

Prefabrication and Offsite Construction in Australia

Presented by
Damien Crough
Managing Director
Advanced Offsite

Founding Director & Board Chair
PrefabAUS

Industry Engagement
ARC CAMPH
Centre for Advanced Manufacturing of Prefabricated
Affordable Housing

Founding Board Member



prefabAUS



The Perception – Education facilities

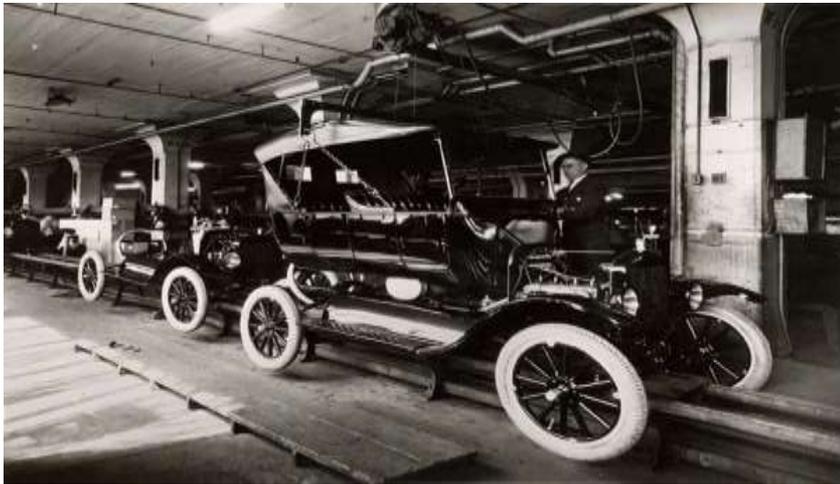
Prefabricated buildings have been viewed as temporary structures with poor build quality.



Changing a nations perception



Traditional technologies



chassis + cabin

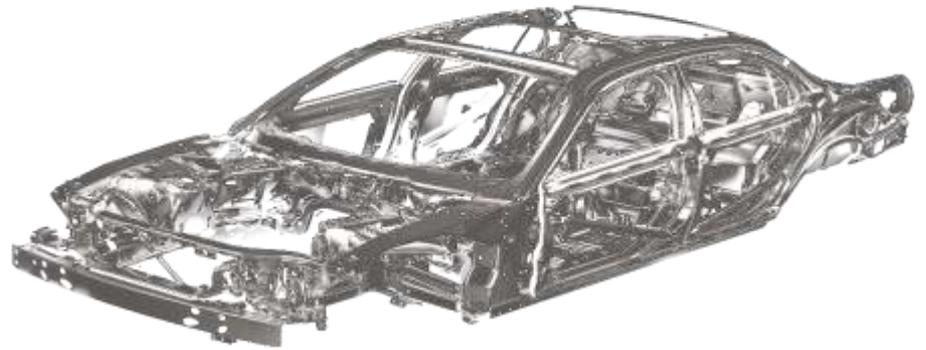


frame + fitout

Chassis evolves into a structural shell



chassis + cabin



lighter + stronger



Technologies are converging to produce integrated structural solutions across all industries





With Australian automotive manufacturing in decline, other industries can capitalise on the manufacturing skillset of:

- **Design & engineering upfront**
- **Procurement and JIT supply**
- **Proactive approach**
- **Focus on improved processes, automation and waste reduction**
- **Continuous innovation and R&D**

Transformational Technologies: Automotive to Building Applications



DfMA & BIM



ERP System automates activity and facilitates information flow

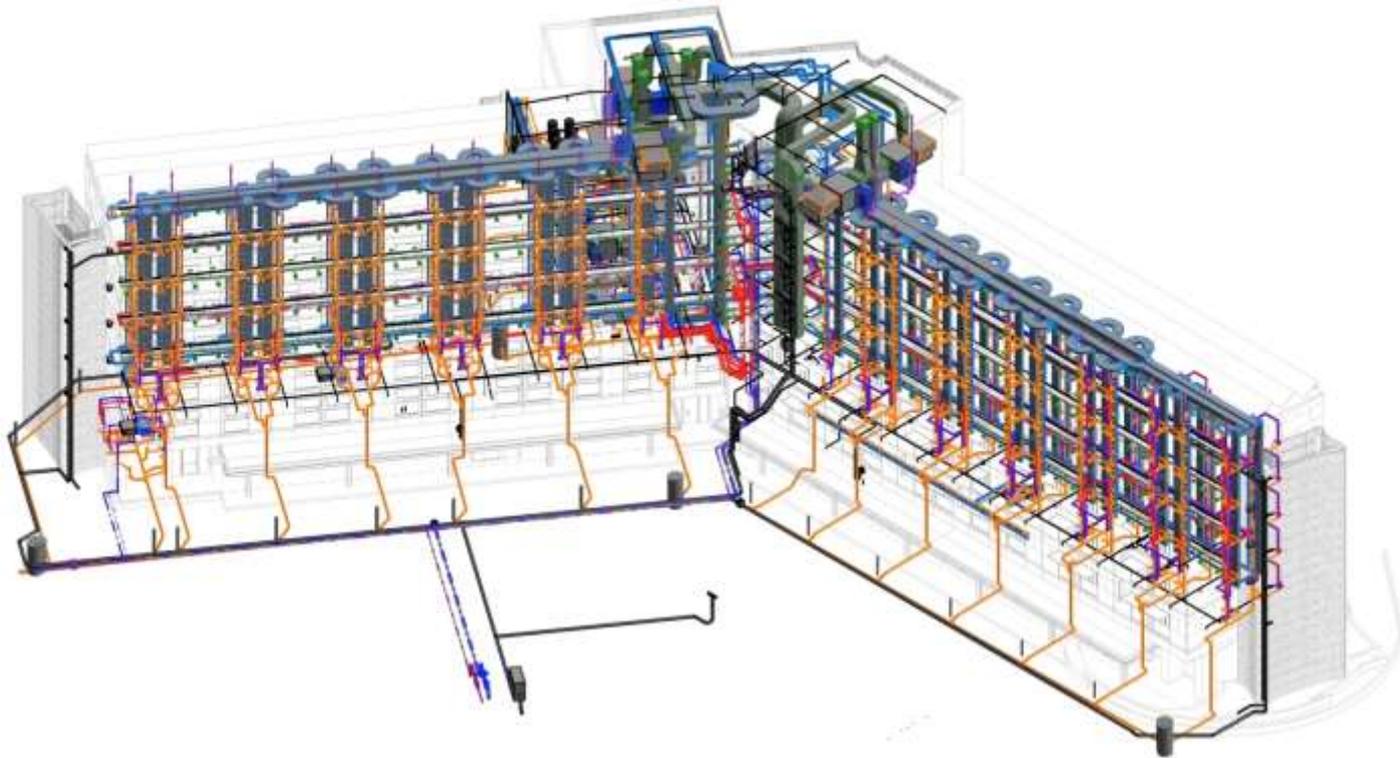
Enterprise Resource Planning (ERP)



Architect



BIM 5D - DfMA



Supply chain



Bill of Materials



Manufacture



Unit Assembly



Bringing automotive manufacturing technology and employees to the construction industry.



UB Technology – profiled panel system



Panel welding process



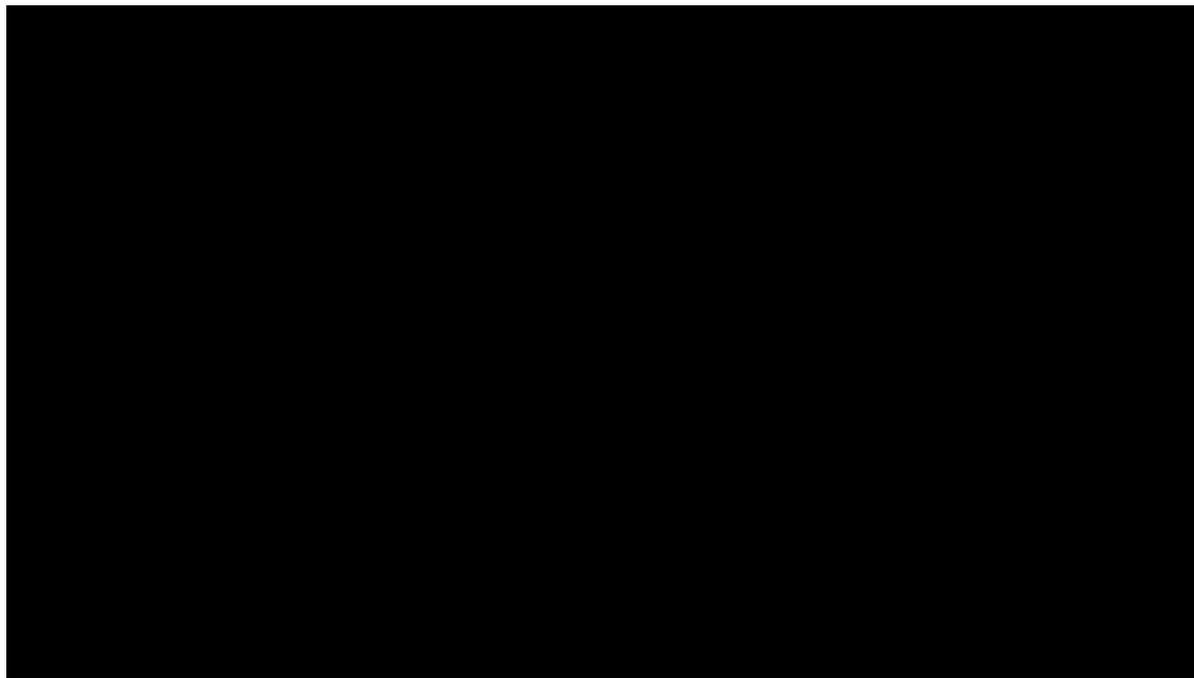
Completed panels placed into jig



Panels held in position and welded into a unit



Buildings can go up in days





PROJECT

Little Hero

ADDRESS

**16-30 Russell Place,
Melbourne**

MODULES

75

APARTMENTS

63

VALUE

\$12m



PROJECT
Pegasus

ADDRESS
**435-439 Whitehorse Rd,
Mitcham**

MODULES
92

APARTMENTS
50

VALUE
\$11.5m

PROJECT

The Nicholson

ADDRESS

**14-20 Nicholson St,
East Coburg**

MODULES

341

APARTMENTS

199

VALUE

\$50m





PROJECT
Centvm

ADDRESS
**100 Plenty Rd,
Preston**

MODULES
219

APARTMENTS
109

VALUE
\$21m

PROJECT
3:East

ADDRESS
**37-39 Bosisto St,
Richmond**

MODULES
63

APARTMENTS
57

VALUE
\$13m



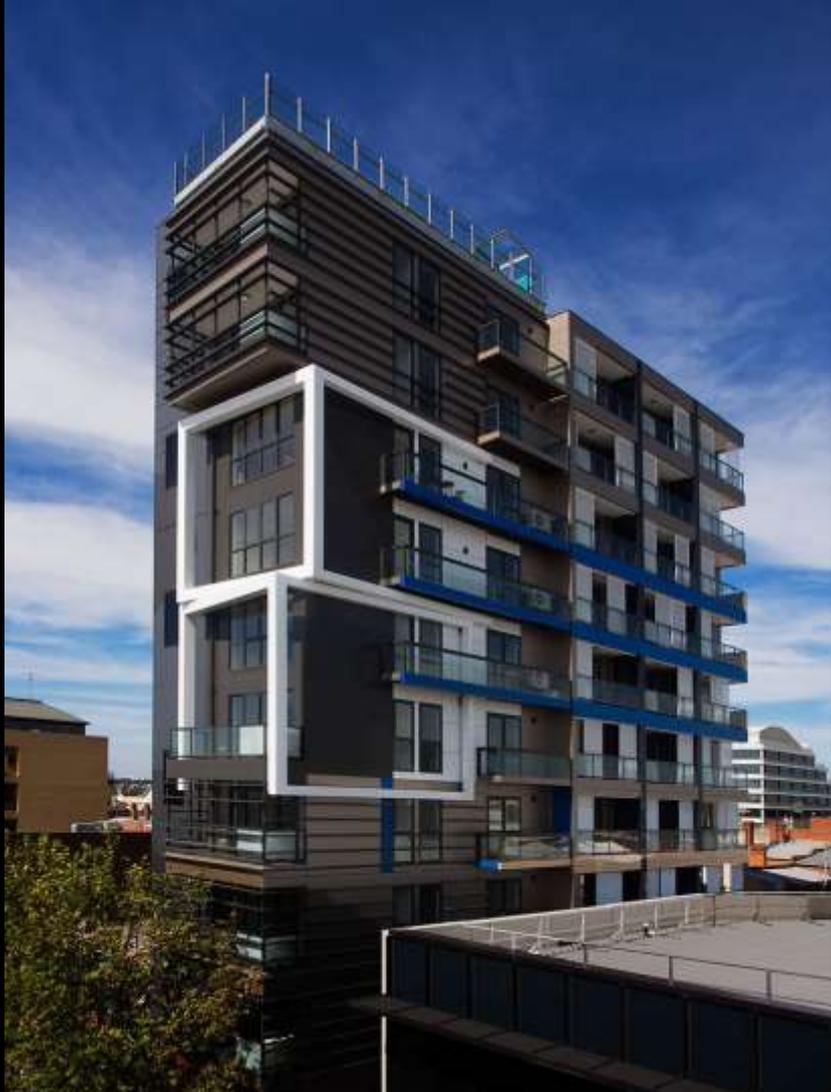
PROJECT
One9

ADDRESS
**19 Hall St,
Moonee Ponds Vic**

MODULES
36

APARTMENTS
34

VALUE
\$4.5m





PROJECT
The Schaller Studio

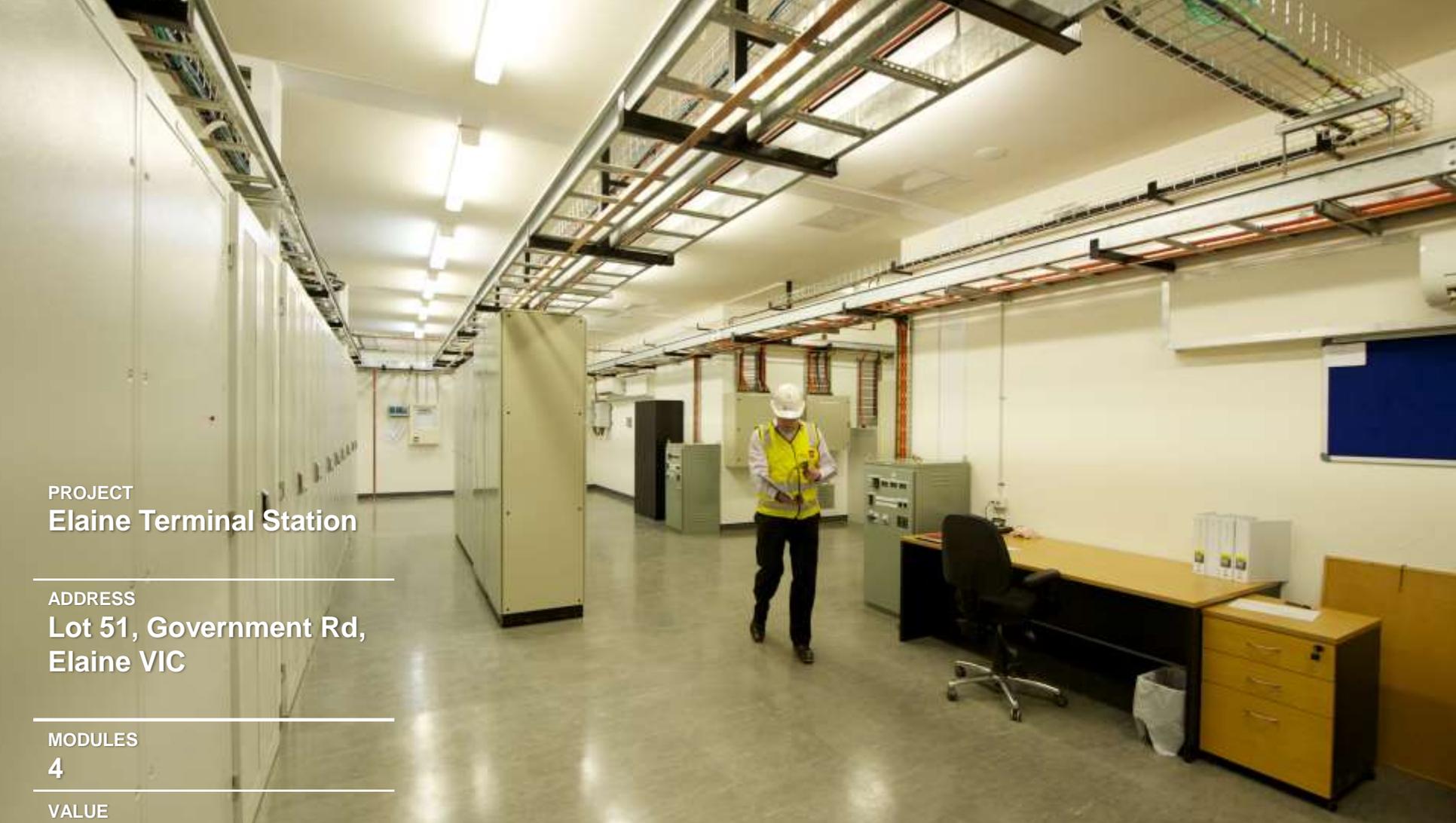
OPERATOR
Art Series Hotels

ADDRESS
**62 Lucan St,
Bendigo Vic**

MODULES
66

ROOMS
128

VALUE
\$14m



PROJECT
Elaine Terminal Station

ADDRESS
**Lot 51, Government Rd,
Elaine VIC**

MODULES
4

VALUE

A modern multi-story apartment building with a white facade, blue accents, and large glass windows. The building features balconies with blue railings and a prominent white structural element on the left side. The scene is set at dusk, with interior lights glowing and a blue sky. A blue car is parked in the foreground on the left, and several other cars are parked along the street. A green lawn is visible in the foreground on the right.

PROJECT
Stella Apartments

ADDRESS
17 Malata Cres,
Success WA

MODULES
96

APARTMENTS
77

VALUE
\$12.7m



PROJECT
Concorde South

ADDRESS
**10 Forrest Circle,
South Hedland WA**

MODULES

108

APARTMENTS

77

VALUE

\$26m



PROJECT
Duffy Primary

ADDRESS
**55 Burrinjuck Cres,
Duffy Act**

MODULES

10

VALUE

\$1.13m



PROJECT
Peppers Hotel

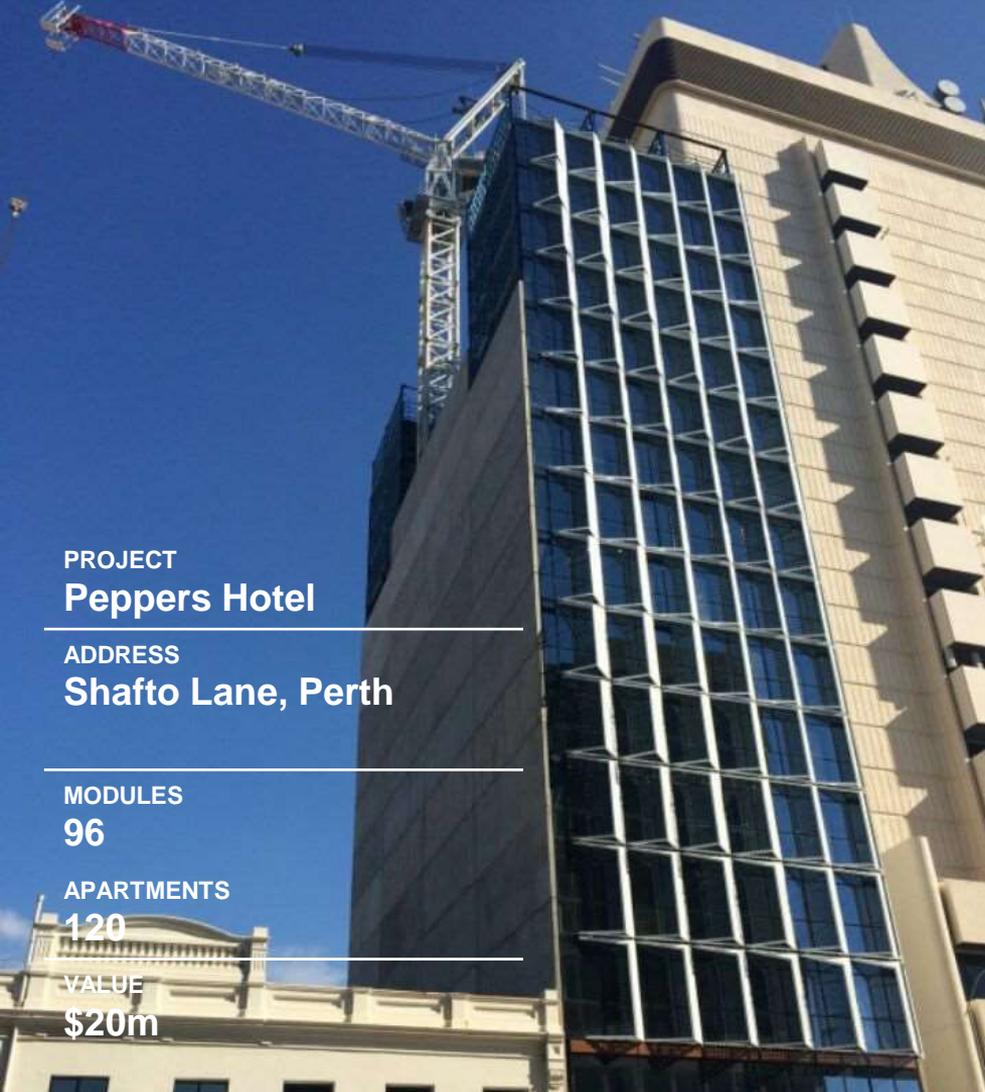
ADDRESS
Shafto Lane, Perth

MODULES
96

APARTMENTS
120

VALUE
\$20m



A tall building under construction. The building has a distinctive facade with a grid of white structural elements and blue-tinted glass windows. A large construction crane is positioned on top of the building. The sky is clear and blue.

PROJECT

Peppers Hotel

ADDRESS

Shafto Lane, Perth

MODULES

96

APARTMENTS

120

VALUE

\$20m





PROJECT

Latrobe Tower

ADDRESS

**323 Latrobe st,
Melbourne**

MODULES

306

APARTMENTS

205

VALUE

\$50m

A low-angle, nighttime photograph of a tall, modern building under construction. The building's facade is dark with some windows illuminated. A large white crane is positioned on the roof, lifting a large, rectangular, blue and white prefabricated module. The sky is dark and cloudy. The overall scene is dramatic and industrial.

PROJECT

Latrobe Tower

ADDRESS

**323 Latrobe st,
Melbourne**

MODULES

306

APARTMENTS

205

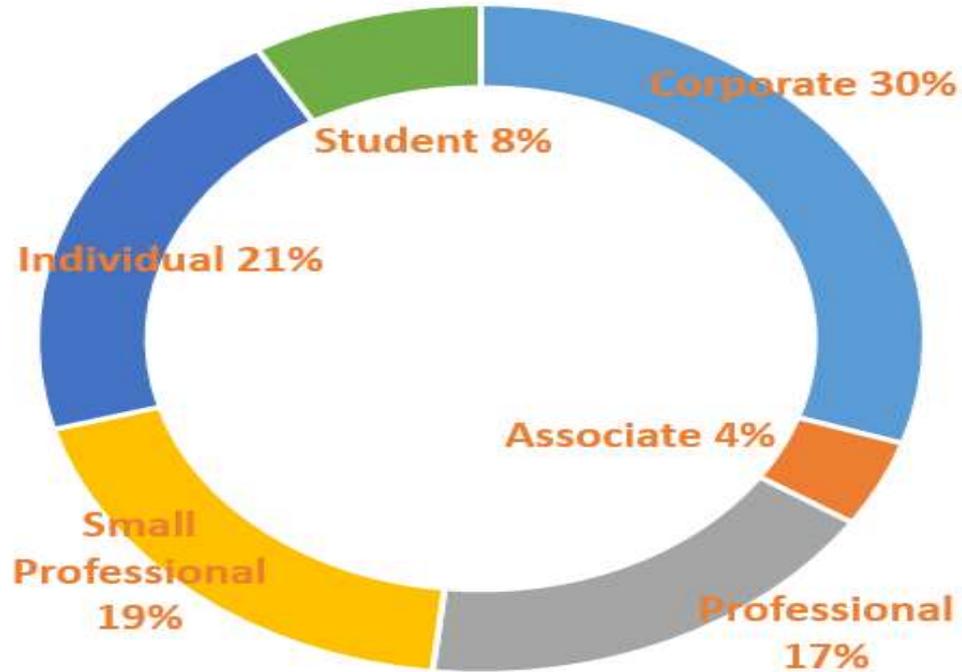
VALUE

\$50m

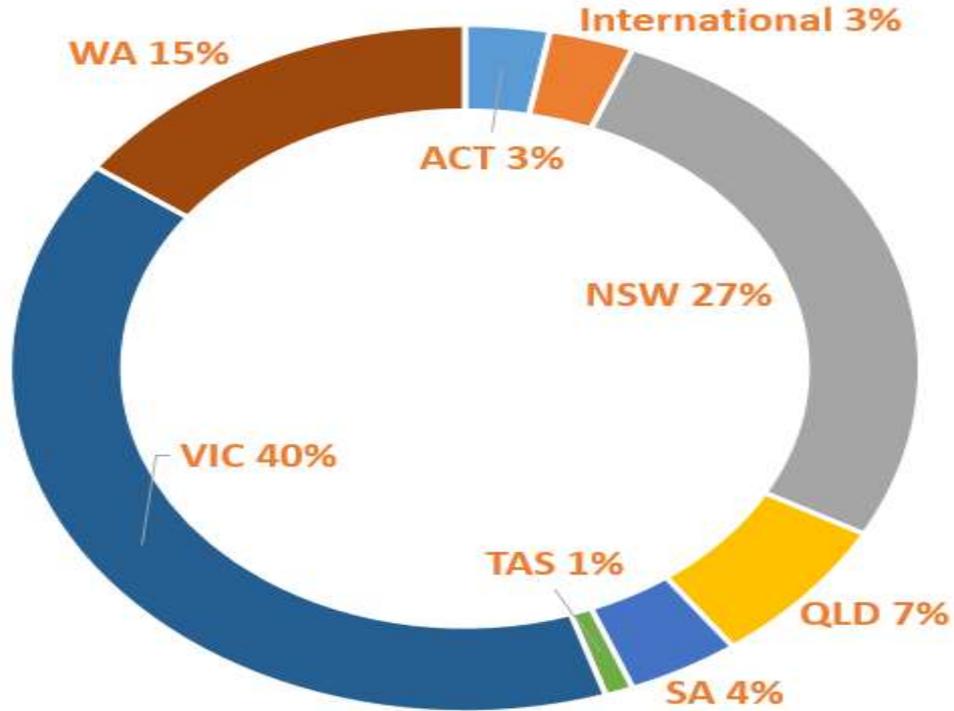
PrefabAUS primary objective

to represent, showcase and advance Australia's prefabricated building Industry through collaboration, innovation and education

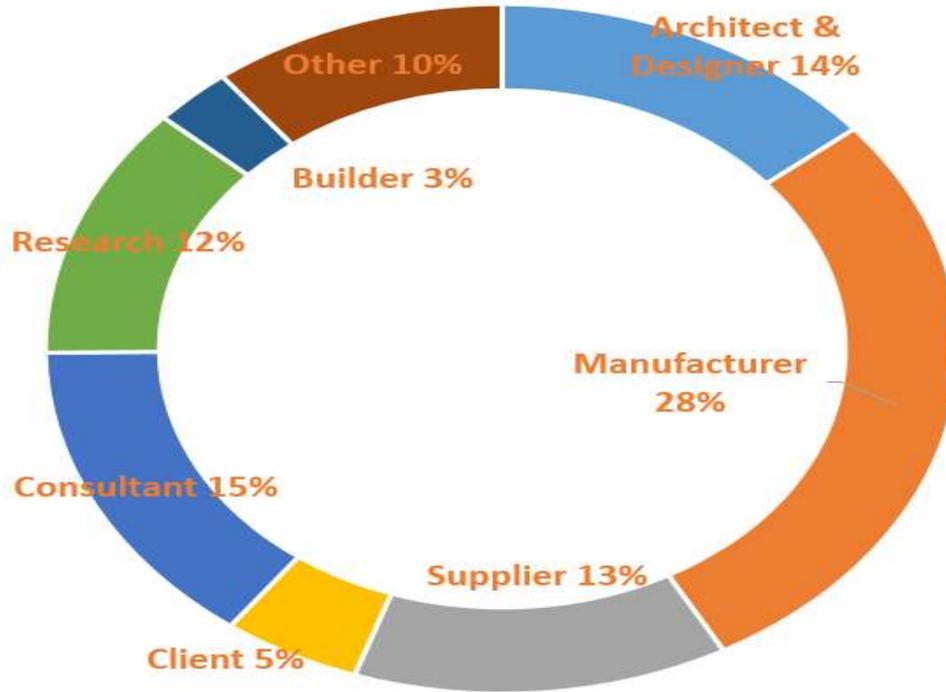
PrefabAUS membership: category



PrefabAUS membership: state



PrefabAUS membership: industry



PrefabAUS Members



New technologies /systems:

- **Timber Building System** – 20,000m² factory in Dandenong using Hundegger CNC machine to manufacture structural panels from NZ Tri-Board and post tensioned steel columns
- **Strongbuild** – Factory in NSW producing low-medium rise timber panelised
- **Impresa House** – 15,000m² Factory in Derrimut Victoria producing Timber panelised walls, floors and roofs using Weinmann German technology
- **Lendlease** – Factory in Eastern Creek NSW producing CLT timber panels and Bathroom Pods
- **Xlam** – Factory under construction in NSW to manufacture CLT

Timber Building Systems – St.Marys Project

20,000m² factory in Dandenong using Hundegger CNC machine to manufacture structural panels from NZ Tri-Board with post tensioned steel columns



Impresa House – factory online October 2016

15,000m2 Factory in Derrimut Victoria producing Timber panelised walls, floors and roofs using Weinmann German technology



The image is a screenshot of the Impresa House website. At the top, there is a navigation menu with links for HOME, ABOUT US, WHY, TECHNOLOGY, PROCESS, and CONTACT. The 'WHY' link is underlined. In the top left corner, the Impresa House logo is displayed, featuring an orange house icon above the text 'IMPRESA HOUSE'. The main visual is a large image of a factory interior where a worker in a white hard hat and a high-visibility yellow vest is operating a large industrial machine. Overlaid on the right side of this image is a 3D cutaway rendering of a modern, multi-story house, showing its internal structure and furniture. A white callout box with an orange circular icon containing a 'C' is positioned over the cutaway, with the text 'INTERMEDIATE FLOORS'. At the bottom left of the image, the word 'TECHNOLOGY' is written in large, bold, white capital letters. Below the image, there is a promotional text block.

TECHNOLOGY

© INTERMEDIATE FLOORS

**You've never seen prefab like this before.
We're introducing the world's most advanced
construction technologies to the Australian market.**

When it comes to prefabricated building design, Australia has lagged behind the rest of the world.
Here, prefab invites suggestions of cheap, unimaginative, cookie-cutter housing made of poor quality materials.

Strongbuild – Macarthur Gardens

Strongbuild – 7500m² Factory in Bella Vista, NSW producing low-medium rise timber panelised system with Randek equipment and processing of CLT panels



Prebuilt - PMC

In 2001, the founders of Prebuilt identified the need for well-designed, high-quality modular buildings that were a million miles from the archetypal boxes coming off production lines at the time.



Modscape - PMC

Modscape is an Australian owned and operated company that utilises the benefits of modular design and prefabrication to create architecturally designed, innovative sustainable homes and commercial projects.



Archiblox - PMC

The vision of an Architect and a Builder, ArchiBlox offers a genuine alternative to the Australian housing market. Beautiful, affordable and sustainable modular homes.



XLam – CLT Factory online in 2017



XLam Announces CLT for Australia

📅 22 May 2016

Australia's first Cross Laminated Timber (CLT) manufacturing plant will be built by XLam in the Albury Wodonga region, representing a \$25 million investment and creating 54 local jobs.

Announced today, the high tech sustainable timber facility will produce 60,000m³ of CLT each year, which is enough to construct the equivalent of one Forte Melbourne – Australia's greenest apartment building – every week.

CLT is a high tech alternative to concrete, made with sustainable plantation timber.

XLam has been manufacturing the innovative and versatile building material in New Zealand for five years and shipping it to Australia, in competition with European



PrefabAUS Members?



- Brookfield Multiplex
- Lendlease
- Mirvac
- Hickory Group
- ARUP
- James Hardie
- Hayball
- Wood & Grieve
- Buchan
- Rivergum Homes

PrefabAUS initiatives

- ARC Centre for Advanced Manufacturing of Prefabricated Housing
- Innovative Manufacturing CRC – Portal for Industry Transformation
- Centre of Excellence for Innovative Construction Technology
- Modular Construction Code development
- Recycled glass fines as replacement for sand in concrete
- Crumb rubber (car tyres) as replacement for aggregate in concrete



ARC Centre for Advanced Manufacturing of Prefabricated Housing

Unlocking the potential growth of Australia's prefabricated building industry

A/Prof Tuan Ngo, The University of Melbourne, Research Director of the ARC Centre of Advanced Manufacturing of Prefabricated Housing

Mr. Damien Crough, Chairman of PrefabAUS, Centre Manager of the ARC Centre of Advanced Manufacturing of Prefabricated Housing

ARC Centre for Advanced Manufacturing of Prefabricated Housing

- Funding was announced on 20th May 2015
- \$4 million from ARC over 4 years
- Supported by PrefabAUS
- ARC-CAMP.H will fund 6 Postdocs and 14 PhD students
- Four research programs
 - Program 1: Innovation in Design for Manufacturing and Assembly
 - Program 2: Advanced Building Systems and Assembly Techniques
 - Program 3: Sustainable and High Performance Materials
 - Program 4: Supply chain and Financing Innovation

Market, Problems and Opportunities

- Australian construction is a \$150bn industry (10% of GDP)
- Prefabricated modular housing currently contributes only \$4.6bn (3% of \$150bn) compared to 60-70% market share in many European countries. There is a huge potential for growth.
- 60,000 affordable dwellings will be required in Melbourne in the next few years, similarly Sydney will also need 80,000 housing units
- The prefabricated modular housing sector is expected to growth to 10% share (at least \$15bn) in the next 5 years
- Current construction industry: **low productivity, high cost, inefficient supply chain.**
- Lack of knowledge and skills in design & manufacturing of modular housing
- Lacks of standards, testing and certification methods, codes of practice, financial models for prefabricated modular housing.

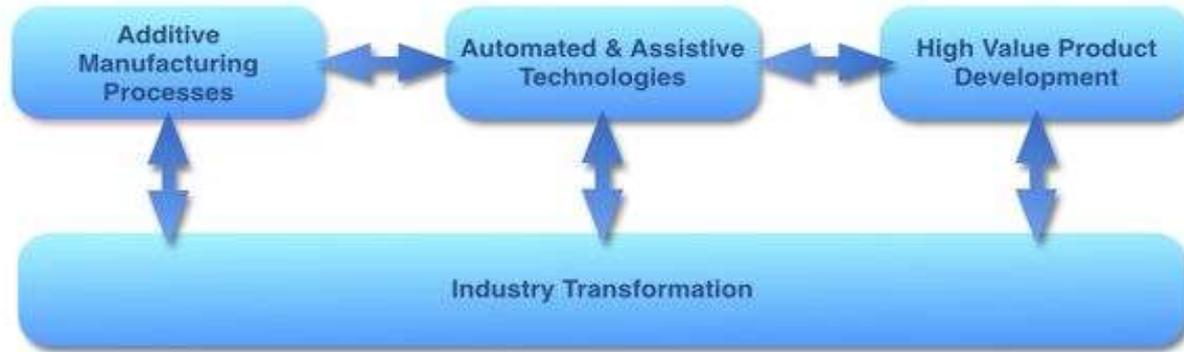


Innovative Manufacturing CRC

A collaborative venture between industry, government and researchers

1. Research Theme Integration

The Industry Transformation theme will provide the critical integrative element across IMCRC themes, ensuring structured and purposeful engagement with end-users to achieve maximum impact and public benefit. The research capability assembled by the IMCRC will ensure opportunities for diffusion of new enabling technologies are maximised and accelerated, operating as an enabler for other IMCRC themes.



IMCRC Integrated Themes

Technological diffusion must overcome a range of impediments experienced by SMEs particularly. The Industry Transformation theme will focus on improving businesses ability to recognise, absorb and apply knowledge and develop new capabilities, providing research services, and building collaborative networks.

Centre of Excellence Innovative Construction Technologies CEICT

An industry-led initiative to unlock the potential growth of Australia's building industry



Centre of Excellence Innovative Construction Technologies



- Assist **+30 SMEs** to **transform and innovate** in Off-site Construction and BIM
- Train/Upskill **+400** professionals in these areas
- Facilitate opportunities to create additional **+1400 jobs** in off-site construction in Victoria
- Supply chain involves workers and companies from both manufacturing and construction and the **transformation has commenced**



Automotive
Transition

High Performance
Materials

Innovative Building
Systems

Advanced Manufacturing &
Assembly Techniques



New jobs created
Up-skill old jobs

Affordable Housing
High quality

Improved Productivity &
Competitiveness

Centre of Excellence Innovative Construction Technologies

Project 1

Establish a Construction Technology Industry Forum;
A Knowledge Hub for BIM and Off-site Construction

Project 2

An Up-skilling and Job transformation platform for Construction

Project 3

A Testing, Compliance and Certification Network for Building Materials & Systems

3 Projects : 4 years : 5 goals

1. Improve industry's productivity and competitiveness by accelerating the adoption of BIM and off-site construction
2. Support innovation of building materials and product and facilitate export opportunities
3. Improve industry connectedness, strategic leadership, and supply chain efficiency
4. Upskill, job transition and knowledge transfer to SMEs
5. Solve product compliance and certification issues



Total Economic
Benefits:
\$500 M

Centre Targets

- Facilitate opportunities to create additional **+1400 jobs** in off-site construction
- Assist (and accelerate) **+30 SMEs** to **transform and innovate** in BIM and Off-site Construction **improving productivity and competitiveness**
- Train/Upskill **+400** professionals in these areas
- Promote off-site construction **up to 60%** faster
- **50% reduction in life cycle costs leading to affordable housing solutions**
- **Improved Environmental outcomes** (e.g. **80%** of site wastage is recycled; **50%** reduction in carbon emission; **70%** reduction in transport)



MODEL CODE FOR THE DESIGN OF MODULAR STRUCTURES



Instigators

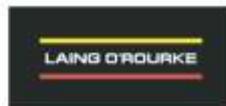


AUSTRALIAN STEEL INSTITUTE

ENGINEERS AUSTRALIA

prefabAUS

Principal Partners (Tier 1)

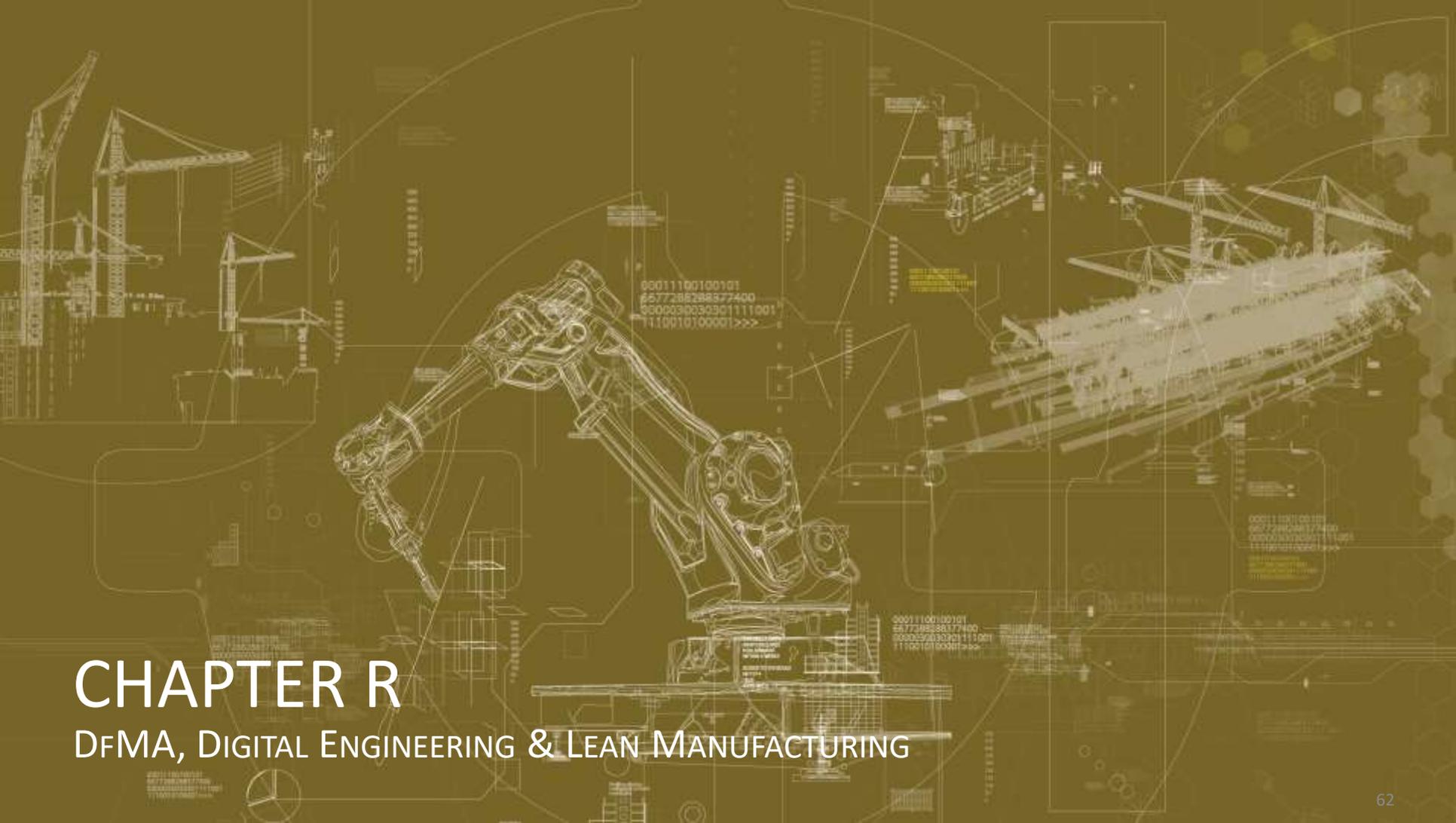


Supply Chain Partners (Tier 2)



Supporting Partners (Tier 3)





CHAPTER R

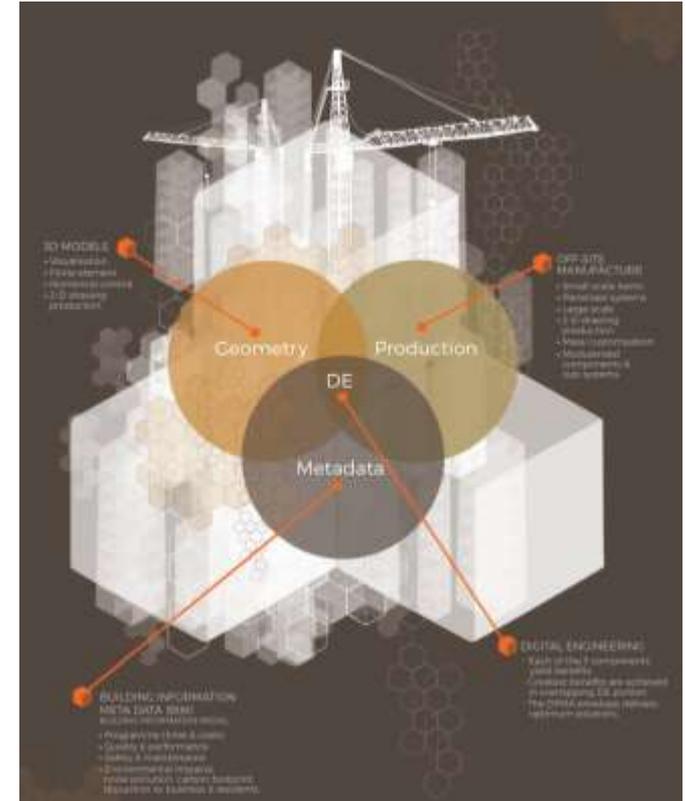
DfMA, DIGITAL ENGINEERING & LEAN MANUFACTURING



DfMA, Digital Engineering and Lean Manufacturing

Introduction

- Design for Manufacture and Assembly (DfMA) – requires consideration and understanding of each step of the supply chain & construction process
- Digital Engineering as delivery tools and processes
- Lean Manufacturing
- Basis of DfMA is virtual reality modelling
- The DfMA Envelope





DfMA, Digital Engineering and Lean Manufacturing

Design for Manufacture and Assembly





DfMA, Digital Engineering and Lean Manufacturing

Digital Engineering

- Building Information Modelling (BIM) software
- Enable inter-discipline & organisational interfacing
- Digital Design Process
- Digital Manufacture
- Digital Construction
- Operation & Facilities Management







imaginext
rivergum

IMAGINEXT

The establishment of Imaginext initiative at Tonsley, is focused on innovating new products and services, processes and design. Imaginext is a five-year, \$1 million commitment by Rivergum to collaborative research and development focused on:

- New Building systems and advanced technology
- Housing affordability – through smarter components, faster build times, reduced waste, strategic locations
- Employment – including apprenticeships, scholarships and work experience in association with leading training providers making strong use of state of the art TAFE facilities at the Tonsley campus
- Medium density/small lot solutions for transit corridors and strategic infill sites



TOWNLIFE LIVING, PLAYFORD ALIVE

This project comprises an innovative range of homes that have been specifically designed to take maximum advantage of the vibrant heart of Playford Alive. The government partnership with Renewal SA was formed to provide affordable housing choices and has produced South Australia's first small lot Torrens Title house and land packages from \$159,000 - \$209,000.

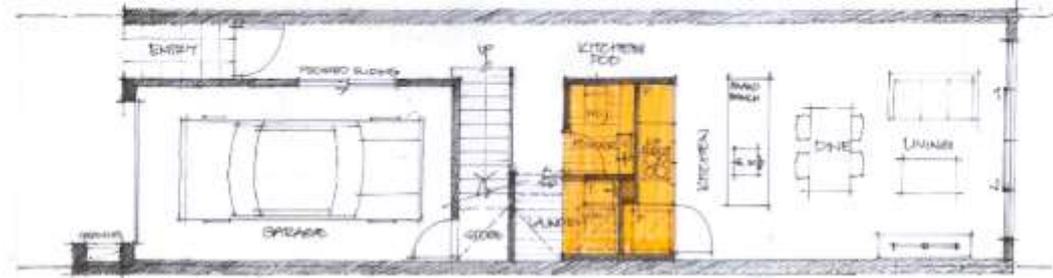


- Single and double storey options
- 1, 2 and 3 bedroom homes
- 4 interior colour schemes
- Turn-key property
- Automatic panel lift garage for 1 car
- Spacious open-plan

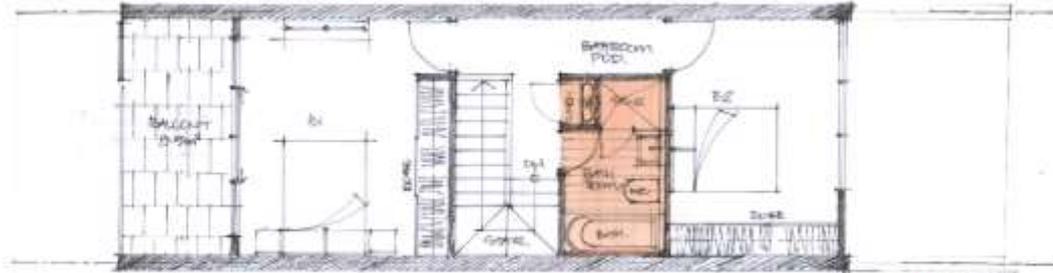




PRODUCT & DESIGN



GROUND
OPTION E



FIRST
OPTION E

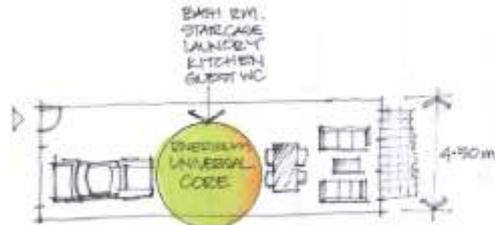


Typical floor plan option



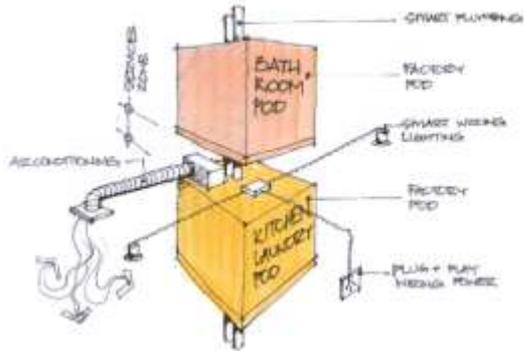


PRODUCT & DESIGN

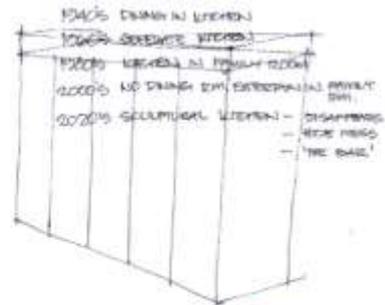


CARPENTRY
PLASTERBOARD
WATER PROOFING
PAINTS
PLUMBING
ELECTRICIAN
TILES
SHOWER SCREEN
FLOORING
GLASSY
AC + DRYWALL

universal core



KITCHEN EVOLUTION:



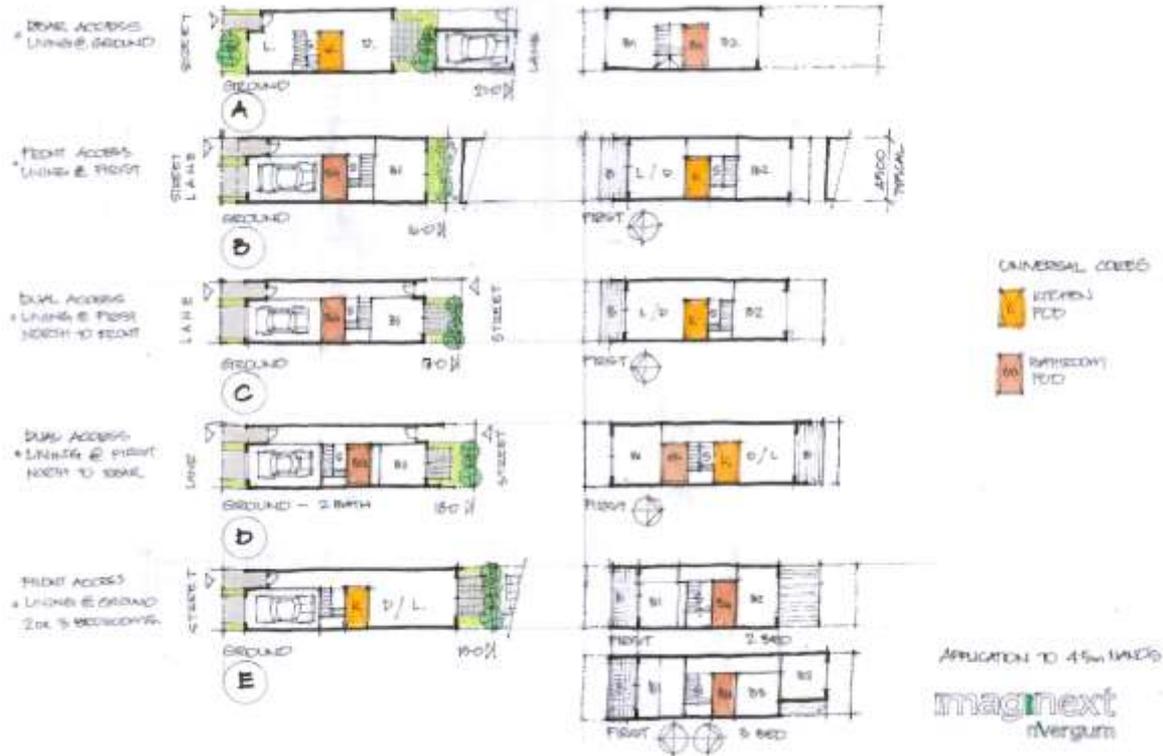
imaginext
rivergum

Philosophy

imaginext
rivergum



PRODUCT & DESIGN



Possible combinations

▶ PRODUCT & DESIGN

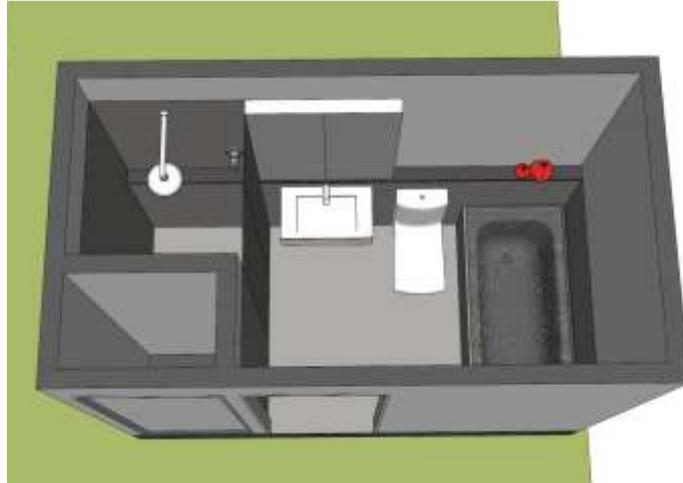


Kitchen pod

➤ PRODUCT & DESIGN



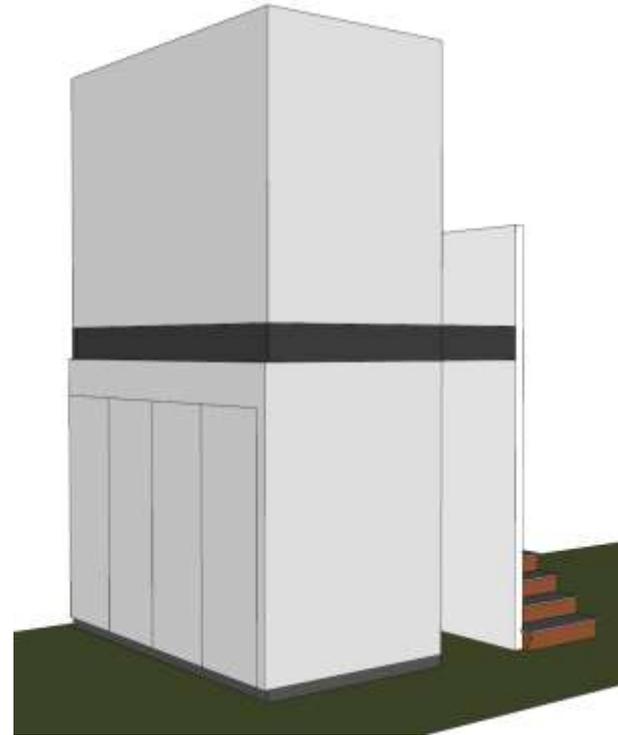
Bathroom pod



▶ PRODUCT & DESIGN



Combine pods





PRODUCT & DESIGN



Add Ground floor plate

➤ PRODUCT & DESIGN



Add First floor plate



imaginext
rivergum

PrefabAUS 2017 Conference

Melbourne, 11 - 13 September 2017

Day 1: Optional Site Visit Program

Day 2: Conference Program Networking Event (evening)

Day 3: Conference Program

www.prefabaus.org.au



Prefabrication and Offsite Construction in Australia

Presented by
Damien Crough
Managing Director
Advanced Offsite

Founding Director & Board Chair
PrefabAUS

Industry Engagement
ARC CAMPH
Centre for Advanced Manufacturing of Prefabricated
Affordable Housing

Founding Board Member



prefabAUS

