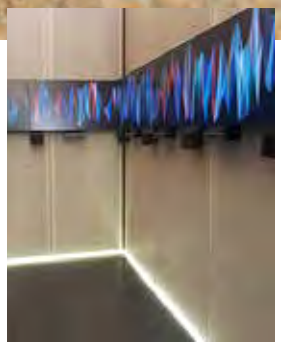
# CEMENT BONDED PARTICLE BOARD CATALOGUE 2017

Beton Wood®

PANELS WITH HIGH DENSITY AND MECHANICAL RESISTANCE

Beton Wood®

Dry construction systems for green building

www.betonwood.com

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# INTRODUCTION

**BetonWood®** s.r.l. produces and sells insulating panels with high density and high mechanical resistance.
Ther construction panel BetonWood is a cement bonded particle board un materiale which adapts to many uses in construction. BetonWood panels are made of high density Portland cement and debarked Pine wood fibers, and it uses water and salt as binders; it provides an excelllent solution for interventions aimed to obtain high levels of thermal lag, thanks to its high density which makes it suitable for self-supporting dry screeds, radiant floor systems and stiffening structures.

The product is environmentally friendly and bio-compatible, opposed to other competitors panels as the OSB panels having high amounts of formaldehyde which is released into the environment as volatile aldehydes (VOC), highly carcinogenic emissions for a period of 24 years.

The fire resistance class and its suitability for emergency exits is guaranteed by European legislation 2003/43/EC - standard EN 13501-2. BetonWood® is then certified fireproof in **A2fl-s1** class according to the new European CE classes. In addition, the European standards EN 13501-2 has also adopted by the Italian state with the D.L. February 16th 2007.

The catalogue describes in detail:

- main properties, physical, mechanical features of BetonWood® cement bonded particcle boards
- basic principles in the construction of structures
- possible bonding and finishing methods

Main properties of BetonWood® cement bonded particle boards.

- fireproof (A2-fl-s1 class according to the standard DIN 13501-2)
- CE certified
- weather resistant
- waterproof
- resistant to fungus, mold, insects
- immune to animals, rodents, termites, etc.
- free from asbestos and formadeide
- free from recycled inks
- antifreezing
- processable with tools for woodworking
- high density
- high mechanical resistance
- vandal resistant
- innocuous to humand and the environment

# APPLICATION AREAS

## Cement Bonded Particle Boards BetonWood

BetonWood® is used in Europe since 1977 starting to East markets, where it is been used over the years, first as structural panel for wooden houses and then gradually expanding the uses.
BetonWood® panels have multiple uses, in particular they can be used in:

- wooden/metal and prefabricated structures
- coatings/ thermal and acoustic insulations
- Internal and external thermal insulation coating system
- ventiled roofs
- radiant floor systems
- exhibitions, installations in general
- floating floors
- materials for bio-ecological construction
- partition walls
- counter walls with high resistance
- fireproof walls and fire doors
- platforms and chutes
- high thermal lag systems
- platforms and floors with high load capacity
- suspended ceilings
- fireproof coatings
- road and railway noise barriers
- formwork
- animal box, etc.

The BetonWood® structural panels can be used in construction replacing wooden panels and represent a valid alternative to materials such as plasterboard, Eraclit, Celenit, Calcium Sulphate, magnesite wood, MDF, OSB, plywood and chipboards. The application areas of BetonWood® are numerous:

- public and private buildings
- commercial buildings
- buildings for the instruction
- buildings for public health
- exhibitions
- prefabricated buildings
- public and private furniture
- entertainment centers
- wood houses
- penitentiaries
- warehouses

The application of these panels and the construction structure can be varied depending on the individual design. Is necessary consider the physical, mechanical and thermodynamic properties of BetonWood® building boards and the principles of the building construction.

# BETONWOOD PRODUCTS OVERVIEW

## Cement Bonded Particle Boards BetonWood

**BetonWood e BetonWood N** Cod. **BTW/BTWN**

BetonWood is made of Portland cement with high density (1350 Kg/m$^3$) and debarked Pine wood fibers. It guaratees an excellent solution to obtain high levels of thermal lag, thanks to its high density wich makes it adapt also in dry screeds, thermal insulation coating systems, roofs, floors, counterwalls and exhibitions.

**BetonWood Sanded** Cod. **BSA**

The BetonWood cement particle boards are also available in the special smoothing Sanded, namely "wood effect" which reduces the tolerances. Cement bonded particle boards, as well as for structural functions it is also used for aesthetic reasons as a coating in various kinds of stand construction.

**BetonWood Tongue&Groove** Cod. **BTWTG**

The BetonWood cement bonded particle boards are also available in the Tongue and Groove version (the edges have a special tongue and groove profile) for some thicknesses.

**BetonWood Tongue&Groove Sanded** Cod. **BSATG**

The BetonWood cement bonded particle boards are also available in the Tongue and Groove Sanded version (the edges have a special tongue and groove profile and the surfaces are sanded) for some thicknesses.

**BetonFiber** Cod. **BTF**

Insulating panels coupled in factory made in BetonWood cement bonded particle board and FiberTherm wood fibers. It can be used as insulation for roofs and floors which require a high mass for thermal and acoustic insulation lag.

**BetonCork** Cod. **BTC**

Insulating panels coupled in factory made in BetonWood cement bonded particle board and Cork Panels. Ideal for the thermo-acoustic insulation with reduced thickness, in restructuring or for internal partition embodiments, and for environments with high humidity.

# BETONWOOD PRODUCTS OVERVIEW

## Cement Bonded Particle Boards BetonWood

**BetonStyr EPS** Cod. **BTSTY**

Insulating panels coupled in factory made in BetonWood cement bonded particle board and polystyrene foam. It adapts to any use as thermal insulation and is suitable in cases of high humidity.

**BetonStyr XPS** Cod. **BTSTX**

Insulating panels coupled in factory made in BetonWood cement bonded particle board and extruded polystyrene. It adapts to any use as thermal insulation and is suitable in cases of high humidity and the need of considerable compressive strength.

**BetonEco** Cod. **BTE**

Insulating panels coupled in factory made in BetonWood cement bonded particle board and mineralized wood fiber. Thermal and acoustic insulation panel.

**BetonWall** Cod. **BWALL**

Modular insulating coupled panels made with cement binded particle board and mineralized wood wool. Sandwich block for dry counter walls, it combines two panels of BetonWood and an internal layer of mineralized wood wool.

**BetonRadiant** Cod. **BTR**

BetonRadiant standard is a modular system for radiant floor heating and it is realized with two BetonWood cement bonded particle boards with high denisty.

It can be coupled with insulating layers such as: wood fiber, blonde cork and polystyrrene foam or extruded polystyrene.

**BetonTherm** Cod. **BTH**

The BetonTherm reinforced thermal insulating coating systems are thermo-acoustic insulation panels with high mechanical resistance, thanks to external surface of BetonWood cement bonded particle board which is coupled with insulation panels such as: wood fiber, blonde cork and polystyrrene foam or extruded polystyrene.

## DEFINITION

Cement bonded particle board is made of debarked Pine wood fibers coming from controlled forests with reforestation cycles FSC and pressed under water and hydraulic binder (Portland cement) with high cold compression ratios.
The result is a high density panel (1350 Kg/m$^3$) with the following thermodynamic properties: thermal conductivity coefficient $\lambda$ = 0,26 W/mK, specific heat c = 1,88 KJ/Kg K, coefficient of the steam penetration resistance $\mu$ = 22,6 and class of fire resistance A2-fl-s1, according to the standard EN 13501-1.

## MAIN PROPERTIES OF BETONWOOD PANELS

The construction panels BetonWood® combines the advantageous properties of rigidity and strength of the cement with the insulating properties of wood fibers and wood workability. We get the panel structure mixing debarked Pine wood fibers with Portland cement that is going to consolidate more in the upper and lower layer of the panels on both surfaces, to create a compact layer in the central part.
The surfaces are smooth and of gray cement color; in case of BetonWood Sanded, the surfaces are subjected to a polishing treatment and calibration to bring out the wood fibers, and give a lower tolerance and an external appearance architecturally most "interesting" to this panel.
The BetonWood® panels are lighter than the traditional building material and are more resistant to weather changes and frost proof. Insects and fungi are not allowed to attack it or damage it.
Thanks to its physical and machanical features, the product is considered one of the best material for light and dry construction.

## PACKAGING OF BETONWOOD PANELS

The product is package on pallet or on wood beams directly in factory.
It is placed a protective layer of a lower category wood chipboard or cement bonded particle boards on the upper and lower part of each pallet. The pallets are locked with with special plastic strapping, and the cement bonded particle board edges are protected.
The total weight of a standard pallet is approximately of 3.200-3.500 kg.
The total weight of a BetonWood N pallet instead is approximately of 1.000 kg.

## BETONWOOD PANELS TYPE

sharp edges

| Size | Thickness | Panels/pallet | m²/pallet | Pallet size | kg/pallet |
|---|---|---|---|---|---|
| 3200x1250 mm | 8 mm | 70 | 280,00 | 3.2 x 1.25 x 0.7 | 3.200 |
| 3200x1250 mm | 10 mm | 60 | 240,00 | 3.2 x 1.25 x 0.8 | 3.000 |
| 3200x1250 mm | 12 mm | 50 | 200,00 | 3.2 x 1.25 x 0.8 | 3.000 |
| 3200x1250 mm | 14 mm | 40 | 160,00 | 3.2 x 1.25 x 0.7 | 3.200 |
| 3200x1250 mm | 16 mm | 35 | 140,00 | 3.2 x 1.25 x 0.7 | 3.200 |
| 3200x1250 mm | 18 mm | 30 | 120,00 | 3.2 x 1.25 x 0.7 | 3.100 |
| 3200x1250 mm | 20 mm | 30 | 120,00 | 3.2 x 1.25 x 0.8 | 3.400 |
| 3200x1250 mm | 22 mm | 25 | 100,00 | 3.2 x 1.25 x 0.7 | 3.200 |
| 3200x1250 mm | 24 mm | 25 | 100,00 | 3.2 x 1.25 x 0.8 | 3.400 |
| 3200x1250 mm | 28 mm | 20 | 80,00 | 3.2 x 1.25 x 0.7 | 3.200 |
| 3200x1250 mm | 32 mm | 20 | 80,00 | 3.2 x 1.25 x 0.8 | 3.600 |
| 3200x1250 mm | 40 mm | 15 | 60,00 | 3.2 x 1.25 x 0.8 | 3.400 |
| | | | | | |
| 2800x1250 mm | 8 mm | 70 | 245,00 | 2.8 x 1.25 x 0.7 | 2.800 |
| 2800x1250 mm | 10 mm | 60 | 210,00 | 2.8 x 1.25 x 0.8 | 3.000 |
| 2800x1250 mm | 12 mm | 50 | 175,00 | 2.8 x 1.25 x 0.8 | 3.000 |
| 2800x1250 mm | 14 mm | 40 | 140,00 | 2.8 x 1.25 x 0.7 | 2.800 |
| 2800x1250 mm | 16 mm | 35 | 122,50 | 2.8 x 1.25 x 0.7 | 2.800 |
| 2800x1250 mm | 18 mm | 30 | 105,00 | 2.8 x 1.25 x 0.7 | 2.700 |
| 2800x1250 mm | 20 mm | 30 | 105,00 | 2.8 x 1.25 x 0.8 | 3.000 |
| 2800x1250 mm | 22 mm | 25 | 87,50 | 2.8 x 1.25 x 0.7 | 2.800 |
| 2800x1250 mm | 24 mm | 25 | 87,50 | 2.8 x 1.25 x 0.8 | 3.000 |
| 2800x1250 mm | 28 mm | 20 | 70,00 | 2.8 x 1.25 x 0.7 | 2.800 |
| 2800x1250 mm | 32 mm | 20 | 70,00 | 2.8 x 1.25 x 0.8 | 3.200 |
| 2800x1250 mm | 36 mm | 15 | 52,50 | 2.8 x 1.25 x 0.7 | 2.700 |

## BETONWOOD N PANELS TYPE

sharp edges

| Size | Thickness | Panels/pallet | m²/pallet | Pallet size | kg/pallet |
|---|---|---|---|---|---|
| 870x515 mm | 18 mm | 70 | 33,155 | 0.87 x 1.03 x 0.7 | 1.000 |
| 1012x515 mm | 18 mm | 66 | 34,400 | 1.01 x 1.03 x 0.7 | 1.000 |
| 1025x515 mm | 18 mm | 66 | 34,840 | 1.02 x 1.03 x 0.7 | 1.000 |
| 1220x515 mm | 20 mm | 56 | 33,600 | 1.20 x 1.04 x 0.7 | 1.000 |
| 1220x520 mm | 20 mm | 56 | 35,530 | 1.22 x 1.04 x 0.7 | 1.000 |

## BETONWOOD T&G PANELS TYPE

tongue and groove edges

| Size | Thickness | Panels/pallet | m²/pallet | Pallet size | kg/pallet |
|---|---|---|---|---|---|
| 1200x500 mm | 20 mm | 56 | 33,600 | 1.20 x 1.04 x 0.7 | 1.000 |

## BETONWOOD SANDED PANELS TYPE

sharp edges

| Size | Thickness | Panels/pallet | m²/pallet | Pallet size | kg/pallet |
|---|---|---|---|---|---|
| 1220x520 mm | 20 mm | 56 | 35,530 | 1.22 x 1.04 x 0.7 | 1.000 |

## BETONWOOD T&G SANDED PANELS TYPE

tongue and groove edges

| Size | Thickness | Panels/pallet | m²/pallet | Pallet size | kg/pallet |
|---|---|---|---|---|---|
| 1200x500 mm | 20 mm | 56 | 33,600 | 1.20 x 1.04 x 0.7 | 1.000 |

On specific agreements, panels can be provided with a different thickness than those indicated remaining in the range from 8 to 40 mm.
The panels can also be supplied with custom dimensions for specific quantities to be established directly with the Sales Office.

The BetonWood® cement bonded particle board are available also in the **Sanded** version, form standard panels smoothed and calibrated with specific machinery, to bring the panels thickness to lower dimensional tolerances. These particular panels have the characteristic of being aesthetically pleasing, because the content of wood inside stands out in the upper and lower part, than a standard panel which has instead the distinction of having a totally cement appearance. The BetonWood® cement bonded particle boards can be machined on the edges in order to facilitate the joints during installation phase:

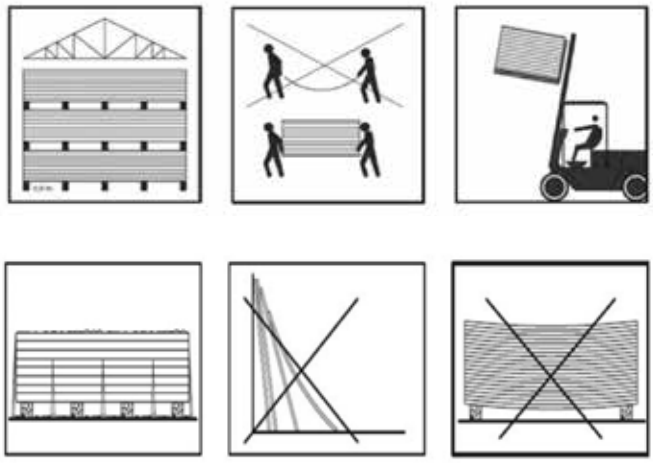
- stepped edges for thickness lower than 14 mm
- tongue and groove edges for thickness higher than 18 mm

## DELIVERY OF BETONWOOD PANEL

The pallet delivery is normally carried out through trailer trucks or couriers.
Considered the high mass of the pallets is recommended that the addressee has the appropriate equipment and mechanical lifting devices with maximum capacities of 3500 / 4000kg to download the goods.
Further transportation or discharges must be regulated and organized by the customer himself / with withdrawal from our warehaouses or delivery by courier.

## STORAGE OF BETONWOOD PANEL

A correct storage is critical to the correct conservation of the material:
• is recomented to place the boards one above the other on the square wooden beams. Avoid bending with the intermediate supports (see figure).
• the panels must be supported for thier entire lenght with wood beams placed at least in four points at a uniform distance. The maximum distance between the wooden supports must be not more than 800 mm.• quando si maneggiano individualmente i pannelli BetonWood® si raccomanda di prenderli per taglio, come un lastra di vetro (vedere figura).
• the pallet must be protected with suitable sheets to prevent the accumulation of dust and avoid contact with moisture from the soil and from the rain.
• after using partially the panels of a pallet, the protection chiboard must be replaced and a ballast must be restored on the upper side of the remaining panels to avoid the distortion of the upper panels.
• avoid to store panels resting them on the edge (see figure).
• avoid the direct exposure of panels to the sun during the storage.



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## TECHNICAL CHARATERISTICS OF BETONWOOD

| | |
|---|---|
| Density (kg/m$^3$) | 1350 |
| Reaction to fire according to the standard EN 13501-1 | A2-fl-s1 |
| Thermal conductivity coefficent $\lambda_D$ W/(m•K) | 0,26 |
| Specific heat [J/(kg•K)] | 1880 |
| Coefficient of resistance to vapor penetration μ | 22,6 |
| Coefficient of linear thermal expansion α | 0,00001 |
| Moisture degree after air conditioning | 6 - 12% |
| Thickness swelling after 24h of storage in water | 1,5% |
| Lenght and width change due to moisture | max 0,3% with temp>20°C and hum. 25% to 90% |
| Air permeability l/min. m$^2$ Mpa | 0,133 |
| Superficial PH value | 11 |
| Bending strength σ (N /mm$^2$) | min.9 (9.000kPa) |
| Transversal tensile strength N (N /mm$^2$) | min.0,5 |
| Shear strength τ (N /mm$^2$) | 0,5 |
| Elasticity module E (N /mm$^2$) | 1stc.: 4500 2stc.:4000 |
| Acoustic insulation | 30dB with a thickness of 12 mm |

| Thickness | Panel weight/m$^2$ | Thickness tolerance Class I |
|---|---|---|
| 8 mm | 11.2 | ± 0,7 |
| 10 mm | 14.0 | ± 0,7 |
| 12 mm | 16.8 | ± 1,0 |
| 14 mm | 19.6 | ± 1,0 |
| 16 mm | 22.4 | ± 1,2 |
| 18 mm | 25.2 | ± 1,2 |
| 20 mm | 28.0 | ± 1,5 |
| 24 mm | 33.6 | ± 1,5 |
| 28 mm | 39.2 | ± 1,5 |
| 40 mm | 56.0 | ± 1,5 |

## DENSITY OF THE BETONWOOD PANEL

In accordance with the requirements of the legislation EN634-2, article 2, the panles density must be greater than 1000 kg/m$^3$. According to the result of the test with a temperature of 20°C, a relative environmental moisture of 50 - 60% and a residual moisture present in the panel equal to 9%, the density of BetonWood® is **δ = 1350 ± 75 kg/m$^3$**

For static calculations - for security reasons - is recommended increase or decrease the maximum value of 20%.

## MOISTURE CONTENT IN DELIVERY

Similarly to wood in natural conditions, BetonWood® panels absorb a balanced content of moisture depending on the temperature and atmospheric humidity.
The moisture content accordin to the requirements of the standard MSZ EN634-2 **μ = 9 ± 3%** can be reached in balanced hygroscopic conditions in correspondence to a temperature of 20°C and with a relative misture of 50-60%.

## MOISTURE CONTENT IN CORRISPONDENZA ALL'UMIDITÀ DELL'ARIA

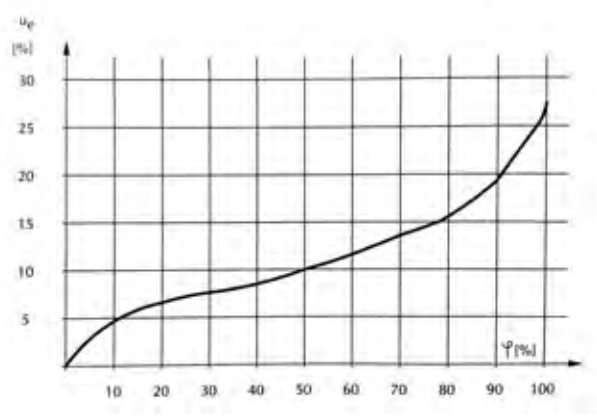



**Figure 1**
Average balance of the moisture content of the cement bonded particle board cemento-legno according to air humidity, t=20°C

with a temperature of 20°C and a relative humidity of 35%, the moisture content is about 7%;
with a temperature of 20°C and a relative humidity of 60%, the moisture content is about 12%;
with a temperature of 20°C and a relative humidity of 90%, the moisture content is about 19%;

## WATER AND STEAM ABSORPTION OF BETONWOOD PANELS

It is known that moisture plays a significant role in the process of deterioration of wooden materials contained in the panel. Therefore it is very important to determine the rules of absorption and transmission of water in the most accurate manner.

## Absorption of the BetonWood panels

- **Absorption of the water vapor in the atmosphere with high humidity and high temperatures t=40°C; φ=100% (tropical climate)**

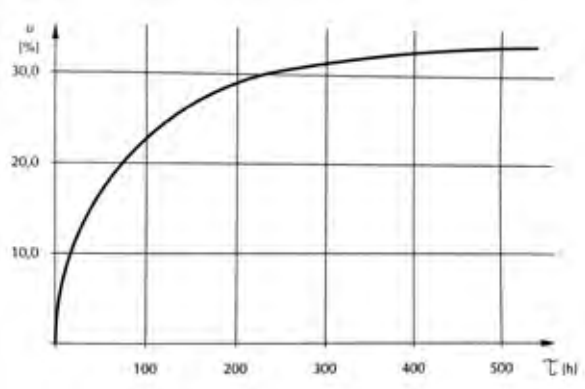



**Figure 2**
Absorption of the water vapor of BetonWood® dry panels (t=40°C; φ=100%)

The figure 2 shows shows the average content of temporary moisture in the BetonWood® panels in the dry state in function of the time.
The temporary absorption of the cement bonded particle boards shows a deviation. This deviation is due to the heterogeneous and partially organic composition of the panel as well as to the density difference. Inside the individual samples, the elements with the highest and the lowest density show, respectively, levels of less and greater absorption and we have been obtained the minor and the major values of moisture the panel is able to absorb.

- **Absorption in atmospherical spaces t=20 ± 2°C; φ=45 ± 5%**

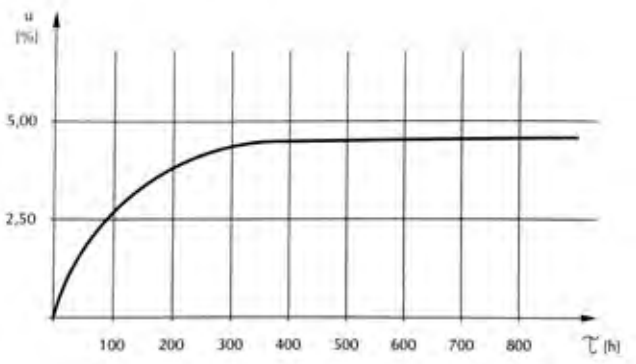
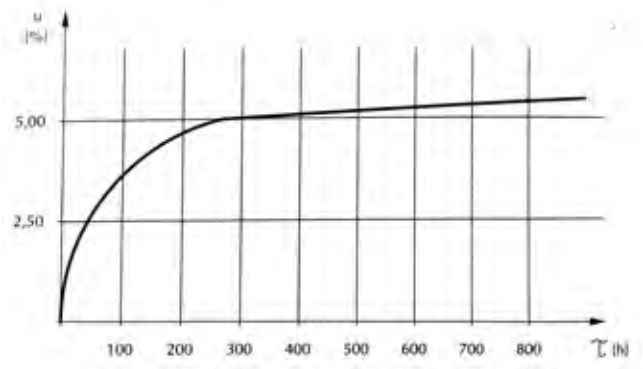



**Figure 3**
Absorption of the BetonWood® panel saturated to the exposure under rain, and subsequently dried in air space
(t=20 ± 2°C; φ=45 ± 5%)

The figures 3 and 4 shows the average content of temporary humidity in cement bonded particle board in wet conditions until saturation through exposure to rain and to steam and then dried up to a state of absolute dryness, in function of time.
We can note that the maximum water absorption of the pretreated panel is changed. The moisture content equilibrium given by the atmosphere should be approximately 7%. The figure show us that even the pretreated panels don't achieve this value although the absorption time available seems to be sufficient.

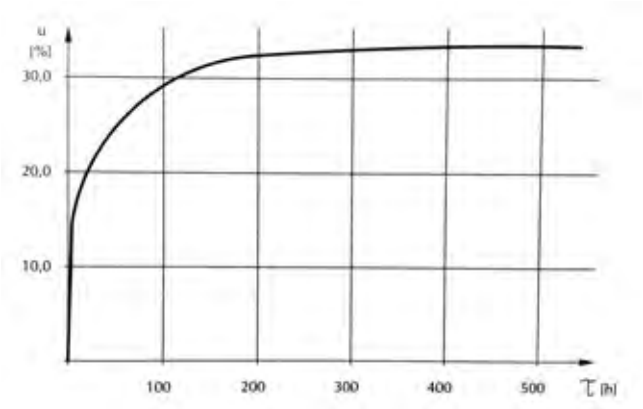
**Figure 4**
Absorption of BetonWood® panel saturated by steam, and subsequently dried in air space
(t=20 ± 2°C; φ=45 ± 5%)




## Water absorption through the exposure to rain

Atmosphere and water temperature **t=14 ± 0,5°C** , water pressure **p=2 bars**

**Figure 5**
Water absorption of the BetonWood® panel saturated by exposure to rain
(t=14 ± 0,5°C; p=2 bars)




The figure 5 shows the average content of temporary humidity of the panel perfectly dried through the exposure of it self to rain, in function of time.
The resistance to humidity of BetonWood® panels has proven to be excellent.

## Desorption of BetonWood panels

- **Desorption to atmospherical spaces t=20 ± 2°C; φ=50 ± 5%**

**Figure 6**
Desorption of BetonWood® panels saturated of water vapor absorbed in the atmospheric environment (t=20 ± 2°C; φ=50 ± 5%)

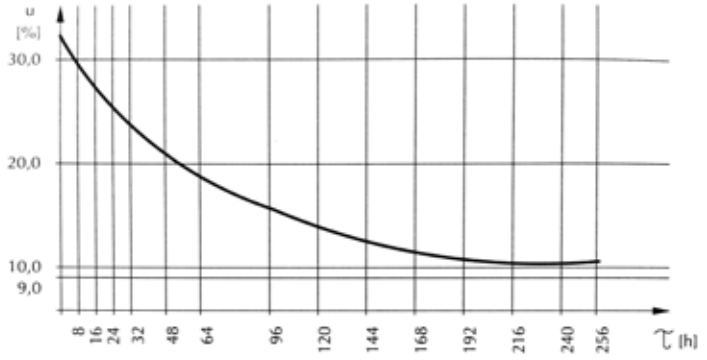
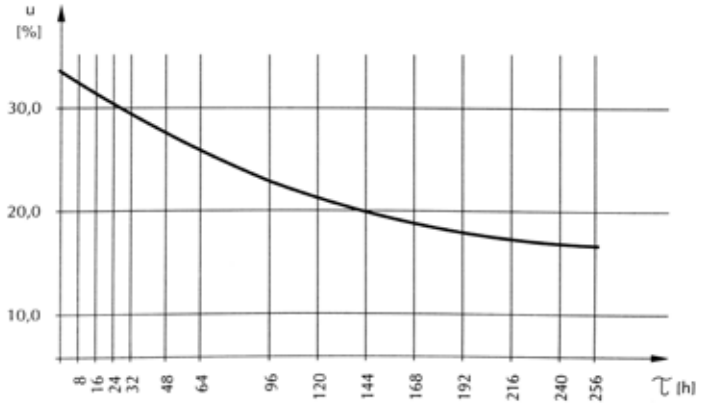


**Figure 7**
Desorption of BetonWood® panels satured through exposure to rain in atmospheric environment
(t=20 ± 2°C; φ=50 ± 5%)




The figures 6 and 7 show the average content of temporary humidity in the cement bonded particle board wet up to saturation through the absorption of  of water vapor and rain exposure, respectively, in function of the time.

- **Desorption of the panel in a balanced state in atmospheric spaces up to a state of absolute dryness**
  **t=102°C; φ=0%**

**Figure 8**
Desorption of the BetonWood®panels satured through the absorption of water vapor in atmospheric environment up to a state of absolute dryness (t=102°C; φ=0%)

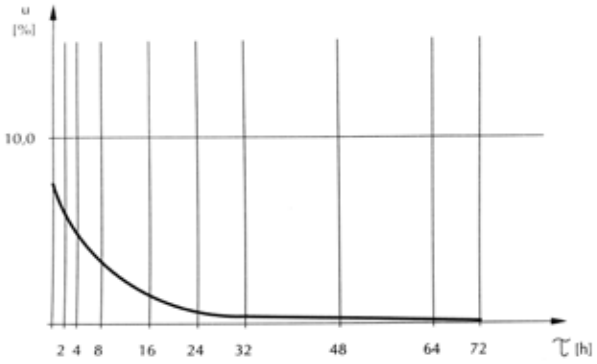
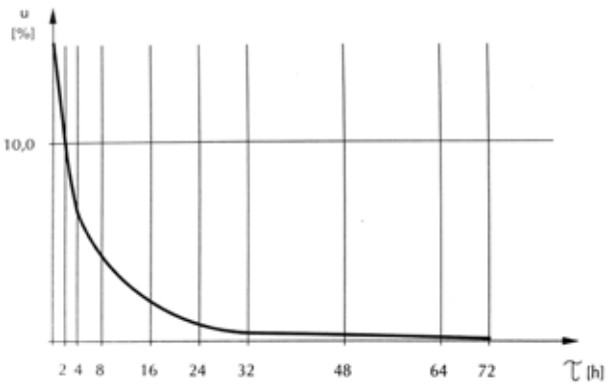



**Figure 9**
Desorption of the BetonWood®panels satured through the exposure to rain in atmospheric environment up to a state of absolute dryness (t=102°C; φ=0%)




The figures 8 and 9 show the average content of temporary humidity in the cement bonded particle board wet up to saturation through the absorption of  of water vapor and rain exposure, respectively, in function of the time.

### Conclusion

It can be asserted that the maximum water absorption of cement bonded particle board is not grater than 35% even for permanent immersion or humidity conditions. It is independent of the method used to increase humidity. The waterproofing pretreatment of panels significantly influence the absorption characteristics.

## WATER ABSORPTION OF THE PANELS THROUGH SOAKING

The figure 10 shows the average content of temporary humidity of BetonWood® cement bonded particle board perfectly dried in function of time. The curve obtained runs logarithmically, indicating precisely the rules for dissemination.
It can be asserted that initially the water absorption increases drastically and reaches a $\mu_{max}$ value after about 50 hours of soaking. There were no significant changes in the moisture content after this period of soaking. The average $\mu_{max}$ value is 27%.

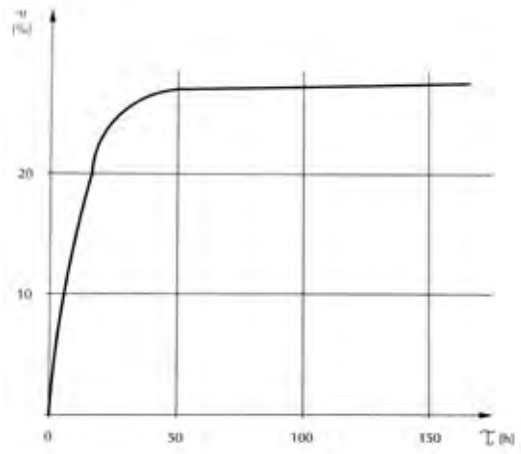



**Figure 10**
Water absorption of BetonWood® cement bonded particle board by soaking.

### Thickness swelling

When the cement bonded particle board is tested according to the standard MSZ EN 317 the thickness swells of 1,5% after a soak of 24 hours.

## DEFORMATION RESISTANCE

The two surface of cement bonded particle boards are generally subjected to an unbalanced load climate. A test was conducted under the following extreme conditions: the upper part of the sample placed freely in a bath of water was brought into contact with the air at a temperature t=20 ± 2°C and the realtive humidity φ=65 ± 5% . The figure 11 shows the arrangement of the measurement points as a result of the deformation, in function of time.

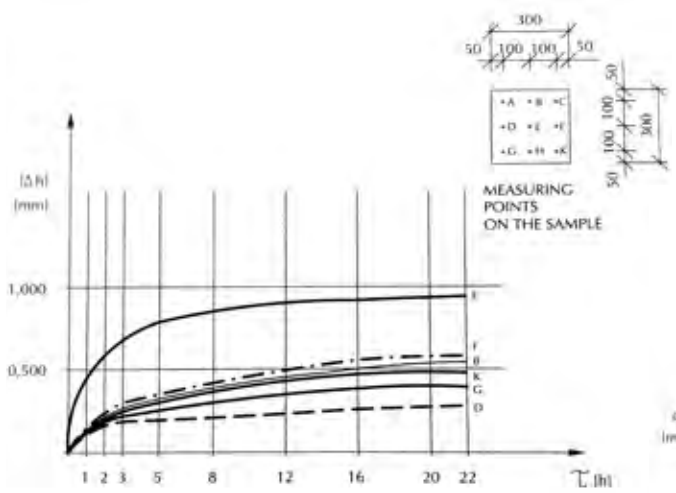



**Figure 11**
The measurement points arranged due to the asymmetric loading climate reported in function of time

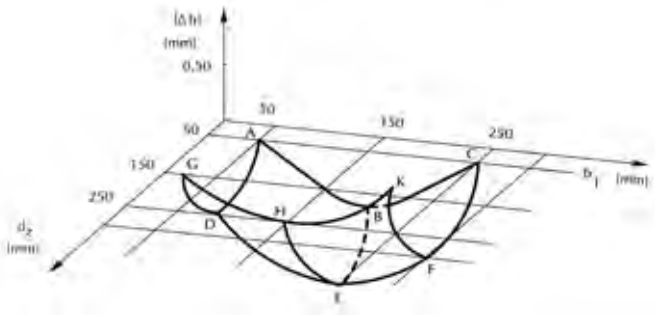


**Figure 12**
Axonometric drawing of the highest deformation

The most drastic deformation can be observed in the first 3 days. The highest deformation can be noticed the 22nd day. In subsequent observations the deformation is insignificant.
The figure 12 shows the axonometric drawing of the highest deformation.

## THERMODYNAMIC FEATURES OF BETONWOOD PANELS

| | |
|---|---|
| Density (kg/m$^3$) | 1350 ± 100 |
| Reaction to fire according to EN 13501-1 | A2-fl-s1 |
| Thermal conductivity coefficient λ W/(m•K) | 0,26 |
| Specific heat c [J/(kg•K)] | 1880 |
| Coefficient of linear thermal expansion α K$^{-1}$ | 1,0 x 10$^{-5}$ |
| Coefficient of vapor penetration Δ [kg/m s Pa] | 0,83 x 10$^{-11}$ |

**Table 1** Shows the building characteristics of cement bonded particle boards

| | |
|---|---|
| Thermal conductivity coefficient λ W/(m•K) | 0,26 |
| Specific heat c [J/(kg•K)] | 1880 |
| Coefficient of resistance to vapor penetration μ | 22,6 |
| Coefficient of vapor penetration D | 0,0039 |
| Air permeability l/min. m$^2$ Mpa | 0,133 |

**Table 2** Shows the building characteristics of cement bonded particle boards according to DIN 4108

| Thickness mm | Heat resistance m² K/W |
|---|---|
| 8 | 0,0308 |
| 10 | 0,0385 |
| 12 | 0,0461 |
| 14 | 0,0538 |
| 16 | 0,0615 |
| 18 | 0,0692 |
| 20 | 0,0769 |
| 24 | 0,0923 |
| 28 | 0,1077 |
| 40 | 0,1538 |

**Table 3** Shows the heat resistence values of the panels with the thickness change

| Thickness mm | Heat transfer W/m² K |
|---|---|
| 8 | 3,666 |
| 10 | 3,565 |
| 12 | 3,471 |
| 14 | 3,381 |
| 16 | 3,295 |
| 18 | 3,213 |
| 20 | 3,136 |
| 24 | 2,991 |
| 28 | 2,860 |
| 40 | 2,527 |

**Tabella 4** Shows the heat tranfer values of the panels with the thickness change

## FARE RESISTANCE OF BETONWOOD PANELS

The BetonWood® panels fall under the category of resistance to fire **A2-fl-s1**. Here are previews of LAPI certification freely available on our website at:
http://www.betonwood.com/pdf/certificazione-al-fuoco-A2fl-s1.pdf

ATTESTAZIONE DI CLASSIFICAZIONE ACL/1458/12/CPD/---

Classification Assessment

RAPPORTO DI CLASSIFICAZIONE DI REAZIONE AL FUOCO N° 1458.0DC0050/12

Reaction to fire classification report n°.

CLASSIFICAZIONE RICHIESTA DA / Classification on behalf of

BetonWood S.r.l.

Via Falcone e Borsellino, 58 - 50013 CAMPI BISENZIO (FI) - ITALY

DENOMINAZIONE COMMERCIALE DEL PRODOTTO

Trade name of the product

BETONYP / BETONWOOD

(Spessore / Thickness: 16 mm)

STANDARD DI PRODOTTO / Product Standard

(Non applicabile / Not applicable)

METODI DI PROVA / Test methods

EN ISO 11925-2: 2010 and EN 9239: 2010

METODO DI CLASSIFICAZIONE / Classification standard

EN 13501-1: 2009

Fire classification of construction products and building elements -

Part 1: Classification using test data from reaction to fire tests

(Classificazione al fuoco di prodotti ed elementi da costruzione -

Parte 1: Classificazione sulla base dei dati di prova di reazione al fuoco)

CLASSIFICAZIONE / Classification

$A2_{fl}$ - s1

La classificazione sopra riportata è valida per la seguente applicazione effettiva:

Rivestimento pavimento posto in opera appoggiato a substrato non combustibile, di Euroclasse $A1_{fl}$ o $A2_{fl}$

Il Laboratorio non è stato coinvolto nella attività di campionamento.

The above reported classification is valid for the following actual end use:

Floor covering in contact with a non-combustible substrate of Euroclasses $A1_{fl}$ or $A2_{fl}$

The Laboratory not has been involved in sampling activity.

Prato, 30/10/2012

Il Responsabile Certificazione
The Certification Manager
Dr. [illegible]

Il Direttore Tecnico
The Technical Director
Dr. Guido Lenzi

Valid until: 29/10/2017

ACCREDIA

ATTESTAZIONE DI CLASSIFICAZIONE ACL/1460/12/CPD/---

Classification Assessment

RAPPORTO DI CLASSIFICAZIONE DI REAZIONE AL FUOCO N° 1460.0DC0050/12

Reaction to fire classification report n°.

CLASSIFICAZIONE RICHIESTA DA / Classification on behalf of

BetonWood S.r.l.

Via Falcone e Borsellino, 58 - 50013 CAMPI BISENZIO (FI) - ITALY

DENOMINAZIONE COMMERCIALE DEL PRODOTTO

Trade name of the product

BETONYP / BETONWOOD

(Spessore / Thickness: 40 mm)

STANDARD DI PRODOTTO / Product Standard

(Non applicabile / Not applicable)

METODI DI PROVA / Test methods

EN ISO 11925-2: 2010 and EN 9239: 2010

METODO DI CLASSIFICAZIONE / Classification standard

EN 13501-1: 2009

Fire classification of construction products and building elements -

Part 1: Classification using test data from reaction to fire tests

(Classificazione al fuoco di prodotti ed elementi da costruzione -

Parte 1: Classificazione sulla base dei dati di prova di reazione al fuoco)

CLASSIFICAZIONE / Classification

$A2_{fl}$ - s1

La classificazione sopra riportata è valida per la seguente applicazione effettiva:

Rivestimento pavimento posto in opera appoggiato a substrato non combustibile, di Euroclasse $A1_{fl}$ o $A2_{fl}$

Il Laboratorio non è stato coinvolto nella attività di campionamento.

The above reported classification is valid for the following actual end use:

Floor covering in contact with a non-combustible substrate of Euroclasses $A1_{fl}$ or $A2_{fl}$

The Laboratory not has been involved in sampling activity.

Prato, 30/10/2012

Il Responsabile Certificazione
The Certification Manager
Dr. [illegible]

Il Direttore Tecnico
The Technical Director
Dr. Guido Lenzi

Valid until: 29/10/2017

ACCREDIA

## ACOUSTIC INSULATION OF BETONWOOD PANELS

The cement bonded particle boards have the intrinsic characteristics that make itself suitable to be an excellent sound insulation. Its consistent mass promotes the abatement of high frequencies and its heterogeneous composition contributes greatly to increase the sound insulation.

The acoustic abatement coefficient is equal to **30 dB for single board with 12 mm of thickness** with a **coincidence frequency of 4200** of the BERGER diagram.

| Thickness mm | Limit frequency(Hz) | Medium acoustic insulation (dB) |
|---|---|---|
| 8 | 6300 | 27 |
| 10 | 5000 | 29 |
| 12 | 4200 | 30 |
| 16 | 3100 | 32 |
| 18 | 2800 | 31 |
| 20 | 2500 | 32 |
| 24 | 2100 | 33 |
| 28 | 1800 | 34 |

**Table 5** Shows the acoustic insulation of cement bonded particle boards in funtion of thickness

| Name/Unit | Standard | Value (for any thickness) |
|---|---|---|
| Density (kg/m$^3$) | MSZ EN 323 | min. 1000 |
| Bending strenght σ (N /mm$^2$) | MSZ EN 310 | 9 |
| Transversal tensile strength (N /mm$^2$) | MSZ EN 319 | 0,5 |
| Transversal tensile strength after cyclic test (N /mm$^2$) | MSZ EN 319 e 321 | 0,3 |
| Thickness swelling after 24h (%) | MSZ EN 317 | 1,5 |
| Thickness swelling after cyclic test (%) | MSZ EN 319 e 321 | 1,5 |
| Elasticity module E (N /mm$^2$) | MSZ EN 310 | classe 1 : 4500 classe 2:4000 |

**Tabella 6** Shows the resistance values according the the European International Standards

## GENERAL RESISTANCE PROPERTIES OF BETONWOOD PANELS

To limit the stress it should be taken the specific data according to the standard MSZ 15025/1989 as a guide to the design of building structures. When building structures are designed, it should be noted the following permits stresses based on the data provided by "Institut für Bautechnik" in Berlin.

- bending resistance allowed to load perpendicular to panel surface: **1,8 N/mm²**
- tensile resistance permitted in the panel plane: 0,8 **N/mm²**
- compression strength allowed level to the panel: **2,5 N/mm²**
- elasticity module in bending for calculation purposes: **2000 N/mm²**

Approximately there is a linear correlation between the flexural strength and the modulus of elasticity for the BetonWood® panels.
It's shown in the figure 13.

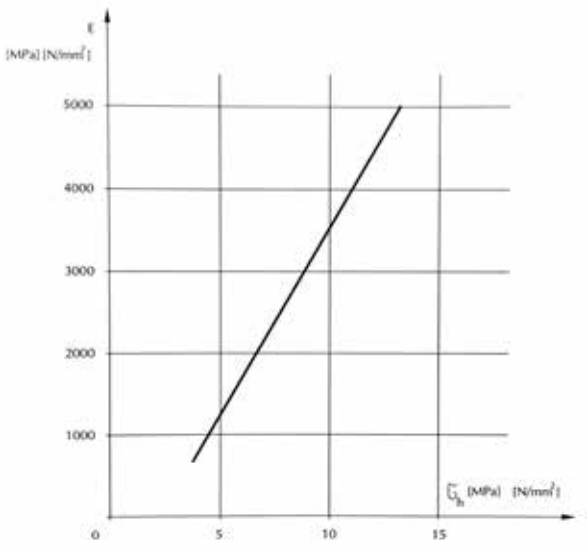



**Figure 13** the flexural strength correlation curve with the modulus of elasticity of the BetonWood® panels.

### Deformation resistance of BetonWood panels

For the test specimens at a uniform cross-section but different length were used.
The figure 14 shows a different range of thickness reductions and the critical resistance values corresponding.

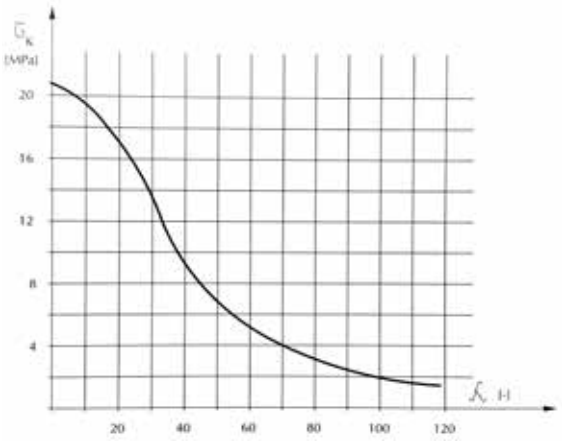



**Figure 14**
Critical resistance value depend on the reduction of thickness of the BetonWood® panel.

In the BetonWood® panels, the deformation occurs on large-sized panels and not on those of small size. The resistance to deformation can be determined by a simple accurate calculation.

## Panels behavior under the influence of a heat load

The thermodynamics curve can be obtained by tracing the deformation as a function of temperature. Figure 15 shows the specific deformation of individual temperature values and two levels of stress.

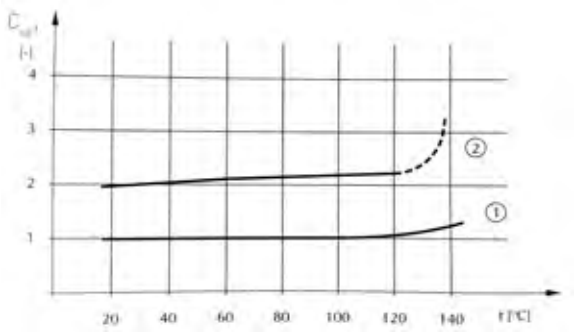



**Figura 15**
Thermodynamic curves of Beton-Wood® panels

1. Curve corresponding to 35% of the bending strength, and at the nominal stress $\delta_1$ = 3,79 MPa
2. Curve corresponding to 70% of the bending strength, and at the nominal stress $\delta_1$ = 7,59 MPa
The test indicates that:
• the thermodynamic curve can be considered linear above a temperature of 120°C;
• the straight section corresponding to the greater nominal stress is more steep due to the effect of temperature on the part of the non-linear curve of the diagram;
• to greater nominal stress, from a temperature of 100°C, an increasing number of samples have not passed the load test, at a temperature of 140°C tutti i campioni all samples have failed under load.
**• the highest thermal load limit BetonWood® panels is 120°C**

## Effect of the humidity content on resistance values

The different resistance values of the cement bonded particle boards are interconnected at the prevailing moisture content at a given time. Figure 16 clearly shows this relationship.

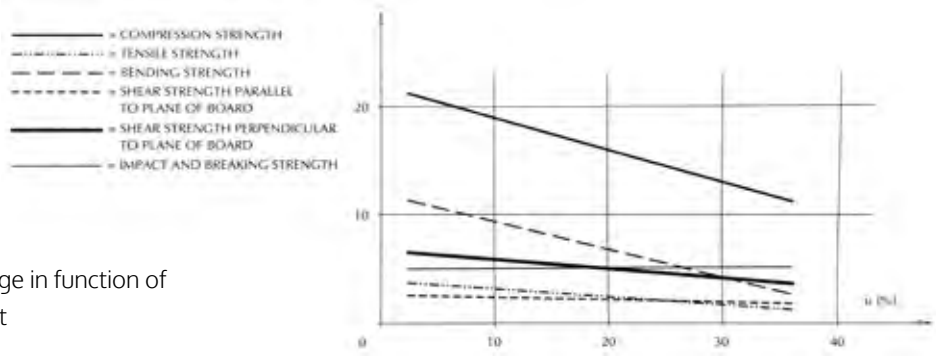



**Figure 16**
Resistance change in function of moisture content

It can be asserted that the resistance to compression and resistance to flexion considerably decrease due to the increase in moisture content. The tensile strength, shear, break, changes slightly under the influence of moisture content. The resistance to impact breakage, unlike the other properties, improves slightly due to the increase of moisture content.

## Viscous creep in BetonWood panels due to the bending stress

To design supporting structures intended to last, the change of individual properties in time plays a significant role. It should be taken into consideration during the design of building structures, that the macromolecular composition of wood changes some mechanical properties while the physical properties remain unchanged. The figure 17 shows the deformation change in function of loadand time coefficient.

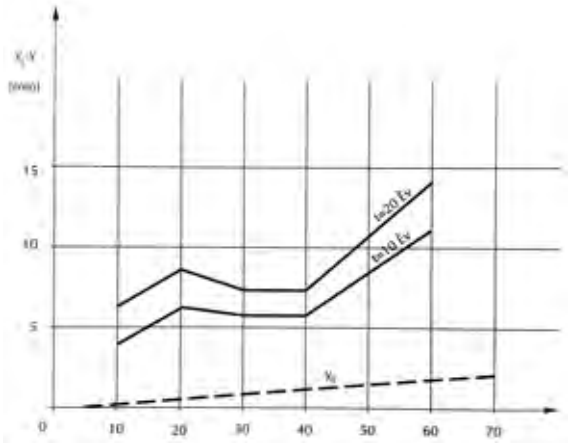



**Figure 17**
Deformation change of BetonWood® panels in function of liad coefficiant and the time

The tests have prooved theat the initial elastic deformation are more favorable for the cement bonded particle boards than the traditional building panels. This happnes thanks to the higher bending rigidity. The initial elastic deformation of BetonWood® building panels is only 1/5 than the value obtained in the panels used in furnishing.

The degree of viscous creep may be clearly characterized by the multiplication factor **α**, which depends on the load time and when multiplied by the references $y_0$ the current deformation corresponds to the charging time t. Although the values **α** of the cement bonded particle boards are usually 2-4 times greater than those obtained for the standard panels, if the charging time exceeds one year, the current deformations will be significantly lower.

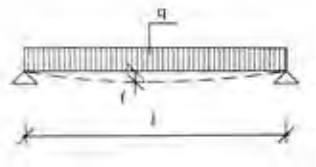
The viscous creep of cment bonded particle boards consists in 3 main phases:

**phase 1:** in this initial phase the deformation occurs at the highest rate and lasts for 3-5 days / 100 hours on average.

**phase 2:** The rate of deformation becomes constant, the deformations show a linear increase in function of time and lasts for 5 - 30 years.

**phase 3:** viscous creep will stop or slow down to a inconsiderable degree.

## CAPACITY CONDITIONS OF BETONWOOD PANELS




q = uniformly distributed load (kN/m²)
l = extension (cm)
f = deformation (mm)

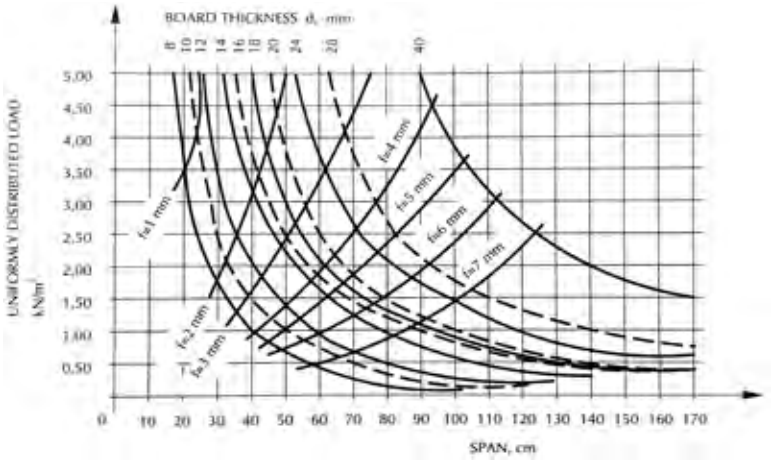



**Figure 18**
Relationship between load, extension, distributed load and deformation

The figure 18 shows the relationship between load, extension, panel thickness and deformation of building panels BetonWood® placed on two supports.

q = uniformly distributed load (kN/m²)
l = extension (cm)

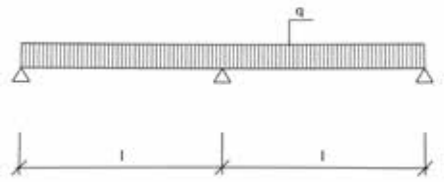



**Figure 19**
Charging scheme on three supports.

| Thickness mm | Uniformly distributed load kN/m² (1 kN x 101,97kg/m²) | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | 1,00 | 1,50 | 2,00 | 2,50 | 3,00 | 4,00 | 5,00 | 6,00 |
| | Distance between bearing or spacing (cm) | | | | | | | |
| **8** | 36 | 30 | 26 | 24 | 22 | 19 | 17 | 16 |
| **10** | 45 | 37 | 33 | 29 | 27 | 24 | 21 | 20 |
| **12** | 55 | 46 | 40 | 36 | 33 | 29 | 26 | 24 |
| **14** | 63 | 52 | 46 | 41 | 38 | 33 | 30 | 27 |
| **16** | 72 | 60 | 53 | 48 | 44 | 38 | 34 | 31 |
| **18** | 80 | 67 | 59 | 53 | 49 | 43 | 39 | 35 |
| **20** | 88 | 74 | 65 | 59 | 54 | 48 | 43 | 39 |
| **24** | 103 | 88 | 78 | 70 | 65 | 57 | 51 | 47 |
| **28** | 118 | 101 | 89 | 81 | 75 | 66 | 59 | 51 |
| **40** | 178 | 148 | 130 | 117 | 108 | 95 | 85 | 79 |

**Table 7** Distance required to place the building panels on three supports in function of the panel thickness and the distributed load.

## NAILS GRIP ON CEMENT BONDED PARTICLE BOARD

The figure 20 shows the test drawing of nails grip.

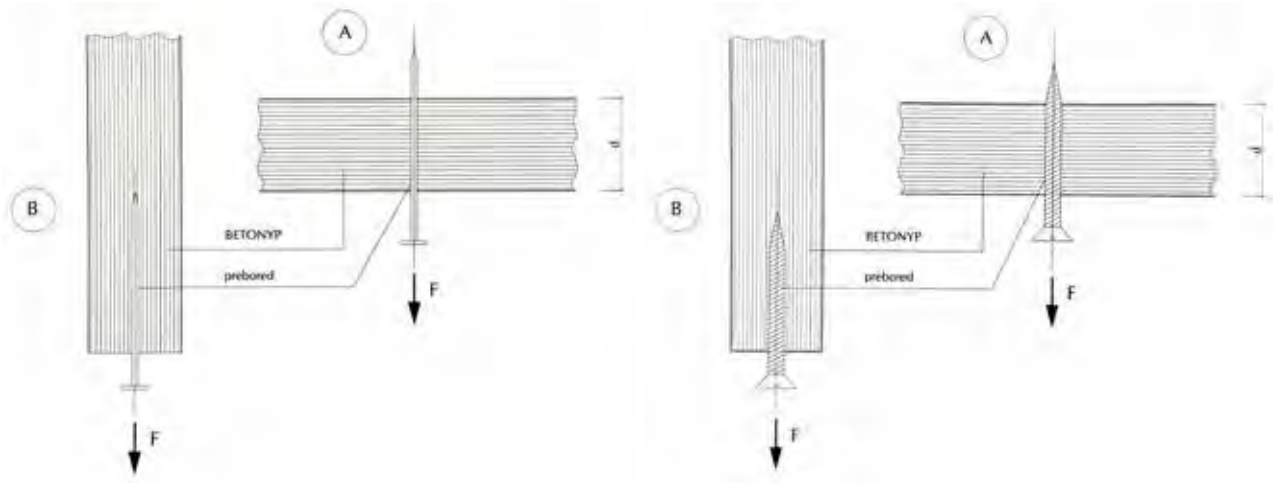



**Figure 20** Test chart for the nails and screws grip.
Nail used for the test: 30 x 3 mm Pre.drilling degree: 0,8 $d_{sz}$

| Thickness mm | 12 | 18 | 24 |
|---|---|---|---|
| | Nail grip N/mm | | |
| **A (perpendicular to the panel plane)** | 39,2 | 51,9 | 81,4 |
| **B (parallel to the panel plane)** | 12,7 | 36,3 | 23,5 |

**Table 8** Nail grip value for the BetonWood® panels

## SCREWS GRIP ON CEMENT BONDED PARTICLE BOARD

| Thickness mm | 12 | 18 | 24 |
|---|---|---|---|
| | Screw grip N/mm | | |
| **A (perpendicular to the panel plane)** | 96,1 | 136,3 | 158,9 |
| **B (parallel to the panel plane)** | 49,0 | 75,5 | 90,2 |

**Table 9** Screw grip value for BetonWood® panels
Screw used for the test: 40 x 4 mm according to the standard DIN 96 pre-drulling degree 0,8 $d_{sz}$

**PRE-DRILLING** 0,8$_{dz}$ ALWAYS RECOMMENDED

## INSECTS AND FUNGI RESISTANCE OF BETONWOOD PANELS

The tests on cment bonded particle board BetonWood executed for the fungi resistance eseguiti per la resistenza a funghi have been performed for decades by the Department of Forest Protection Methods in the University for Forestry and Wood Industry.

Tests were carried out on the panels for their resistance to mold in accordance with MSZ 8888/9-69. Tests have proven that BETONWOOD panels are "fungicides".
Tests werw carried out also for the rasistance to fungi on rotten wood in accordance with the legislation MÉMSZ 50 373. In the tests were used cultures of Coniphora cerebella, Poria vaporaria and Trametes versicolor, which are the most damaging fungi in the field of civil engineering structures: none of the species of fungi have damaged BetonWood®panels, therefore, it was proved that cement bonded particle board are "fungi resistant". This is confirmed by the results of tests performed by Mutsui Lumber Company, Tokyo.
It has been proven by tests carried out by European institutes that the termites do not attack the BetonWood® cement bonded particle boards not even in the acute starvation phase. \BAM, Bundesanstalt für Materialprüfung, Berlino, test result No. 5.1;\4403,1985\.
The resistance to the insect of the BetonWood® panels was confirmed even from tests conducted at Tokyo University, Faculty of Agriculture.

## WEATHER RESISTANCE OF BETONWOOD PANELS

BetonWood® panels are resistant to atmospheric agents, because the wood fibers are protected from the cement against external damage.
The material of formworks completely or partially buried in the ground shows no damage during the tests carried out for many years. The series of tests conducted by the Research Institute of WoodWorking confirms these results. The cement bonded particle boards were tested by EMPA/Switzerland, 1975/ in a series of measures consisting of 150 cycles at a temperature of -20°C and +20°C and to a variable moisture content. These tests definitely qualify the panel as resistant to frost. It results that the BetonWood® panels without finishing are able to resist to the atmospherical agents and to extreme stresses.

In permanent change of relative humidity, the effect of direct rain, water and steam cause a change in panel moisture content (see sections about moisture content).
The change of moisture content causes a limited dimensional change.
**Dimensional change in plane:** at a temperature of +20°C, with a relative humidity range from 25% to 90%: max. 0,3%.
**Practically:** for a humidity content variation of ±10%: ±2mm/m.
When a structure is designed, this dimensional variations should be hold in consideration.

The Institute of Quality Control for The Building Industry has obtained the following results testing the cement bonded particle board in a FEUTRON device for 96 hours and in an atmosphere maintained at 60°C and at 100% of relative humidity.

| | |
|---|---|
| **Thickness bulge** | **0,92%** |
| **Dimensional variation of the plane** | **0,15%** |

(test result of ÉMI N°. M-34/1975)

## PROCESSING OF BETONWOOD PANELS

### Basic principles of processing

Processing of BetonWood® requires the use of equipment with carbide tip. It can be used also traditional hand tools (iron, chrome-vanadium) even if, in this case, the wear will be greater.
Manual processing is facilitated by the using metallic saws or metallic reamers. This is recommended to improve the aspiration of dust while working BetonWood®panels.
The minimum aspiration speed should be 30m/s.

### Cut on measures

It is recommended the use of saws with carbide tip. The cutting depth should be adjusted so the saw blade protrudes slightly (3-8 mm) from the BetonWood®panels.
It can be obtained an excellent edge quality, an increase of the durability of the same and a low resistance to the cut using a saw with serrated carbide blades as shown in Figure 21. It can be also used blades with other shapes taking under consideration that the durability of the edge will be reduced.
($n_{min}$ = 4500 $min^{-1}$ = 75 $s^{-1}$)

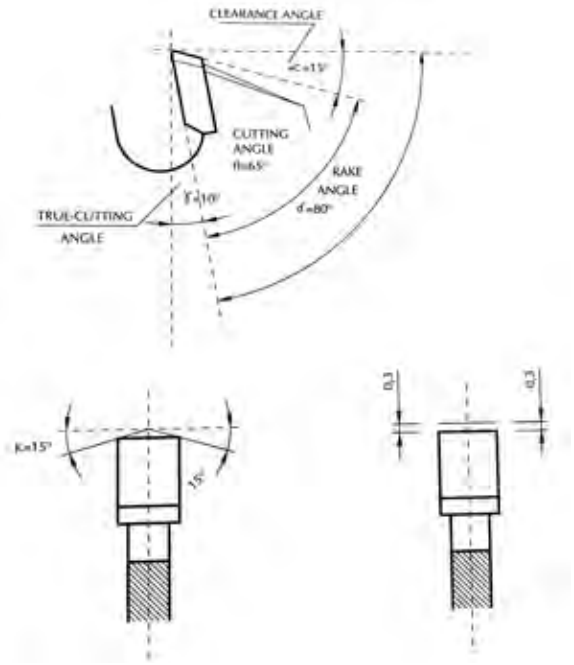



**Figure 21**
Types of teeth used for cutting the BetonWood® panels

### Grooves cut

It is recommended the use of saws with carbide tip. (v = 1,5 - 6 mm).
($n_{min}$ = 5300 $min^{-1}$ = 88 $s^{-1}$)

### Circular cutting and other types of cuts

It can be used an electric compass to cut holes with a larger diameter of 30 mm as for the cutting of other shapes and for cutting corners. ($n_{min}$ = 1600 rounds/min)

## Drilling

For this operation are recommended high speed steel reamers with tools with original carbide tips. ($n_{min}$ = 400 W; $n_{min}$ = 1200 $min^{-1}$ = 20 $s^{-1}$)
Reamers with higher value of rounds per minute can obtain claner holes. It is recommended using a solid wood piece at the exit point of the reamer. The advancement of cutting speed should be kept to a minimum.

**Recommended tools typologies:**
• from 1,5 to 16 mm diameter: helical drill with an angle cone of 60°
• from 8 to 16 mm diameter: morticer with a guide tip and engraving margin
• from 16 to 40 mm diameter: alesatrice with guide tip and cutting margin
It can be also used reamers with a diameter from 1,5 to 16 mm with excavation devices with a metallic hard tip.

## Milling

It is recommended, even for these operations, use milling machines with carbide tips. Set of milling machines with reversible blade ensures a quick replacement and high accuracy. ($n_{min}$ = 22000 $min^{-1}$ = 367 $s^{-1}$)

## Sanding

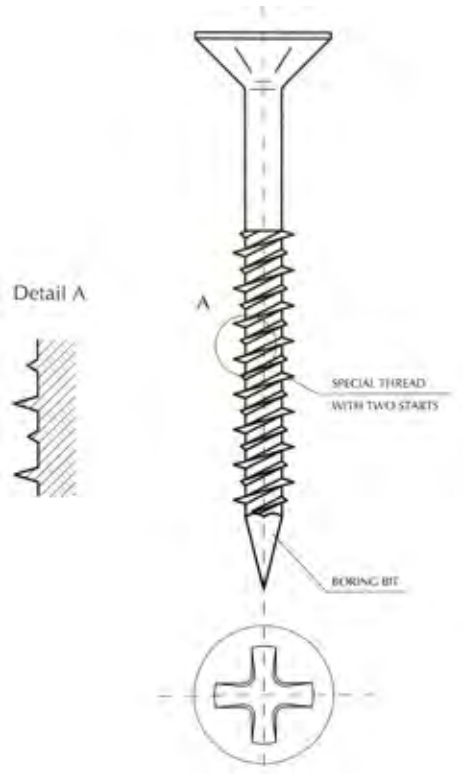
Edge irregularities can be removed by sanding. The recommended dimensions for the sandpaper texture are per la grana della carta vetrata sono: 60 - 80. It can be reached an appropriate depth of cut with the use of belt sanders. It should be ensured dust extraction in all circumstances.
(v = 350 m/min)

## Clamps and nail fixing

Prebored BetonWood® panels can be nailed using manual methods but it is always better the use of screws. Their fixing to the natural wood can be carried out only by mechanical fixing and pneumatic clamping with automatic perforations. The joints can be improved significantly by the use of spiral nail.

## Screw fixing

In the mass production, the BetonWood® panels can be can be screwed with electrical or pneumatic devices (es. toggling machines, riveters). In the structure assembling it can be used more effectively the screw with two spin type, as shown in Figure 22.



## BETONFIX NF57 SCREWS(provided by BetonWood)

The screws for cement bonded particle board are specifically designed to work in exterior environments coupled with cement bonded particle boards and the special surface treatment makes them more resistant to aggressive agents than standard screws.

## BETONFIX NF60 SCREWS (provided by BetonWood)

The screws for cement bonded particle board are specifically designed to work in exterior environments coupled with cement bonded particle boards. The high tecnology drill tip which allows a perfect drilling capacity also for high thicknesses.

## FIXING OF BETONWOOD PANELS

When assembling structures, it should be taken in consideration the following mounting recommendations:

| Scew fixing | Nail fixing | Clamp fixing | Bonding |
|---|---|---|---|
| With pre-drilling.<br>Hole diameter:<br><br>$D = 0,8 - 1,1 \times D_s$<br>$D_s$ = screw diameter | Without pre-drilling for panel thickness under 10 mm. Above this thickness is recommended predrilling.<br><br>$D = 0,8\ D_n$<br>$D_n$ = nail diameter | Recommended for panels with a thickness under 12 mm only using medium length clamps and appropriate tools. | It provides additional support to the nailing and fixing with clamps. It advises an alkaline reaction adhesive. |

The cement bonded particle boards should be carefully fixed on a frame.

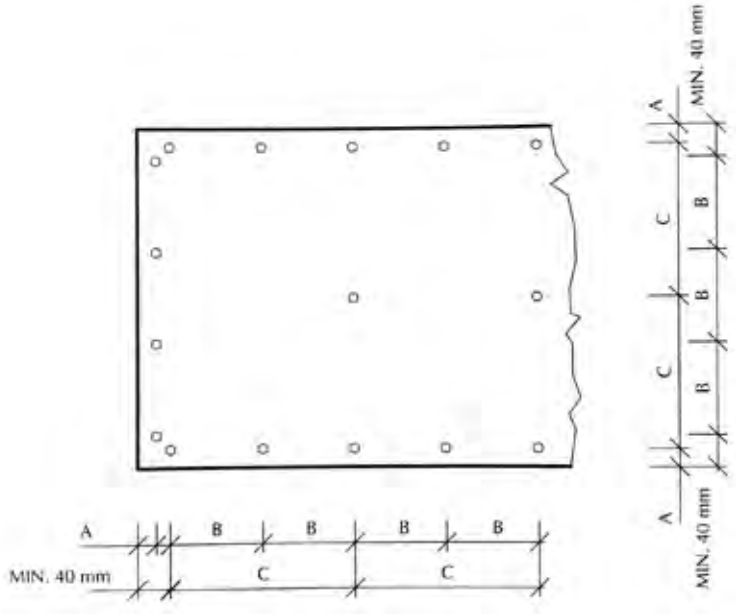



**Figure 23**
Requested distances for fixing

• in the figure 23 and in the table 10 are shown the requested distances for fixing the most of the panels used. The fixing distances on the angles must be selected in order to avoid excessive transverse weakening.
• is recommended to use di usare a fixing with screws for panels with a thickness of 16 mm.
• is necessary use frames resistant to corrosion, hooks and galvanized equipment, cadmium plated, etc.
• appropriate supports must be provided during fixing the panels for any assembly method.

| Thicknesses mm | Edge A | Edge B | Edge C |
|---|---|---|---|
| | Fixing distance mm | | |
| **8, 10, 12, 14** | 20 mm | 200 mm | 400 mm |
| **16, 18, 20** | 25 mm | 300 mm | 600 mm |
| **24, 28** | 25 mm | 400 mm | 800 mm |
| **40** | 40 mm | 600 mm | 1200 mm |

**Table 10** Fixing distance in function of BetonWood ® panels thicknesses

## JOINTS

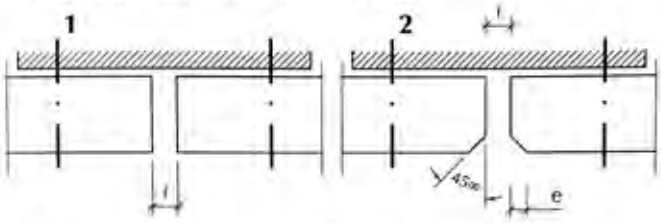
When a BetonWood® structure is designed, it must be taken in consideretion the following reccomandations:
- dimensional changes of the structure components basing on the temprature
- dimensional changes depending on humidity content
- load movements on the structure
- external effects, loads (wind pressure, vibrations, etc.)
- fixing elements (typology, dimension, quality, etc.)

When extensions are realized, it must be appropriately selected the width of substrate to ensure that the support is reliable.

### Visible joints

It can be realized a wide range of extensions with BetonWood® panels with different edge types. Some examples are shown in figure 24 and table 11.

Per pannelli con spessore inferiore a 14 mm




Per pannelli con spessore superiore a 14 mm

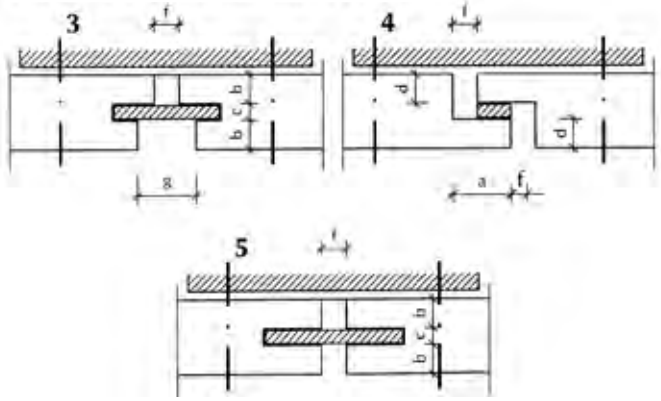



**Figure 24**
Extensions realized with different typologies of edges

**Table 11**
Dimensions and symbols shows in figure 26 in funtion of panels thickness

| Symbols | below 14 mm | 14 - 24 mm | beyond 24 mm |
|---|---|---|---|
| | Thickness of BetonWood® panels | | |
| a | - | 11 - 16 | max.20 |
| b | - | min. v/2 - 2 | min.8 |
| c | - | max. 4 | max.8 |
| d | - | v/2 - 0,5 | v/2 - 1 |
| e | min.3, max v/3 | min.3, max.5 | min.3, max. v/4 |
| f | usually 8 - 10 mm depends by the size of the panel | | |
| g | - | usually 2f | usually 2f |

The different shapes of edges are shown in figures 25, 26, 27 e 28. The extensions can be covered with wood, aluminum and plastic profiles. These are shown in figures 29 and 30.

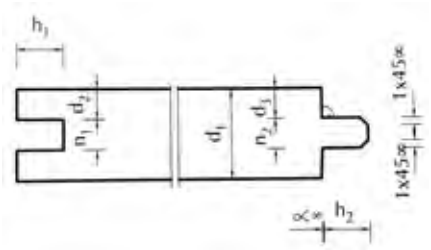
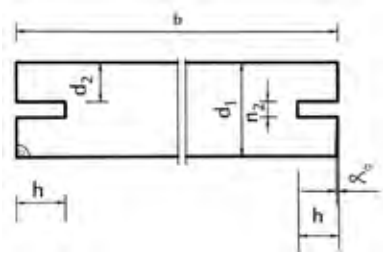


**Figura 25**
Tongue and Groove edge
Min. thickness **18 mm**

| $d_1$ | 18 | 20 | 24 | 28 | 32 | 36 | 40 |
|---|---|---|---|---|---|---|---|
| $n_2$ | 6 | 6 | 8 | 8 | 8 | 8 | 8 |
| $n_1$ | 6,5 | 6,5 | | 8,5 | 8,5 | 8,5 | 8,5 |
| $d_2$ | 6,25 | 7,25 | 8,25 | 10,25 | 12,25 | 14,25 | 16,25 |
| $d_3$ | 6,5 | 7,5 | 8,5 | 10,5 | 12,5 | 14,5 | 16,5 |
| ∝ ° | 2° | 2° | 2° | 1,5° | 1,5° | 1,5° | 1,5° |
| $h_1$ | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| $h_2$ | 8,5 | 8,5 | 8,5 | 8,5 | 8,5 | 8,5 | 8,5 |

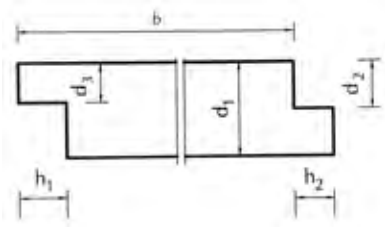
## Invisible joints

When a surface without joints is realized, the external and internal perimeter needs different steps.
On the internal walls and false ceilings is usually used a plasterboard paneling screwed directly on Beton-Wood®. Instead, on the external walls is recommended to use a glass fiber net and levelling products.



| $d_1$ | 16 | 18 | 20 | 24 | 28 | 32 | 36 | 40 |
|---|---|---|---|---|---|---|---|---|
| $n_2$ | 3,5 | 3,5 | 3,5 | 3,5 | 3,5 | 3,5 | 3,5 | 3,5 |
| $d_2$ | 5,5 | 6,5 | 7,5 | 9,5 | 11,5 | 13,5 | 15,5 | 17,5 |
| ∝° | 2° | 2° | 2° | 1,5° | 1,5° | 1,5° | 1,5° | 1,5° |
| h | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |

**Figure 26** Interlocking joints edge - Min. thickness **16 mm**



| $d_1$ | 12 | 16 | 18 | 20 | 24 | 28 | 32 | 36 | 40 |
|---|---|---|---|---|---|---|---|---|---|
| $d_3$ | 5,5 | 7,5 | 8,5 | 9,5 | 11,5 | 13,5 | 5,5 | 17,5 | 19,5 |
| $d_2$ | 5,8 | 7,8 | 8,8 | 9,8 | 11,8 | 13,8 | 15,8 | 17,8 | 19,8 |
| $h_1$ | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 | 10 |
| $h_2$ | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 | 9 |

**Figure 27** Stepped edge - Min. thickness **12 mm**

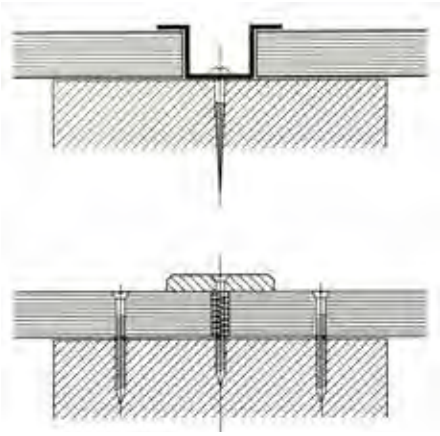


**Figure 28** Joints

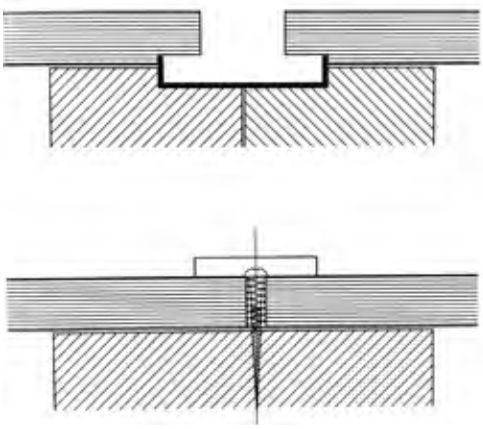


**Figure 29** Joints

## DRILLING

Before choosing and applying the adhesive on the panels BetonWood® is highly recommended ask for technical information to the adhesive supplier.

## FINISHING, PICTURING

For finishing BetonWood®, it should be taken in consideration the following recommendations:
• thanks to its high cement content, the panel shows alkaline reactions.
• the panel surface is smooth and sufficiently absorbent.
• the moisture content shouldn't exceed 14%
Because of the alkalinity of the panel, it should be used to alkali-resistant materials for the finishing of BetonWood® panels and it should be applied an alkali resistant primer.

Priming is used to:
• reduce the surface alkalinity
• make the absorbency uniform
• reduce the moisture absorbency
For this purpose it can be used the so-called "deep primer" alkali-resistant (which doesn't showsaponifications on the surface). Before the material application for finishing is highly recommended ask technical informations to our office.

The BetonWood® panels are used in thermal insulation coating systems. After the panel fixing on the supporting frame (X-Lam or metallic) and the filling of joints with bicomponent elastic cement mortar, proceed laying the glass fiber net BetonNet Glass 360 and the levelling operations.

For the painting consult the list prices.

## BETONWOOD ON METAL STRUCTURES

BetonWood provides natural insulation complete systems with high-performance and high thermal lag for external and internal walls and counter walls screwed on metal structures.
We recommend the consultation of installation instructions.
Once positioned the panels BetonWood N® at intervals on metallic structure (the size of which will depend on the size of the panels) they will be arranged in a staggered way and screwed. The arrangement of the screws are shown on page 29, follow the instructions as shown in Figure 23 and Table 10.
Space the panels 3 mm one from the other, then proceed to the filling of the joints with suitable bicomponent elastic cement mortar and with the cover joint tape in fiber glass BetonNet Strip.
For skimming an high density fiber glass net is layed from the top to the bottom and then is possible a levelling operation in compliance with the manufacturers instructions.

## BETONWOOD ON WOOD STRUCTURES, X-LAM, OSB









## BETONWOOD AS DRY SCREED

BetonWood provides natural insulation complete systems with high-performance and high thermal lag and sound insulation for floors and ceilings whether external or internal, standard or floating.

As you can see from the product overview on page 5, BetonWood has created a system of panels for radiant heating flooring in cement bonded particle boards named BetonRadiant which can also be laid in floating version on adjustable feet or layed on propped cork granules.






## BETONWOOD AS ROOF

The BetonWood panels, used in coupled with insulating materials (such as BetonFiber, BetonCork, BetonStyr, BetonEco) or with FiberTherm wood fiber panels for roofing, give the possibility to produce great high thermal displacement solutions for cold and hot climates.

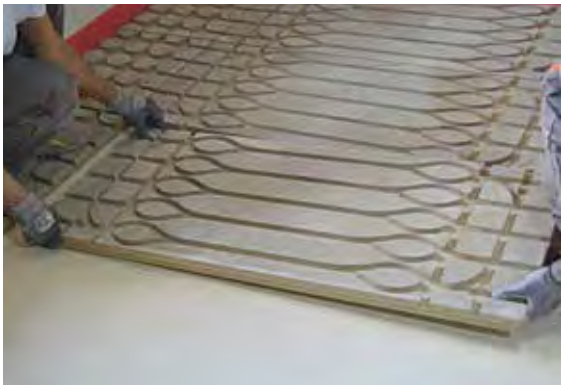
## BETONWOOD AS EXTERNAL/INTERNAL FACING WALL

The BetonWood cement bonded particle board can be covered for indoor or outdoor use, with ceramic or stone tiles that can be easily installed directly on the surface of our panels.

## BETONRADIANT AS RADIANT HEAT FLOOR

Beton Radiant is a modular system for the realization of radiant floors, it is an excellent solution for a radiant floor heating system with condensing boilers. The system can also be used on the ceiling and on floating screeds.

It begins installing always starting from the main condensing boiler (as shown in figure).
For cutting the boards we recommend the use of suitable equipment, such as circular saws, table saws, flexible carbide or diamond disks fitted with blades for wood, and we recommend the use of dust extraction systems.

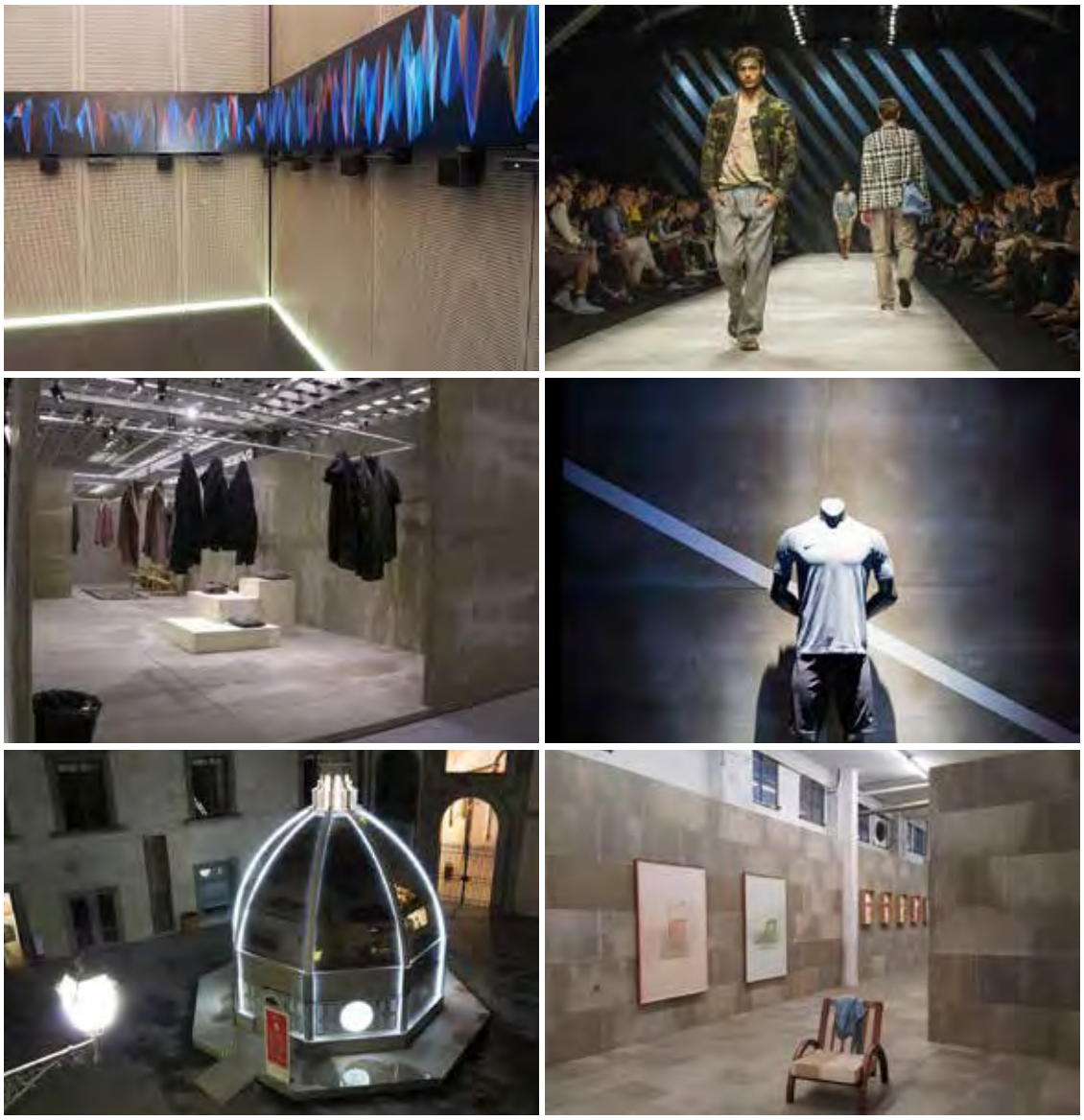






## BETONWOOD IN EXHIBITIONS

The BetonWood panels thanks to their aesthetic characteristics are also very used for permanent or temporary installations. They are used for fairs, stands, museums, stages for fashion shows, shops such as Nike and Colmar.



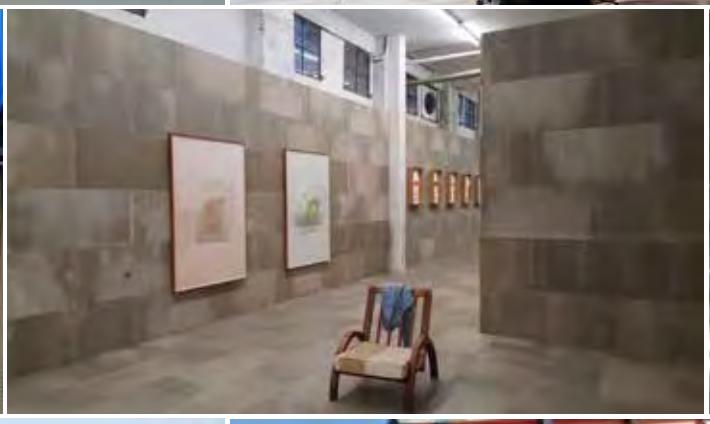
# NOTES

# CEMENT BONDED PARTICLE BOARD CATALOGUE 2017

BetonWood®

PANELS WITH HIGH DENSITY AND MECHANICAL RESISTANCE






**BETONWOOD Srl**

**Dry building systems for green building**

Office:
Via Falcone e Borsellino, 58
I-50013 Campi Bisenzio (FI)

T: +39 055 8953144
F: +39 055 4640609

info@betonwood.com
www.betonwood.com



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CERTIFICATIONS
The BetonWood products are certified CE according to the standard EN 13168

All indications and requirements set out above are based on our current technical and scientific knowledge, which in any case are to be considered purely indicative, as the conditions of use are outside of our control. Therefore, the buyer must still verify the suitability of the product to the specific case, taking all responsibility for the use, raising BetonWood from any claim for consequential damages.
For any question or information please contact our commercial office writing an email to info@betonwood.com

SELL CONDITIONS: dowloadable from the site www.betonwood.com