

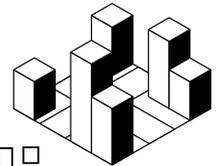
32 3.4 Number of Elements per 8m x 8m  
Number of Lifts per 8 storeys

68 6.7 Number of Elements per 8m x 8m  
Number of Lifts per 8 storeys

32 3.3 Number of Elements per 8m x 8m  
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24 3.0 Number of Elements per 8m x 8m  
Number of Lifts per 8 storeys

40 4.4 Elements per 8m x 8m  
Number of Lifts per 8 storeys



building  
**4.0** crc

2021

# ANNUAL REPORT

[building4pointzero.org](http://building4pointzero.org)



Australian Government  
Department of Industry, Science,  
Energy and Resources

**AusIndustry**  
Cooperative Research  
Centres Program

# BUILDING 4.0 CRC

Building 4.0 CRC officially began on 1 July 2020. This report marks the first 1.5 years of operation, of the CRC's seven-year tenure.

Building 4.0 CRC is an industry-led, research and development consortium co-funded by the Australian Government. The CRC aims to deliver tangible benefits for the building industry and the broader community through a range of initiatives, including innovative R&D projects, education, advocacy, policy, and regulatory advice and industry development initiatives.

Drawing on best-in-class industry, government, and research partners, the first 1.5 years of this collaborative effort have validated the high-level vision of the CRC: to demonstrate that the creation of a new industry-wide building ecosystem will deliver more productive, valuable, and equitable benefits to all stakeholders in the building industry, and to greater society. Through our vision we hope to transform the industry, facilitating change through new technologies and collaborative models. This acknowledges the need to radically lower environmental impact and deliver more efficient production processes, which the CRC proposes will lead to better buildings.

## OUR PARTNERS

### COMMERCIAL INDUSTRY



### PEAK INDUSTRY BODIES



### RESEARCH AND EDUCATION



### VOCATIONAL EDUCATION AND TRAINING PARTNER



### GOVERNMENT



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# EXECUTIVE SUMMARY

Since launching in July 2020, Building 4.0 CRC has generated substantial achievements, not least of which was managing to launch and function during a global pandemic.

New processes, systems, and collaboration methods were developed and implemented to remain effective and operational within the “new normal” of virtual networks.

The CRC and its partners rose to the challenge, kick-starting 28 of 54 identified projects, awarding 17 PhD Scholarships, featuring in 69 publications, and holding discussions with at least 23 prospective SMEs, all in its first 1.5 years. Several of these projects are outlined in this report.

In this first Annual Report, we have captured our major achievements from the July 2020 - December 2021 period; a period of great uncertainty for business operation. Our work is presented across our four focus themes: **People, Practices and Culture**; **Sustainability**; **Industrialisation**; and **Digitalisation**.

We thank all of our partners for their efforts over the past 1.5 years, and congratulate them on their significant involvement in Building 4.0 CRC and our collaborative successes to date.



*“Projects are beginning to deliver impact – delivering real results to our partners and the wider industry.”*



*“Having now navigated the stormy waters of the pandemic, 2022 will be all about taking our organisation to the next level. We will come together to network and learn, and we will reach out – to government, to SMEs, to the wider industry... You will see the CRC boost its activities as an advocate and educator, as we assume our mandated position as a platform for change.”*

## Building 4.0 CRC major achievements

### Successful launch of Building 4.0 CRC

The CRC developed and kept its research and collaboration operations on track, despite the COVID-19 pandemic and associated challenges.

### Approx. 54 projects

These were either in operation, preparation, or formation. Total launched as at December 2021: 28

### Collaboration formed with the Advanced Manufacturing Growth Centre (AMGC)

AMGC's Prefab Innovation Hub aims to deliver productivity, sustainability, health and wellbeing, and safety improvements in conjunction with high quality design to the building sector.

### Research Capacity Guide

This Guide was devised for Building 4.0 CRC partners and launched at an online CRC event. Functioning as a directory, the Guide helps Industry and Government Partners to identify the capabilities offered by Monash University, the University of Melbourne, Queensland University of Technology, and Holmesglan Institute, thereby enhancing existing, or setting up new, project collaborations.

### 324 Masters level researchers worked with the CRC

24 at Monash University, 300 at The University of Melbourne.

### Building 4.0 CRC became a member of the Digital Twin Consortium

The consortium is a global ecosystem to accelerate the development, adoption, interoperability, and security of digital twins and enabling technologies.

### Executive, Board and Committees established and positions appointed

The Board comprises three Independent Directors, two Nominee Directors, the Chair, and CEO. Board Committees are the: Projects Advisory Committee (PAC); Audit and Risk Committee (ARC); and Nominations and Remuneration Committee (NRC). The CRC is also proud to have appointed the international and diverse Scientific Advisory Committee (SAC, <https://building4pointzero.org/meet-building-4-0-crcs-scientific-advisory-committee/>) and Industry Advisory Committee (IAC, <https://building4pointzero.org/building-4-0-crcappoints-industry-advisory-committee/>).

### 17 Building 4.0 CRC Scholarships awarded to our first PhD cohort

This includes 5 international students. All students accepted scholarship offers, with local students matched with Building 4.0 CRC projects.

### Chair of Building 4.0 CRC, Dr Bronwyn Evans AM awarded a Member in the General Division (AM)

Dr Evans AM appeared on the Queen's Birthday 2021 Honours List for her significant service to engineering, standards, and medical technology.

### Commenced partnership with Holmesglan Institute

Holmesglan is Victoria's largest Vocational Education provider. They've begun the process of curriculum expansion and development in the construction industry, through involvement and learnings from CRC projects.

### 69 publications and outputs emerged from CRC activities

These include: collateral (x2); manuscripts (x3); media releases (x3); news articles (x19); newsletters (x8); podcasts (x6); and presentations (x28).

### Several consortium partners are SMEs

More than half of the CRC's active projects involve at least one SME partner, including Ynomia, Utexture, M-Modular, and Ultimate Windows. A process was launched to capture interest from external SMEs interested in being involved, with plans commenced to formally introduce further SMEs at the end of 2021 via the “Elevator Initiative”.

### Several communication channels were established by Building 4.0 CRC including:

**Website:** <https://building4pointzero.org/>. Launched 2020, boasted 10,260 users in first financial year.  
**LinkedIn channel:** [/building-4-0-crc](https://www.linkedin.com/company/building-4-0-crc/). Launched in 2020, gained 508 followers in first financial year.  
**Newsletters:** 27 internal weekly newsletters issued to partners, followed by 9 editions of replacement publication, Building Culture.  
**Future Building Podcast:** 7 editions released, sponsored by Building 4.0 CRC, hosted by CRC CEO, Prof. Mathew Aitchison. Available on Spotify, Apple Podcasts, and Google Podcasts.

## PEOPLE, PRACTICES AND CULTURE

In the People, Practices and Culture focus area, we are looking to deliver balanced, fair, and customer-centric outcomes, and are effectively seeking to prepare the future leaders of the building industry. We aim to uncover real innovation, with the right governance, policy, and regulation in place to help ensure it is safe and compliant in its implementation.

We strive to achieve this through the following attributes:

- Design-Led (consumer-driven; customer-focussed; experience-based; human-centered design);
- Open, Diverse, Safe (ethical governance; collaborative; trustworthy; best practice; mutual regulation; mental health; wellbeing);
- Education and Training (fostering the next generation; future of work);
- Innovative (forward-thinking, aspirational, and intelligent; technology adoption; boosting R&D investment; continual improvement; long-term collaborative approach); and
- Regulation, Policy, and Better Governance.

### PROJECTS

#### #7 New Technologies – the Future of Work, Skills and Industrial Relations (IR)

A.G. Coombs Group, Holmesglen Institute, Lendlease Digital, Monash University, Queensland University of Technology, Master Builders Association of Victoria, The University of Melbourne

#### #12 VR/AR Technologies in Vocational Education and Training (Scoping Study)

Holmesglen Institute, Master Builders Association of Victoria, Monash University, Queensland University of Technology

#### #17 The Implications and Opportunities from Industry 4.0 for the Building Industry

AMGC, all CRC parties, Monash University, Queensland University of Technology, The University of Melbourne

#### #30 Critical Path IMPACT through Productisation

Lendlease Digital, Monash University, The University of Melbourne

#### #35 Prefab Housing Solutions for Bushfire & Disaster Relief

AMGC and Prefab Innovation Hub, Various Building 4.0 CRC Industry Partners, Monash University, The University of Melbourne, Queensland University of Technology



*"We're seeing a real gap in terms of what's going on in the industry and what we're actually training. The CRC provides an opportunity to really engage the cutting-edge technology, processes and procedures, to enable us to ensure that we train people for the future and of the past."*

DR ROSS DIGBY, SKILLS & TRAINING LEADER,  
HOLMESGLEN INSTITUTE

## CASE STUDY: VR/AR TECHNOLOGIES IN VOCATIONAL EDUCATION AND TRAINING (SCOPING STUDY)

### PROJECT: #12

#### DATE COMMENCED AND DURATION:

May 2021, 6 months

#### PROJECT LEAD:

Dr Ali Rashidi, Monash University

#### PROJECT PARTIES:

- Holmesglen Institute
- Master Builders Association of Victoria
- Monash University
- Queensland University of Technology

### OVERVIEW

Vocational Education and Training (VET) is a major part of Australia's education system. It is crucial to train practitioners with innovative technologies to gain fundamental skills in critical and creative thinking, ICT capability, and intercultural understanding for meeting Australia's future workforce.

Innovative vocational education based on Virtual and Augmented Reality (VR/AR) can provide initial skilling and help workers to retrain, as jobs and industries evolve. This project aims to explore the integrated utilisation of VR/AR technologies in the VET system. It seeks to define desirable extended reality technologies for design and development/evaluation of appropriate skills training platforms in building and construction, and will recommend how to effectively adapt these digital technologies (VR/AR) in vocational skills training for the building industry.

### OUTCOMES

The team has identified opportunities and challenges in the adoption of technologies in safety/skills training development and knowledge acquisition for vocational education and training programs in Australia's building and construction industry. This will ultimately lead to the design, development and testing of new extended reality technologies, or the adaptation of existing VR/AR technology, to guide vocational skills training in the building and construction industry.

### FUTURE PROJECT POTENTIAL

This project will enable VET researchers/educators to effectively use VR/AR technology in their teaching and training practices, and will help equip the trainers with a digital skills capability focused on the building industry. The resulting guide will provide a benchmark for future research, regarding the commercial implementation and continual improvement of VR/AR prototype development for workforce capacity improvement in building and construction.

The successful uptake of this digital skills capability by VET educators responds well to Industry 4.0 applications, and the results will also shed light on the opportunities for effective workforce capacity development in the Architecture, Engineering, and Construction industry.

*"As the world turns to digital, we must be prepared for the technical, social, and operational change that comes with it. The collaboration offered through Building 4.0 CRC is enabling MBAV, as a Peak Industry Association partner, to combine the skills and knowledge of our training leaders from the Building Leadership Simulation Centre and Holmesglen Institute, with research experts from Monash University and QUT, to build the innovation training ecosystem that will underpin Australia's future workforce capacity development in the building industry."*

PHILIP ALVIANO, SUSTAINABLE BUILDING ADVISOR, MASTER BUILDERS ASSOCIATION OF VICTORIA



## SUSTAINABILITY

The Sustainability focus area aims to deliver better buildings that operate efficiently, minimising the impact on the environment. In this approach, the whole building lifecycle is considered, and the ways by which we can reduce environmental impact are taken into account – from design through to demolition, and beyond.



*"The Green Building Council of Australia's recent report, 'Closing the performance gap in Australia's commercial office sector', shows that modelled energy performance of Green Star certified buildings is being achieved in the operation of buildings, as demonstrated by NABERS Energy ratings. The report's new research, funded by the Australian Government Department of Industry, Science, Energy and Resources, was peer-reviewed by Building 4.0 CRC's Dr Victor Bunster. His proficient and detailed review has confirmed that these findings are genuine; that our rating systems really do make a difference. Being part of the CRC consortium has many useful benefits! We will continue working in collaboration to find solutions for operationally and environmentally efficient buildings."*

HELEN BELL, RESEARCH MANAGER, GREEN BUILDING COUNCIL OF AUSTRALIA

We strive to achieve this through the following attributes:

- High-performance buildings (energy efficiency; reduced waste; intelligent and automated controls; better design);
- De-carbonisation (zero carbon footprint; how the industry works with other sectors);
- Healthy, Ecological (reduced toxicity; fostering bio-diversity; higher environmental quality); and
- Circular Economy (recycle and reuse; design for disassembly; self-sustaining, off-grid and autonomous).

### PROJECTS

#### #5 Automatic compliance and energy rating system

uTecture, Green Building Council of Australia, The University of Melbourne, Monash University, Queensland University of Technology

#### #11 Environmental Credentials for Building Technology Platforms

uTecture, Coresteel, Monash University

#### #18 Long-Span Low-Carbon Floor Systems

Lendlease Digital, Sumitomo Forestry, Monash University, The University of Melbourne

#### #27 Environmental Decision-Support for Structures

BlueScope Steel, Monash University, The University of Melbourne

## CASE STUDY: AUTOMATIC COMPLIANCE AND ENERGY RATING SYSTEM

### PROJECT: #5

#### DATE COMMENCED AND DURATION:

December 2020, 6 months

#### PROJECT LEAD:

Dr Philip Christopher

#### PROJECT PARTIES:

- uTecture Australia
- Green Building Council of Australia
- University of Melbourne
- Monash University
- Queensland University of Technology

### OVERVIEW

This project will transform the current process of energy compliance checks for new residential homes by integrating existing rapid digital building software with Australia's building regulation and performance assessment requirements.

The outcome is intended to be a fully integrated and seamless workflow with home design and subsequent implications, and energy performance assessment performed in real time.

To date, the team has investigated and summarised the National Construction Code thermal compliance requirements for detached homes throughout Australia and New Zealand. Key focal points included provisions for insulation and glazing in the different climate zones around Australia. To fully understand thermal compliance around Australia, this project also examined the building information needed to perform a Nationwide House Energy Rating Scheme (NatHERS) assessment as well as the Building Sustainability Index (BASIX) used in New South Wales.

The project then developed an engine to estimate the annual expenses and CO<sub>2</sub> emissions for uTecture designed homes, enabling consumers and designers alike to understand the cost and emission benefits of better performing homes and higher star rating appliances for heating and cooling.

Finally, recommendations were made to include the provision of embodied energy assessments into the software utilising existing databases and a bill of materials for the homes, to provide a more comprehensive whole-of-life assessment for new homes.

### OUTCOMES

The most significant findings include the opportunity that cloud-based computing provides for quick, accurate and accessible feedback on the energy performance of homes, throughout Australia, empowering consumers and designers to make informed decisions for new homes.

### FUTURE PROJECT POTENTIAL

The project findings will help to improve the construction industry by facilitating informed decision-making when it comes to design preferences and thermal performance of homes. Through the utilisation of cloud-based computing, coupled with both cost and emission assessments, people building their new home can choose their level of home performance, in real time, without the current significant costs and time required for a full home energy assessment.

The outcomes will benefit the community by empowering new build decision-making to ultimately drive the next generation of sustainable, energy efficient housing through accurate, timely and relevant information for consumers.

Ultimately, this project is the first step towards a more sustainable and automated energy assessment for homes in Australia, with future work in the pipeline to extend these capabilities to New Zealand and beyond.

*"The ability for people to better understand the energy performance of the home they choose to build in real time is a win-win for home buyers, the sellers, and the environment. This CRC project, and the industry-research-government collaboration that brought it to success, has been the first important step in a transformative journey for green buildings of the future."*

HELEN BELL, RESEARCH MANAGER, GREEN BUILDING COUNCIL OF AUSTRALIA



# INDUSTRIALISATION

The focus area, Industrialisation, aims to improve the processes around building and construction through introducing the principles of advanced manufacturing to the industry. This will help pave the way towards a more efficient, more effective approach to construction, with the potential for significant time and cost benefits.

We strive to achieve this through the following attributes:

- Efficiency (disintermediation; standardisation; automation; waste elimination; lean production principles; Industry 4.0);
- Process-oriented (product-driven; systematisation; increased safety; visibility of data and process);
- DfMA (advanced manufacturing; embedded regulation; end-to-end solutions); and
- Effective Supply Chain and Logistics (tracking, provenance and data collection; reduction in process "friction").



*"Bluescope can work with Building 4.0 CRC partners to look at the hybrid flash composite designs, and how products can work best together, to ensure sustainability and long-term building practices for our industry; continually improving in that space. We're also seeing digital platforms as a huge opportunity for us to all work together, and look at how we can work better and smarter. Projects run smoother where everyone has collaborated and worked together to give the best bits of everything that we do as an industry, bringing that together into one desired result. This process also introduces a more efficient, smarter and sustainable supply chain."*

NATHAN BLACKWELL, NATIONAL BUSINESS DEVELOPMENT MANAGER,  
BLUESCOPE AUSTRALIAN STEEL PRODUCTS

## PROJECTS

### #8 Prefab, Integrated Wall Systems - Scoping Study

Bentley Homes, Ultimate Windows, The University of Melbourne, Monash University

### #9 Implementing DfMA and Lean in Construction: Best Practice Guidelines through a Study of Building Services and Structure

A.G. Coombs Group, Lendlease Digital, Monash University, The University of Melbourne

### #10 Product Platform for Volumetric Building (Scoping Study)

Fleetwood Australia, Monash University

### #19 Hybrid Timber-Steel Structural Systems for Mid to High Rise Buildings – Phase 1 Scoping Study

BlueScope Steel, Hyne & Son, Monash University, The University of Melbourne, Queensland University of Technology

### #20 Systems and methods for robustness of mid-rise light gauge steel (LGS) buildings – Phase 1 Scoping Study

BlueScope Steel, The University of Melbourne, Monash University

### #23 When prefab hits the ground: Barriers and opportunities in the Australian housing market

Fleetwood Australia, Sumitomo Forestry, Monash University, Queensland University of Technology

### #25 Operational Excellence framework of steel fabrication and processing in the OSM and prefabrication sector (Phase 1)

BlueScope Steel, Fleetwood Australia, Monash University, The University of Melbourne, Ynomia

### #26 New materials for windows of the future

Ultimate Windows, Monash University

### #28 Componentised Internal Wall Systems for Multi-residential Applications

Lendlease Digital, Monash University, The University of Melbourne

### #31 Demystifying Volumetric Construction: A Study of the Bathroom Pod

Lendlease Digital, Monash University, Queensland University of Technology, The University of Melbourne

### #34 Acoustic flanking performance of mid-rise Light Gauge Steel (LGS) structures – Phase 1 Scoping Study

BlueScope Steel, Monash University, The University of Melbourne

### #42 Workflow Automation Tools for Home Designs Phase 1 Scoping Study

Bentley Homes, M-Modular, The University of Melbourne, Queensland University of Technology

# CASE STUDY: WHEN PREFAB HITS THE GROUND: BARRIERS AND OPPORTUNITIES IN THE AUSTRALIAN HOUSING MARKET

## PROJECT: #23

### DATE COMMENCED AND DURATION:

April 2021, 6 months

### PROJECT LEAD:

Dr Alysia Bennett, Monash University

### PROJECT PARTIES:

- Fleetwood Australia
- Sumitomo Forestry Australia
- Monash University
- Queensland University of Technology

## OVERVIEW

Traditional construction practices in Australia have been criticised for their focus on the reduction of upfront construction costs at the expense of quality, performance, and flexibility. However, current and emerging prefabrication processes could provide the efficiency and quality of construction to the traditional built-to-sell market, by incorporating the possibilities to cater for the recently developing built-to-rent sector, which shifts the housing profit model from capital gains to one based on ongoing rental income, with viability tied to minimising ongoing expenditure.

This scoping study seeks to examine the intersection of these assets and prefabrication processes, to identify opportunities for the housing and construction sector to reduce ongoing greenhouse gas emissions and increase the quality of stock.

## OUTCOMES

- There's no single solution or answer to address the barriers to scaling up prefabricated construction in Australia. A primary factor identified in international markets has been the facilitative role of changes to government policy, regulation, and taxation.
- There's a sweet spot at the intersection of prefabricated construction systems and government strategic planning ambitions in Australia: missing middle housing (e.g., townhouses, low-rise blocks of 2 to 3-bedroom apartments, duplexes, and granny flats). These typologies are highly desired by renters and owner-occupiers alike, and often enable the amenity and flexibility of a detached dwelling yet the economy of scale of an apartment block.
- State governments around Australia are interested in encouraging greater uptake of missing middle typologies on high amenity infill sites.
- Prefabrication of missing middle housing is particularly appealing for infill as it may facilitate shorter construction timelines and consequently minimise disruption on existing residents and businesses.

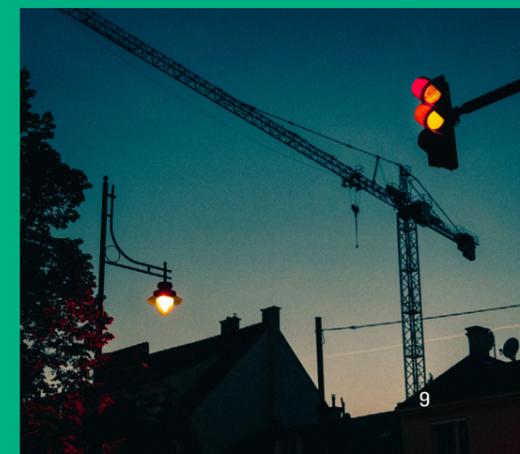
## FUTURE PROJECT POTENTIAL

- Multiple state governments are amending planning processes to accommodate the specificities of missing middle typologies to reduce the uncertainty of development approval. Greater certainty could facilitate an increase of investment in medium density housing, especially if supported by other financial and taxation incentives.

- Honing in on off-site construction opportunities in missing middle assets could provide a viable market for the prefabrication industry, with further potential to improve the speed and quality of construction in Australia.
- Focusing on these typologies could address the shortage of diverse, quality dwelling options in highly amenable locations across the country. This increase in the quality and durability of buildings would make cities safer and more sustainable for their communities.

*"Driving the continued expansion of prefabrication offerings, whether components or whole systems, has the potential to improve the speed and quality of construction in Australia. The resulting increase in the quality and durability of buildings offers communities a safer and more sustainable choice. We are pleased to be involved in the CRC consortium, the channel through which we can bring these ambitions to fruition."*

BRENDAN POPE, HEAD OF DESIGN & INNOVATION, FLEETWOOD AUSTRALIA



## DIGITALISATION

The focus area, Digitalisation, seeks to move us towards the digital world, and develop a faster, smarter, and more sustainable and responsive building industry. This area will help the building industry to utilise recent technological advances, techniques, and processes, and lead the industry into its future.

We strive to achieve this through the following attributes:

- Data-driven (transparency; data collection and analysis; visualisation, simulation and prediction);
- Connected (standard protocols; cyber-physical systems);
- Platforms and Systems (automation; disintermediation; explicit mapping of systems, processes and procedures); and
- Tech-enabled (Industry 4.0, cloud computing, IoT, sensors; smart contracts and Fintech; Blockchain and distributed authentication; robotics and automation).



*“The Australian construction industry is evolving to one harnessing digital technology and adaptive fabrication in order to improve safety, sustainability and productivity. Further to this, the pandemic has brought to life an opportunity to improve the way we design and assemble homes and buildings, by building on local design and manufacturing capability to improve product quality, speed to market and job creation.”*

DARYL PATTERSON, CHIEF PRODUCT OFFICER & HEAD OF DESIGN,  
LENDLEASE DIGITAL

### PROJECTS

#### #1 ePlanning and eApprovals – Scoping Study

Lendlease Digital, uTecture, Sumitomo Forestry, A.G.Coombs Group, Salesforce.com,Inc., Master Builders Association of Victoria, Victorian Building Authority, Victorian Government Department of Environment, Land, Water and Planning, Monash University, The University of Melbourne

#### #2 Automated tracking of construction materials for improved supply chain logistics and provenance – Phase 1 Scoping Study

BlueScope Steel, Holmesglen Institute, Lendlease Digital, Monash University, Queensland University of Technology, Salesforce.com,Inc., Sumitomo Forestry, Master Builders Association of Victoria, The University of Melbourne, Victorian Building Authority, Ynomia

#### #3 Projects to Platforms: Investigating New Forms of Collaboration – Scoping Study

A.G. Coombs Group, BlueScope Steel, Hyne & Son, Lendlease Digital, Monash University, Sumitomo Forestry, The University of Melbourne

#### #4 Computational Design and Optimisation Tools for Prefabricated Building Systems – Phase 1 Scoping Study

M-Modular, The University of Melbourne, Queensland University of Technology

#### #6 Field data collation to support real-time operational management

Lendlease Digital, Ynomia, Standards Australia, Monash University, Queensland University of Technology, The University of Melbourne

#### #12 VR/AR Technologies in Vocational Education and Training (Scoping Study)

Holmesglen Institute, Master Builders Association of Victoria, Monash University, Queensland University of Technology

#### #22 Generative design and BIM-based Design Automation methods for Steel Framed Buildings – Phase 1 Scoping Study

BlueScope Steel, The University of Melbourne, Queensland University of Technology

#### #46 Data analytics for structural fibre resources optimisation

Hyne & Son, Queensland University of Technology

## CASE STUDY: ePLANNING AND eAPPROVALS (SCOPING STUDY)

### PROJECT: #1

#### DATE COMMENCED AND DURATION:

March 2021, 6 months

#### PROJECT LEAD:

Dr Davood Shojaei, University of Melbourne

#### PROJECT PARTIES:

- Lendlease Digital
- uTecture
- Sumitomo Forestry Australia
- A.G.Coombs Group
- Salesforce.com, Inc.
- Master Builders Association of Victoria
- Victorian Building Authority
- Victorian Government Department of Environment, Land, Water and Planning
- Monash University
- The University of Melbourne

### OVERVIEW

Planning and building approval processes are still largely paper (PDF) based, which make them inefficient and time-consuming, imposing significant costs on both industry and government. The project team reviewed these processes in several jurisdictions in Australia and overseas, identifying major challenges across technical, legal and stakeholder requirements.

### OUTCOMES

A roadmap was developed that encompasses several projects and recommendations to move toward modern systems and speed up the overall process – effectively reducing processing time and cost. Systems can now be accessed that can provide initial assessment results and that facilitate the tracking of applications.

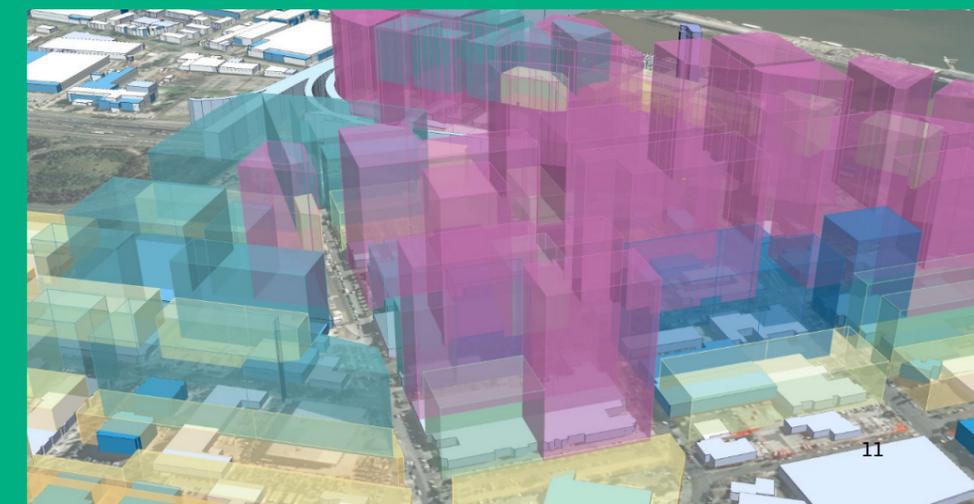
### FUTURE PROJECT POTENTIAL

Building 4.0 CRC ultimately aims to embrace the opportunities that digital workflow and digital twin technology provide to design, develop, and deliver an innovative and integrated digital platform to facilitate effective, efficient, and timely planning, building permits, approvals, ongoing compliance with planning controls, building regulations and other regulatory requirements. The new system also proposes a single source of information (point of truth) for both proposed and approved designs, upon which future policy, planning and regulatory decisions can be based.

The potential benefit to government and industry is significant, as well as that for the general public, who will save significant time and cost when acquiring early assessment results for their planning and building applications.

*“We conduct land development activities on a global scale. With the increasing needs surrounding property development, it makes sense that we have access to technologies that speed up the development process, while significantly reducing the cost. This project’s roadmap, to modernise the planning and building approval processes using digital technologies, and the proposed projects by the team, are introducing a new and innovative way to approach land and property developments. We’re looking forward to working in collaboration with Building 4.0 CRC to implement and lead this initiative in Australia.”*

RYO KABURAGI, NATIONAL BUSINESS DEVELOPMENT MANAGER, SUMITOMO FORESTRY AUSTRALIA





## TRANSFORMING THE INDUSTRY

In our mission to transform the building industry by delivering better buildings at lower cost, and the human capacity to lead the future industry, Building 4.0 CRC is ensuring that the right collaboration and engagement is occurring across the whole industry.

Plans to add to our already strong existing partner base will see the consortium further grow across our four key focus areas: people, practices and culture; sustainability; industrialisation; and digitalisation. To manage this effectively for both existing and potential partners, the CRC has implemented a Preferred Partner Strategy and an Elevator Initiative.

### Preferred Partner Strategy

Our Preferred Partner Strategy guides the process of identifying and recruiting new partners to the CRC.

We have considered a range of strong potential partners who have expressed interest in joining the consortium as members, or as project partners.

Our Industry Lead, Isaac Coonan, is leading the strategy, which now includes plans to develop an SME and Industry Engagement Platform – the Elevator Initiative.

### The Elevator Initiative

Our Elevator Initiative aims to accelerate the collaboration and adoption of emerging technologies and innovation within the property and construction industry.

The new initiative addresses a rapidly growing subsector of the building industry – property and construction technology ventures – and provides a support framework for industry to harness their technology and innovation.

Participating businesses will be invited to leverage the CRC’s extensive industry networks, research, and expertise, creating a collaborative platform to help drive the industry forward. In return, our existing CRC partners will be provided with a vetted network of emerging property and construction technology businesses that can contribute value to our core projects.

## PROJECTS

Below is a selection of Building 4.0 CRC projects that are already promising to make an impact.

View all Projects:

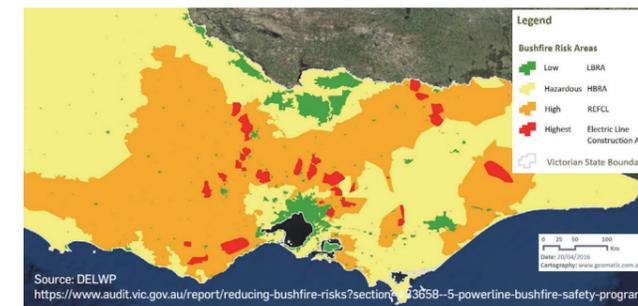


### #8 Prefab, Integrated Wall Systems – Scoping Study

Bentley Homes, Ultimate Aluminium Windows, The University of Melbourne, Monash University

Design of a high-performance wall system exceeding the performance of a 7-star dwelling.

<https://building4pointzero.org/projects/prefab-integrated-wall-systems-scoping-study/>



### #35 Prefab Housing Solutions for Bushfire & Disaster Relief

AMGC and Prefab Innovation Hub (Funding body), Various Building 4.0 CRC Industry Partners, Monash University, The University of Melbourne, Queensland University of Technology

Developing prefab housing designs that are fire safety compliant and resilient to different natural hazards, low cost, and sustainable, for both temporary and long-term accommodation.

<https://building4pointzero.org/projects/prefab-housing-solutions-for-bushfire-disaster-relief/>

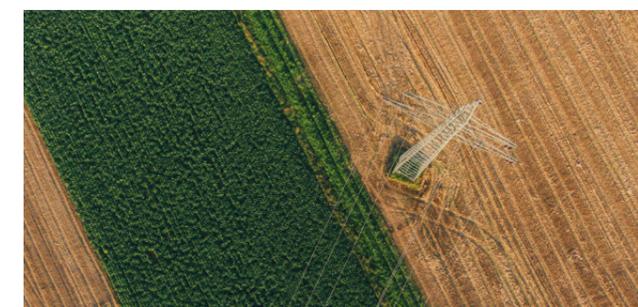


### #3 Projects to Platforms: Investigating New Forms of Collaboration – Scoping Study

A.G. Coombs Group, BlueScope Steel, Hyne & Son, Lendlease Digital, Monash University, Sumitomo Forestry Australia, The University of Melbourne

Examining construction’s disparate ecosystem to consolidate the broader network of actors through an examination of industry-wide business-level platforms.

<https://building4pointzero.org/projects/project-title-projects-to-platforms-investigating-new-forms-of-collaboration-scoping-study/>



### #18 Long-span Low-Carbon Floor Systems (Scoping Study)

Lendlease Digital, Sumitomo Forestry Australia, Monash University, The University of Melbourne

Laying the groundwork for developing a low carbon, suspended floor system capable of spanning 8m or more.

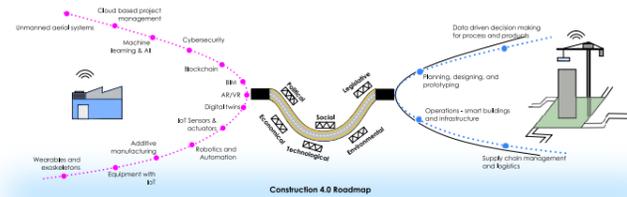
<https://building4pointzero.org/projects/long-span-low-carbon-floor-systems-scoping-study/>

## Lighthouse Projects

True to their namesake, Lighthouse Projects function as beacons looking towards the future direction of industry. With well-defined objectives and measurable outcomes, Lighthouse Projects address real-world problems, transforming outmoded practices and approaches. In simple terms, Lighthouse Projects not only clarify what needs to be done, but how to do it.

Building 4.0 CRC's Lighthouse Projects focus specifically on issues in building and construction, drawing from the vast body of in-depth research being conducted within the CRC. With the aim of developing and manufacturing physical prototypes and innovative, practical solutions, our Lighthouse Projects offer a unique opportunity to conduct targeted, industry-led research and development. Though there are several exciting Building 4.0 CRC Lighthouse Projects currently in development, we always look forward to hearing proposals for more...

**Contact: Dr Rachel Couper, [rachel.couper@monash.edu](mailto:rachel.couper@monash.edu).**

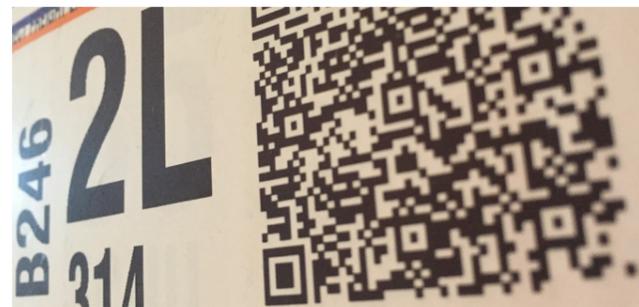


### #17 The Implication of Industry 4.0 for the Construction Industry: Towards Smart Prefab

AMGC and Prefab Innovation Hub (Funding body), Various Building 4.0 CRC Industry Partners (submissions and contributions will be received from all Industry Partners in the CRC), Monash University, The University of Melbourne, Queensland University of Technology

Developing a roadmap for Smart Prefab and Industry 4.0 for the broader Australian building industry.

<https://building4pointzero.org/projects/the-implication-of-industry-4-0-for-the-construction-industry-towards-smart-prefab/>



### #2 Automated tracking of construction materials for improved supply chain logistics and provenance – Phase 1 Scoping Study

BlueScope Steel, Holmesglen Institute, Lendlease Digital, Monash University, Queensland University of Technology, Salesforce.com, Inc., Sumitomo Forestry Australia, Master Builders Association of Victoria, The University of Melbourne, Victorian Building Authority, Ynomia

Investigating the building supply chain and assessing tracking technologies for sectoral appropriateness.

<https://building4pointzero.org/projects/automated-tracking-of-construction-materials-for-improved-supply-chain-logistics-and-provenance-phase-1-scoping-study/>



### #9 Implementing DfMA and Lean in Construction: Best Practice Guidelines through a Study of Building Services and Structure

A.G. Coombs Group, Lendlease Digital, Monash University, The University of Melbourne

Investigating the major challenges and opportunities for the effective implementation of DfMA and Lean production principles in construction.

<https://building4pointzero.org/projects/implementing-dfma-and-lean-in-construction-best-practice-guidelines-through-a-study-of-building-services-and-structure/>



### #11 Environmental Credentials for Building Technology Platforms

uTecture Australia, Coresteel Australia, Monash University

Developing an ISO-compliant Life Cycle Assessment framework to quantify and communicate environmental impacts using the uTecture and Airbuldr platforms as cases.

<https://building4pointzero.org/projects/environmental-credentials-for-building-technology-platforms/>



### #10 Product Platform for Volumetric Building (Scoping Study)

Fleetwood Australia, Monash University

Developing a common organisational product platform for Fleetwood's built solutions to improve production efficiency while driving flexible designs.

<https://building4pointzero.org/projects/product-platform-for-volumetric-building-scoping-study/>



### #27 Environmental Decision-Support for Structures

BlueScope Steel, Monash University, The University of Melbourne

Generating a knowledge base to inform the development of decision-support systems, supporting environmentally efficient building design.

<https://building4pointzero.org/projects/environmental-decision-support-for-structures/>

# EDUCATION & TRAINING



## Partnering with VET

As the rate of technological change increases and the number of products on the market continue to grow, there is a greater need for skilled and trained personnel to help integrate the new products, technologies, and processes and 'make them work'.

Building 4.0 CRC partner, Holmesglen Institute, is developing a Skills and Training Plan that is focussing on an Engagement and Awareness Strategy for CRC partners. Led by Dr Ross Digby, the strategy will enhance our partners' understanding of how they can engage the Vocational Education and Training (VET) sector, and how the sector can help implement findings, innovations, and products developed through CRC projects.

It is anticipated that, through such collaboration, research outputs could be integrated into the current and future training of trades people working in the construction sector. This means that the CRC could effectively influence the development of training package components and, as such, help to ensure that new products, technologies, and processes are adopted by the market with minimal risk of incorrect or inefficient use.

## Building 4.0 CRC's first PhD Cohort

We have welcomed our first cohort of PhD candidates to the team!

Comprising a mix of top-up scholarships and full scholarships, with five international candidates in the mix, we are looking forward to the pioneering initiatives and solutions that our first PhD students will bring to the consortium.

The successful candidates are learned in topics including Building Information Modelling (BIM), sustainable design, energy efficiency, resilient buildings, computational design, digital fabrication, innovative material practices, automation and robotics, and safety in construction, to name a few.

"Our students bring a wealth of diversity to the CRC through who they are, what they know, and what they're keen to learn. We look forward to working with them in discovering new innovations and bettering the building industry," said Dr Angela Solarte, the CRC's Research Education Leader.

View all PhDs on the Building 4.0 CRC website: <https://building4pointzero.org/people-partners/#phds>.

*"Their fresh minds, new ways of thinking, and eager spirits will ensure that we not only achieve our project milestones, but that we also position ourselves to lead the transformation of the building and construction industry into the future."*

DR ANGELA SOLARTE, RESEARCH EDUCATION LEADER, BUILDING 4.0 CRC

## Monash University



Ankit Shringi



Brandon Johns



Fernando Pavez

## University of Melbourne



Karen Tanfield



Marko Radanovic



Peyman Jafary

## Queensland University of Technology



Fereshteh Banakar



Nazli Soltanmohammadlou



Son Tung Vy

## Second round of recruitment now open

Building 4.0 CRC's second round of PhD Scholarships is open for application!

Twenty-two scholarships are available for students pursuing research higher degrees in line with Building 4.0 CRC projects. Full and Top-Up Scholarships, and project support funding, are available for eligible students.

Closing date for applications: Monday 28 February 2022.

More information and to apply: <https://building4pointzero.org/education-training/#careers>.



Kaveh Mirzaei



Mohaimdeen Islam



Rebecca Dickson



Rinu Ann Sebastian



Sajjad Eini-Zinab



Thais Goncalves Sartori



Tobias Kramer



Yussra Rashed



## Meet... Nazli Soltanmohammadlou

Nazli Soltanmohammadlou is a PhD student from Iran. Earlier this year, she was awarded a Building 4.0 CRC PhD Scholarship, and in December 2021, she will join us in Australia.

We asked Nazli a few questions about her work, and her upcoming contributions to the CRC.

### What inspired you to become a Civil Engineer?

I saw flexibility and diversity in this area of study. Civil engineers can work in a range of positions and projects, across technical and management areas.

### How did you become aware of Building 4.0 CRC and what led you to apply?

Over the years, I've been collaborating with many construction health & safety academics including the CRC's Dr Carol Hon (QUT) since 2017. This led me to Building 4.0 CRC.

### Please provide a sentence or two regarding what you intend to research in your PhD project: *A Sociotechnical System for Plant and Machinery Safety in Construction sites.*

I'm aiming to solve issues arising from workers and machines, to refine actions and better understand the impact of the research through relationships between project partners. My work will help improve construction safety – one of the KPIs for Australia's construction industry.

### How will your research make a difference to the CRC, and contribute towards the consortium's goals?

My research will help promote an efficient health & safety management system in Australia; also helping to achieve the CRC's quality and safety targets.

### What are the major changes you would like to see in the construction industry?

The application of appropriate construction technologies (e.g., safety technologies) in each stage of the construction process.

# AROUND THE CRC

Building 4.0 CRC is committed to excellence and inclusivity in all that we do. We're set up as a diverse international research centre, enabling us to draw on vast cultural knowledge and global industry insights to achieve the most innovative building outcomes for Australia, and around the world. It is this collaboration of brilliant minds, and our broad stakeholder network, that demonstrates we have the capacity and credibility to lead the building industry into its future.



### Building 4.0 CRC Chair awarded Order of Australia

Chair of Building 4.0 CRC, Dr Bronwyn Evans AM, was awarded a Member in the General Division (AM), appearing on the Queen's Birthday 2021 Honours List for her significant service to engineering, standards, and medical technology.

Read more: <https://building4pointzero.org/building-4-0-crc-chair-awarded-order-of-australia/>.

### The Team

The Building 4.0 CRC Team is made up of:

- A 7-person Board, which addresses independence, skills and diversity;
- A highly diverse and skilled Executive Team, comprising financial, industry, research, project, education, skills and training, and media and communications expertise;
- 3 x Program Leaders;
- 3 x Research Leaders;
- A Lighthouse Projects Manager; and
- A Research Education Leader.

Our Leaders and Managers are all drawn from our Partner Universities. Meet the team: <https://building4pointzero.org/people-partners/>.



The Board (L-R): Nominee Director: Shane Murray; Director: William (Bill) Ruh; CEO: Prof. Mathew Aitchison; Independent Director: Jan Bingley; Chair: Dr Bronwyn Evans AM; Independent Directors: Steve Gower, Theodora Elia-Adams.

### The Committees

Building 4.0 CRC has set up the following committees to provide guidance with strategic project selection, building regulation and policy, industry transformation in building and other industrial sectors, and R&D expertise. The committees ensure our research and development is strategically appropriate, at world standard, and pointing the industry in the right direction, and help the consortium link into relevant opportunities and initiatives.

#### Board Committees:

- Projects Advisory Committee
- Audit and Risk Committee
- Nominations and Remuneration Committee

#### Non-Board Committees:

See opposite

#### Industry Advisory Committee (international):

-  Bronwyn Weir
-  Geoffrey London
-  Selina Short
-  Pamela Bell
-  Jerker Lessing
-  Steve Holzer

#### Scientific Advisory Committee (international):

-  Prof. Anne Beim
-  Prof. Andrea Chegut
-  Prof. José Torero Cullen
-  Prof. Martin Rudberg
-  Prof. Lars Stehn
-  Prof. Andrew Whittaker.

### Thank you, Dr Bill Humphries

From the beginning, we were very fortunate to have had Dr William (Bill) Humphries on board as our Industry Manager. Bill helped to prepare the CRC bid and assisted with its establishment. His impressive track record in industrial R&D and innovation – with Bill having worked for over 20 years in high-level positions at CSIRO, as a research manager, and a scientist – saw him make a tremendous impact on the CRC's development. His engagement with our industry partners made sure they were deriving maximum value from the CRC, and, in this, was exemplary. We thank Bill for his valued contributions and commitment to the CRC and wish him an enjoyable, well-earned retirement.

We have since welcomed Isaac Coonan into the role of Industry Lead; more information: <https://building4pointzero.org/people/isaac-coonan/>.



### Communications & Media

Statistics from the past 18 months suggest that the CRC is successfully reaching its partners and broader stakeholders:

- 15,191 website users, 25,623 sessions (and 65,010 page views).
- 708 LinkedIn followers.
- 461 subscribers.

Our top three articles to date:

- Building 4.0 CRC welcomes its first PhDs!
- 10 more projects launched by Building 4.0 CRC
- Building 4.0 CRC consortium proposal uses new technologies to improve quarantine solutions

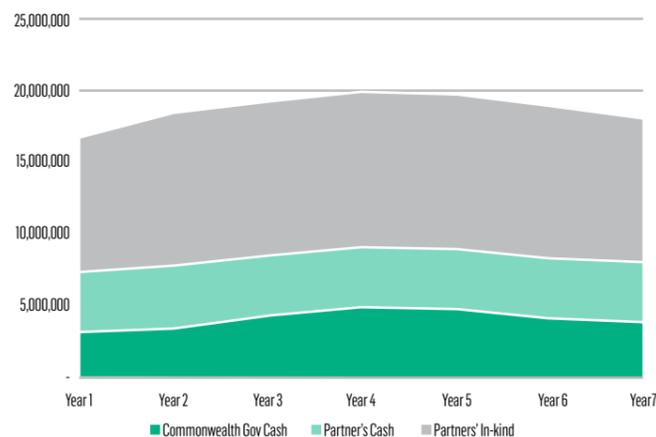
# FINANCIAL OVERVIEW

The CRC's annual financial statements, prepared for financial year 2020-2021, are audited and provided to the Commonwealth, ACNC, Members and partners. Scan the QR code for the first year's financial statements.



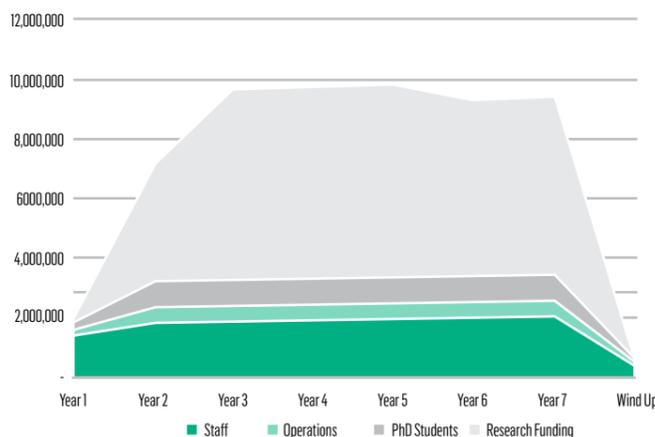
## Income over 7 years

Partners' cash and in-kind contributions leveraging \$28m in Commonwealth funding over 7 years.



## Expenditure over 7 years

The low flat fixed administrative costs and high investment in research over 7 years.



# FUTURE PLANS

Building 4.0 CRC is planning to return to its in-person events initiative, within its 2022 Engagement and Events Strategy.

We've heard the feedback from partners: the 2022 strategy will see the delivery of a CRC Partner Showcase (March 2022), an Annual Conference (September 2022), and ongoing workshops, panel sessions, topical events, and sessions that will involve partners and those within the broader building industry.

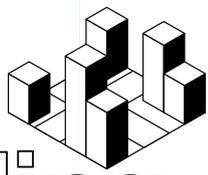
These events will continue to be supported by our media and communications channels, including internal and external newsletters, our website, and our LinkedIn feed. In addition to our Podcast, we've set up a YouTube channel, which will feature key content for our engagement and events initiative.

Visit our YouTube channel:



Finally, we look forward to continuing to grow our core business: initiating, developing and running collaborative research projects. We will also continue to train more students, welcome new partners, and seek new innovations, as we strive to lead the building industry into the future.

**If you are interested in being a part of Building 4.0 CRC's future, please contact our Industry Lead, Isaac Coonan: [i.coonan@building40crc.org](mailto:i.coonan@building40crc.org).**



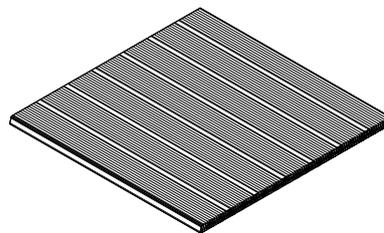
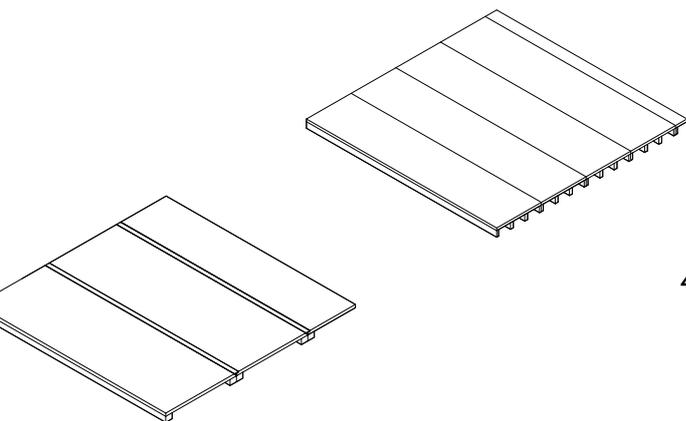
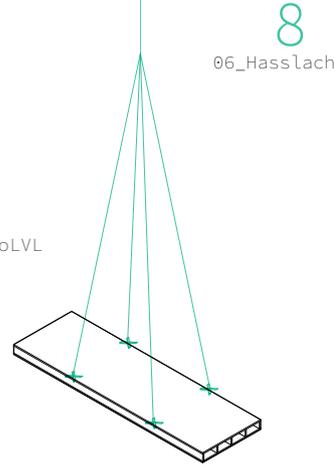
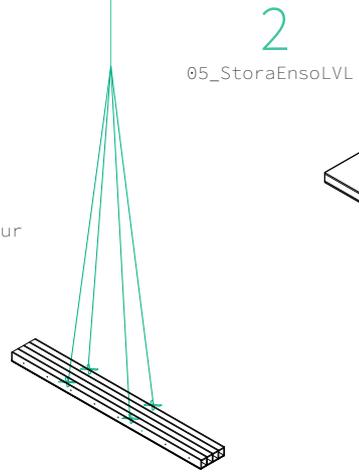
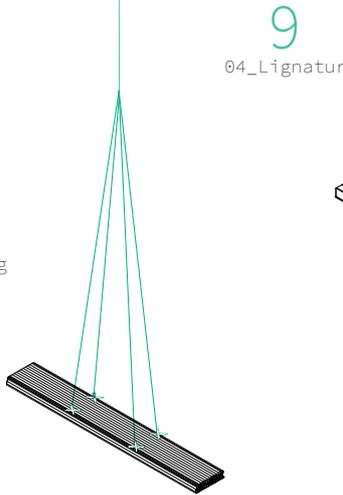
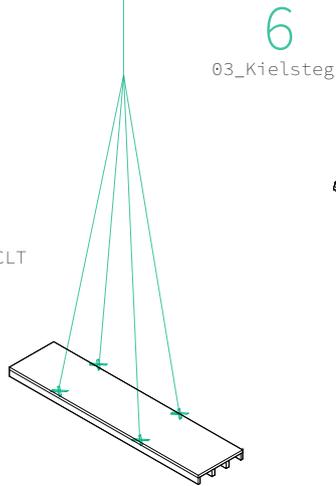
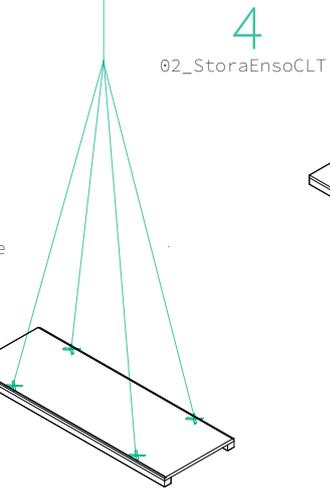
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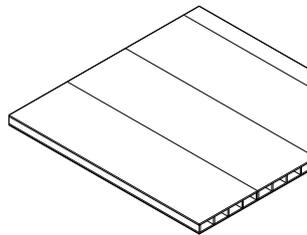
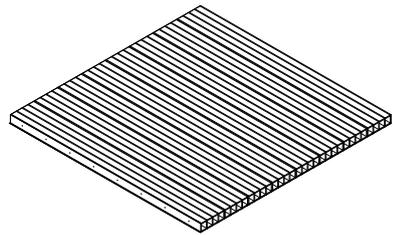
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 [www.building4pointzero.org](http://www.building4pointzero.org)

 [/building-4-0-crc](https://www.linkedin.com/company/building-4-0-crc)



56  
6.7 Number of Elements per 8m x 8m  
Number of Lifts per 8 storeys



24  
2.7 Number of Elements per 8m x 8m