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UNIVERSITY OF GALWAY

TERG
Timber Engineering Research Group



Use of Mass Timber in Construction

Timber Engineering Research Group
4th March 2026

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TERG Director

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University
ofGalway.ie



Opps4GPP

Ryan
Institute



Contents

- Timber Engineering Research Group
- Mass timber for sustainable construction – products, uses and design challenges
- Policy development, regulatory environment and considerations
- Examples of mass engineered timber buildings
- Research overview and case study projects



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SUSTAINABLE
DEVELOPMENT GOALS

University of Galway is an SDG Ambassador and ranks 1st for sustainable development in Ireland according the Times Higher Education Impact Rankings 2025

Timber Engineering Research Group (TERG)

Established 2004 by Prof. Annette M. Harte

Research Areas:

- Characterisation of timber properties
 - Non-destructive testing for timber grading
 - Engineered wood products development
 - Structural design, analysis and testing
 - Structural monitoring, sensors and instrumentation
 - Life cycle assessment
 - Numerical modelling
-
- Over €3.2 million in direct funding in last 4 years
 - National: DAFM, EPA, Construct Innovate
 - International: EU Horizon, Interreg, Erasmus+, COST



Figure: Visits by the Department of Agriculture, Food and the Marine (DAFM) to TERG at University of Galway



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 www.universityofgalway.ie/terg/

TERG Research Priorities

Standards (Test, Product standards and code compliance)

- Forest

- Forest management
- Site studies

- Timber Processing

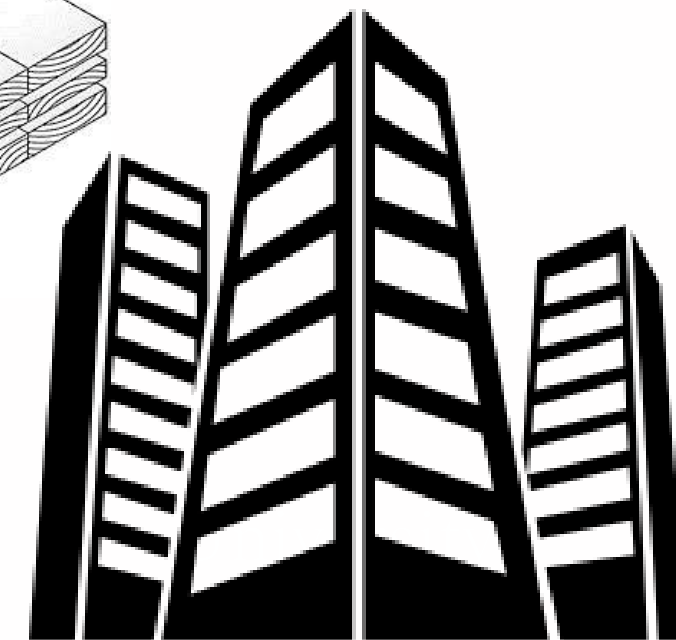
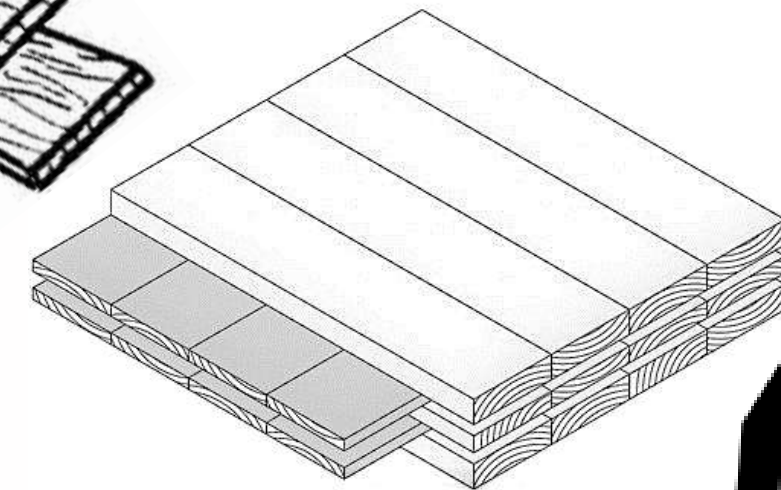
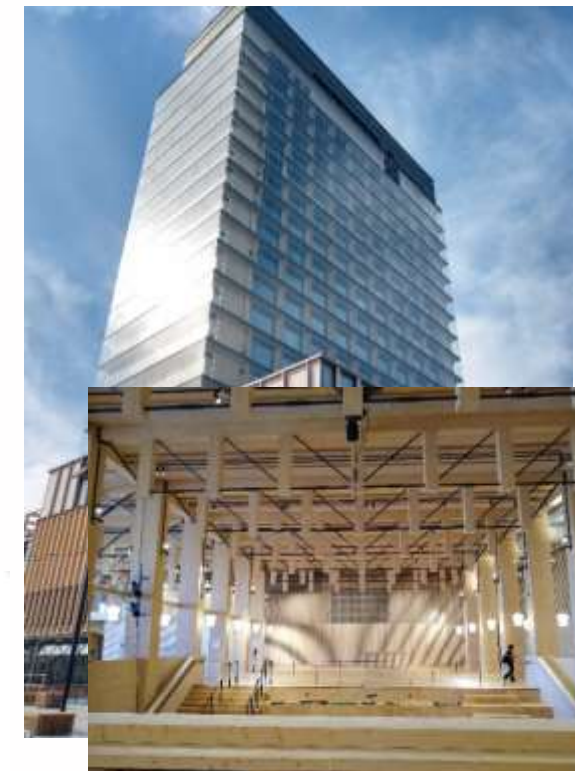
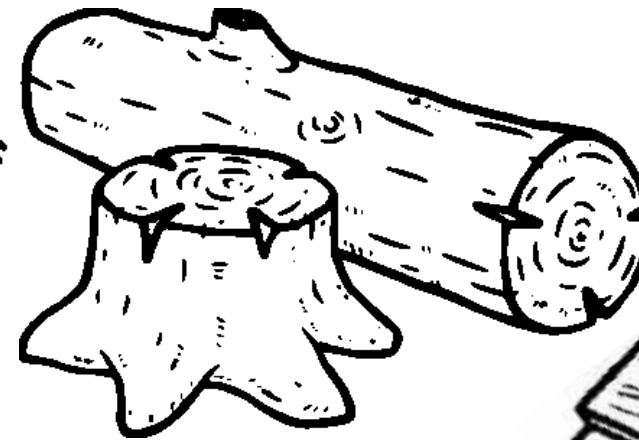
- Sawmills
- Timber quality

- Product Manufacturing

- Added value products
- Engineered wood products

- Timber Construction

- Design guidance
- Building professional engagement



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Timber for sustainable construction

- Timber is the name used to refer to wood that has been converted into some (structural or non-structural) products

- Local homegrown resource
- Renewable natural resource, lowest carbon footprint (GWP) & energy requirement for manufacturing of primary structural materials → housing
- Reusable, recyclable, biodegradable
- Highly durable when properly designed and detailed, and treated where appropriate
- Associated MMC innovations



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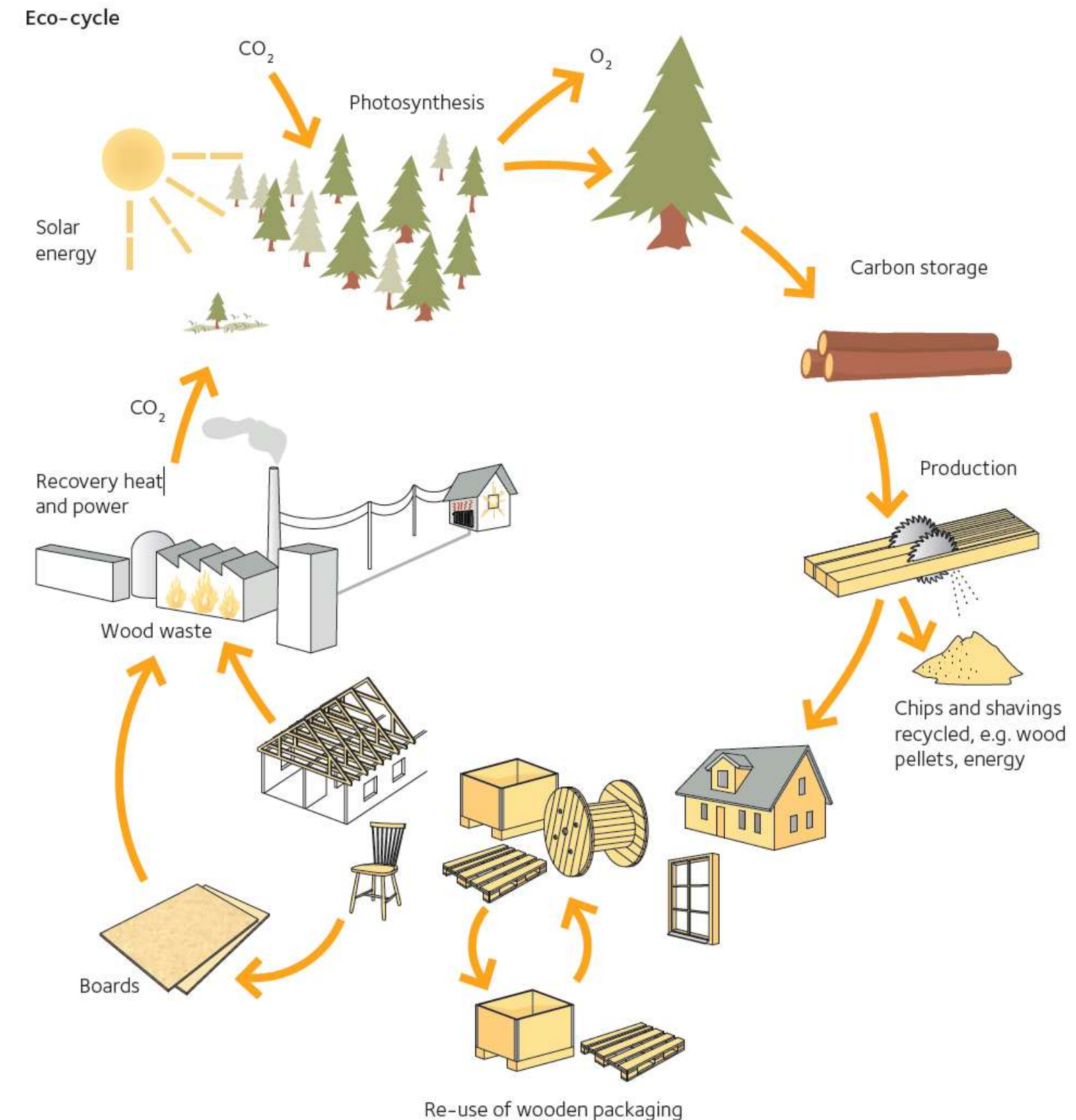
Can tim

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Expand



Beyond the Trees, a



to reduce

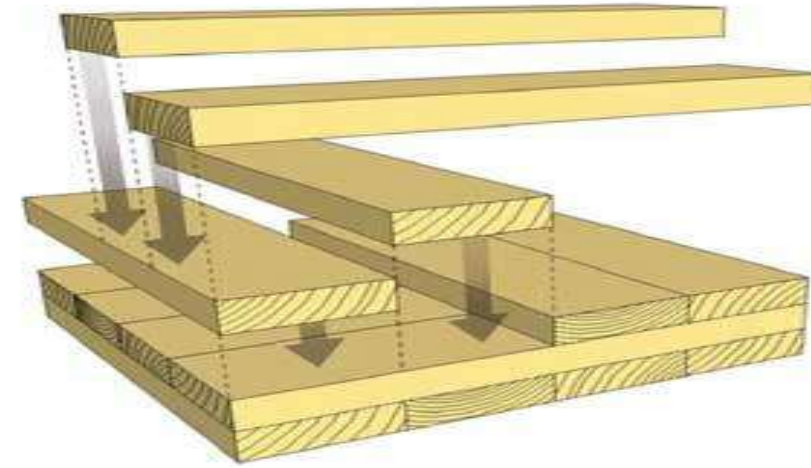
in timber



Timber and Engineered Wood Products



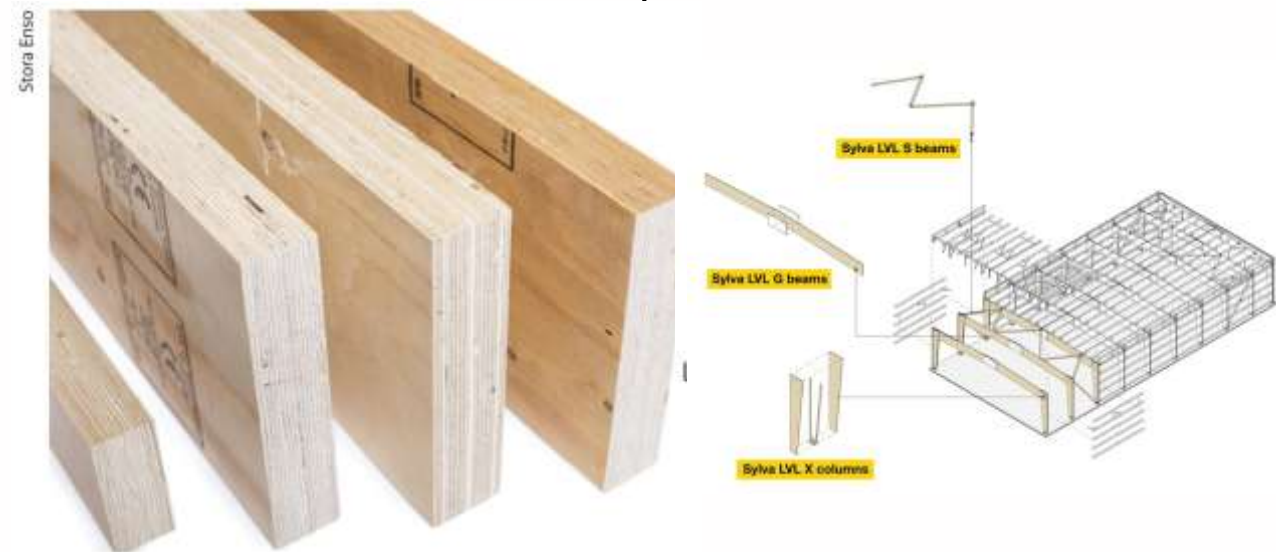
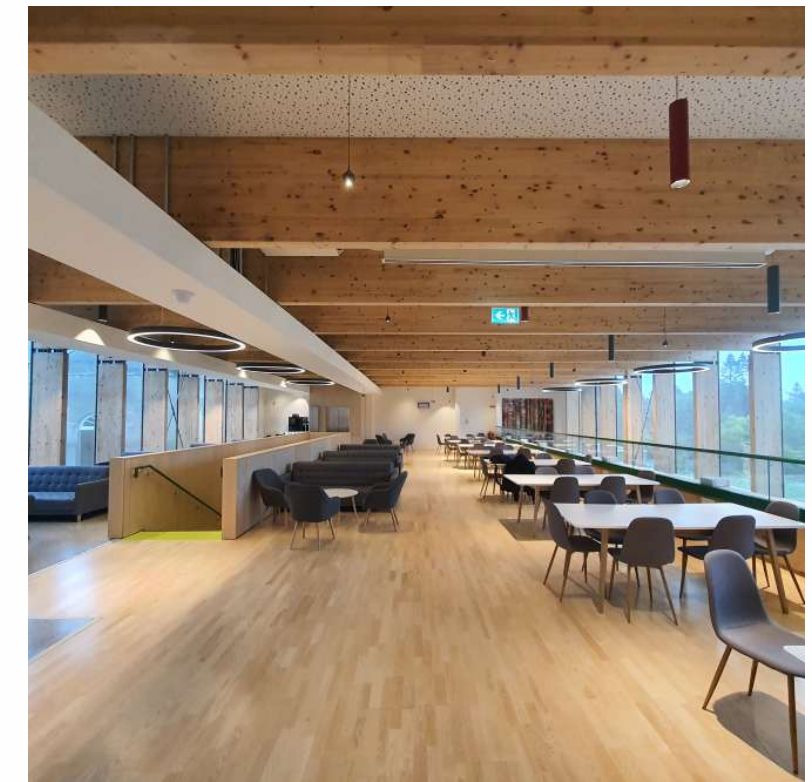
Sawn Timber e.g. Joists, Timber frame, roof trusses



Cross Laminated Timber (CLT) e.g. floors, walls, roofs



Glued Laminated Timber (Glulam) e.g. beams, roof, columns, bridge construction



Laminated Veneer Lumber (LVL) e.g. columns, beams, floors, roofs



Parallel Strand Lumber (PSL) e.g. long span beams, columns



Composite systems e.g. Metal Web Joists)



Panel products (Orientated strand Board, Plywood, MDF) e.g. flooring, wall sheathing, facades



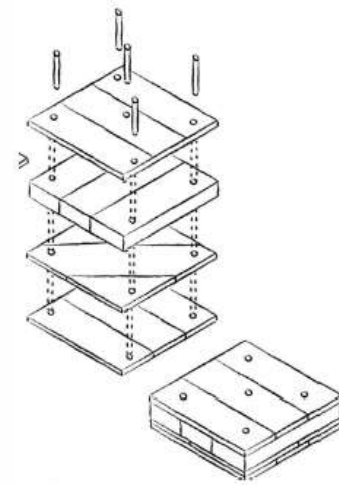
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For more info see: <https://www.universityofgalway.ie/terg/knowledge/ewp/>

Other Engineered Wood Products (EWPs)



Structural Insulated Panels (SIP)
– timber panels e.g. OSB glued to polystyrene insulation



Dowel Laminated or Cross Laminated Timber (DLT or DCLT) e.g. floors, walls, roofs (see AFTB project on TERG website)



Nail Laminated Timber (NLT) e.g. floors. Can use wooden nails!

See: <https://www.youtube.com/watch?v=LLKGpFoga6I>



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For more info see: <https://www.universityofgalway.ie/terg/knowledge/ewp/>

Advantages of EWPs and mass timber

- Defects are small and are distributed throughout the element resulting in greater product reliability, strength, stiffness and dimensional stability compared to an equivalent solid timber element.
- Elements with greater depths and spans can be easily produced.
- Design for Manufacture and Assembly (DfMA) and efficient construction
- Uses:
 - Replicable low-rise public and community buildings (schools, healthcare, libraries, creches)
 - Mid-rise apartments (4-6 storeys)
 - Vertical extensions to existing buildings (“Optoppen”)

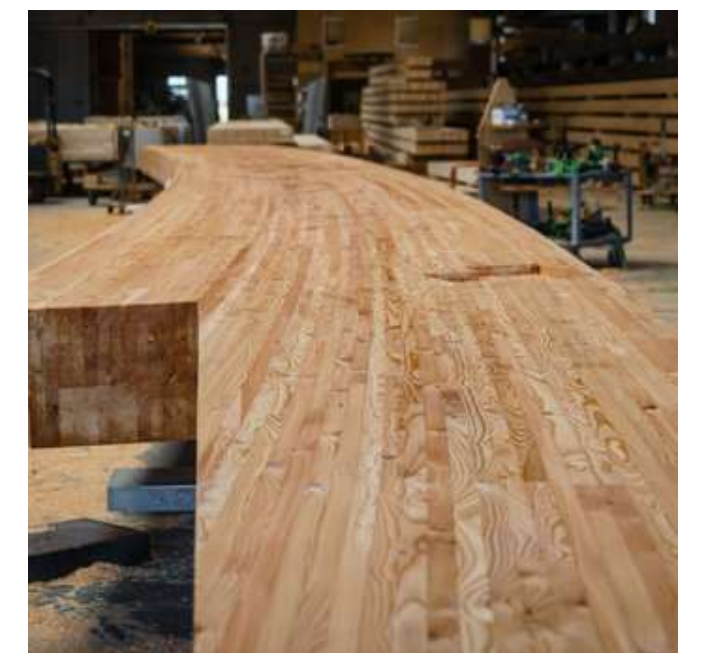
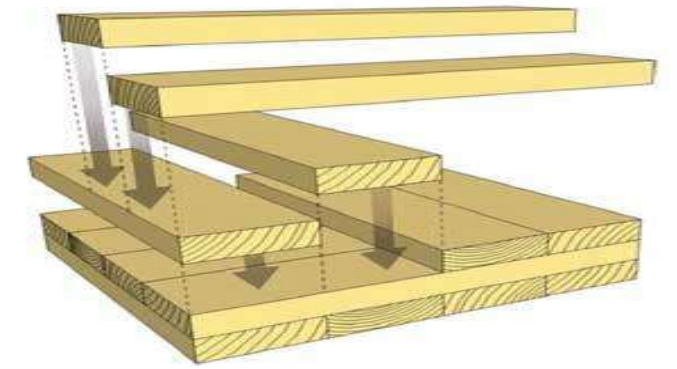


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General notes on mass timber elements

- See: <https://www.universityofgalway.ie/terg/knowledge/guidance/>
- **Cross Laminated Timber:** Panel Spans (width) typically 3-5 m. Maximum panel length typically 13 - 24 m.
 - A 5-layer, 140 mm thick panel fabricated from Irish C16 timber can span 4 m
- **Glulam:** Laminae 19-50 mm in thickness, 90-240 mm wide. Typical max spans of up to 31 m at a beam depth of 2 m. Columns can typically be 90-200 × 90-420 mm in cross section
- **LVL:** max size of panels 24 m x 2400 mm x 75 mm for beams and columns



Design Guidance & relevant standards

- **Timber Design:**

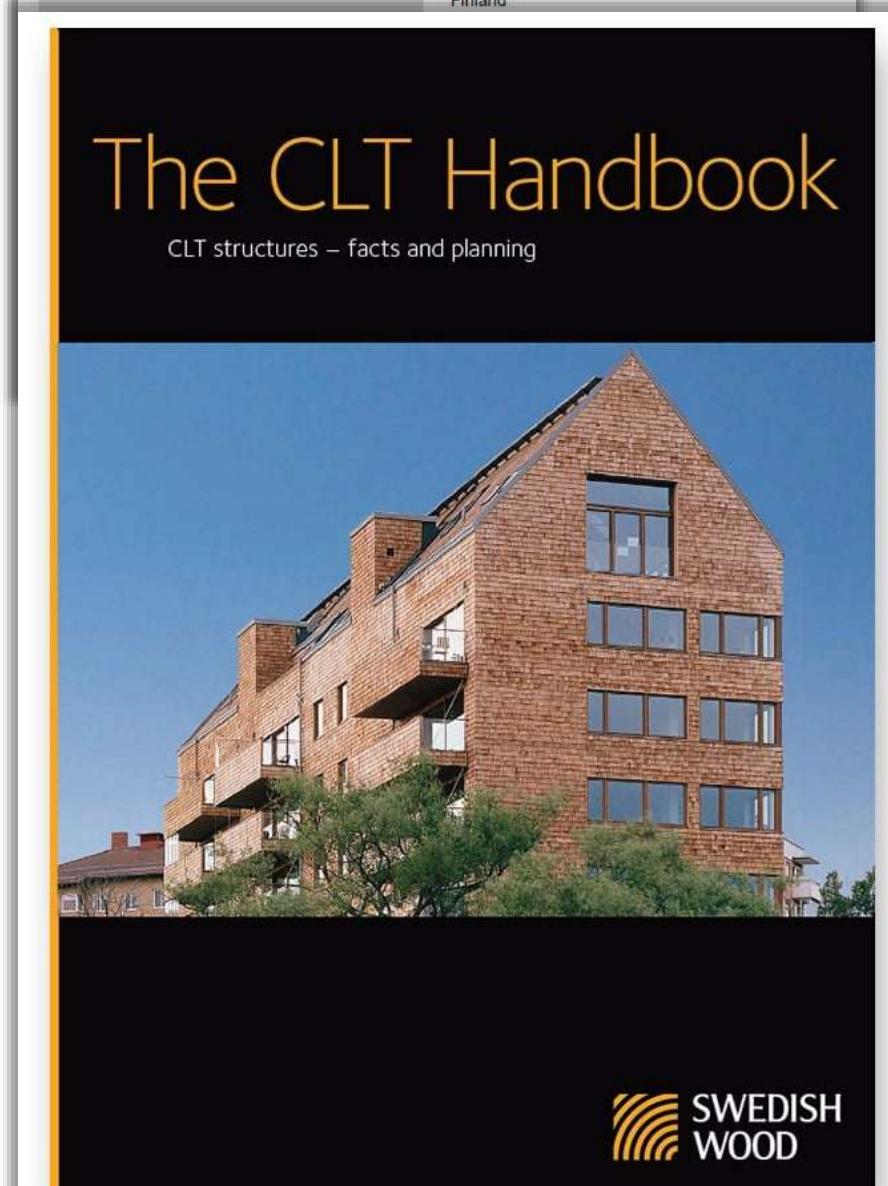
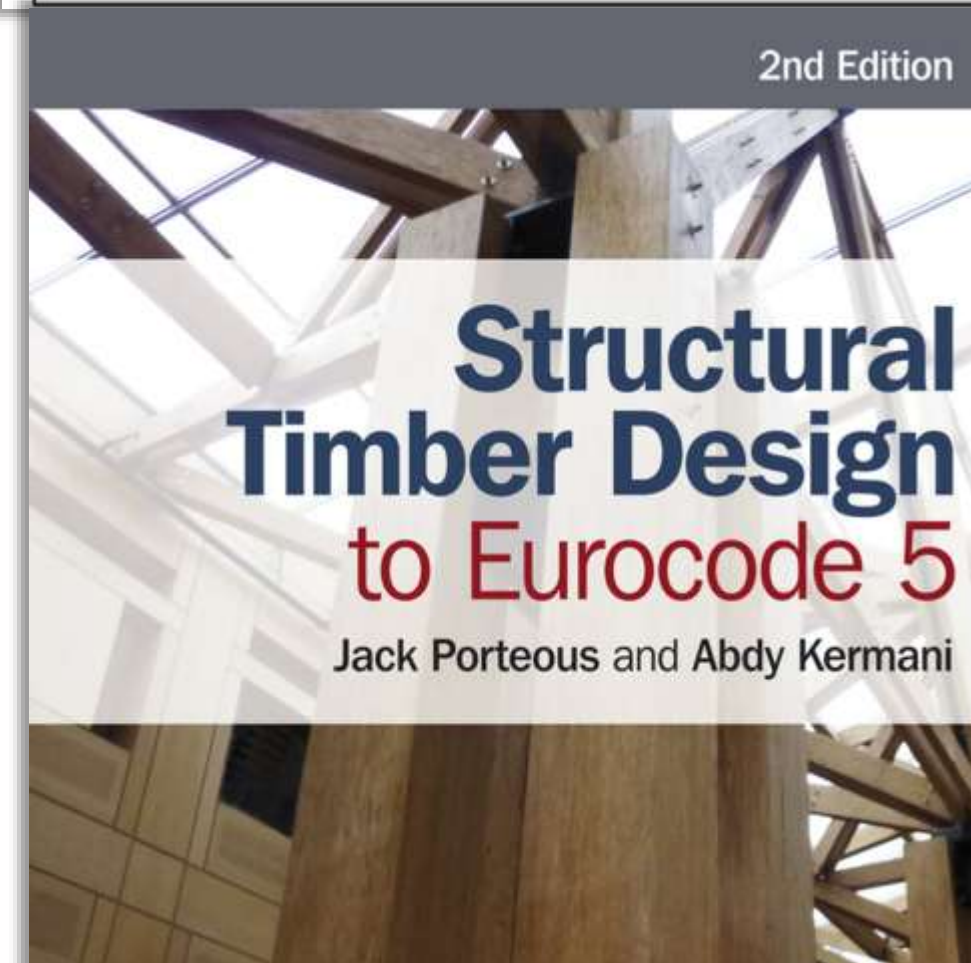
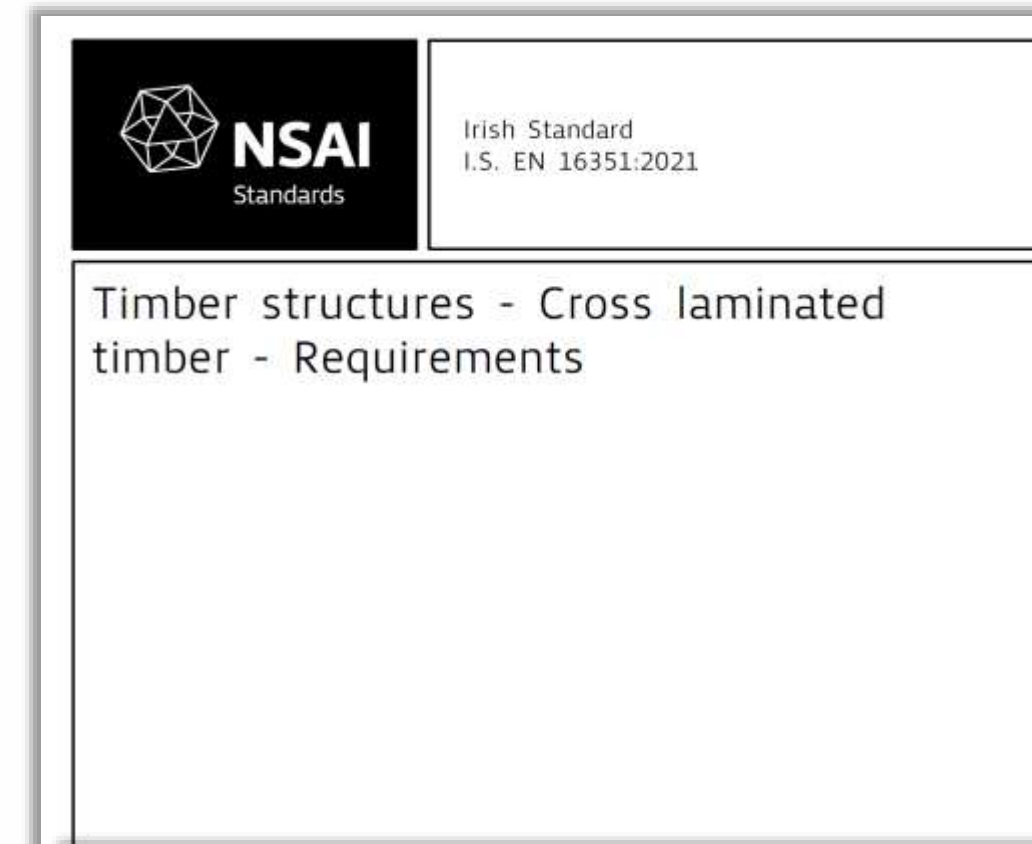
- Timber frame dwellings: I.S. 440
- I.S. EN 1995 Eurocode 5
- I.S. EN 338 Structural timber strength classes

- **Mass timber design:**

- I.S. EN 1995 (Eurocode 5) – **REVISED 2027**
- I.S. EN 14080 – Glulam
- I.S. EN 16351 Product Standard for CLT
- European Technical Assessments (ETAs)
- The Swedish Wood CLT Handbook
- Woodworks and Thinkwood Mass Timber Design Manual



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Design Challenges

- Acoustics – direct and flanking sound transmission
- Floor Vibration
- Fire
 - Building Regulations (Part B)
 - Exposed or Apply Protective layer e.g. gypsum plasterboard
- Water ingress or internal leaks
 - Appropriate details
 - Insurance

Neighbours' voices, parties, heels, plants, appliances. Your residents are complaining.



There is a structural NOISE PROBLEM.

SOLVE IT

Are you getting complaints that "the house feels like the street"?



The problem is SEALING.

GO TO SILENCE



Does your client hear upstairs neighbours' footsteps and children chasing each other around the house?



He has a problem with IMPACT NOISE.

HOW TO DO IT

Are TV, stereo, parties and tenants' voices disturbing?



It's a matter of AIRBORNE NOISE.

TURN DOWN THE VOLUME



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PIANO

RESILIENT SOUNDPROOFING PROFILE

Theoretical reduction of **up to 10 dB** when used as a vibration damper

Acoustic load

0.008 N/mm²

4.3 N/mm²

0.008

4.3

0.008

4.3

Products		Thickness	Acoustic improvement $\Delta L_{p1}^{(1)}$	Acoustic load	Maximum applicable load
XYLOFON 20		6 mm	> 7 dB	0.016-0.14 N/mm ²	1.25 N/mm ²
XYLOFON 35		6 mm	7.4 dB	0.038-0.32 N/mm ²	3.61 N/mm ²
XYLOFON 50		6 mm	10.6 dB	0.22-0.68 N/mm ²	8.59 N/mm ²

MODCONS: Fire performance testing of Irish CLT at MTU

- Standard ISO 834 Fire Testing curves
- Charring rate of Irish CLT Panels in line with Eurocode 5 (0.63-0.65 mm/min)
- See also IS EN 1995-1-2

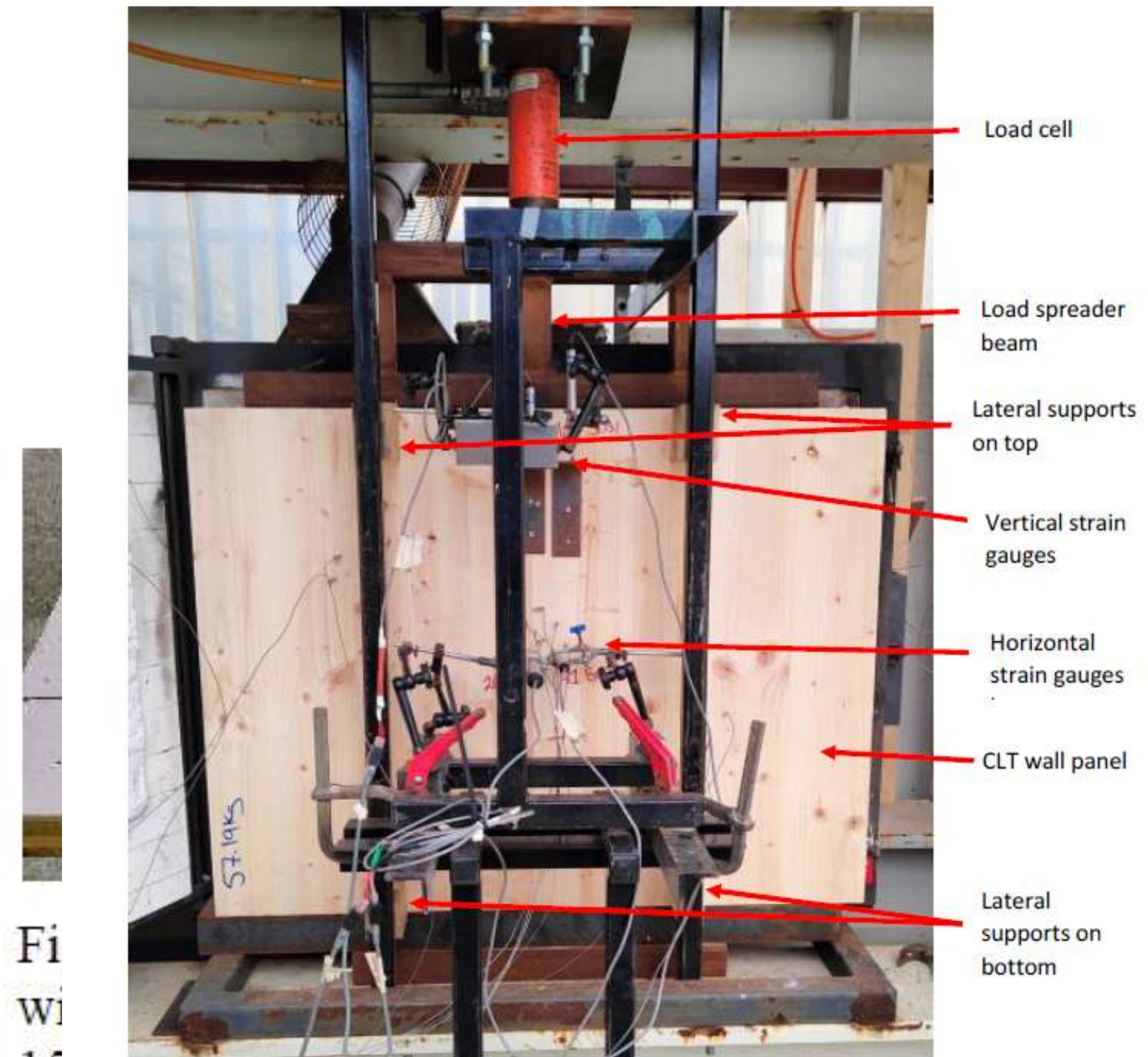


Figure 5. A test panel up against the kiln opening showing the side of the panel not exposed to fire



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Why timber?

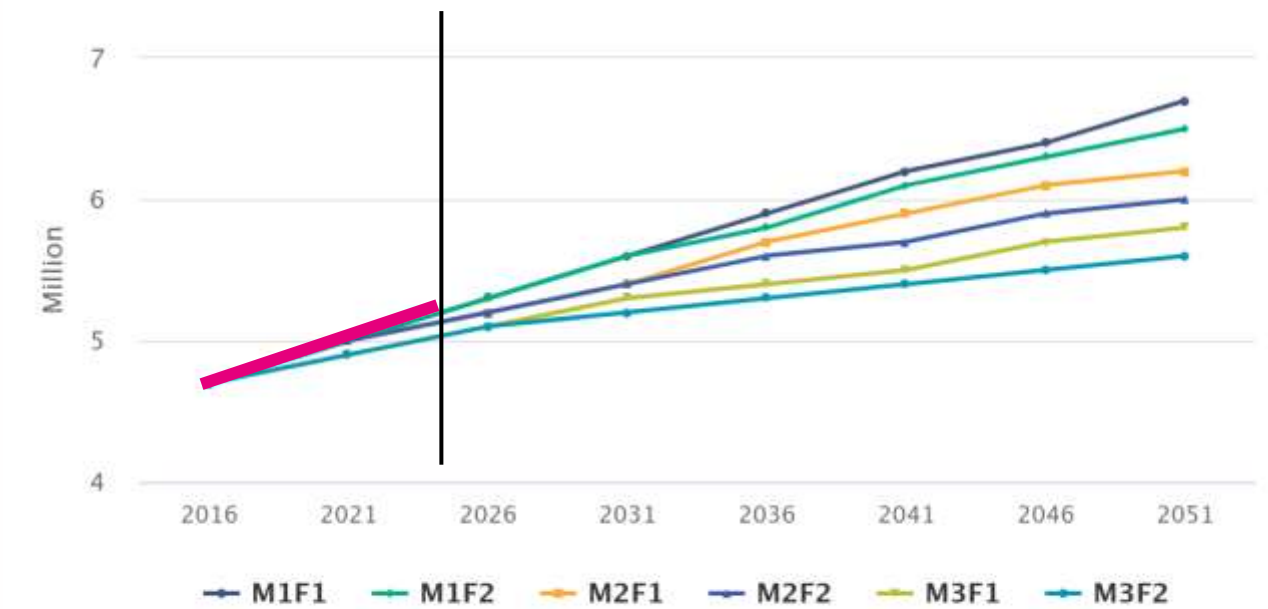
Policy development, regulatory environment and considerations

Why timber? Challenges and Opportunities

Challenges:

- Changing populations and housing demand e.g. Up to **60,000** new homes required per annum in Ireland (completion rate of 36,284 in 2025; 30,330 in 2024; 32,695 in 2023);
- Lowest % population living in apartments – **build taller?**
- Vertical extensions may require lighter weight structures

Figure 2.1 Population projections by selected assumptions, 2016 - 2051



Source: CSO Ireland
Highcharts.com

Note: Excluding French overseas departments up to and including 1997. Breaks in series: 1991, 1998, 2000-01, 2008, 2010-12, 2014, 2015, 2017, 2019, 2021-2023.
Source: Eurostat (online data code: demo_gind)

eurostat



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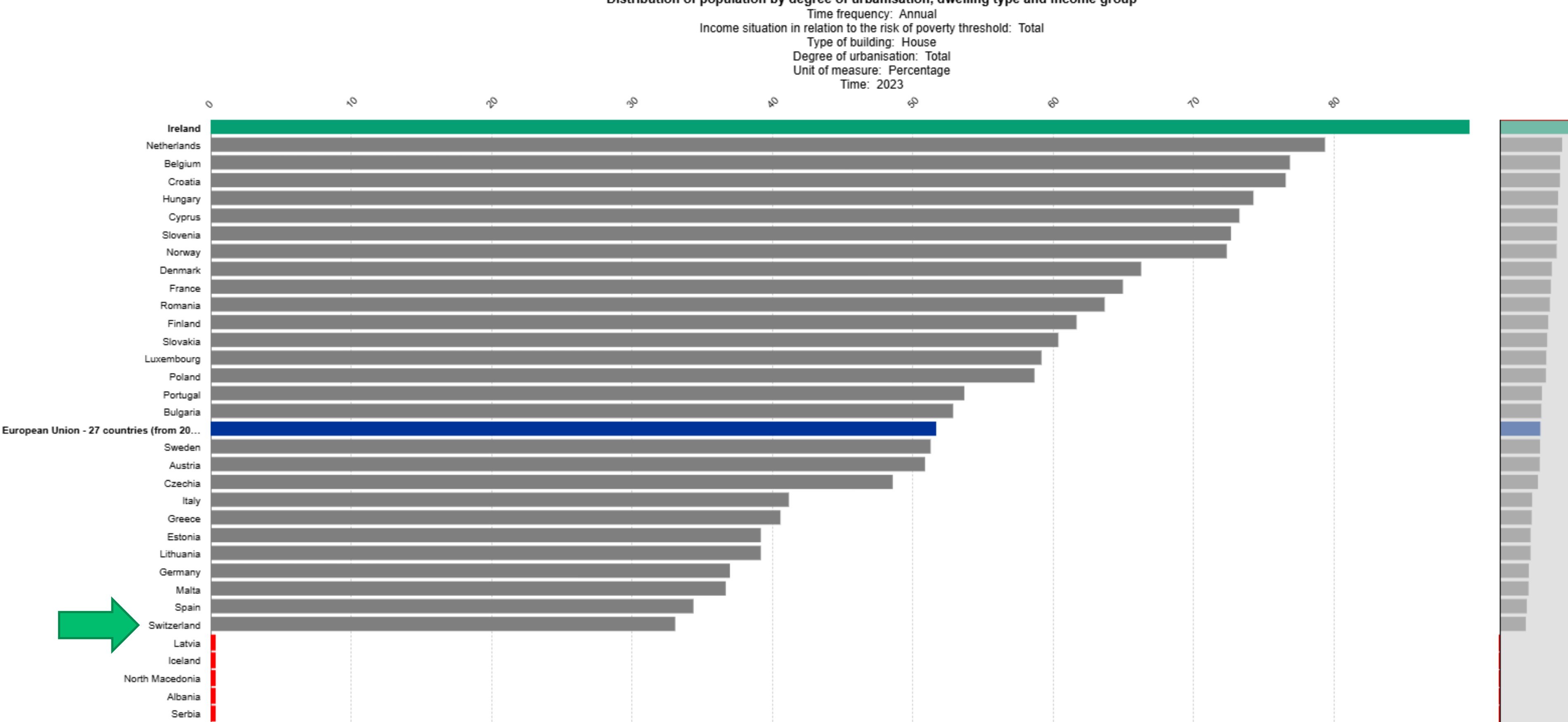


Figure: Dwelling types in Europe - Houses

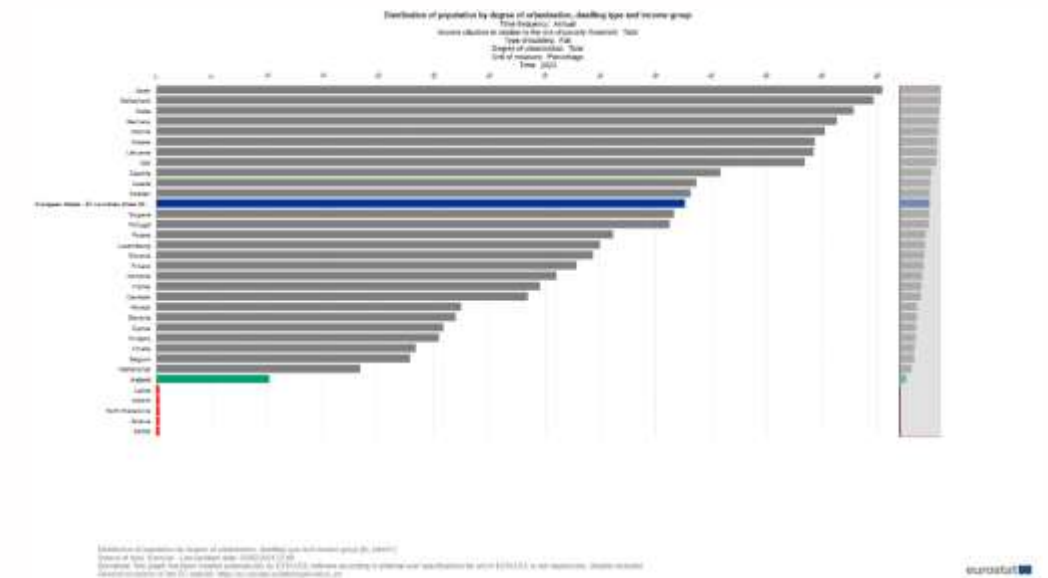
Dwelling types in Ireland (2023):

- 10.2% in flats/apartments (EU27 average 47.7%)
- 89.7% in houses (EU27 average 51.7%)

Why timber? Challenges and Opportunities

Challenges:

- Changing populations and housing demand e.g. Up to **60,000** new homes required per annum in Ireland (completion rate of 36,284 in 2025; 30,330 in 2024; 32,695 in 2023); lowest % population living in apartments – **build taller?**
- Apartment completions up 39% 2024-2025 (was down 24% from 2023-2024)
- Harness **Modern Methods of Construction (MMC)** using timber: lighter weight than other structural materials, speed onsite, quality control and ease of offsite prefabrication, use of local materials and supply chains, reduces onsite labour



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Why timber? Challenges and Opportunities

Challenges:

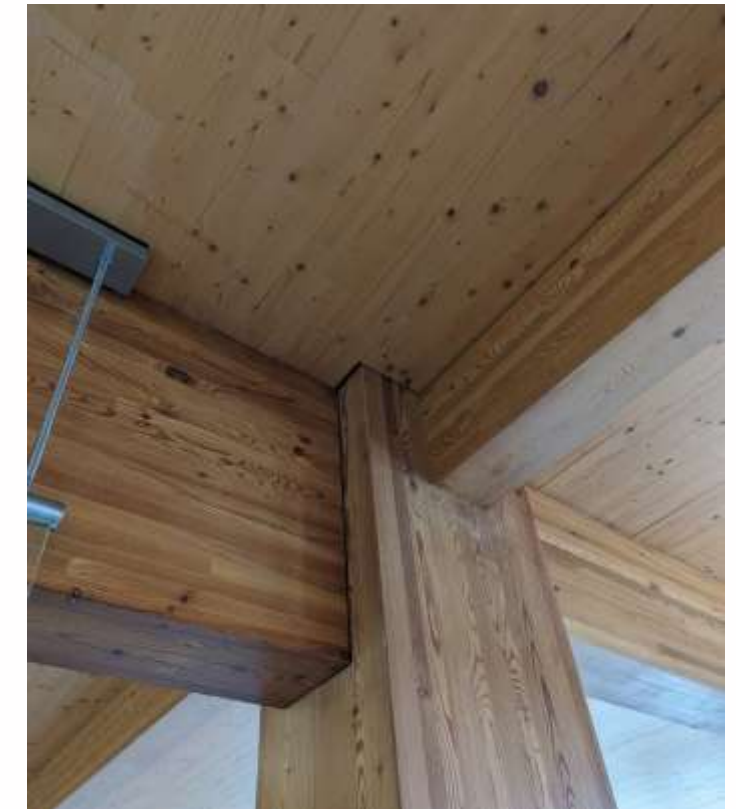
- Ireland's greenhouse gas emissions: 10.4 tonnes per capita (3rd highest in EU/EEA states, EPA 2023); 37% of national emissions from the built environment (IGBC 2022)
- Building more - associated increase in carbon footprint with traditional construction materials (concrete, masonry block)
 - How to meet net zero by 2050?

Opportunities:

- Forestry and forest products: Output of roundwood to increase to ~8 million m³ by 2035 in Ireland (Coford, 2021)
 - Substitution of concrete & steel with structural timber – carbon storage
- Link construction demand with forestry policy, wood value chains, and land use to optimise climate mitigation benefits (CAP 2024, 2025)
 - Homegrown vs imported timber



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Civil Engineering Research in Ireland 2022

Timber construction in Ireland for the mitigation of climate change and the housing crisis in 2022

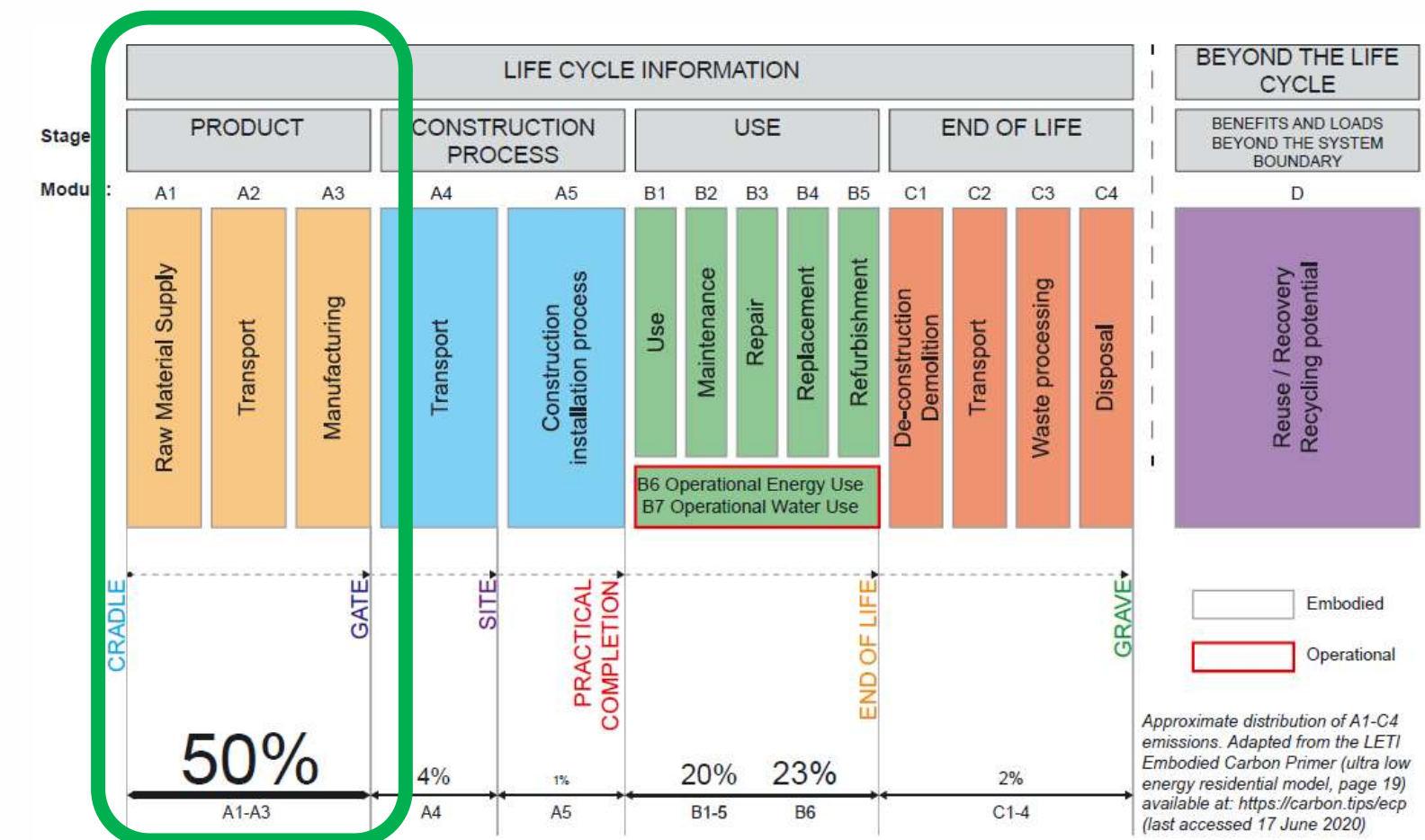
Opportunities: Need to increase timber in construction

- e.g. only ~24% of new dwellings in Ireland are timber frame (48% of new low-rise scheme housing)
- Scotland: as high as 92% of new dwellings!

Challenges for timber in Ireland



- No new guidelines for timber procurement since 2013 (sustainable sourcing) except EU Deforestation-free products Regulation (EUDR; from 30 Dec 2024)
- Tradition and perception
- Exemplar timber building case studies needed to highlight benefits of timber
 - **Wood first policy needed in tender criteria?**
 - Competencies of design professionals, contractors etc
- Using verified production data (A1-A3) to assess lifecycle embodied carbon footprint (ignoring biogenic carbon storage), timber products can have up to **8 times less emissions** than concrete by volume
- Complete lifecycle data is needed (Cradle to Grave and cascading uses)



Orr et al. 2020, *The Structural Engineer*



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Policy Drivers for Timber in Construction

- **EPA/DECC/OGP (2024)**
 - **Green Public Procurement** guidance for the public sector (2024) and Buying Greener: Green Public Procurement Strategy and Action Plan 2024-2027
 - Reduction in embodied carbon of all public building projects
 - **OGP Circular 17/2025:** mandatory implementation of GPP for all tenders above OGP thresholds; low-carbon construction and whole life carbon (WLC) analysis for large public building projects (>1000 m²) from 2026 – following EPBD and Level(s) framework
 - Declaration of embodied carbon in BER/EPC of buildings from 31 Dec 2027.
 - *(See also the Capital Works Management Framework)*
- **Paris Agreement** – Nationally determined contributions i.e. emissions limits; **Sustainable Development Goals** (SDGs)
- Revised Design Codes for timber in construction (Eurocode 5 - 2027)
- New (Feb 2026): The **Whole of Government Circular Economy Strategy 2026-2028:** Accelerating Action



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Policy Drivers for Timber in Construction

- Revised **Energy Performance of Buildings Directive** (EPBD Recast):
 - Achieve zero-emission and fully decarbonised building stock by 2050; calculation of whole life-cycle carbon for new buildings
- Updated **Construction Products Regulations** (CPR; entry into force Jan 2025, Application Jan 2026):
 - Mandatory declaration of environmental data and lifecycle impacts of construction products and materials in an expanded Declaration of Performance/Conformance (DoPC)
 - Reporting of this data through Digital Product Passports
- **Climate Action Plans** (2024, 2025)
 - e.g. Action: IN/24/4 *“Implement actions to promote timber use in construction arising from Working Group on Timber in Construction, led by DAFM”*
 - 13.3.2.3 Construction: *“Modern Methods of Construction (MMC) encourages products such as cross-laminated timber and timber frame that can replace concrete and steel in many applications such as floors, roofs, walls and stairs due to their strength and versatility”*



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12.1.2 Analysis of sectoral emissions: *A key target for the industry sector is to reduce emissions associated with the use of concrete and there remains scope for the construction industry to use more timber in construction.*

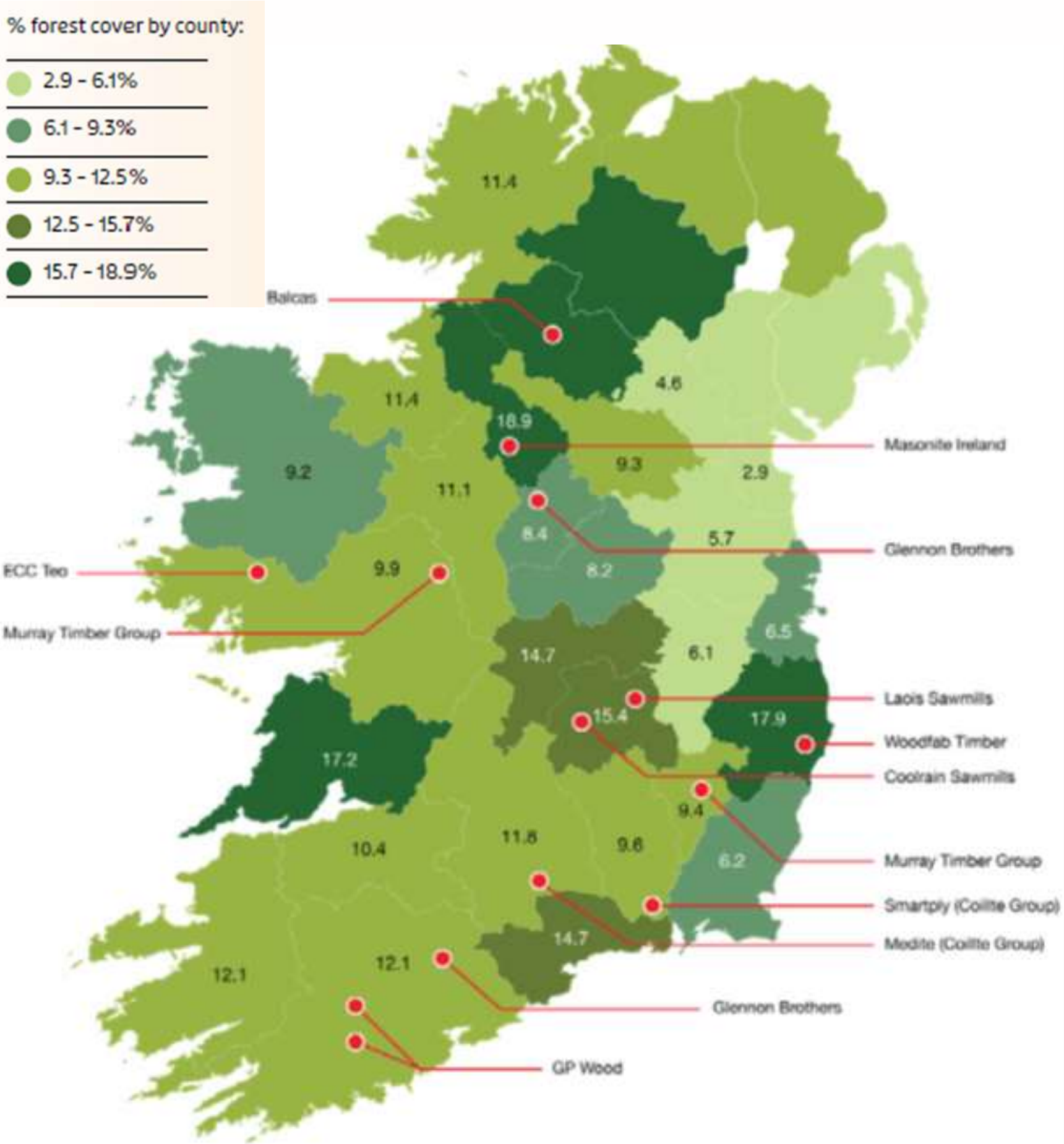




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Examples of mass engineered timber buildings

Examples of timber buildings in Ireland



Dun Laoghaire Rathdown County Council Offices and Samuel Beckett Civic Campus (© Bucholz McEvoy Architects)



(© Longford County Council)



Bord Na Móna HQ (© Bord Na Móna; Plus Architecture)



(© Dept for Communities, Northern Ireland)

Center Parcs Swimming Pool Ballymahon, Longford, Ireland

- Up to 57.5 m arched glulam beams
- 1.8 m deep beams

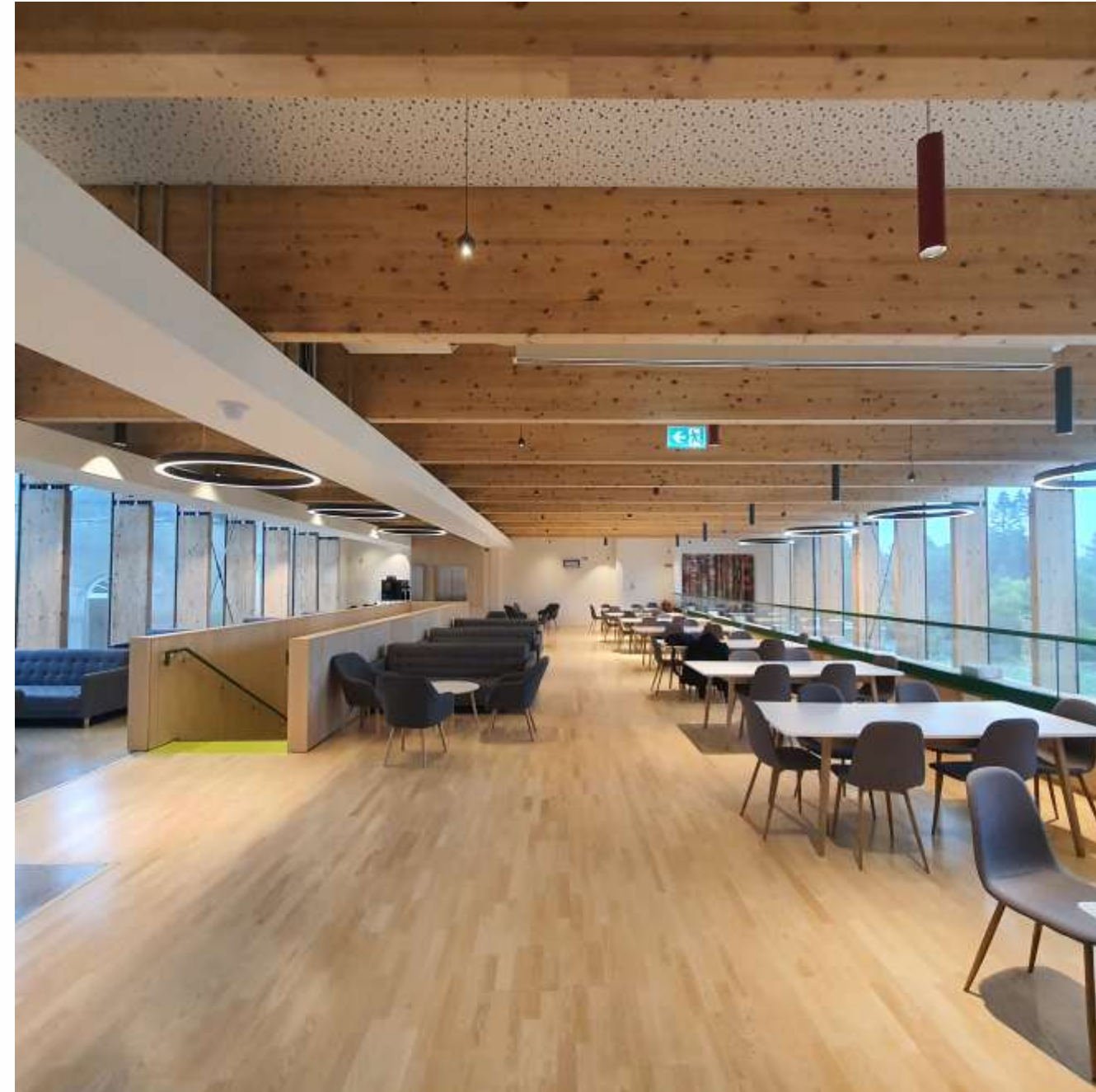


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<https://www.wiehag.com/en/references/center-parcs-ballymahon/>

Avondale Forest Park Wicklow, Ireland

- **Pavilion:** 25 m glulam beams, all fabricated from Irish C16 timber
- **38 m tall tower:** fabricated from Irish Douglas Fir

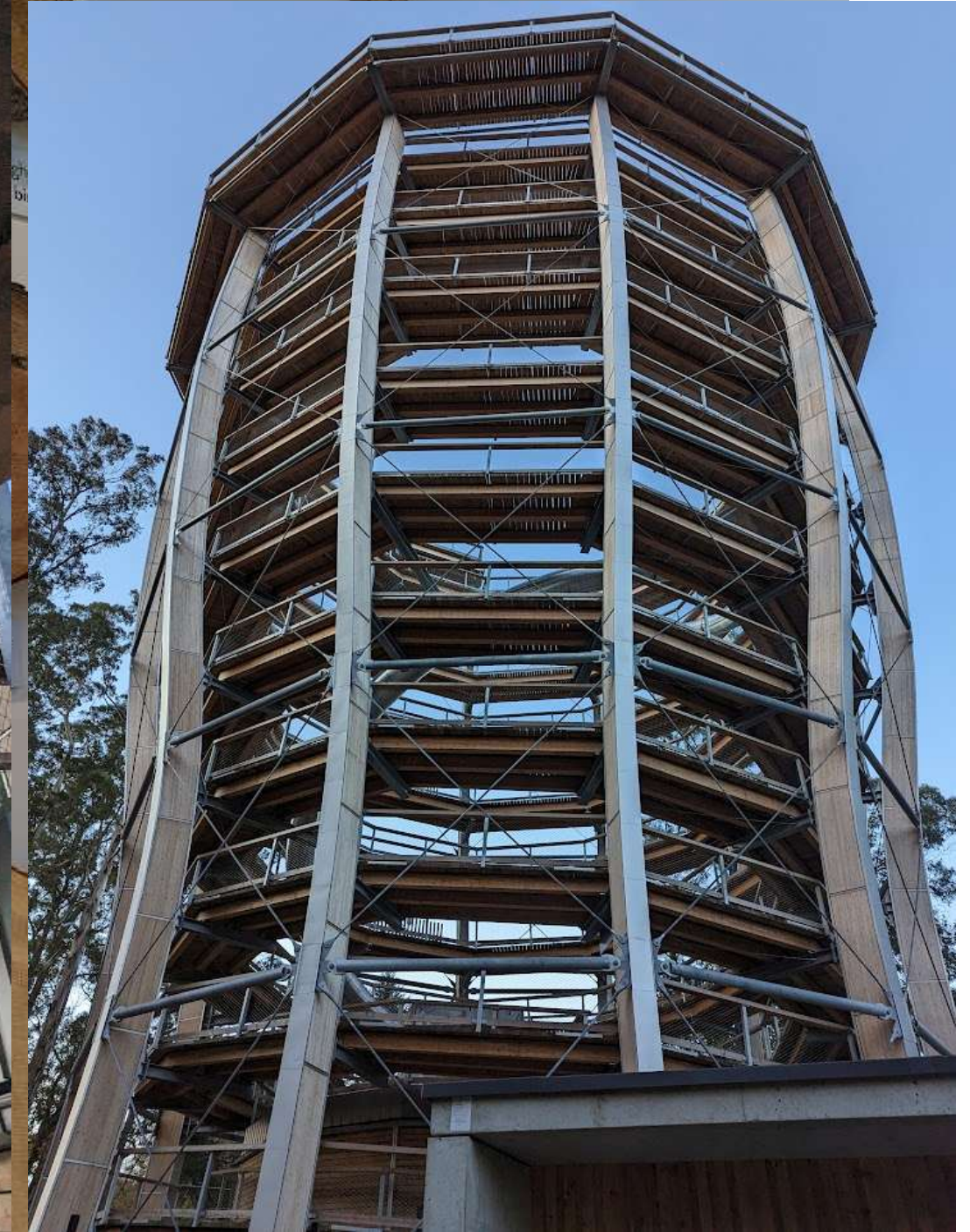


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Image courtesy of Des O'Toole, FII and Coillte

Avondale Forest Park Wicklow, Ireland

- **Pavilion:** 25 m glulam beams, all fabricated from Irish C16 timber
- **38 m tall tower:** fabricated from Irish Douglas Fir



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International Examples



Living Lab - Innorenew centre of excellence (Izola, Slovenia)



The Carbon Neutral Laboratory (U. Nottingham, UK)



Gensler NEXT building (Seattle USA)



BE-ST, Accelerate to Zero, Scotland
<https://www.be-st.build/about/>



NMITE Living Lab, Transforming Timber UK



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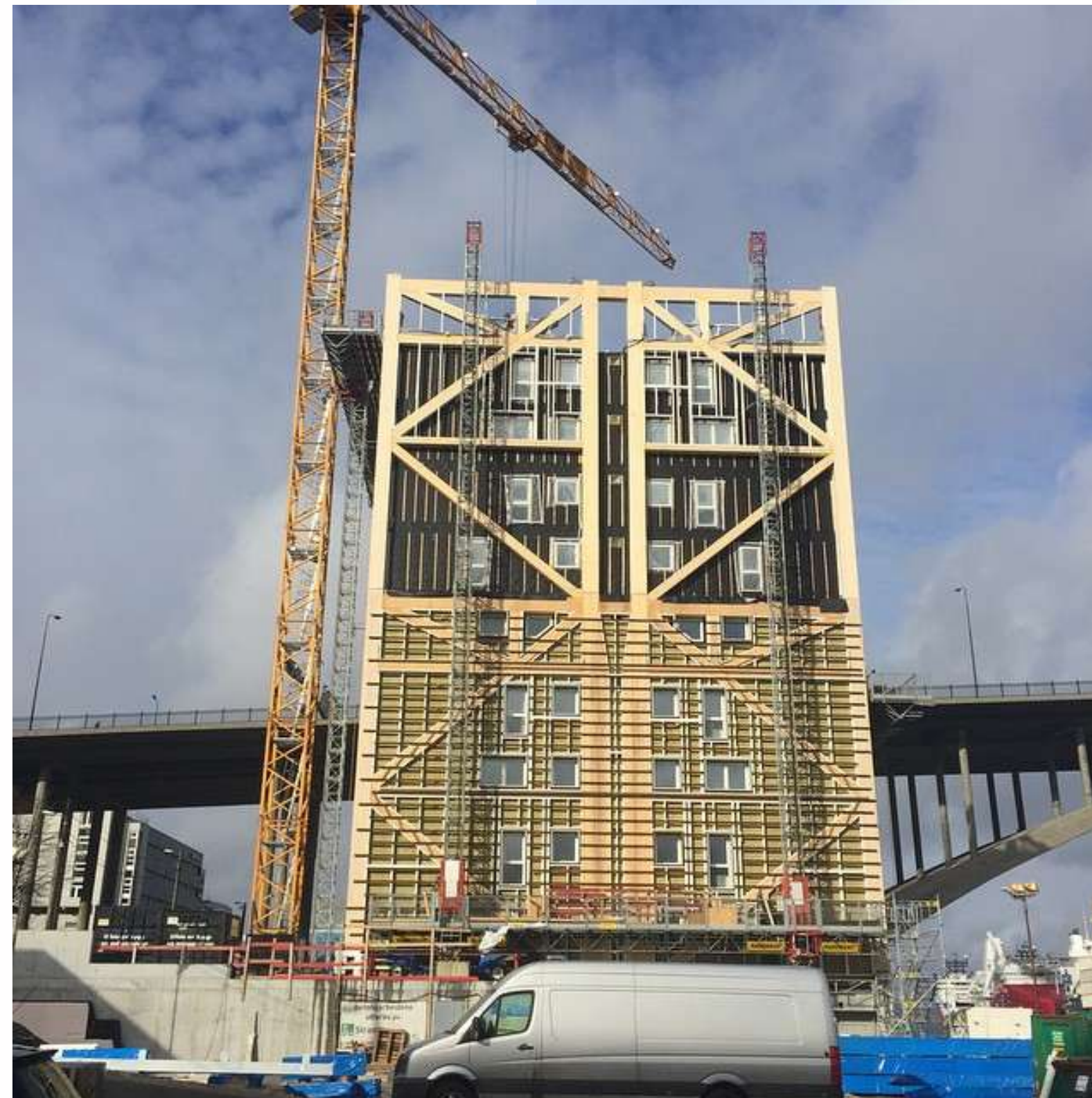
Treet Building (2015)

Bergen, Norway

14 storey
52.8 m tall
Modular CLT
& glulam



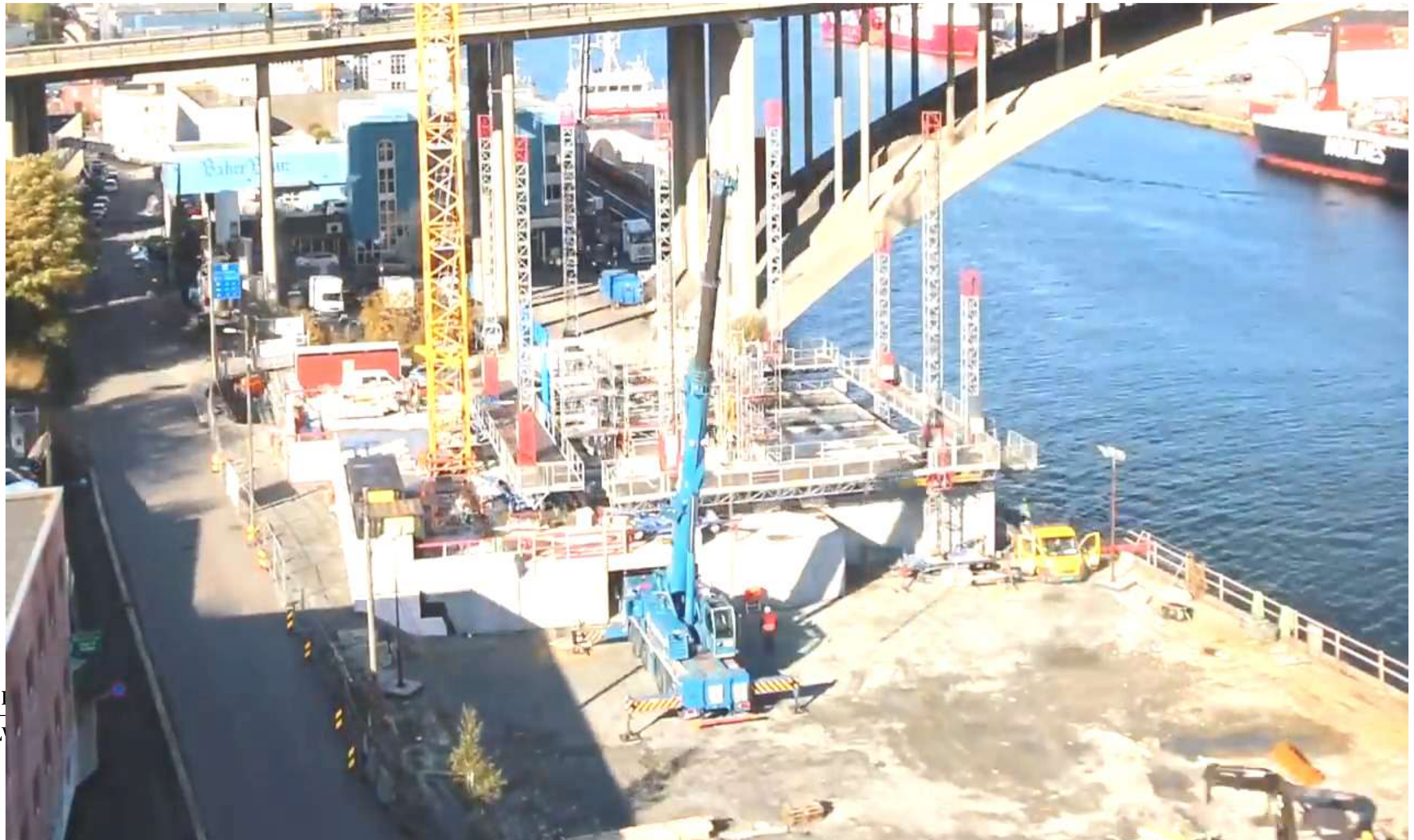
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Treet Building (2015)

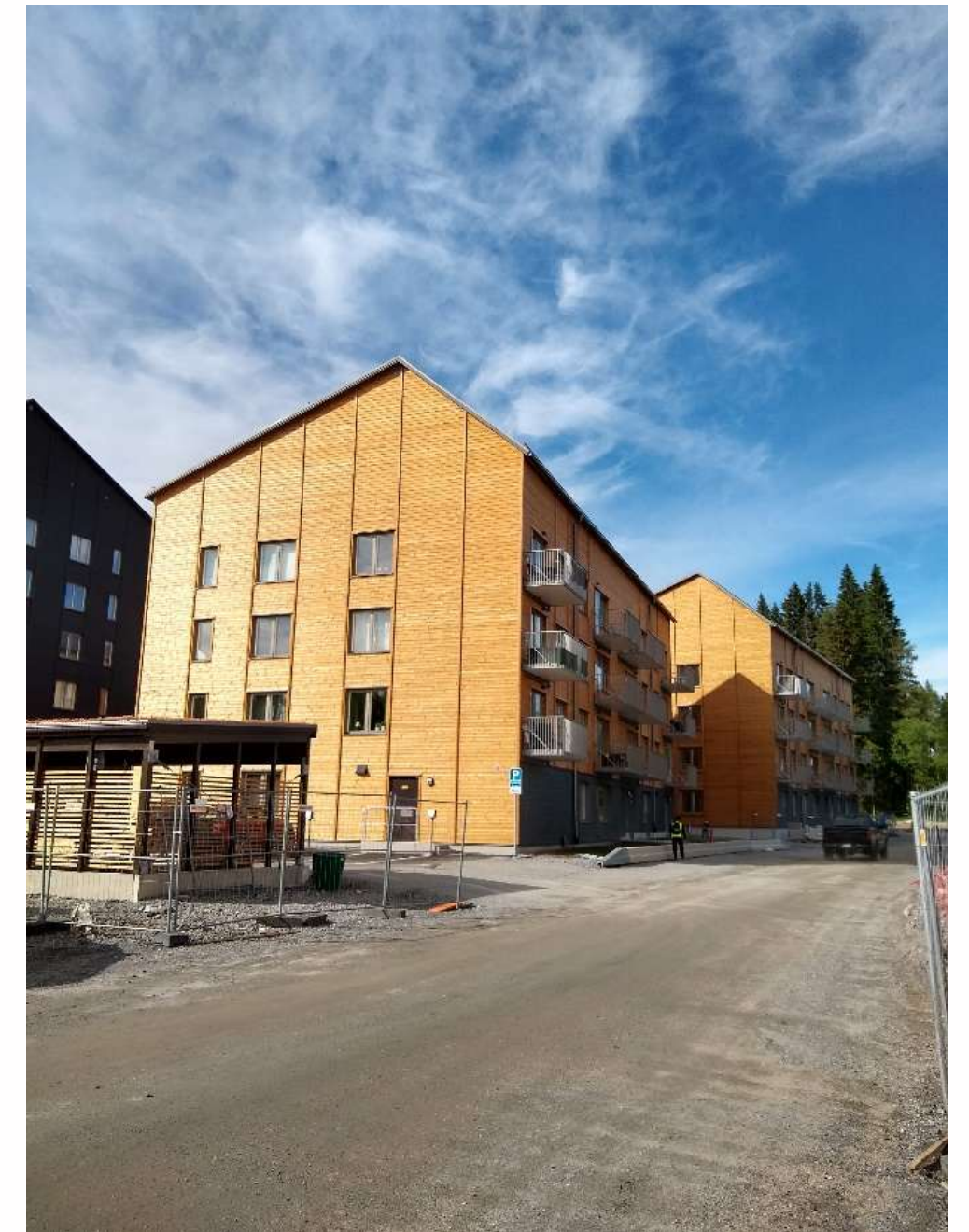
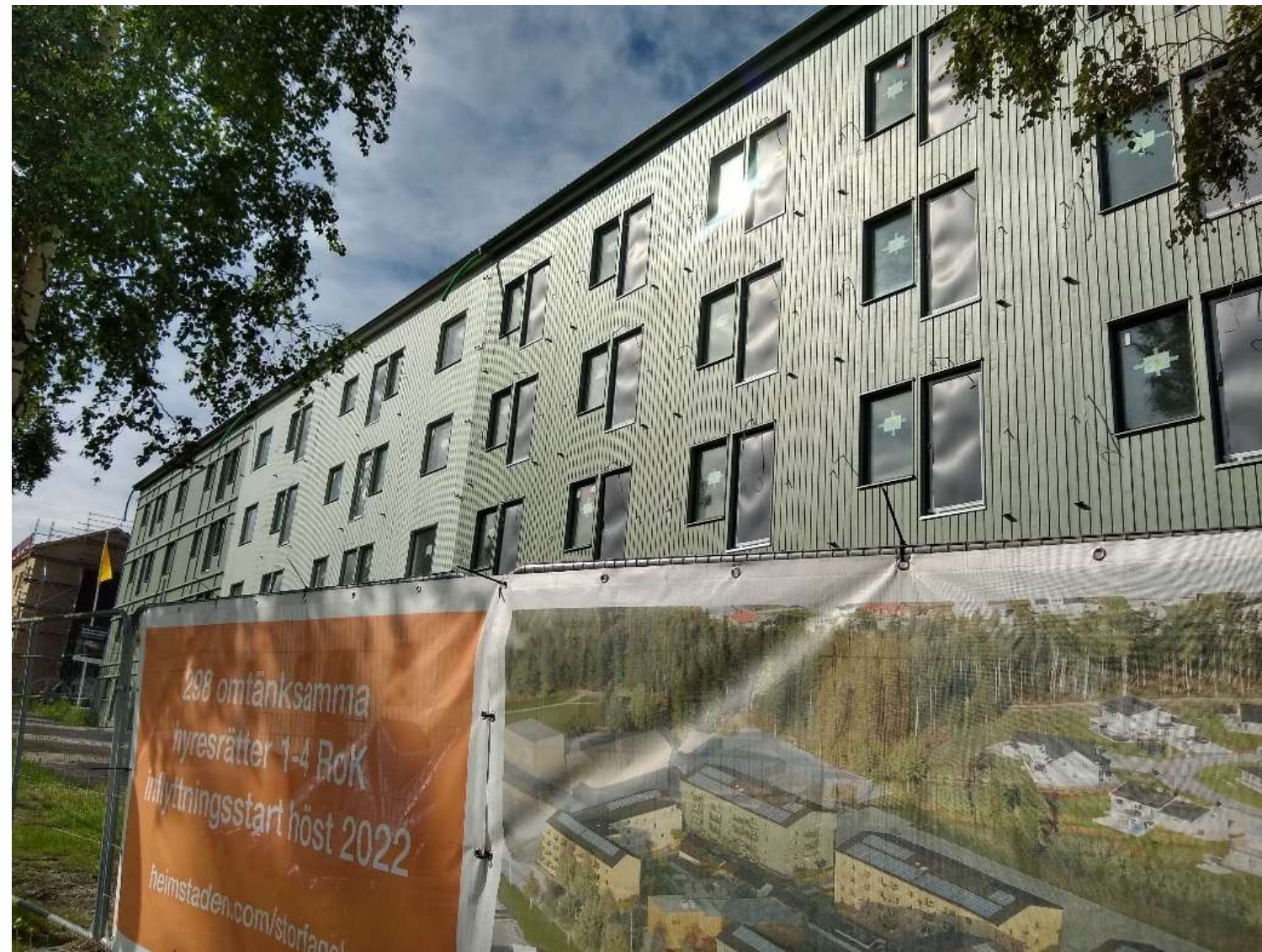
Bergen, Norway

14 storey
52.8 m tall
CLT & glulam



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City of Wood Skellefteå, Sweden



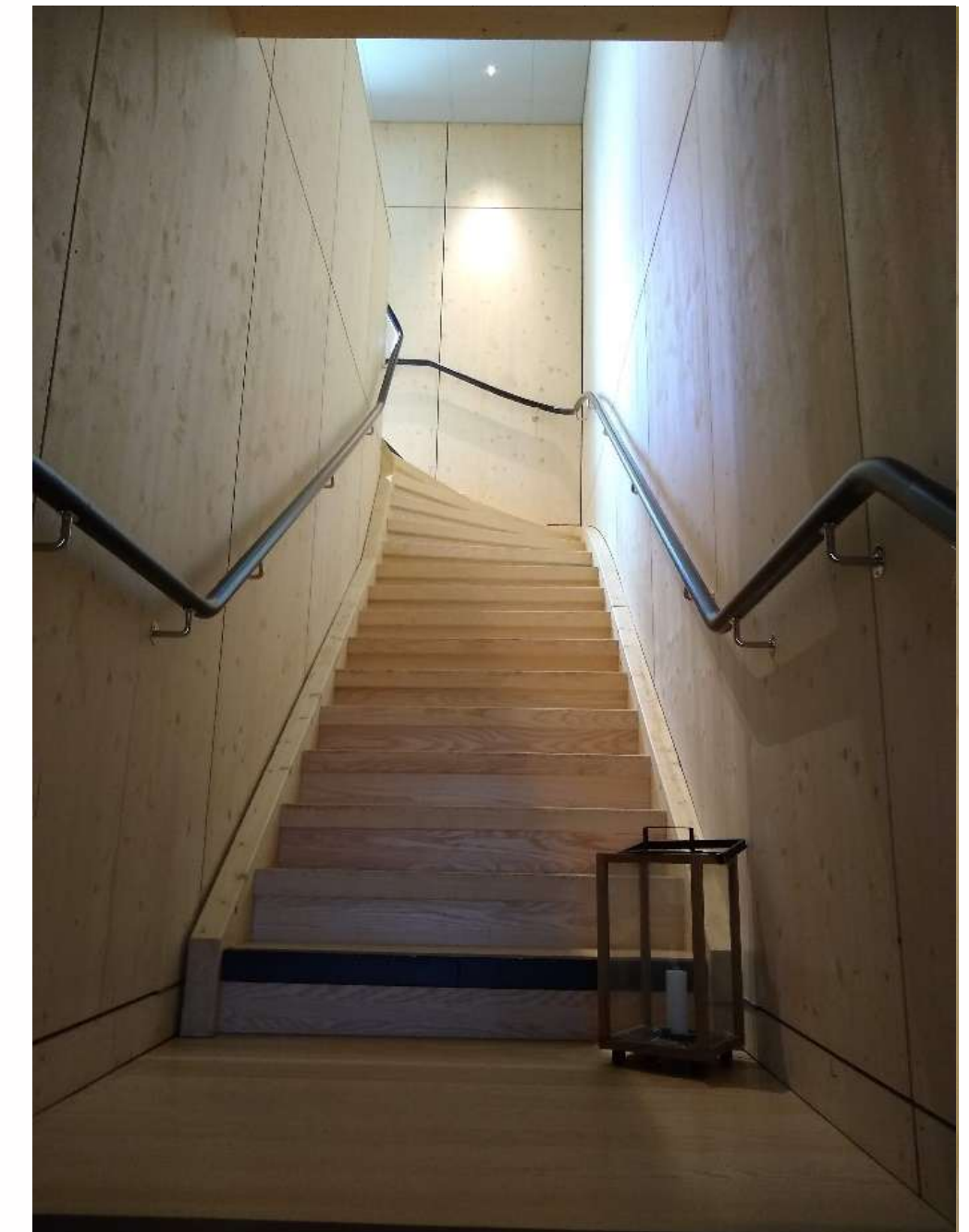
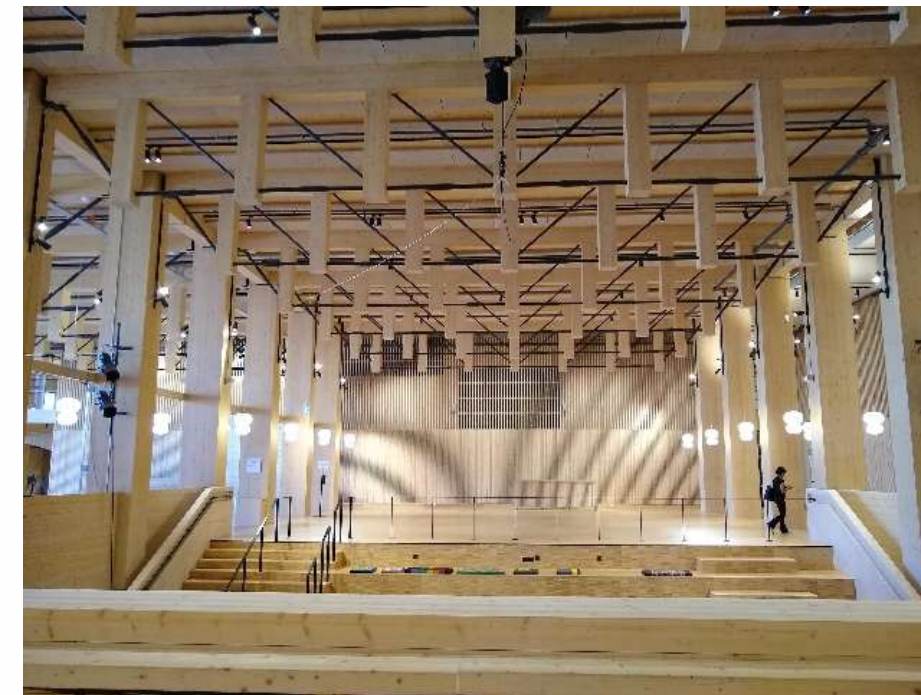
Engineered wood structures and rapid modular construction



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Sara kulturhus – The Wood Hotel Skellefteå, Sweden

20-storey Cultural centre, conference halls, theatre, hotel - CLT

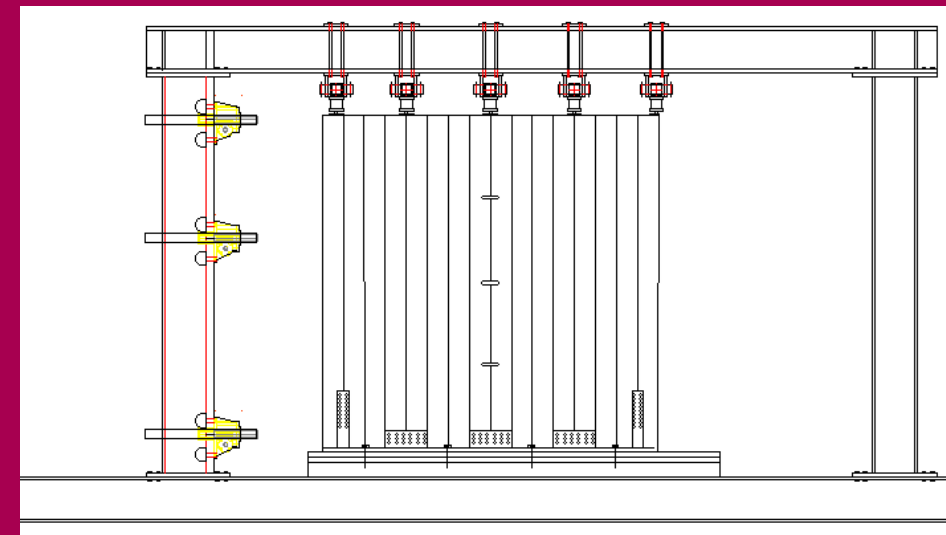


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Current Research Projects and Case Studies



MODCONS Project (2020-2026)



Modular Mass Timber Building for the Circular Economy

Main objective: To develop modular multi-storey solutions for **building with wood** using homegrown resources that are:



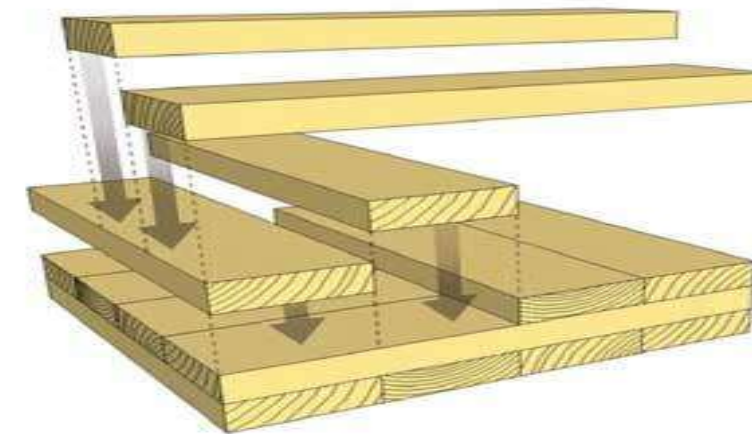
Stackable



Scalable



Adaptable & Reusable
(new & existing buildings)



CLT Panels made with
Irish Sitka Spruce



(Lloyd Alter, 2018) Waugh Thistleton Architects



Examples of volumetric and
panelised construction



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www.universityofgalway.ie/terg/

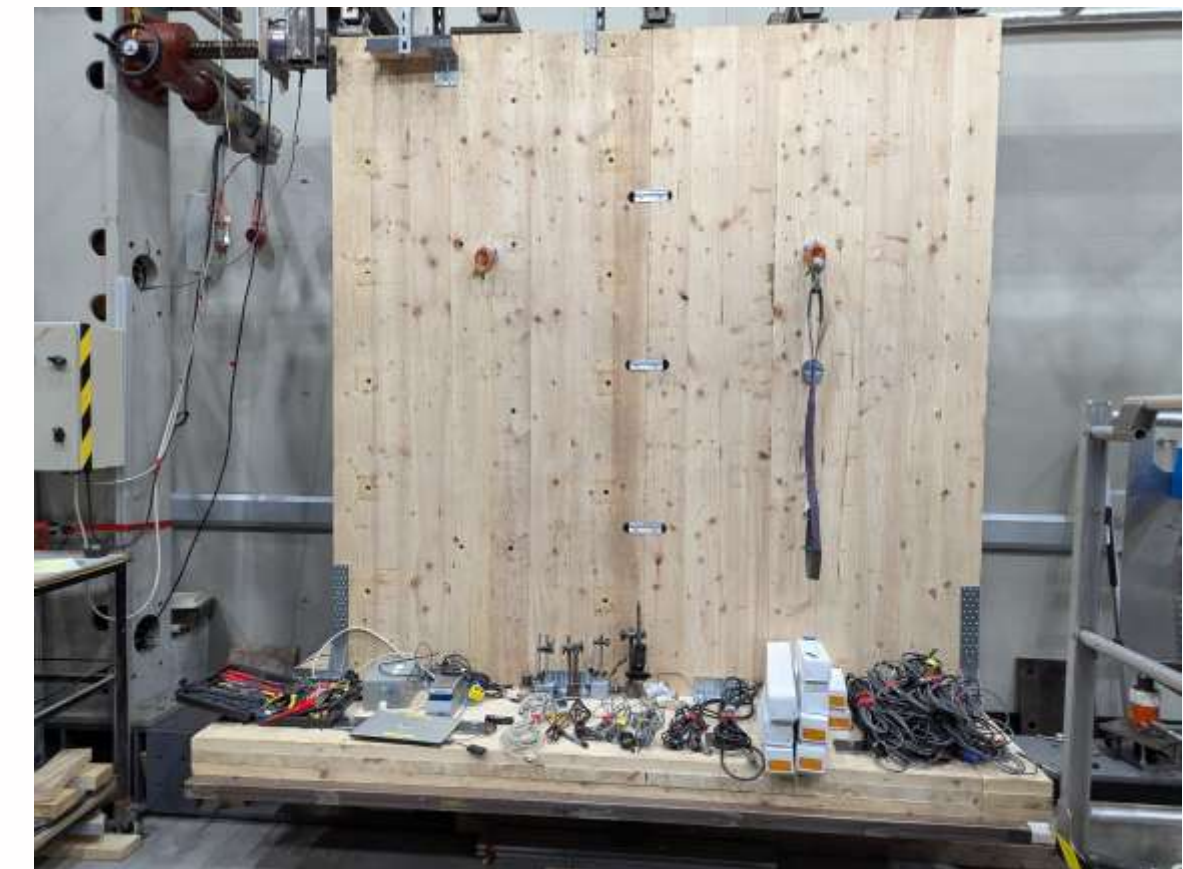
CLT panel manufacturing



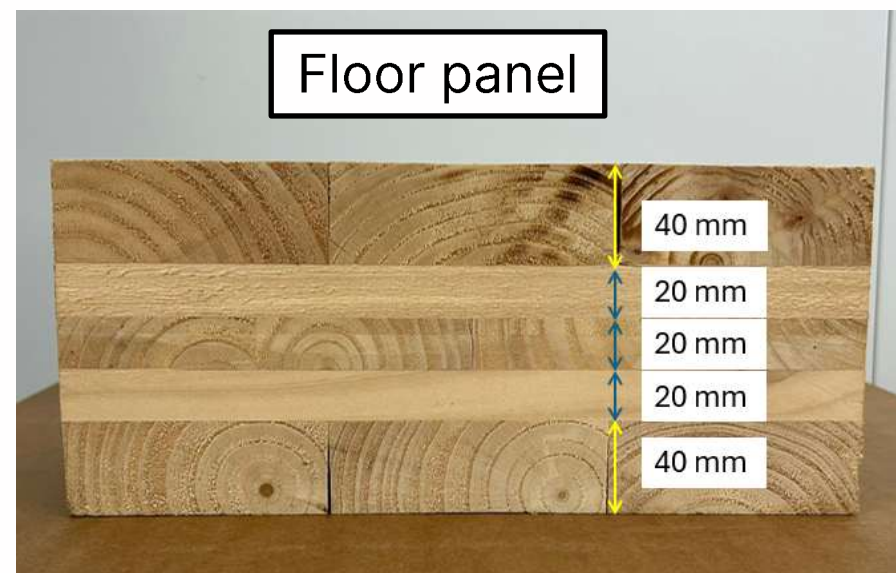
Transportation of C16 boards



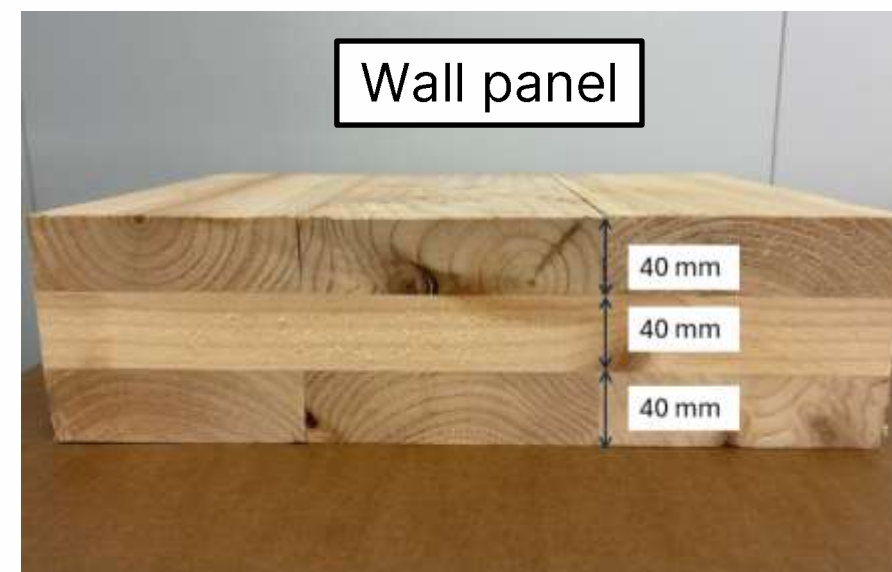
CLT panel subjected to pressure



CLT panel after manufacture



Floor panel



Wall panel



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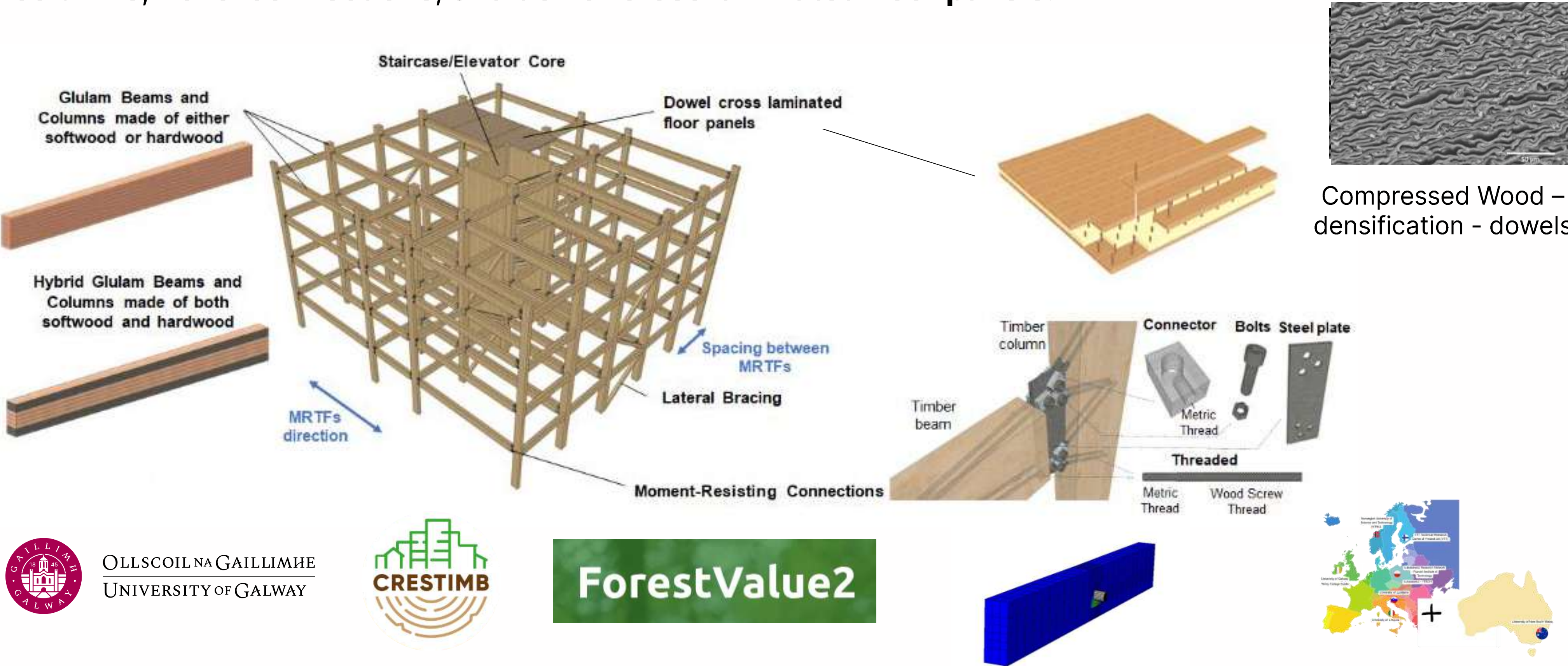
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CRESTIMB Project: Innovative engineered timber system

The system includes **moment-resisting timber frames (MRTFs)** made of **glulam beams and columns**, **novel connections**, and **dowel-cross laminated floor panels**.



Construct Innovate Research Projects

Partner: D/RES Properties:

- Mass timber design and construction – building design and detailing; development of interim guidance for practitioners
- National mass timber demonstrator building – sensors and performance monitoring of mass timber buildings



Partner: UCD and G-frame Structures:

- Design workflow efficiency for mass timber



Partner: Coillte:

- Woodspec: Development of online materials for new online timber design guide
- Whole life carbon assessment of new Irish homegrown timber housing estate



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www.timberspec.ie

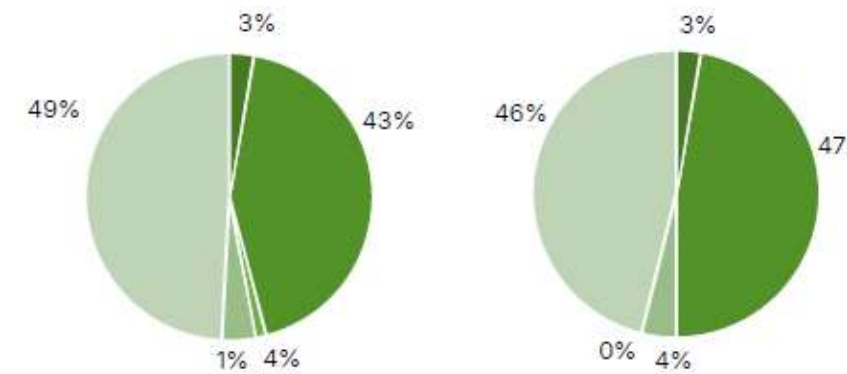
NTMK Mass Timber Demonstrator Buildings



- NTMK Crèche (600 m²) & Community Centre (400 m²), Newtown Mount Kennedy, Co. Wicklow
- Currently under construction
- NZEB community building by D/RES, using CLT walls and floors, glulam columns and beams, wood fibre insulation and incorporating a green roof.
- Off-site Design for Manufacturing and Assembly (DfMA) construction methodology
- Embodied carbon assessment carried out – meets RIAI 2030 targets (450 kgCO₂e/m²)

Embodied Carbon Final Results

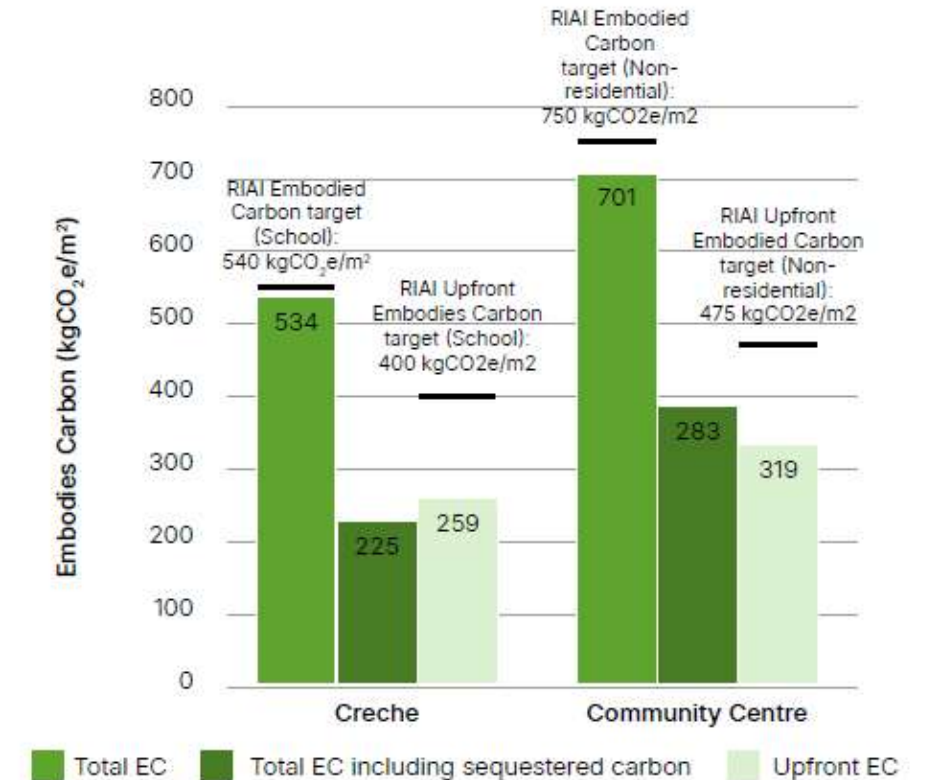
EC and life cycle modules contributions for each building



	Crèche	Community Cent
C1 - C4	18	23
B4	230	327
A5	5	3
A4	22	26
A1 - A3	260	321
Total (kgCO ₂ e/m ²)	535	701

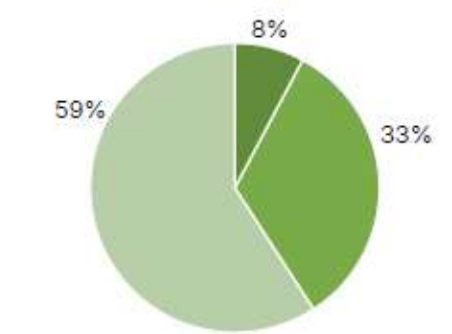
RIAI Carbon Ambition Targets

EC and life cycle modules contributions for each building

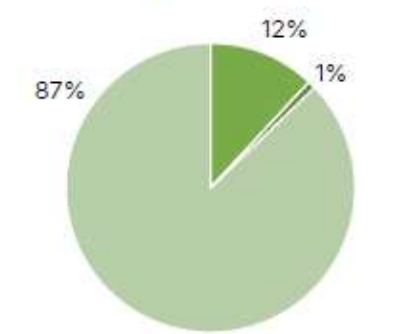


Relative Impact of Super-Structure Elements

EC Impact of Super-Structure Elements



Mass of Super-Structure Elements



CLT Glulam Steel Connective elements



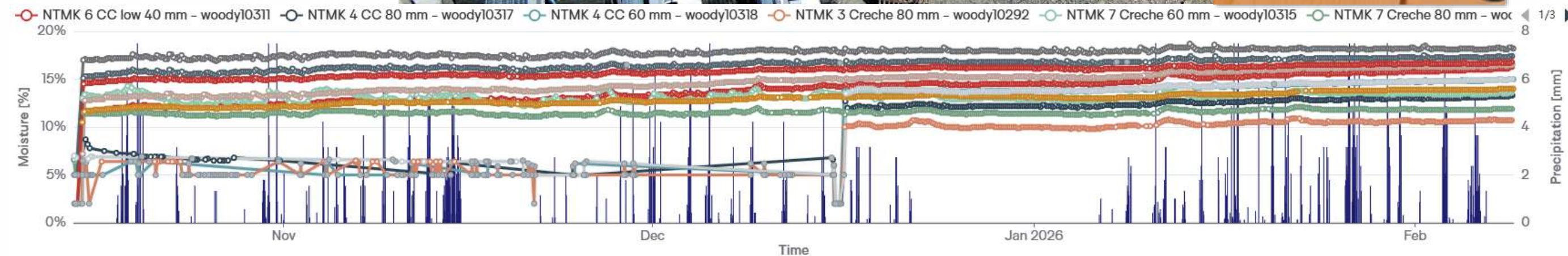
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Further information on D/RES vision for mass engineered timber development can be found here:
[D/Res Properties](https://www.dresproperties.com). © Plus Architecture

NTMK Mass Timber Demonstrator – Living Lab

- D/RES partnered with Construct Innovate and University of Galway for research and knowledge-sharing, establishing the project as a demonstrator building for future mass timber developments
- Mass timber design guidance developed – to be published in 2026
- Structure instrumented to remotely monitor its performance



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D/RES

Further information on D/RES vision for mass engineered timber development can be found here: [D/Res Properties](#). © Plus Architecture

Homegrown timber development and promotion

- Ireland's first **all homegrown timber** residential housing development – now under construction
- Launched by Minister for Housing and Minister for Forestry in June 2025
- Whole life carbon assessment
- Instrumentation and monitoring of buildings – open access timber frame performance data for global timber community



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Timber in Construction Steering Group



Interdepartmental group established (2023 – 2025) with the aim to create the conditions:

- to increase the use of timber in construction whilst ensuring the highest degree of building safety and property protection
- to examine regulatory and standardisation challenges
- to maximise the use of home-grown timber in construction

Five thematic groups comprising over 60 members across a wide range of stakeholders (industry, academia, government departments and agencies):

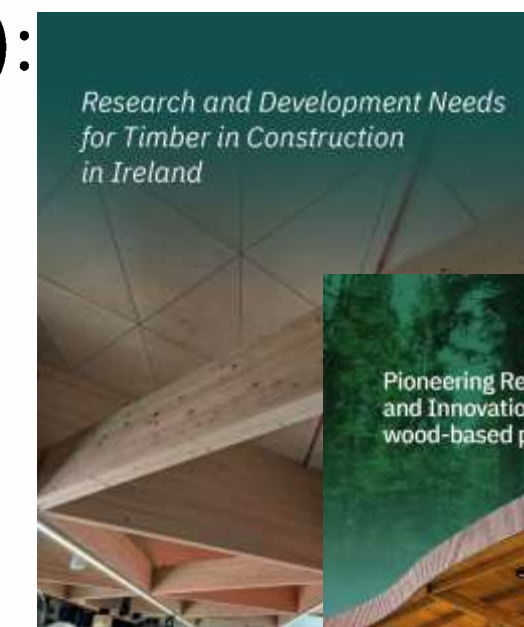
- Market Opportunity
- Regulation, Standards and Compliance
- Public Procurement and Demonstration Projects
- Research and Development
- Communication, Education, Training and Public Awareness



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Global Policies Influencing the Greater Adoption of Timber in Construction



Conclusion and Recommendations

- **Policy & Regulation:**

- Mass-timber is a viable solution for construction in Ireland
- Wood first policy for new public buildings to promote the use of wood in construction – **Public demonstrator buildings need to be delivered**
- Learn from best international practice – incentives required to support greater adoption of timber in construction to take advantage of its climate mitigation and job creation potential
- Whole life cycle carbon reporting for all construction projects
- Review subjective application of Technical Guidance Document B on Fire Safety – clear on use of timber over 4 storeys in line with international practice



Sara kulturhus –
The Wood Hotel
Skellefteå, Sweden
(20 storeys)



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www.universityofgalway.ie/terg/

Conclusion and Recommendations

- **Education, Training and public awareness** for design & construction professionals, fire safety officers, public authorities, etc including examples of best practice
 - New taught Civil Engineering Masters module since 2024 - *Timber Engineering and Design of Timber Structures*
 - Upcoming seminars within current research projects
- Establishment of the new **Timber Knowledge Development and Innovation** facility co-funded by DAFM and DETE, which will be coordinated by Enterprise Ireland to drive expertise, research, and innovation in the use of timber across the construction sector.



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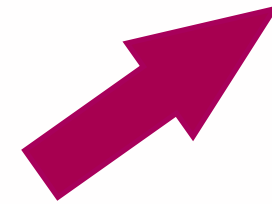
Thank you!

More Info:

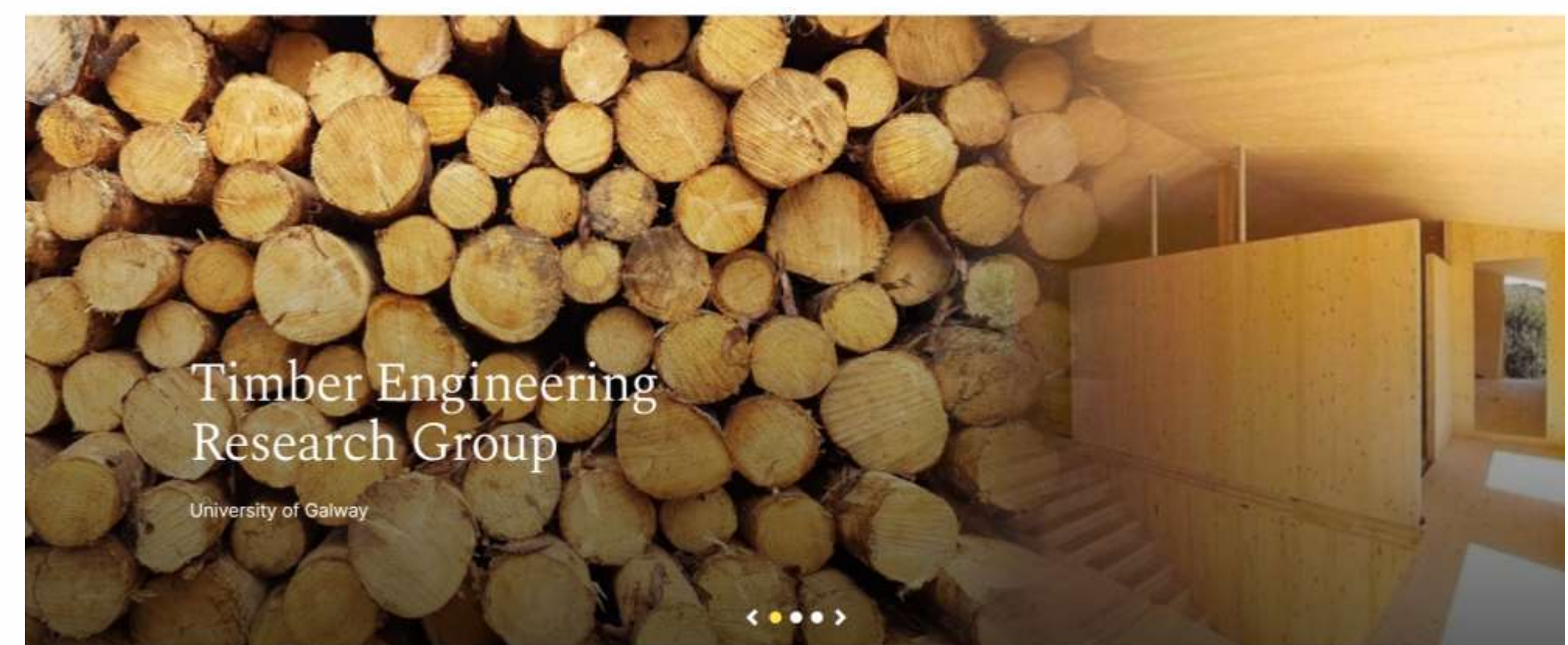
www.universityofgalway.ie/TERG

Publications:

<https://www.universityofgalway.ie/terg/publications/>



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Welcome to the Timber Engineering Research Group, University of Galway

The Timber Engineering Research Group (TERG) was established at University of Galway in 2004 by Prof. Annette Harte. TERG aims to support the increased use of timber as a sustainable construction material by performing technical and scientific research to create a broader understanding of the basic material and develop added-value engineered wood products. The group is affiliated with the Ryan Institute for Marine, Environmental and Energy Research.

Publications

Overview
Team Members
Active Projects
Completed Projects
Publications
Facilities
News & Events
Timber Information Resource Centre
Survey
Mailing List

TERG Research Publications

Publications by the Timber Engineering Research Group are listed below within the year of publication:

Search by "Topic"

Search by "Year"

2023

Gil-Moreno, D., Manso, R., O'Ceallaigh, C., & Harte, A. M. (2023). **The influence of age on the timber properties and grading of Scots pine and larch in Ireland.** Forestry: An International Journal of Forest Research. doi:10.1093/forestry/cpad027 [Download](#)

O'Ceallaigh, C., Harte, A.M., McGetrick, P.J., (2023). **Predicting the long-term creep behaviour of glued laminated elements.** Proceedings of the 14th International Conferences on Application of Statistical and Probability in Civil Engineering (ICASP14), Dublin, Ireland. [Download](#)



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Thank you for your attention Questions?

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