

Development of a prototype cross-laminated timber panel made from local timber to improve the construction of buildings in terms of sustainability

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01. Rationale

The project was designed to obtain the information needed to assess whether the manufacture of cross-laminated timber panels (CLT) in Catalonia using local timber is technically and economically feasible. To this end, a prototype panel was manufactured under real industrial production conditions. This allowed us to measure the performance of the processing and preparation of the wood (sanitisation, planing, drying), the quality of the manufactured product and its strength. Based on the technical results together with the economic and market information that has also been obtained, the evidence for and against manufacturing CLT in Catalonia with Catalan wood has been identified. The project analysed CLT manufacturing technologies, design procedures and building construction. Visits were paid to factories, CLT machining centres, adhesive producers and specialised industrial machinery manufacturers in Europe.

The objectives addressed in the framework of this project were:

1. Determine the physical and mechanical properties of the country's wood in order to determine the potential quality of the CLT that can be obtained.
2. Ascertain the wood processing yields for CLT production: drying, sawing, planing, optimisation and gluing.
3. Manufacture prototype panels with local wood and analyse their properties according to current European standards.
4. Analyse the potential market and the feasibility of implementing CLT manufacturing technologies in Catalonia.

In accordance with these objectives, the project consisted of four parts:

1. Analysis of wood yield loss as a consequence of the removal of unacceptable singularities by means of automatic optical technology for the manufacture of cross-laminated timber. This yield study was carried out with red pine wood (*Pinus sylvestris*) and was followed by a drying yield study with red pine wood and lario pine wood (*Pinus nigra*).
2. Manufacture of prototype panels and determination of their strength properties so as to gain preliminary data on the potential and weaknesses of manufacturing cross-laminated timber with red pine (*Pinus sylvestris*) from Catalonia.
3. Characterisation of the strength of part of the material used for

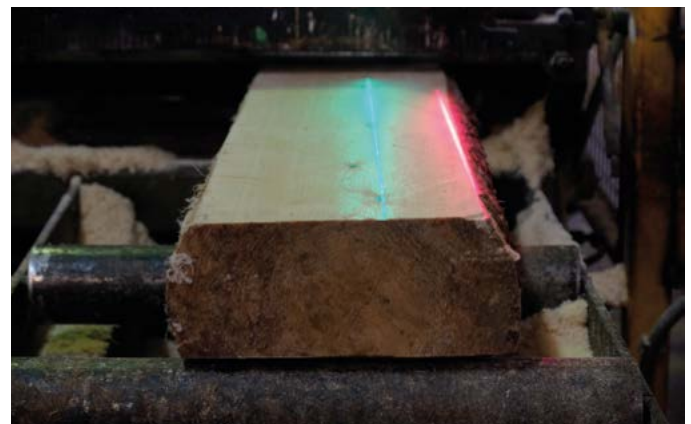
the yield study in order to know the population distribution of the strength of the batches studied, as well as the characteristic strength (fifth percentile). In addition, several hypotheses were also made on how to distribute the population in order to optimise the resulting characteristic strength and thus maximise the mechanical strength of the cross-laminated timber (CLT) boards.

4. Market study with the objective of hypothesising the future potential of CLT in the construction market in the future.

02. Results and conclusions

The results obtained show that the weaknesses are the cost of raw material, the availability of material and the relatively low yield of local wood. The strengths are the high strength of the material and the increase in demand, which is already apparent and is expected to increase even more in the near future. Therefore, further research is recommended to improve the weaknesses identified, for example through the use of automatic grading systems that identify the best structural timber for each project, or the improvement of the drying processes.

From a qualitative point of view, the industrial manufacture of CLT panels in Catalonia is technologically feasible. In terms of the strength characteristics of the material and the gluing processes, there is no reason to rule out the possibility of manufacturing this material with local wood. However, it must be borne in mind that it is necessary to achieve a processing yield comparable to that of other European factories in order to produce competitively priced panels. To achieve this, it is necessary to have enough affordable timber with a reduced amount of singularities that comes from forests managed to obtain quality wood.



Wood being sawed. Photo: Operational Group

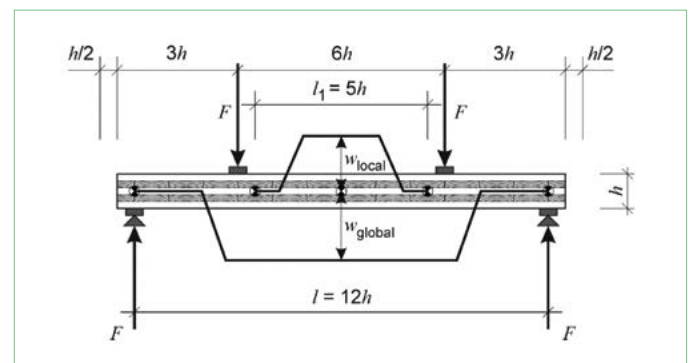


Diagram of trial panel. Source: Operational Group.