

Livin Modular – Mould Sizes “The Future”

(June 2017)

- ✓ **15 years of Modular Precast Production**
- ✓ **1500 Modules poured in Australia,**
- ✓ **Significant Considerations**
 - **Design**
 - **Transport**
 - **Manufacture**

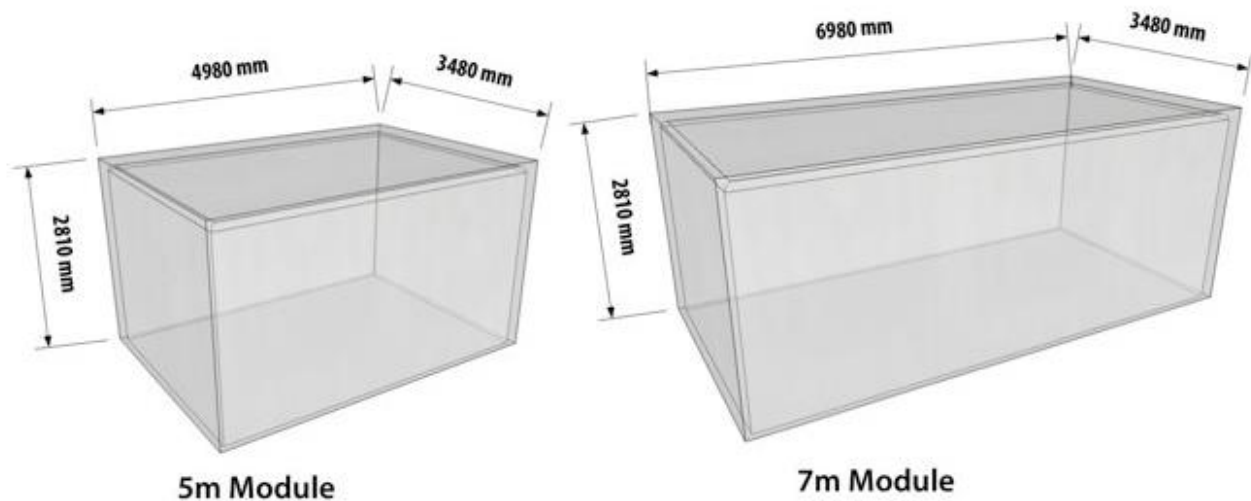


Background

Current Mould Sizes

Mould #1 4.98m*3.48m*2.81m

Mould #2 6.98m*3.48m*2.81m



Transportability

Generally 3.5m wide (Excluding chains) and 4.6m high (total height from road) are the gazetted wide and high load limits without escort vehicles required in most states. However due to the mining requirements there may be special considerations for WA especially in rural or remote areas?

Standard trailers vs “drop Deck Trailers–

Usually 12m long and 2.4m wide and can carry approx 24t. However, we usually like to use “drop deck” trailers that have a 9m drop tray to keep the load lower. The modules can travel on standard “flat tops” are a higher centre of gravity.

	Standard Trailer	Drop Deck	Low Loader	Comment
Tray length	12m	9m drop tray/3m	10m	
Tray Width	2.4m	2.4m	Up to 3m	
Tray Height	1.5m	1.1m	0.9m	
Frame	0.25m	0.25m		
Max permit height	4.6m	4.6m	4.6m	

Total Height (From Rd)	4.56m	4.16m	3.96m	
Max basic permit width	3.5m	3.5m		*Anywhere in Australia During Daylight hours, without escort vehicle.

Build Cost considerations

The cost of producing a “blank” without doors & windows is generally cheaper than a module with doors and windows because of the time and resources needed to form up the openings. We get no credit for the steel that is cut out for a door or window or opening and it is waste plus we often add more around the edges to compensate.

The basic costs per m2 for larger modules reduces as the overheads, staff, transport, cranes costs etc are static. The extra concrete and steel is minimal compared to the area that is gained.

However, there is a limit to this rule as soon as the modules get too large to handle with standard cranes & transport.

Module Sizes		4m*3.5m	5.0m*3.5m	6.0m*3.5m	7.0m*3.5m	8.0m*4m
Floor Area	m2	14	17.5	21	24.5	32
% change in Area	%	100%	125%	150%	175%	229%
Cost/m2	%	100%	91%	85%	78%	65%

Design Considerations

Mould Width

As we can cast part modules we have found over time that the most important dimension is the width of the mould. Transport and Handling are a large consideration especially when you go over the 3.5m dimension.

Similarly, once the 4m dimension is reached then there are extra structural considerations, reinforcement and concrete thickness that increase, costs, and weight. Hence the 3.5m & 4m wide moulds are proven to be the most efficient, flexible and can be transported, lifted and installed with local and easily sourced equipment.

Construction joints

The typical detail is for the modules to be separated by a 20mm joint when placed horizontally. This allows for construction tolerances and gives an acoustic, thermal and fire break between rooms to assist in BCA compliance.

Grids

Most designs are set up on a series of grids that everything is referenced to as imaginary datum's. They are usually at regular spacing's in both directions. The modules are designed to suit regular dimensions that can be interchanged to suit these regular grid spacing's.

Height

Current moulds are set at 2.7m ceiling height which has served us very well until now. However, it is quite easy to cast a shorter unit in a larger mould but it is impossible to cast a taller unit. For that reason, it is recommended that the mould heights be increased to give internal ceiling dimensions of 3m and a roof thickness of 150mm. This would give 3170mm overall height dimension.

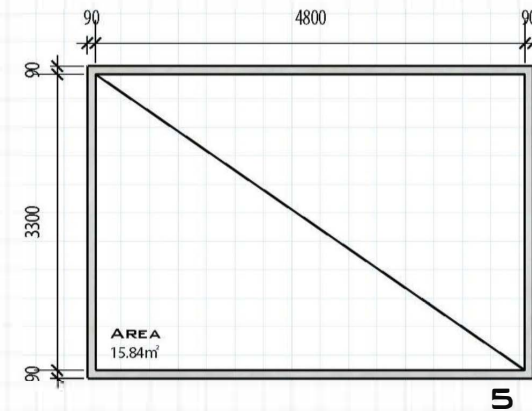
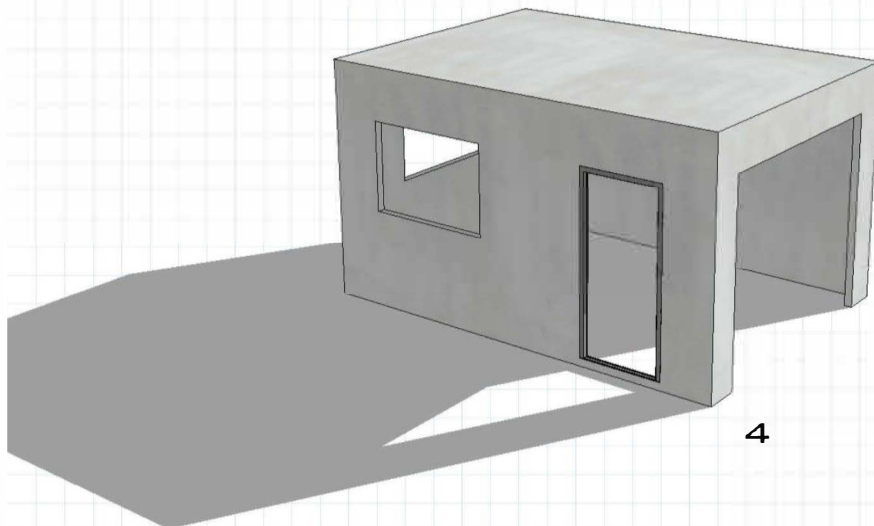
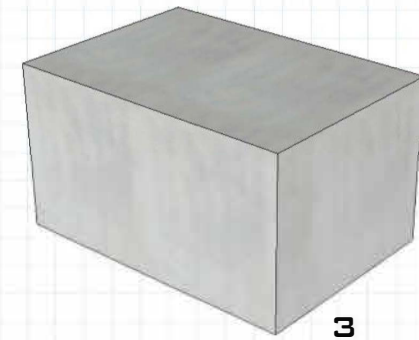
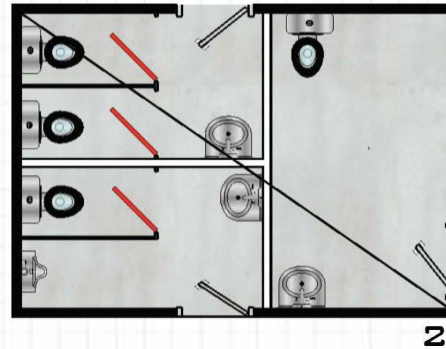
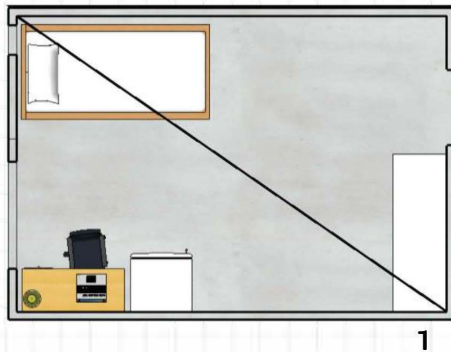
Room Sizes

Internal dimensions for rooms are at the discretion of the owner and the designer but there are typical ranges that are generally used for functionality and practicality,

Room	Internal Dimensions	Recommended sizes (Modular)	Generic Name
Main bedrooms	3.3m – 3.8m	3.3m + 3.8m	5m & 8m ("A" & "D")
Secondary bedrooms	2.9m – 3.5m	3.3m	5m & 7m ("A" & "B")
Study	2.9m -3.3m	3.3m	5m ("A")
Bathrooms	2.2m-3.0m	3.3m (part module)	5m ("A")
Kitchen /Living	Flexible	3.3m+ 3.8m	7m & 8m ("B" & "D")
Garages -Single	3.5m*5.8m	3.8m	8m ("D")
-Double	5.5m*5.5m-6.8m	3.0m (part 3.3m)	6m ("C")
-Double Plus	6.8m*6.8m	3.3m	7m ("B")

5M MODULE

- 1 - Student Accommodation
- 2 - Small Toilet Block
- 3 - Module
- 4 - Small Shed
- 5 - Module Dimensions

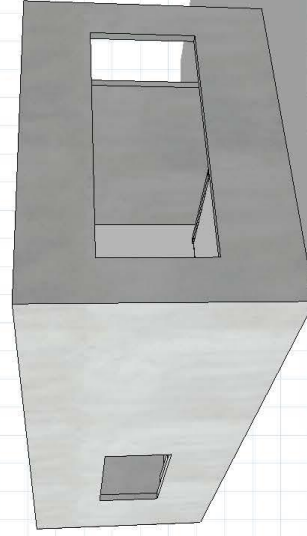
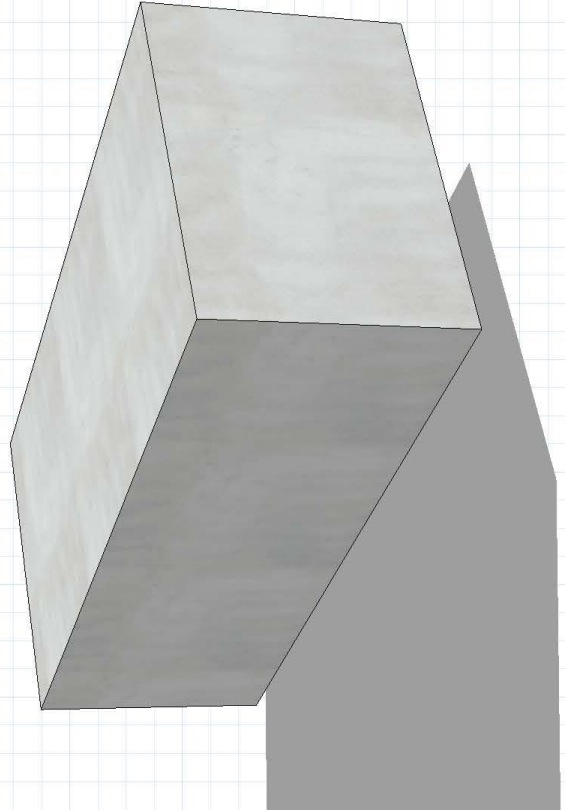
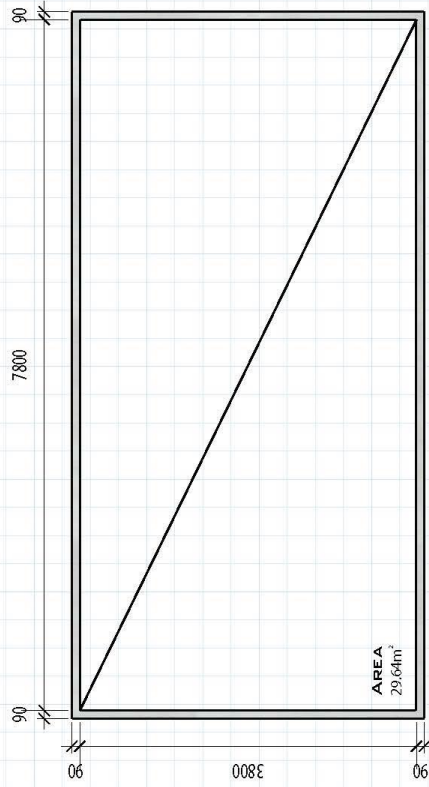
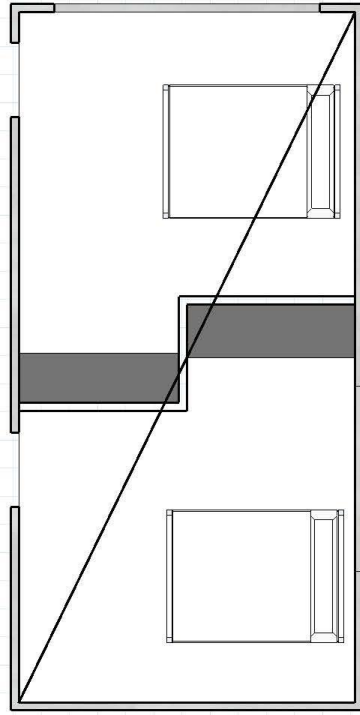


4M MODULE

- 1 - Wider Bedrooms
- 2 - Module Dimensions



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OTHER POTENTIAL APPLICATIONS

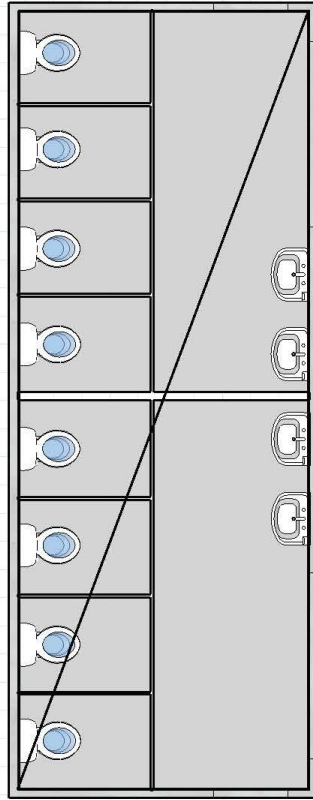
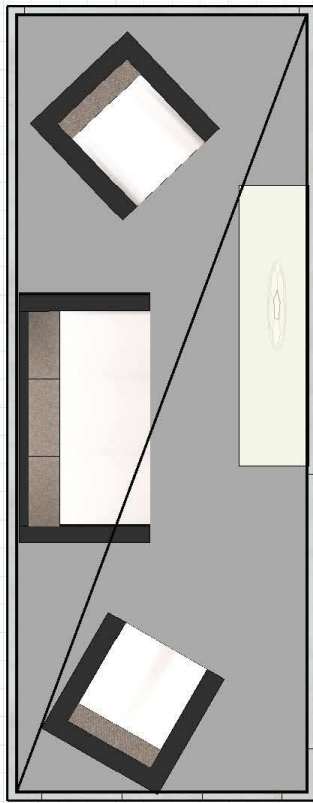
- Larger kitchen/dining rooms
- Wide living rooms
- Bedroom/bathroom combinations
- Toilet blocks

9M MODULE

- 1 - Larger Living Room
- 2 - Toilet Block
- 3 - 2 Bedrooms
- 4 - Module Dimensions

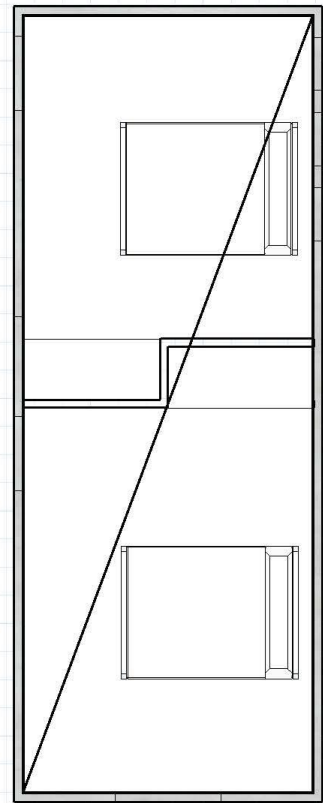
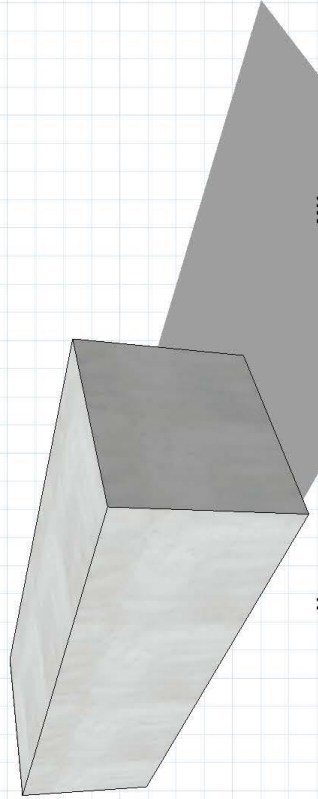


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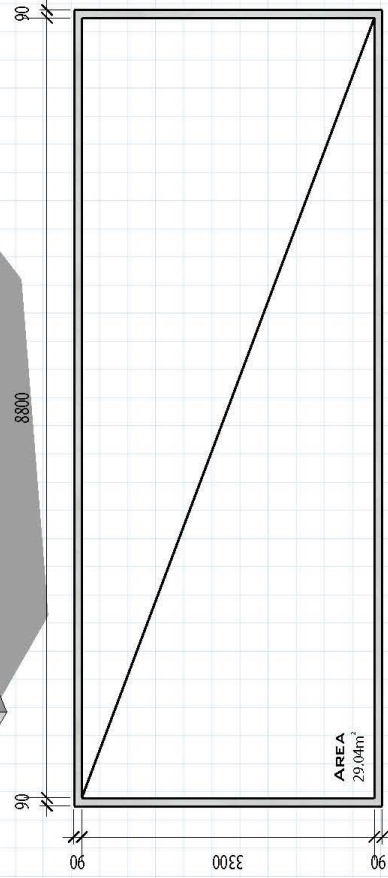


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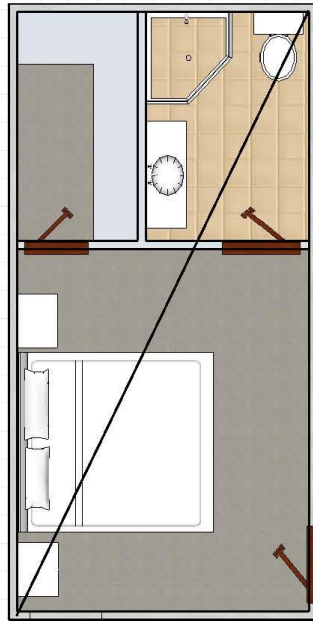
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7M MODULE CONT.

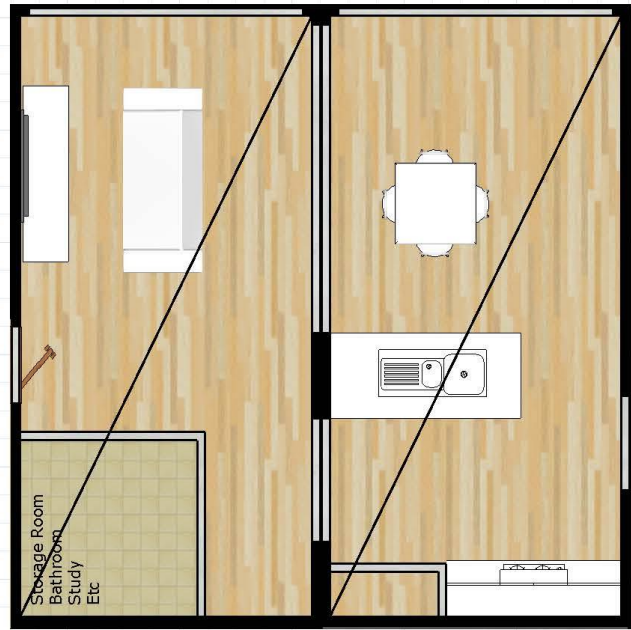
- 5 - Master Bedroom w/ E/S & WIR
- 6 - 2 Small Bedrooms
- 7 - Kitchen/Dining/Living (2 Modules)
- 8 - Module Section
- 9 - Single Garage



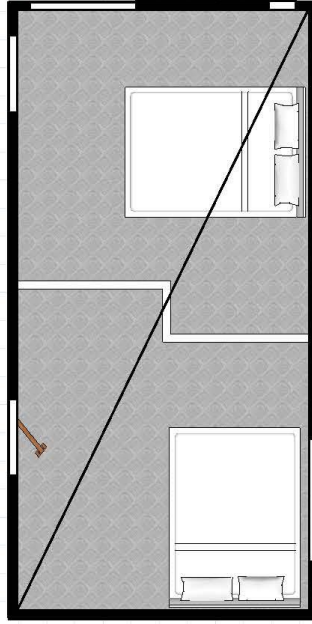
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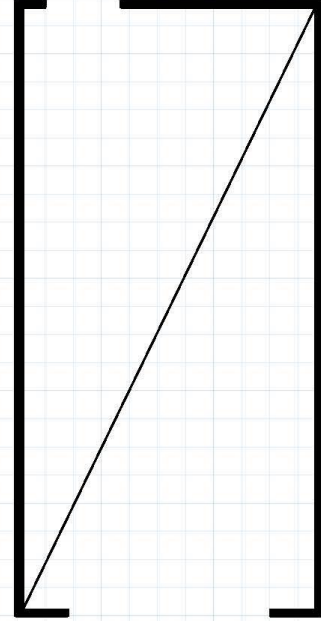
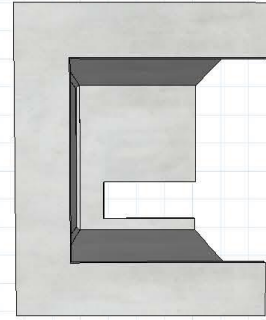
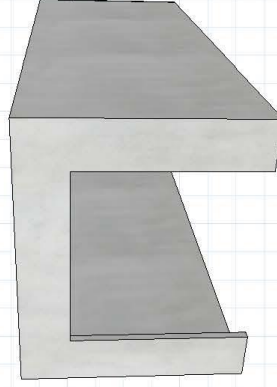
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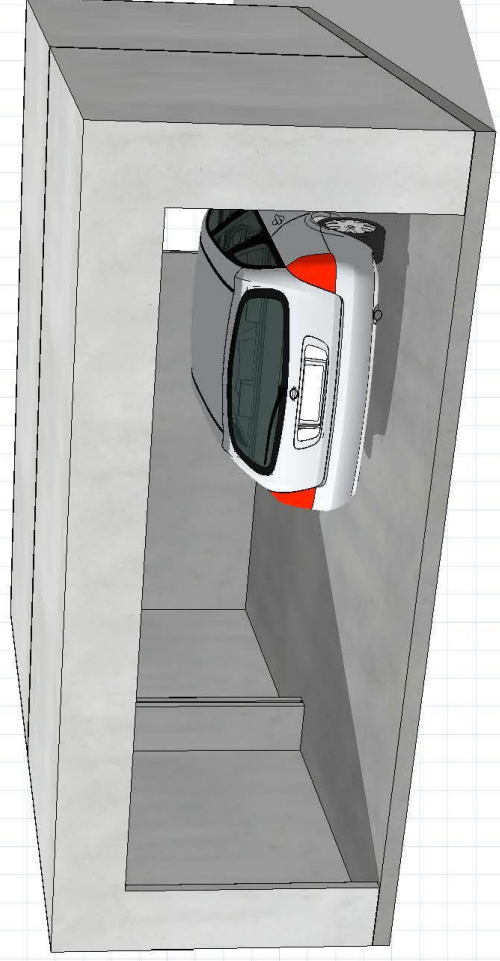
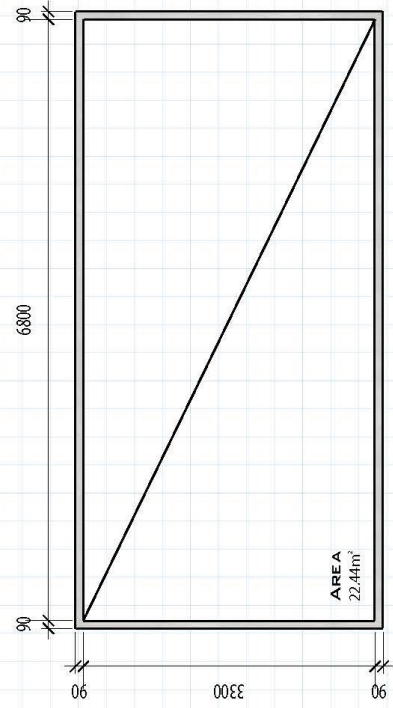
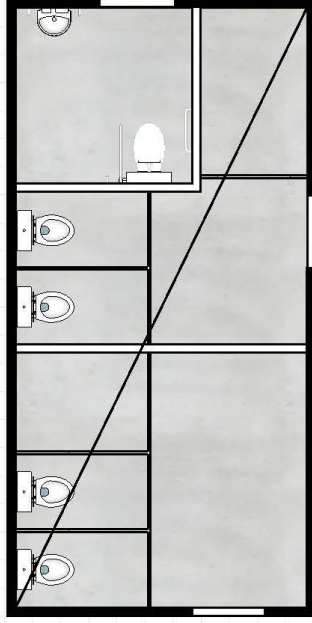
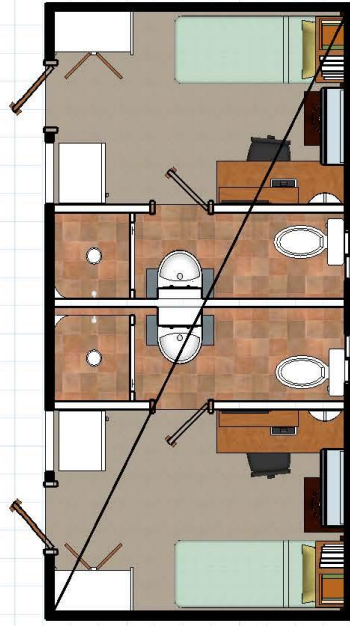
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7M MODULE

- 1 - Mining Cabins
- 2 - Toilet Block
- 3 - Module Dimensions
- 4 - Double Garage (2 Modules)



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Mould Summary in order of recommendation

Generic Name	Mould External Dimensions	Internal Area (m2)	External Area (m2)	Popular uses	Special Comment
"A"	(5m) 5m*3.5m *2.81m high	15.84	17.33	<ul style="list-style-type: none"> • 2 No good-sized rooms • Larger main room • Large toilet block 	<ul style="list-style-type: none"> ✓ Existing Mould ✓ Efficient costs/m2
"B"	(7m) 7m*3.5m *2.81m high	22.44	24.29	<ul style="list-style-type: none"> • 2 bedrms with dividing wall • Kitchen & dining • Good size single garage • Good size Double garage • Main bedroom & ensuite • Toilet blocks 	<ul style="list-style-type: none"> ✓ Existing Mould ✓ By far the most common size we produce
"C" (New)	(6m) 6m*3.5m *3.11m high	15.84	17.33	<ul style="list-style-type: none"> • Half of double Garage • Toilet block (small) • Study • Student accommodation • Storage 	<ul style="list-style-type: none"> ✓ Dedicated "new" mould for garage production. ✓ Allowing for up to 3.5m wide modules to do other rooms.
"D" (New)	(8m) 8m*3.5m *3.11m high	29.64	31.76	<ul style="list-style-type: none"> • Wider bedrooms • Larger Living & Dining Areas 	<ul style="list-style-type: none"> ✓ "new" mould ✓ More difficult to transport. (escort plus restrictions) ✓ Maximum Efficient costs/m2 to produce
"E" (Future)	(9m) 9m*3.5m *3.11m high	29.04	31.25	<ul style="list-style-type: none"> • 2 No good-sized rooms • Larger main room • Large toilet block 	<ul style="list-style-type: none"> ✓ Possibly convert the 5m mould at future date. ✓ Efficient costs/m2

Note: Sizes above are the approximate sizes of moulds and do not take into account the joint spaces.

Design Flexibility

What we can demonstrate is that a single mould width (Say 3.5m) with a variable casted length can be used for many different accommodations needs and requirements. In fact a single mould can produce an entire community needs.

Eg

- ✓ Townhouses
- ✓ Shop Fronts
- ✓ Garages

- ✓ Hospital
- ✓ School



