

POLITECNICO DI TORINO
FIRST SCHOOL OF ARCHITECTURE
Master of Science in Architecture (Construction)
Honors theses

Built with wood in contemporary architecture
The regional wood cross laminated panel building system
A contribution to valorise Piedmont woodworking chain

by Antonio Spinelli

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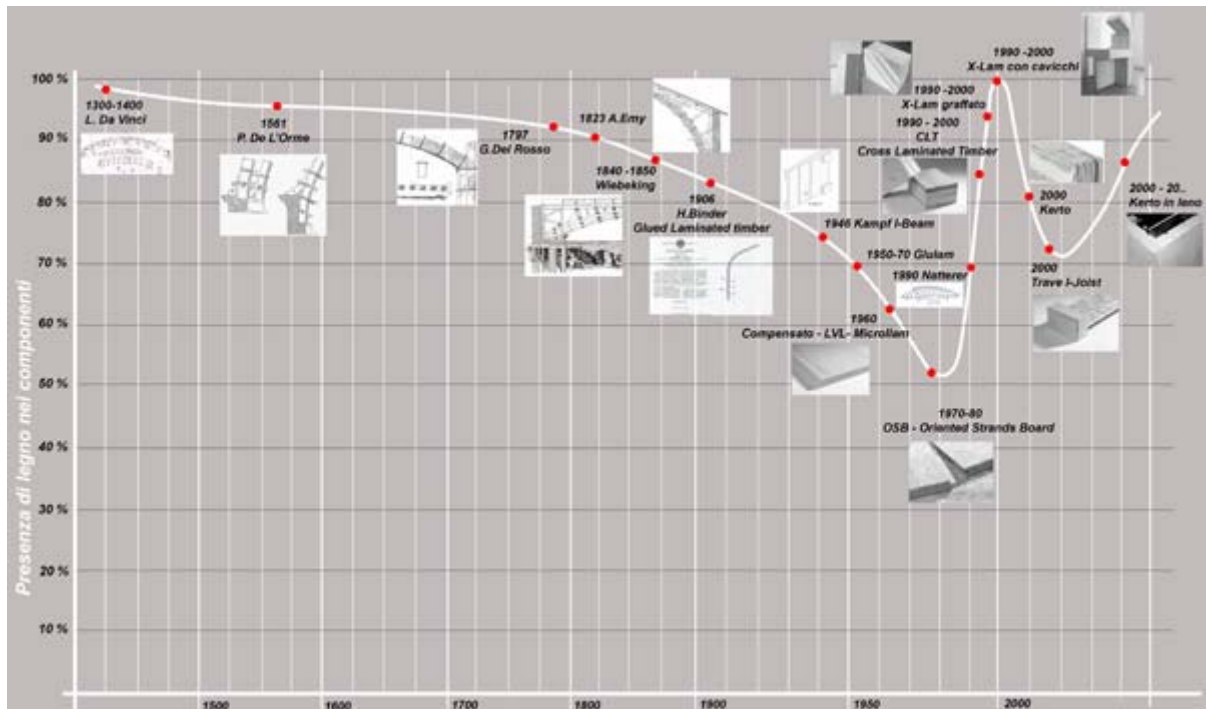
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The recent attention towards environmental themes promote to reconsider wood as material for construction. Wood is a renewable material, coming from nature, ever present but today not used as possible. New wood innovative material and construction systems are promoted and used as alternative to steady materials and construction practice in architecture since the first years of '900.

Today are questions about which could be the future of wood architecture and which could the best direction to follow with the intent to improve this natural material, ever present in our tradition, forget during the capitalism era, but recently reconsider as alternative into material's construction.

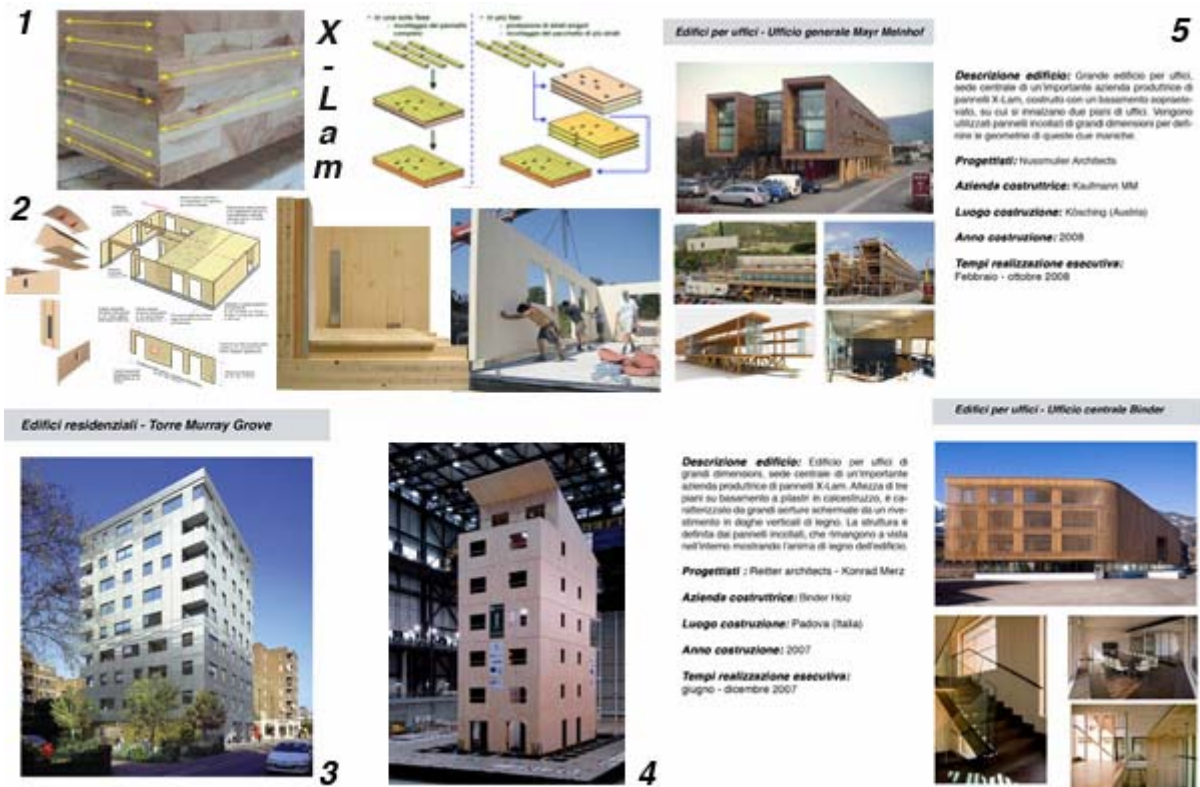
The definition of new based wood products, which could insert in construction structural material market, is the easy target to reach to promote the valorisation and utilization of wood in the existing chain of custody. This permanent use is the best to stock carbon for a long time and it contributes to regenerate forest.

The evolution of structural wood products, obtained with lamination of parts of the trunk, has been analyzed in the thesis; it has been designed a graphic reporting the most important innovation happened in wood working chain since '800 to nowadays.



Time chart of evolution of wood laminated products (boards, sheets, planking)

Afterwards it has been studied the hardwood construction system called “Cross Laminated Timber”. The plane elements, made with wood boards, connected with finger-joint, overlap and glued in orthogonally layers (X-Lam); this panels, made essentially with hardwood, are defined X-Lam, CLT, CrossLam... They are utilized as structural elements, their static behaviour as plate or slab, permitted to use them as wall, slab and cover. The innovation came from Austrian sawmill, to exploit external boards of the trunk, very resistant but rich of defect and not usable for make wood laminated beam, they decide to make timber laminated structural plane, used in the moste recent wood architecture. With their high mechanical performance they could be used in different kind of architecture without problems.



1 X-Lam: X-Lam panel (www.promolegno.it), 2 Hardwood construction system (www.promolegno.it), 3 Murray Grove Project (www.waughthistleton.com), 4 Sofie Project (www.progettosofie.it), 5 X-Lam architecture schedule

Wood is a material related to its chain of custody that localizes the production context and defines the outcome into the market. The market survey reveals the increase of use of wood in Italy and Europe, between furnishing and construction products. The valorisation of this material could not arise only from the project of a new product, but from the project of the whole wood working chain, definition of its main point and outcomes.

This preface is the prelude of the objective of the thesis; the valorisation of the wood chain of custody in Piedmont with the production of hardwood X-Lam panels to use in wood regional architecture. The first step, according to the improvement of an active management of forest land and to the increments of Piedmontese wood products, is based on the results of recent projects and studies (sustained by Regione Piemonte and Provincia di Torino) about forestal planning, actual local wood resources and material abundance to imagine their possible use in construction. The second step continued with the analysis of local companies in the wood chain district and the study of their specificities, in order to value their interest and skills about cross laminated timber panels production.



Configuration of the short chain of custody with participants, panel production process, cutting of panel and determination of mechanical trials

In the last part of the research, some cross laminated timber panels were produced with chestnut wood of Canavese and poplar wood, afforded and worked by a local consortium and a local company. The panels had been tested by a technical laboratory to verify their mechanical behaviour in order to be used as structural components. The obtained results had been examined and compared to softwood multilayers panels of the same thickness, and they allowed to provide some possible use of this innovative product.

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