



## Manufacturing excellence Made in Italy

### *Wood System International S.r.l.*

The forty years experience in the construction industry of laminated wood, the propensity to continuous research and technological innovation has brought the Wood System International Ltd to invest their resources even in the green building industry, embracing the ecological principles following the concepts of sustainable development.

In view of these recent and important developments, the company has been developing new patents with the aim of extending their knowledge and professional know-how throughout the national territory and globally, both for the construction of multi-storey of residential nature, commercial and industrial (P-LAM-P patent) that for spacial reticular structures (Spacewood patent, on the market since about 20 years).

The Wood System International Ltd has therefore decided to initiate a policy of development of a network of collaborations with designers, associations, consortia, universities, Ministry of economic development, civil protection and research institutes in the construction industry of wood, industry technical journals, producers of panel in X-Lam and laminated wood, including those actually marketing and use these materials. All this to offer to the construction market a range of solutions that combine environmental, economic efficiency, durability and speed of assembly in compliance with the regulations for the structural analysis and related checking in " elastic range" especially for high seismic risk areas and high wind pressure. The goal that the Woodsystem International Ltd arises it is to sell all the components of the various patented systems (steel nodes, steel grafts from potting, the closed cell foam rubber, the improved adherence bars, the epoxy bi - component, and so on..) excluding X-Lam and laminated wood panels. The Wood System International Ltd staff, on request, it can also develop the project proposals in their various forms, from the preliminary stage to the executive one. All in order to extend the spread of patented systems it owns worldwide, behind the recognition of Royalties.

On 7th January 2019 the international patent application (PCT / IB2018 / 05515, International Publication Number WO 2019/012473 A1) was published by the International Bureau, Patent Coverage Treaty, in 120 countries worldwide. The Ministry of Economic Development (Directorate General for Production Development and Competitiveness at the Italian Patent and Trademark Office) and the commission, having examined the technical documents referring to our P-Lam-P system, certifies the following:

Feedback on innovation = YES at 100%  
Feedback on level of invention = YES at 100%  
Feedback on industrial application = YES at 100%

Finally, we believe that, on specific request, we may consider the possibility of transfer and sale our patents (individually) in the States of your interest.

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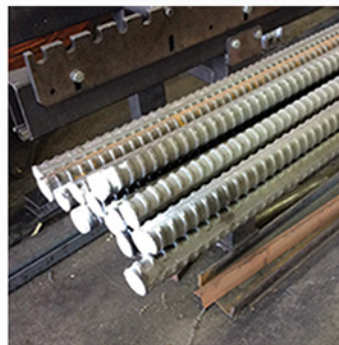




THE NEW SYSTEM P-LAM-P OF WOOD SYSTEM INTERNATIONAL Ltd  
CONSTRUCTION SYSTEM FOR MULTISTOREY BUILDINGS IN X-LAM

The innovative patented system P-Lam-P for the construction of wooden buildings in X-Lam consists in the realization of a vertical connection between wall/floor/wall through the use of steel bars with improved adhesion and two-component epoxy resin. The bicomponent epoxy resin casting principle is applied to the connection system at improved adhesion bar placed along the walls of the building, for tensile and shear stresses. By pouring the resin from the top, the complete filling of the working holes in the walls is ensured, with the air coming out from above. The reinforced wood, makes the structure monolithic wholly, protecting the steel parts from fire and corrosion; in this way the structure does not require ordinary and/or extraordinary maintenance throughout its nominal life. In the case of high tensile and shear stresses, the X-Lam lamellar panel comprises a central layer of fir laminate wood (LVL).

Cylindrical head screws are used for the wall/wall and floor/ceiling connection. A closed-cell high density expanded rubber interposed between the upper wall, the floor and the lower wall is used as an anti-vibration, soundproofing, moisture barrier and thermal bridges barrier. The new concept system also appears to be completely disappeared inside the walls and floors in X-Lam, protecting all parts in steel from fire and corrosion, as well as canceling the electromagnetic fields. The reduced quantity of items in the catalog and the related decrease in warehouse logistics, in addition to the drastic reduction in assembly times, the easy retrieval of these materials, already present on the world market, and the fact that they do not require special processing, make this system extremely competitive. The whole new building system can be dimensioned in the elastic field with a structure factor of  $q = 1.5$  and it is optimal for areas with high seismic risk and allows to safeguard human lives and their heritage. The structural materials used are eco-friendly (90% wood) and 100% recyclable.



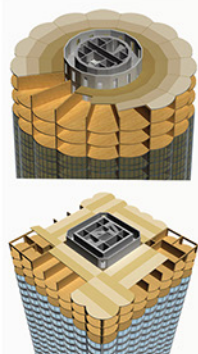
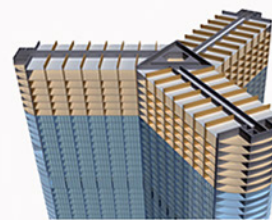
Performed the calculations, from the results of the tensile and shear efforts, you can dimension all the improved adherence bars, resined in the middle layer of the walls with a two-component epoxy glue (in micro-lamellar hardwood). These bars take the place of the hold down for tensile efforts and of nerved angular for shear efforts and therefore the programs and the structural calculations appear to be equal to those currently in use, with the difference that with the P-Lam-P System you can perform all the checks in *elastic range*. The truth is that the rigid structures in X-Lam panels cannot be very *ductile* and therefore must be calculated in the elastic range.



For what concern the structural calculations, Wood System International Ltd is available, with its own technical department, for every request and requirement of technical character. It remains inescapable the study and knowledge of technical regulations for a conscious evaluation of the results of the processing in addition to the necessary expertise and experience of specialists (at least for the most complex structures). Thanks to the revolutionary patented system P-LAM-P, referred to the wooden / steel interconnections developed by the company, the production times for this type of product are very fast (about 1 \ 4 compared to traditional systems in reinforced concrete and masonry). The industry of the traditional buildings of reinforced concrete and masonry produces about 40% of carbon dioxide emissions caused by man; this figure would be greatly reduced if more buildings were made of wood. Is 'therefore important to underline the strong sustainable character of this material which has ability to retain CO2 even after its implementation.



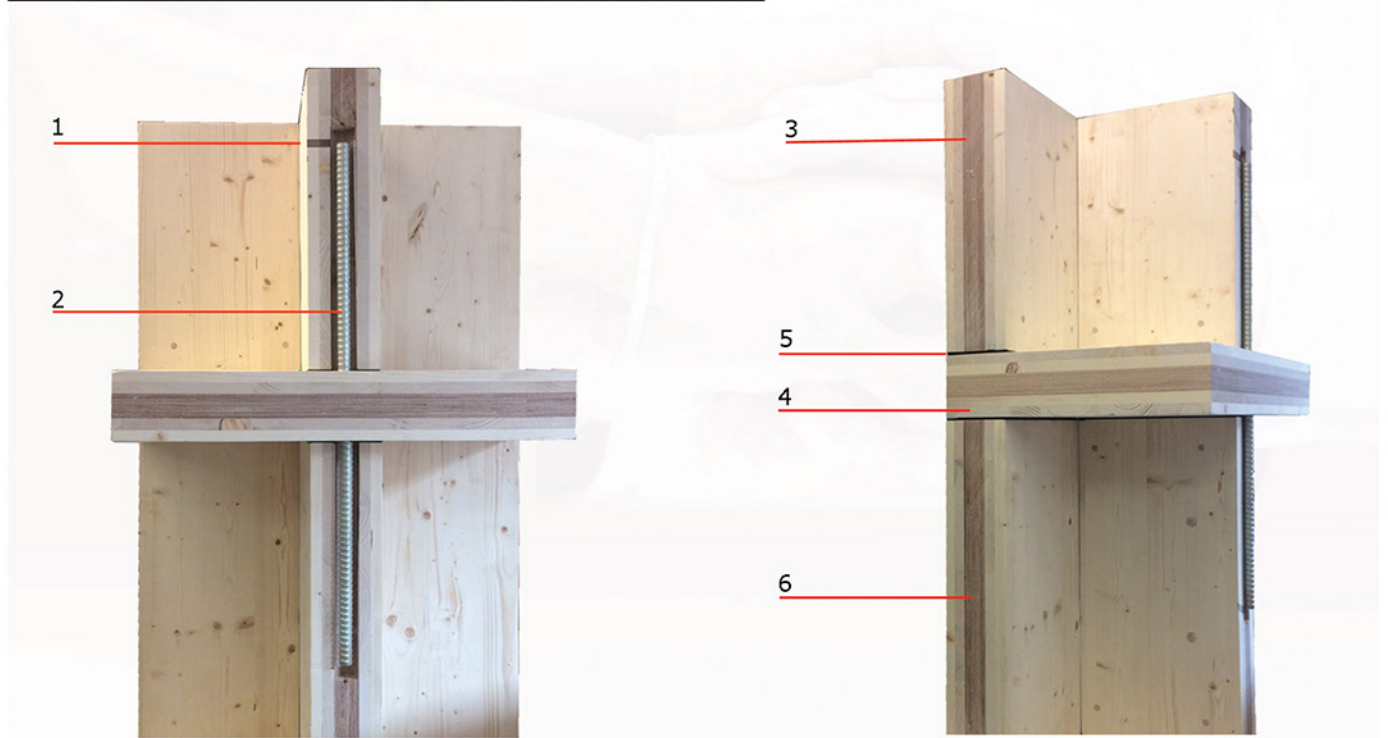
For what concerns the steel connections, our P-LAM-P system is much more economical than higher are the tensile and shear efforts affecting the building; with existing connection systems in use, in fact, beyond certain efforts is not possible to realize wooden buildings in X-Lam.



We'd like to specify that the P-LAM-P system is able to ensure a cost equal to about 30% less compared to the systems currently in use, percentages that vary depending on the height of the building to be carried and to the seismic classification of the project area and on the associated wind pressure conditions. Speed of assembly, economy and security are also guaranteed for single-storey buildings.



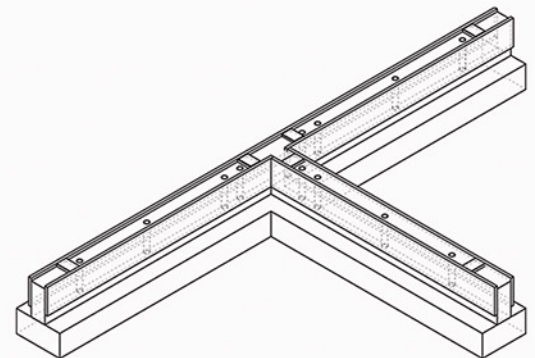
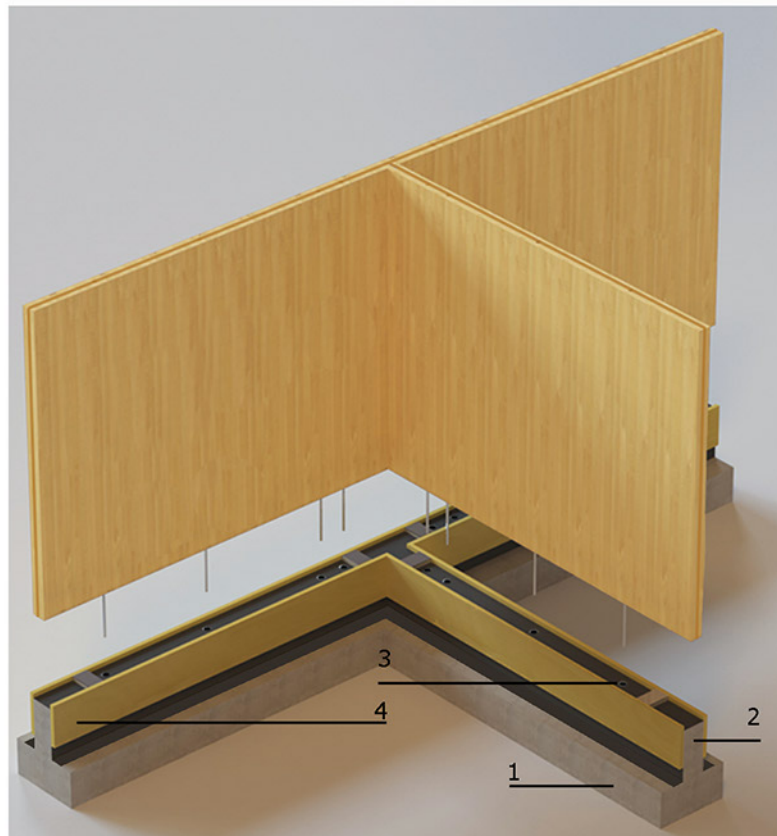
## P-LAM-P SYSTEM: WALL-FLOOR-WALL CONNECTION



- 1- Hole for the injection of bicomponent epoxy resin
- 2- Dywit galvanized steel bar at improved adherence
- 3- Cross laminated X- Lam panel
- 4- X-Lam floor

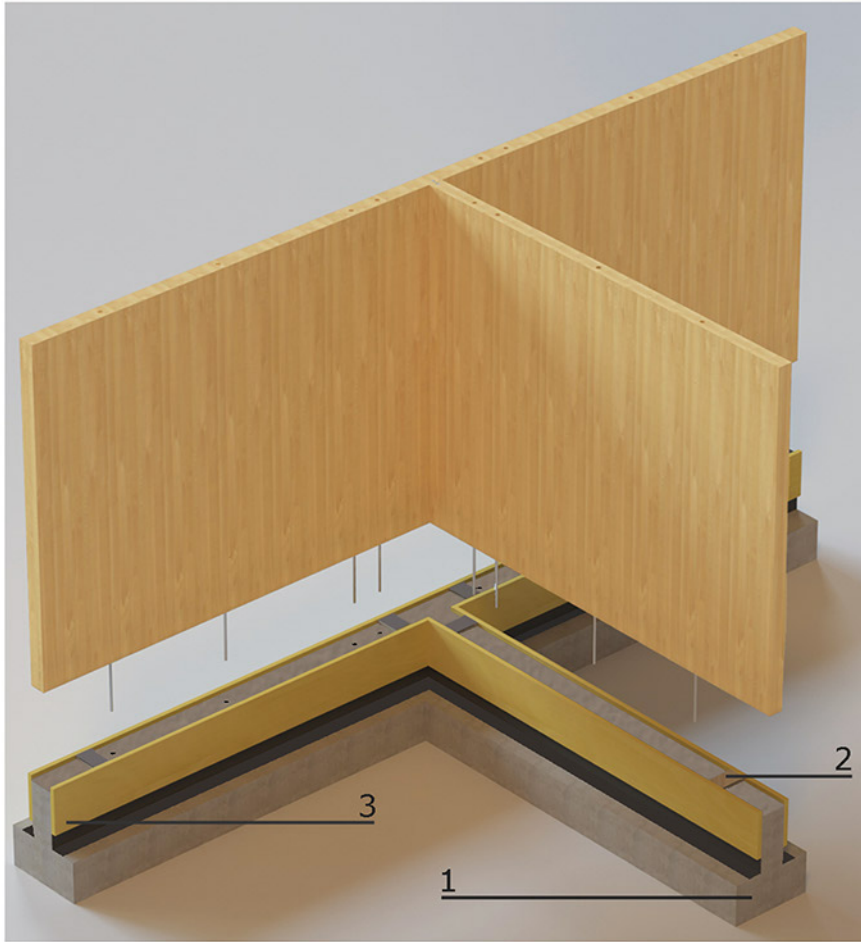
- 5- High density foam rubber with closed cells having an antivibration function, barrier to air and moisture.
- 6- Possibility of inserting the central layer in fir-laminated wood (LVL)

## CONNECTION SYSTEM TO REINFORCED CONCRETE



- 4- Temporary tables to contain the three-component polyester mortar
- 3- Galvanized steel corrugated tube inserted during the casting phase of the reinforced concrete.
- 2- Reinforced concrete abutment, h=50 cm, to support the X-Lam wall for elevation from ground level and with function of protection from atmospheric agents.
- 1- Reinforced concrete

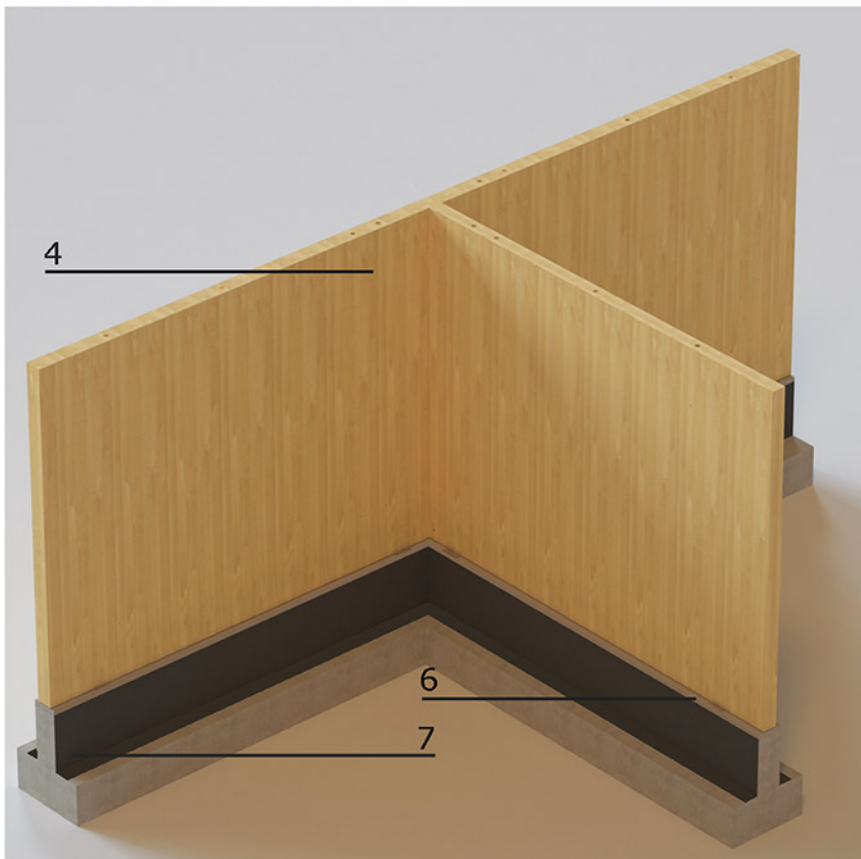
## ASSEMBLY PHASES OF X-LAM WALLS ON REINFORCED CONCRETE FOUNDATION



1- Realization of foundation beams and of upward reinforced concrete abutment with insertion of galvanized steel corrugated pipes before the casting

2- Realization of steel plates installed on cement mortar for the leveling of the support surface of the X-Lam walls

3- Insertion of provisional boards for containment of the three-component polyester casting mortar



4- Placement of the X-Lam wall in to reinforced concrete abutment and insertion of the relative Dywit bars into the corrugated tubes

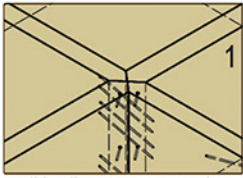
5- Casting of emaco to fix the steel bars with improved adhesion to the reinforced concrete foundations

6- Casting of the three-component polyester resin for leveling the X-Lam walls and with barrier function to rising damp to prevent the deterioration of wood

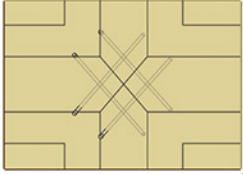
7- Removal of temporary boards of containment of autoleveling casting



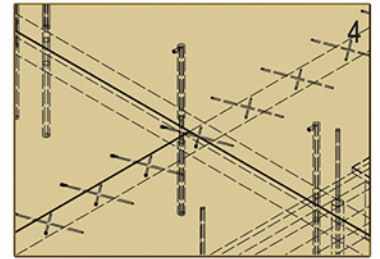
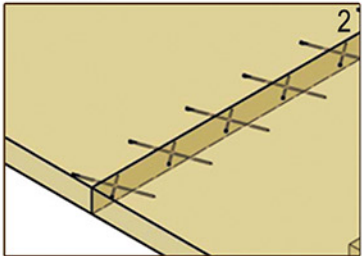
# WALLS AND FLOOR CONNECTIONS FOR STANDARD BUILDINGS



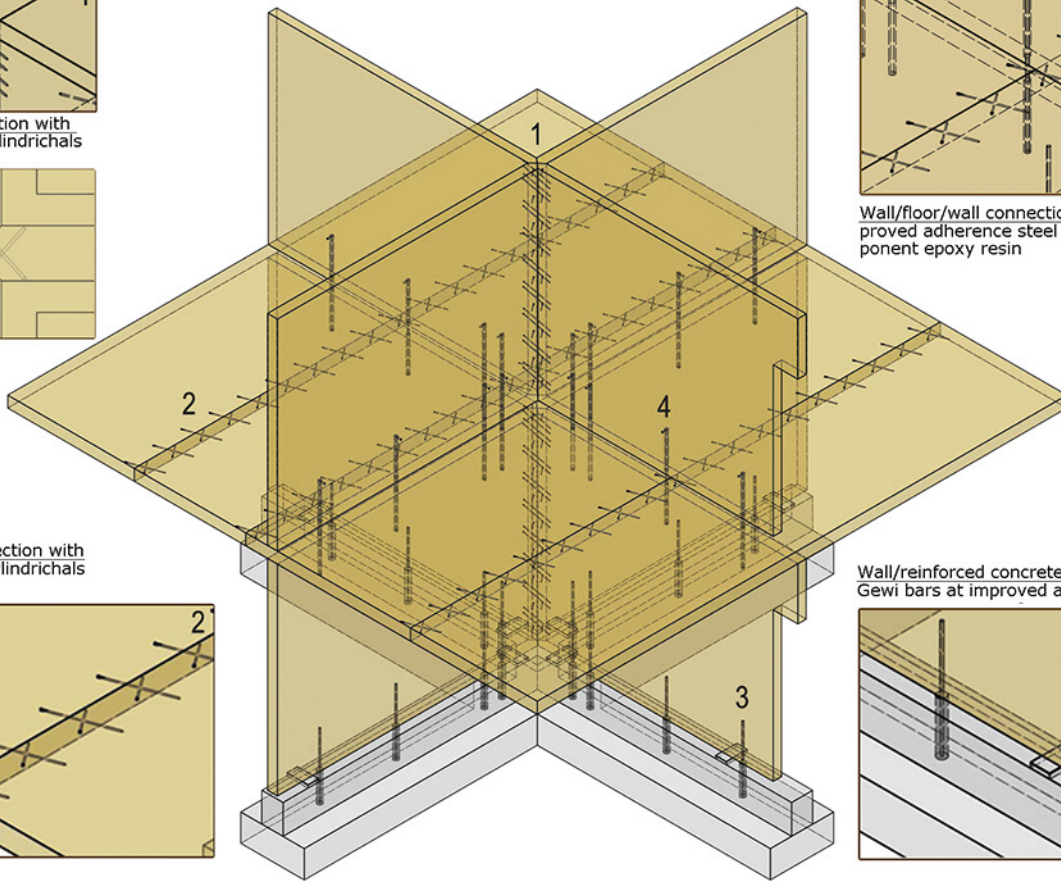
Wall/wall connection with fully threaded cylindrical head screw



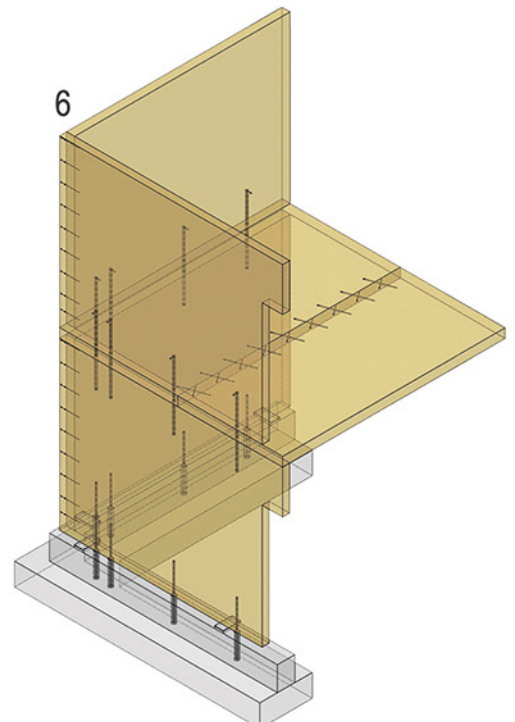
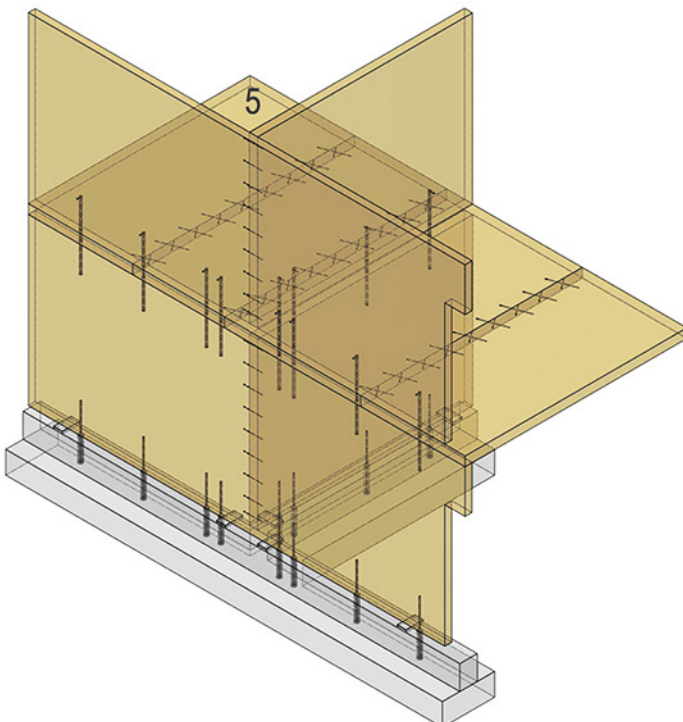
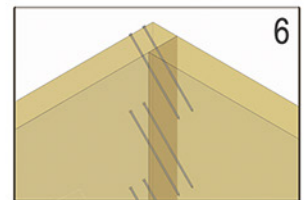
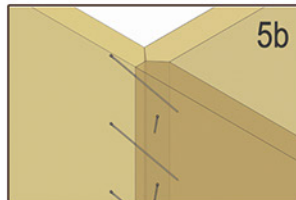
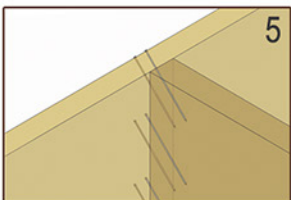
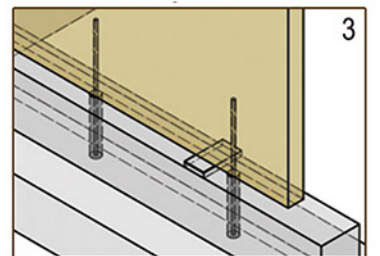
Floor/floor connection with fully threaded cylindrical head screw



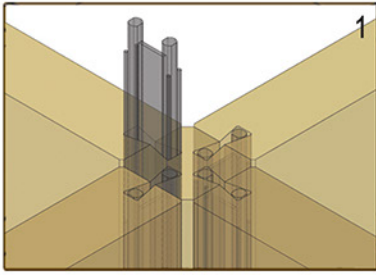
Wall/floor/wall connection with high improved adherence steel bars and bicomponent epoxy resin



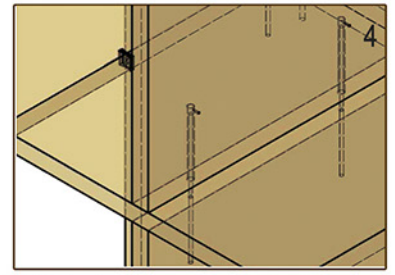
Wall/reinforced concrete connection with Gewi bars at improved adherence



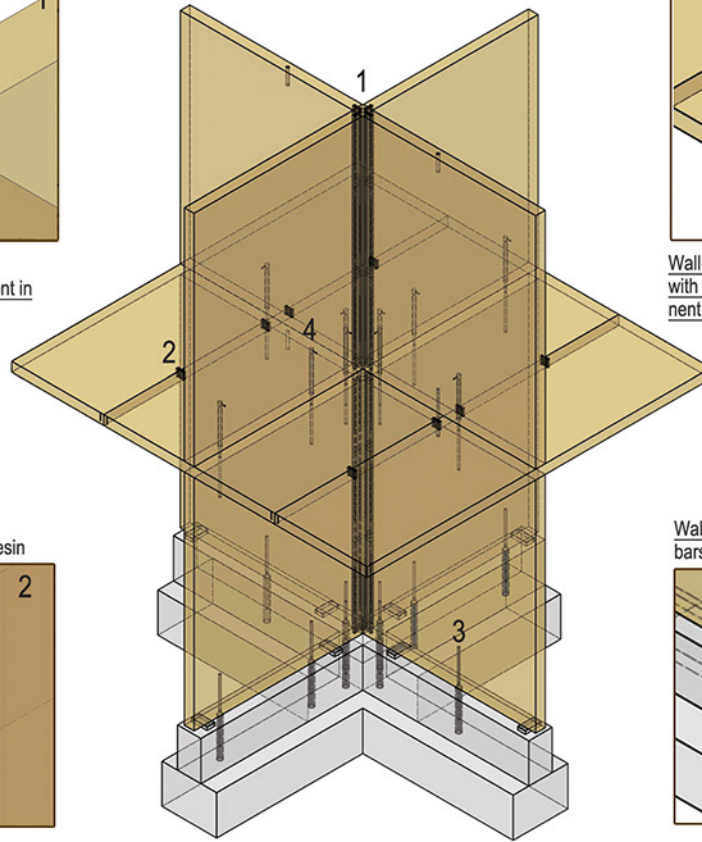
# WALLS AND FLOORS CONNECTION FOR SPECIAL BUILDINGS



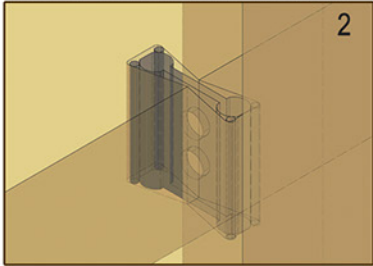
Wall / wall connection with H profiles in galvanized steel, central connection element in X-Lam and bicomponent epoxy glue



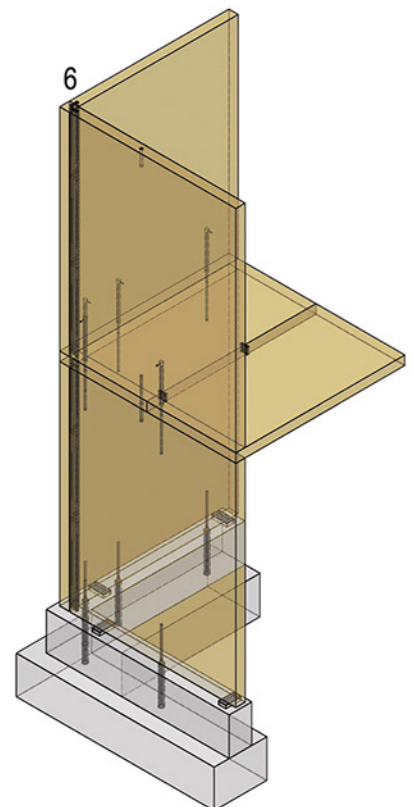
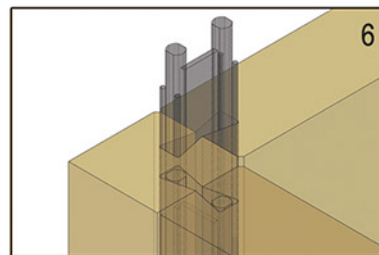
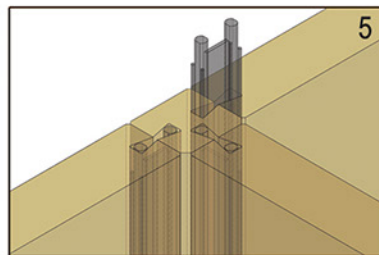
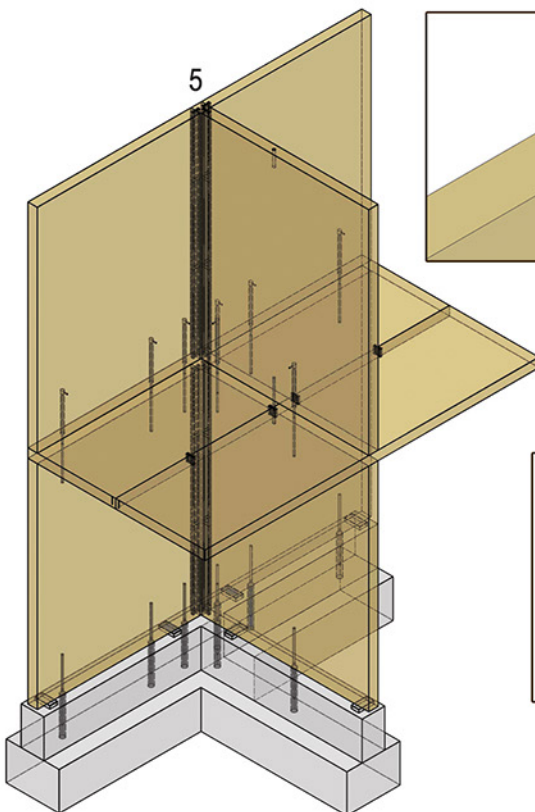
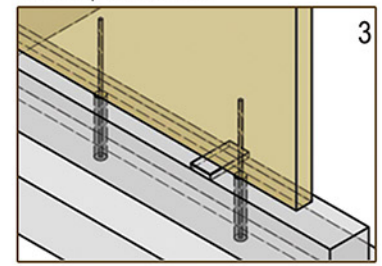
Wall / floor / wall connection with Gewi bars with improved adhesion and epoxy bicomponent resin



Floor/floor connection with H profiles in galvanized steel and bicomponent epoxy resin

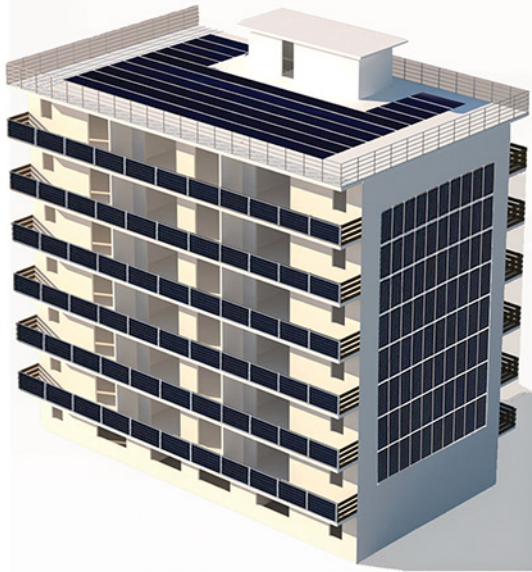


Wall/reinforced concrete connection with Gewi-bars at improved adhesion



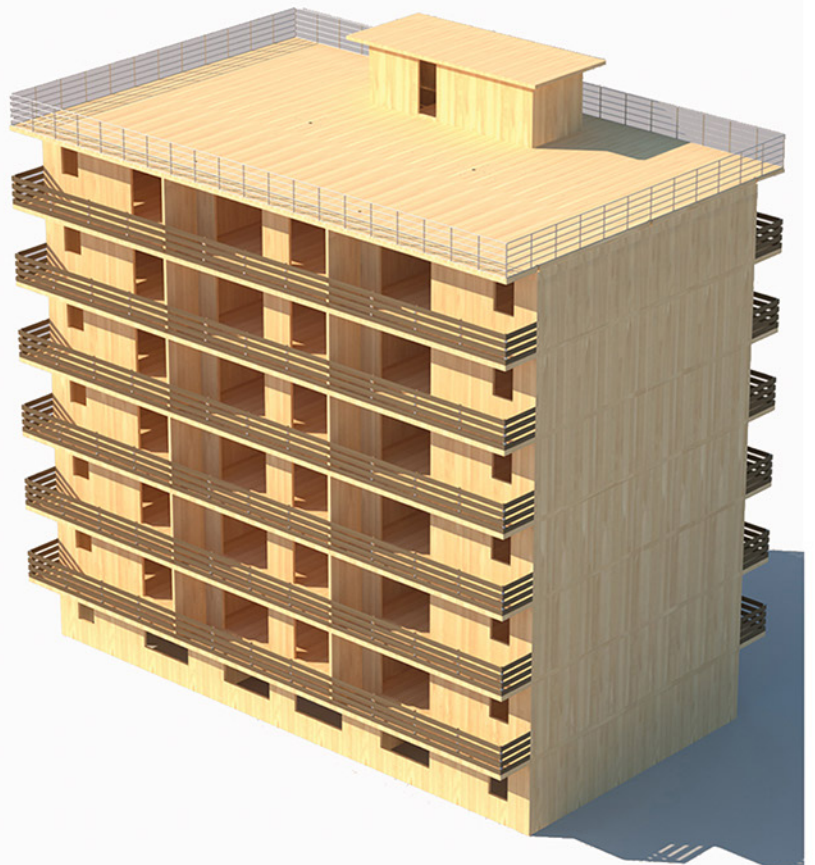
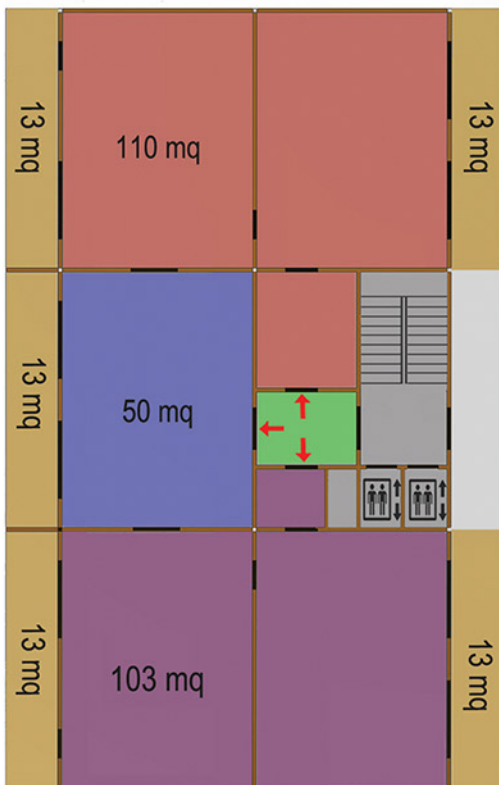


**DEFINITIVE PROJECT OF A MULTISTOREY BUILDING  
WITH PATENTED SYSTEM P-LAM-P - N.7 FLOORS**



This definitive project provides the exclusive use of walls and floors in X-Lam, including the stairwell, the elevator shaft, and various ancillary rooms. The structural framework of the building has a size of 6x8 meters; this modularity allows the realization of different size of housing on a total surface of 370 square meters in plan for each plan. The surface area indicated above allows obtaining a maximum number of 3 accommodations for floor, for a total of 21 units. It remains to firm the ability to create larger apartments through openings suitably positioned on the internal load-bearing walls, predictable processes at the design stage and prefabrication. The building has 2,590 square meters in plan plus a plan coverage of 370 square meters on which are placeable about 300 square meters of photovoltaic panels to produce clean energy. Non-load-bearing interior walls have the only function to configure the local interior, allowing you to change the interior layout without compromising the stability of the building. The realization of the building provides the use of about 900 cubic meters of panels in X-Lam, about 18,000 kg of steel, 18 travel transport of the various materials to destination and about 7 working weeks for structural mounting . Moreover, by providing internal and external insulation of an excellent standard, you can create a "passive" house by breaking down energy costs to a minimum and ensuring the highest standards of living comfort in all seasons. However much care needs to know that the wooden houses cancel almost all the electromagnetic fields.

Typical floor



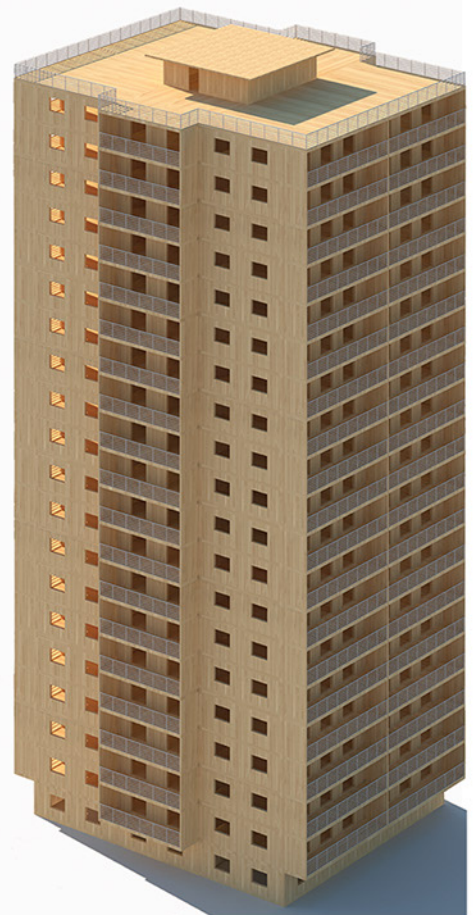


**DEFINITIVE PROJECT OF A MULTISTOREY BUILDING  
WITH PATENTED SYSTEM P-LAM-P - N.20 FLOORS**

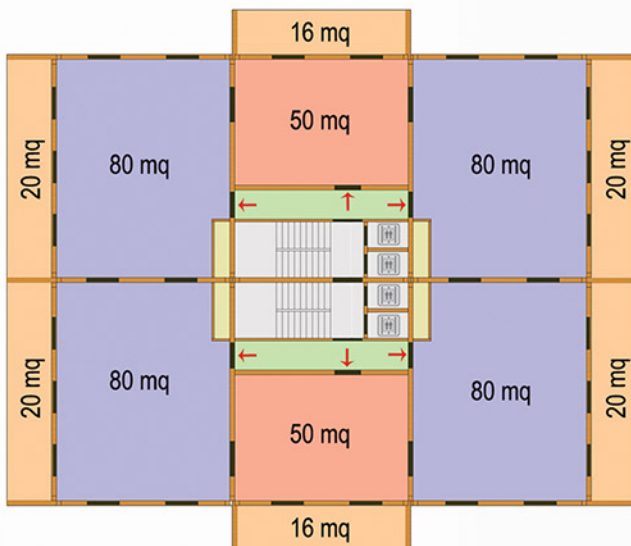


The definitive project in question produced entirely by our staff, it allows the construction of the tallest multi-storey building in the world (66 meters high) made exclusively with wooden walls and floors in X-Lam, including stairwells, elevator shafts, and local accessories. The structural framework of the building is 8x10 mt, modularity that allows the implementation of different size of housing on a total floor plan of 592 square meters per floor. With a maximum number of 6 flats per floor (for a total of maximum 120 accommodation) and the ability to create more space through openings suitably positioned on the internal load-bearing walls provided in the construction phase, the building has 11.840 square meters overall with the covering floor of 592 square meters on which you can install 500 square meters of photovoltaic panels, and any additional wind power systems for the production of clean electricity. Non-load-bearing interior walls have the only function to configure the local interior, allowing later the ability to change the layout of the interior spaces without compromising the stability of the building. The realization of the building provides the use of about 5,500 cubic meters of X-Lam panels, about 132,000 Kg of steel, 120 of transport to destination and about 6 months for the structural assembly. The incidence per square meters of land consumption is equal to 5% (about 600 square meters in plan) and to 95% for building constructed square meters (about 12.000 square meters) developed in 20 floors.

The own weight of the wood is equal to 1/5 of the own weight of reinforced concrete and masonry, so the multi-storey wooden buildings allow a high saving for the construction of concrete foundations, they can avoid piling and they very suitable where the terrains have poor capacity. The incidence in kg is 90% for wood and 10% for steel, therefore it is clear that our construction patented system P-Lam appears to be the safest, the cheapest, the most sustainable and fast installation in existing work on the world market.



Top view - generic floor





## TECHNICAL DATA OF COMPARISON BETWEEN THE SYSTEMS CURRENTLY IN USE AND THE PATENTED SYSTEM P-LAM-P

1- The first factor to highlight and certainly the most important from the point of view of mechanical strength, which differentiates the P-Lam-P system from the current systems in use is the following: the P-Lam-P system allows to eliminate the use of about 95% of the screws, the plugs, nails, and so on..considering that the connections are made through the use of bars and grafts to improved adherence glued with a two-component epoxy resin in the walls and floors in X-Lam.

This resin treatment "restore" the fiber of the wood cut by the drilling fiber transforming all connections strengths and not weaknesses as in the case of the current systems in use by the insertion of screws, nails and pins that invariably cause the cutting of the wooden fibers. Another very important element on the structural safety floor consists in the fact that all the bars and resinated grafts inside the timber, in case of fire, are protected by the wood itself which, as known, carbonize slowly being a poor conductor of heat. Furthermore, all steel bars and vertical continuous profiles are protected against corrosion.

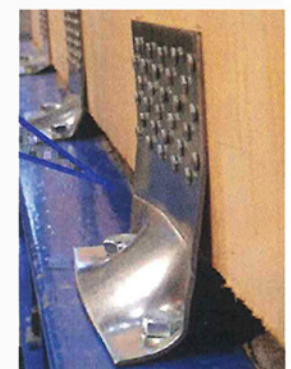
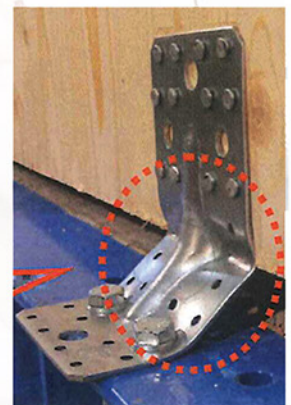
2- Another advantage of the P-LAM-P system consists in the fact that, unlike what happens with the systems currently in use (where the hold down and the angular ribbed are nailed on the internal and external faces of the walls and the perforated plates are riveted on the outer faces of the walls creating a significant space for further work of construction of the inner and outer coats in addition to plants, considerably increasing the assembly time), with the P-Lam-P system the carpentry is replaced by corrugated bars and continuous profiles resined at the center of the walls (not visible) which significantly reduces the timing of realization of internal and external coats and plant engineering.

3- Analyzing the systems currently in use is clear that the same is certified by ETA with values of "ductility", and then in the plastic range, which means that, in case of seismic events or strong wind pressure, the structure and connections are otherwise damaged and you need to replace the wooden parts and metal assembly carpentry. Moreover, taking into account that the products in X-Lam provide vertical and horizontal coatings, interior and exterior coats with a placement of fixtures, it is obvious that a replacement surgery becomes expensive especially in economic terms.

4- The P-Lam-P system provides for the realization of a continuous and vertical connection for the whole height of the wall through the use of appropriately shaped and corrugated bars and epoxy resin. Therefore, a continuous connection is obtained over the entire height of the walls in X-Lam, making the steel profile united with the X-Lam walls and the construction monolithic overall. In this way, air tightness, humidity, noise reduction of vibrations and thermal bridges are guaranteed.

5- The P-LAM-P system, wich has bars and grafts positioned in the center of the X-Lam walls, exactly in correspondence of the calculation geometry, creates centric connections, while the other connecting systems currently in use, wich has connections outside the walls, creating eccentric efforts.

6- On the side are some photographs of tensile tests of the hold down and the shear tests of angular plates performed at the Faculty of Engineering, University of Trento (IT) and related to the current systems of connection between the panels of walls and floors (both in X-Lam). Such systems are nailed on the outer faces of the walls and floors. The photographic images show that in case of earthquake / high wind pressure all connections leaving damaged and requiring their replacement; in reality, the intervention in question is not easily sustainable and is less expensive to rebuild from scratch.





## GEWI BARS - Technical details from catalogue

Diametro nominale $\varnothing$	Tensione snerv. / rottura $f_{0,2k}/f_{tk}$	Sezione trasversale A	Carico snervamento $F_{yk}$	Carico ultimo $F_{tk}$	Peso	Peso DCP	Foro sul legno $\varnothing$
[mm]	[N/mm <sup>2</sup> ]	[mm <sup>2</sup> ]	[kN]	[kN]	[kg/m]	[kg/m]	[mm]
20	500/550	314	157	173	2.47	5.9	40
32	500/550	804	402	442	6.31	9.5	52
40	500/550	1,257	628	691	9.86	13.6	62

N.B: the diameter and the length of the bars and the depth of the hole on the wood will be calculated by the structural designer for the traction and cutting efforts

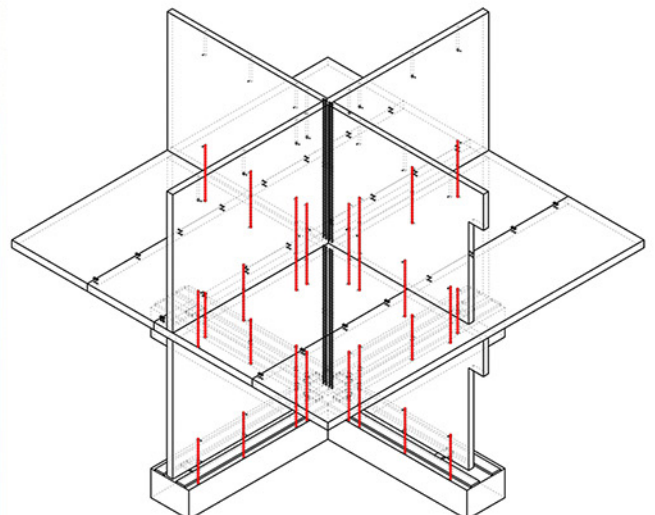
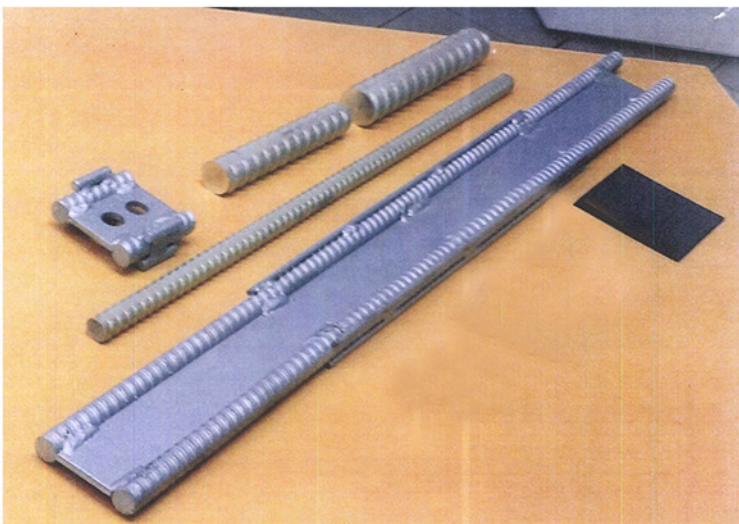
## INDICATIONS FOR THE STRUCTURAL CALCULATION OF THE PATENTED SYSTEM P-LAM-P

For the execution of structural calculation you can set a box of spatial geometry composed of wall and floor panels; after the calculation, from the results of the stresses obtained by traction and shear, all the bars with improved adhesion can be dimensioned, which will be resinated with two-component epoxy glues in the central layer of the walls.

These bars work simultaneously in both cutting and traction and take the place of hold downs for tensile stresses and ribbed angles for shear stresses. It follows that the software and the structural calculations are those currently in use and therefore you can perform all the checks in "elastic field" with structure factor  $q = 1.5$  and in this way confirm the seismic requirements of the building in accordance to the current regulations in force. The real fact is that rigid panel structures cannot be very "ductile" and therefore they must be calculated in the elastic field. Moreover, for the earthquake-prone areas 1,2 and 3, the Civil Engineering offices do not give the green light to build if the structural calculations do not include the structure factor  $q = 1.5$  and the checks in the elastic field (for the area at seismic risk 3, the projects are checked by drawing on 10% of those presented).

## DYWIDAG BARS

Acciaio Dywidag®	Diametro	AREA	PESO	F <sub>yk</sub>	F <sub>tk</sub>	F <sub>yk</sub> /f <sub>tk</sub>	Foro nel legno Diametro
	(mm)	(cm <sup>2</sup> )	(Kg/ml)	(KN)	(KN)	(N/mm <sup>2</sup> )	(mm)
20 F 0005	20	3,14	2,56	282	345	900/1100	40
32 E 0000	32	8,04	6,54	764	844	950/1050	52
40 E 0000	40	12,57	10,20	1194	1320	950/1050	62





THE NEW PATENTED SYSTEM P-LAM-P FOR THE CONSTRUCTION OF X-LAM BUILDINGS WOOD REFERRED TO THE NOMINAL LIFE OF THE BUILDING (NTC 2008/2018 AT POINT 2.4.1) AND TO THE DEGRADATION OF STRUCTURAL MATERIALS (NTC 2008/2018 AT POINT 2.5.4)

Ntc 2008/2018 in point 2.4.1 Nominal life of a structural work: it is intended as the number of years in which the structure, subject to ordinary maintenance, must be used for the purpose for which it was intended (in the specific case is a wooden building and its nominal life must be at least 50 years).

Ntc 2008/2018 at point 2.5.4 Degradation: the structure must be designed so that the degradation, during the nominal life, as long as normal ordinary maintenance is adopted, does not compromise its performance in terms of resistance, stability and functionality, taking them to the below the level required by these rules.

The measures to protect against the excessive degradation must be established with reference to the foreseen environmental conditions.

The protective measures against excessive degradation must be obtained through an appropriate choice of details, materials and structural dimensions, with the possible application of protective substances or coatings, as well as with the adoption of other active or passive protection measures.

The points Ntc 2008/2018 2.4.1 Nominal Life and the Ntc point 2008/2018 2.5.4 Degradation also apply to X-Lam / Clt wood panels and to reinforced concrete foundation, underground and above ground (minimum 50 cm above ground level). The reinforcing rods, with improved adhesion, must be protected by hot galvanizing.

The structural designer, adopting the new patented construction system P-Lam-P, meets all the Ntc 2008/2018 standards, with reference to all structural materials. This construction system is not subject to ordinary maintenance, seen that the casted epoxy bicomponent resin expels all the humid air from above.

**Conclusions:** adopting the new construction system and carrying out hot-dip galvanizing of reinforcing rods for reinforced concrete of foundation, the nominal life of a building with cross-laminated wood panels (X-Lam) can be over one hundred years.

NOTE 1) The connections currently in use are laid dry inside the finished walls, so it is not possible to perform ordinary (mandatory) maintenance or extraordinary maintenance; the current building system exploits the ductility of the connections and therefore, in case of seismic events, these must be replaced because of their deformation (in addition to requiring the replacement of all the damaged X-Lam panels in the fixing points of the deformed connections using nails and screws). Therefore the structural designer performs the calculation and the relative checks considering the dissipative structure in the plastic field, with structure factor  $q = 2.5$

NOTE 2) Difference between reinforced wood and reinforced concrete.

Concrete, not being an adhesive, acts only by friction with the reinforcing rods, so that ordinary maintenance is impossible, if not at a superficial level.

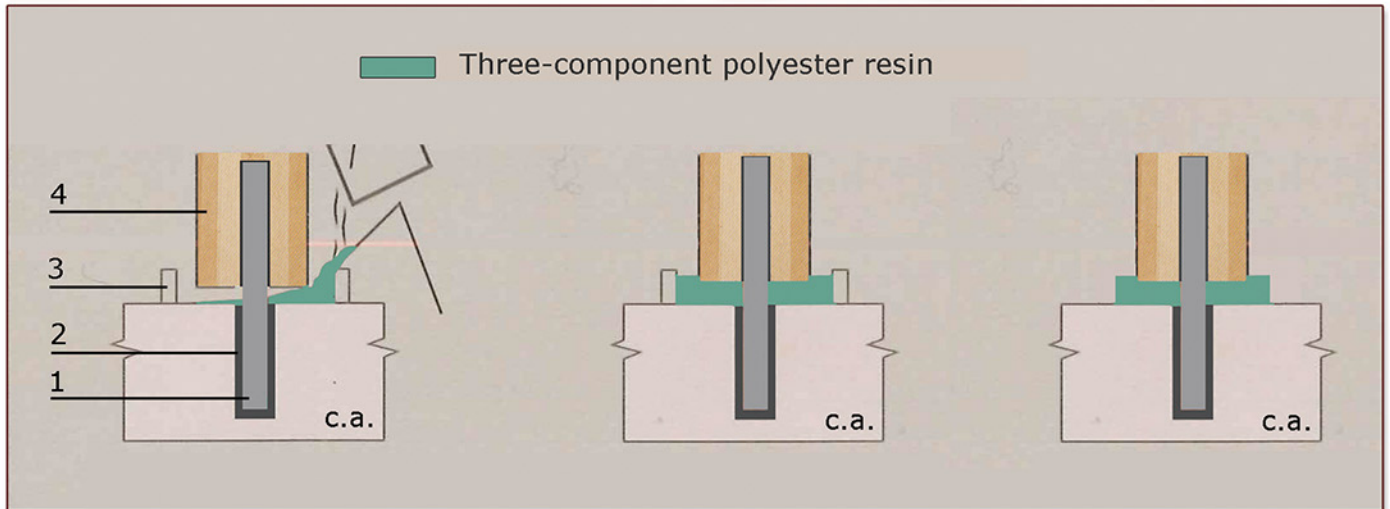
Reinforced wood is obtained by casting the two-component epoxy resin (the same is an excellent adhesive) by making a bond of wood and steel that makes the structure monolithic as a whole, protecting all steel parts from fire and corrosion; in this way the structure does not needs of ordinary and/or extraordinary maintenance throughout its nominal life.

NOTE 3) The connections currently in use are protected by galvanic zinc coating (about 10 microns), therefore a regular periodic maintenance is required to check the state of deterioration and this period will be decided by the structural designer taking into account the environmental conditions.



NOTE 4) With reference to the support of the panels in X-Lam on reinforced concrete, the new P-Lam-P construction system provides the use of a three-component polyester resin which has the function of:

- Leveling of the X-lam walls on reinforced concrete
- Ascent moisture barrier, avoiding the degradation of wood.



- 1) Galvanized steel Gewi bar at improved adherence
- 2) Anti-shrinkage concrete of type Emaco
- 3) Wooden boards to contain the three component polyester resin of leveling
- 4) X-Lam/clt wall



NOTE 5) For the armatures of reinforced concrete foundation is recommended to protect them with hot galvanizing treatment (50 microns) to extend the nominal life of the building (over 100 years)

NOTE 6) By adopting the new P-Lam-P constructive system, the structural designer can perform the calculation and the relative checks considering the structures as non dissipative, with structure factor  $q = 1.5$  and safety coefficients equal to minimum 2 for the wood and 1.5 for steel; the real fact is that rigid panel structures in X-Lam can not be very ductile and therefore must be calculated in the elastic field. Furthermore, the P-lam-P construction system guarantees air and moisture resistance and eliminates vibrations, electromagnetic fields and thermal bridges.



NOTE 7) The Ntc 2018 provide structural bonding on site, see pag.347 - 11.7.7.2 Adhesives for joints made on site.

The adhesives used on site (for which the requirements of the UNI EN 301013 standard are not complied with) must be tested according to the appropriate test protocol, to demonstrate that the shear strength of the joint is not less than that of the wood, under the same conditions as the test protocol.

#### TWO-COMPONENT EPOXY RESIN OF FLUID / LIQUID TYPE AND RELATIVE EQUIPMENT:

- Pneumatic gun for less fluid resin injection using cartridges
- Two-component epoxy liquid resin injection machine for dosing, mixing, dispensing and maintaining the constant temperature (about 20°C) of the resin by means of heating bands fixed to the 2 tanks and relative thermostats.
- Heater tank for storage on site of resins with relative thermostats.

#### PHASE OF USE OF EPOXY TWO-COMPONENT RESINS:

Ensure that all vertical wall slots in X-Lam are sealed using silicone or epoxy resin cartridges before the resin injection phase.

In the event of moisture in the millings and holes, dry using compressed air before injecting the resin.

For the summer season with temperatures higher than 25 °, store the type A and type B packages in cool places (for example in the underground parts of the building) and in any case the injection of the epoxy resin bi-component is preferable to run it early in the morning or Towards evening.

Make sure that the steel profiles and bars are galvanized without the presence of greasy oils, etc., for the hot months protect all the steel parts from direct sunlight, to avoid overheating.

Make sure that the resin is completely filled in the various injection phases.

Conclusion: carefully following all the indications described above, the P-Lam-P system can be used in every season of the year.

Resin injection machine



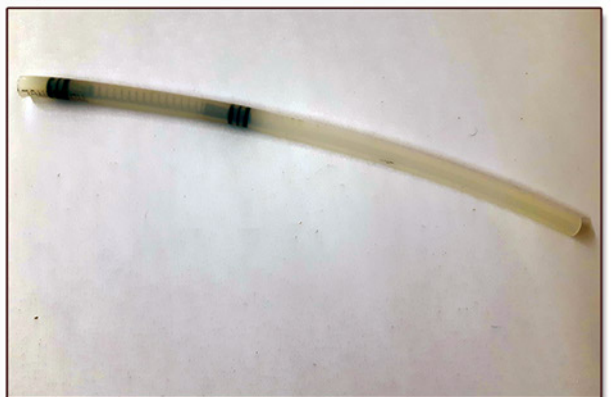
Heater drum



Pneumatic gun



Thin cane with microvalve for resin injection





NOTE 8) The protection of the floor panels after their assembly and relative fasteners can be obtained by using an elastomeric membrane reinforced with non-woven polyester fabric with continuous, smooth and flexible -25 mm by 4 mm (SBS ). The protection of the wall panels in the upper and lower faces can occur through the use of self-adhesive closed-cell high density foam rubber, to be applied in the factory before being transported on site.

By realizing wooden buildings with the P-Lam-P construction system  
you can obtain the following results:

## **SAFETY**

Safeguarding of human lives and their real estate, immediate accessibility of buildings after the earthquake, possibility to ensure these buildings (practices already in use in Japan and New Zealand) since they are calculated in the elastic field, as per regulation N.T.C.2018

## **ENVIRONMENTAL SUSTAINABILITY**

The structural materials used are 100% recyclable (90% wood)

## **DESIGN SPEED**

Rapid construction with certain and competitive costs. The assembly timing is reduced by about 1/4 compared to those relating to traditional systems of reinforced concrete and masonry construction.

## **ECONOMY**

The own weight of the wood is equal to 1/5 of the weight of the reinforced concrete and traditional masonry, this means a lower cost of transport and construction of works in an armed foundation. With excellent internal and external insulation and the installation of renewable energy systems (photovoltaic panels, heat pumps, wind systems, etc.) the passive house quality standard can be achieved, reducing consumption costs to minimum energy and electromagnetic fields.

## **DIFFUSION OF THE SYSTEM IN THE WORLD**

On 17 January 2019 the international patent application (PCT / IB2018 / 05515, International Publication Number WO 2019/012473 A1) was published by the International Bureau, Patent Cooperation Treaty, in 120 countries worldwide.

Responding to the above requirements, the P-Lam-P system is able to optimally meet the new requirements of the wood construction market with excellent potential for deployment all over the world.

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