APAA 3D Printing Master Class

We will start from 18:00

Curago

AUSTRALASIA PROPERTY ADVISORY ASSOCIATION

PRINT m9ns

Acknowledgement

We would like to acknowledge the Wurundjeri people who are the Traditional Custodians of this Land. We pay our respects to Elders past, present and emerging.

AUSTRALASIA PROPERTY ADVISORY ASSOCIATION

PRINT UNION

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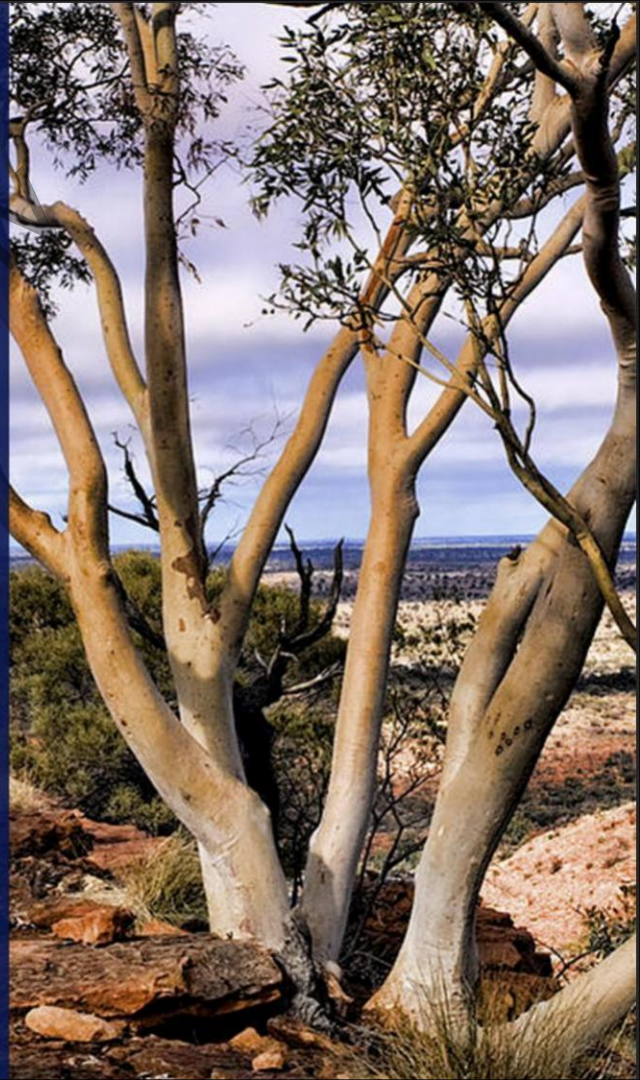

AUSTRALASIA PROPERTY ADVISORY ASSOCIATION

We are a not-for-profit organisation creating a community for property developers and multidisciplinary leaders that operate across the entire development lifecycle.

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Guests of Honor

Hemant Chaudhary

Founder and Managing Director,
Circular Economy Alliance Australia

Shu Guo

Founder of SGA Design

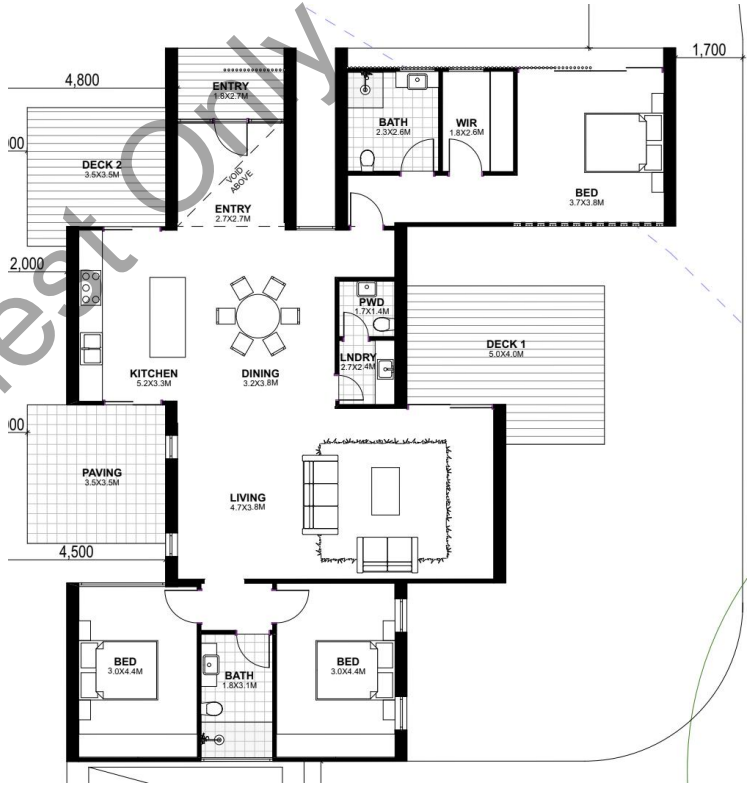
Lei Wang

Director, Print365

What is 3D Printing?

The action or process of making a physical object from a three-dimensional digital model, typically by laying down many thin layers of a material in succession.

3D Modular Printing House



Case Study-Construction Process

Standardised Design for window and door frame, kitchen and bathroom system

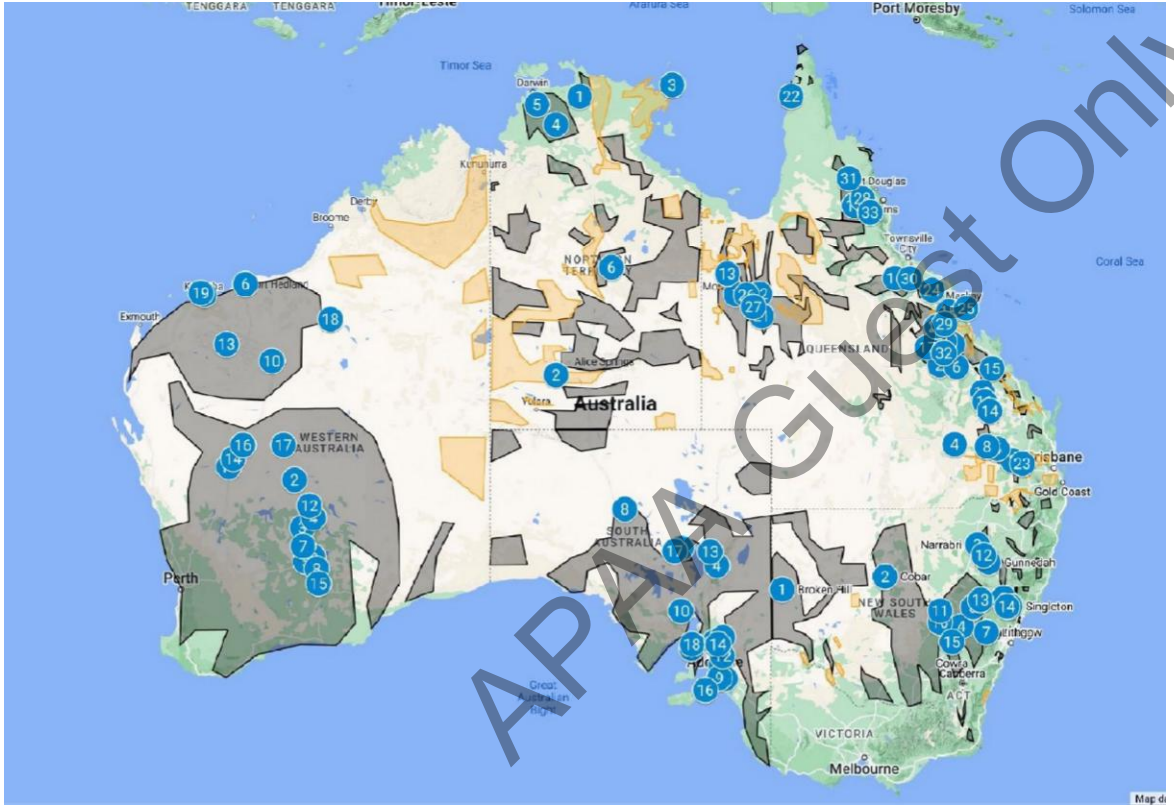
Characteristics of 3DP system

- High durability and stable structure
- 60% reduction on the skilled workers and labours
- Easy access of local material
  Target on the problem: A shortage of skilled labor and supply chain disruptions have led to a severe supply-demand imbalance in housing.

- Modular design and standardization system design aims to solve building material supply shortages and brings the benefits of fast installation

- 80% reduction of construction time and 40% reduction in capital costs

Market Opportunities



- The target market includes government and socially subsidized housing in remote areas, regular residential housing, and small commercial properties.
- Remote areas refer to the outskirts, remote regions, and extremely remote areas of the capital cities in each state of Australia. They are collectively referred to as 'remote areas'.
- Government supports and high acceptance of new housing type
- Relatively low Land value compared to the capital city

Market Opportunities

Despite the federal government pledging a million new homes in the next five years, Australia is still on track for a shortfall of more than 106,000 homes.

- According to RCV, an estimated 87,400 new homes need to be built in regional Victoria in the next 15 years alone.
- An extra 227,000 social homes need to be built in regional Australia just to meet the demand of today
- According to Aboriginal Housing Office (AHO) Budget
  $550,000 AUD Capital Costs
  $400,000 Maintenance and Insurance
  200 new houses and renovated 260 housing units statewide in regional NSW

Market Opportunities

Commercial housing or short-term rental properties also face serious supply-demand imbalances.

Demands come from those who frequently travel to and from mining areas and for conferences. They often face a situation where there are no rental properties available. Regional Vacant rate is about 1.2% (Australian Bureau of Statistics, Sep 2023)

- miners
- management personne
- various short-term contract engineers and technicians
- government officers
- consultants and contractors

The Design of 3D Print Buildings

Methodology, Permits and Potentials

The Design Brief

To Create a modularised solution that covers as broad type of buildings in remote area with as less and simple modules as possible.

Buildings in Remote Areas

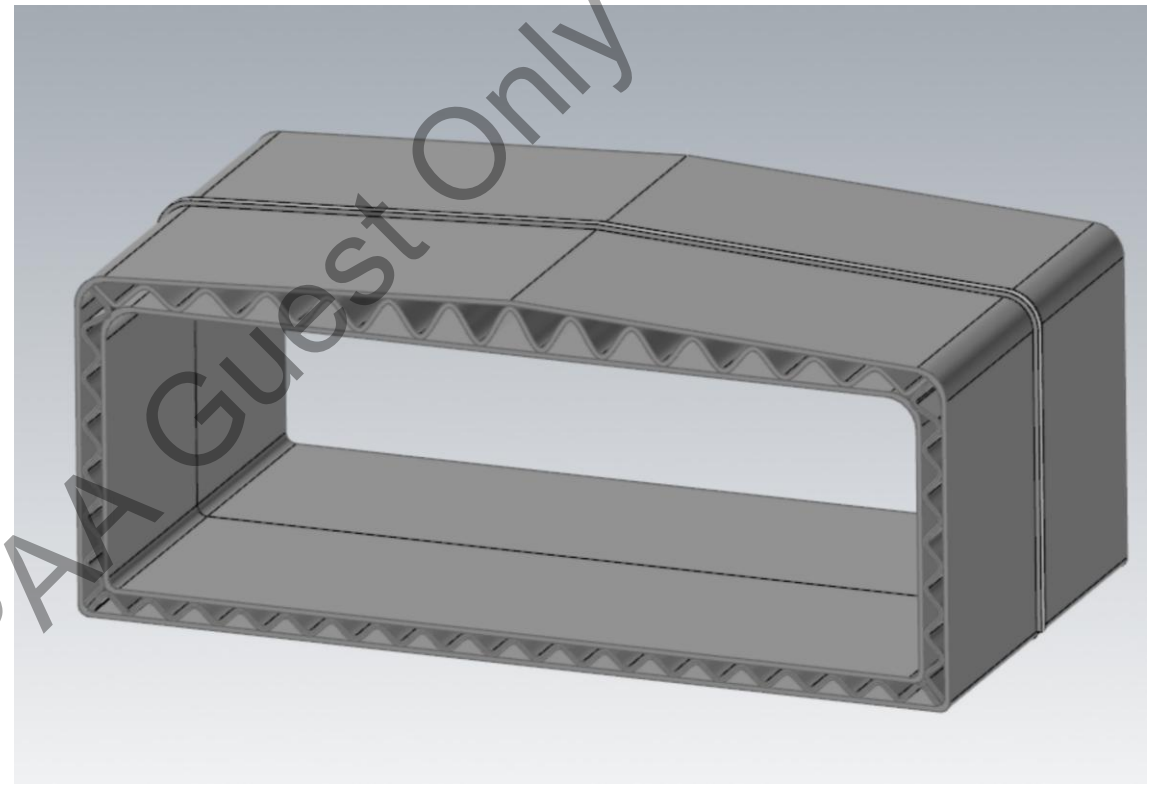
The Common Characteristics

- Residential houses, community houses, motels, ERA's, childcares, clinics, milkbars, small community centres, post offices …

  - Single storey
  - Ceiling height no taller than 2.7m

The Solution

- A D-shaped module constructed by a parallel truss system.



The Benefits

Structurally sturdy with strong compression resistance and tensile strength.

Relatively **lightweight**.

Excellent **acoustic and thermal performance**.

Two no. of full width + full length **openings**, offering great design flexibility.

Case Study

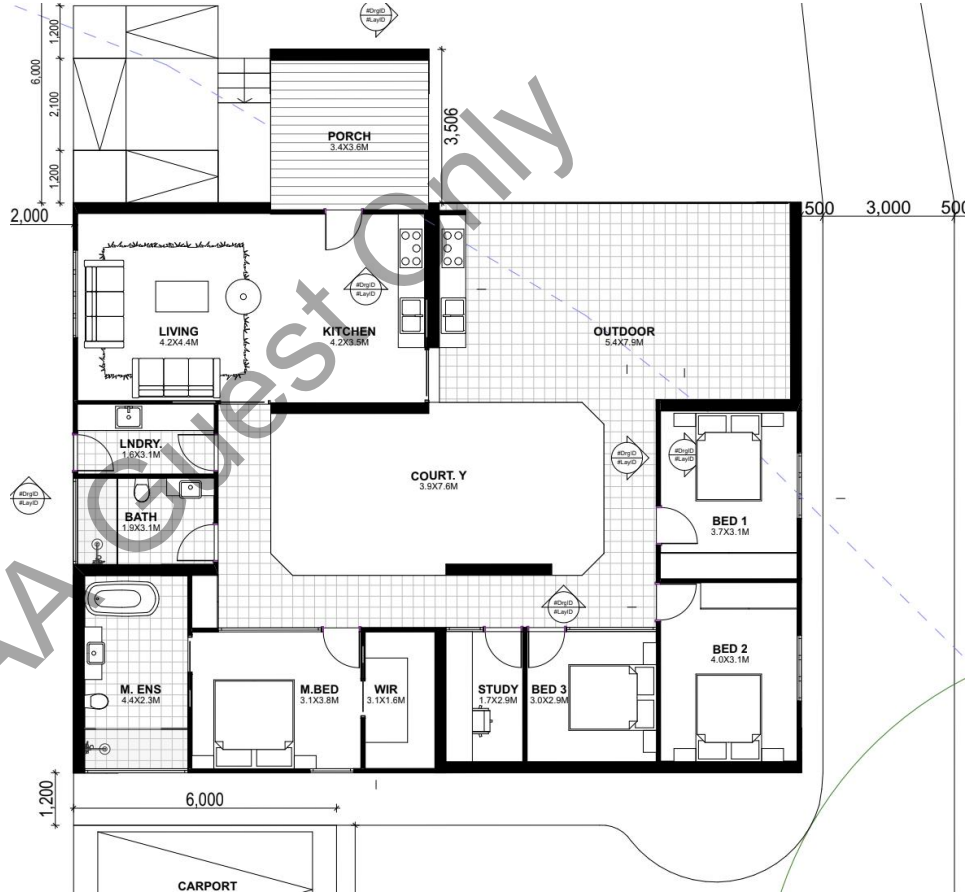
A 3 bedroom display house at Cobar, NSW

Case Study

A 3 bedroom display house at Cobar, NSW

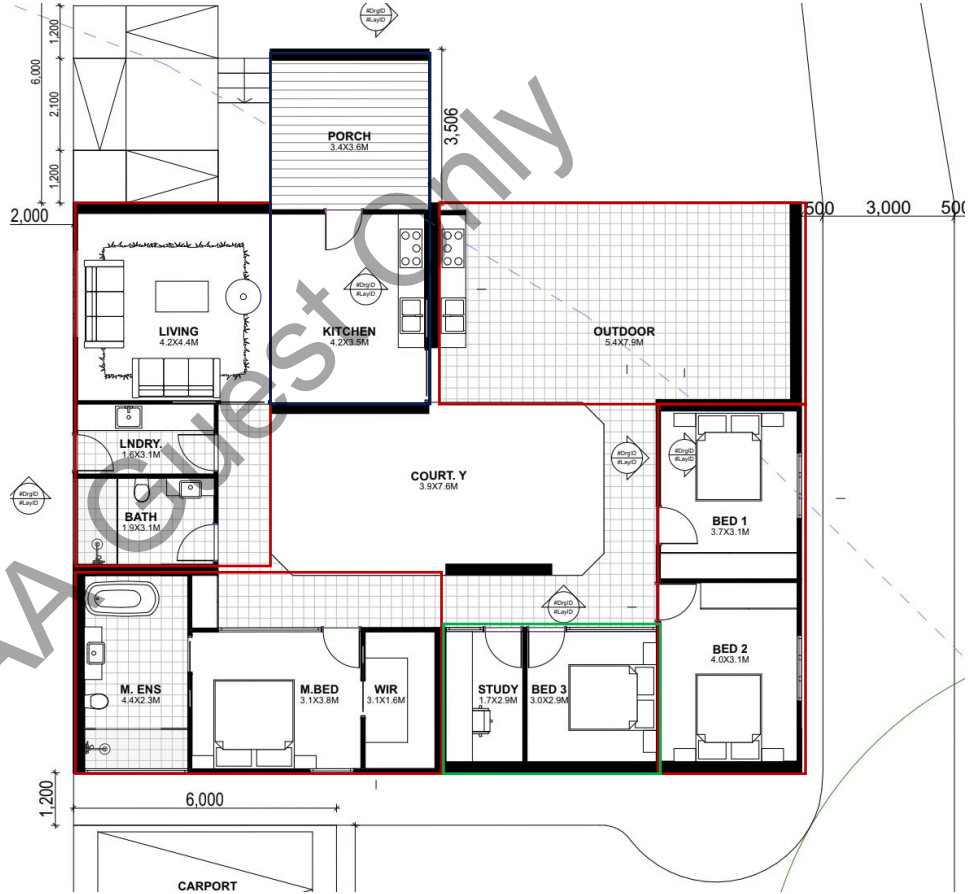
Case Study

A 4 bedroom house for indigenous communities.



Case Study

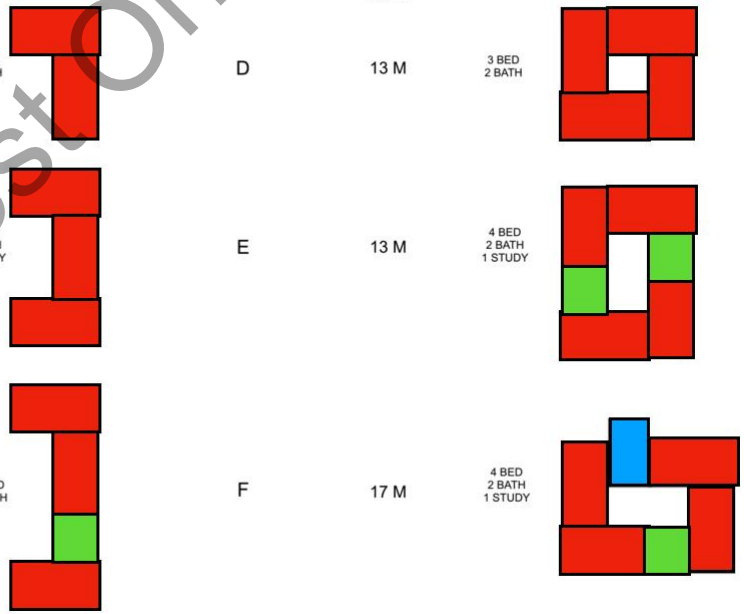
A 4 bedroom house for indigenous communities.



Case Study

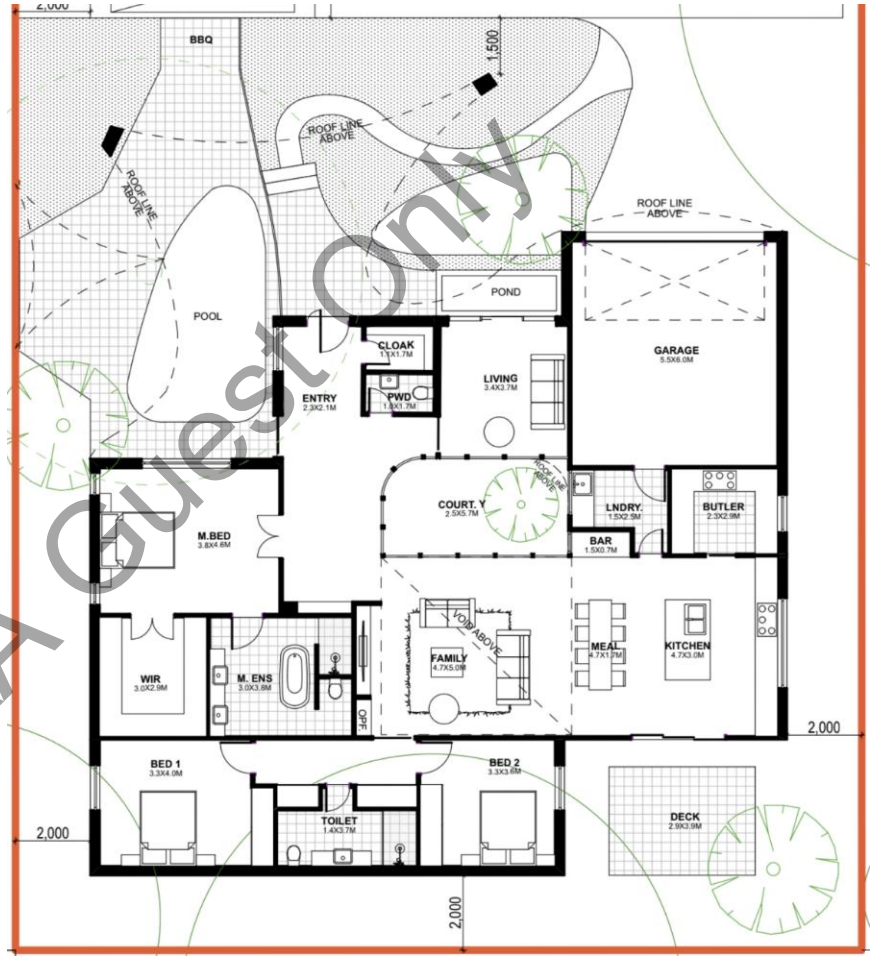
Modular design

SOLUTION	BUILDING WIDTH	LAYOUT	SOLUTION	BUILDING WIDTH	LAYOUT
A	8.5 M	1 BED 1 BATH	D	13 M	3 BED 2 BATH
B	8.5 M	2 BED 2 BATH 1 STUDY	E	13 M	4 BED 2 BATH 1 STUDY
C	8.5 M	3 BED 2 BATH	F	17 M	4 BED 2 BATH 1 STUDY



Case Study

A high-end 3-bedroom house



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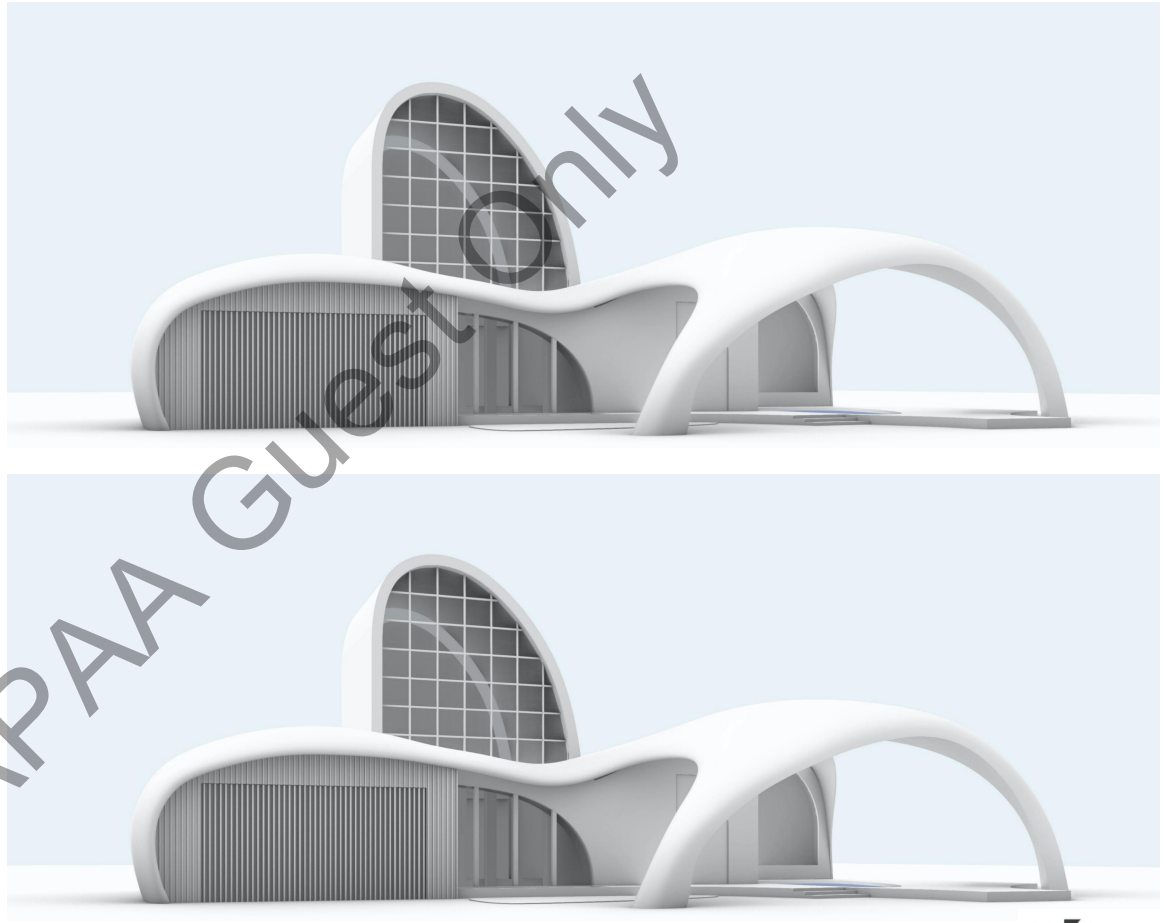

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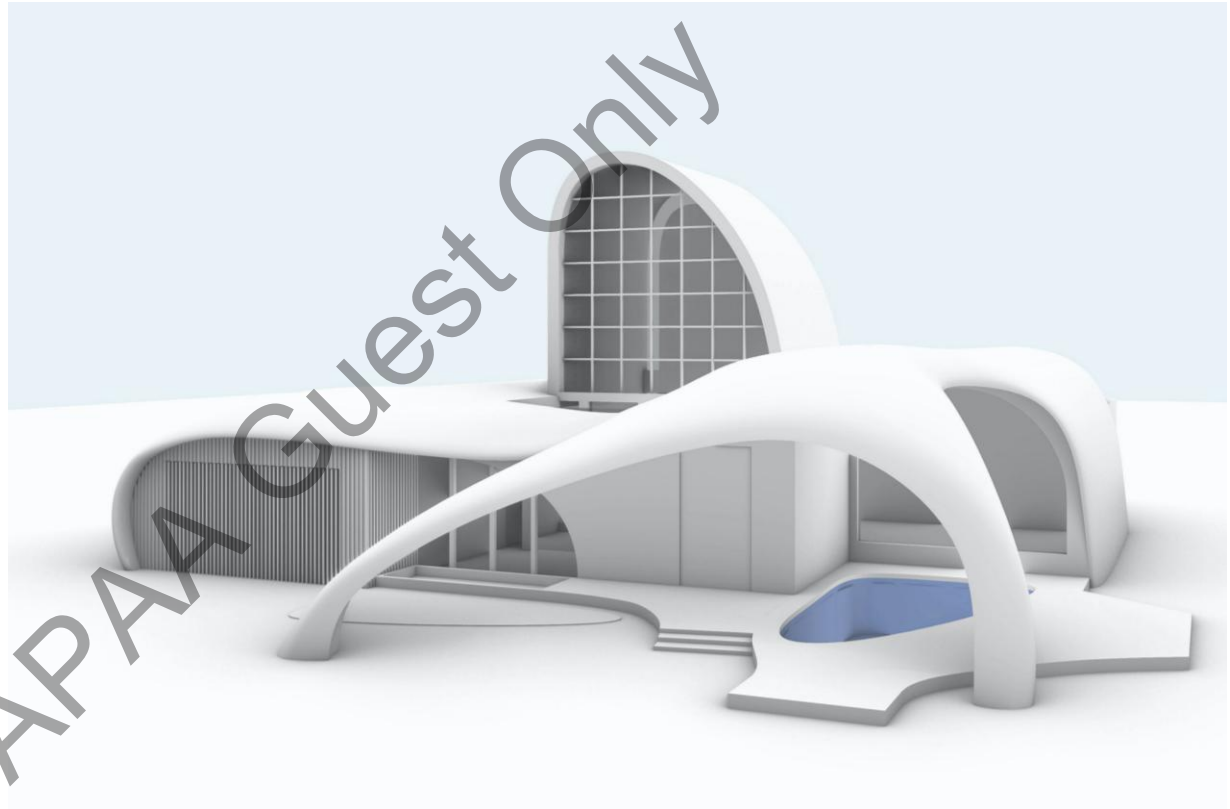
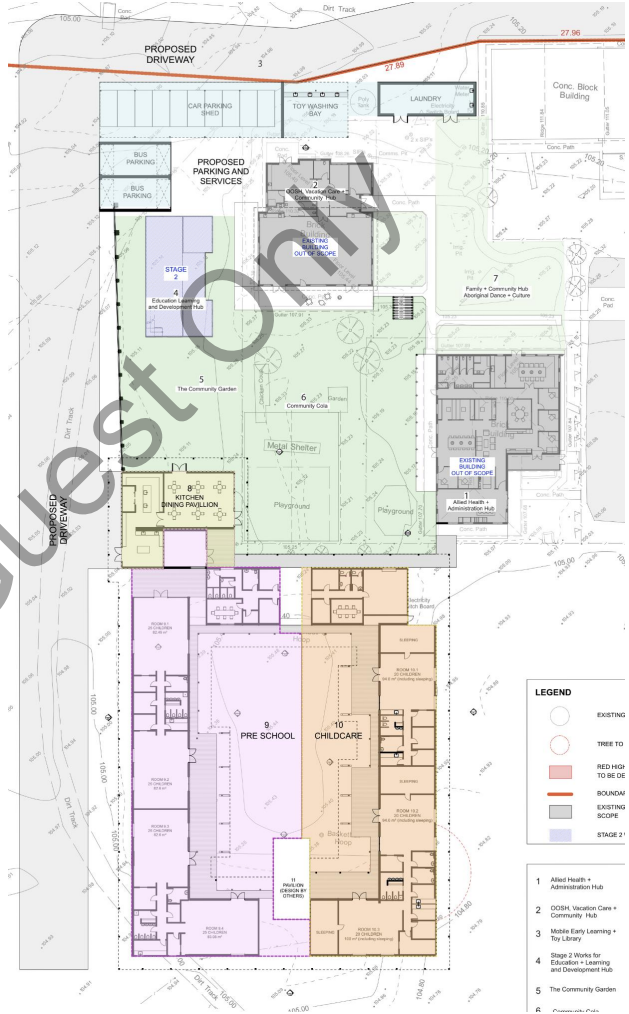


Case Study

A childcare of 159 seats
at Bourke, NSW



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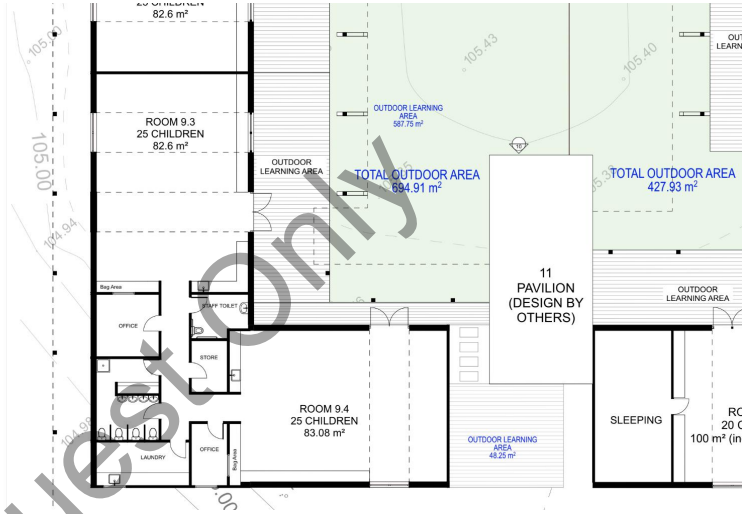

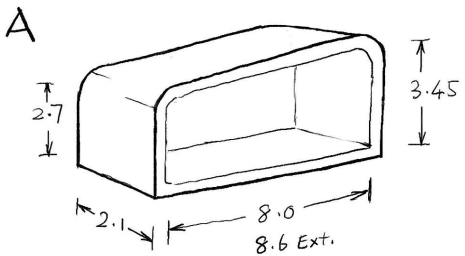

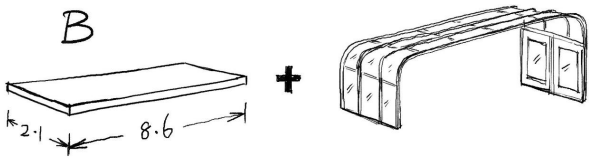

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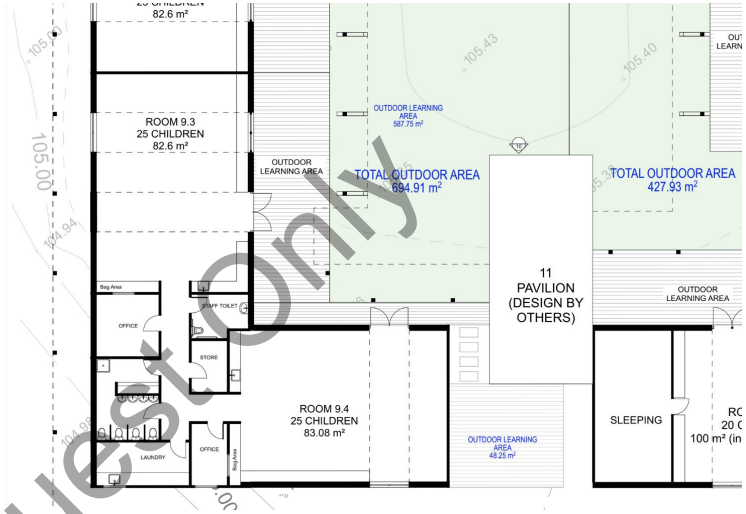

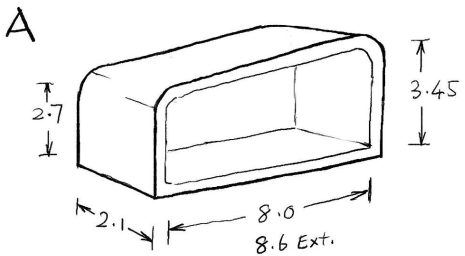

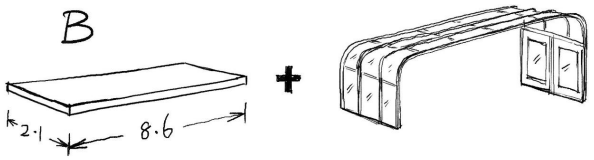

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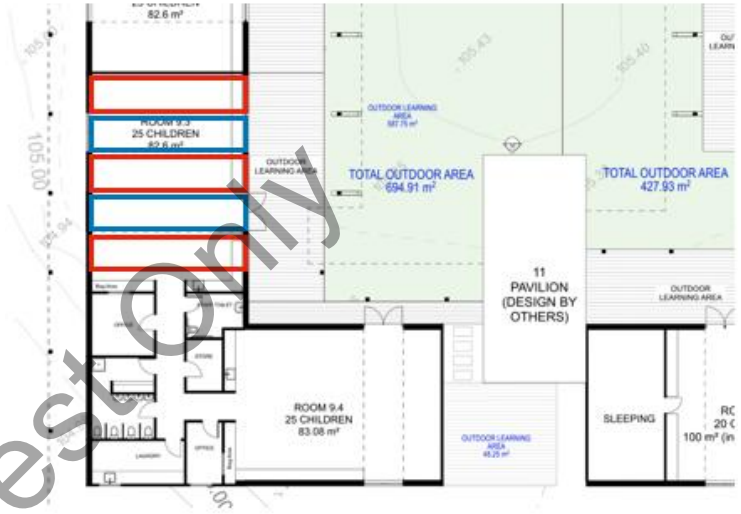

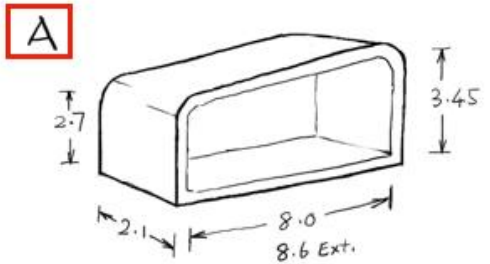

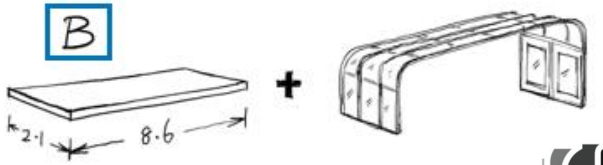

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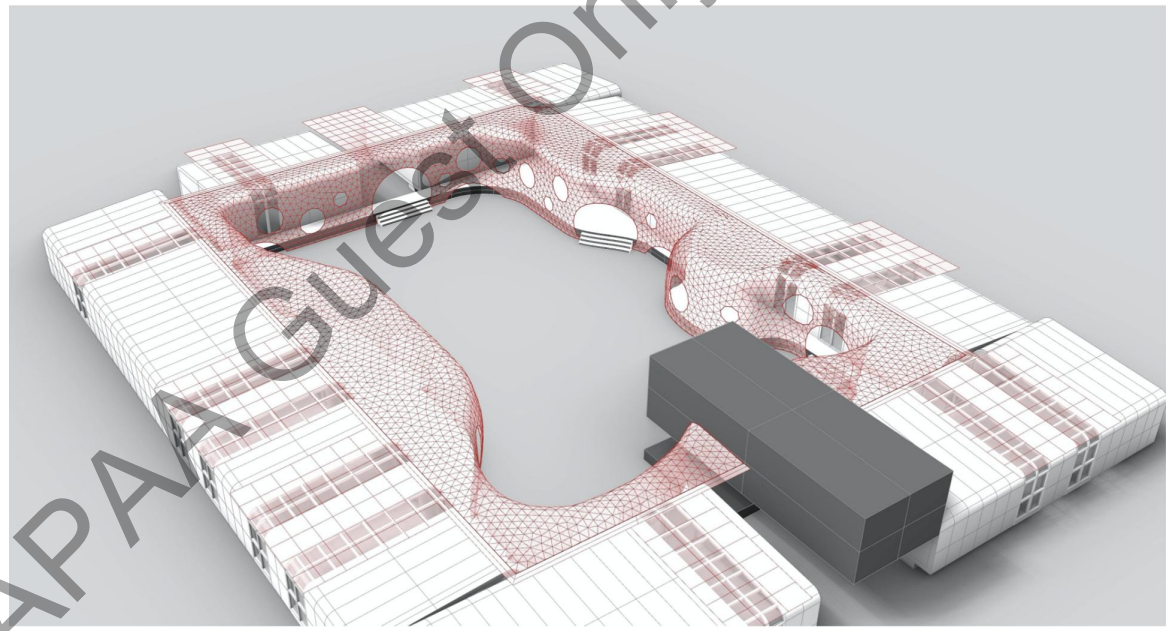

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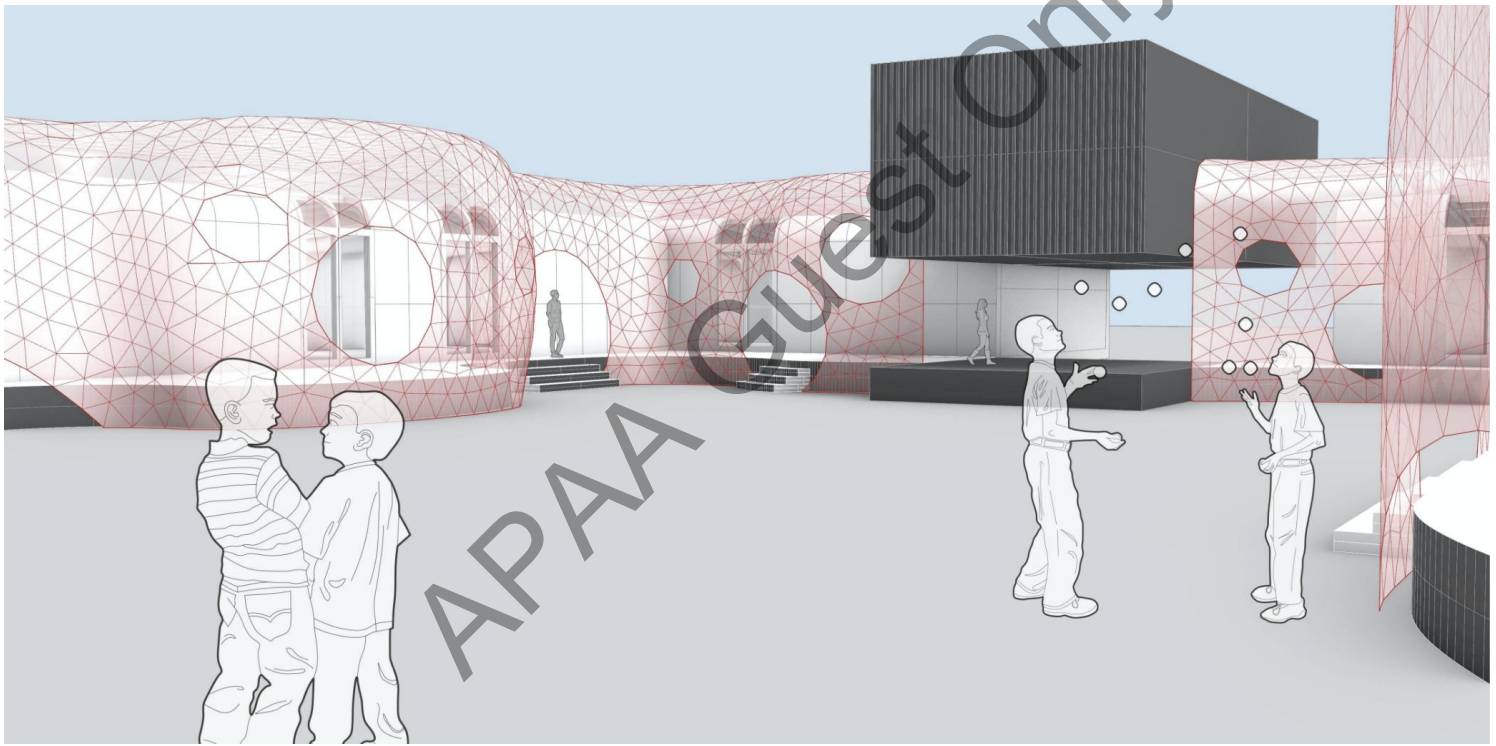

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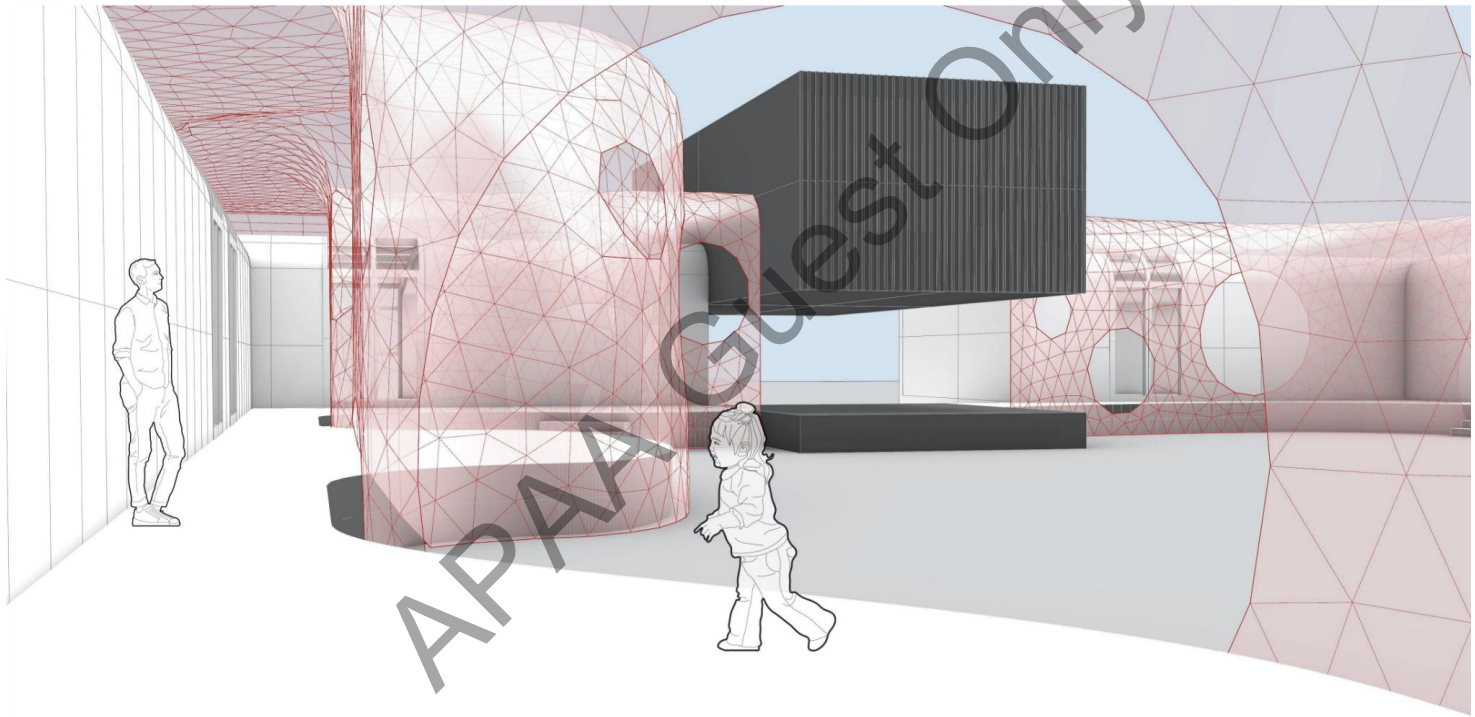

The Fit-out

85% of internal fit-out can be completed in the factory.
All windows, doors, linings, coverings, joineries, fixtures and fittings will be modularised for simple and quick installation with controlled quality.

The Permit Application

New South Wales

Local Government (Manufactured Home Estates, Caravan Parks, Camping Grounds and Moveable Dwellings) Regulation 2021

under the

Local Government Act 1993

- Town planning process has no difference.
- Building permit process is similar

Take away

- 3D printing presents the most cost-effective prefabrication method for diverse building types in remote areas.
- On-site printing is generally discouraged in remote areas.
- A 3D printing factory serves multiple purposes beyond concrete module production, acting as a fit-out facility, material storage, and maintenance hub.
- 3D printing offers an flexible, sustainable, and cost-effective construction solution.
- The business model of 3D printing can bring benefits to various local stakeholders, including builders, tradespeople, logistics providers, and labourers.

APAA 3D Printing Master Class

Thank you for listening

Free Discussion

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AUSTRALASIA PROPERTY ADVISORY ASSOCIATION

PRINT 3D

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ASSOCIATION

THANK YOU FOR ATTENDING

Our Next Function

The Future Homes Seminar

Date: Thursday, 11 April 2024
Time: 4.30pm commencement
Location: Level 6, 140 William Street Melbourne (Madgwicks Lawy
Discount Code: APAA

REGIONAL RENTAL MARKETS ARE TIGHT, WITH LIMITED RENTAL STOCK AND POOR AFFORDABILITY.

23.3% OF REGIONAL HOUSING RENTED

Historically, regional Australia has had a smaller proportion of rental stock available, with 23.3% of regional dwellings rented in 2021 compared to 32.3% in Australia's most expensive markets (and as high as 51.3% in some LGAs)[3].

518,634 UNOCCUPIED DWELLINGS IN REGIONS

This is not due to a differing owner-mortgage/-outright share, but the amount of unoccupied dwellings. Regional Australia (at 518, 634) has almost the same amount of unoccupied private dwellings as metropolitan areas (at 524, 453).

REGIONAL RENTS CONTINUE TO INCREASE

Where capital city rents fell between 2020 and 2021, regional rents continued to increase, and only in 2023 have capital cities felt similar inflationary pressures[4].

RENTAL MARKETS IN REGIONS ARE NOT IMPROVING

The tight rental market in regions is not improving. The regional vacancy rate has decreased from 1.5% (September 2022) to 1.2% (September 2023)[5].

REGIONAL HOUSING HAS NOT KEPT PACE WITH POPULATION GROWTH.

REGIONAL AUSTRALIA IS GROWING

During the decade to 2022, regional population continued to grow at an average of about 89,000 people each year, while the number of homes approved for construction declined in four out of these 10 years[6]. While regions continue to grow, monthly building approvals have been decreasing, a similar trend to capital cities[7].

REGIONAL AREAS ARE SEEING A GREATER INCREASE IN HOUSE PRICES

With supply not keeping up with demand, affordability of housing has been challenged across the country – with regional areas seeing a greater increase in house prices.

MEDIAN REGIONAL HOUSE VALUES INCREASE BY 54.2%

Between March 2020 and December 2023, the median value of dwellings in capitals increased by 29.3% from $643,540 to $832,193, while the growth was more notable in regional Australia, with the median value increasing by 54.2% from $392,802 to $605,780[8].

REGIONAL AUSTRALIA IS ON THE FRONT LINE OF THE NATION'S HOUSING CHALLENGE.

Source: National Regional Housing Summit 2024

Regional Market data

Top 10 regional areas hit with the highest % rental increase in 12 months

Region	12 month rental increase %
1. Central Queensland	21.8%
2. Goldfields Region WA	21%
3. Central Coast WA	20.8%
4. Northern WA	18.4%
5. South Western Victoria	17.3%
6. South West WA	16.8%
7. Southern Queensland	16.7%
8. Queensland Far North Coast	12.5%
9. Eyre SA	12.5%
10. Western Victoria	12.1%

- The annual population growth in regional Australia is about 28~40%

Regional Housing Crisis

- Overcrowded, nearly one-quarter (23%) of all people living in overcrowded housing while comprising just under one-fifth (19%) of the Australian population.

- High Construction costs, typically 2-3 times higher than in capital cities due to extremely scarcity of technical labor and material supply

- Limited construction resources are thus concentrated in the industrial construction sector, which leads to a situation where residential and small commercial construction markets are neglected.

- Remote areas are mostly located in the Australian hinterland or northern tropical regions, or in coastal areas far from major ports. These areas are either characterized by hot climates or high air corrosiveness, requiring high durability and thermal performance of buildings.

The main issues facing

- A shortage of skilled labor and supply chain disruptions have led to a severe supply-demand imbalance in housing.
- Government funding and incentive policies are difficult to effectively utilize, despite a high demand for government housing.
- Commercial housing or short-term rental properties also face serious supply-demand imbalances.

Regional Housing Crisis

Despite the federal government pledging a million new homes in the next five years, Australia is still on track for a shortfall of more than 106,000 homes.

- Prefabrication is a practical solution to meet urgent housing needs by providing speedy and cost-efficient dwellings
- The quality of materials and construction practices can vary between manufacturers, leading to potential issues with structural integrity over time.
- Does not offer the same level of quality as a traditional home due to light weight
- Thermal performance is low

Government Incentives

In response to the significant housing shortage, the Australian federal and state governments have formulated numerous policies and allocated considerable funds to promote housing construction and maintenance in remote areas. Each year, billions of dollars in direct allocations or incentive policies are provided, along with various complementary policies.

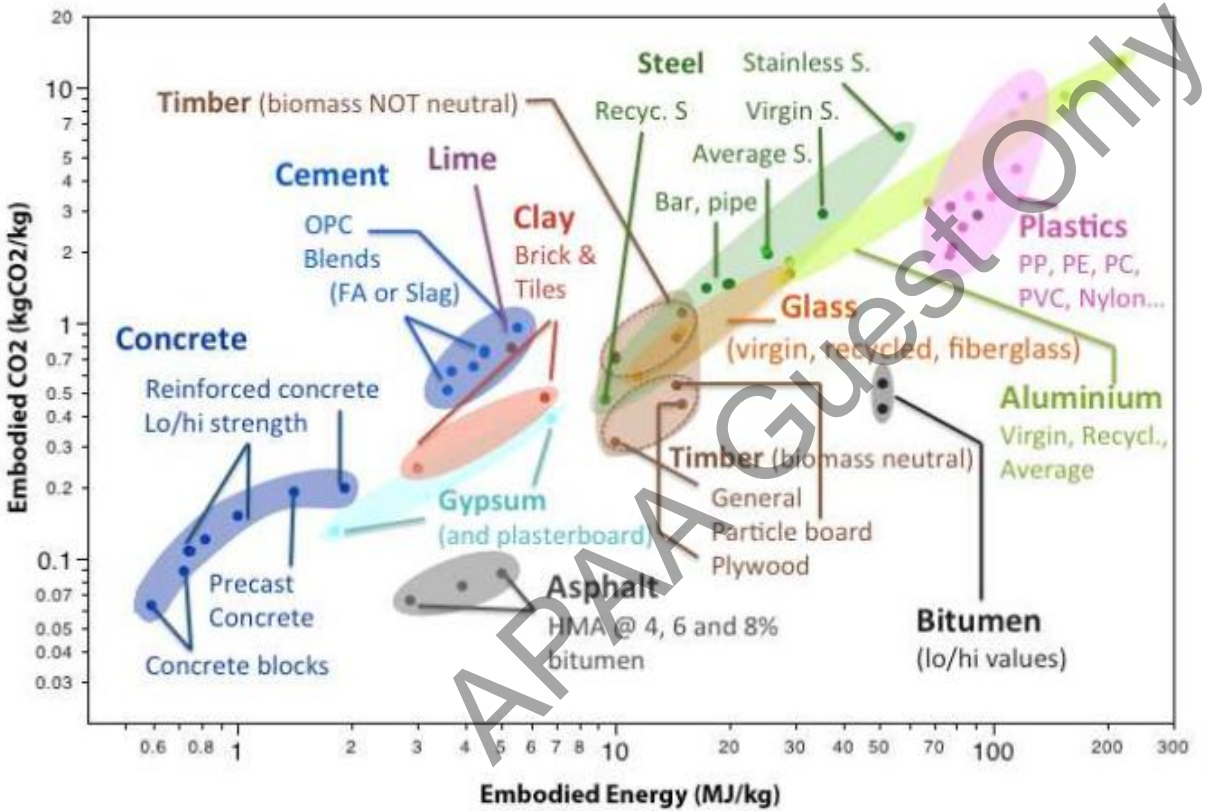
However, these policies have had limited effectiveness, with only a small number of construction projects being completed each year. 'Unspent funds' have become a major challenge for both the government and the local market.

	ON-SITE	OFF-SITE
Design Flexibility	Very High	Limited by transportation and lifting weight
Print quality	Depends on weather, temperature, wind speed and no curing condition	Controlled environment, enough curing time
Transportation	Transport machine and materials to site	Require lifting calculation and structral calculations of printed elements
Site Work- After foundation is completed		
Site Preparation	Machine Assembly	Unload the printed elements
	Site Security	
	Cemetious material storage & Discharger machine	
	Pumping vehicle standby throughout the printing process	
Operation	3D printing engineers standby to run the program and print	Assemble the printed elements
	Exposed to air pollution and noise pollution	
	Roofing and Structral columns if needed	

Comparison Chart -3-Bedroom brick veneer house

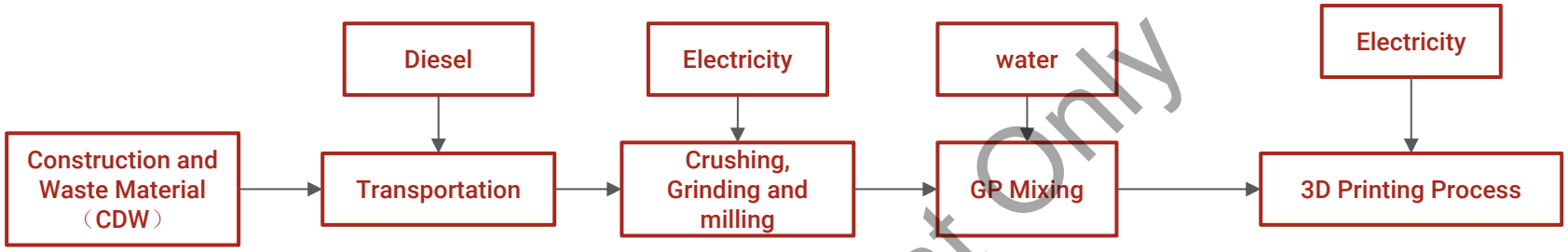
	Average Project Time for 3D Project	Comparsion	
Foundation and Structural	1~2 weeks	40% Labour reduction 80% reduction of construction time	
Site installation	1 week	60% Labour reduction 70% reduction of construction time	
Services connection	1 week	Similar to conventional method	Service connection holes reserved during printing stage
Exterior	NAN		
Lock up stage	1 weeks	90% constrution time reduction	Doors and windows designed for 3D Casstte, no cladding and roof covering requirement
Fixing Stage	2~3 weeks	About the same time consumption, depends on the design	Standardized kitchen and bathroom design applied
Total project time two month			

Embodied energy and Carbon emission



Decouple material impact from volume
Source: Barcelo et al, 2014

LCA System Boundary diagram



CDW-based 3D Printed structure & conventional masonry construction

	Waste based 3D Printing per m3	Mansonry Structure
Somg Formation Potential	29.8 kg of CO_2 eq.	25.14 kg of CO_2 eq.
Fossil Fuel Depltion	507.3 MJ	693.4 MJ
Total Global Warming Potential	488 kg of CO_2 eq.	533.7 kg of CO_2 eq.