

Designing for Reuse & Disassembly of Timber

St. John Walsh, University College Dublin

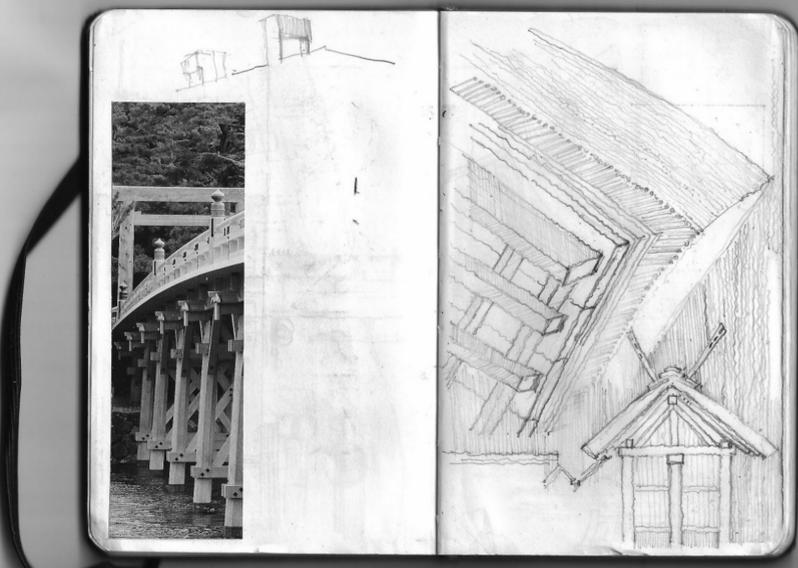


Figure 1 : Traditional Timber Reuse at Ise, Japan - Site Visit

Encapsulated Structural Timber in the Irish 'Material Bank'

A study of the current Irish housing stock was undertaken to establish the volume, dimensions and quality of the timber used in residential structures as well as the manner of its encapsulation. Housing in Ireland is largely made up of low density single family dwellings with a masonry outer leaf construction. This typology has resulted in large footprints, with significant amounts of quality timber components which have been protected from the elements and therefore remain in a good condition.

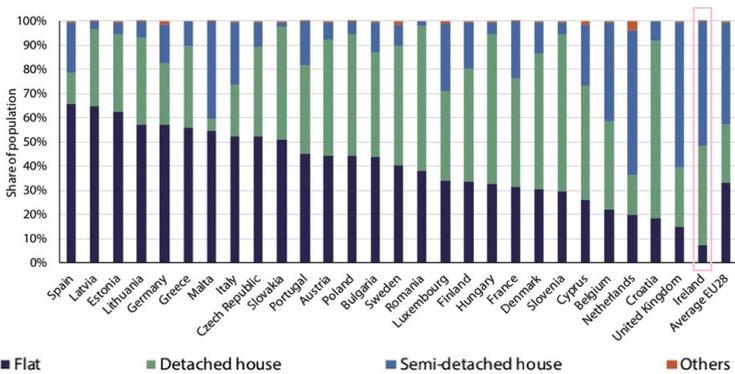


Figure 3: Distribution of population by dwelling type in EU member states 2015 (Source: CSO, Eurostat & SEAI / Table SEAI)

In traditional Irish construction, a high volume of structural timber per square metre (0.031 cubic meters) exists due to the low-density nature of our housing stock.

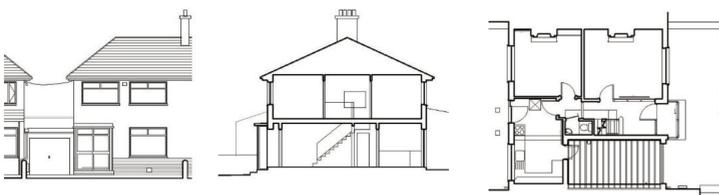


Figure 4: Case Study; Typical Suburban Semi-Detached House



Figure 5: Case Study; Typical Suburban Semi-Detached House - Survey / Demolition Photos

The most common section size used in Irish dwelling construction is 37.5 x 112.5mm (1.5" x 4.5"), making up approx. 60% of all linear meterage and with a high potential for reuse in Cross Laminated Panels and other timber products.

Linear Meters - National Estimate, Ireland (2020)

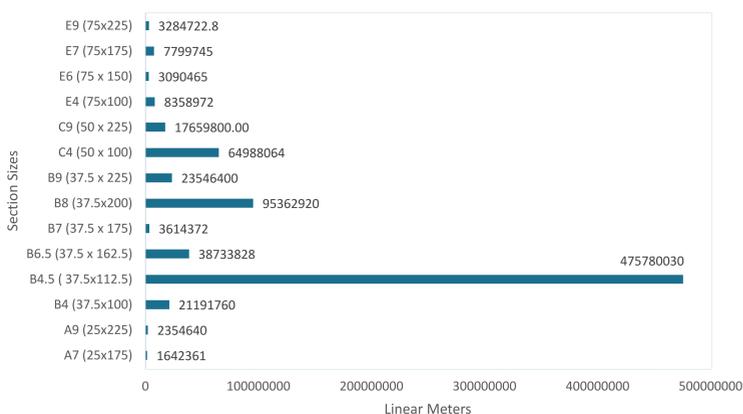


Figure 7: Based on 1) average cubic metres per m2 (Infuturewood, 2020), 2) average m2 per house (National Estimate, 2013)

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Buildings as timber 'Material Banks'

Within the context of growing environmental awareness and reduced resources, life cycle assessment (LCA) of construction materials now forms part of the European Commission's 'Level(s)' framework for Green Public Procurement [1]. Yet in Ireland, timber is largely considered a single use product, with almost all material incinerated following demolition and thus increasing the production of carbon

As life cycle assessment of materials becomes mainstream, producers, manufacturers and designers of buildings are required to change their approach to the use of materials including timber, by considering carefully how components, designs and assemblies forming 'Material Banks' will allow for disassembly and reuse of these products in the future, much like the shrines of Ise, Japan.

Demolition practices driven by labour and waste treatment costs

Current demolition practices, rarely considered in the design and construction of buildings, have been studied as they will play a key role in the recovery of quality reusable timber components. Utilising onsite observation of comparative examples and case studies from industry partners, the practical aspects of demolition, the flows of waste from the demolition site, and the commercial factors driving this industry were documented. Almost all waste timber produced in Ireland from demolition is either incinerated or downcycled (Figure.2) .

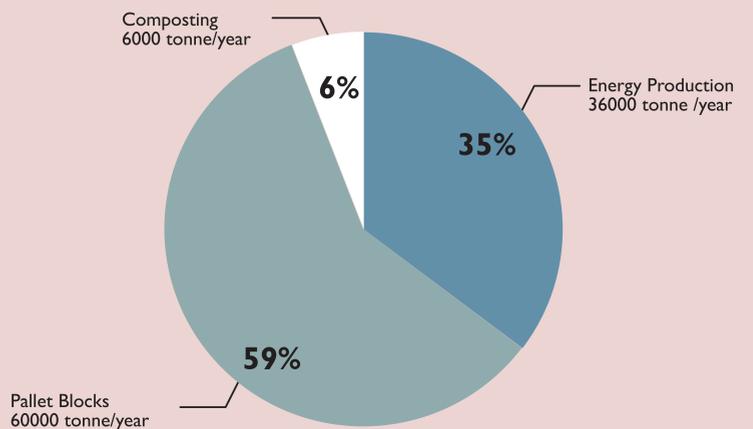


Figure 2 : Amount of wood waste in Ireland per annum and end-use (6)

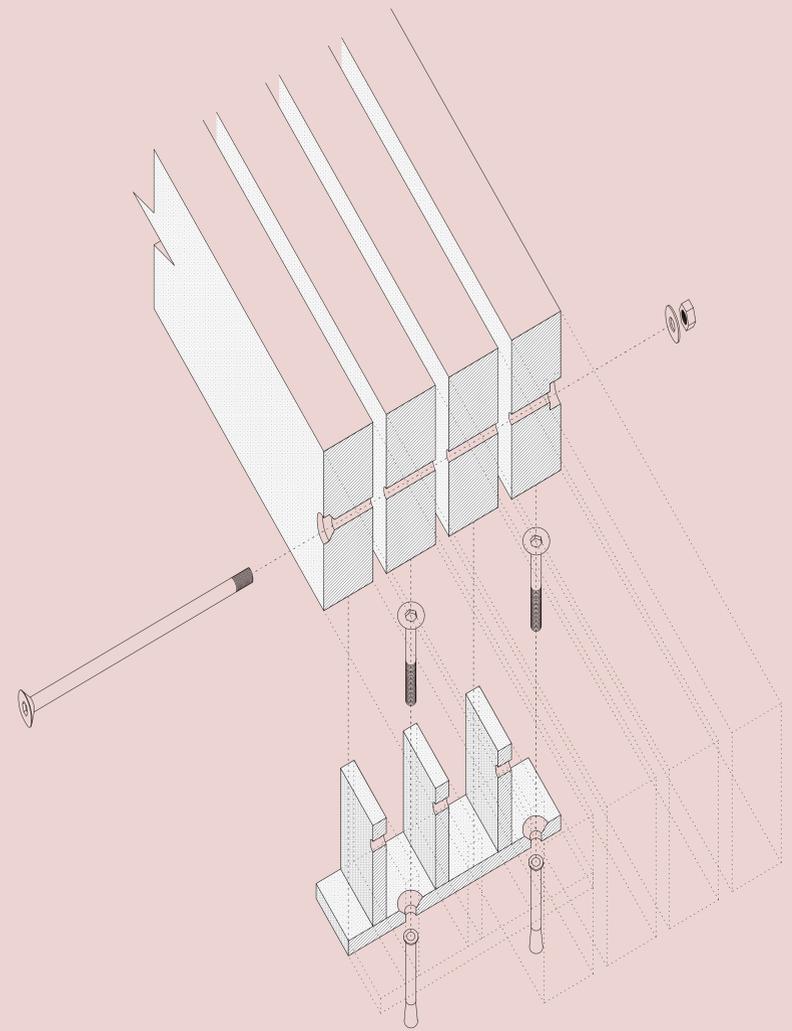


Figure 6: Exploded Axonometric Detail, Reversible Timber Construction, St. John Walsh / AY Architects

Reversibility of Timber Connections

In conjunction with craftsmen and those who demolish buildings, current principles and strategies of design for disassembly have been assessed from the perspective of timber construction to establish what methods might easily enable disassembly and future reuse of timber. This assessment has highlighted that simple traditional techniques, such as pre forming holes, might ensure fixings can be removed easily following use with limited damage to the material, while not increasing the cost of construction prohibitively.

The Future of Irish Timber Construction

The analysis highlights that a huge amount of waste timber which is potentially suitable for reuse or remanufacture is disposed of every year in Ireland. This fact, along with the significant quantities of potentially reusable structural timber in the Irish housing stock, highlights an opportunity for the development of accessible principles and strategies for design for disassembly & reuse that could be easily implementable on site.

**ADDING VALUE TO TIMBER COMPONENTS THROUGH CONSIDERATION OF
DEMOLITION AND DISASSEMBLY**

St. John Walsh
stjwalsh@gmail.com
University College Dublin, Ireland

Abstract

Consideration of the life cycle of timber products within the traditional construction sector in Ireland has been extremely limited to date. As a consequence, the majority of timber recovered following demolition is incinerated and therefore contributing to global warming.

Analysis of the current Irish housing stock has shown that it contains high volumes of quality timber components in good condition and of significant capital value. In making relatively minor adjustments to design, construction and demolition practices, opportunities exist to enable disassembly and reuse which would add value to forestry, timber components and completed constructions.

Biography



Walsh, St John

Expertise: Architecture

Biography - St John Walsh

St John established Alder Architects in 2018 having gained over 10 years experience working with award winning architecture practices in Ireland and the UK on a range of projects from small scale domestic commissions to large public and commercial buildings.

While working with Donaghy & Dimond Architects in Dublin, he was project architect on both Inchicore National School & the Gate Lodge extension in Rathfarnham, respectively awarded RIAI Awards for Best Educational Building & Domestic Extension in 2015. With AY Architects, he was project architect on Eleanor Palmer Science Lab, built for Eleanor Palmer Primary School in Camden, which has been awarded a RIBA London Award for 2019. He has also worked with Scott Tallon Walker & BDP architects on award-winning large scale commercial & residential projects.

Having studied in Dublin and Copenhagen, St. John graduated from UCD in 2010 with a first class honours degree and continues to be involved in academia. Currently in the role of design studio tutor at the UCD School of Architecture, he has previously acted as a visiting critic at UCL's Bartlett School of Architecture and studio mentor at the Royal College of Art London.

Proceedings of the 2020 Society of Wood Science and Technology International Convention

“Renewable Resources for a Sustainable and Healthy Future”

Edited by Susan LeVan-Green

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InnoRenew CoE and University of Primorska, Slovenia*

July 12-15, 2020

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The cover image features a scenic view of a coastal town with a prominent church tower, set against a blue sky and sea. Overlaid on the image are several logos and text elements. On the left, the Society of Wood Science & Technology logo is displayed. On the right, the logos of the University of Primorska and the InnoRenew CoE are visible. A large blue banner at the bottom contains the event title and location information.

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TABLE OF CONTENT

MONDAY, JULY 13TH

Keynote:

Wood Aging by Bohumil Kasal..... 1

Early Stage Researchers: Chairs Benedikt Neyses, Luleå University of Sweden;
Martin Nopens, Universität Hamburg, Germany

Slovenian wood-based bioeconomy: present state and future perspectives
by Domen Arnič..... 1

Distributed Ledger Technology for Data Privacy and Traceability in Wood Supply Chain
Environments by Sidra Aslam 3

Spatial Augmented Reality to Improve Manufacturing of Timber Frame Prefabricated Wall
Elements by Birger Bartuska 4

Can Woody Biomass from Orchards Still Be Considered a Waste Material? By Maria
Roberta Bruno 5

The differentiating Anatomical Features of Five Tree Species From East Seram,
Indonesia by Tekat Dwi Cahyono 11

Evaluation Of The Seismic Behavior Of Hybrid Walls With Cross Laminated Timber
For Building In Chile by Tulio Carrero 12

Water resistance of wood adhesives derived from cottonseed meal with all
components utilization by Nairong Chen 14

Comparison of Devices for Acoustic Tomography of Tree and Material Properties of
Degraded Wood by Valentino Cristini 15

Cascading Potential for Recovered Wood from Heavy Timber Frame Typology in
Pre-Modern Dwelling Buildings in Madrid by Marina de Arana-Fernández 16

The Economic Balance of Obtaining the Raw Material for Briquettes and Pellets from
Forest Sanitation by Molnar Gabor..... 28

Determining the Aerodynamic Diameter of Various Wood Dust Types, to Better
Assess Possible Health Risks by Maria Georgiades 38

Rapid determination of the quality of Spanish coniferous wood by models based
on IR spectroscopy by René Herrera Díaz 39

Different types of coatings used for wooden shingles exposed to natural and
artificial aging by Dominik Hess 40

Sustainable development – international framework – overview and analysis
in the context of forests and forest products with competitiveness and new
opportunities by Annika Hyytiä 41

Predictive Modeling and Optimisation of Alkaline Sulphite and Sodium Hydroxide
Pretreatment of Maize (Zea mays) stalk fractions in the Production of Bioethanol
by Tolulope Kolajo 42

Proceedings of the 2020 Society of Wood Science and Technology International Convention

Adding Value to Timber Components through Consideration of Demolition and Disassembly by St. John Walsh	436
Preparation of Cellulose Acetate-Polyacrylonitrile Composite Nanofibers by Multi-fluid Mixing Electrospinning Method: Morphology, Wettability, and Mechanical Properties by Dong Wang	437
Analysis of VOCs and odor-active compounds from veneered particleboard coated with water-based lacquer by Qifan Wang	438
Effect of lacquer decoration on VOCs and odor release from <i>P.neurantha</i> (Hemsl.) Gamble by Bin Zeng	455

REGULAR POSTERS:

Properties of Particleboard Made from Recycled Polystyrene and Cocos nucifera Stem Particles by Babatunde Ajayi	456
Heterospecific tree density and environmental factors affect <i>Azelia africana</i> Sm. population structure in the Pendjari Biosphere Reserve, West Africa: Implications for Management and Restoration by Atanasso Akpovi Justin	457
Enhancing the fire resistance of cement-bonded particleboard made of Scots pine and Poplar by Tibor L. Alpár	459
Promotion of Eucalyptus Hybrid Species as Utility Poles for Electricity Transmission: The Mechanical Strength Properties of <i>Eucalyptus urograndis</i> Grown in Ghana by Emmanuel Appiah-Kubi	469
Increasing Cold Tack of pMDI resin with Partial Soy Flour Substitution by Osei Asafu-Adjaye	477
Adhesive Bonding of Planed and Sawn Jointed Sugar Maple Lumber: Bending Strength of Glued Joints by Mohammadali Azadfar	478
The Influence of Oil Uptake on Moisture Excluding Efficiency in Thermally Treated Wood by Jan Baar	479
Non-linear Material Model of Mechanical Behaviour of Oak Wood Exposed to Different Relative Humidity Conditions by Martin Brabec	488
Building Your Social Media Presence by Candra Burns	489
Development of technology for one-sided surface carbonization of wood by Petr Cermak	490
Surface free energy of ten tropical woods species and their acrylic and alkyd varnishes wettability by Wayan Darmawan	496
Bond Strength of Wood Adhesives: The Sensitivity of Standard Test Methods to Imperfections by Mohammad Derikvand	507
Bagasse xylan nanocomposite films with high transparency, barrier properties and enhanced mechanical strength characteristics by Seyedrahman Djafaripetroudy	515
Experimental analysis of mass loss kinetics during heat treatment of wood by Jakub Dömény	516

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