System600

Research & Development

A joint initiative of Homes NSW and Building 4.0

The Challenge

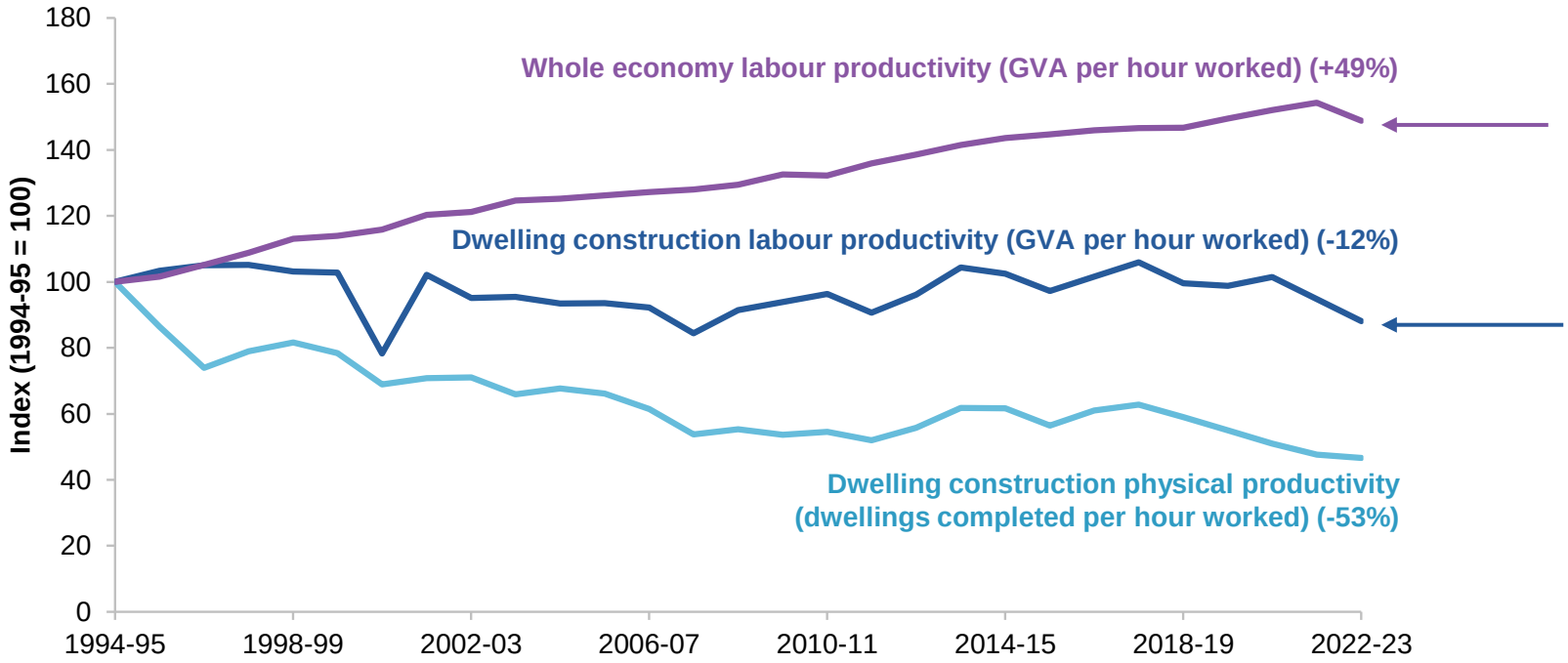
Increase supply without compromising quality, using resources more efficiently
(people, land, materials, energy, capital, natural)
and to **speed up** the entire process

The Question

Can Modern Methods of Construction Assist?

Why Do Anything Different?

Australian Residential Construction Productivity: **30 years of significant productivity decline**



- **Products**
- True Manufacturing @ Scale
- Learning Effects

- **Service Offering**
- Bespoke design
- Custom fabrication
- Every Project is a Prototype
- Fee on Cost Business Model

A Continuum of MMC Application

Traditional Approach	ECI Approach	System Approach
Custom Design	**Custom Design**	**System-based Design,** using standard Components
+	+	
MMC **Solution Retrofitted**	MMC **Solution Input** Provider Involved in project Design Development	**MMC Solution Integrated**
Unlimited design flexibility	Some cost/time benefits	Highest potential benefits
Low-to-nil impact	Early supplier lock-in	Trade off in design flexibility

Shifting construction **offsite yields minimal gains**, while transforming it into repeatable **products maximizes the power of manufacturing**

A Component Based System

A **standardised system of components applied across a project pipeline** with clear principles and requirements to ensure **compatibility**, **standardisation**, and **flexibility** in multi-story home design.

Open Curated System

- Avoids proprietary lock-in; available to third parties to use and expand, licensing framework protects the system
- **Integration** managed by the Rules and Principles of the System

Interchangeable Components (that can be proprietary)

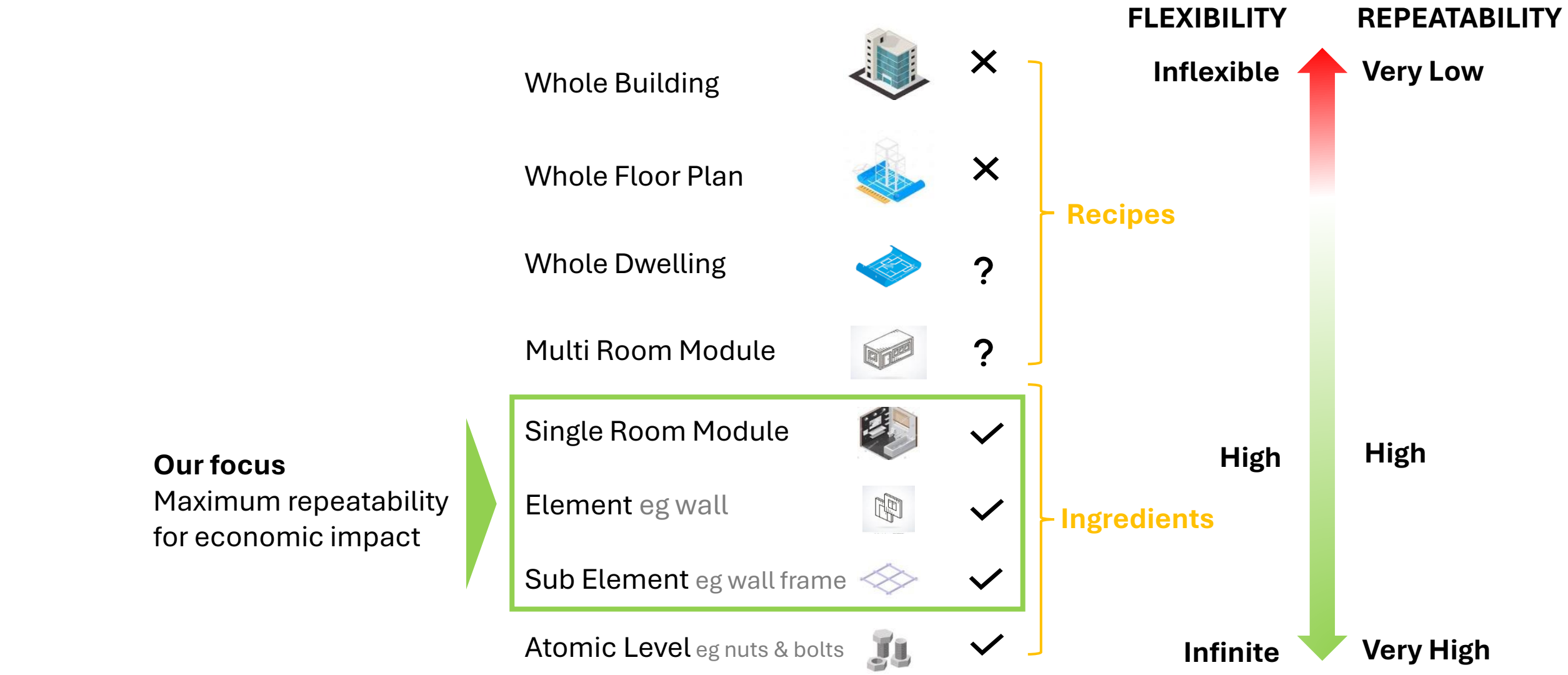
- Products from different suppliers integrate seamlessly, encouraging **competition, innovation,** and better pricing via a distributed supply chain

2D-Based Construction

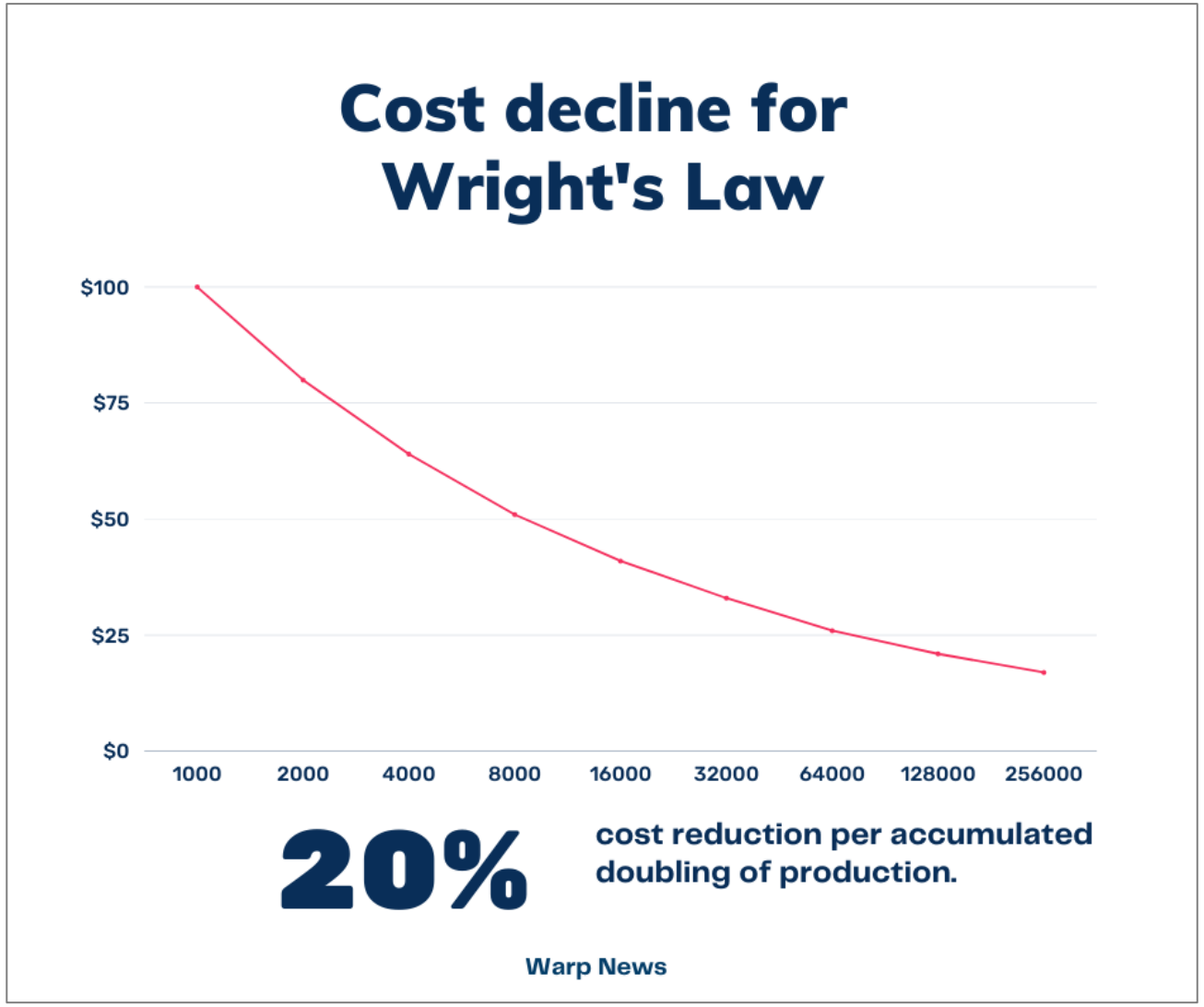
- Prioritizing **flat components over full modular** (except bathroom pods) to balance standardisation with design flexibility

Selecting Part Granularity

4-6 Level Apartment Typology



Creating Value



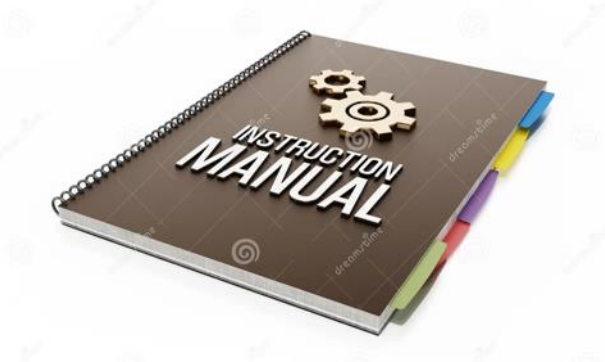
System Rationale

Learning Effects	Cost reduction and quality improvement learnt from repetition
Consistency of Solutions	Provides certainty in delivery, interoperability and scale
Distributed MMC Supply Chain	Drives competition, avoids proprietary lock in and concentrated risk
Design Leveraging a Component Library	Design incorporates components from first sketch onwards
Procurement Leveraging a Component Library	Volume Pricing Agreements to capture benefits of scale and learning effects

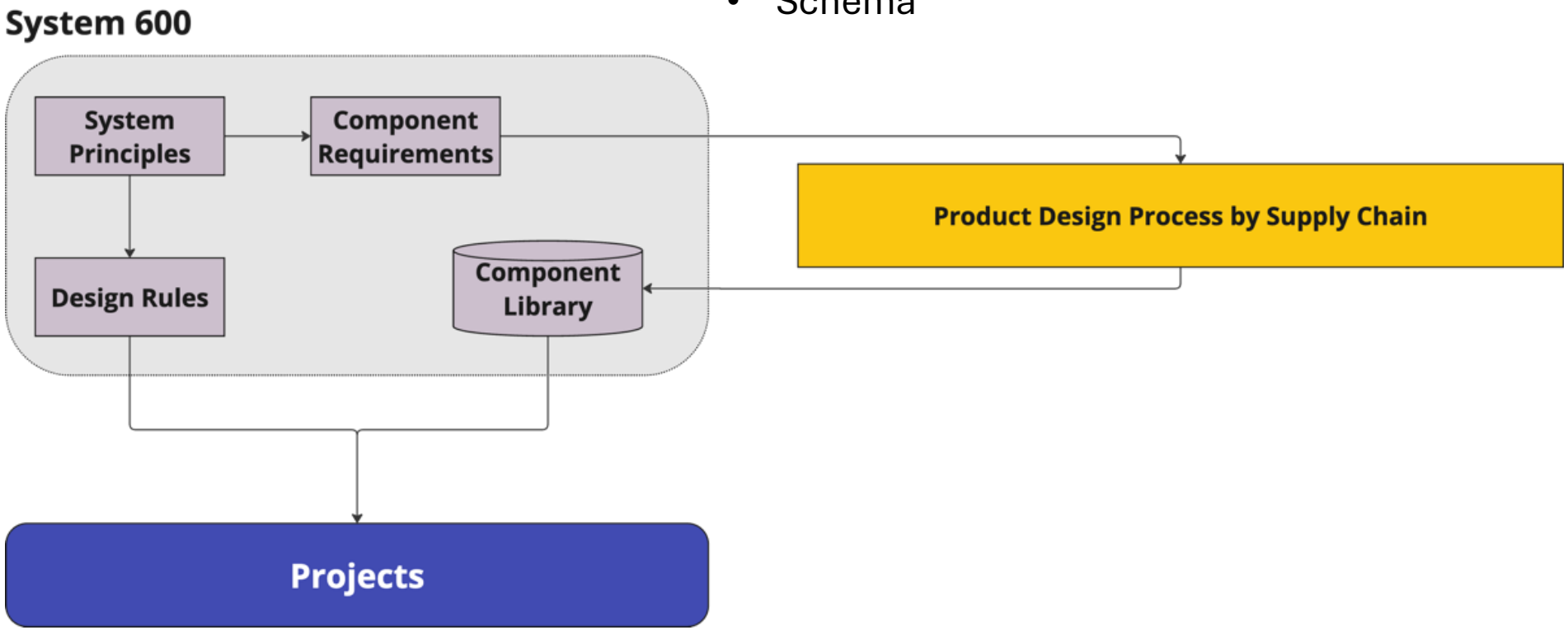
System Principles

- **Minimize unique parts, maximise use of limited SKUs**. Seek 80% standardisation as a minimum. Balance can be customised parts
- **Decouple and recouple** material compositions to redistribute complexity
- **Fixed Flexible and Free parts categorisation**. Allow flexibility where engineering cost is low, and impact is high
- **Flexible Packaging** – Adapt packaging to project logistics, allowing components to be used individually, in subassemblies, or as large-scale modular assemblies
- **Smart Interfaces** – Design component connections for interchangeability, simplified installation and disassembly

System Contents



- Overview
- Scope
- **Principles**
- Subsystem Descriptions (Structure, Services, Interior, Exterior)
- **Design Rules**
- **Component Requirements**
- **Component Library**
- Schema

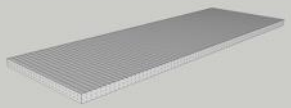


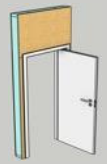
System 600 – Component Concepts

Structure


Lift Shaft KoP


Stair & Frame KoP


CLT Floor Panel


Door Wall

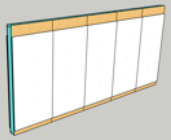

1200 Wall


1800 Wall

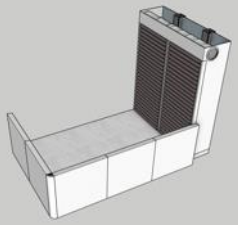

2400 Wall


3000 Wall

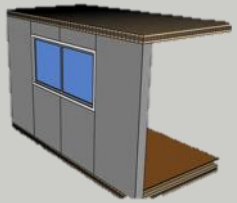

3600 Wall


6000 Wall

Exterior


Balcony KoP


Universal Backplane

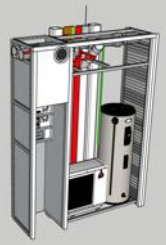

Architectural Layer

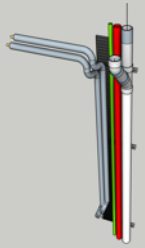

Feature Elements

Window Set

Performance Layer

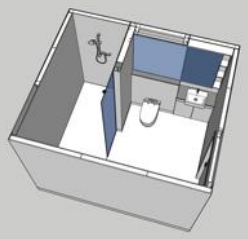
Services


External Services Module


Vertical Riser Rack

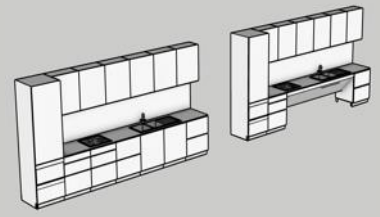

Horizontal Distribution Rack

Interior


Accessible Bath Pod


Standard Bath Pod


Laundry Pod

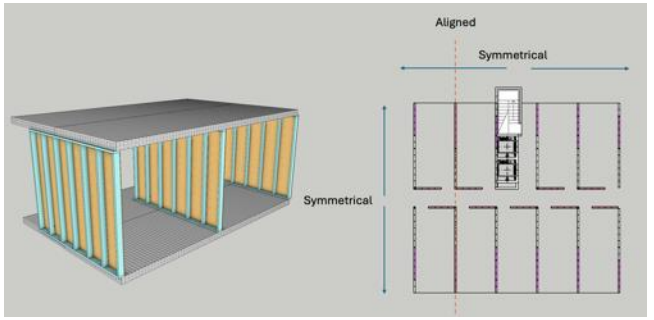

Kitchen Cabinets KoP

Robes / Storage / General Cabinetry

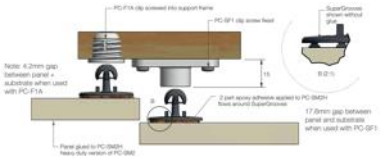
Floor Overlay System

Key Moves

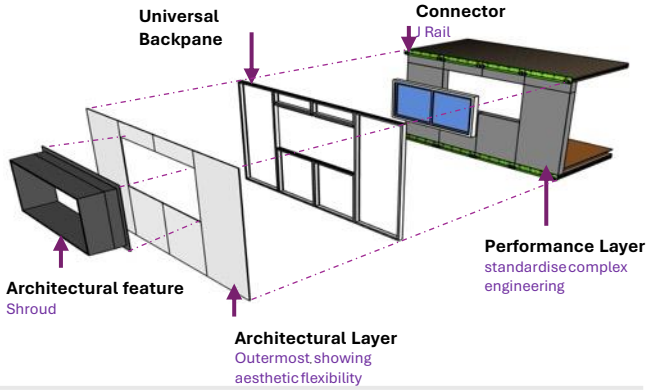
- Simplified structure, distributed the lateral system



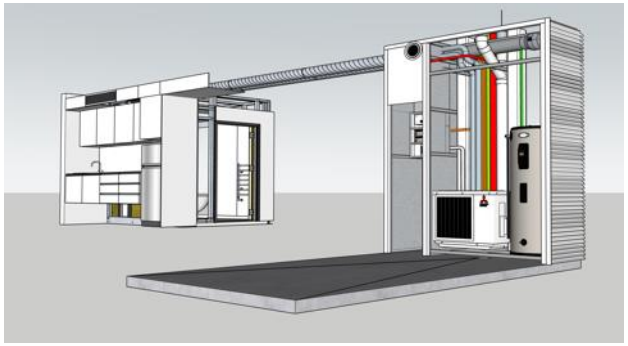
- Decoupled wall finish from wall frame



- Multi-layered unitized façade, continuous fixing rail, standardised glazing units and consistent weatherproofing details



- Services packaging into exterior module, vertical riser rack and distribution in bulkhead spine.
- Co-location of kitchen and bathroom. Reduction in risers, overhead work and fire cell penetrations



External Services Module

Pre-terminated Wiring Loom for all Power and Lighting, transported in ESM

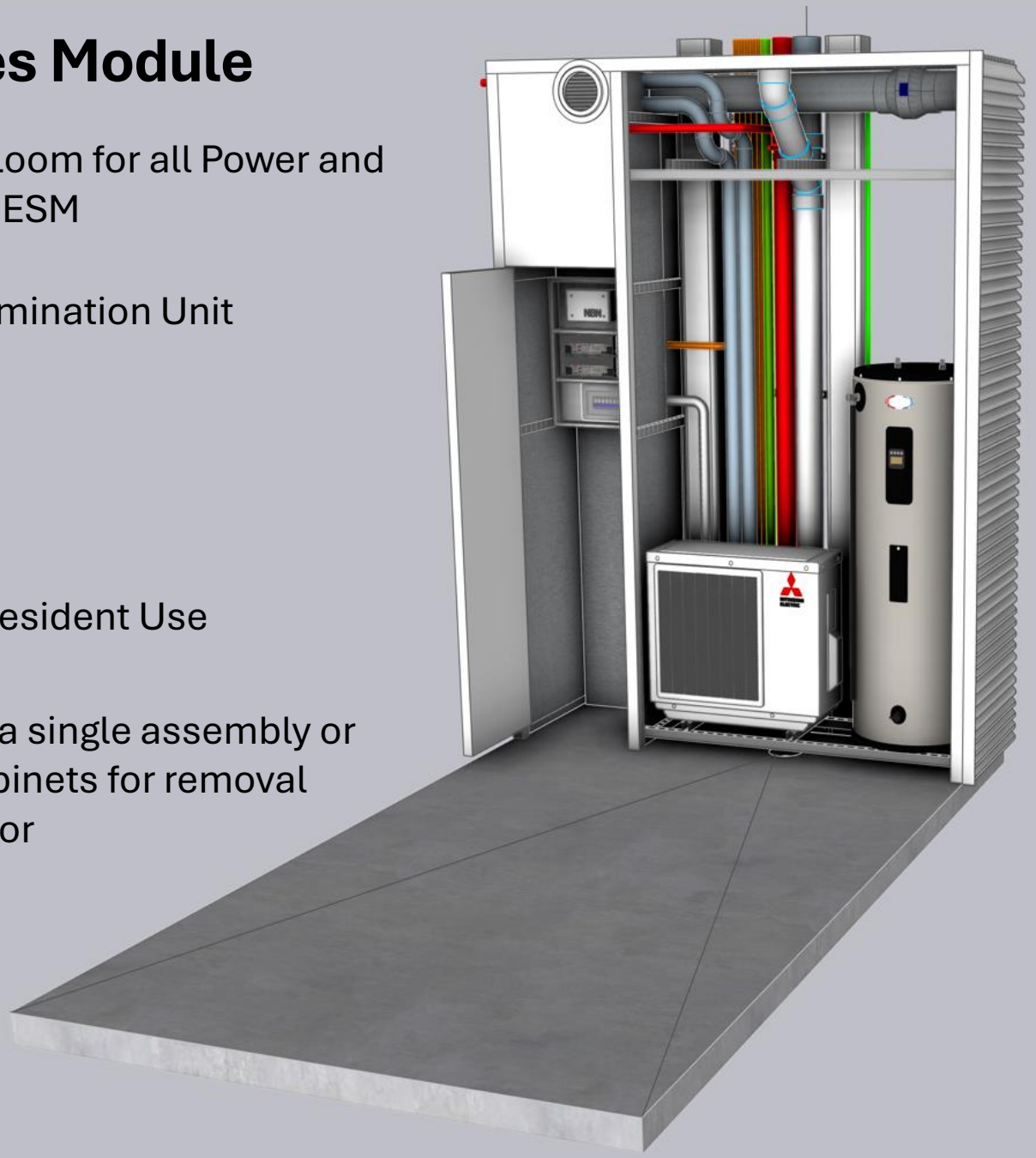
Fibre Optic Network Termination Unit

LED Lighting Drivers

Unit Switch Board

Storage Cupboard for Resident Use

Modular chassis, lift as a single assembly or break down into two cabinets for removal without crane via elevator



Exhaust Air Duct & Inline Fan

Stormwater & Balcony Floor Drain

Balcony Support Columns

Riser Rack for Power, Sprinkler, Water Supply, Fibre Optic, TV Antenna & Stormwater

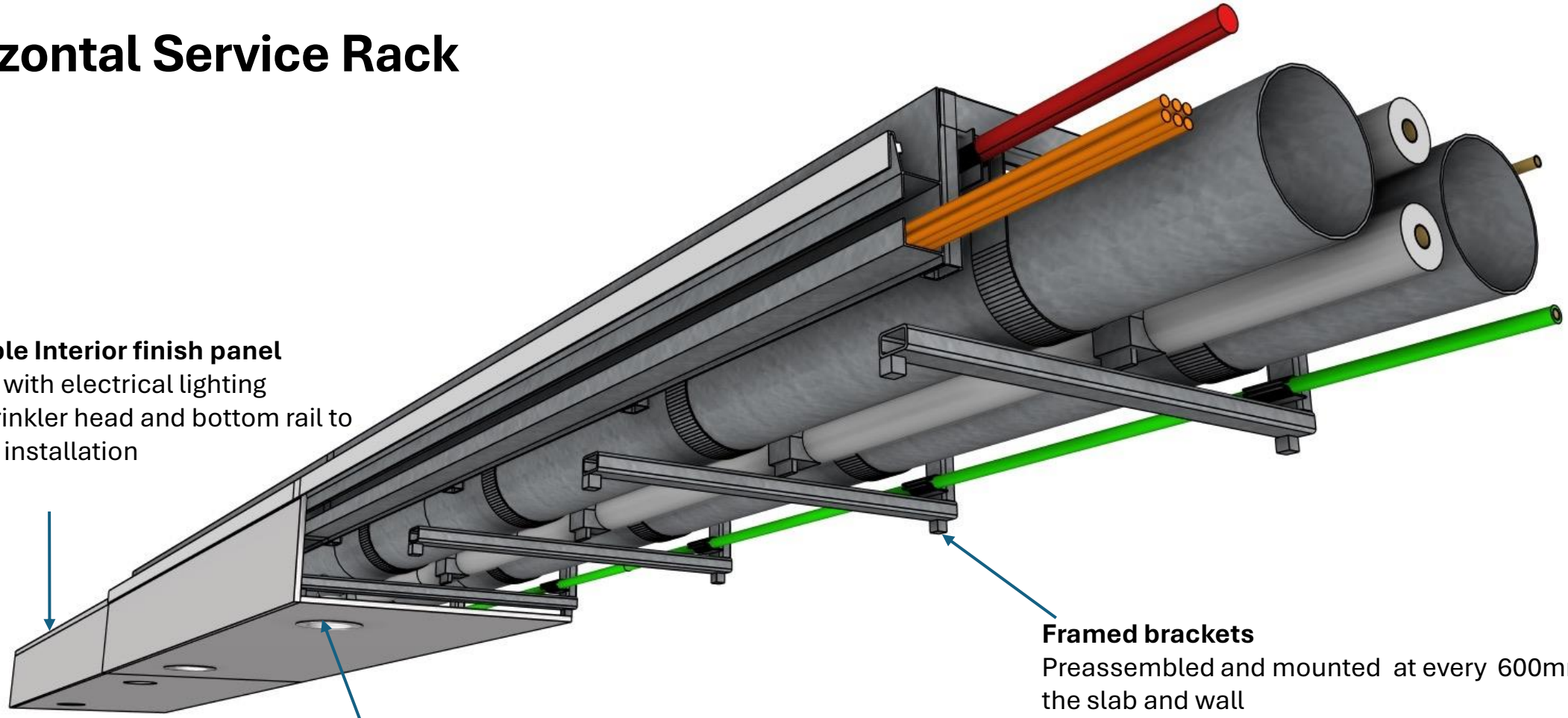
Inverter Water Heater

AC Condenser

Precast Prefinished Slab to falls

Cast structural connectors for support frames

Horizontal Service Rack



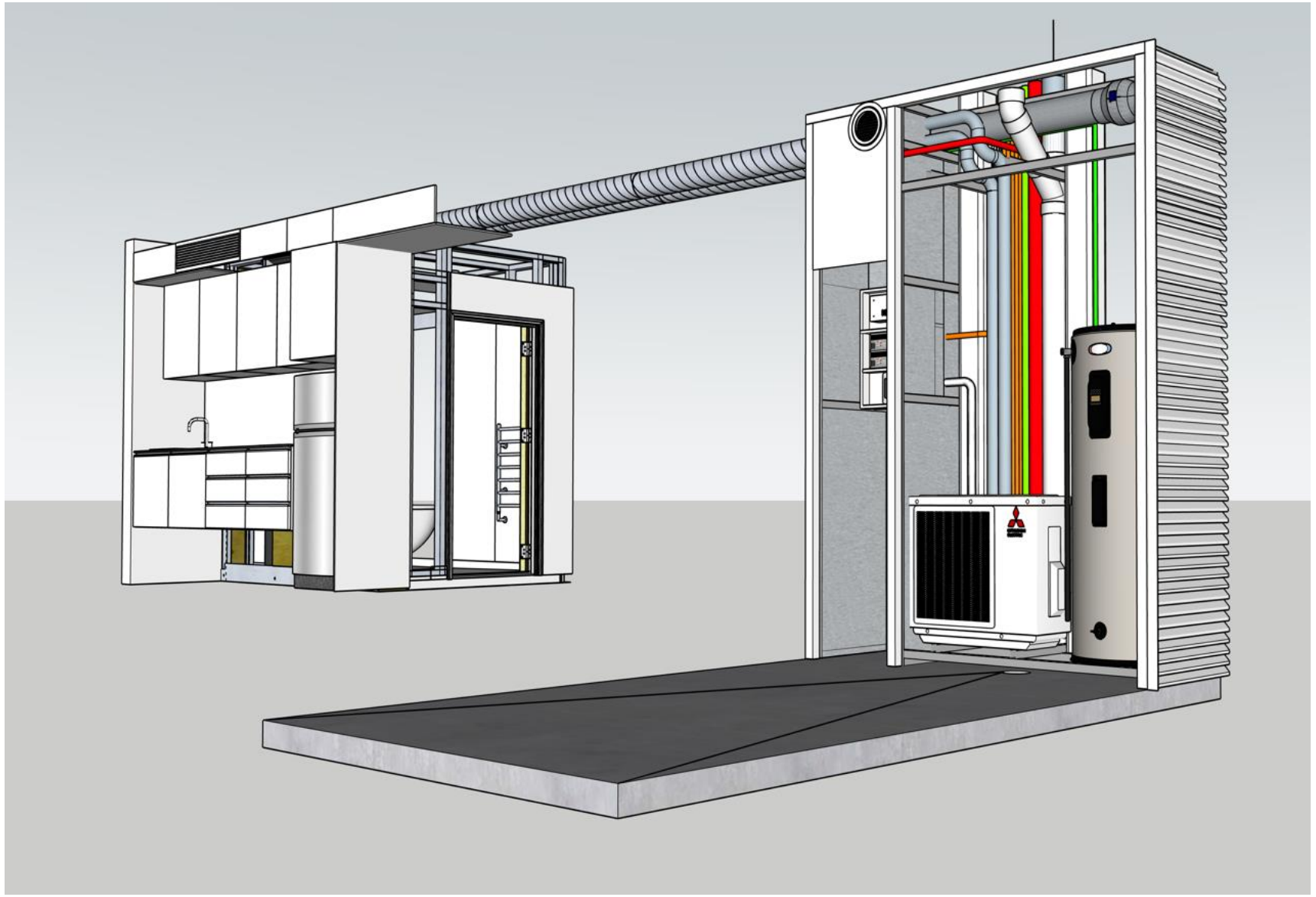
Demountable Interior finish panel
Preinstalled with electrical lighting fixtures, sprinkler head and bottom rail to ease on site installation

Framed brackets
Preassembled and mounted at every 600mm to the slab and wall

Pre-installed clips to take on finishing panels

Lighting fixture / Sprinkler
Location alternates every bulkhead as per requirement in the interior layout

Services Distribution Concept



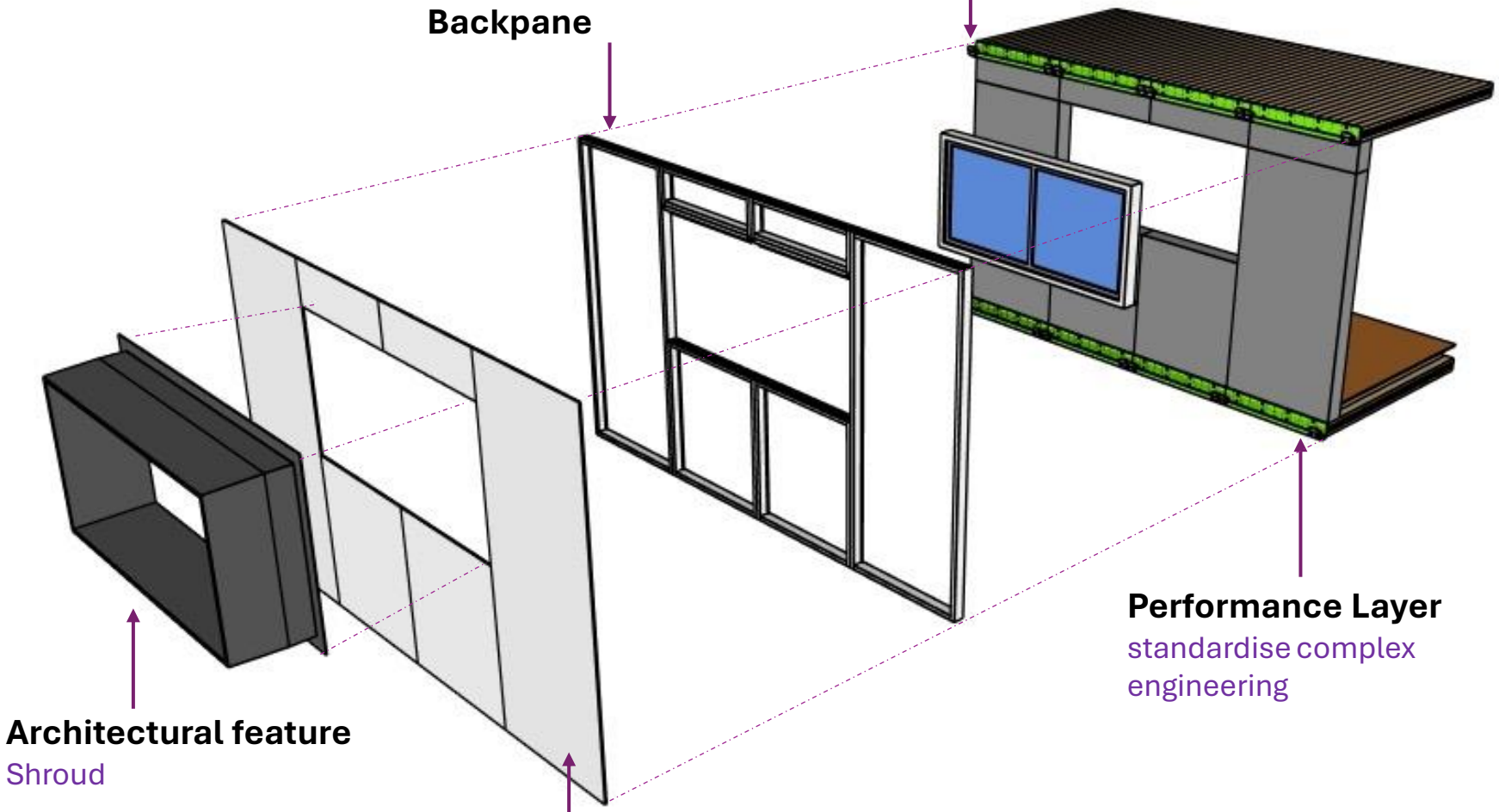
Horizontal Service Rack
Connects to façade for air intake and exhaust and refrigerant lines
Distributes lighting, sprinklers and power

Sewer and H/C water supply shared between kitchen and bathroom

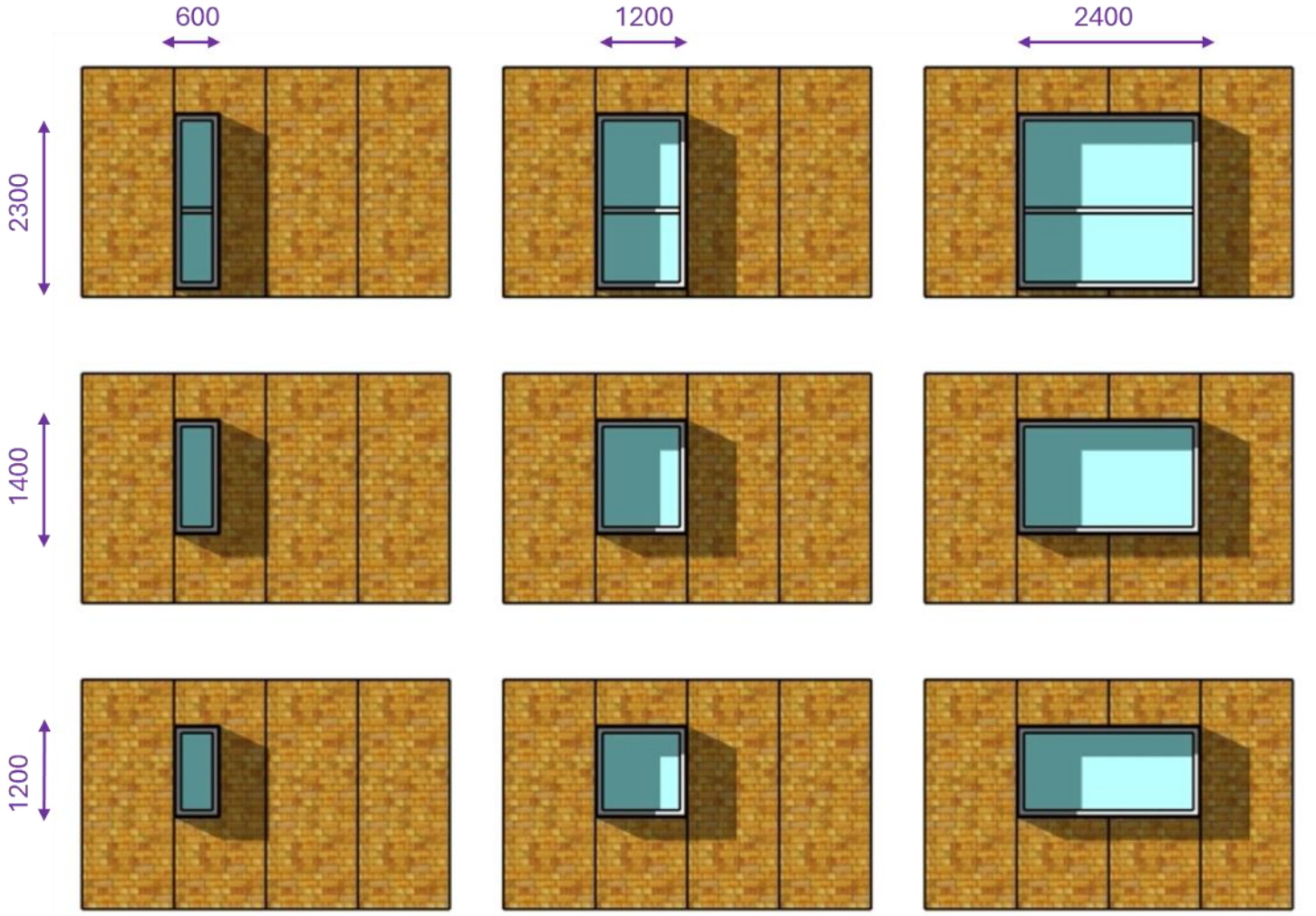
Vertical Service Rack
Riser for all services except sewer
Outside, behind ESM

External Service Module
Riser for all services except sewer
Hot water generation
Air conditioning
Unit Distribution Board
Exhaust Ventilation
Fresh air supply
Stormwater drainage
Data network services
Lighting low voltage drivers

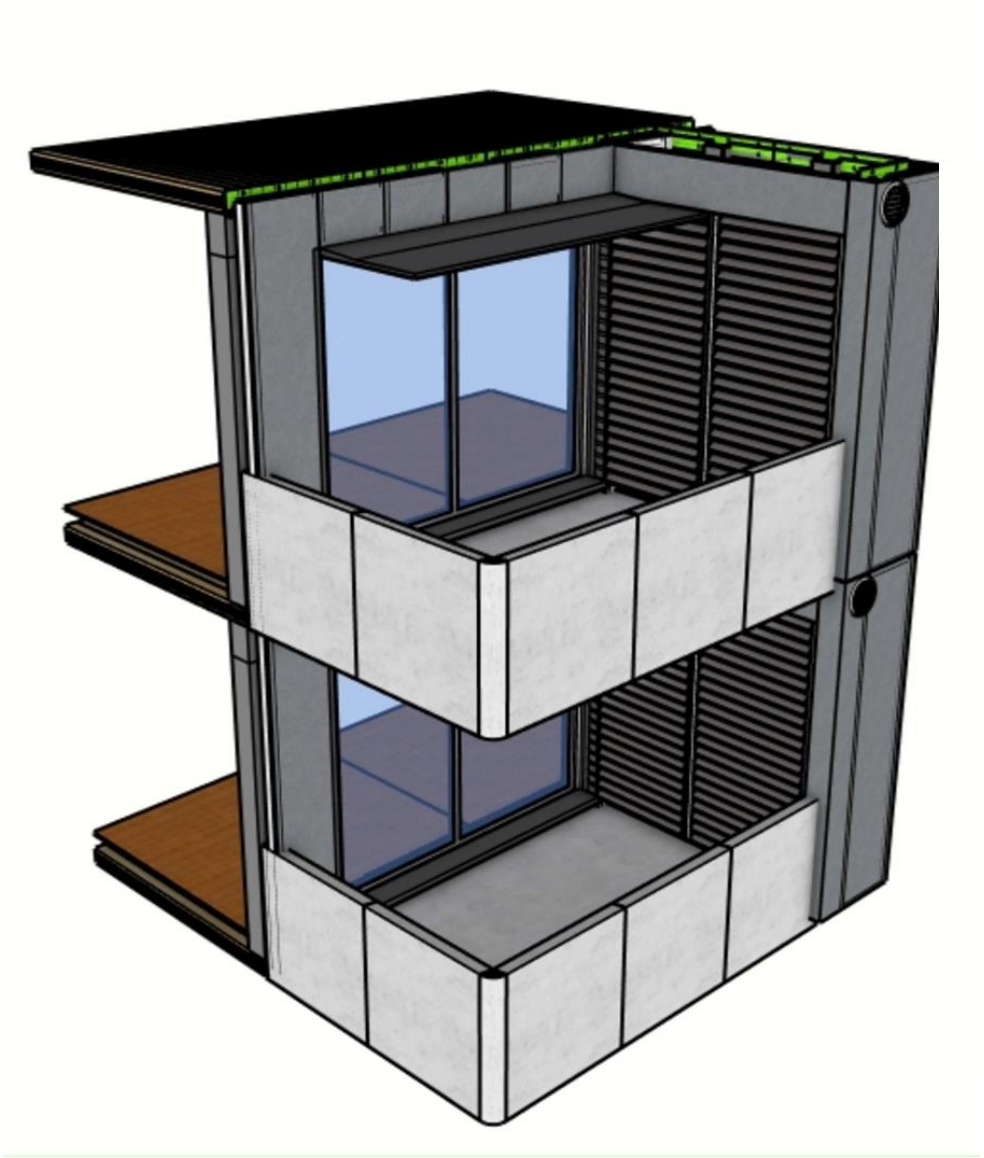
Multi Layered Unitised Exterior Systems

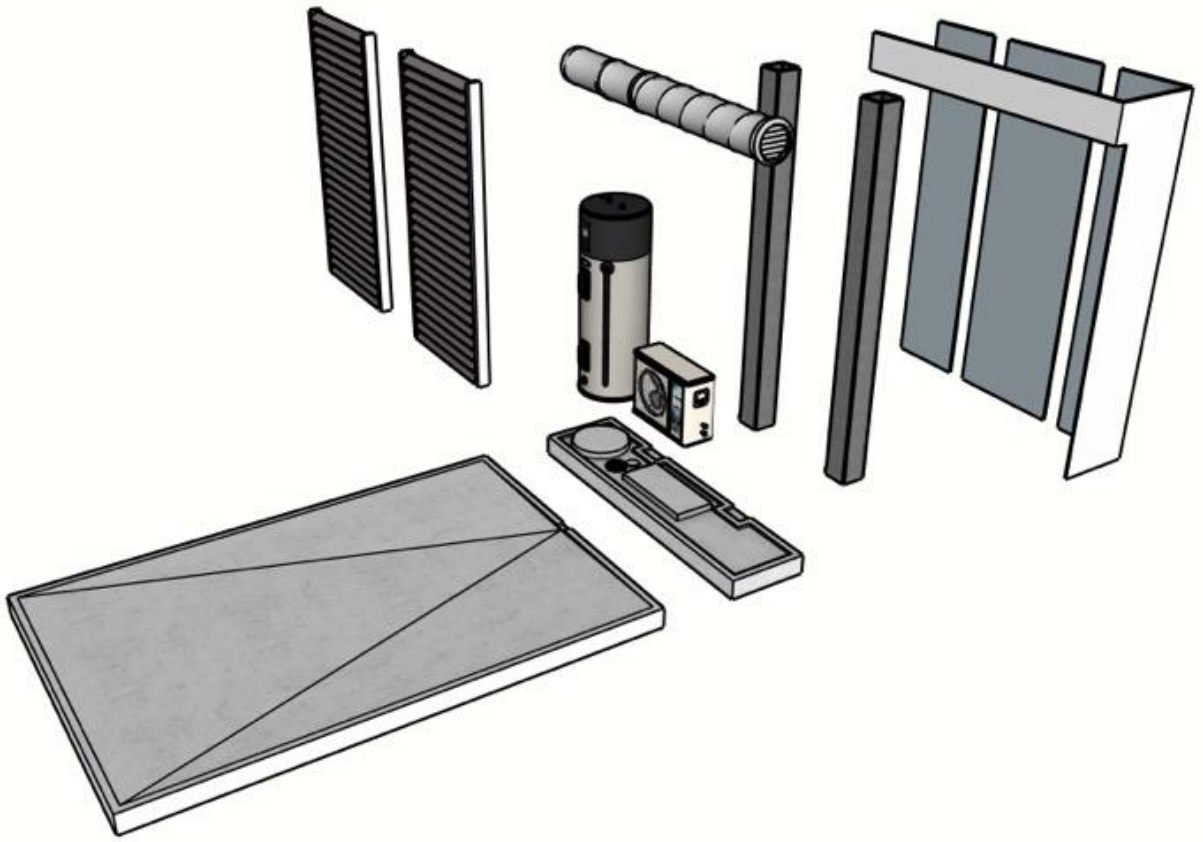


Standardised Sizes



Balcony Structure and Cladding Kitset





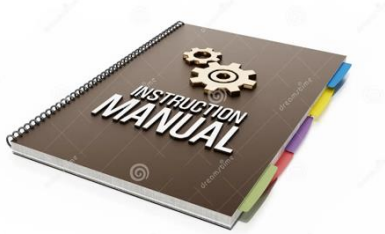
Demonstrator Apartment

On exhibition in Sydney, July

A Digital Foundation

System integrity

- Rules captured as Design Assist tools, managing the degrees of freedom

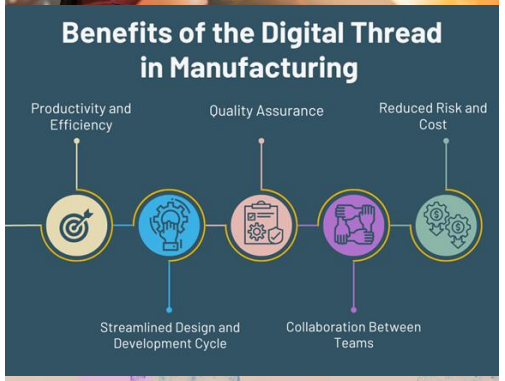


User Support

- Realtime design analysis for System Users (cost, carbon, efficiency, functionality)

Threading the pieces together -

- Design integration of Components from distributed chain
- Component Data Sharing at appropriate fidelity levels
- Procurement
- Supply Chain Logistics



System and Product Development, Industry Improvement

- Benchmarking and Feedback

Further information at: **building4pointzero.org**