

Construct Innovate Seed Fund 2023 – Winning Projects

Project Title	Certification of Innovative Construction Products and Systems
Project Description	This project aims to create industry awareness and recommendations relating to certification requirements of new/innovative products. It aims to provide clarity and help the construction industry understand the relationship between CE Marking/ETAs/EADs, Agrément certification, BCAR and design responsibility when adopting new products/systems on projects. It will also provide clarity and help the construction industry understand the relationship around durability and inconsistencies that exists within the industry between the CPR, Irish Building Regs, NSAI, and the DoH LG requirements. It will also provide guidance or recommendations on approaches to streamline new product certification in Ireland.
Project Team	Dr. Daniel McCrum, University College Dublin Glenveagh (Associate Member) Unilin (Associate Member)

Project Title	Advancing Indoor Acoustic Quality Through Innovative Acoustic Metamaterial Solutions
Project Description	This project aims to perform a feasibility study to investigate the effectiveness of using artificially engineered acoustic metamaterials to improve the indoor acoustics of the built environment. It will investigate the indoor acoustic problems in Irish dwellings and will model, design, fabricate and test new acoustic metamaterials to insulate these hazardous indoor noisy frequencies. It is expected that the project findings will (i) contribute to the retrofitting of existing houses in Ireland for improved acoustic performance and also (ii) enhance the indoor acoustic performance of newly constructed dwellings in Ireland as part of the National Development Plan 2021-2030.
Project Team	Dr. Muhammad Muhammad, University of Galway Dr. Eoin King, University of Galway Amplitude Acoustics

Project Title	TimberFlow: Enhancing Efficiency in Mass Timber Construction Through Innovative Design Practices and Capacity Building
Project Description	This project aims to enhance the efficiency of Mass Timber (MT) construction by comprehensively reviewing its design workflow for a case study project with the industry partner, G-frame Structures, encompassing the design process, drawings, connection details, and associated costs. It aims to identify potential optimizations in the design and modelling processes of Mass Timber, with a specific focus on connection details and the Computer Numerical Control (CNC) fabrication of Cross-Laminated Timber (CLT) panels. It will develop a Graphical User Interface (GUI) design tool to

	<p>streamline the design-construction workflow with a user-friendly interface and design standardisation through a digital library featuring common connection types.</p> <p>Furthermore, the project will yield educational materials suitable for training and skill development in the field of MT construction.</p>
Project Team	Dr. Muhammad Muhammad, University of Galway Dr. Patrick McGetrick University of Galway G-Frame Structures Ltd.

Project Title	Building Regenerative Towns & Cities
Project Description	<p>The main objective of this project is to mainstream biodiversity actions in the construction sector through the curation and dissemination of exemplar biodiversity case studies.</p> <p>The project will develop and curate high-quality, practical existing case studies on how to protect and enhance biodiversity in the most common building typologies and infrastructure found in Irish towns and cities. A minimum of 10 case studies will be developed as part of this project.</p>
Project Team	Marion Jammet, Irish Green Building Council LDA Land Development Agency Arup, Cairn Homes, Cluid Housing, Coady Architects , Glenveagh, Hibernia, KRA and TU Dublin.

Project Title	Woodspec: A Guide to Designing, Specifying and Detailing Timber in Ireland
Project Description	<p>Woodspec is an existing, established guide book to Designing, Specifying and Detailing Timber in Ireland, originally published in the mid-90's.</p> <p>A previous project led by Forest Industries Ireland to update Woodspec was split into a Phase 1 and 2. Phase 1 saw the preliminary website redesign completed and a selection of content updated by the relevant subject matter experts. Phase 2 is the focus of this proposal and will support the full redevelopment of the guide to be completed.</p> <p>This proposal seeks to complete the technical review, format and update of Woodspec to meet the needs of the modern specifier and design practitioner and to encourage a greater use of wood and promote the role of timber in displacing other materials, such as concrete and steel in construction, to help lower the carbon footprint of the built environment.</p>
Project Team	Dr. Patrick McGetrick University of Galway COILLTE DAC & Forest Industries Ireland

Project Title	Naturally Grown Timber Pilot Project
Project Description	This project is a collaboration between South Dublin County Council, Coillte DAC, Medite Smartply and University of Galway, to demonstrate the potential for homegrown timber and wood-based panel products in timber frame in a scheme of 20-30 social houses to be constructed in 2024/25. The project builds on manufacturing trials undertaken in 2023, coordinated by Forest

	<p>Industries Ireland and Coillte in collaboration with a large-scale timber frame manufacturer and Irish sawmill and with the support of the University of Galway and TU Dublin. A key work package comprised of the assessment during the various stages of production with recommendations of the optimum production guidelines for home-grown timber.</p> <p>This project aims to undertake a full carbon and lifecycle assessment (LCA) of the development and publish a project case study report quantifying the benefits in terms of speed, embodied carbon footprint, quality and precision, waste reduction, and the circular economy. In addition, to assist with the dissemination of the project results and to open engagement opportunities with the timber frame sector.</p>
Project Team	Dr. Patrick McGetrick University of Galway COILLTE DAC & South Dublin County Council

Project Title	Mass Timber Demonstrator Buildings
Project Description	<p>D/RES Properties are developing and building a 1,000 m² Community Centre and Creche using mass timber and an off-site Design for Manufacturing and Assembly (DfMA) construction methodology. They propose to use the Community Centre and Creche as a baseline CLT building which can demonstrate the use of typical CLT floor cassettes, walls and roofs, as well as standard mass timber structural connection details, membranes and tapes that can be utilised across other building typologies.</p> <p>The project aims to define the key aspects for the design, detailing, off-site DfMA process, optimised delivery and efficient erection which can provide the highest value for knowledge sharing to accelerate the use of mass timber in Ireland. The Lifecycle Assessment (LCA) of the project will be a key part in the sustainability credentials of the final mass timber development, following cradle to grave principles for which very limited data is currently available not only in Ireland but internationally.</p>
Project Team	Dr. Patrick McGetrick University of Galway D/RES Properties (Associate Member)

Project Title	Mass Timber Living Lab
Project Description	<p>D/RES Properties are developing and building a 1,000 m² Community Centre and Creche using mass timber and an off-site Design for Manufacturing and Assembly (DfMA) construction methodology.</p> <p>This presents a unique opportunity for a Living Lab demonstrator to assess the success of this project, establishing a mass timber performance database in Ireland and building upon recent mass timber research at University of Galway.</p> <p>The project's core objective is to establish criteria for measuring and monitoring the post-occupancy satisfaction of users (Indoor environmental quality, operational effectiveness & structural material performance) and the overall success of the design of the mass timber building. This research aims to advance understanding of mass timber construction and its implications for sustainable architecture and community well-being.</p>
Project Team	Dr. Patrick McGetrick University of Galway

	D/RES Properties (Associate Member)
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Project Title	Home User Guides, Templates and Best Practice
Project Description	<p>This project will progress the recommendations of the IGBC Healthy Homes Ireland report which made a key recommendation that home occupants were empowered to operate their homes to be healthy and efficient.</p> <p>Whilst many home builders provide quality “Consumer Information and Aftercare” information to home buyers and occupants, this practice is not universal and the quality of the information is not uniform across all areas.</p> <p>The focus of this project will be to provide a freely available template and an example of a best practice Home User Guide. This Home User Guide will be the standard practice for providing information to home occupants on how to operate their homes and ensure that integrated systems, such as heating and ventilation, are maintained and run correctly. It will be applicable to both new and existing homes.</p>
Project Team	<p>John Fingleton, Irish Green Building Council</p> <p>Cairn Homes, Cash Support</p> <p>Velux</p>

Project Title	Development and 3D Printing of Three Dimensional Reinforcement from Waste Composites for Concrete Structures (3DREDO)
Project Description	<p>The Project aims to combat the inherent lack of ductility in cementitious materials by employing an innovative approach that harnesses waste polymer and composite materials (Polypropylene, high density polyethylene, etc. reinforced with carbon and glass fibres) for the purpose of 3D printing customised three-dimensional reinforcements dedicated to enhancing concrete components.</p> <p>The project will create and analyse diverse three-dimensional reinforcement structures made of waste composites, including lattice formations and composite rebars, with varying structural parameters to optimise ductility and mechanical performance in cementitious components</p> <p>Through this approach, it also provides an opportunity to provide an avenue for repurposing plastic and composite waste materials, including discarded items from daily activities and large-scale industrial sources, within the construction sector, thereby enhancing the circular economy.</p>
Project Team	<p>Dr. Pouyan Ghabezi, University of Galway</p> <p>FutureCast</p>
Project Title	Automated QUALity Control System for 3D Construction Printing (AQUA3D)

Project Description	<p>Currently within the company partner of this proposed research project (HTL), quality control data for 3D Concrete Printing (3DCP) is manually collected and entered into print log sheets. This includes object parameters, ambient conditions, and information obtained from batch plants, pumps, and printers.</p> <p>This project aims to automate data collection using specialised equipment and storing the collected data in a centralised online database and dashboard.</p> <p>The proposed system will offer functionalities that enable automated data collection during the printing process, creating prompts for necessary input, recording timestamps for various events, and integrating sensors and monitoring devices for real-time environmental data. This system aims to streamline the quality control process, enhance accuracy, and enable data-driven decision-making. It will also provide a basis for future advancements, including machine learning capabilities for automated parameter adjustments based on predetermined criteria</p>
Project Team	Dr. Pouyan Ghabezi University of Galway Harcourt Technologies Ireland Limited HTL. tech HTL

Project Title	MOTOR-1 (Mobile Construction Robot Project – Phase 01)
Project Description	<p>This project will see the initial deployment of an Autonomous Mobile Robot (AMR) for construction industry process development. It will develop a framework for the deployment of autonomous mobile vehicles in a construction or manufacturing environment. This will involve initial training in AMR technology, a digital/virtual definition of the work environment, safe mobility operational zones and a specific designation of workspaces. The framework will also include a programming process for the robot arm and end-of-arm tooling programming steps, similar to the familiar static/track robotic system utilisation.</p> <p>The second half of the project will see the deployment of the AMR into industry where modular housing units or façade components are manufactured by Construct Innovate member Ecolux Modulars. This project will provide direct exposure to state-of-the-art automation fabrication technology for this industry partner including evaluation of the technology within their own process flows. Through this collaboration, the project will identify where the subsequent AMR R&D is required in this sector.</p>
Project Team	Dr. Noel Harrison University of Galway Ecolux Modular

Project Title	Leveraging the Role of PP Fibres in Maximising Adoption of 3D Concrete Printing Technology in the Irish Construction Industry
Project Description	<p>Printable concrete containing polypropylene (PP) fibres offers benefits such as crack control, structural integrity, and reduced shrinkage. PP fibre has been used for 3DCP with a limited dosage, however, there has been limited or no research to date on the utilisation of high dosages and lengths of PP fibres.</p> <p>Through this project, the PP fibres in conventional 3D Concrete Printing (3DCP) mix will be optimised with higher dosages and more considerable lengths. Tests will be performed to assess the performance of the 3DCP mix with the aim to provide improved crack resistance, structural integrity, reduced</p>

	material slumping, and design flexibility. Subsequently, the prototypes will be evaluated using the optimised 3DCP mix with PP fibre. By addressing the challenges associated with material properties and performance, the project contributes to the advancement and adoption of 3DCP in construction in Ireland and globally.
Project Team	Dr. Mehran Khan , University College Dublin Dr. Ciaran McNally, University College Dublin Harcourt Technologies Ltd (HTL)

Project Title	Commercialisation of Low Carbon Cements
Project Description	<p>The cement industry is said to account for 8% of global CO2 emissions and therefore, new ways to make cement are needed to help fight climate change. Strategies that contribute the most to emission reductions are enhancing the material efficiency (reduce the clinker/cement ratio through clinker substitutes) and developing novel cements of near zero emission.</p> <p>The proposed research applies cement chemistry and technology to produce low carbon cement, using industrial waste as the main raw material.</p> <p>Low-carbon cement designs to be tested in the laboratory to emphasise strength and long-term durability. They will also be tested on-site with the help of the industry collaborators on this project, who will attempt to integrate the new cements into their existing technology and batching chain.</p> <p>The validation of site application will promote the understanding and application of low-carbon materials in construction in Ireland. Longer term, it will promote low carbon, environmentally sustainable cements.</p>
Project Team	Dr. Sara Pavia Trinity College Dublin SISK, KILSARAN, FLI precast, ROADSTONE

Project Title	Developing an Environmental, Social and Governance (ESG) Methodology for Construction Industry
Project Description	<p>Irish companies are embarking on a journey towards net zero carbon. This requires a change in thinking and executing designs, solutions, products and services in the construction industry.</p> <p>This research project aims to investigate an ESG journey for a construction company that identifies the critical areas of focus to deliver services and products in a sustainable manner. The project will review the state-of-the-art in ESG approaches, identify best practice in ESG strategies relevant to the construction industry, develop a methodology for identifying ESG priorities, and demonstrate this methodology on a case study of a building façade developer (GLF Façades) setting a path to decarbonisation and sustainable construction products and services.</p> <p>The project will also develop an awareness campaign to build understanding and commitment among the company staff in respect to climate action and to include sustainability as a core value and also share this study and knowledge gained with the wider construction industry in Ireland.</p>
Project Team	Dr. Magdalena Hajdukiewicz University of Galway GLF Façades

Project Title	Investigating Polymers as Pipe-jacking Lubricants
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Project Description	<p>Microtunnelling, commonly known as pipe-jacking, has emerged as the preferred method of utility pipeline construction. Microtunnels are constructed by advancing a tunnel boring machine and a train of concrete pipes from a launch shaft. Friction between the embedded concrete pipe surface area and the ground can be reduced significantly by administering a lubricant (typically bentonite) into the overcut between the pipe and the ground, yet friction remains a challenge in longer drives.</p> <p>Polymers are used as lubricants in other areas of civil engineering, however no research has been conducted to date on the viability of such polymers in pipe-jacking. The project will explore the potential of polymers through testing in the University of Galway with potential for field projects to be undertaken by the industry collaborator if test results prove adequate.</p> <p>The overall aim of the project is to assess the potential of polymers to reduce skin friction (both background and stoppage-induced) in pipe-jacking contracts, thereby improving efficiency and reducing risk. Results will be disseminated to industry through workshops on project completion.</p>
Project Team	<p>Assoc. Prof. Bryan McCabe University of Galway Ward and Burke Construction Limited, KB International , Environmental Geotechnics Ltd</p>
Project Title	DECAR-CON: Decarbonisation of Construction Process for Buildings in Ireland
Project Description	<p>As part of the Building a Zero Carbon Roadmap, a number of actions were identified including (i) improve Carbon reporting from site activities and develop a strategy for zero carbon sites (ii) start to measure the carbon footprint of the construction process and to develop more accurate benchmarks for A5 module and (iii) Develop a roadmap for transition to fossil fuel free zero carbon construction sites by 2035.</p> <p>This project aims to address these issues through industry engagement to identify the carbon emissions associated with the process of constructing buildings in Ireland. The collected data from companies will be used for developing a roadmap with solutions for decarbonising a building's construction process. Furthermore, the data will also be used to inform the calculation of the embodied carbon associated with the life cycle (production, construction, use and end of life) of a building in Ireland.</p>
Project Team	<p>Dr. Paul Moran University of Galway Pat Barry , Irish Green Building Council , John Paul Construction Stewart Construction</p>
Project Title	DEEP-PHit: Evaluation of Deep and Passive House Retrofit Homes
Project Description	<p>The Irish government's Climate Action Plan (CAP) set retrofit targets for the residential sector with the EU proposing to move from nearly-zero energy buildings to zero-emission buildings by 2030. This will mean current building performance standards may be shifted to meet this requirement.</p> <p>The focus of this project is to evaluate the sustainability of homes retrofitted to the Passive House Retrofit Standard from an economic and environmental</p>

	<p>perspective to determine if they are a suitable pathway to move towards Zero Emission Buildings.</p> <p>The project will evaluate embodied carbon of homes retrofitted to SEAI 'deep' retrofit and Passive House retrofit standard and measure energy and IEQ performance of houses retrofitted to this standard. It will also conduct an environmental and economic life cycle assessment of homes retrofitted to SEAI 'deep' retrofit and Passive House retrofit standard to determine the sustainability of design solutions. Finally, the project will provide practical, applicable and usable research outputs (e.g. guidance documents, tools, reports, webinars, etc.) to communicate the outcomes of the project.</p>
Project Team	<p>Dr. Paul Moran University of Galway</p> <p>Helena McElmeel Architects, KORE RETROFIT, Passive House Association of Ireland (PHAI), Royal Institute of the Architects of Ireland (RIAI)</p>