



Reinforced wooden beams.

IS IT:

Product

Technology

Equipment

APPLICABLE FOR:

Restoration

Rehabilitation

New Construction

APPLICABLE ON:

1. Foundations and underground structures

2. Vertical structures

3. Horizontal structures and vertical connections

4. Roof and terraces

5. Façade and building envelope

6. Finishes and completion elements

7. Integrated services

8. General strategies for building recovery

Related companies: ARMALAM® beams.

DESCRIPTION

The new Armalam® technology provides a reinforced beam that can be made industrially for mass production.

The reinforced wooden beams have high performance both in terms of stiffness and resistance.

Armalam® is an innovative and competitive product also from an economic point of view.

The innovation involves the reinforcement of glued laminated wood with the insertion of one or more steel or CFRP bars in special housing, joined with epoxy adhesive.

The product is perfectly compatible with the modern production cycle of glulam and therefore can be widely used in the field of new buildings, but it is also ideal for use in the important sector of structural consolidation of the existing building stock, where it is essential. It has flexible and adaptable techniques to the specificity of the specific case of application.

WHY TO USE

The advent of glued laminated timber did not represent a point of arrival for technological research and innovation: glulam timber beams, reinforced in the most diverse ways with various materials, such as metal sheets, fibers, steel bars, plastic sheets and similar, while ensuring a certain improvement in the performance of the beam (increase in mechanical characteristics of 10-20%), have proved not entirely satisfactory from the point of view of their industrial production and performance during construction.

The Armalam® beam has an equivalent admissible tension up to 28 MPa and an equivalent elastic modulus up to 28000 MPa, mechanical characteristics that allow both a saving in height of up to 40% compared to a laminated beam having the same base, and compare an Armalam® beam to two side by side beams of the same size in lamellar. An Armalam® beam is therefore also competitive from an economic point of view.

The innovation involves the reinforcement of glulam wood with the insertion of one or more steel or CFRP bars in special longitudinal milling made in some lamellas and joined to them with a special epoxy adhesive, an integral part of the same technology.

HOW TO USE AND APPLY

The applications of the Armalam® beam range from roofs, floors, large span structures, ...

The structural elements of the Armalam® type, being characterized by an high resistance, an high apparent elastic modulus and a bending rupture with the formation of a pseudoplastic (dissipative) hinge, are winning, compared to a traditional wooden section in glulam or solid wood, in the following cases:

- when the height of the wooden load-bearing element must be as low as possible for design, functional, architectural needs, etc .;
- when the thickness of the entire structural package is bound by a maximum limit that cannot be exceeded;
- if you want to build a timber floor and/or a roof supported by a masonry structure that has to be stabilized: each Armalam® type beam, with its reinforcing bars, can form a connection between the walls at a ring beam height, guaranteeing a bilateral bond;
- when the building was realized in a seismic area: in addition to the presence of the bars for a bilateral connection to the ring beam, the type of break (never brittle) of the Armalam® member is exploited with the formation of a dissipative pseudo-plastic hinge;
- when wooden structures have to work in a very humid environment and/or with a very high permanent load: the sizing of a "normal" glulam beam, taking into account long-term checks, is much more penalized than sizing of an Armalam® type element.

TECHNICAL CHARACTERISTICS

An Armalam® beam is, therefore, a wooden beam reinforced with one or more reinforcing bars along its entire length, in close analogy to the case of reinforced concrete: a new type of structural element, the result of a very recent Italian technology, which was officially presented to the public in the stand of Trentino Wood, during the SAIE 2001 fair of Bologna, after a long and careful experimentation.

The method has been developed so as to be perfectly compatible with the modern production cycle of glulam, but it also lends itself to being used in the important sector of consolidation of the existing building stock, where it is

essential to have flexible and adaptable techniques. specificity of the single case.

The research developed along the two directions of theoretical study and laboratory experiments.

RECOMMENDATIONS AND OTHER INFORMATION

The Armalam® timber beam are not recommended in simply compressed elements or in the realization of curved structural elements, except in the case of a beam with a curved intrados with concavity facing upwards. In the case of compression and bending, in order to use an Armalam® beam, bending must prevail over compression.

The structural elements in reinforced laminated wood, precisely because of their characteristics of high resistance values and elastic modulus and for their behavior at break in bending with the formation of pseudo-plastic hinges, are ideal when:

- the section height of the load-bearing element must be as low as possible for design, functional, architectural needs;
- the maximum thickness of the entire structural package is restricted;
- action is taken in a seismic area. (In fact, it is possible to exploit both the presence of metal bars for an effective connection to the perimeter ring beam of the floor, and the type of break, never fragile, of the reinforced laminated wood member);
- wooden structures are intended for environments with very high humidity and / or with strong variations thereof.

EXAMPLES

ROOFS

Beams. The use of an Armalam® type element can represent a valid solution. The greater length, then, of some joists compared to the others can lead to an oversizing of all the joists and, therefore, it can become interesting to arrange some elements in Armalam® only where the stresses are higher to have, then, a sizing of the others less cumbersome joists.

Trusses. The use of reinforced members is particularly suitable for trusses with a raised chain. The bending check in the knot between chain and strut is, in fact, very strict and involves the use of relevant sections. Furthermore, if the chain is made in Armalam®, the traction connection between the chain and the strut is greatly simplified, which can be achieved by means of the reinforcement bars extended beyond the head of the chain and a suitable counterplate on the pressure-bent strut; the joint in the middle of the chains is also facilitated (a removable structure can be created with greater flexibility of use).

FLOORS

Support beam (orthogonal to the joists). For very high span floors, it is sometimes useful to have a cross beam to halve the span of the floor. This structural element determines, with its intrados, the most critical point for respecting the minimum inter-floor levels: the design choice to use the Armalam® beam can be interesting and economical.

Joists. If you want to respect a certain thickness of the structural package and have "normal" center distances, using an Armalam® joist can be the alternative to the composite wood-concrete slab. Furthermore, by using the reinforcement bars of the Armalam® type joists, to connect the ring beams together, it creates light and resistant floors with a behavior in line with the modern design philosophy in the seismic field.

REFERENCES / SOURCES AND LITERATURE

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https://www.designingbuildings.co.uk/wiki/Insitu_reinforcement_of_timber_beams

WEBSITE OF THE COMPANY

<https://www.armalam.it/travi-armalam/>

<https://buildingcue.it/cose-il-legno-armato/10917/>

<http://www.fantigroup.it/legnoarmato>



IMAGES AND CAPTIONS



Fig.1: The reinforced beam is obtained by reinforcing the classic glulam wood with the insertion of one or more steel bars in special longitudinal millings made in some lamellas and joined to them. © <https://buildingcue.it/cose-il-legno-armato/10917/>

LEGENDA

- A – Pannello ArmaFloor h. 14-22 cm
- B – Barre in acciaio B450C Ø18
- C – Tavola di collegamento tra i pannelli
- D – Barriera al vapore
- E – Connettori per solaio collaborante
- F – Soletta in cls C28/35 con rete Ø8 20x20

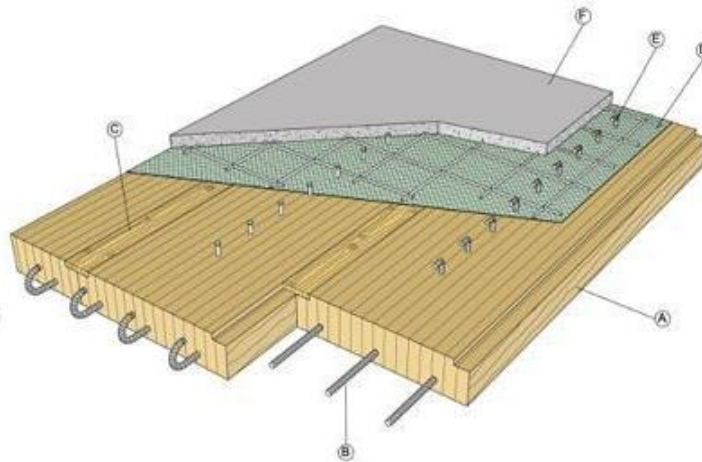


Fig.2: The Armalam® glulam beams for timber floors. © <https://www.armalam.it/travi-armalam/>