



POLITECNICO  
DI TORINO

# Honors thesis

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MASTER OF ARCHITECTURE FOR THE SUSTAINABLE  
PROJECT

*Abstract*

**Looking at innovation: lightweight wood constructions.**

Experimental designs, patents and technology transfers in America  
and Europe in XIX - XX century.

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Wood for its specific characteristics (workability, elasticity, high flexural strength, good resistance to compression) is widely used in building constructions; for this reason, timber has long been used as material for architecture in all regions in which it turns out to be an available resource.

Before XIX century, timber construction and building technology were based on tradition and experience. Designs and methods of construction depended on different conditions, first of all on the availability of building materials and tools. Building shapes and techniques were also determined by habits, climate, and cultural characteristics.

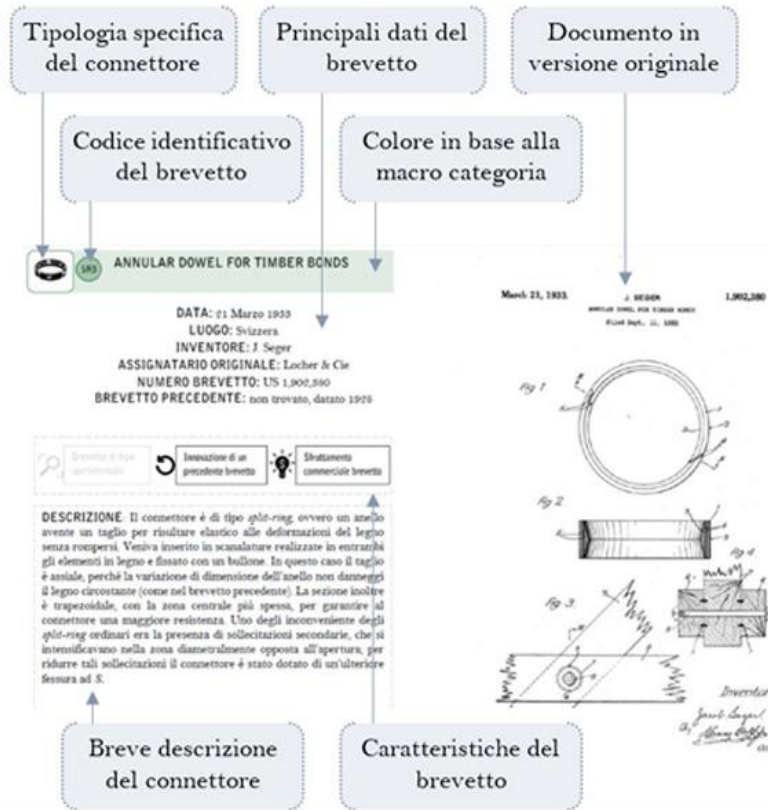
Industrialisation in the XIX century had induced development in vernacular wooden architecture, leading to development in wooden construction. Even though industrialisation supplanted conventional building techniques, traditional construction influences are still evident in modern timber buildings.

This thesis deals with light-weight wood constructions; in particular it investigated in the innovation process of wooden components and joining systems, that took place in Europe and United States between XIX and XX century.

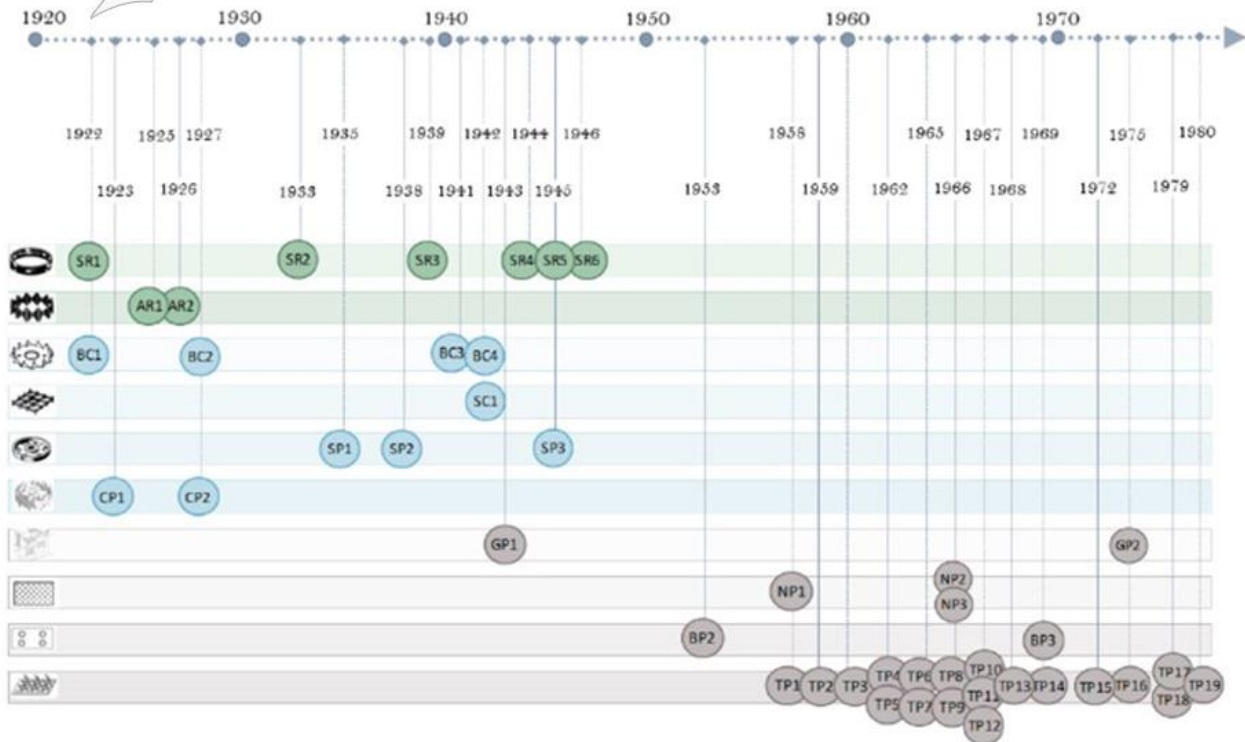
Researches started from the analysis of the developments in wooden joints and fastener systems, pointed out which were the main factors that allowed innovations in wood construction technologies. Different needs and economic conditions during the years, the discovery of a new wood product (Glulam) at the beginning of the last century, innovation in production process during all the XX century, brought to an evolution in wood joining methods and new metal fasteners, having different shapes and characteristics.

The thesis had been possible thanks to an unconventional research method. In fact, because of the lack of information in architectural history books, the main sources were patents and historic documents. The patents of different metal connectors for joining wood, found out on *EPO* website (*European Patent Office*) and *Google Patent*, had been selected, catalogued and placed on a timeline to have an overall view of innovation.

## ESEMPIO DI SCHEDATURA DI UN BREVETTO























## LINEA DEL TEMPO DEI BREVETTI SCHEDATI ED ANALIZZATI



Linea del tempo dei brevetti analizzati, inseriti in base alla data di registrazione.

The first part of the thesis highlights the main innovations of wooden structures and their connection systems between the last two centuries, describing which aspects had contributed to the whole technological innovation process.

EVOLUZIONE DEI SISTEMI COSTRUTTIVI IN LEGNO								
	Prima del 1900	1900-1700	1800	1900-1940	1920-1950	1950-1990		
EVOLUZIONI	EUROPA  Connessioni legno-legno	EUROPA  Connessioni legno-legno	EUROPA  Connessioni con tasselli o spinotti	NORD AMERICA  Connessioni con chiodi	EUROPA e NORD AMERICA  Connettori metallici di superficie	EUROPA  Connessioni con chiodi e bulloni	EUROPA e NORD AMERICA  Connessioni con piastre	
SISTEMI COSTRUTTIVI	Sistema a graticcio <i>Stav system</i> <i>Grid system</i> <i>Cruck system</i>	Sistema a telaio <i>Fachwerkbau</i> <i>Colombage</i> <i>Half Timber Work</i>	Strutture reticolari	Strutture intelaiate <i>Ballon Frame &amp; Platform Frame</i> Strutture reticolari	Sistema reticolari a grandi luci	Sistema reticolari a grandi luci, strutture a portali	Sistema reticolari a grandi luci, <i>roof trusses</i> , sistema a gabbia portante	
AMBITI APPLICATIVI	<i>Edilizia residenziale, edifici culto</i>	<i>Edilizia residenziale</i>	<i>Ponti e strutture con grandi luci</i>	<i>Edilizia residenziale ed infrastrutture</i>	<i>Magazzini, torri radio, stazioni ferroviarie, fabbriche</i>	<i>Depositi, magazzini, hangar, strutture temporanee</i>	<i>Architetture a grandi luci, residenze (USA)</i>	
LEGENDA	 Legno massiccio	 Legno massiccio	 Legno massiccio  Legno laminato  Tavole sovrapposte	 Legno massiccio	 Legno massiccio  Legno laminato  Tavole sovrapposte	 Legno massiccio  Legno laminato	 Legno massiccio  Legno laminato	
SISTEMI DI CONNESSIONE E DI CARPENTERIA		Chiodi e staffe forgiati	Tasselli e spinotti in legno, bulloni	Chiodi prodotti in serie	Carpenteria metallica: anelli, bulldog, shear plates, bulloni	Chiodi e bulloni	Piastre dentate e chiodate, piastre bullonate e connessioni a taglio multiplo	
	PRODUZIONE ARTIGIANALE		PRODUZIONE MECCANIZZATA		PRODUZIONE IN SERIE		PRODUZIONE CNC	

Elaborazione grafiche: Elisa Dorigo e Valentina Domenin

The second part analyzes the different types of metal connectors, identified thanks to patents, which have enabled the development of new wooden structures from the early decades of XIX century.

