03

LIFE EcoTimberCell

Bulletin LIFE EcoTimberCell

lifeecotimbercell.eu

lifeecotimbercell.eu

Our world is changing and

the way we build as well

With the contribution of the LIFE financial instrument of the European Union

Content

A versatile board for EcoTimberCell systems

Context

Among the LIFE EcoTimberCell project's actions, the study and improvement of wood fibre hardboard to ensure the highest performance of the final product is noteworthy. With the development of these studies, **the aim is to obtain a fibreboard adapted to EcoTimberCell structural systems with improved** mechanical, moisture and fire resistance qualities and that is as ecological as possible.

In order to get to know the board in depth, it is necessary to carry out a complete **characterisation campaign** that includes tests to determine the physical and mechanical properties:

- Thermal conductivity,
- Moisture,
- Density,
- Water vapour permeability.
- Mechanical characteristics (resistance and rigidity to flexion, traction, shear and compression).

All these results can be consulted in detail in the Improved Board for EcoTimberCell Systems, available for download on the project website: https://www.life-ecotimbercell.eu/tablero-mejorado-para-sistemas-ecotimbercell-catalogo

The board

Tablex is a Natural Fiber Board, a wood fiber board **without artificial bonding agents**. This is the brand name of high-density fibreboard manufactured by **Betanzos HB** from sustainably managed wood residues from local plantations, as certified by the Forest Stewardship Council (**FSC®**) and the Programme for the Endorsement of Forest Certification (**PEFC**).

High-density wood fibre board is produced in a **sustainable** way from wood and certified forest industry by-products, with renewable energy, obtaining a product with excellent resistance and durability properties, which in addition to being natural, is recyclable and biodegradable, making it a material with a **multitude of applications**.

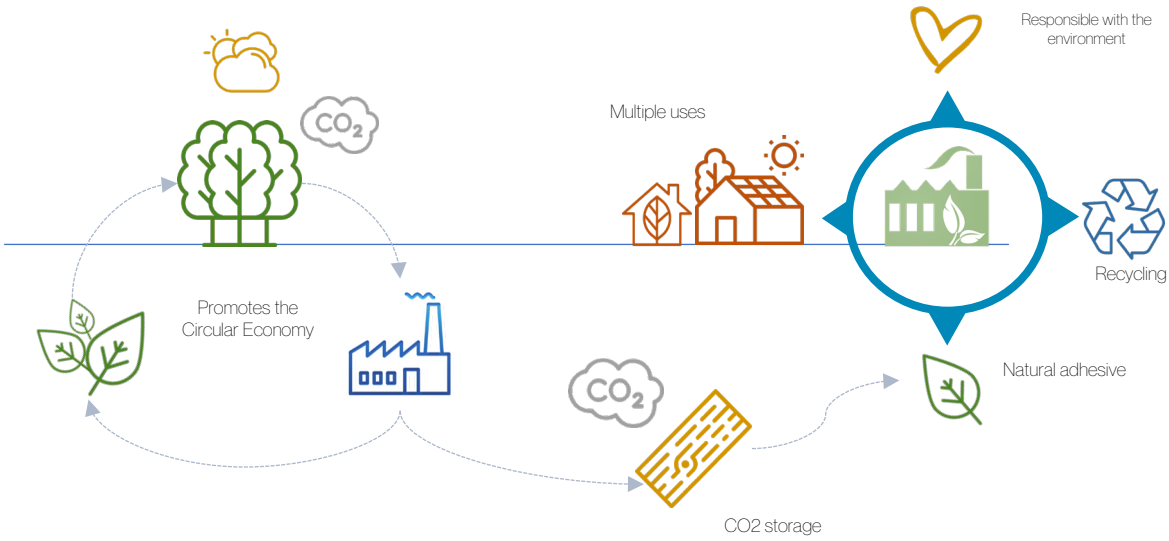
Sustainable product

The manufacturing process of hardboard is characterised by the fact that no artificial adhesives are used to bind the wood fibres, using water as a carrier for the fibres. The final product has a dark brown colour, which originates from the polymerisation of lignins and sugars at high temperatures, and has characteristic markings on one side from resting on a metal mesh during pressing.

Tablex is **'pure wood'**, as it is made from wood and water, taking advantage of the thermoplastic properties of lignin as a natural adhesive.

It is a biomaterial that acts as a CO_2 store from its previous stage as a tree until the end of its life cycle. The CO_2 trapped during the growth of the tree continues to be stored during the entire time the product is used.

In addition, it contributes to the **circular economy** because it uses wood residues that in this way are used for products that store carbon in the long term, playing a role in the action against **Climate Change.**



Board physical properties

Thermal conductivity

In order to determine the board's thermal resistance, a first thermal conductivity test campaign has been carried out in accordance with the provisions of the UNE-EN 12664 Standard.

"Construction materials. Determination of thermal resistance by the stored hot plate method and the heat flow meter method".

From the tests carried out, it has been concluded that the **thermal conductivity (λ)**, which measures the heat transmission capacity through the material, has an **average value of 0.371 (W/mk)**.

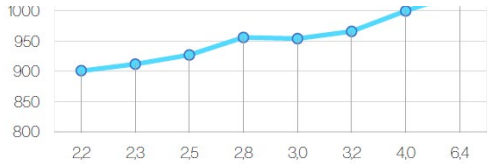
Humidity

Having subjected the Tablex board to conditioning by means of a climatic chamber at a temperature of 20° C and 65% relative humidity, it was determined that the board's **equilibrium humidity** is around **6%**.

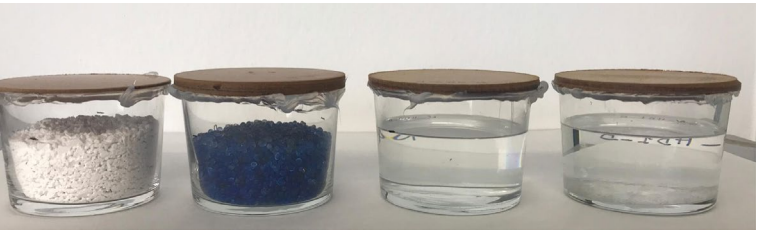
Density

As specified in European Standard EN 325, the density of the Tablex board has been calculated from the defect-free specimens taken after the mechanical test. The density is obtained from the samples taken from the board by dividing the weight of each sample by the volume of the sample.

Density evolution (kg/m3) with the board thickness (mm).



Water vapour permeability



The determination of the Tablex boards' hygrometric performance is based on the indications of the UNE-EN ISO 12572 standard "Hygrothermal performance of products and materials for buildings. Determination of water vapour transmission properties".

The following table shows the water vapour resistance factors expressed in the European Standard EN 12524 of different wood boards. These values allow a comparison with the results obtained in this first test campaign for Tablex

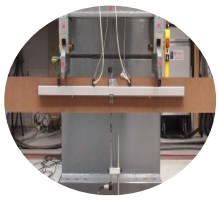
Water vapour resistance factor (μ)		
Thickness	Dry treetop	Moist treetop
Tablex (2 mm)	74	59
Tablex (5 mm)	80	57

Board mechanical properties

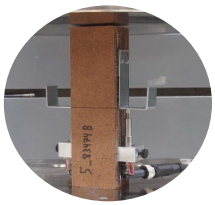
Test Plan

For the characterization of the Betanzos HB board, several tests are carried out on each of the selected Tablex boards in order to obtain the main properties that define the behaviour of the board, based on the UNE-EN 789 standard. Within the framework of the LIFE EcoTimberCell project, the 5.4 mm thick board is analysed for its subsequent application, forming the core of the structural cell.

Traction



Edge bending



Compression in the plane

Shearing stress

Rolling shear

Perpendicular compression

Test Results

CHARACTERISTIC RESISTANCE				
Traction	Longitudinal	$f_{t,l,k}$	23.7	N/mm²
	Perpendicular	$f_{t,t,k}$	18.7	N/mm²
Compression on the board plane	Longitudinal	$f_{c,l,k}$	25.4	N/mm²
	Perpendicular	$f_{c,t,k}$	18.8	N/mm²
Edge bending	Longitudinal	$f_{m,k}$	33.5	N/mm²
Shear, at large		$f_{v,k}$	11.1	N/mm²
Shear, on the plane		$f_{r,k}$	2.0	N/mm²
Compression perpendicular to the plane		$f_{c,90,k}$	-	N/mm²

Stiffness				
Traction	Longitudinal	$E_{t,l}$	5181	N/mm²
	Perpendicular	$E_{t,p}$	4900	N/mm²
Compression on the board plane	Longitudinal	$E_{c,l}$	5317	N/mm²
	Perpendicular	$E_{c,p}$	4116	N/mm²
Edge bending*	Longitudinal	E_m	5816	N/mm²
Shear, at large		G_v	1876	N/mm²
Shear, on the plane		G_r	403	N/mm²
Compression perpendicular to the plane**		$E_{c,90}$	509	N/mm²

Non-destructive methods as an evaluation tool

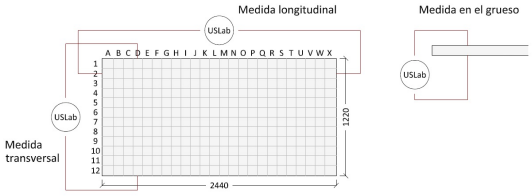
Non-destructive testing is any type of test performed on a material that does not permanently affect its physical, chemical, mechanical or dimensional properties. They are used for the characterization of materials such as wood and its derivatives, allowing to obtain mechanical properties of the materials with great efficiency and low cost without losing the precision in the results.

In the tests carried out on the 5.4 mm Betanzos HB board, the **USlab equipment was used as an ultrasound method**.

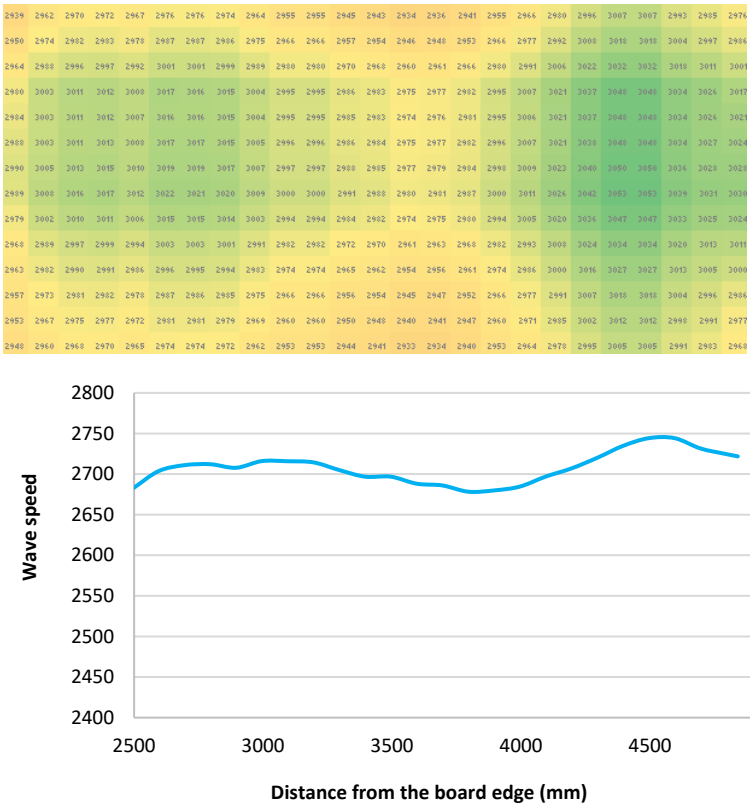
The direct measurement with this equipment is the time [on µs] that the acoustic wave takes to travel through the specimen, the speed results obtained can be related to the density of the board to obtain the stiffness coefficient, also known as an elasticity dynamic module.

The test results have verified the good correlation between the data obtained by ultrasound methods and the results of the mechanical tests, allowing to estimate the **quality of the board and its corresponding properties by means of non-destructive methods**.

The ultrasound application is a tool for innovation and quality improvement in the board production line, since it provides a much wider knowledge of the mechanical properties of the board and its performance without the need to submit it to destructive tests.



Point mesh made on the board for transversal, longitudinal and thickness measurement.



Recording of ultrasonic wave transmission speed according to the measuring points on the board. In green, areas with higher speed in the transverse direction.

News

LIFE EcoTimberCell at the I International Woodworking Conference 2020 [07/02/2020]

On February 7th and 8th, the First International Conference "Wood 2020" with the slogan "Technology - Project" was held in La Coruña, at CESUGA's headquarters, with 3 sessions linking wood to the territory, architecture and furniture.

The LIFE EcoTimberCell project was present in the second session of Wood and Architecture, on 7 February, through Manuel Guaita as a speaker, with the paper entitled Development of new products for a Galician construction bioeconomy.

These sessions focused on Technological Innovation and its relationship with the Project, understanding it as a rational search for intelligent, coherent and logical solutions, highlighting biological, ecological and anthropological issues as a guarantee for a more sustainable way of living.

New website for the LIFE EcoTimberCell project [01/03/2020]

The LIFE EcoTimberCell project publishes its new website to incorporate the new contents and advances in 4 languages, Spanish, Catalan, Galician and English.

life-ecotimbercell.eu

It includes the new image of the project and a new section for networking with other projects and entities.

We also include space for the future spinoff of the University of Santiago de Compostela, TimberSoul, and the resource area to access the documentation generated in the project that will be updated with relevant publications in the coming months.

Access the videos associated with LIFE EcoTimberCell [08/05/2020]

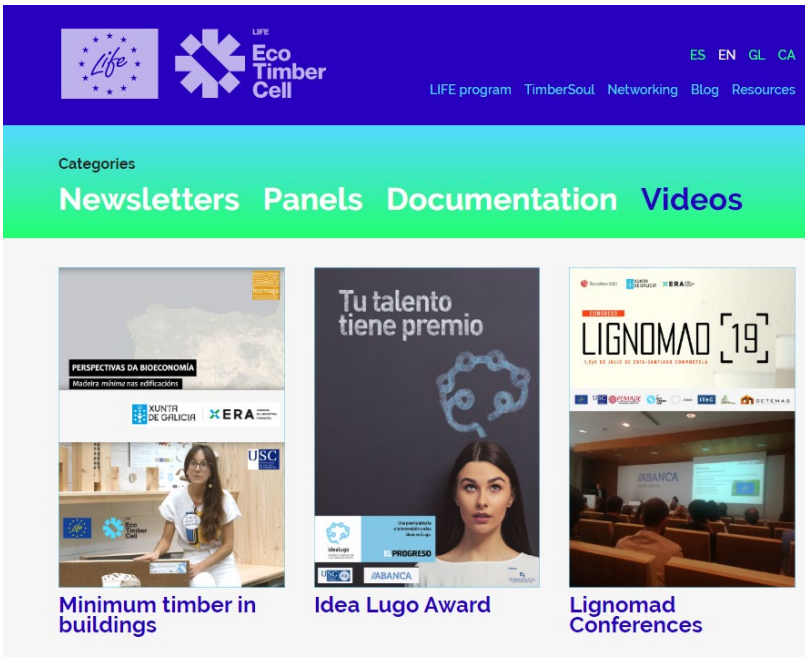
From the resources section of LIFE EcoTimberCell project website, you can access videos associated with this LIFE project. In the future, new self-produced videos will be included to provide more information about the project and its scope.

The following videos are currently available:

- LIFE EcoTimberCell's participation in LIGNOMAD19, the Congress on Construction with Wood and other Lignocellular Materials.

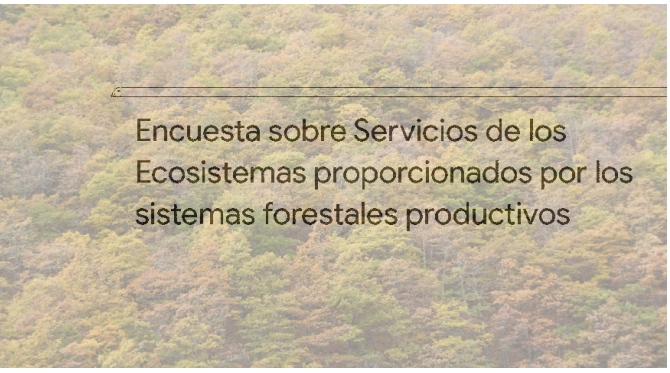
- The presentation of Idea Lugo prizes for innovation and entrepreneurship, in which LIFE EcoTimberCell was awarded.

- The video produced by FEARMAGA with the collaboration of XERA Agency within the topic Bioeconomy Perspectives, in which we talk about the minimum wood in buildings .



Help us to value the multiple benefits of forest systems. Take part in our survey [24/06/2020]

In Life EcoTimberCell, our aim is to reduce energy consumption in construction through the development of local wood construction products from sustainable forest management. In this way, a change in the conventional construction model with a high CO_2 footprint is promoted, while at the same time encouraging better use of the land.



At LIFE EcoTimberCell we work to promote the valuable Ecosystem Services provided by forests, through the promotion of sustainable forest management, guaranteed by the two main forest certification seals used in Spain:

Ecosystem Services can be defined as all those **benefits that society obtains from ecosystems**; a concept increasingly applied to environmental conservation, human welfare and the involvement of human interventions in the natural environment. Some of the most relevant ecosystem services provided by forests are their role as climate regulators, pests and diseases, carbon sink, nutrient cycling, and the provision of wood and biodiversity conservation, as well as recreational, cultural and spiritual benefits.

We want to **put in value** the benefits provided by productive forest systems. Therefore, we are evaluating the Ecosystem Services they provide us. With this objective, we have designed a survey. **Knowing the perception** that the actors involved have about these services is key to enriching the final result of this evaluation.

If you are a forest owner, you work in the public administration, forestry sector, architecture studios, research technology

centres, construction sector or real estate agencies, or you are thinking of acquiring a sustainable home, and you want to collaborate in improving the results obtained, click on the following link(https://forms.gle/U6YvuJuvS4K5ZYEu5).

LIFE EcoTimberCell team thanks you very much for your collaboration, your vision is very important to us and completing this survey will only take a few minutes.

The results obtained will be integrated into the Ecosystem Services Evaluation, which we will publish as part of the project's conclusions on the LIFE EcoTimberCell website.

03

LIFE
EcoTimberCell

lifeecotimbercell.eu

lifeecotimbercell.eu

With the contribution of the
LIFE financial instrument of the
European Union