bamboo X-treme® GRAD® Cladding are solid boards in various widths for exterior applications. The boards are made from bamboo strips that have been compressed and thermally modified at 200°C. This unique Thermo-Density® process provides Bamboo X-treme® with the highest durability class possible in the appropriate EU norms, increases the stability and density, and consequently the hardness. MOSO® Bamboo X-treme® GRAD® Cladding is designed for installation on the GRAD® demountable and hidden installation system. Contrary to wood products, this material can achieve fire resistance without impregnation with expensive and eco-damaging fire retardants. The Closed profile achieves the fire resistance Class B-s1-d0<sup>1)</sup> (EN 13501-1) with the GRAD® installation system. Like any tropical hardwood species, when exposed to outdoor conditions, Bamboo X-treme® will turn grey over time creating a very natural look.



Product Code	Shape	Finish	Surface	End-matched	Length edges	End edges	Effective width (mm)*	Dimensions (mm)
BO-DTHT1180-BG	GRAD®	Unfinished	Flat	No	R3	2mm x 45°	45	1850x45x20
BO-DTHT1190-BG	GRAD®	Unfinished	Flat	No	R3	2mm x 45°	64	1850x64x20
BO-DTHT220-BG	GRAD®	Unfinished	Flat	No	R3	2mm x 45°	119	1850x119x20
BO-DTHT540-1-BG	GRAD®	Unfinished	Flat	Yes	R1	2mm x 45°	136	1850x136x20

\*) Effective width without gap between the boards, distance after installation on GRAD® system 6 mm (except for Closed profile).

## Installation

- Installation instructions are available from MOSO®: [www.moso-bamboo.com/cladding/grad](http://www.moso-bamboo.com/cladding/grad)
- MOSO® guarantees the bamboo material and the mounting materials (fastener/screw) it supplies but does not guarantee the connection with other materials (such as sub frame joist/battens). It is the responsibility of the installer to make sure the used installation method matches such materials during the full lifetime of the product.
- Store in a cool and dry place away from direct sunlight, and protected from weather influences, dirt and dust.
- Installation instructions for the GRAD® installation system are available from GRAD®: [www.gradconcept.com](http://www.gradconcept.com)

Flat Rail



## technical characteristics and certifications

- Density: ± 1150 kg/m<sup>3</sup>
- Dimensional stability: length: + 0.1%; width: + 0.9% (24 hours in water 20°C)
- Resistance to Indentation - Brinell Hardness: ± 9.5 kg/mm<sup>2</sup> (average value - EN 1534)
- Reaction to fire: Class B-s1-d0 (EN 13501-1)<sup>1)</sup>
- Flame spread index: Class A (ASTM E84)
- Thermal emittance: 0.81 (ASTM C1371)<sup>2)</sup>
- Solar Reflectance (SR): 0.32 (ASTM C1549)<sup>2)</sup>
- Solar Reflectance Index (SRI): Low 27, Medium 30, High 33 (ASTM E1980)<sup>2)</sup>
- Modulus of Elasticity: 13565 N/mm<sup>2</sup> (mean value - EN 408)
- Bending strength: 54.4 N/mm<sup>2</sup> (characteristic value - EN 408)
- Biological durability: Class 1 (EN 350 / CEN/TS 15083-2), simulated graveyard test / Class 1 (EN 350 / CEN/TS 15083-1)
- Effectiveness against Blue Stain: Class O (EN 152)
- Effectiveness against European Termites: Class M (EN 350 / EN 117 - Coptotermes gestroi)
- Use Class: Class 4 (EN 335)
- CO<sub>2</sub> neutral: LCA report TU Delft (ISO 14040/44) ([www.moso-bamboo.com/lca](http://www.moso-bamboo.com/lca))
- Environmental Product Declaration - EPD (EN 15804) ([www.moso-bamboo.com/epd](http://www.moso-bamboo.com/epd))
- FSC®: Products available with FSC® certification on request.
- Contribution LEED BD+C - v4: MR 1, MR 2, MR 3 (FSC®), SS 7 v2009: MR 6, MR 7 (FSC®)
- Contribution BREEAM: MAT 1, MAT 3 (FSC®), MAT 5 (HD)
- Guarantee: 25 years

<sup>1)</sup> Tested on 18 mm thickness, without gaps between boards, with ventilation space behind boards.

<sup>2)</sup> Tested on 3 years weathered MOSO® Bamboo X-treme®.



Also available with  
FSC® certification.



The mark of  
responsible  
forestry  
FSC® C002063

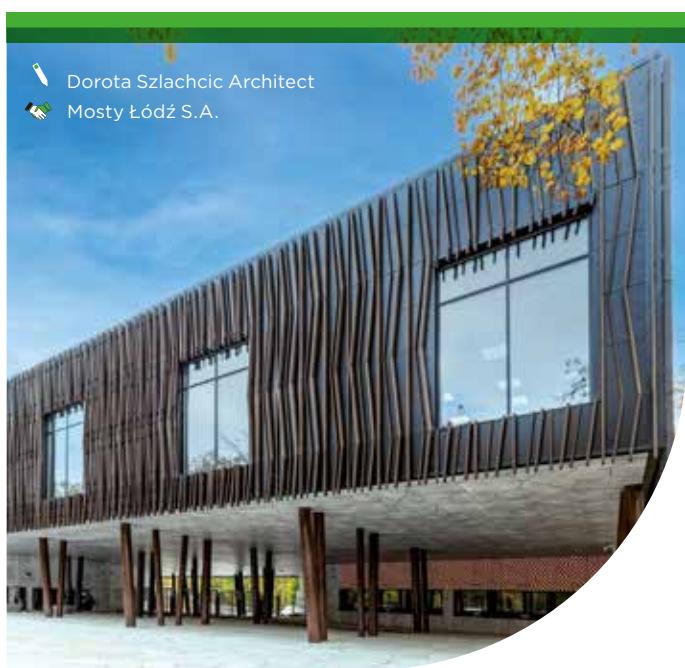


breeam



Stéphane Malka Architecture  
David Ducastel (Philéas Fotos)

**Event complex Oxygen La Défense** (5500 m) Paris, France



**Orientarium in the Municipal Zoological Garden**  
(43.000 m) Łódź, Poland



ÁBATON Arquitectura  
Gradhermetic  
Victoria Munoz

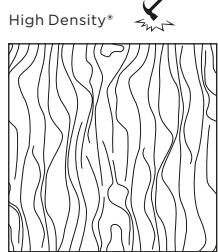
# MOSO® Bamboo X-treme® Outdoor Beams

A unique heat-treatment process at 200°C and compression of the bamboo strips to increase the density make the MOSO® Bamboo X-treme® material extremely durable and stable. This durability and stability, and the pre-profiled rounded edges, make MOSO® Bamboo X-treme® Beams ideal for use in outdoor furniture and facades. The elaborate manufacturing process provides MOSO® Bamboo X-treme® Outdoor Beams with the highest durability class possible in the applicable EU norms. As with tropical hardwoods, the colour of the material changes under the influence of wind, rain, frost and sunshine (UV-light). This results in a typical weathered natural grey-tone. Regular cleaning and maintenance with a finish/sealer protects the material against this weather related discolouration.

**BO-DTHT2171-2-01**  
2000 x 80 x 40 mm



**BO-DTHT2173-2-01**  
2000 x 40 x 40 mm



Product Code	Finish	Edges (also on ends)	Dimensions (mm)
BO-DTHT2170-2-01	Sikkens Cetol	R4	2000x115x40
BO-DTHT2175-2-01	Sikkens Cetol	R4	2000x90x40
BO-DTHT2171-2-01	Sikkens Cetol	R4	2000x80x40
BO-DTHT2172-2-01	Sikkens Cetol	R4	2000x60x40
BO-DTHT2174-2-01	Sikkens Cetol	R4	2000x55x40
BO-DTHT2173-2-01	Sikkens Cetol	R4	2000x40x40

Other dimensions, bevel and finish can be produced custom made.

## Installation summary

- To allow natural shrink- and swell behaviour, install beams with a minimum of 4 mm distance.
- MOSO® Bamboo X-treme® Beams must be mechanically fixed, using screws/bolts. The fixing method depends on the application.
- Use stainless steel A2 screws/bolts.
- For all our standard size beams, except 40x40 mm, we advise a minimum of 2 screws per fixing point. 40x40 mm beams can be fixed with 1 screw per fixing point.
- Horizontal installation:
  - The number of fixing points is depending on the application and applicable load.
  - In general, a 2 meter beam should at least have 3 fixing points (2 on the sides and 1 connection in the middle).
- Vertical installation:
  - End of the beam should be angled (min. 15°) to improve water drainage.
  - Beams longer than 1 meter have to be fixed in at least 3 points.
- To avoid cracks caused by excessive water uptake, the (cut) ends of the beams must be treated with a sealer.
- Store in a cool and dry place away from direct sunlight, and protected from weather influences, dirt and dust.
- Full version available at ► [www.moso-bamboo.com/x-treme/beams](http://www.moso-bamboo.com/x-treme/beams)

## technical characteristics and certifications

- Density: ± 1150 kg/m<sup>3</sup>
- Dimensional stability: length: + 0,1%; width + 0,9% (24 hours in water 20°C)
- Resistance to Indentation - Brinell Hardness: ± 9.5 kg/mm<sup>2</sup> (average value - EN 1534)
- Reaction to fire: Class B-s1-d0<sup>1)</sup> (EN 13501-1), applicable as a material test
- Flame spread index: Class A (ASTM E84)
- Thermal emittance: 0.81 (ASTM C1371)<sup>2)</sup>
- Solar Reflectance (SR) 0.32 (ASTM C1549)<sup>2)</sup>
- Solar Reflectance Index (SRI): Low 27, Medium 30, High 33 (ASTM E1980)<sup>2)</sup>
- Modulus of Elasticity: 13565 N/mm<sup>2</sup> (mean value - EN 408)
- Bending strength: 54.4 N/mm<sup>2</sup> (characteristic value - EN 408)
- Biological durability: Class 1 (EN 350 / CEN/TS 15083-2), simulated graveyard test  
Class 1 (EN 350 / CEN/TS 15083-1)
- Effectiveness against Blue Stain: Class O (EN 152)
- Effectiveness against European Termites: Class M (EN 350 / EN 117 - Coptotermes gestroi)
- Use Class: Class 4 (EN 335)
- CO<sub>2</sub> neutral: LCA report TU Delft (ISO 14040/44) ([www.moso-bamboo.com/lca](http://www.moso-bamboo.com/lca))
- Environmental Product Declaration - EPD (EN 15804) ([www.moso-bamboo.com/epd](http://www.moso-bamboo.com/epd))
- FSC<sup>®</sup>: Products available with FSC<sup>®</sup> certification on request.
- Contribution LEED BD+C - v4: MR 1, MR 2, MR 3 (FSC<sup>®</sup>), SS 7 v2009: MR 6, MR 7 (FSC<sup>®</sup>)
- Contribution BREEAM: MAT 1, MAT 3 (FSC<sup>®</sup>), MAT 5 (HD)
- Guarantee: 10 years

<sup>1)</sup> Tested on panel material with 18 mm thickness, without gaps between boards, with ventilation space behind boards.

<sup>2)</sup> Tested on 3 years weathered MOSO® Bamboo X-treme®.



Also available with  
FSC<sup>®</sup> certification.



The mark of  
responsible forestry  
FSC<sup>®</sup> C002063



breeam

# MOSO® Bamboo X-treme®

## test results



The excellent performance of MOSO® Bamboo X-treme® has been extensively tested by acknowledged research institutes. Find a summary of the most important test results below. Full reports are available upon request. **Only MOSO® can ensure you have the original, unique Bamboo X-treme® product.** Other products that copy the original do not offer the same hardness and level of durability, dimensional stability and ecology. With a look-alike product, there is a large risk of claims after installation. Always ask for the original, certified MOSO® Bamboo X-treme® products!



Durability of MOSO Bamboo X-treme, *Heat Treated Strand Woven Bamboo*: resistance against soft-rotting micro fungi according to CEN/TS 15083-2

Report code: 17.0083-C

Date: 29 March 2017

Page: 8/14

According to EN 350, the durability class is determined based on the x-value. To calculate the x-value, the median mass loss of the test species is compared to the median mass loss of the Beech or Pine references. Hardwoods are compared to Beech, Softwoods are compared to Pine. As Bamboo is neither softwood nor hardwood a comparison is made with both reference wood species Pine sapwood and Beech.

Based on the mass loss found and the comparison to Beech and Pine, the tested MOSO Bamboo X-treme, *Heat Treated Strand Woven Bamboo*, can be classified in durability class 1 when using the method described in EN 350.

MOSO Bamboo X-treme, *Heat Treated Strand Woven Bamboo*, performs comparable to Azobé and Merbau. Little variance is found between the different boards.

### durability

CEN/TS 15083-2  
(ENV 807) /  
EN 350

class 1



Durability of heat treated strand woven bamboo: resistance against degradation by Basidiomycetes according to EN 350 and CEN/TS 15083-1

Report code: 17.0083-B

Date: 29 March 2017

Page: 8/14

According to EN 350, the durability class is calculated based on the mass loss obtained with the fungus resulting in the highest median mass loss. For all fungi the mass loss is less than 5%. This implies that, when using the EN 350 to determine the durability, MOSO Bamboo X-treme, *Heat Treated Strand Woven Bamboo* can be classified in durability class 1.

### durability

CEN/TS 15083-1  
(EN 113) /  
EN 350

class 1



Resistance of Heat Treated Strand Woven Bamboo against blue staining fungi

Report code: 9.061-E

8 September, 2009

Page: 10/10

### 4 Conclusion

On behalf of Moso International BV an EN 152 blue stain test was performed on Heat Treated Strand Woven bamboo. UV-weathering was used as preconditioning of part of the samples. The combination of UV light and water spray resulted in strong discoloration of the surfaces of both the bamboo samples and the Pine sapwood reference samples.

Neither on the weathered nor on the original Bamboo samples discoloration of the blue stain fungi or the hyphae of the blue stain fungi could be observed. As a result it can be concluded that the susceptibility of this Heat Treated Strand Woven Bamboo towards blue stain is very low.

### resistance against blue staining fungi

EN 152

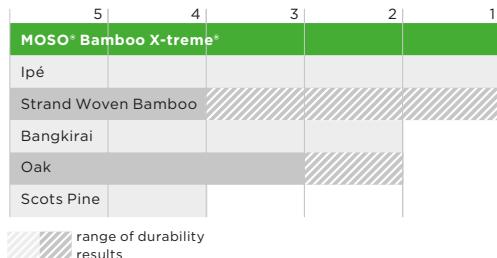
class 0

## harder and more durable than almost any other hardwood

### durability class

#### class 1

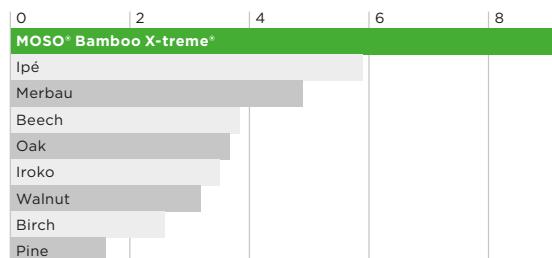
(EN 350 (CEN/TS 15083-2 / CEN/TS 15083-1)



### average brinell hardness

± 9.5 kg/mm<sup>2</sup>

(EN 1534)



Classification Durability Class					
Use Class	1. very durable	2. durable	3. moderately durable	4. slightly durable	5. not durable
1 interior	o	o	o	o	o
2 moist interior	o	o	o	(o)	(o)
3 exterior, above ground	o	o	(o)	(o)-(x)	(o)-(x)
4 ground contact / fresh water	o	(o)	(x)	x	x
5 salt water	*	(x)	(x)	x	x

o Natural durability sufficient.

(o) Natural durability normally sufficient, but for certain end uses treatment may be advisable.

(o)-(x) Natural durability may be sufficient, but depending on end use, preservative treatment may be necessary.

(x) Preservative treatment is normally advisable.

x Preservative treatment necessary.

\*

Natural durability of Bamboo X-treme® not tested in salt water.

Efectis

Efectis Nederland BV  
2013-02-01/2022-02-01 (Rev 2)  
February 2020  
MOSO International BV

CLASSIFICATION

4.2 CLASSIFICATION

The product, MOSO® Bamboo X-treme, in relation to its reaction to fire behaviour is classified: B

The additional classification in relation to smoke production is: s1

The additional classification in relation to flaming droplets / particles is: d0

Reaction to fire classification: B – s1, d0

Classification ASTM E84		
Classification	Flame Spread Index	Smoke Developed Index
A	0 - 25	0 - 450
B	26 - 75	0 - 450
C	76 - 200	0 - 450

**Carbon footprint (kg CO<sub>2</sub> eqv.) per m<sup>2</sup> during product lifespan**

CSC*	PRODUCTION**	TRANSPORT	TOTAL
-31,84	24,457	5,198	-2,185

\* Construction Stored Carbon  
\*\* Production includes all elements of making 1 m<sup>2</sup> of product, such as the raw materials, transportation to factory, production processes, waste.  
\*\*\* End of Life takes all elements of the end of life into consideration, such as the credit received for energy recovery as well as the negative impact of incineration.

In line with circular economy principles, MOSO® always recommends trying to upcycle or repurpose your bamboo products at the end of their life and looks at incineration as a worst case scenario. In 2021 MOSO® fully investigated bamboo incineration for green energy production together with Renewi (Dutch waste company) and confirmed that MOSO® Bamboo Products are classified as B grade wood (in the Netherlands) and can be safely burnt in an incineration plant for energy recovery.

The life cycle and the carbon footprint of MOSO® Products are evaluated according to ISO 14040/44.  
For more information: [www.moso-bamboo.com/ica](http://www.moso-bamboo.com/ica)  
The full report is available on request.  
Confidential - This information is the property of Moso International BV, Zwaag, The Netherlands. Any use or reproduction without permission will be prosecuted.

**Carbon footprint (kg CO<sub>2</sub> eqv.) per m<sup>2</sup> after incineration**

CSC RELEASED	END OF LIFE***	TOTAL
31,84	-6,003	23,65

**experts in sustainability**  
**nibe**

Author:  
NIBE experts in sustainability  
Dr. ir. Pablo van der Ligt, Sustainability Manager Moso International B.V.  
N. Nicholson, Sustainability Specialist Moso International B.V.

### durability

EN 350 (CEN/TS 15083-2 / CEN/TS 15083-1)

#### class 1

### use/risk class

EN 335

#### class 4

### fire resistance

EN 13501-1

#### class B-s1-d0

### reaction to fire

(FSI 25 / SDI 45)

#### ASTM E84

#### class A

WUI approved

CAN/ULC-S102

### carbon footprint

ISO 14040/44

#### CO<sub>2</sub> neutral

# the sustainability of Bamboo X-treme®

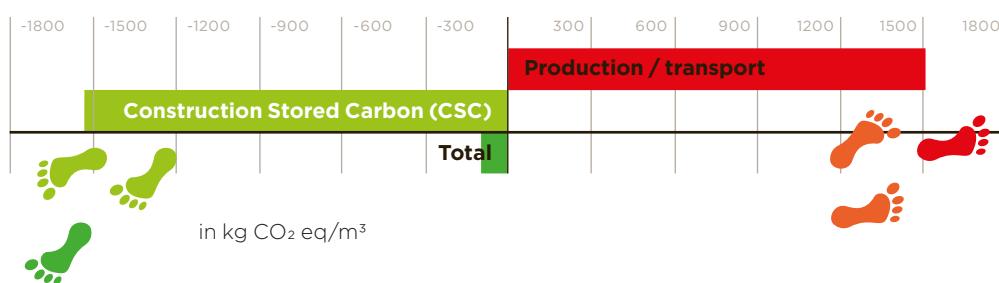
MOSO® Bamboo X-treme® offers clear sustainable advantages and is even proven to be CO<sub>2</sub> neutral during the product lifespan! The inclusion of Bamboo X-treme® contributes to a higher LEED, BREEAM, Green Star, HQE and DGNB certification score for green building projects. That's one of the reasons why you can find MOSO® Bamboo X-treme® and other MOSO® Products in many sustainable reference projects all over the world.

## carbon footprint

### MOSO® Bamboo X-treme®: CO<sub>2</sub> neutral during the product lifespan\*

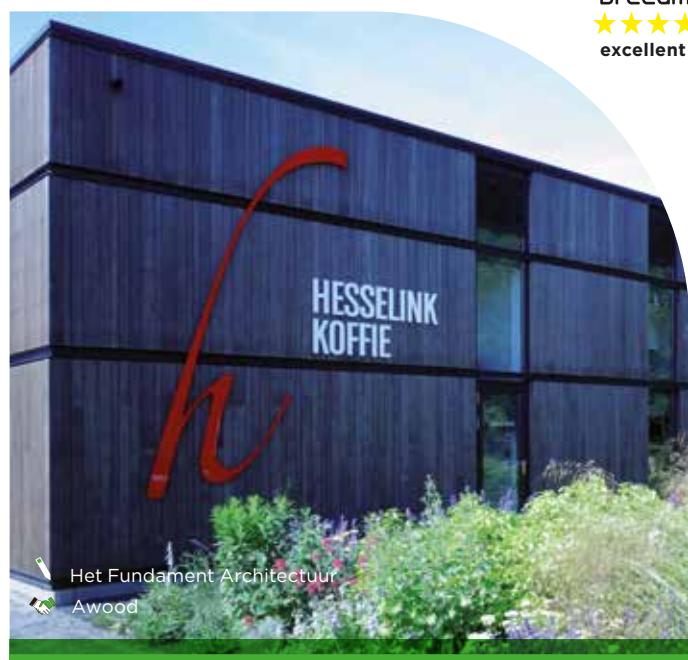
MOSO® has conducted several LCA studies, including carbon footprint studies, together with Delft University of Technology (TU Delft) and NIBE (LCA experts). The 2015 LCA report, available at [www.moso-bamboo.com/lca](http://www.moso-bamboo.com/lca), was the first of its kind and resulted in many new findings about the carbon footprint of bamboo products. The environmental impact of MOSO® Bamboo Products, excluding the carbon sequestration effect, has also been published in 2016 and updated in 2022 in an official Environmental Product Declaration (EPD) following EN 15804 ([www.moso-bamboo.com/epd](http://www.moso-bamboo.com/epd)).

\* This includes the CO<sub>2</sub> (biogenic carbon - EN 16449) stored in the product.



### Office Hesselink Koffie (Coffee Roastery)

BREEAM - Winterswijk, the Netherlands

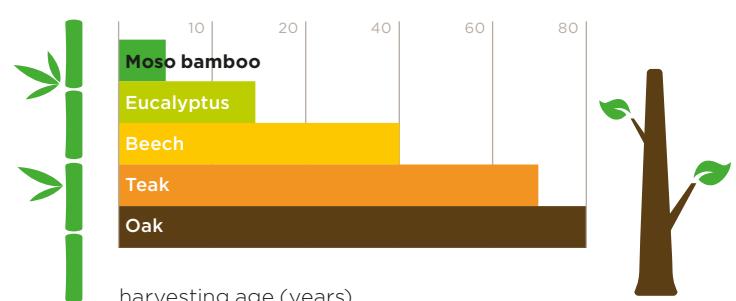


breeam  
★★★★★  
excellent

## unsurpassed growing speed

### bamboo: the fastest growing plant in the world

Because of the fast growth, Moso bamboo is managed as an agricultural crop: the annual harvest of the 4 to 5-year-old stems - compared to 60-80 years for tropical hardwood! - provides a steady annual income to farmers and stimulates the bamboo plant to reproduce even faster. Therefore, by default, no deforestation occurs with production of MOSO® Bamboo X-treme®, while large amounts of CO<sub>2</sub> are captured in the bamboo forests and products ([www.inbar.int/understanding-bamboos-climate-change-potential](http://www.inbar.int/understanding-bamboos-climate-change-potential)).

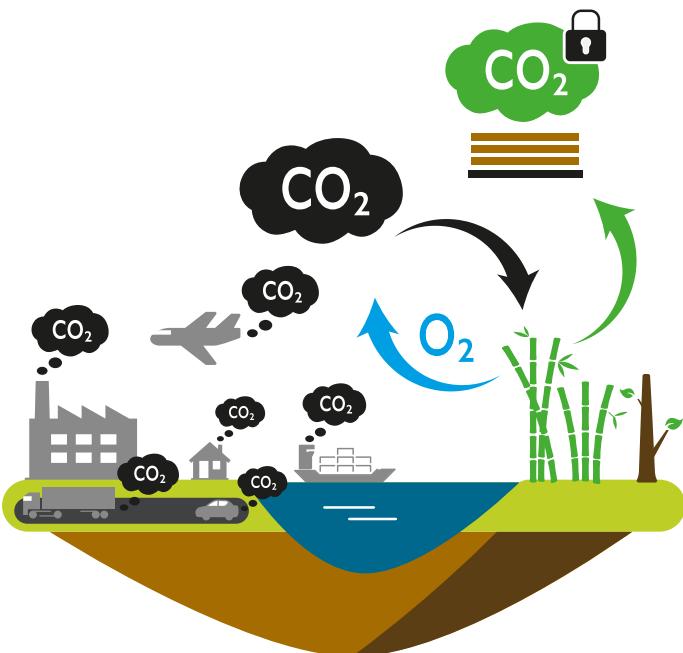




## carbon storage in bamboo

### biobased materials act as CO<sub>2</sub> sinks

Through photosynthesis, plants absorb carbon dioxide (CO<sub>2</sub>) and convert it into glucose (building block for biomass) and oxygen. The CO<sub>2</sub> is stored in the material for the lifetime of the product, and even longer if the product is recycled into new, durable products. Due to the fast growth - and related high yields - Moso bamboo locks far more CO<sub>2</sub> in durable products compared to wood species. The locked amount of CO<sub>2</sub> can be calculated rather simply by looking at the density of the material and taking into account the biobased content. For example, Bamboo X-treme® locks almost 1.660 kg CO<sub>2</sub> per m<sup>3</sup> of bamboo, which is the equivalent of the CO<sub>2</sub> emissions of 14.000 km driven by a mid-range car.



Check out how bamboo can save the world at:  
[www.moso-bamboo.com/sustainability](http://www.moso-bamboo.com/sustainability)



**Notiz Hotel NHL Stenden** - Green Key Award Gold  
(1200 m<sup>2</sup>) Leeuwarden, the Netherlands



Contributes to a higher score for green building projects worldwide



**Alfonso X residential building** - ASPRIMA-SIMA Award  
(5100 m<sup>2</sup>) Madrid, Spain

# MOSO® Bamboo X-treme® Outdoor Cladding user information

## appearance and colour

MOSO® Bamboo X-treme® is a natural product, which can vary in colour, grain and appearance. Colour will change over time depending on the maintenance schedule. The boards have a brown to dark brown colour when installed, which turns into a lighter caramel colour several weeks after installation. Without further maintenance the colour gets greyish relatively fast (similar to most other wood species).

If a brown colour is preferred, maintenance should be done with an exterior finish. For further details see the installation instructions.

MOSO® Bamboo X-treme® shows similarity to other hardwoods in grain and structure. The characteristic bamboo nodes however can still be recognised and provide the product with a special and lively look.

## normal phenomena

Cracks on the surface and on the ends of the boards can occur due to the different drying characteristics of the surface and board ends. This does not affect the stability or durability of the board.

The surface side of the boards will become rougher over time and can form (small) splinters as a result of continuous water absorption and desorption due to dry and wet weather periods. Dimensional change or cupping of the boards can occur after installation. These phenomena are normal for most hardwood species and MOSO® Bamboo X-treme®.

After installation, there might be some bleeding or leaching of colour from the bamboo material when it gets wet, e.g. when it rains. This possible bleeding is typical for wood and will disappear over time. The brownish liquid can easily be cleaned from the Bamboo X-treme® material, however controlled water drainage and prevention of splash water is required to prevent any discoloration of surrounding or underlying building components.

**Luxurious garden** Cladding installed with Grad's invisible rail installation system - Arnhem, the Netherlands



Endless  
possibilities with  
**MOSO® Bamboo**  
**X-treme®**



**Grotius residential towers** Closed cladding installed at the crown of the buildings - The Hague, the Netherlands



Since 2008 over  
6 million m<sup>2</sup> decking  
and cladding installed in  
more than 60 countries

 Moke Architects  
 MOSO®

**Public Elementary School “IKC”** Photo taken 5 years  
after installation - (320 m<sup>2</sup>) Amsterdam, The Netherlands

**Jumbo Head office** Photo taken 5 years after installation  
(2.500 m<sup>2</sup>) Schiedam, The Netherlands



**Oxygen La Défense** Photo taken 4 years after installation  
(5500 m<sup>2</sup>) Paris, France

## Office Hesselink (Coffee Roastery)

(200 m<sup>2</sup> Varibo) Winterswijk, Netherlands



## Housing project De Krijgsman

(320 m<sup>2</sup> Closed) Muiden, Netherlands



## Leisure Space Burgos

(120 m<sup>2</sup>) Villacienzo, Burgos, Spain



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