

Session Topic	Abstract Topic	Submission Title	Summary	First Name	Last Name	Company
Poster Session 1A - EIC & ECCS (Engineering)	Education, Innovation & Challengers - Engineering Focus	ENHANCING ENGINEERING WOOD DESIGN EDUCATION IN CANADA: ADDRESSING THE LACK OF MASS TIMBER DESIGN IN CURRICULA	The growing demand for larger wood-based structures has significantly expanded the market for mass timber but has also exposed a shortage of trained professionals in engineering design, project management, and construction. Accredited civil engineering programs often lack mandatory wood or timber courses, contributing to this shortage. This study analyzes the state of wood design education in Canada, with a focus on mass timber, and proposes strategies to enhance university-level civil engineering curricula to include more mass timber design.	Blériot	Feujofack	Canadian Wood Council
Poster Session 1A - EIC & ECCS (Engineering)	Education, Innovation & Challengers - Engineering Focus	ENGAGING ARTIFICIAL INTELLIGENCE CONTENT GENERATORS IN THE CONTEXT OF A GRADUATE TECHNICAL COURSE: 2ND ITERATION	For better or worse the artificial intelligence (AI) became inescapable part of the academic environment and of our lives and the fact cannot and should not be ignored. There seems to be growing consensus that the use of AI as a tool in any aspect of research activity should be referred to not only by the name of the tool, but with a thorough description of the purpose and approach. That consensus has to be promptly communicated to students through class materials and practical exercises encouraging a curated engagement of AI tools and critical analysis of the outcomes in all aspects of the field related work where students may, rightly or not, perceive their utilities. The purpose of this presentation is to communicate an attempt of such curated AI Engage exercise in the context of a graduate level hybrid course on foundations of Scientific Methodology for graduate students in Wood Science and Engineering program at Oregon State University.	Lech	Muszynski	Oregon State University
Poster Session 1A - EIC & ECCS (Engineering)	Education, Innovation & Challengers - Engineering Focus	Risk Identification in Industrialized Timber Construction	Risk identification is critical for managing industrialized timber construction projects due to their specific characteristics. Proper risk identification through the project life cycle allows for mitigating events that can negatively impact the project's success. Seminal research provides relevant information regarding risk identification in traditional construction projects. However, this approach is underdeveloped in industrialized timber construction. This research aims to identify risks in the phases of the project life cycle in industrialized timber construction (i.e., design, manufacturing, transport, assembly, and operation). A systematic literature review was conducted to identify risks that were classified based on the industrialized timber construction life cycle, such as manufacturing, assembly, logistics, and transportation. Once classified, these risks were validated through interviews with experts in different stages of the industrialized timber construction life cycle. The findings present a list and classification of specific risks in timber construction. Identifying these risks will contribute to effective project management, optimizing performance across different stages of industrialized timber construction projects.	Manuela	Lopez	CENAMAD / Pontificia Universidad Católica de Chile
Poster Session 1A - EIC & ECCS (Engineering)	Exemplars & Construction Case Studies - Engineering Focus, Exemplars & Construction Case Studies - Practitioner Focus	USE OF CLT (CROSS LAMINATED TIMBER) IN CIVIL ENGINEERING	Japan is a "forestry nation" with forests covering 70% of the country's land area. Utilizing wood as a domestic resource leads to regional development. As part of this, CLT (Cross Laminated Timber) has come to be widely used as a structural and interior material for buildings. However, it has not been used much in civil engineering structures. In response to this, the Japan CLT Association has launched the project for utilizing CLT in civil engineering. We report on products of floorboards, snow fences, and railway platforms made by CLT. In order to use CLT in the civil engineering, prototype CLT floorboards, snow fences and railway platforms were produced and compared with existing steel floorboards, steel snow fences and reinforced concrete platforms, respectively. The CLT floorboards were trialed at civil engineering construction sites and related materials and equipments were developed. The snow protection function of the CLT snow fences was confirmed by wind tunnel tests, before being trial installed on a public road. A model railway platform was also prototyped, and load tests were conducted to confirm that it fully met the strength standards. Currently, the only guideline available for structural design using CLT is for the architecture in Japan. When using CLT in civil engineering, specifications such as appearance, stress, and adhesive function differ from those for architecture. Hence, it is desirable to develop CLT specialized for civil engineering that is cost-effective, for example by using non-standard woods or lamina that do not meet JAS (Japanese Agricultural Standards).	IKEDA	YUTAKA	HAZAMA ANDO CORPORATION
Poster Session 1B - MPD & TABD (Architectural/Engineering)	Material Performance & Durability - Architectural Focus	A Study on the Physical Properties and Flame Retardant Performance of High-Concentration Boron-Based Flame Retardant PB with Amino Resin Additives	In this study, high-concentration boron-based flame retardants were developed utilizing amino resins (Urea-Formaldehyde resin(UF) and Melamine-Formaldehyde resin(MF)) as carriers. These flame retardants were applied to particleboard using a flame retardant-resin blending method. The efficacy of the flame retardants was evaluated in terms of flame retardancy, as well as physical and mechanical properties. Preliminary experiments indicated that MF resin exhibited superior flexural strength compared to UF resin and offered approximately 13% enhanced water resistance. Consequently, subsequent experiments were conducted using MF resin as the carrier. Under the 2% MF resin condition, the addition of the flame retardant led to a 60% increase in flexural strength and a 20.3% improvement in water resistance compared to the untreated control. Furthermore, with respect to flame retardancy—an essential criterion for wooden furniture and construction materials—the material met the KS F 2819 standard, thereby confirming its applicability as a construction material.	Halim	Park	Chungnam National University
Poster Session 1B - MPD & TABD (Architectural/Engineering)	Material Performance & Durability - Architectural Focus, Sustainability and Timber in a Circular Economy - Architectural Focus, Education, Innovation & Challengers - Architectural Focus	Systematic Review on The Environmental Impact And Cost Competitiveness Of Mass Timber Construction	In recent decades, mass timber has emerged as a sustainable building technology, drawing increased attention to assess the potential advantages and challenges of mass timber construction (MTC), aiming to facilitate its broader market penetration. The majority of these studies focus on high-rise commercial timber structures, leveraging the relatively lighter weight of timber compared to steel and concrete. This review article systematically examined relevant literature and categorized them into two key domains: (1) environmental impact, and (2) cost competitiveness. Publications from 2013 to 2023 were identified via Google Scholar. After two phases of screening, additional articles were added from references for the final analysis. Although extensive research remains imperative across the two domains, the results underscore the promising environmental impact of MTC compared to conventional materials, with notable advantages in terms of carbon footprint reduction, with Life Cycle Assessment (LCA) as the main tool to assess the environmental impact of MTC. The cost competitiveness review highlights the need for comprehensive comparisons across various design configurations. Future research should explore additional factors such as fire safety, moisture management, acoustics, and biophilia benefits to provide a more comprehensive understanding of the potential applications of mass timber technology.	Ramtin	Mirmohammad Sadeghi	University of Oklahoma

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Poster Session 1B - MPD & TABD (Architectural/Engineering)	Timber Architecture & Biophilic Design - Architectural Focus	WOOD IN HOSPITAL INTERIORS: A SCOPING REVIEW	Background. Hospitals, together with the rest of the building sector must shift towards more sustainable solutions to meet the global climate goals. Wood is seen as an environmental friendly material, and may have positive health effects on users. Because of the material's organic properties this material needs special consideration when implemented in complex buildings as hospitals. Objective. The purpose of this scoping review is to give an overview of the research field on the use of wooden material for interior purposes in hospital buildings. The desired result is a knowledge base that may facilitate the design process and decision-making for the use of wood in hospital environments. Design. The search was conducted in online databases as a Boolean search, restricted to peer reviewed, journal articles from the last ten years in English. Because of the small number of articles in the initial search, the eligibility criteria's were modified by removing the time restriction and to include conference articles in addition to journal articles. Results. The literature search to current date contains 14 sources, divided on four main themes. The sources vary in method, and both qualitative, quantitative and mixed-method studies are included. Conclusions. This scoping review implies a research field in its early beginning. As the number of sources are few, the findings of this study is highly contextual, and the study offer no general conclusions to the use of wood in hospitals. The number of articles is not enough to claim evidence, though successful implication implies beneficial effects on users of hospitals.	Anders Qvale	Nyrud	Norwegian University of Life Sciences
Poster Session 1B - MPD & TABD (Architectural/Engineering)	Timber Architecture & Biophilic Design - Architectural Focus	USE OF EUCALYPTUS POLES IN TIMBER STRUCTURES - BRAZIL	The use of eucalyptus wood in the building site is intensifying in Brazil, consolidating it as an alternative to the native tropical wood. Nowadays, planted forests occupy only 0.6% of Brazilian territory and supply about 85% of all forest-based products found in the market. Pinus and eucalyptus are the main fast-growth species that occur in our country. The structural performance and linearity of the rounded pieces result in a crescent use of eucalyptus treated wood, especially in rural constructions and fences, as well as in country houses and high standard beach houses and hotels. The pressure-treated wood market is becoming more and more attractive, due to its profitability and crescent demand by the building sector. Eucalyptus rounded shape results in a cost-effective application of the material, besides providing an economical form of construction. Starting from the experience of several timber structures executed in central Brazil, it was proposed the use of pressure-treated eucalyptus poles as the main structural material in different building types as restaurants, wineries, homes, and facilities in natural areas. The buildings were designed according to bioclimatic guidelines, to be fully adapted to local climate. Some requirements as natural ventilation and illumination, thermal inertia, green covering, and protection against sunlight in the facades were added to the architectural designs, aiming to build "sustainable constructions".	ROBERTO	LECOMTE DE MELLO	Casacerta Architecture Design & Building
Poster Session 1B - MPD & TABD (Architectural/Engineering)	Timber Engineering & Structural Performance - Engineering Focus Timber Architecture & Biophilic Design - Engineering Focus	Fiber structures and tensile out-of-interface properties of natural Ficus inoculated connections	Trees can adapt to external loads and form inoculated connections (i.e., self-growing connections). During this process, the connection can optimize its shape and internal fiber morphology to fulfill its physiological and mechanical functions. This self-optimization can inspire nature-based design, but it requires a deeper understanding of fiber features and the resulting mechanical strength of a connection. This paper focused on the connections of living trees fused by Ficus benjamina L. To describe connections' growth stages, the interface curvature was proposed and measured. Fiber structures were characterized by optical microscopy. Tensile-out-of-interface tests were designed and conducted to measure the tensile strength and maximum resistance. Curved merged fibers at the interface primarily provided bonding strength and structural integrity to a connection. Tensile strength ranged from 0.29 to 1.3 MPa depending on the growth stage of a connection. The interface curvature of a connection was found to be negatively correlated with its strength. Meanwhile, it could distinguish failure modes from failure at the interface to failure across stems at around 60%. The tensile failure of a connection was mainly caused by the combination of rolling shear and perpendicular tension of the merged fibers. By studying these self-optimized anisotropic structures, the research aims to develop strategies for resource-efficient use and nature-inspired design.	Xiuli	Wang	Forschungszentrum Jülich
Poster Session 1C - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	Prediction of Nonlinear Behaviors of Light-Frame Wood Shear Walls by Nail Connection	In light-frame wood construction, a shear wall is an important component that provides lateral force resistance. Lateral loads acting on shear wall are transmitted to horizontal diaphragm, distributing the load to provide stability to the structure. Shear walls of light-frame construction consist of stud, sheathing, nails and anchorage. Therefore, the performance of a shear wall vary depending on the methods used to compose these four elements (studs, sheathing, nails and anchorage). The lateral resistance of a shear wall can be expressed as the deformation by the sum of four elements, including the effect of bending of studs, shear of sheathing, nail slip, and anchorage deformation. According to APA (American Plywood Association) and CWC (Canadian Wood Council) researches, among the four elements, the nail slip between sheathing and stud contributed approximately 65% ~ 75% of the overall deformation of shear walls. Other elements such as bending of studs, shear of sheathing, and anchorage deformation do not contribute significantly to the total racking deformation of a shear wall. In this study, the nonlinear behavior of light-frame wood shear walls resulting from nail connection between studs and sheathing among the four elements was predicted, and the results were compared with those of the shear wall deformation obtained through experimental testing.	Hyung Woo	Lee	National Institute of Forest Science
Poster Session 1C - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	VERTICAL AND SHEARING PERFORMANCE OF KUMIMONO USED IN TRADITIONAL WOODEN STRUCTURES	In this study, we focused on the structural performance of Kumimono for structural analysis of traditional wooden architecture such as five storied pagodas, temples and shrines. Kumimono is called bracket complexes in English, and is a component between columns and a roof. In a previous research, it is said that vertical performance of Kumimono has an influence of the vertical motion of a whole building. However the vertical stiffness of Kumimono is not clear quantitatively. Therefore we conducted compression tests for one Kumimono at first. In the tests, we had some various test cases changing how to apply vertical load because the parts in actual traditional buildings have a possibility to have some gap due to deterioration over time and vertical load way can change. Furthermore, horizontal loading tests applying moment and shearing force for two Kumimono. We verified the evaluation method for the compression performance and shearing performance applying vertical load based on those experimental results.	Iuko	Tsuwa	Japan
Poster Session 1C - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	SHEAR STRENGTH AND STIFFNESS OF CLT SPECIMENS WITH DIFFERENT SPECIES-ADHESIVES COMBINATIONS	Cross Laminated Timber (CLT) is used in several countries in Europe and North America and also in Brazil. Its bending design is governed by the rolling shear effect, which occurs with the rolling of the layers of the central wooden lamellae that form the element due to shear stresses. This manuscript presents a study of the strength (Fvt) and stiffness (Gvt) to rolling shear in CLT specimens made with 4 species of Brazilian wood and polyurethane adhesive. The tests were carried out on two models of shear test specimens (vertical and inclined) taken from CLT panels, and also on elements subject to bending. The results showed that there were no major differences between rolling shear strength (Fvt) values, with the greatest differences observed for stiffness values (Gvt). Rolling shear strength results ranged from 2.05 MPa to 4.02 MPa and stiffness results from 82 MPa to 365 MPa. These values exceeded normative recommendations that propose variations between 0.8 and 1.2 MPa for strength Fvt and 50 MPa for stiffness Gvt.	Julio Cesar	Molina	University of São Paulo

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Poster Session 2A - MPD (Engineering)	Material Performance & Durability - Engineering Focus	FRACTIONAL ORDER DERIVATIVE APPROACH OF VISCOELASTIC BEHAVIOR OF TROPICAL WOOD	For some time now, wood has offered itself as an alternative to other modern construction materials, and has become the material of choice for structures, mainly because of its renewable nature, durability and ease of shaping. However, once in service, even at room temperature and under low stresses, it deforms and faces the problems of creep and recovery. The objective of our work is to model and predict the viscoelastic deformations of <i>Entandrophragma cylindricum</i> (Sapelli) wood by a rheological approach based on fractional calculus theory. Zener and Burger fractional models were used to elucidate these phenomena. The simulations show that the proposed models fit the creep experimental data with an average reliability of 97% and the recovery process with a reliability of 99%.	NGUEDJIO	Loic Chrislin	Clermont Auvergne University (France), University of Dschang (Cameroon)
Poster Session 2A - MPD (Engineering)	Material Performance & Durability - Engineering Focus	Study on Charring Properties of Engineered Wood Exposed to High Temperature according to Adhesive Type	"Poster only" To confirm the charring properties of engineered wood exposed to high temperature according to adhesive type, we fabricated test specimens with two adhesives (resorcinol and polyurethane) used in glued laminated timber (GLT) or cross-laminated timber (CLT) from the Republic of Korea, and performed a full-scale fire resistance test. When GLT was laminated with polyurethane and resorcinol adhesives, respectively, exposed to high temperature, we confirmed that the charring depth of GLT using polyurethane increased by approximately 40% compared to that of GLT using resorcinol. Similarly, the charring depth of CLT adhered with polyurethane showed a tendency to increase about 60% compared to that of CLT bonded with resorcinol. Engineered wood bonded with resorcinol showed a uniform char layer without separation from specimens when exposed to high temperatures, but engineered wood adhered with polyurethane showed separation of the char layer from the bonding surface, which was found to be detrimental to fire resistance.	Yun-Jeong	Choi	Korea Institute of Civil Engineering and Building Technology (KICT)
Poster Session 2A - MPD (Engineering)	Material Performance & Durability - Engineering Focus Sustainability and Timber in a Circular Economy - Engineering Focus Timber Engineering & Structural Performance - Engineering Focus	INNOVATIVE CONNECTION SOLUTIONS FOR TCC FLOOR SYSTEMS: MECHANICAL AND ENVIRONMENTAL ASSESSMENT	In recent years, Cross-laminated timber (CLT) has gained popularity in construction sector, attributable to its advantageous structural performance and associated environmental benefits. The application of CLT in timber-concrete-composite (TCC) floor systems has been increasingly explored, especially on the connection type and composite actions. However, existing building codes and standards may not be entirely adapted to the utilization of CLT and TCC systems. This limits design options, while simultaneously fostering opportunities for innovation within the field. This study investigates the feasibility of a novel connection solution for CLT-concrete composite floor (CCCF) systems, emphasizing both mechanical performance and environmental sustainability. Lab experiments and life cycle assessment (LCA) are conducted, to get the mechanical properties of the new connector and relevant environmental impact. Manufacturing, installation, and end-of-life stages are enclosed for the LCA calculation. Consequently, these results are compared with a functionally equivalent hollow core slab floor system. The results highlight its potential as a viable alternative to conventional concrete slabs, together with reduced environmental impact and strong structural properties. Relevant reusability is also discussed.	Cristina	Dachin	HAMK
Poster Session 2A - MPD (Engineering)	Material Performance & Durability - Engineering Focus Material Performance & Durability - Architectural Focus Timber Engineering & Structural Performance - Engineering Focus	INTRODUCTION OF NON-DESTRUCTIVE TESTING FOR NOVEL COMPOSITES AND JOINTS OF TIMBER AND BAMBOO	Due to increasing demand for sustainability, manifold efforts are made to reduce CO2 emissions. Renewable raw materials such as timber and bamboo even have a negative carbon footprint when it comes to procurement, making them very attractive for industrial use in terms of environmental targets. New material concepts with these renewable materials or combinations of both, additionally, a particular visually appealing alternative with glass fibre reinforced polymer, are analysed to develop adequate NDT (Non-Destructive Testing) solutions for the quality control in later production processes. NDT offers special opportunities in terms of cost savings compared to destructive testing procedures. The presented efforts to develop solutions for new renewable material applications are embedded in a comprehensive proceeding for NDT introduction to later series production. Prior evaluation of selected NDT methods with particular potential for testing renewable material concepts like radiographic computed tomography, ultrasonic testing, microwave or terahertz testing as well as thermography determines the specific strengths and limitations of each method. Experimental investigations with active thermography clarify the general suitability of different excitation sources that can be used for timber and bamboo. Practical results provide information about detectable material inhomogeneities and structural defects. The findings are supplemented by finite element calculations to estimate corresponding defect characteristics. Finally, main influences on thermographic testing that need to be considered in order to achieve robust quality control are pointed out as a preview of the next steps required to complete NDT qualification.	Ulrike	Siemer	Berliner Hochschule für Technik
Poster Session 2A - MPD (Engineering)	Material Performance & Durability - Engineering Focus Sustainability and Timber in a Circular Economy - Engineering Focus Sustainability and Timber in a Circular Economy - Practitioner Focus	BAMBOO BENDING WITH STEAM	Bamboo can be bended successfully with steam. Detailed analysis of the mechanical properties shows the characteristics of the steam-bended bamboo shapes (hardness, indentation, analysis of diameter after bending, tensile strength) and their dependence of the parameters of the bending process.	Ralf	Förster	BHT Berlin
Poster Session 2A - MPD (Engineering)	Material Performance & Durability - Engineering Focus Timber Engineering & Structural Performance - Engineering Focus	COMPRESSIVE BEHAVIOR OF TIMBER AT DIFFERENT ORIENTATIONS TO THE GRAIN	Wood is orthotropic in three main directions, namely longitudinal (L), radial (R), and tangential (T). In practical uses of timbers as a construction material, loading cases under compression, especially in timber connections, can occur at various orientations to the grain, not only in the three main directions. Off-axis compressive strength and stiffness, including a spreading effect, are essential to design timber structures. In this paper, compression and partial compression tests at different orientations were conducted to clear the influence of a fiber direction, spreading effect, and damage zones. The dependences of the Young's modulus and strength on the loading angle for the longitudinal direction are shown. The deformation and failure behavior were also strongly influenced by the loading angle. A kink band failure often occurred in the specimens at the loading angle of 0 degrees, shear failure often occurred at 15 and 30 degrees, and compressive failure perpendicular to the grain often occurred at 45, 60, and 90 degrees. The spreading effect increased with decreasing the loading angles in the strength and Young's modulus. We proposed an evaluation method of the off-axis compressive strength and stiffness, including a spreading and damage zone effect, using Hankinson's equation.	Marina	TOTSUKA	Chiba University

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Poster Session 2B - STCE (Engineering)	Sustainability and Timber in a Circular Economy - Engineering Focus	Shaking table tests on the traditional timber structure of the stage on the cliff using the model of a 3D printer	This study investigates the seismic performance of traditional timber structures, with a focus on the stage of the main pavilion at Kiyomizu-dera temple in Japan. Traditional timber connections in East Asia, including Japan, use notching and fitting techniques, resulting in superior seismic performance due to larger structural members compared to residential buildings. The research involved creating a 1/50 scale model of the pavilion and stage using a 3D printer, based on static loading tests. The foundation of the model was made from structural plywood, corresponding to the actual structure's column lengths. Seismic tests included white noise, simulated seismic waves from the Building Center of Japan, and 1995 Kobe earthquake data. Test observations revealed natural frequencies, damping, and load-deformation relationships. Results showed that the main pavilion's natural frequencies matched microtremor observations, while the stage's frequencies were lower. Additionally, reduced stiffness was found between the pavilion and the stage, suggesting a structural distinction between the two parts. The study concludes that the main pavilion and stage have different seismic characteristics, highlighting the complex dynamics of traditional Japanese timber structures.	Atsushi	TABUCHI	0
Poster Session 2B - STCE (Engineering)	Sustainability and Timber in a Circular Economy - Engineering Focus	CHRONOLOGICAL AND GEOGRAPHICAL DISTRIBUTION OF CONVENTIONAL TIMBER FRAME CONSTRUCTION TECHNIQUES OBSERVED IN EXISTING HOUSES IN MIE PREFECTURE, JAPAN	This study aims to understand the diversity of conventional construction methods for timber houses in Mie Prefecture, Japan. These methods, which have evolved over time to accommodate local conditions, exhibit distinct chronological and geographical distributions. A questionnaire survey was conducted among inhabitants of timber houses in six districts: Hokusei, Chusei, Iga, Nansei, Shima, and Higashikishu area. The survey collected data on foundation, floor, wall, and roofing to identify patterns of adoption and regional variations. Comparative analysis with Kanto-region revealed distinct patterns in the adoption of modern materials and techniques. Kanto showed gradual transition to modern construction methods, while Mie rapidly adopted them after 2000. Exterior finish and roofing materials retained traditional elements and regional variations in both areas, suggesting these elements preserve local architectural characteristics.	WAKANA	MATSUMOTO	MIE UNIVERSITY
Poster Session 2B - STCE (Engineering)	Sustainability and Timber in a Circular Economy - Engineering Focus	MELALEUCA RHAPHIOPHYLLA BARK HARVEST CONDITIONS FOR SUSTAINABLE ENGINEERED BARK BOARD PRODUCTION	This study investigated sustainable bark harvesting from swamp paperbark (Melaleuca raphiophylla) in order to produce engineered wood products, namely bark boards. The influence of bark condition on bark board properties and when to harvest bark were investigated. Bark was manually harvested on five occasions between October 2022 and February 2025 from seven different trees at a site in the South-West of Western Australia. The moisture content and weathered condition of the bark were assessed. A total of 70 kg of bark was harvested across the 29-month period with up to 18 kg of bark being harvested from a single tree. The influence of bark condition on bark properties has permitted recommendations to be made on when bark should be harvested, and which bark is better suited to the manufacture of bark boards. It has been possible to sustainably harvest bark over the period without causing fatality to the trees despite the Southwest being in drought during that period. This study suggests that bark should be harvested after a four-week period of low rainfall and humidity, with at least 18 months in between harvest to allow bark to weather, with the first harvest occurring when the girth of the tree is between 900 mm and 1800 mm.	William	Richards	The University of Western Australia
Poster Session 2C - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	TIMBER FAILURE AT SCREW TIPS ON GLULAM REINFORCED BY SELF-TAPPING SCREWS	Recently, the development of high-strength and -stiffness joints has become increasingly prevalent due to the expanding utilization of timber structures for medium to large-scale buildings. At column-beam joints in timber structures, bearing strength and stiffness perpendicular to the grain are often dominant. Consequently, increasing the bearing strength and stiffness perpendicular to the grain is essential for achieving high strength and stiffness joints. One method for enhancing bearing capacity and stiffness is reinforcement by self-tapping screws like piles in a loaded area on beams. This paper investigates one of the failure modes of glulam beams reinforced by self-tapping screws: timber compressive failure perpendicular to the grain at screw tips. We conducted experiments on 9 or 36 specimens for central or corner column-beam joints. For central column-beam joints, the experimental values were 1.77-1.92 times the calculation values from the previous model in the bearing capacity. We then proposed a bearing capacity model that could correctly evaluate the experimental values. For corner column-beam joints, the mechanism of compressive stress spreading in the specimens is different from that for central column-beam joints, and a new evaluation method was proposed.	Junki	TATEYAMA	Chiba University
Poster Session 2C - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	Analysis of Stress Distribution in Contact Area of Cross Laminated Timber Shear Wall to Floor Connection	This paper investigates the behavior of shear walls in multi-story wooden buildings constructed with Cross-Laminated Timber (CLT) in relation to the stiffness of the floor structure. Numerical models were compiled and a series of experiments were prepared to determine the influence of the floor panel's contact area in compression perpendicular to plain on the stress and deformation of the wall panels. It can be seen from the analysis that the loading of the lower wall panel by the upper wall panel is uneven. This is contrary to classic models which consider the uniform loading of the upper edge of the lower panel along its entire length. The stiffness of the floor panel also affects the load on the tension anchors. As the thickness of the floor slabs increases, the horizontal deformation decreases. Additionally, the bending deformation of the wall panel in the vertical direction influences the length of the compressed area, which also affects the load on the anchors.	Lukas	Velebil	Czech Technical University in Prague - University Centre for Energy Efficient Buildings
Poster Session 2C - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	PUSH-OUT TESTS ON TIMBER-TO-TIMBER COMPOSITE (TTC) SYSTEMS MADE OF HARDWOOD	This paper presents the results of experimental investigations on push-out specimens realized with glulam beams and boards made of Italian short supply chain timber and inclined screws. The main aim is to define the fasteners' stiffness, strength, static ductility and failure modes and so, to assess their goodness for the timber-to-timber composite (TTC) floor use. The specimens are tested according to the EN 26891 under quasi-static monotonic loading.	Martina	Sciomenta	University Of L'aquila
Poster Session 2C - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	GLUED IN PLATES: NEW POSSIBLE SOLUTION FOR SLAB-COLUMN CONNECTION IN POINT SUPPORTED TIMBER-BASED SLABS	The current push from the scientific and engineering community, for high-span point-supported slabs from timber-based materials, requires reinforcement solutions for punching the slab. This paper explores new possible methods of reinforcement with glued-in plates. It describes a new product for slab-column connection and describes a project with the aim to develop and optimising this product with numerical analysis and experimental methods. The major challenge is the resistance of a timber-glue-steel connection. Preliminary analysis indicates that the proposed punching reinforcement method effectively enhances the slab's punching capacity.	Michal	Kázmér	Slovak University of Technology in Bratislava

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Poster Session 2C - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	NON-DESTRUCTIVE AND SEMI-DESTRUCTIVE METHODS FOR WOOD GRADING VIA ASSESMENT OF STANDING TREES AND LOGS	<p>POSTER - The high demand for spruce timber has led to the expansion of Norway spruce monocultures outside its natural ecological area in central Europe; it results in a wide-range and gradual variation of wood properties. The wood quality plays an important role in timber structure properties thus the individual selection of material is the first important step of traditional carpentry. The selection of trees in the forest should be emphasized to reach a balance between properties for better processing and material properties. Therefore, simple and reliable methods for in-situ assessment of standing trees or logs are searched. The goal of this study is to test standing trees and logs by several methods and to describe relationships between the evaluated material parameters. The trees from stand in Czech Republic with optimal ecological conditions for Norway spruce were felled during 3 seasons, consequently milled to logs and tested by several methods. Wood densities, sound velocities, dynamic moduli of elasticity, micro-drilling and indentation resistances were measured. The visual assessment was carried out as well. The relationships between properties were statistically tested to determine the reliability of used non-destructive and semi-destructive methods to predict wood quality and also to describe the significance of harvest period.</p>	Michal	Kloiber	Czech Academy of Sciences Institute

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Poster Session 3A - EIC, STCE (Engineering/Practitioner)	Material Performance & Durability - Engineering Focus, Timber Engineering & Structural Performance - Engineering Focus, Education, Innovation & Challengers - Engineering Focus	STATIC CALCULATION AND CONSTRUCTION OF GLUED LAMINATED ANTENNA TOWER	***POSTER***Antenna towers with telecommunication equipment surround us, and they are often perceived as structures that disrupt the environment. Glued laminated timber is a material with exceptional mechanical and visual characteristics, offering great durability due to appropriately designed construction details. This paper will present the static calculations and the construction process of a 40-meter tall antenna tower with telecommunication equipment made of glued laminated timber. One important aspect is the significantly lower carbon footprint of such towers, which will play an increasingly significant role in the future.	Šime	Serdarević	University of Applied Science
Poster Session 3A - EIC, STCE (Engineering/Practitioner)	Timber Engineering & Structural Performance - Engineering Focus, Education, Innovation & Challengers - Engineering Focus	CONSIDERATION OF FLUID FORCES ACTING ON PARTS OF WOOD HOUSE UNDER FLOOD	Floods are occurring frequently due to climate change, and it has become difficult to protect residential areas with levees alone, so the Japanese government has shifted its policy to basin flood control. It is necessary to ensure the safety of wood houses even in flooded areas, so we subjected to the model of wood house to investigate the structural safety of wooden houses under the fluid forces caused by flood disaster. To ensure structural safety under fluid forces, it is necessary to ensure horizontal shear capacity and prevent sliding and overturning, and past research has shown that sliding is the most severe problem for ordinary wood houses. Additionally, the 2021 Ministry of Land, Infrastructure, Transport and Tourism Notification No. 1392 stipulates that the fluid force acting on a building is calculated from the fluid resistance formula. On the other hand, the past survey of flood damage to wood houses have shown that in wood houses whose openings or mud walls have been destroyed in advance, the horizontal force calculated by the fluid resistance formula does not match whether the sliding will occur or not. Therefore, the hydraulics model test employing the scaled-down models of wood houses with and without openings were conducted to study the possibility of applying a reduction factor for the pressure-receiving area of house with openings. As a result, it was suggested that if there is an opening of similar size on the side where fluid force acts and on the opposite side, it may be possible to reduce the pressure receiving area on examining the sliding. However, it was found that on examining the overturning using the fluid resistance formula, it may not be possible to reduce the pressure-receiving area.	Takahiro	Tsuchimoto	Building Research Institute
Poster Session 3A - EIC, STCE (Engineering/Practitioner)	Sustainability and Timber in a Circular Economy - Engineering Focus, Sustainability and Timber in a Circular Economy - Architectural Focus, Exemplars & Construction Case Studies - Engineering Focus	HOW TO BUILD INDUSTRIALLY SCALABLE VALUE CREATION FROM TIMBER CONSTRUCTION BY-PRODUCTS IN NEW ZEALAND	Global economies seek solutions for a circular economy and climate change mitigation. Forest biomass and sawn timber processing by-products offer several value-added components to replace unrenewable carbon-intensive materials. Generally, sawn goods utilize only approximately half of the harvested timber volume. When aiming for circular and zero waste construction, it is not enough to use local wood sources for timber construction unless all the wood-derived molecules are fully utilized. Numerous projects worldwide are developing biomass-based biorefineries, but the upscaling of these technologies require cross-sectoral and multidisciplinary partnerships. In this paper, we propose a holistic approach to analyse and visualise value-creation possibilities in the New Zealand (NZ) context, targeting locally sourced, undervalued and undervalued wood species that can be used in construction and finishing. The focus is on finding economically, socially, and ecologically sustainable solutions. Additionally, we present cases of industrial value-chains and by-products, to provide a baseline understanding on the scale-up potential with techno-economic feasibility.	Tuula	Jyske	University of Helsinki
Poster Session 3A - EIC, STCE (Engineering/Practitioner)	Sustainability and Timber in a Circular Economy - Practitioner Focus	Assessing the regional end-of-life impacts of wood waste in the United States	The environmental impacts of four end-of-life scenarios for wood waste (recycling, composting, incinerating, and landfilling) were evaluated on national and regional levels across the United States (U.S.). The distribution of wood waste in the four scenarios was assessed by analyzing waste characterization reports for each state. Then, transportation from cities to waste processing facilities was modeled in geospatial software to estimate the transportation distances and associated environmental impacts for each scenario in each region. The environmental impacts of waste processing, waste disposal, and new product manufacturing were estimated for each region, as well as the carbon storage benefits and substitution benefits of displacing fossil products. Summing these impacts and benefits revealed a clear climate benefit for the recycling scenario. The distribution of wood to the four scenarios and the transportation distances varied substantially across regions, producing variations in environmental impacts. This research has improved the understanding of how differing wood waste practices across the U.S. produce different environmental impacts, which highlights areas for improvement in terms of climate and waste reduction goals.	Christina	Bjarvin	University of Washington
Poster Session 3B - TESP & TABD (Architectural)	Timber Engineering & Structural Performance - Architectural Focus	A SIMPLIFIED APPROACH FOR ESTIMATING THE BACKBONE RESPONSE OF TIMBER-FRAMED PARTITION WALLS	This study investigates the seismic behaviour of a timber-framed partition wall subjected to unidirectional quasi-static lateral cyclic tests and quantifies associated drift thresholds at various damage levels. This study outlines the construction and testing of a multi-winged timber-framed partition wall, designed to reflect common New Zealand building practices. Moreover, theoretical formulations predicting ultimate strength, initial stiffness, and drifts corresponding to screw damage and plasterboard buckling are scrutinized and refined using experimental data from previous tests. The predicted bi-linear shear force vs. drift backbone curve, using the refined formulations, reasonably capture the experimental backbone curve, validating the reliability of the simplified approach.	Jitendra	Bhatta	University of Canterbury
Poster Session 3B - TESP & TABD (Architectural)	Timber Engineering & Structural Performance - Architectural Focus	EXPERIMENTAL EVALUATION OF HYGROTHERMAL PROPERTIES OF CHILEAN RADIATA PINE CROSS-LAMINATED TIMBER PANELS FOR CONSTRUCTION APPLICATIONS	One of the main challenges with Cross-Laminated Timber (CLT) is its sensitivity to moisture. As a hygroscopic material, wood exchanges moisture with the environment, causing dimensional changes that affect the stability and energy efficiency of CLT constructions. This study analyzes the thermal conductivity, density, and thermal transmittance of CLT manufactured with radiata pine timber grown in Chile. The results showed that the adhesive used in the panels increased the thermal conductivity compared to pine wood alone, although it did not significantly alter the apparent density. Despite the higher conductivity, the thermal transmittance was adequate for insulation in construction. It is suggested to investigate adhesives and treatments to optimize the thermal performance of CLT.	Paula	Salgado	0
Poster Session 3B - TESP & TABD (Architectural)	Timber Engineering & Structural Performance - Architectural Focus	EXPERIMENT ON AXIAL CAPACITY-BENDING CAPACITY RELATIONSHIP OF PLASTIC HINGE OF STEEL BAR-TIMBER COMPOSITE COLUMN	In light of the current climate crisis, there has been much recent interest in using timber structural members in large buildings, since timber is as renewable natural resource, and moreover, in severe earthquake prone, such as Japan, they are more desired on the grounds of light weight of timber members. We are developing a frame system formed by timber members reinforced by deformed steel bars (i.e. rebars) using epoxy resin adhesive. We have already a technique for the connection between column of ground floor and reinforced concrete foundation. However, behavior of the column subjected to bending under higher axial force was not investigated. In previous WCTE 2023, bending characteristic of the other portion except hinge of the column derived from loading test and a calculation method for the bending moment capacity was reported [1]. We have planned an experiment to investigate bending characteristic of the hinge of the column under bending and higher axial force. This paper reports the experiment, its results, and comparison of the experiment result and calculation on bending moment capacity.	RIN	KAMIMAKISE	Kagoshima University

Session Topic	Abstract Topic	Submission Title	Summary	First Name	Last Name	Company
Poster Session 3B - TESP & TABD (Architectural)	Timber Architecture & Biophilic Design - Architectural Focus	Occupant outcomes in timber-rich environments: A review	Occupant outcomes are an important area of research into the effects of building design and material selections, especially amongst green buildings. In these buildings, views to the outside and natural materials, including timber among others, are associated with numerous benefits for occupants, including increased productivity, the experience of biophilia, and other indicators of positive feelings. These benefits point to the importance of well-designed buildings, not only for sustainability and health but also for human psychological well-being. However, few studies focus specifically on occupant outcomes from timber as a structural or interior material. This research will use a robust literature review methodology to seek, select, and review existing literature on occupant outcomes, focusing on those studies that offer findings about timber and wood interiors. Findings most relevant to industry will be presented at the conference.	Georgia	Lindsay	University of Tasmania
Poster Session 3B - TESP & TABD (Architectural)	Timber Engineering & Structural Performance - Architectural Focus	LCA COMPARISON OF A MASS TIMBER BUILDING WITH AN EQUIVALENT STEEL ALTERNATIVE	This study presents the results of a comparative life cycle assessment (LCA) between a mass timber and steel structural design for Adohi Hall at the University of Arkansas. The study shows that utilizing mass timber results in a 19% lower embodied carbon footprint than steel for the same building design, when considering modules A1-A4 (cradle to construction site). The mass timber design stores approximately 2757 tonnes of CO ₂ eq, further contributing to climate change mitigation. These findings highlight the environmental potential of mass timber construction as a decarbonization pathway in institutional buildings.	Mahboobeh	Hemmati	University of Arkansas
Poster Session 3C - MPD (Engineering)	Material Performance & Durability - Engineering Focus	EVALUATION OF GROWTH STRESSES IN LIVING TREES OF <i>Corymbia citriodora</i> Hill & Johnson (<i>Eucalyptus citriodora</i> Hook) USED FOR STRUCTURES BY DETERMINING THE LONGITUDINAL RESIDUAL STRAIN	The equipment called extensometer is the responsible for the measurement of longitudinal residual strain (LRS). The objective of this study was to measure the LRS in <i>Corymbia citriodora</i> Hill & Johnson, checking in four different positions in the tree and their correlation with diameter at breast height (DBH), height and thickness of the bark. Eight trees of <i>Corymbia citriodora</i> were chosen randomly. In each tree, the following measurements were taken: DBH, bark thickness, tree height and the LRS in four different positions. A low correlation between LRS and the variables DBH, height and thickness of the bark was found. It can be concluded that there is a need, for a more accurate evaluation, a large number of trees are evaluated to provide a better understanding of the correlates of longitudinal residual strain and other variables in the population evaluated.	Alexandre	Carvalho	Federal Rural University of Rio de Janeiro
Poster Session 3C - MPD (Engineering)	Material Performance & Durability - Engineering Focus	INTERLAMINAR SHEAR FAILURE DAMAGE EVOLUTION PROCESS OF CLT BASED ON ACOUSTIC EMISSION TECHNOLOGY ANALYSIS	Cross laminated timber (CLT) was recognized as alternative to traditional construction materials. In this study, CLT was prepared by the plantation Chinese fir using one component polyurethane. Acoustic emission technology was used to evaluate the damage evolution and failure mode of CLT interlayer shear during load process. The variation of acoustic emission (AE) energy could accurately reflect the evolution of CLT interlayer shear damage. The results showed that the CLT interlayer shear failure mode was mainly the rolling shear failure of the transverse laminate, and the failure mainly occurs at the wheel position and the wood ray position at the junction of the morning and evening wood. In the deformation stage, the AE energy signal was less, the wood fiber bundle buckling, tensile microcracks start to sprout. In the crack propagation stage, the cumulative energy of AE increased linearly, and the shear crack signals with high RA value and low AF value increased. In the failure stage, AE energy signals form a local peak value, and the fracture form of CLT changes from tension-type failure to tension-shear composite failure.	haiqing	ren	Chinese Academy of Forestry
Poster Session 3C - MPD (Engineering)	Material Performance & Durability - Engineering Focus	ENHANCEMENT OF FIRE PROPERTIES IN WOOD FIBER-BASED THERMAL INSULATION FOR ECOLOGICAL NEW CONSTRUCTION AND RENOVATION PROJECTS	The significance of environmental considerations in construction is steadily rising on a global scale, particularly within the construction regulations of all EU countries. This trend is driving the increased adoption of ecological and renewable building materials and enhancing the energy efficiency of buildings, such as through improved thermal insulation. Although wood fiber-based thermal insulation presents a viable option for broader use, its application is typically restricted in buildings over two stories high in many countries due to fire regulations. Currently, the most commonly used building thermal insulations are A2 fire class mineral wools (glass and rock wool), which are energy and emission intensive to produce. However, wood fiber-based thermal insulation can achieve a fire class B rating when treated with fire retardants. This paper focuses on the development and investigation of new fire-resistant, wood fiber-based thermal insulations for both new construction and renovations. It also examines their potential applications, prerequisites, and environmental impacts as integral components of low-carbon industrial wood construction.	Hüseyin Emre	İlgin	Tampere University
Poster Session 3C - MPD (Engineering)	Material Performance & Durability - Engineering Focus	TECHNICAL PERFORMANCE OF INNOVATIVE DOVETAIL MASSIVE TIMBER BOARD SLABS	The application of bonding agents and metallic joiners is crucial in formation of engineered timber products (ETPs). Nonetheless, the employment of adhesives presents sustainability issues owing to the release of harmful emissions. Likewise, metal connectors adversely affect the disposal, reuse, and recyclability of ETPs. A different approach that solely utilizes natural wood, referred to as dovetail massive timber board slabs (DMTBSS), obviates the necessity for adhesives and metal joiners, inspired from one of the ancient joining techniques. Nonetheless, current research on DMTBSS has concentrated on deficient empirical assessment of joint details, rather than examining performance of an entire load-bearing members. Our experimental research examined fire, airborne sound insulation, and air permeance performances of these innovative elements. Model-scale test specimens with dimensions of 200x950x950, 200x1160x1190, and 1160x1160x200 mm (as the smallest element) were utilized, respectively. The results highlighted the superior performance of DMTBSS, with the average charring rates between 0.65-0.70 mm/min, an R _w value of 43 dB, and q ₅₀ values of 1.4-9.9 m ³ /(m ² h). Although the commercial and structural applications of the dovetail concept are currently quite limited, our goal is to promote its widespread adoption through studies such as ours.	Hüseyin Emre	İlgin	Tampere University
Poster Session 3C - MPD (Engineering)	Material Performance & Durability - Engineering Focus	Natural weathering of traditional linseed oil paints	"POSTER ONLY" Linseed oil paints have been in use in interior and exterior decorating for a long period of time, but they died out due to the explosive growth of the petrochemical industry in the second half of the 20th century and due to disadvantages like more demanding application, long time of drying and related time consumption and labour costs. In Czech Republic, the preservationists interest in traditional coatings is increasing and the effort for resuming of their usage in historical monuments restoration appeared. Nevertheless, they are falling on cost orientated companies' dislike to work with traditional oil paint due to time-consuming process or more likely absolute ignorance of its correct application. Norway spruce (<i>Picea abies</i>) samples were brushed in two layers by handmade prepared linseed oil based coating. Four different types of pigments were used. All samples were exposed to natural weathering for five years without any maintenance. The change in paints color was evaluated, together with moisture content changes caused by rain and air relative humidity. The influence of paint color on the surface temperature was also determined. The type of used pigment has a fundamental influence on the resulting properties of traditional oil paint. There is significant difference between paints in moisture absorption. The colour darkness affects the surface temperature, which can accelerate sample drying. The coating color is relatively stable during weathering, but the appearance is influenced by chalking and dirt deposition, especially in case of white coating.	Jan	Baar	Mendel university in Brno

Session Topic	Abstract Topic	Submission Title	Summary	First Name	Last Name	Company
Poster Session 4A - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	Enhancing end-grain bonding of timber components under low-temperature curing conditions	Timber Structures 3.0 (TS3) technology developed during the last 10 years represents an emerging method in timber engineering, focusing on end-grain bonding of timber components. For a wider application, this study investigates the effects of low curing temperatures on tensile strength of the bond and explores mitigation strategies. Results indicate that low curing temperatures adversely affect mechanical properties, while using heated casting resin significantly improves bonding strength. The findings provide design-relevant tensile strength values and effective bonding strategies for low ambient temperatures.	Steffen	Franke	IBK Institute of Structural Engineering
Poster Session 4A - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	EFFECT OF AXIAL FORCE ON NATURAL FREQUENCIES OF COLUMNS ATTACHED TO TIMBER BUILDINGS	The effect of axial stress on the natural frequency of columns was investigated in the evaluation of Young's modulus for columns attached to existing buildings. First, elemental tests revealed that the natural frequency of wood increased when axial stress was applied to the wood, and then showed a downward trend when the axial stress was 1.5 kN/mm ² . When the side pressure at the end of the wood was increased, the natural frequency increased up to the natural frequency of the fixed end in the first-order mode, and increased to 63 % of the natural frequency of the fixed end in the third-order mode. Next, tests on an existing building revealed that the attachment of beams to columns other than at the ends of the columns caused vibration modes similar to harmonics in the column vibration modes. In addition, it was confirmed that the natural frequency of the columns increased when the second-story floor beams were loaded. Although a similar relationship between axial stress and natural frequencies obtained from elemental tests was confirmed, differences in the natural frequencies obtained were caused by differences in the Young's modulus of the wood.	Hiroki	Yoshinuma	Toyo University
Poster Session 4A - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	Performance-Based Seismic Design of High-Rise Timber Office Buildings	As interest in carbon reduction and sustainable architecture grows, timber buildings are gaining attention. In South Korea, with the relaxation of regulations on timber buildings in 2020, interest in high-rise timber buildings has increased. However, according to the current structural standards (KDS), there are difficulties in designing mid- to high-rise buildings. This study aims to establish a performance-based seismic design procedure applicable to timber buildings of 13 stories or more, composed of RC shear walls and GLT frames, using the KDS performance design method based on the potential application of engineered wood. The structure's performance is evaluated through nonlinear static analysis. Specific procedures for designing according to the KDS performance design method were established, and allowable criteria for engineered wood members were presented. The basic design of the target building can follow current structural standards, and in order to determine the satisfaction of performance goals, the allowable criteria for each member and the creation of a nonlinear analysis model must properly reflect the actual nonlinear behavior of each member.	Huijin	Kim	TI Structural Engineers
Poster Session 4A - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	FEASIBILITY OF CROSS-LAMINATED TIMBER PANEL FOR BRIDGES APPLICATION: PRELIMINARY EXPERIMENTAL, NUMERICAL AND ANALYTICAL STUDY	Application of CLT in both structural and non-structural elements of bridges has increased globally. The CLT panel comprises several layers of timber boards which are stacked crosswise at 90 degrees and glued together on the wider face of timber boards. Although CLT panel has played a significant role in the current progress of timber mass construction in Pasific area, there is not even one notable bridge CLT project. Therefore, this paper investigates the feasibility of using CLT panels in bridge applications, based on local material. This research examines the structural performance of CLT experimentally, numerically, and analytically. Experimental test results demonstrate that CLT and CLT composite double T-beams are sufficiently strong to carry structural loads for bridge applications. A numerical parametric study, based on an experimentally verified ABAQUS model, confirmed that a bare CLT panel and CLT composite elements which are fabricated from locally grown Radiata Pine are structurally ideal for short to intermediate span bridge application. This study revealed that the CLT bridge has potential for factory prefabrication which makes site assembly faster. Additionally, majority of non-structural bridge elements could be supplied from wasted CLT material. Ultimately, the CLT bridge is an excellent, environmentally friendly alternative to concrete bridges with a lower environmental impact.	Reza	Masoudnia	Red Stag Timber Lab
Poster Session 4B - MPD & TESP (Engineering)	Material Performance & Durability - Engineering Focus, Timber Engineering & Structural Performance - Engineering Focus, Education, Innovation & Challengers - Engineering Focus	EVALUATION OF PARAMETRIC FIRE MODELS FOR UNDER-VENTILATED MASS TIMBER COMPARTMENTS	Timber burns but is efficient for building structures with unusual yet beneficial thermal properties. Research suggest that the timber structural elements can contribute to a fire event and add to the compartment's fuel load. This results in a more hazardous and intense fire event. Despite these challenges, the search for analytical method(s) for fire safe design using timber can create pathways for mass timber structures. This paper critically investigates the assumptions and analytical methods in developing parametric fire curves for timber fire compartments. This involves reproducing parametric time-temperature curves, comparing to historical experimental results, and observe the fire dynamics within exposed timber compartments. By highlighting key governing factors during fire, Amanda will bring society a step closer to a universally acceptable method for structural timber design and enable progress towards fire safe complex timber building structures.	Jasmin	Goldberg	Aurecon
Poster Session 4B - MPD & TESP (Engineering)	Material Performance & Durability - Engineering Focus, Timber Engineering & Structural Performance - Engineering Focus	Bending strength of cross-nail-laminated timber assembly with wooden nails	In these times of climate crisis, the construction sector is increasing the use of engineered wood products (EWPs) in the buildings since it is a more ecological and sustainable material. Among the different wood products that exist there is cross-nail-laminated timber (CNLT) with aluminum nails that is used as a structural wall. In addition, densified wooden nails comparable to aluminum nails have appeared on the market. Therefore, this study aims to analyze the bending strength of CNLT with wooden nails. The results show that this product has a low modulus of elasticity to function as a slab, so that it can be used as a wall, with the advantage is a more ecological product than NCLT with aluminum nails, since only use wood in its manufactured.	Eduard	Correal	Forest Science and Technology Centre of Catalonia (CTFC)
Poster Session 4C - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	EVALUATION ON THE BEHAVIOR OF SCREWED CONNECTIONS BETWEEN CROSS-LAMINATED TIMBER PANELS AND STEEL PLATES	Despite the extensive use of steel-to-CLT screwed connections in CLT structures, there is still a lack of detailed knowledge on the mechanical performance of these connections. This paper presents experimental and analytical investigations on the behavior of screwed connections between cross-laminated timber panels and steel plates. Experimental tests were conducted on a series of steel-to-CLT screwed connection specimens designed with different distances between narrow faces and screws. Failure modes, load-displacement responses, capacities, stiffnesses, and ductility of the specimens were obtained and compared. The deformation inside the specimens was evaluated based on the X-ray digital radiography method. The effects of narrow faces and orthogonally placed layers on the connection behavior were studied. An analytical model was then developed to predict the capacity of the screwed connection. The models were validated by the test results and can serve as a convenient tool for designing such connections.	Xijun	Wang	Tongji University

Session Topic	Abstract Topic	Submission Title	Summary	First Name	Last Name	Company
Poster Session 4C - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	Comparative Analysis of Existing Models on Pull-out Stiffness of Glued-in Rod in Glulam	Glued-in Rod (GIR) is gaining recognition for its efficiency and innovative approach in timber joint applications. GIR joints offer high withdrawal capacity, rigid stiffness, fire and corrosion resistance, and aesthetic advantages due to the concealment of the rods within the timber. Despite over 30 years of research, a universal design standard for GIR has not been established. Moreover, design equations for predicting pull-out stiffness do not fully account for certain critical influences or are too complex for practical use. This study proposes a simplified equation to predict GIR pull-out stiffness, addressing the gaps in existing models. Experimental validation was conducted using various GIR geometries under pull-out loading conditions. The proposed equation aims to provide a practical design tool that includes the consideration of timber shear deformation, facilitating the effective design and implementation of moment-resisting joints in timber structures.	Lee	Gwang	Seoul National University
Poster Session 4C - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	IMPACT OF INTER-PANEL CONNECTIONS ON VIBRATIONS OF CLT FLOORS	Cross-laminated timber (CLT) floors are typically composed of multiple CLT panels. At design stage, such floors are usually modelled numerically either as a single solid slab or more frequently as a set of independent panels with no inter-panel connections. This paper aims to demonstrate numerically a significant effect of two common inter-panel connections, i.e. single surface spline and half-lapped joint, on vibration modes of CLT floors composed of two and three panels. The connections are modelled as an equivalent 2D elastic strip nested in-between the CLT panels. This relatively simple yet robust numerical model can be used conveniently in design offices, regardless finite element (FE) software. The matching monolithic slabs and floors without the inter-panel connections are studied for comparison. The results showed that the difference is far too big to ignore.	Nada	Simović	Faculty of Civil Engineering, University of Belgrade
Poster Session 4C - TESP (Engineering)	Timber Engineering & Structural Performance - Engineering Focus	60-MINUTE COMBUSTION TEST UNDER LOADING OF STEEL BAR-TIMBER COMPOSITE BEAMS	POSTER ONLY Recently, timber buildings are desired from a viewpoint of global warming, and moreover, in severe earthquake prone zones, such as Japan, they are more desired on the grounds of light weight of timber members. We are developing a frame system formed by hybrid timber members strengthened with deformed steel bars (i.e. rebars) using epoxy resin adhesive. In order to practice the system, it is necessary to investigate fire resistance performance of the members. As a trial, we conducted a 60-minute burn test of one relatively small cross section of a steel bar-timber composite beam and reported its results in previous WCTE 2023. Now, for practical use, we have conducted a 60-minute burn test of three beams with relatively large cross sections. This paper reports the experiments and results.	Shinichi	Shioya	Kagoshima University

Session Topic	Abstract Topic	Submission Title	Summary	First Name	Last Name	Company
Poster Only - No Presentation	Material Performance & Durability - Engineering Focus	Diffusion Analysis of Protective Pigment Oil Coatings	The conservation of historic wooden structures is challenging due to their susceptibility to environmental degradation. This research investigates the diffusion properties of nine commercially available protective pigment oil coatings using a Dynamic Vapor Sorption (DVS) analyzer. By understanding these properties, we aim to improve coating performance and extend the lifespan of treated wood, thereby enhancing conservation strategies for wooden cultural heritage.	Jakub	Dömény	Mendel University in Brno
Poster Only - No Presentation	Exemplars & Construction Case Studies - Engineering Focus	Construction Tests of a Folding Timber Bridge	"POSTER ONLY" Serious disasters from earthquakes, typhoons, pouring rain, debris flow and so on often occur in Japan. Such disasters almost always cause roads and bridges to break. If the traffic and lifelines are shut off, citizens are isolated from the other areas and their daily life is damaged. It may be necessary to rescue injured persons rapidly. For the quick recovery from natural disasters, emergency bridges are sometimes constructed. In this case, the construction time should be as short as possible. This study presents a new emergency bridge with short construction time, which is a folding bridge. The bridge type is Howe truss, and the span length is 9.9m. The hinges which can make the bridge to fold are attached between truss panels. Outdoor tests of this bridge construction were executed on the ground in the Hakodate National College of Technology. In the tests, the bridge was assembled by modifying from folded condition to unfolded condition. A pseudo river and a construction site were settled in the ground and the unfolded bridge was erected by using 13t rough terrain crane. It took only 2 hour and 30 minutes to complete this timber bridge.	Hideyuki	Hirasawa	Hakodate National College of Technology
Poster Only - No Presentation	Timber Engineering & Structural Performance - Engineering Focus	INTERNAL STRESS WITHIN TIMBER—STEEL BAR COMPOSITE BEAM DUE TO CHANGING OF TEMPERATURE AND MOISTURE CONTENT	POSTER ONLY We have been developing a frame system formed by timber members reinforced by deformed steel bar(rebar) using epoxy resin adhesive. Two major problems of the composite timber member are that its timber and rebar have different coefficients of thermal expansion and that timber expands and contracts due to variations in moisture content. Due to these factors, there is a need for a generalized method that can assess the variation of stress and strain in the wood and the rebar inside the member due to variations in wood temperature and moisture content. This paper proposes equations to estimate the internal stress of the wood and the rebar according to the variation in those temperature and wood's moisture content.	TAKESHI	IZAKI	Kagoshima University
Poster Only - No Presentation	Timber Engineering & Structural Performance - Engineering Focus	COMPRESSIVE STABILITY STUDY OF FOUR-SIDED SIMPLY-SUPPORTED CONSTRAINED CLT WALL	This paper aims to investigate the compressive stability performance of CLT walls. In actual engineering, CLT walls often have lateral restraints, but none of the current studies consider the effect of lateral restraints on the compressive stability performance. CLT wall was regarded as a type of orthotropic plate formed via construction, assuming a four-sided simply supported constraint, based on the orthotropic plate buckling theory, a method for calculating the buckling capability of CLT walls under uniform-compression is derived in this paper. Formulas for determining the boundary between the elasto-plastic instability and elastic instability was also proposed. The accuracy of the calculation method was verified by the CLT walls numerical models, and the overall error was found to be small. The proposed equations offer accurate predictions of the buckling capability of CLT walls under uniform-compression.	DI	CHEN	China Southwest Architectural Design and Research Institute Co. Ltd
Poster Only - No Presentation	Timber Engineering & Structural Performance - Engineering Focus	A Study on Charring Properties of GLT Beams using Domestic Larch	The main structural members of a building shall secure fire resistance performance in order to prevent the collapse of structure in the fire accident. In Korea building laws and regulations require building structure members of a certain size or larger to have a fire resistant structures. Fire resistant structures refer to members or structural forms that maintain performance even when the main structural members of a building are exposed to high-temperatures for a certain period of time during a fire, and fire resistant structures should also be applied to structural members used in wood structures. Internationally, timber structure fire resistance measures apply the charring rate and charring depth of wood exposed to high temperatures to fire resistance design and are considered to have secured fire resistance performance through cross-sectional design with a charring depth. In Korea, the criteria for recognizing the fire resistance structure of wood members are charring depth per hour, and the member design should be applied by applying the charring depth for wood structure buildings. In this study, fire resistance performance tests are performed on structural beams made of domestic larch, and charring properties are analyzed and the results. To this end, Load bearing fire test was conducted on the structural member(GLT). The results of the fire resistance test considered the are charring depth according to the fire resistance time, the charring depth change according to the charring rate and the load	Kwon Hyuk	Baik	Korea Institute of Civil Engineering and Building Technology (KICT)
Poster Only - No Presentation	Timber Engineering & Structural Performance - Engineering Focus	Status of stadardization of fire-resistant structures according to the Korean Building Act for glued laminated timber using Korean larch	In wooden structures, it is widely known that the level of fire resistance is determined by a charring rate or charring depth, and their results are adopted for the design of fire resistance. In this study, specimens of Korea larch column with a lamination wooden type are prepared and the properties of fire resistance such as the charring depth, load ratio and the specific charring rate suggested by EN Code are investigated. In Korea, in order to apply to fire-resistant structures of buildings, fire resistance performance is certificated for each structure and can be used. The Koera standardization status for applying glued laminated timber as a fire-resistant structure according to the Korean Building Act is introduced and the current progress is introduced.	Jae Hong	An	Korea Institute of Civil Engineering and Building Technology (KICT)
Poster Only - No Presentation	Material Performance & Durability - Engineering Focus, Timber Engineering & Structural Performance - Engineering Focus	A Study on Charring Depth of Cross-Laminated Timber(CLT) Walls according to the Fire Resistance Time under Non-Load Bearing Fire Test	In this paper, we investigated the charring depth of cross-laminated timber(CLT) walls under non-load bearing fire test, and observed the effect of fire resistive covering on the charring depth. The fire resistance test was conducted with five test specimens at 30-minute intervals from 1 to 3 hours, and the wall thickness was fixed to 210 mm. In addition, a fire resistance test was conducted for 2 hours using dry fireproof boards as fire resistive covering, and verified by the charring depth and internal specimen temperature. This study presented a domestic charring depth for a 3-hour fire-resistant structure of CLT walls under non-load conditions, and the effect of dry fire protection covering was observed. As time increased under non-load bearing fire test without fire protection covering, the charring depth of CLT walls increased steadily, and a decrease in the charring depth was observed depending on the dry fire protection covering. It is judged that it can be used as basic data for applying the domestic fire-resistant structure of CLT walls in the future, and it can be cited as comparative analysis data for fire resistive covering materials for CLT walls and loading tests of CLT walls.	Suho	Kim	Korea Institute of Civil Engineering and Building Technology (KICT)

Session Topic	Abstract Topic	Submission Title	Summary	First Name	Last Name	Company
Poster Only - No Presentation	Timber Engineering & Structural Performance - Engineering Focus	Numerical Study on Timber-timber composite (TTC) floors	Timber-timber composite floors are becoming popular due to their lightweight and environmentally sustainable construction. Recent studies demonstrate concepts for achieving long spans with superior stiffness and vibration performance. However, there are no comprehensive studies investigating the impact of different parameters on the ultimate capacity and serviceability stiffness of floor systems. Additionally, the effective width is not clearly defined for engineers to use in analytical models. In this study, a finite element (FE) model using SAP2000 is employed to simulate cross-laminated timber (CLT) panels connected to laminated veneer lumber (LVL) as a floor system. The FE model is validated using data from push-out experiment conducted on this floor system, accurately capturing the load-deflection and peak load of the beams compared to existing experimental results. The validated model is then used for a parametric study to examine the effects of different parameters, including panel width, thickness, stiffness of shear connectors, their spacing, and the breadth and depth of LVL beams. Additionally, design equations and tables are suggested for engineers in this study.	Alireza	Chiniforush	The University of Melbourne
Poster Only - No Presentation	Material Performance & Durability - Engineering Focus, Timber Engineering & Structural Performance - Engineering Focus	STRAIN RATE EFFECTS ON FRACTURE ENERGY AND STRENGTH PROPERTIES OF RADIATA PINE AND SPOTTED GUM	Recent advancements in mass-engineered timber products have enabled the construction of tall buildings in earthquake-prone areas. Additionally, scenarios such as progressive collapse and accidental member failure necessitate a thorough understanding of timber materials under high strain rate loadings. In this study, locally sourced Machine Graded Pine (MGP10) timber was used to fabricate test specimens. The compressive test specimens were designed according to ASTM D143-22 standards, and the tensile tests followed ASTM D3500-20 guidelines. Compressive tests examined the effect of grain direction and loading rate on mechanical properties, using specimens cut parallel, tangential, and radial to the grain direction. Tensile tests were conducted on specimens cut parallel to the grain direction, subjected to various loading rates. The study also investigated the size effect on specimens under compression and tension, detailing specific sizes and shapes for the tests. The tests utilized MTS and Instron testing machines, measuring strains with laser transducers and extensometers. Results showed variations in ultimate stress and energy absorption based on loading rate and direction, highlighting the influence of grain orientation and specimen size on mechanical behaviour. The study concluded with an analysis of typical failure modes observed during compression and tension tests.	Alireza	Chiniforush	The University of Melbourne
Poster Only - No Presentation	Material Performance & Durability - Engineering Focus, Timber Engineering & Structural Performance - Engineering Focus	Retrofitting of Cracks in Connections with Glued-in Rods in Beech Glulam	Glued-in rods can provide efficient connections with a high loadbearing capacity and can be regarded as state of the art for softwood glulam. The use in combination with hardwood glulam is still quite seldom and further investigations are needed to get it accepted more widely. Several methods are known to avoid failure due to tension stress perpendicular to the grain during the service life of glued-in rod connections. Fully threaded screws are often used to reinforce or retrofit timber for tension perpendicular to the grain. Therefore, this method could present a convenient technique to retrofit cracks parallel to the rods in connections with glued-in rods. Tension tests using specimens with artificial cracks along the glued-in rods showed that the full loadbearing and yield capacity could be attained in case the cracks were retrofitted using fully threaded screws.	Martin	Lehmann	Bern University of Applied Sciences