MOSO bamboo x-treme
the next generation in decking
With the introduction of Bamboo X-treme, MOSO has developed a truly ecological and durable alternative for increasingly scarce tropical hardwood. MOSO uses a unique patented process to alter the hardness, dimensional stability and durability to a level superior to the best tropical hardwood species. Although Bamboo X-treme may be used in several outdoor applications, at the moment the main use is for terrace decking.

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Since centuries bamboo poles and bamboo components are used in outdoor circumstances. Unfortunately many additional protective measurements are needed to guarantee a sufficient and acceptable lifetime. In dry circumstances poles will crack and the bamboo inner wood material, due to its high “sugar”-components, will be easily attacked by micro-organisms and fungi. In the land of origin bamboo can be replaced fast and cost efficient, but in Western countries this is not an option. Therefore, wouldn’t it be great to find a way to use one of the fastest growing plants on earth as an alternative for scarce hardwood species and to make the material suitable for outdoor applications?

With this challenge MOSO started to research and test various existing methods to protect bamboo in outdoor circumstances. The initial tested wood protection methods, which are also often used by other bamboo suppliers, were not satisfying and did not perform according to MOSO’s quality standard. Therefore MOSO decided to develop its own way to solve the problem by modifying the density of the bamboo and combining this with a special heat treatment process to improve the durability and stability of bamboo, referred to as “density-thermo treatment” in this text. In 2008 MOSO’s invention is registered internationally. The patent registration is currently in a PCT Procedure which will finally lead to patent registration in all European countries and several countries worldwide. In 2009 the relevant laboratory and practical tests were done, which proved that the density-thermo treatment is the right method (and currently the only efficient solution) to make bamboo suitable for outdoor applications.

untreated bamboo has a durability class 5 according to EN350 (not durable). By modifying the bamboo with the density-thermo treatment, the dimensional stability of bamboo is improved with almost 50%. Besides stability improvement, the durability is improved to the best durability class possible, from class 5 to class 1 (ENV807 class 1, EN113 class 1 according to EN350).

The density heat treated bamboo is also very well protected against superficial fungi (EN152, Class 0). This bamboo outdoor product reaches, as only bamboo material available on the market, the use/risk class 4 according to the EN335, which means it can be used in direct fresh water contact, direct earth contact and it does not need any additional treatment.

Doesn’t the density-thermo process compromise the environmental sustainability of this product? No it does not: MOSO commissioned Delft University of Technology to execute an official LCA and carbon footprint study according to ISO 14040/44. The report, available on request, concludes that this bamboo outdoor product is CO2 neutral or better over the full life cycle. In fact, because of the superior durability, the product does not have to be replaced as often as other hardwood species while at the same time taking advantage of the enormous growth capacity of giant bamboo.

The special high density pressing (increasing the density from 650-700kg/m³ to approx. 1200kg/m³) will more than compensate the disadvantage of material brittleness of heat treated bamboo, and will strongly improve the hardness of this product. After pressing, the material is stronger and harder than almost any other hardwood in the world. That is why we call it: Bamboo X-treme.

discover the bamboo x-treme benefits

**hard & durable**
- Class 1, in accordance with EN113 (use/risk class).
- Density heat treated bamboo: significantly stronger than almost any other hardwood in the world.
- Density heat treated bamboo: significantly harder than almost any other hardwood in the world.
- Durability Class 4 in accordance with EN350 (use/risk class).
- Class 0 fungi resistance in accordance with EN807.
- Exceptionally hard, Brinell 9.5kg/mm² (hardest wood available).

**high stability**
- Very stable as a result of the thermo treatment combined with high density compression.
- More stable than Bangaliria (yellow balau) and other tropical hardwoods.
- Limited tendency to torsion.
- No head side gap between boards necessary.
- Only 5-6mm expansion space between the sides of the boards.
- Possibility to use pressure impregnated pine as sub frame.

**easy to install**
- 2 installation possibilities with just 1 product: fastener installation or screw down.
- Both sides of the board - ribbed or flat - can be used.
- Fixed board length: Treatment sub frame is flexible installation. No head side tongue and groove for flexible installation.
- Macro bevel on head side, avoiding sharp edges.
- Complementing density-thermo sub frame joints available.
- Tapper 48.66 semi-approx. 1100kg, therefore easy for transportation and stocking.

**economical**
- Simple and fast installation. Up to 30% savings in cost!
- Reduced loss of material during installation, because of the head side tongue and groove.
- Every plank has been hand checked after production, therefore no loss of material.
- Cost effective transportation because of the fixed 1850mm length.
- Cost effective and space reducing stocking because of unique multi usable board.

**beautiful appearance**
- A beautiful, natural bamboo look.
- Customer choice for flat or ribbed surface.
- With faster installation no damage of the boards by screw holes.
- Free of knots and natural plant resins.
- Customer choice for natural greying or keeping brown colour with maintenance.

**endless resource**
- Made from MOSO’s bamboo, with a growing speed of up to 1 meter per day, the fastest growing plant on earth.
- Ready for harvest after 5 years (compared to up to 100 years for hardwood species).
- Consisting of approx. 40% natural bamboo fibres.

**CO₂ neutral**
- Official LCA and carbon footprint studies by Technical University Delft according to ISO 14040/44 confirms that Bamboo X-treme is CO₂ neutral or better over the full life cycle.
- No use of fungicide in the production.

**warranted quality**
- Bamboo X-treme decking is of the highest quality and comes with a product guarantee of 10 years.
- Patented MOSO product.
- BR-51 fire safety classification according to EN13501-1.

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**durability class according to EN350 (ENV807/EN113)**

<table>
<thead>
<tr>
<th>material</th>
<th>durability class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Scots Pine</td>
<td>Class 3</td>
</tr>
<tr>
<td>Oak</td>
<td>Class 3</td>
</tr>
<tr>
<td>Strand Woven Bamboo</td>
<td>Class 3</td>
</tr>
<tr>
<td>Moso Bamboo X-treme</td>
<td>Class 1-4</td>
</tr>
</tbody>
</table>

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**MOSO Bamboo X-treme**

- **light weight**: 1 pallet = 48.66 sqm approx. 1100kg.
- **fixed board length**: 1850mm.
- **planks necessary**: 1 plank = 125mm x 1850mm.
- **fastener installation**: Up to 30% savings in cost.
- **tapered countersunk**: Perimeter boards are required for a perfect finish.
- **tapered countersunk**: Perimeter boards are required for a perfect finish.
- **No damage**: Of the boards by screw holes.
- **Shortest possible distance**: Between boards.
- **Cost effective**: And space saving.
- **Versatile**: Fastener installation or screw down.
- **products available**: MOSO’s density heat treated bamboo.

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**density thermo treatment process**

- **before (left)**: Properly dried, contain plant resins, the sugar molecules are still visible, after the treatment they have disappeared. With this treatment bamboo is no longer a feeding place for fungi and microorganisms.
- **after (right)**: Properly dried, contain plant resins, the sugar molecules are still visible, after the treatment they have disappeared. With this treatment bamboo is no longer a feeding place for fungi and microorganisms.
MOSO Bamboo X-treme is a solid, high density bamboo board, made from compressed bamboo strips. Bamboo X-treme is suitable for outdoor applications, especially as decking. A special, patented heat treatment process provides Bamboo X-treme the highest durability class possible in the appropriate EU norms (see technical characteristics below) and increases the density - making it very hard. The special symmetrical shape of the sides offers the possibility to choose between either the ribbed or the flat surface, and allows for quick installation with MOSO fasteners. Like any untreated tropical hardwood species, when exposed to outdoor circumstances, Bamboo X-treme will turn grey over time creating a very natural look.

**installation summary** (full version available on www.moso.eu)
- Install a suitable, stable and durable sub frame.
- Determine which side of the board will be used: the ribbed or flat side.
- Fix the boards on the sub frame using fasteners (to be inserted in the grooves of the board) or alternatively with screws (through the surface).
- Use a 1.5% slope and make sure good ventilation is secured.
- After installation: make sure proper cleaning and maintenance is done, fitting to the chosen finish.
- When not applying outdoor oil 2x per year, the floor will acquire a grey colour tone and the typical bamboo wood grain structure will become less visible.
- Bamboo X-treme is available pre-oiled or unfinished.
- For further info: please see the installation/maintenance instructions.

**technical characteristics**
- Density: \( \frac{4}{6} \times 1200 \text{ kg/m}^3 \)
- Dimensional stability: length: \( +0.1 \% \), width: \( +0.9 \% \) (24 hours in water 20°C)
- Resistance to indentation: Brinell Hardness: \( \geq 9.5 \text{ kg/mm}^2 \) (EN 152)
- Reaction to fire: Class Bfl-s1 (EN 13501-1)
- Modulus of Elasticity: \( 10^{3} \text{ N/mm}^2 \) (EN 408)
- Breaking strength: \( 50 \text{ N/mm}^2 \) (EN 408)
- Biological durability: 1 (EN 350 / EN 807)
- Effectiveness against Blue Stain: Class 0 (EN 152)
- Use Class: 4 (EN 335)

**accessories**

### MOSO® fastener and screw
With these fasteners Bamboo X-treme decking can be easily installed. When installed correctly there will be 5-6mm gaps between the boards. The fastener is supplied with matching stainless steel screws (square bit).

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Item</th>
<th>Material</th>
<th>Color</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CLIP-SCREW-BX03</td>
<td>Fastener</td>
<td>Stainless steel A2 (AISI304)</td>
<td>Brown</td>
<td>27x22,5x10,8</td>
</tr>
<tr>
<td>CLIP-SCREW-BX03</td>
<td>Screw</td>
<td>Stainless steel A2 (AISI304)</td>
<td>Black</td>
<td>4.5x50</td>
</tr>
</tbody>
</table>

### sub frame joists
The Bamboo X-treme sub frame joists are made of the same material as the decking boards: high density heat treated bamboo.

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Material</th>
<th>Finish</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BO-SB50</td>
<td>High density heat treated bamboo</td>
<td>Unfinished</td>
<td>2440x70x40</td>
</tr>
</tbody>
</table>

### endprofile
The BO-DTHT162 is an endprofile for an elegant finish of the sides of the decking. It is placed vertically against the sides of the terrace to cover the sub frame.

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Material</th>
<th>Finish</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BO-DTHT162</td>
<td>High density heat treated bamboo</td>
<td>Unfinished</td>
<td>1850x137x20</td>
</tr>
</tbody>
</table>

### broom stick and disk
the silicium carbid broom and machine disk are perfectly suited to clean and smoothen the decking surface of Bamboo X-treme and to remove splinters due to the capability to sand the surface in addition to cleaning it.

<table>
<thead>
<tr>
<th>Product Code</th>
<th>Material</th>
<th>Finish</th>
<th>Dimensions (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disk-01</td>
<td>16” Silicium carbid disk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Broom-01</td>
<td>Silicium carbid broom</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Venco Campus - The Netherlands (BREEAM Excellent)
Paal 17 - Texel The Netherlands
Hotel Riberach - Belesta France
Lentini’s restaurant - Torino Italy
private home - Lyon France
Bijenkorf - Amsterdam the Netherlands

400m²
1200m²
200m²
200m²
120m²
Installation Instructions

Before Installation
- Waterlogging under the decking must be avoided by providing a permeable substructure. This can be achieved by sand layers and gravel dispersion above.
- There should be (removable) stone tiles 40-50mm thick to distribute the pressure of the sub-frame. See drawing.
- Install the decking boards with a slope of 1:12 to enable water to run off the surface.
- Secure good ventilation of the decking by the sub frame. See drawing.
- Cracks and splinters on the surface and on the ends of the boards will arise from the different drying characteristics of the surface and cross cut ends. Besides this the surface gets rough. This phenomenon is normal for most wood species and is minimized upon product by its patented ‘Density-Therm’ production method. Head sides cracks can be further minimized by applying wax on cross end sides of the cut boards, see below:
- Splinters and roughness can be removed by cleaning the surface of the decking with the sikkim carbide broom or machine disk. (Please apply, the surface will become smooth and splinters are removed.)
- Dimensional change or cupping of the boards can occur after installation. This phenomenon is normal for most wood species and is minimized for this product by its patented density-heat treated production method.
- When using the flat side of the boards for the installation please note that deformation under influence of climate will be significantly more visible. Deformation of the surface is not considered to be fault of the material.

The Installation
- Keep at least 5-6mm expansion space between the boards (in width direction). When using MOSO Bamboo X-treme fasteners installation this is automatically the case.
- Before starting the installation check the stability of the boards and the shape of the head side tongue and groove no expansion space is needed on the head side.
- Every cut head side has to be impregnated with a minimum of 6 mm, to prevent water penetration. Head side wax is available as accessory.

Installation with Fasteners
- Determine the surface side of the boards (ribbed- or flat surface).
- Use the MOSO Bamboo X-treme fasteners or other suitable fasteners in the following sequence:
  - Press fastener in the groove of one board.
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  - Press fastener in the groove of one board.

Additional Note
- Whilst all due care is taken to ensure the accuracy of the installation instructions, individual circumstances (location, sub floor and installation procedures) may vary and are beyond the manufacturer’s control. In case of doubt, therefore, consult the distributor.

These instructions are subject to change. For the latest version visit www.moso.eu/youtube

Maintenance & Cleaning

Maintenance WOCA
- The surface of decking is weathered under influence of wind, rain, frost and sunshine (UV). As a result, the surface turns grey, dirty and cracks/splinters will appear.
- WoodCare Denmark has developed different outdoor cleaning- and maintenance products. WOCA Exterior Cleaner loosens dirt and removes green growth from the surface, without damaging it.

Cleaning
- Seak Bamboo X-treme with plenty of water. If possible use a garden hose.
- Mix exterior cleaner with water in the ratio 1:2 and apply it. If the decking is extremely dirty, exterior cleaner may be used undiluted. Clean the decking with a silicon carbide brush or machine disk (see accessories). Scratch the soaked material lengthwise following the bamboo grain until the material appears clean. If the decking has a flat surface, first scrub under an angle of 45 degrees before scrubbing in the length direction. When using a machine disk this is not necessary. Repeat the cleaning if necessary. Clean the surface with water and let the floor dry.
- Leave Bamboo X-treme to dry for approx. 24 hours. The material must be completely dry before oil treatment can be done.

Application
- Apply in dry weather only. Avoid direct sunshine and high temperatures.
- Stir the oil thoroughly before use. Apply an even thin coat of oil with a brush.
- The oil is cream-coloured when it is wet.
- After a few minutes, the material has an oily appearance as the water is evaporating.
- Wipe off any excess oil with clean cotton cloths after no more than 5-10 minutes.
- Take particular care to remove excess oil from joints and grooves.
- Repeat the above process.
- When the material is dry, it may be polished with a polishing pad or polishing machine to ensure an extra hard-wearing surface. It is advisable to use oil for oil to harden thoroughly, depending on weather conditions and outdoor temperature. The material should not be watered during this period.

Maintenance Flat Side
- Please bear in mind that on the flat surface, irregularities in the surface (e.g. cracks, splinters) are better visible than on the ribbed surface. If regular maintenance with a water based oil treatment is performed, this will be reduced. A silicon carbide disk / broom should be used to smoothen the surface. If this does not give a satisfactory result, the surface can be sanded (use a machine disk with 80 grid open sanding paper on the dry decking). After that the decking should be treated with a water based decking oil.

Risk of Self-Ignition
- Due to the risk of self-ignition it is important that oil-wetted cloths are soaked in water and are disposed in a tightly closed container after use.

Check out the Maintenance movie at www.moso.eu/youtube
The excellent performance of Bamboo X-treme has been extensively tested by MOSO through acknowledged research institutes. Find a summary of the most important test results below. Full reports are available upon request.

### Carbon Footprint (CO₂eq) per kg final product

<table>
<thead>
<tr>
<th>PRODUCTION</th>
<th>END OF LIFE</th>
<th>CO₂</th>
<th>CO₂ credit</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.670</td>
<td>-1.062</td>
<td>0.6080</td>
<td>-0.6085</td>
</tr>
<tr>
<td>0.429</td>
<td>-0.189</td>
<td>0.24</td>
<td>-0.082</td>
</tr>
</tbody>
</table>

### Eco-costs (€) per kg final product

<table>
<thead>
<tr>
<th>PRODUCTION</th>
<th>END OF LIFE</th>
<th>CO₂</th>
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<td>0.429</td>
<td>-0.189</td>
<td>0.24</td>
<td>-0.082</td>
</tr>
</tbody>
</table>

### Use / Risk Class

- **Use Class**: EN1535
- **Class**: 4

### Brinell Hardness

- **EN1534**: 9.5 kg/mm²

### Resistance Against Surface Fungi

- **EN152**: Class 0

### Durability

- **EN113 / EN350**: Class 1

- **EN153**: Class 1

- **EN807 / EN350**: Class 1

- **MOSO Bamboo X-treme**: Class 1

- **Ipé**: Class 1

- **Bangkirai**: Class 1

- **Oak**: Class 1

- **Strand Woven Bamboo**: Class 1

- **Scots Pine**: Class 1

### Author


The life cycle and the carbon footprint of MOSO products are evaluated according to ISO 14040/44. For more information, visit [http://www.moso-bamboo.com/bamboo/new/LCA-carbon-footprint](http://www.moso-bamboo.com/bamboo/new/LCA-carbon-footprint).

The full report is available on request.

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appearance and colour
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 WOCA exclusive exterior oil teak colour or a comparable water based oil/saturator with teak pigments (for the unfinished version).

Direct after installation 1 layer of oil (pre-oiled version) or 2 layers of oil (unfinished version) have to be applied. See for further details the installation instructions.

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

normal phenomena
Cracks on the surface and on the end of the boards can arise from the different drying characteristics of the surface and cross cut ends. This does not affect the stability of the board.

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

swimming pool
If Bamboo X-treme is to be used around swimming pool areas, the following has to be taken into account: Bamboo X-treme is a natural (wood like) product and can therefore not be referred to as a “bare foot” product.

As with any wooden product used outdoors, there is always a risk of formation of splinters, however splinters from Bamboo X-treme are normally smaller than (tropical) hard wood splinters. A regular maintenance with oil (more frequently necessary around swimming pools) is required to reduce the formation of splinters. Furthermore, regular maintenance with the silicium carbide broom or -disk is required to effectively remove splinters and smoothen the surface.

use of the flat side
When using the flat side of the board as surface side please note that surface deformation (under influence of climatical changes) will be significantly more visible on the flat side compared to the ribbed side. Deformation of the surface is not considered to be a defect of the material.

user information
Gradation of greying of Bamboo X-treme over time:
new, non-weathered decking (left), after 3 months of weathering (middle) and after 18 months of weathering (right).
see the ease of installation, cleaning and maintenance of Bamboo X-treme on: www.moso.eu/youtube