XEPOX

VIDEO

EN 1504-4

TWO COMPONENTS EPOXY ADHESIVE

RELIABLE
Proven durability evidenced by 30 years of use in timber construction.

HIGH PERFORMANCE
High-performance two-components epoxy adhesive. The strength of the connection is dependent on the timber due to the adhesives over-performance.

VERSATILE
In cartridges for practical and fast use, in 3 litre and 5 litre sizes for larger volume joints.

CHARACTERISTICS

FOCUS	structural gluing
TYPES	joints with rods, joints with perforated or sand-blasted plates
RANGE	5 products to adapt to all installation requirements
APPLICATION	applicable by spray, brush, percolation or spatula depending on viscosity

VIDEO
Scan the QR Code and watch the video on our YouTube channel

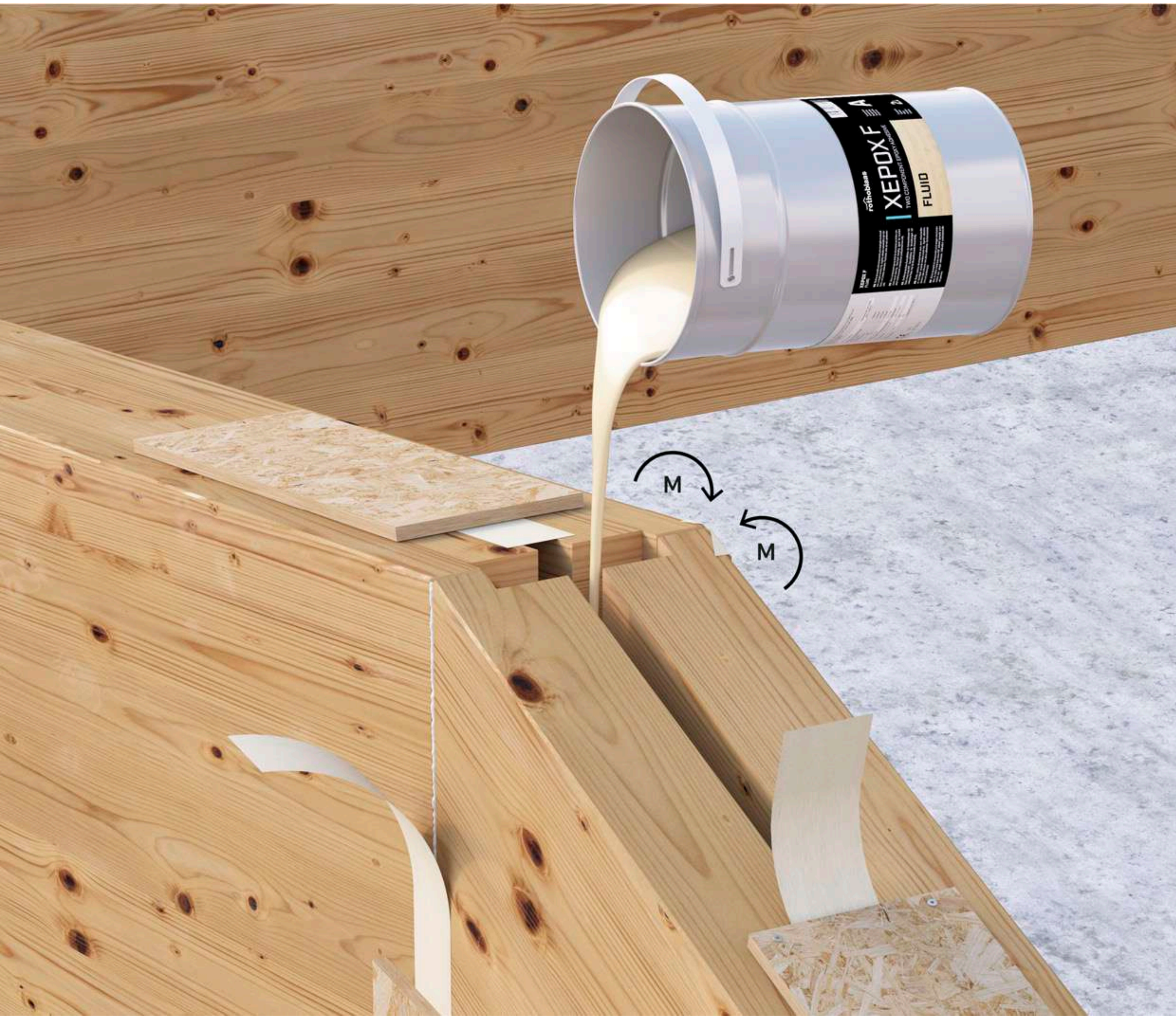
MATERIAL

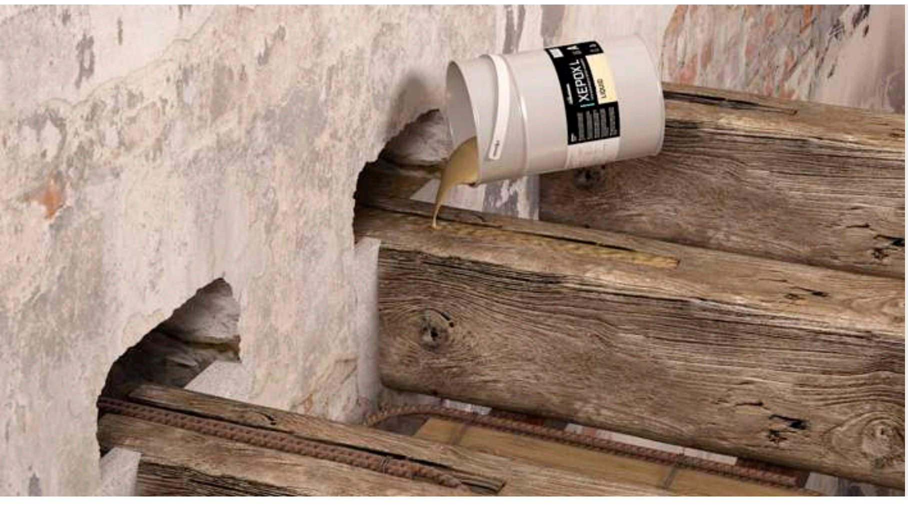
Two components epoxy adhesive.

FIELDS OF USE

Shear joints, axial action and moment achievable on

- solid timber and glulam
- CLT
- concrete





STRUCTURAL

Ideal for creating rigid multi-directional joints.

STATIC CONSOLIDATION

Can be used to rebuild “timber material” in combination with metal rods and other materials.

CODES AND DIMENSIONS

DRUMS

CODE	description	content [ml]	pcs
XEPOXP3000	P - primer	A + B = 3000	1
XEPOXL3000	L - liquid	A + B = 3000	1
XEPOXL5000		A + B = 5000	1
XEPOXF3000	F - fluid	A + B = 3000	1
XEPOXF5000		A + B = 5000	1
XEPOXG3000	G - gel	A + B = 3000	1

CARTRIDGES

CODE	description	content [ml]	pcs
XEPOXF400	F - fluid	400	1
XEPOXD400	D - dense	400	1

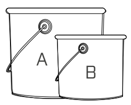
ADDITIONAL PRODUCTS - ACCESSORIES

CODE	description	pcs
MAMDB	double cartridge gun	1
STINGXP	mixing nozzle	1

APPLICATIONS

XEPOX P - primer

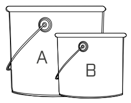
Two-components epoxy adhesive with extremely low viscosity and high wetting properties for structural reinforcments through carbon or glass fibre textures. Useful to protect sanded metal sheets SA2,5/ SA3 (ISO 8501) and to realize FRP (Fiber Reinforced Polymers) bits. Applicable by roller, spray and brush. Shelf life 36 months in the original unopened packaging, at temperatures between +5°C and +30°C.



Component A classification: Eye Irrit. 2; Skin Irrit. 2; Skin Sens. 1; Aquatic Chronic 2. Component B classification: Acute Tox. 4; Skin Corr. 1B; Eye Dam. 1;Skin Sens. 1; Aquatic Chronic 3.

XEPOX L - liquid

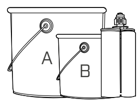
Two-components epoxy adhesive for structural usage, very fluid, applicable via pouring into very deep vertical holes and suitable for large joints with hidden bits placed in quite extended grooves, also good in case of reduced spacing (1mm or more), provided that the slots are accurately sealed.
Pourable and injectable. Shelf life 36 months in the original unopened packaging, at temperatures between +5°C and +30°C.



Component A classification: Eye Irrit. 2; Skin Irrit. 2; Skin Sens. 1; Aquatic Chronic 2. Component B classification: Acute Tox. 4; STOT RE 2; Skin Corr. 1B; Eye Dam. 1; Skin Sens. 1; Aquatic Chronic 3.

XEPOX F - fluid

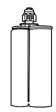
Two-components epoxy adhesive for structural usage, applicable via injection into holes and grooves, provided that the slots are accurately sealed. Preferable for binding timber connectors bent (Turrini-Piazza method) into timber-concrete composite floors, both with new and existing beams; gaps between timber and metal of approximately 2 mm or more. Percolation into the vertical holes in the groves after inserting the metal plate or rod bits. Pourable and injectable with cartridge. Shelf life 36 months in the original unopened packaging, at temperatures between +5°C and 30°C.



Component A classification: Eye Irrit. 2; Skin Irrit. 2; Skin Sens. 1; Aquatic Chronic 2. Component B classification: STOT RE 2; Skin Corr. 1A; Eye Dam. 1; Skin Sens. 1; Aquatic Chronic 3.

XEPOX D - dense

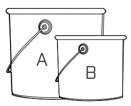
Two-components epoxy thixotropic (dense) adhesive for structural usage, applicable via injections especially into horizontal or vertical holes in Glulam and solid timber beams, masonry or reinforced concrete walls.
Injectable with cartridge.
Shelf life 36 months in the original unopened packaging, at temperatures between +5°C and +30°C.



Component A classification: Eye Irrit. 2; Skin Irrit. 2; Skin Sens. 1; Aquatic Chronic 2. Component B classification: Repr. 1A; Acute Tox. 4; Skin Corr. 1B; Eye Dam. 1; Skin Sens. 1; Aquatic Chronic 3.

XEPOX G - gel

Two-components epoxy gel adhesive for structural usage, applicable via trowel also on vertical surfaces, permits the realization of thick or uneven layers. Suitable for large timber overlaps, for gluing structural reinforcing elements by using glass or carbon fiber textures and for metal or timber coatings.
Spreadable. Shelf life 36 months in the original unopened packaging, at temperatures between +5°C and +30°C.



Component A classification: Eye Irrit. 2; Skin Irrit. 2; Skin Sens. 1; Aquatic Chronic 2. Component B classification: Acute Tox. 4; Skin Corr. 1A; Eye Dam. 1; STOT SE 3; Skin Sens. 1; Aquatic Chronic 3.

TECHNICAL FEATURES

Properties	Standard		XEPOX P	XEPOX L	XEPOX F	XEPOX D	XEPOX G
Density	**ASTM D 792-66**		≈ 1,10	≈ 1,40	≈ 1,45	≈ 2,00	≈ 1,90
Stoichiometric volume ratio (A/B)[1]	-		100 : 50 [2]	100 : 50	100 : 50	100 : 50	100 : 50
Pot life 23 ± 2° 150 cc	**ERL 13-70**	[min]	-	50 ÷ 60	50 ÷ 60	50 ÷ 60	60 ÷ 70
Working life of the mixture	**ERL 13-70**	[min]	25 ÷ 30	25 ÷ 30	25 ÷ 30	25 ÷ 30	-
Application temperature (maximum relative moisture 90%)	-	[°C]	10 ÷ 35	10 ÷ 35	10 ÷ 35	5 ÷ 40	5 ÷ 40
Suggested thickness	-	[mm]	0.1 ÷ 2	1 ÷ 2	2 ÷ 4	2 ÷ 6	1 ÷ 10
Normal adhesion tension σ	**EN 12188**	[N/mm²]	21	27	25	19	23
Slant shear strength σ_0 50°	**EN 12188**	[N/mm²]	94	70	93	55	102
Slant shear strength σ_0 60°	**EN 12188**	[N/mm²]	106	88	101	80	109
Slant shear strength σ_0 70°	**EN 12188**	[N/mm²]	121	103	115	95	116
Shear-adhesion strength τ	**EN 12188**	[N/mm²]	39	27	36	27	37
Unitary breaking load in compression[3]	**EN 13412**	[N/mm²]	83	88	85	84	94
Elastic modulus in compression	**EN 13412**	[N/mm²]	3438	3098	3937	3824	5764
Thermal expansion coefficient (ranging between -20°C / +40°C)	**EN 177**	[m/m·°C]	$7{,}0 \times 10^{-5}$	$7{,}0 \times 10^{-5}$	$6{,}0 \times 10^{-5}$	$6{,}0 \times 10^{-5}$	$7{,}0 \times 10^{-5}$
Tensile strength[4]	**ASTM D638**	[N/mm²]	40	36	30	28	30
Elastic modulus in tension[4]	**ASTM D638**	[N/mm²]	3300	4600	4600	6600	7900
Flexural strength[4]	**ASTM D790**	[N/mm²]	86	64	38	46	46
Elastic modulus in flexure[4]	**ASTM D790**	[N/mm²]	2400	3700	2600	5400	5400
Unitary shear strength by punch tool[4]	**ASTM D732**	[N/mm²]	28	28	28	19	25
Viscosity	-	[mPa·s]	A = 1100 B = 250	A = 2300 B = 800	A = 14000 B = 11500	A = 300000 B = 300000	A = 450000 B = 13000

NOTES:

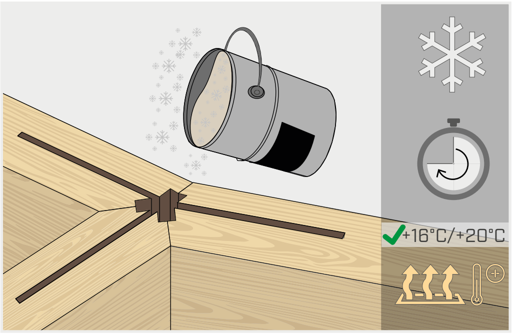
[1] The components are packaged in pre-measured quantities, ready to use. The ratio is by volume (not weight).

[2] It is best not to use more than one litre of mixed product at a time. The weight ratio between components A:B is around 100:44,4.

[3] Average value at the end of the loading / unloading cycles.

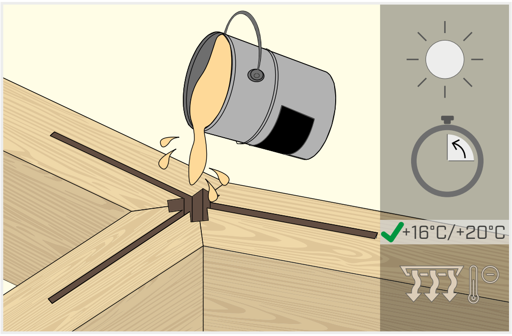
[4] Test values from the research campaign "Innovative links for timber structural elements" - Politecnico di Milano.

APPLICATION AND CONSERVATION TEMPERATURE



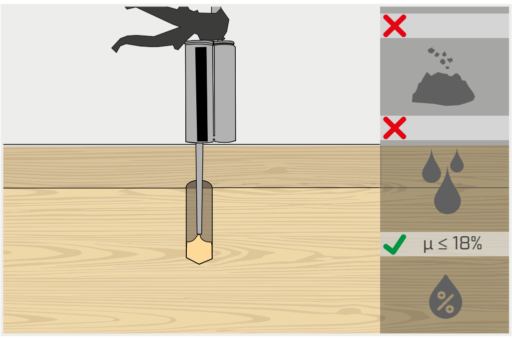
ADHESIVE CONSERVATION

Epoxy adhesives must be maintained at moderate temperature levels (approximately +16°C/+20°C) both in winter and summer until the moment they are used. Do not store the package in cold temperature environments, as it may increase the viscosity and hinder the pouring and the cartridge extrusion. Do not leave the package exposed to direct sunlight, as heat reduces the polymerisation times.



ADHESIVE APPLICATION

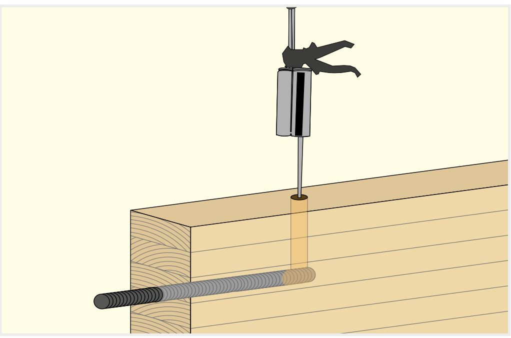
The advised ambient application temperature is > + 10 °C. If the temperature is too cold, it will be necessary to warm up the packages at least one hour prior to using them or warm up the application sites and the metallic bits before percolating the product. If the temperatures should be too high, it will be necessary cool the product down, avoiding the hottest time of day.



GROOVING AND HOLE TREATMENTS

Before pouring and injecting the adhesive, holes and grooves must be protected from meteoric water and humidity, and cleaned with compressed air. If the parts expecting the potting are wet, it is mandatory to dry them. XEPOX adhesive is recommended for use with timber that has been adequately dried, with a moisture content lower than 18%.

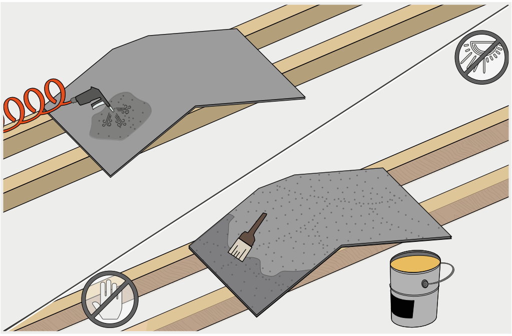
JOINTS WITH GLUED RODS



RESIN

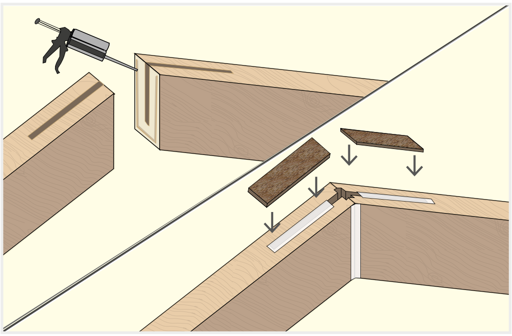
Joints with rods are suitable for extrusion with biaxial cartridges, given the small quantities of resin. To change the amount of adhesive to be injected, cut the end of the nozzle. For gluing long rods, it is recommended to prepare filling holes at right angles to the rod.

MOMENT JOINTS WITH PLATES



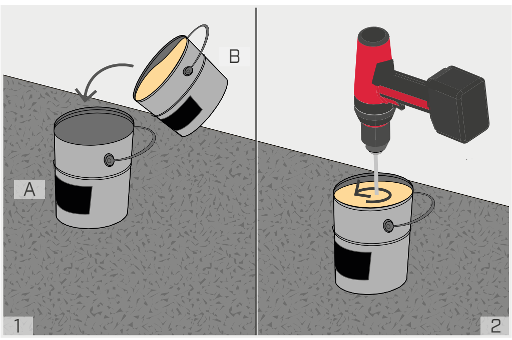
PREPARATION OF METALLIC SUPPORTS

The metallic bits reinforcing the joints must be cleaned and ungreased. Smooth sheets must be treated with grade SA2,5/SA3 sanding and then protected through a layer of XEPOX P to avoid their oxidation. Especially during hot seasons, it is necessary to protect the metallic surfaces from direct sunlight.



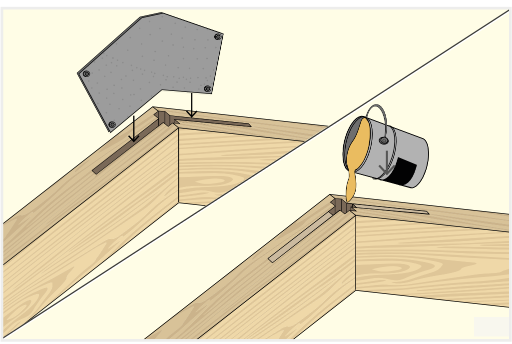
PREPARATION OF TIMBER SUPPORTS

Close to the vertical edges, apply continuous strips of adhesive paper tape at about 2÷3 mm from the edge.
Next, apply a continuous bead of acetic silicone and apply pressure so that it also adheres to the surface protected by the tape. The outer grooves of the sloping elements must be sealed with strips or wooden planks, leaving only the end of the grooves uncovered at the highest point from where the adhesive is exposed.



PRODUCT PREPARATION

To use the product in drums, poor the hardener (component B) into the drum containing the epoxy resin (component A). Vigorously mix the two different coloured components. We recommend a suitable mixer with a double helix mounted on an power tool; alternatively a metal whisk can be used. Mix until the colour is consistent. Pour the resulting mixture.
To distribute the mixture into crevices of significant length and for castings, pour directly from the drum or spread the product with a spatula.



RESIN

It is best to provide "useful" bearing of adhesive to be made with a special machine at the top of the structural timber elements as an additional guarantee of the functionality of the contact system. Spaces between the metallic and timber bits should be 2÷3 mm wide on each side. To guarantee the correct positioning of the bits in the grooves, place spacing washers in the inserts during the protection polymerisation phase with XEPOX P.

XEPOX EPOXY ADHESIVE

A HISTORICAL FAMILY OF PRODUCTS FOR JOINTS BETWEEN TIMBER ELEMENTS, ABLE TO GUARANTEE AN EXCELLENT RESTORATION OF STRENGTH AND STIFFNESS

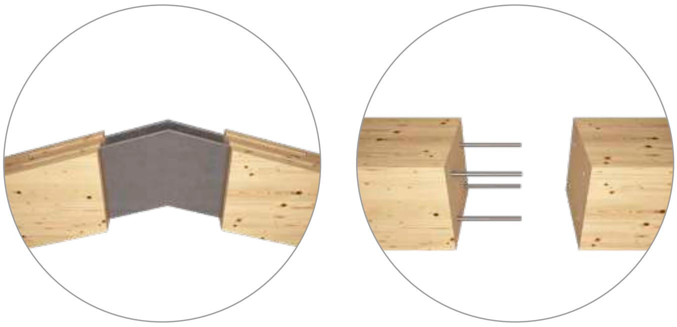
XEPOX epoxy adhesives are two-component resins specifically formulated to penetrate the microstructure of wood and adhere to it with great effectiveness, and to reduce the typical resin crystallization.

The mixture of components A and B causes an exothermic reaction (heat development) and, once hardened, forms a three-dimensional structure with exceptional properties, such as: durability over time, interaction with no humidity, excellent thermal stability, great stiffness and strength.
Each chemical or mineral element of the formulation has a specific role and all together they contribute to the achievement of the performance characteristics of the adhesive.

FIELD OF USE

The different viscosities of XEPOX products guarantee versatile uses for different types of joints, both for new constructions and for structural recoveries. The use in combination with steel, in particular plates, sandblasted or drilled, and rods, allows to provide high strength in limited thickness.

1. MOMENT CONTINUITY JOINT



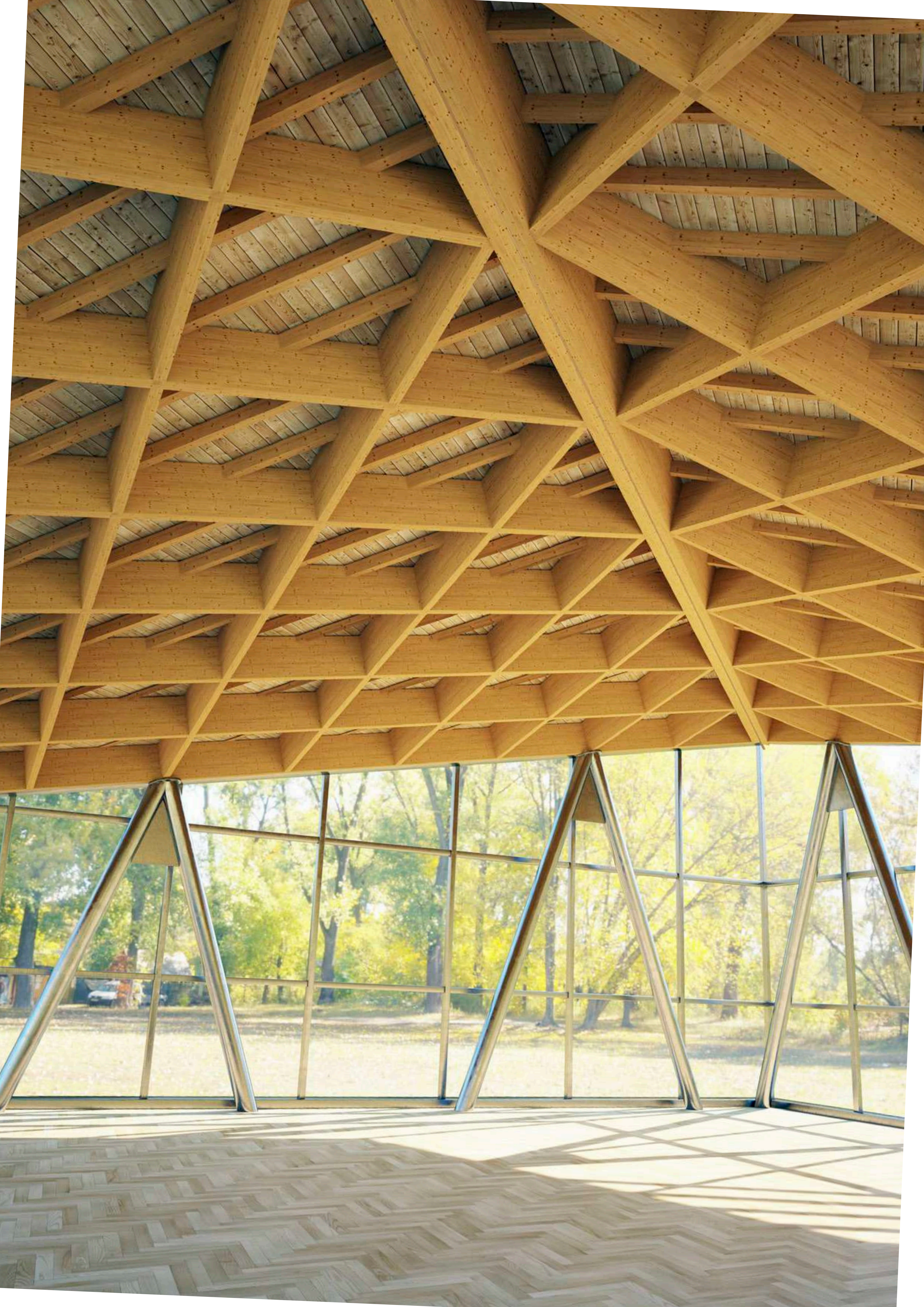
2. TWO OR THREE-WAY CONNECTIONS

3. TIMBER JOINT

4. REHABILITATION OF DAMAGED PARTS

AESTHETIC IMPROVEMENTS

The cartridge format also allows it to be used for aesthetic adjustments and gluing in small quantities.



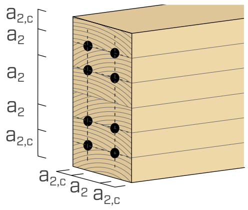
JOINTS WITH GLUED RODS

The indications contained in DIN 1052:2008 and in the Italian standards CNR DT 207:2018 are reported.

MINIMUM DISTANCES FOR RODS

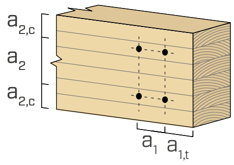
TENSION
Rods glued // to the fibre

a_2	5d
$a_{2,c}$	2,5d



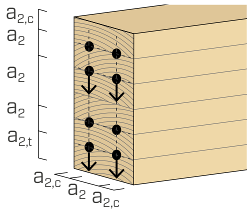
TENSION
Rods glued ⊥ to the fibre

a_1	4d
a_2	4d
$a_{1,t}$	2,5d
$a_{2,c}$	2,5d



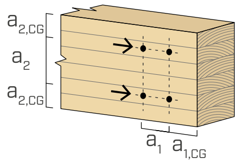
SHEAR
Rods glued // to the fibre

a_2	5d
$a_{2,c}$	2,5d
$a_{2,t}$	4d



SHEAR
Rods glued ⊥ to the fibre

a_1	7d
a_2	5d
$a_{1,CG}$	10d
$a_{2,CG}$	4d



The minimum insertion length is:

$$l_{min} = max \begin{Bmatrix} 0,5\ d^2 \\ 10\ d \end{Bmatrix}$$

CALCULATION METHOD

TENSILE STRENGTH

The tensile strength of a rod of diameter d is equal to:

$$R_{ax,d} = min \begin{cases} f_{yd} \cdot A_{res} & \text{steel failure} \\ \pi \cdot d \cdot l \cdot f_{v,d} & \text{timber shear failure} \\ f_{t,0,d} \cdot A_{eff} & \text{timber tensile strength} \end{cases}$$

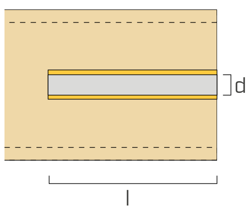
The effective area considers a square of timber with a maximum side of 6d; the area is reduced for smaller distances between the elements or from the edge.

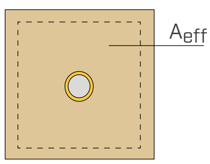
f_{yd} = design steel strength

$f_{t,0,d}$ = timber design tensile strength

The shear strength of the bonding $f_{v,k}$ depends on the insertion length

l [mm]	$f_{v,k}$ [MPa]
≤ 250	4
250 < l ≤ 500	5,25 - 0,005 x l
500 < l ≤ 1000	3,5 - 0,0015 x l





for angle α of inclination with respect to the fibre the following occurs:

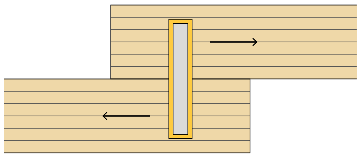
$$f_{v,\alpha,k} = f_{v,k} \cdot (1,5 \cdot sin^2\alpha + cos^2\alpha)$$

SHEAR STRENGTH

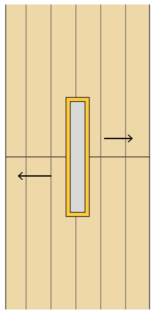
The shear strength of a rod can be calculated using the well-known Johansen's formulas for bolts with the following measures.

For rods glued perpendicularly to the fibre, the bearing stress strength can be increased by up to 25%.

$f_{h,k} = f_{h,k} + 25\%$



$f_{h,k,//} = 10\% \; f_{h,k,}$



The bearing stress strength for rods glued parallel to the fibre is 10% of the value perpendicular to the fibre.

The hollow effect is evaluated as the strength given by the extraction bonding (failure b).
To obtain the strength of a rod bonded at an α angle, it is permitted to interpolate linearly between the strength values for α at 0° and 90°.

EXPERIMENTATION

The extraction calculation of a rod glued with XEPOX is reported, comparing the result with the tests carried out at the University of Biel, measuring the overstrength factor between the test and the calculation. This demonstrates the existing safety margin: however, it should be remembered that the value resulting from the test is not a characteristic value and is not intended to be used in the design.

GEOMETRIC DATA

Specimen side	80	mm
A_{eff}	6400	mm
d	16	mm
l	160	mm
f_{yk}	900	MPa
$f_{t,0,k}$	27	MPa
γ_{M0}	1	
k_{mod}	1,1	
γ_M	1,3	

Steel failure	162,9	kN
Timber shear failure	29,0	kN
Timber tensile strength	146,2	kN
$R_{ax,d}$ = design resistant axial action	29,0	kN
$R_{ax,m}$ = experimental average strength axial action	96,3	kN
f = overstrength factor	3,3	

NOTES:

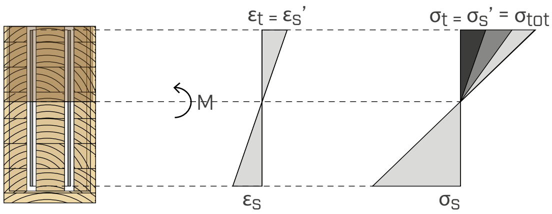
The tensile strength was derived from the average density of the specimens used for the tests.

The calculations were made taking into account the values of k_{mod} and γ_M according to EN 1995 1-1, and γ_{M0} according to EN 1993 1-1.

MOMENT JOINTS WITH PLATES

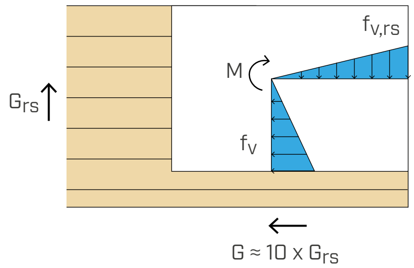
CALCULATION MODE | HEAD SECTION

The stresses due to the moment and the axial action are determined by homogenizing the materials of the section, in the hypothesis of conservation of the flat sections. The shear stress is absorbed only by the plates. It is also necessary to check the stresses acting on the timber section net of the grooved sections.



CALCULATION METHOD | MOMENT DISTRIBUTION ON THE STEEL-WOOD-ADHESIVE INTERFACE

The moment is distributed over the number of interface surfaces and then broken down into stresses, considering both the polar inertia around the centre of gravity and the different rigidity of the wood. In this way, the maximum tangential tensions are obtained in the orthogonal and parallel direction to the fibre, to be verified also in their interaction.



Polar moment of inertia of half the bit with respect to the centre of gravity, weighed on the timber cutting modules:

$$J_P^* = \frac{l_i \cdot h^3}{12} \cdot G + \frac{l_i^3 \cdot h}{12} \cdot G_{rs}$$

Calculation of tangential forces and combined verification:

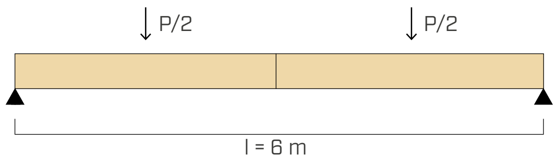
$$\tau_{max,hor} = \frac{(M_d + M_{T,Ed})}{2 \cdot n_i \cdot J_P^*} \cdot \frac{h}{2} \cdot G + \frac{N_d}{2\ n_i\ A_i}$$

$$\tau_{max,vert} = \frac{(M_d + M_{T,Ed}) \cdot e}{2 \cdot n_i \cdot J_P^*} \cdot G_{rs} + \frac{V_d}{2\ n_i\ A_i}$$

$$\sqrt{\left(\frac{\tau_{max,hor}}{f_{v,d}}\right)^2 + \left(\frac{\tau_{max,vert}}{f_{v,rs,d}}\right)^2} \leq 1$$

EXPERIMENTATION

The calculation of two joints made with XEPOX is shown, comparing the result with the 4 point bending tests carried out at the Politecnico di Milano. The **overstrength factor** between the test and the calculation is determined, which demonstrates the good safety margin that exists in the calculation of the joints. The value resulting from the test **is not a characteristic value and is not intended to be a use value in the design**.



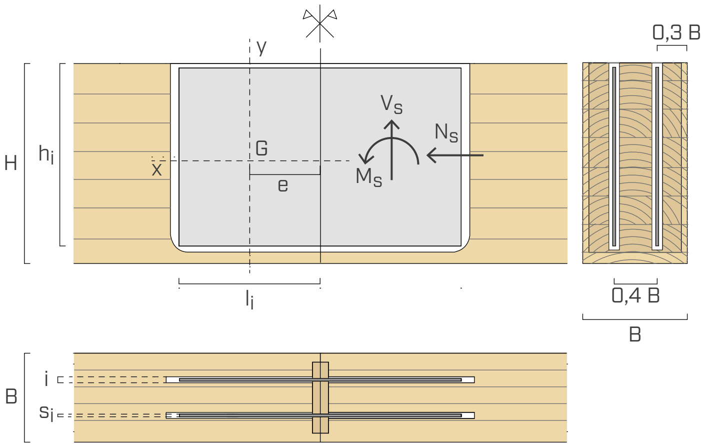
LEGEND:

B	beam base
H	beam height
α_1	beams angle of inclination
n_i	number of bits
S_i	metal bits thickness
h_i	metal bits height
l_i	metal bits insertion length
A_i	half bit surface
e	eccentricity between the centre of gravity of the plate and the head joint
B_n	beam width less the grooving
σ_t	maximum compressive stress in timber
σ_s'	maximum compressive stress in steel
σ_s	maximum tensile stress in steel
σ_{tm}	maximum flexural force in timber
$\tau_{max,hor}$	maximum horizontal tangential force
$\tau_{max,vert}$	maximum vertical tangential force
$f_{v,d}$	shear strength parallel to the fibre
$f_{v,rs,d}$	shear strength perpendicular to the fibre
$k_{c,90}$	parameter from EC 1995 1-1

EXAMPLE 1 | CONTINUITY JOINT

GEOMETRY OF THE NODE: BEAM AND PLATES

n_i	2	mm	B	200	mm
S_i	5	mm	H	360	mm
h_i	320	mm	B_n	182	mm
l_i	400	mm			
e	200	mm			



PROJECT MATERIAL AND DATA

Steel class	**S275**
γ_{M0}	1
Wood class	**GL24h**
k_{mod}	1,1
$\gamma_{M\ timber}$	1,3

Metal bits sandblasted to grade SA2.5/SA3 (ISO8501).

USE OF XEPOX

Protect the bits from oxidation with **XEPOX P**. Use **XEPOX F** or **XEPOX L** adhesive.

CONTROLS

M_d	design moment applied	**54,3**	**kNm**

HEAD JOINT VERIFICATION [1], [2]		
		% verification
σ_t	10,6 MPa	53 %
$\sigma_{s'}$	185,8 MPa	68 %
σ_s	274,9 MPa	100 %

VERIFICATION OF THE TIMBER CROSS-SECTION WITHOUT THE GROOVING		
		% verification
σ_{tm}	14,1 MPa	70 %

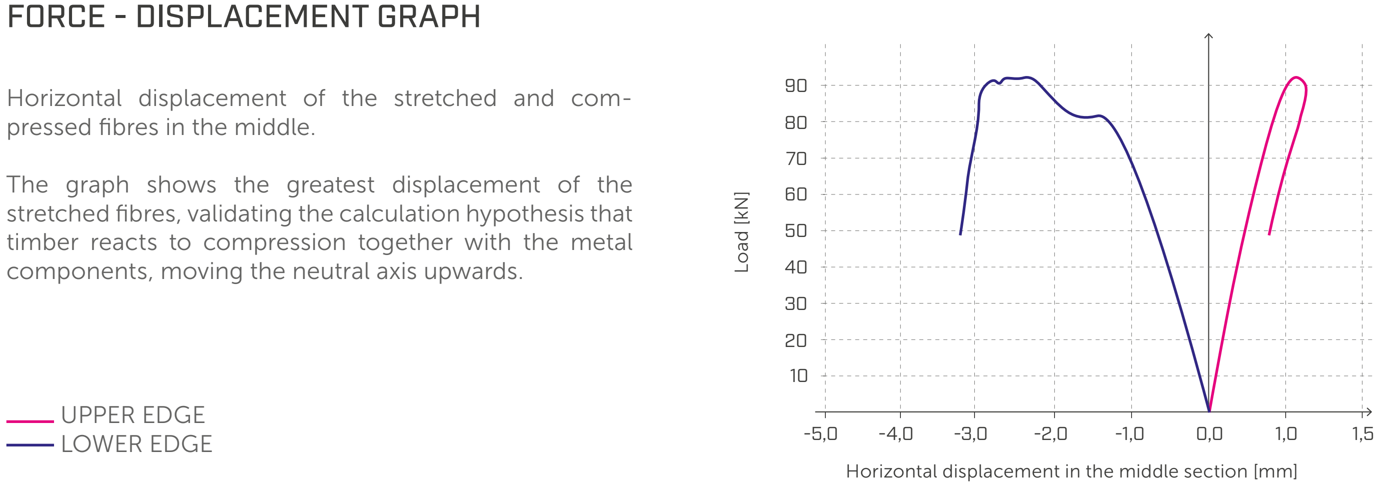
INTERFACE SURFACES MAXIMUM TANGENTIAL TENSION CHECK [3], [4]		
		% verification
J_P*	$8{,}56 \cdot 10^{11}$ Nmm^2	
$\tau_{max,hor}$ (3)	1,7 MPa	57 %
$\tau_{max,vert}$ (3)	0,2 MPa	20 %
combined verification		60 %

$M_d = M_{Rd}$	applied moment = design strength moment	**54,3**	**kNm**
M_{TEST}	test resistant moment	**94,1**	**kNm**
f	overstrength factor	**1,7**	

FORCE - DISPLACEMENT GRAPH

Horizontal displacement of the stretched and compressed fibres in the middle.

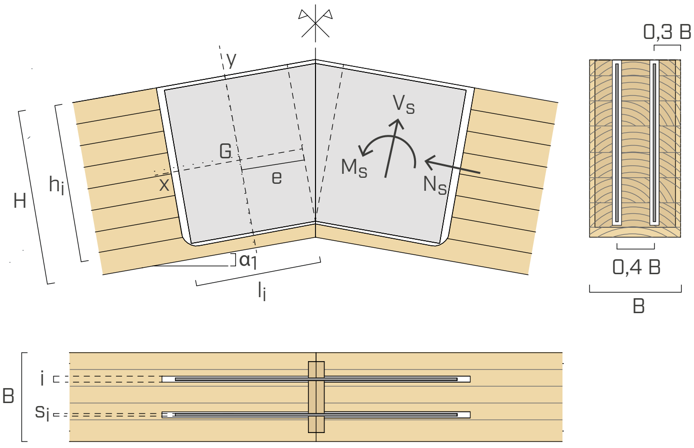
The graph shows the greatest displacement of the stretched fibres, validating the calculation hypothesis that timber reacts to compression together with the metal components, moving the neutral axis upwards.



EXAMPLE 2: KNEE JOINT

GEOMETRY OF THE NODE: BEAM AND PLATES

n_i	2	mm	**B**	200	mm
S_i	6	mm	**H**	360	mm
h_i	300	mm	**B_n**	176	mm
l_i	568	mm	**α_1**	21,8	°
e	332	mm			



PROJECT MATERIAL AND DATA

Steel class	**S275**
γ_{M0}	1
Wood class	**GL32c**
k_{mod}	1,1
$\gamma_{M\ timber}$	1,3

Metal bits sandblasted to grade SA2.5/SA3 (ISO8501).

USE OF XEPOX

Protect the bits from oxidation with **XEPOX P**. Use **XEPOX F** or **XEPOX L** adhesive.

CONTROLS

M_d	design moment applied	**63,5 kNm**

HEAD JOINT VERIFICATION [1], [2]		
		% verification
$k_{c,90}$ (A)	1,75	
σ_c	12,7 MPa	100 %
$\sigma_{s'}$	180,7 MPa	66 %
σ_s	262,0 MPa	95 %

VERIFICATION OF THE TIMBER CROSS-SECTION WITHOUT THE GROOVING		
		% verification
σ_t	16,7 MPa	62 %

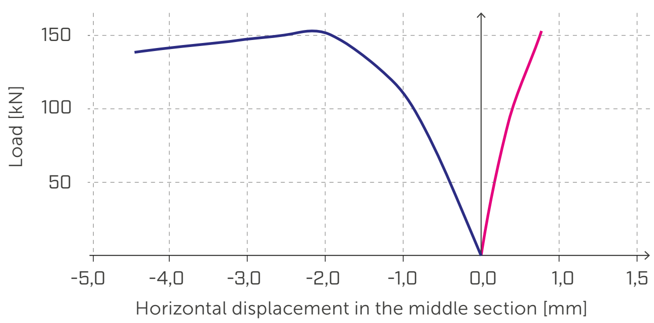
INTERFACE SURFACES MAXIMUM TANGENTIAL TENSION CHECK [3], [4]		
		% verification
J_p*	$1{,}52 \cdot 10^{12}$ Nmm^2	
$\tau_{max,hor}$ (3)	1,1 MPa	38 %
$\tau_{max,vert}$ (3)	0,2 MPa	21 %
combined verification		43 %

$M_d = M_{Rd}$	applied moment = design strength moment	**63,5 kNm**
M_{TEST}	test resistant moment	**131,8 kNm**
f	overstrength factor	**2,1**

FORCE - DISPLACEMENT GRAPH

Horizontal displacement of the stretched and compressed fibres in the middle.

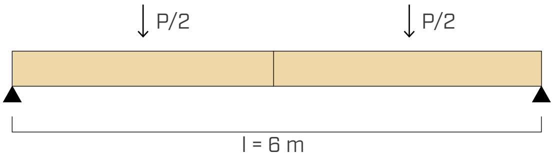
The graph shows the greatest displacement of the stretched fibres, validating the calculation hypothesis that timber reacts to compression together with the metal components, moving the neutral axis upwards.



UPPER EDGE
LOWER EDGE

JOINTS STIFFNESS

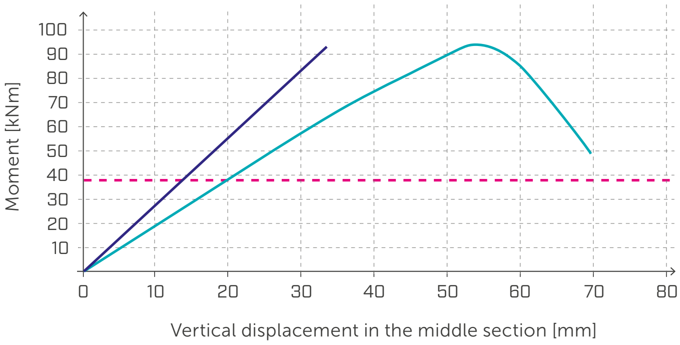
The moment joints made with XEPOX adhesives guarantee excellent stiffness to the connected elements. In support of this, we compare the deflection values obtained from analytical calculations for an unjointed beam of equal span, cross-section and load with the experimental data in calculation example 1.



To obtain a deflection reference value from the available experimental data, an operating load must be determined. To achieve this, it is possible to consider the strength moment of 54.5 kNm calculated for the beam in calculation example 1, which ideally corresponds to the maximum acceptable stress at the Ultimate Limit State. Starting from this data, and assigning a realistic load distribution on the beam, it is possible to determine a maximum stressing moment in operation using the load amplification coefficients according to the reference standard.
Assuming therefore to dimension a flat roof made of timber that cannot be walked on, the following loads are defined.
$p = 1{,}5\ kN/m^2$; $q = 1{,}5\ kN/m^2$
In this hypothesis, the total load, in the strictest operational combination, is about 70% of the load at the Ultimate Limit State. As a result, the maximum working moment is 54.3 x 0.7 = 38 kNm, which causes an instantaneous deflection, for the unjointed beam, of about 13 mm, while the deflection measured experimentally is 19 mm. The increase in vertical displacement during operation is therefore: l/1050.

MOMENT - DISPLACEMENT GRAPH

—— BEAM WITH XEPOX JOINT
—— CONTINUOUS BEAM
- - - MAXIMUM MOMENT IN OPERATION



NOTES:

(A) $k_{c,90}$ is a factor that modulates the compressive strength of timber in relation to the force-fibre angle in the Hankinson formula (EC 1995-1-1, section 6.1.5). However, the formula does not take into account the stabilization of the wood fibres offered by resin, which fills the wood voids; the designer can decide to increase this factor.

(1) The calculation of the cross-section has been made considering elastic-line bonds for all materials. It should be noted that in case of axial and shear loads, it is necessary to check the combination of these forces.

(2) In this calculation, it is considered that the resin bearing allows full contact of the interface section, and therefore the timber can react to compression. If the bearing is not made, it is advisable to check the metal bit alone as a reagent, applying the formula with the geometrical parameters of the bit:

$$f_{yd} \leq \frac{M_d}{\frac{B \cdot h^2}{6}}$$

(3) XEPOX adhesives are characterized by tensile and shear strength values much larger than those of timber and with constant value over time. Due to this reason the interface torsional capacity check can be performed only on the timber element, considering the same check satisfied by the adhesive.

(4) The shear stress "τ" of the timber-adhesive-steel interface, transferred to the timber, is calculated at its maximum value in the case of an inclination parallel or perpendicular to the wood grain. These stresses are compared for the wood shear strength and the rolling shear strength, respectively. The calculation made here should also take into account the value of the transport moment $M_{T,Ed}$ resulting from the shear stress, if any.

It should be noted that the calculations have been made taking into account the values of k_{mod} and γ_M according to EN 1995 1-1, and γ_{M0} according to EN 1993 1-1.