Australasian Health Infrastructure Alliance

AHIA Modern Methods of Construction (MMC)

Guidance Document

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AusHFG Australasian Health Facility Guidelines

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Australasian Health Facility Guidelines

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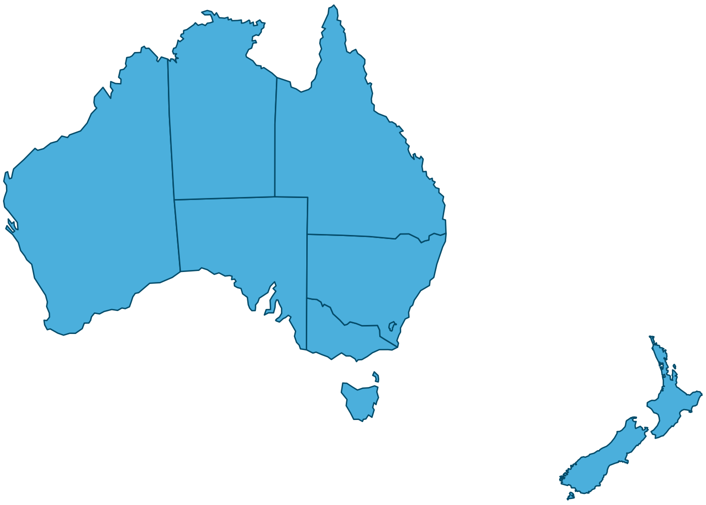
Cultural Acknowledgement and Terminology

The Australasian Health Facility Guidelines (AusHFG) are developed in collaboration with stakeholders across Australia and Aotearoa, New Zealand.



Acknowledgement of Country

We acknowledge the Aboriginal people and Torres Strait Islander People as traditional owners and continuing custodians of the land throughout Australia and the Torres Strait Islands.

We acknowledge their connection to land, sea, sky and community and pay respects to Elders past and present.

Acknowledgement of Te Tiriti o Waitangi

We acknowledge Māori as tāngata whenua in Aotearoa New Zealand.

Te Tiriti o Waitangi obligations have been considered when developing the AusHFG resources.

Terminology and Language in the AusHFG

Throughout the AusHFG resources, the term ‘Indigenous Peoples’ is used to refer to both the Aboriginal and Torres Strait Islander Peoples of Australia and Māori of Aotearoa, New Zealand. Where references to specific cultural requirements or examples are described, the terms ‘Aboriginal and Torres Strait Islander Peoples’ and ‘Māori’ are used specifically. The AusHFG respect the right of Indigenous Peoples to describe their own cultural identities which may include these or other terms, including particular sovereign peoples or traditional place names.

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Glossary of Terms

Definitions of key MMC-related terms

Acronym	Definition
AHIA	Australasian Health Infrastructure Alliance
AS	Australian Standard
AS/NZS	Australian and New Zealand Standard
AusHFG	Australasian Health Facility Guidelines
BCA	Building Code of Australia – Volume 1 and Volume 2 of the NCC
NCC	National Construction Code (Australia)
NZBC	New Zealand Building Code
PCG	Project Control Group
PUG	Project User Group
SME	Subject Matter Expert
MMC	Modern Methods of Construction
DfMA	Design for Manufacture and Assembly

1 Introduction

1.1 Background

The Australian Health Infrastructure Alliance (AHIA) is a collaborative partnership between all public health infrastructure authorities across Australia and New Zealand. As custodians of the Australasian Health Facility Guidelines (AusHFG), AHIA supports the planning and delivery of healthcare infrastructure by providing contemporary, evidence-based resources that promote quality, efficiency, and innovation.

In recent years, AHIA has expanded its role to include the development of resources addressing emerging challenges and opportunities in health infrastructure delivery. One such initiative is the creation of a Modern Methods of Construction (MMC) Guidance document, designed to support jurisdictions in exploring and implementing innovative construction methodologies that improve the speed, cost-effectiveness, and quality of healthcare projects.

MMC offers significant potential to respond to increasing pressures on capital works programs, including skills shortages, cost escalation, and demand for rapid delivery, by leveraging standardised design, prefabrication, offsite manufacturing, digital integration, and other advanced construction technologies. While adoption of MMC is increasing across the broader construction sector, its uptake in healthcare infrastructure remains varied across jurisdictions.

The AHIA MMC Guidance will provide a nationally consistent, practical resource that defines MMC, outlines its benefits and limitations, and shares key lessons learned from recent projects across Australia and New Zealand. Through jurisdictional consultation, case studies, and expert input, the guidance will identify opportunities for collaboration, standardisation, and market development, positioning AHIA jurisdictions to confidently navigate the future of healthcare infrastructure delivery.

1.2 Purpose of the Guidance Document

The purpose of this document is to provide AHIA jurisdictions with a structured approach to adopting MMC in healthcare infrastructure projects. The document is relevant to any jurisdiction considering MMC for projects and programs of work, for all key phases, from Business Case through to Delivery and Post Occupancy. This guidance aims to:

- **Define MMC:** Provide a clear and contemporary definition of MMC as it applies to the healthcare sector, including the range of construction approaches and technologies it encompasses.
- **Describe the Types of MMC:** Outline the various categories and methods of MMC, such as volumetric modular construction, panelised systems, and hybrid approaches, and their relevance to healthcare facility design and delivery.
- **Identify Benefits and Opportunities:** Highlight the potential advantages of MMC, including improved timeframes, cost efficiency, build quality, sustainability outcomes, workforce optimisation, and delivery in remote or constrained environments.
- **Examine Challenges and Limitations:** Explore the regulatory, logistical, financial, and cultural barriers that may impact the adoption of MMC within different jurisdictions and project contexts.
- **Document Jurisdictional Approaches and Experiences:** Capture current practices, case studies, and lessons learned from jurisdictions across Australia and New Zealand to inform future MMC applications.
- **Recommend Appropriate Use Cases:** Provide guidance on where MMC is most suitable and effective within healthcare infrastructure, considering facility types, project scale, and geographic considerations.
- **Address Design, Compliance, and Standardisation:** Offer insights into how standardised design elements and compliance pathways can better support the integration of MMC into health capital works.
- **Support Collaboration and Market Development:** Identify opportunities for AHIA jurisdictions to work together to remove barriers, promote innovation, and support the growth of a more mature MMC market across the region.

- **Inform Procurement and Policy:** Recommend procurement models, policy reforms, and planning strategies that can facilitate broader MMC adoption in healthcare settings.
- **Guide Future Research and Innovation:** Establish a foundation for ongoing knowledge sharing, performance monitoring, and research into emerging MMC technologies and practices.

1.3 Key Findings

High-level summary of MMC benefits, challenges, and best practices

MMC offer significant opportunities to improve the delivery of health infrastructure projects across Australasia.

Key benefits identified by the health industry, when MMC is implemented appropriately, include:

- time savings
- addressing skills shortages and;
- an opportunity to reduce costs.

The health industry also identified:

- improved quality and safety through controlled offsite manufacturing
- minimised disruption on live healthcare sites, and;
- increased certainty in delivery, particularly in regional and remote areas.

Common challenges persist, including:

- limited industry capability and supply chain maturity
- regulatory and certification complexities (particularly across jurisdictions), and;
- a general resistance to change within traditional procurement and delivery models.

Best practices emerging from the health industry include:

- embedding MMC considerations early in project planning and business case development
- aligning standardised design efforts with MMC-compatible components
- fostering early contractor involvement to support innovation, and;
- ensuring clear delineation of responsibility for prefabricated elements.

The health industry also emphasised the need for:

- consistent terminology
- clearer procurement frameworks
- shared lessons learned to support broader uptake and;
- improved confidence in MMC across the sector.

2 Understanding Modern Methods of Construction (MMC)

2.1 Definition of MMC

It is important to maintain a consistency of terminology and definition relating to MMC to assist awareness, adoption and innovation. For the purposes of the MMC AHIA Guidance Document and its related design outputs, AHIA has adopted the following definition:

Modern Methods of Construction (MMC) describes a broad spectrum of construction methodology, systems, processes, and products which seek to improve productivity, provide better efficiency, and achieve value for money, quality and sustainable outcomes from the Construction Industry.

In the context of healthcare infrastructure, MMC includes both offsite and onsite construction approaches that incorporate advanced manufacturing techniques, digital technologies, and standardised design principles. It encompasses a variety of products such as volumetric modular construction, panelised systems, hybrid methods, and sub-assemblies, as well as process innovations like Design for Manufacture and Assembly (DfMA), digital design integration, and collaborative procurement.

MMC is not a single solution, but a flexible and evolving approach to construction that considers market conditions to encourage innovation, reduce delivery time, improve health and safety, and supports environmental and social sustainability goals.

Figure 1 MMC Category Deliveries

2.2 MMC Categories

To effectively integrate MMC into healthcare infrastructure projects, it is essential to understand the unique design implications of each MMC category. The UK Government's seven-category framework provides a structured lens for evaluating MMC strategies, from full volumetric solutions to site process innovations.

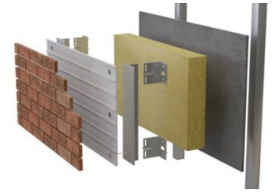
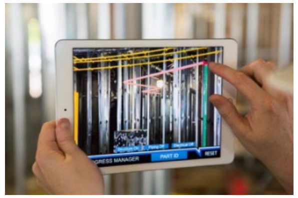
Figure 2 UK MMC Categories (Cast) – refer Table 1 MMC Categories

UK MMC Categories (Cast)

Each category presents distinct opportunities and challenges within the context of healthcare design, delivery, and operation. The following guidance outlines key design considerations for each category, offering practical advice to support decision-making during early planning, business case development, and detailed design stages. These insights are informed by Australian and New Zealand healthcare projects, jurisdictional interviews, and best-practice examples, helping project teams maximise the value of MMC in delivering safe, efficient, and adaptable clinical environments.

Figure 3 Modular Ward, Bunbury Hospital, WA

Table 1 MMC Categories

1	2	3	4	5	6	7
Pre-Manufacturing – 3D Primary Structural Systems	**Pre-Manufacturing – 2D Primary Structural Systems**	**Pre-Manufacturing Components – Non-Systemised Primary Structure**	**Pre-Manufacturing – Additive Manufacturing**	**Pre-Manufacturing – Sub-Assemblies and Components**	**Traditional Building Product Improvements**	**Site Process Improvements and Technology**
						
3D (Volumetric) construction producing three-dimensional units in controlled factories before final installation. These units vary in form, from basic structures to fully finished ones with services installed e.g. full units in apartments buildings or mini units including bathroom pods ready to be stacked and loaded.	2D ''Panelised'' is a systemised approach involves using flat panel units for basic floor, wall, and roof structures. These panels are produced in a factory environment and assembled on-site to create a final three-dimensional structure. The most common method is using open panels, which consist of skeletal structures with services, insulation, external cladding, and internal finishes installed on-site. More complex closed panels include lining materials, insulation, services, windows, doors, internal wall finishes, and external claddings.	Pre-manufactured structural members, including framed or mass-engineered timber, cold-rolled or hot-rolled steel, and precast concrete, are used for load-bearing elements such as beams, columns, walls, core structures, and slabs. These components are not substantially constructed on-site by the workforce and are not part of a systemised design. Additionally, this category encompasses substructure elements like prefabricated ring beams, pile caps, driven piles, and screw piles.	This technique allows for creating parts using various materials based on digital design and manufacturing techniques. It can be done remotely, on-site, or at the final workface.	This category focuses on non-structural components and sub-assemblies for construction. It includes unitised non-structural walling systems, roofing finish assemblies separate from the main structure, and mini volumetric units (pods) for areas like kitchens and bathrooms. Also covered are pre-formed wiring looms and mechanical engineering composites produced off-site. It excludes conventional masonry and standard building products unless significantly reconfigured.	This category encompasses traditional single building products manufactured in large formats, pre-cut configurations, or with jointing features aimed at minimising on-site labour required for installation.	This category aims to cover innovative on-site construction techniques that leverage process improvements not classified within the main pre- manufacturing categories 1-5 or materials innovation in Category 6. It includes measures like factory-standard workface encapsulation, Lean Construction methods, integration of physical and digital worker augmentation technologies, workface robotics, exoskeletons, wearables, drones, verification tools, and the adoption of advanced plant and machinery

Category 1 – Pre-Manufacturing – 3D primary structural systems

3D primary structural systems, also known as ''Volumetric'' or ''Modular'' construction, involves the offsite fabrication of three-dimensional structural units (or "modules") in a controlled manufacturing environment. These modules are typically fully enclosed and may include internal finishes, services, fixtures, and fittings. Once transported to site, the modules are assembled to form a complete building or part of a building.

3D (Volumetric) construction is particularly well-suited to healthcare settings where speed, precision, and quality are paramount. This approach can significantly reduce onsite construction time, minimise disruption to live hospital environments, and allow for safer, more predictable delivery programs. It is especially beneficial for urgent or temporary health facilities, outpatient clinics, wards, or accommodation buildings, and can be scaled to suit both regional and metropolitan projects.

Figure 4 MMC Category 1 Images

Category 2 - Pre-Manufacturing – 2D primary structural systems

A systemised approach involves using flat panel units for basic floor, wall, and roof structures. These panels are produced in a factory environment and assembled on-site to create a final three-dimensional structure. The most common method is using open panels, which consist of skeletal structures with services, insulation, external cladding, and internal finishes installed on-site. More complex closed panels include lining materials, insulation, services, windows, doors, internal wall finishes, and external claddings. Structural performance applies to primary walls and all floors.

2D ''Panelised'' construction involves the prefabrication of flat building components such as walls, floors, and roofs, which are then transported to the construction site and assembled into the final structure. These panels may be structural or non-structural and often incorporate insulation, external cladding, and service penetrations.

2D systems offer design flexibility and are ideal for projects that benefit from a hybrid approach combining prefabrication with traditional construction. They are useful in healthcare for constructing building envelopes quickly, enabling faster lock-up and fit-out stages. 2D ''Panelised'' construction can support high-quality thermal and acoustic performance, important factors in clinical environments, and is well-suited to standardised hospital rooms or clinic layouts.

Figure 5 MMC Category 2 Images

Category 3 - Pre-Manufacturing Components – Non-Systemised Primary Structure

Pre-manufactured structural members, including framed or mass-engineered timber, cold-rolled or hot-rolled steel, and precast concrete, are used for load-bearing elements such as beams, columns, walls, core structures, and slabs. These components are not substantially constructed on-site by the workforce and are not part of a systemised design. Additionally, this category encompasses substructure elements like prefabricated ring beams, pile caps, driven piles, and screw piles.

Category 3 elements are particularly valuable in addressing the challenges of delivering large, complex facilities within constrained timelines and environments. The use of precast concrete cores and prefabricated steel or timber structural systems can significantly accelerate early construction stages, enabling faster transition to above-ground works. This is especially beneficial in hospital redevelopments or expansions where minimising disruption to existing operations is critical. Additionally, prefabricated substructure components, such as pile caps or ring beams, support rapid and consistent groundworks, an important consideration in regional or remote settings where access to skilled labour and equipment is limited. These elements offer targeted efficiencies that improve program certainty and can be seamlessly integrated into hybrid delivery models for healthcare facilities.

Figure 6 MMC Category 3 Images

Category 4 - Pre-Manufacturing – Additive Manufacturing

This technique allows for creating parts using various materials based on digital design and manufacturing techniques. It can be done remotely, on-site, or at the final workface.

Additive manufacturing, such as 3D printing of building components or formwork, offers emerging opportunities to enhance precision, customisation, and speed in the delivery of complex elements. As digital design tools become more integrated with construction workflows, through BIM and DfMA, additive manufacturing may increasingly support the production of highly tailored, non-load-bearing components in clinical environments where hygiene, spatial accuracy, and flexibility are paramount.

Figure 7 MMC Category 4 Images

Category 5 - Pre-Manufacturing – Non-structural assemblies and sub-assemblies

This category focuses on non-structural components and sub-assemblies for construction. It includes unitised non-structural walling systems, roofing finish assemblies separate from the main structure, and mini volumetric units (pods) for areas like kitchens and bathrooms. Also covered are pre-formed wiring looms and mechanical engineering composites produced off-site. It excludes conventional masonry and standard building products unless significantly reconfigured.

Hybrid systems combine elements of both volumetric and panelised construction with traditional building methods to create a tailored approach that leverages the strengths of multiple systems. For example, a hybrid solution might involve volumetric modules for service-intensive spaces alongside panelised walls and conventional slabs or frames.

Healthcare infrastructure often involves complex spatial and functional requirements that do not lend themselves to a single method. Hybrid systems offer the flexibility to prefabricate highly repeatable components (patient bathrooms or plant rooms) while allowing bespoke clinical spaces to be built traditionally or with other MMC elements. This balance makes hybrid systems a practical option for hospitals and health precincts with mixed-use spaces and varying performance demands.

Figure 8 MMC Category 5 Images

Category 6 - Traditional building product led site labour reduction / productivity improvements

This category encompasses traditional single building products manufactured in large formats, pre-cut configurations, or with jointing features aimed at minimising on-site labour required for installation. The use of modular wiring systems has been adopted in health care projects.

Figure 9 MMC Category 6 Images

Category 7 - Site process led labour reduction / Productivity Improvements

This category aims to cover innovative on-site construction techniques that leverage process improvements not classified within the main pre- manufacturing categories 1-5 or materials innovation in Category 6. It includes measures like factory-standard workface encapsulation, Lean Construction methods, integration of physical and digital worker augmentation technologies, workface robotics, exoskeletons, wearables, drones, verification tools, and the adoption of advanced plant and machinery.

Healthcare buildings are highly complex and service intensive. Digital and automated construction techniques enable accurate design coordination, clash detection, and manufacturing integration, reducing costly onsite rework and improving program certainty. Building Information Modelling (BIM) and digital design also enhance facility management post-construction by providing as-built data and digital asset registers. In healthcare, where compliance and adaptability are critical, these technologies support better long-term outcomes and safer, more efficient project delivery

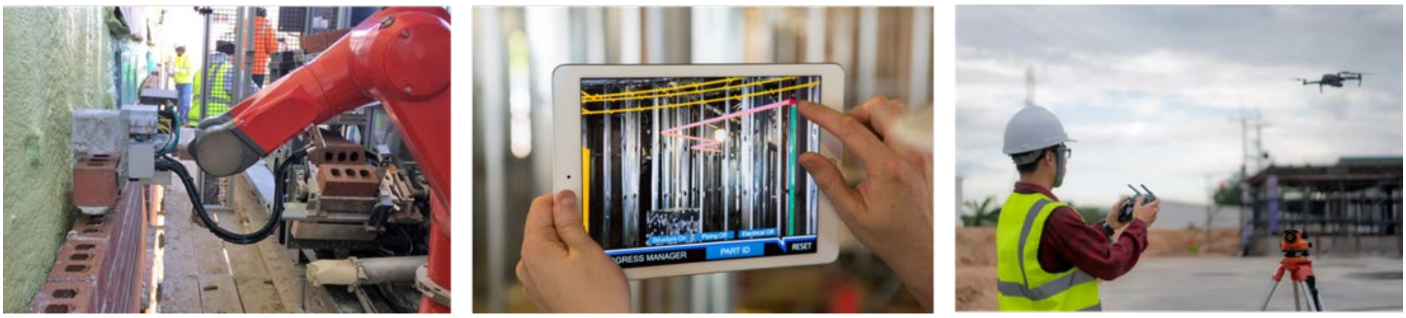


Figure 10 MMC Category 7 Images

Figure 11 Sunshine Hospital (MMC Category 1), VHBA, VIC

2.3 Benefits of MMC

MMC offers a range of compelling benefits for healthcare infrastructure, from faster delivery and improved safety to enhanced quality and sustainability outcomes. However, these benefits can only be realised when MMC is considered early in the project lifecycle and aligned with the specific drivers, constraints, and priorities of each project. Successful implementation depends on selecting the appropriate MMC categories to suit the facility type, clinical functionality, location, and delivery context.

When MMC is treated as an afterthought or retrofit solution, many of its advantages, such as design standardisation, offsite efficiencies, and program certainty, are significantly diminished.

Embedding MMC thinking from the outset enables more informed planning, optimised design, and coordinated procurement, ensuring healthcare projects can maximise value while delivering safe, high-performing, and future-ready facilities.

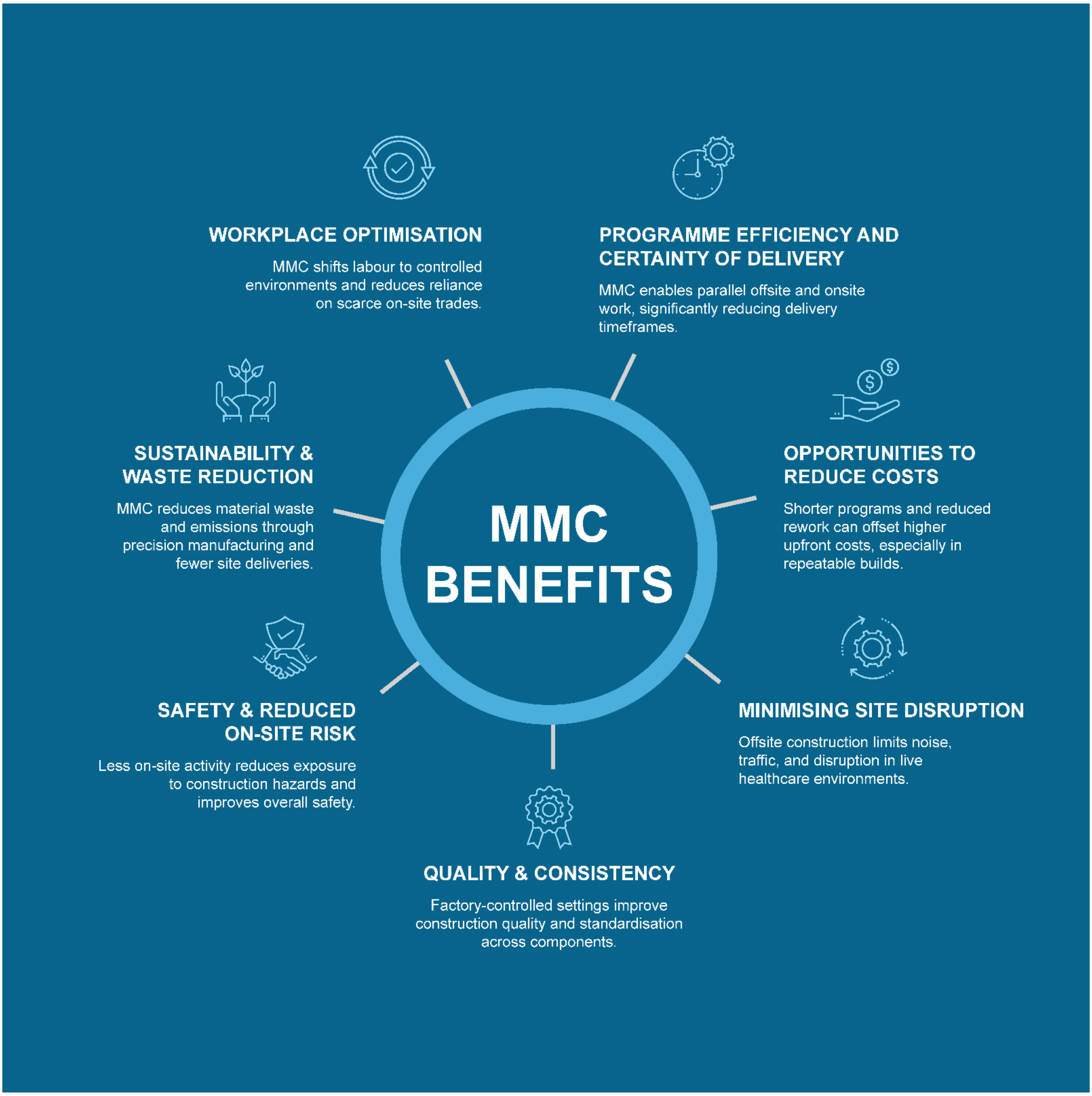


Figure 12 MMC Benefits

Table 2 Benefits of MMC

Benefit	Description
Programme Efficiency and Certainty of Delivery	MMC significantly accelerates construction programs by allowing building components to be manufactured offsite while site preparation occurs in parallel. This concurrent sequencing compresses delivery timeframes, reduces critical path dependencies, and provides greater certainty around program milestones. In healthcare settings, where timely delivery can be directly linked to patient outcomes and service continuity, this benefit is especially valuable.
Opportunities to Reduce Costs	Although MMC can involve higher upfront costs due to transport, cranage, or customisation, these are often offset by shorter construction durations, reduced rework, and greater operational efficiency over the building's lifecycle. Repeatable designs and economies of scale can also drive cost reductions over time, particularly for standardised facility types like outpatient clinics or residential care units. However, to realise these cost benefits, it is critical that the suitability of MMC, across the different categories, is assessed early and appropriately for each project context.
Minimising Site Disruption	Healthcare environments are often live operational settings where disruption must be minimised. MMC reduces the duration and intensity of onsite activities by shifting the bulk of construction to controlled factory environments. This leads to less noise, dust, and traffic on hospital campuses, enabling hospitals to maintain patient care with fewer interruptions and lower risk to vulnerable users and staff.
Quality & Consistency	Building in factory-controlled settings allows for improved quality assurance, precision fabrication, and consistent delivery standards across modules or components. In healthcare, where clinical requirements demand high-quality finishes, hygienic materials, and compliance with strict codes, this consistency helps ensure robust and repeatable outcomes that meet or exceed regulatory standards.
Safety & Reduced On-Site Risk	By reducing the amount of manual labour and high-risk activities occurring on-site, MMC lowers exposure to workplace hazards. Factory environments offer safer working conditions, better ergonomics, and stronger supervision, while construction sites benefit from shorter durations and fewer personnel. This leads to improved safety records and fewer incidents during healthcare project delivery.
Sustainability & Waste Reduction	MMC supports sustainability goals through reduced material waste, more efficient energy use in production, and lower transport emissions due to fewer site deliveries. Components are fabricated with precision, minimising offcuts and packaging waste. Many MMC manufacturers also integrate sustainable materials and circular economy principles, aligning with the healthcare sector's growing environmental performance requirements.
Workforce Optimisation	With growing challenges in sourcing skilled labour, especially in regional and remote areas, Standardised Designs support more efficient training and transfer of Health Services staff and MMC provides a viable solution by transferring much of the workforce requirement to offsite manufacturing facilities. This approach reduces reliance on traditional on-site trades and enables access to a more stable, centralised labour pool. It also supports workforce development by introducing new roles in digital fabrication and logistics.

3 Key Challenges and Barriers

3.1 Regulatory and Policy Barriers

Across the health sector, several policy-level barriers hinder the wider adoption of MMC in healthcare infrastructure projects. A common challenge is the application of local content requirements, which, while important for supporting regional economies, can inadvertently limit the ability to engage specialist MMC manufacturers located outside the jurisdiction or interstate. These policies can restrict access to mature supply chains and reduce opportunities for economies of scale.

In addition, procurement frameworks are often rigid and risk-averse, with standard templates and procedures that do not easily accommodate alternative delivery models or early contractor involvement, both of which are critical for successful MMC integration. Internal governance processes can discourage deviation from established procurement norms, creating a culture in which innovation is difficult to justify without clear precedent.

Other constraints include design, planning and compliance pathways that are not well-aligned with prefabricated construction methods, resulting in delays or increased complexity during approvals.

Together, these policy and procedural settings present systemic barriers to MMC uptake and reinforce the need for reform to support more flexible, innovation-friendly approaches across the public health infrastructure sector.

3.2 Financial and Market Challenges

Cost perceptions

A key barrier identified across jurisdictions is the divergent and often misinformed perception of MMC's cost profile. Some stakeholders view MMC as a low-cost, rapid-deployment solution suited only to basic or temporary infrastructure, while others report experiencing cost premiums of up to 20% compared to traditional construction methods. These conflicting views have contributed to hesitancy in embedding MMC as a core delivery strategy.

In many cases, perceived or actual cost premiums are not inherent to MMC itself, but rather a consequence of late integration into the project lifecycle, where MMC is adopted as a retrofit solution rather than being planned from project commencement. This often leads to duplication in design work, increased coordination challenges, and missed opportunities for economies of scale. Additionally, procurement models that are not tailored to MMC can inflate costs by failing to capitalise on efficiencies in manufacturing, logistics, and program compression.

> Without more consistent and transparent cost data, particularly from projects where MMC has been effectively integrated early, this perception gap will continue to act as a barrier to its broader use in healthcare infrastructure.

Cost & Financial Modelling Limitations

Across the health sector, it remains difficult to accurately benchmark the costs of MMC against traditional construction methods. While MMC is often perceived as more expensive, particularly when introduced late in a project or when cost comparisons do not account for lifecycle benefits, time savings, or reduced site disruption, jurisdictional reviews have shown that this perception is not always misplaced. In some instances, real additional costs have been observed, particularly for Category 1 MMC (volumetric modular), even when planned from the outset. These costs can arise from factors such as transport, cranage, and manufacturing complexity. Business case frameworks and financial modelling tools are also not well configured to assess MMC approaches, leading to uncertainty during project approval. This lack of clarity undermines confidence in MMC's value proposition and reinforces the perception of a cost premium. To support informed decision-making, MMC suitability and cost implications must be assessed on a case-by-case basis, with clear data capturing both benefits and limitations.

Limited competition in MMC supply chains

Across the construction industry, there is limited maturity and competition within the MMC supply chain. The small number of capable suppliers, many of whom are concentrated in specific jurisdictions, creates a reliance on a handful of providers, which in turn drives up costs, restricts market responsiveness, and increases project risk.

This lack of depth in the supply chain also makes it difficult to secure competitive pricing through traditional procurement processes, often leading to non-compliant or sole-source procurement pathways that conflict with standard government guidelines.

As a result, project teams are frequently forced to justify MMC solutions through time or risk-based arguments rather than cost efficiency. In addition, where procurement models require multiple tender submissions, the absence of competing MMC bids can stall progress or default projects back to conventional delivery methods.

This constrained market environment also poses challenges for quality assurance, supply continuity, and long-term performance guarantees, key concerns for health infrastructure projects with complex clinical and operational requirements.

Figure 13 Northern Hospital Delivery, VHBA, VIC

Workforce and Skills Limitations

Workforce and skills limitations are a critical barrier to both traditional construction and the broader adoption of MMC. Challenges in accessing sufficient skilled labour to deliver healthcare infrastructure projects are common, with shortages particularly acute in regional and remote areas.

This general labour constraint is compounded by a lack of workforce capability specific to MMC, including skills in modular assembly, digital fabrication, Design for Manufacture and Assembly (DfMA), and precision installation techniques. The current training and accreditation systems remain heavily geared toward conventional construction methods, with limited MMC-focused content in trade qualifications or professional pathways.

As MMC requires a different skill mix, shifting labour demand from site-based trades to factory-based technicians, logistics coordinators, and digitally enabled roles, here is a growing gap between what the industry needs and the workforce being produced.

3.3 Internal Stakeholders and Understanding of MMC

Conservatism & Resistance to Change

A cultural resistance to MMC commonly occurs from internal stakeholders, project teams, and delivery partners to move away from established, traditional construction methods. This conservatism stems from a preference for familiar processes and a reluctance to experiment with unfamiliar approaches, particularly in risk-sensitive environments like healthcare. In the absence of internal champions, demonstrable case studies, or clear policy directives, MMC is often perceived as a novelty or exception rather than a mainstream solution. This limits early consideration of MMC during project planning and reduces the opportunity to realise its full benefits.

Risk Appetite & Perception

MMC is often perceived by stakeholders—particularly end users, facilities managers, and asset owners—as carrying increased risk in relation to quality, durability, and long-term maintenance. These concerns can stem from limited exposure to MMC projects, uncertainty around warranties and lifecycle performance, or past experiences with poor implementation. In some cases, MMC is viewed as an untested or “experimental” method that carries reputational or operational risk. This risk aversion can influence procurement decisions and reinforce a default to traditional methods, even when MMC might offer superior outcomes.

Awareness of Opportunity and Approach

It is recognised that the limited awareness of when and how to best leverage MMC, often results in missed opportunities to embed it early in project planning. In many cases, MMC is not actively considered during the business case or early design phases, and is only introduced reactively, typically in response to program pressures or site constraints.

This lack of strategic integration reflects a broader gap in organisational awareness, internal capability, and confidence in MMC delivery models. Project teams are often unsure about what types of healthcare infrastructure are suitable for MMC, how to align it with clinical planning and compliance requirements, or which procurement pathways best support it.

Without clear internal guidance or dedicated MMC champions, decision-makers default to traditional construction methods, even where MMC may offer significant benefits. Addressing this barrier not only requires improved education and training, but also the development of clear MMC decision-making tools, case studies, and design exemplars that demonstrate where MMC works best and how it can be successfully implemented from concept to completion.

4 Recommendations for MMC Implementation

4.1 When and Where to Use MMC in Healthcare

Project Suitability

It is recognised that MMC is most effective in healthcare projects where standardisation, repeatability, and program certainty are critical. Ideal applications include regional and remote projects, where traditional construction faces logistical and workforce challenges, as well as enabling infrastructure, such as plant rooms, site accommodation, and temporary facilities that support staged hospital redevelopments.

MMC is also well-suited to low- to medium-complexity facilities, including community health centres, mental health units, rehabilitation centres, and staff accommodation, where repeatable clinical layouts can be efficiently delivered using modular or panelised systems. Additionally, projects with tight timeframes or limited site access benefit significantly from offsite fabrication, which can reduce onsite activity and disruption to existing operations.

The benefits of MMC are most fully realised when it is considered early in project planning, allowing for design optimisation and alignment with procurement and delivery strategies. While complex acute care facilities may not be suited to full modular delivery, they can still benefit from hybrid approaches, such as modular bathrooms or prefabricated service risers, demonstrating that MMC can play a valuable role across a spectrum of healthcare projects when applied strategically.

Table 3 MMC Project Type

Project Type	Description
Temporary Facilities	Best suited to Category 1 (Pre-Manufacturing – Non-structural assemblies) and Category 2 (Pre-Manufacturing – Structural systems). These facilities can be rapidly deployed using modular units or flat-pack components.
Regional and Remote	MMC provides a practical solution for areas with limited skilled labour and difficult site access, enabling faster, more reliable project delivery. Categories 1–3 and 5 are particularly useful in these locations.
Residential	Key worker accommodation, aged care, and residential rehabilitation facilities are well suited to Categories 1, 2, and 3 due to uniform, repeatable layouts that support efficient offsite construction and rapid assembly.
Low Acuity Facilities	Ideal for MMC approaches, including ambulance stations, outpatient clinics, and temporary or surge healthcare buildings. Best suited to Categories 2 (structural), 3 (volumetric modular), and 5 (pre-manufactured components).
High Acuity Facilities	More complex settings like ICU and operating theatres may be partially delivered via Category 2 (Pre-Manufacturing – Structural Systems) and Category 5 (Pre-Manufactured Components), with hybrid or integrated methods.
Congested Urban Sites	MMC minimises onsite construction activity, reducing disruption, noise, and logistics challenges in busy metropolitan locations. Categories 3 (volumetric modular) and 6 (site-based MMC processes) are commonly applied.

Decision-making frameworks for MMC integration

To support more consistent and confident adoption of Modern Methods of Construction (MMC), there is a clear need for structured decision-making frameworks that can guide project teams in assessing the suitability of MMC early in the planning process.

> MMC is often considered too late or not at all, resulting in missed opportunities for efficiency, standardisation, and innovation.

A practical decision-making framework which aligns with assurance pathways and gateway reviews will help jurisdictions evaluate MMC options based on key factors such as project type, location, time constraints, clinical requirements, and market readiness.

It should include screening questions, cost-benefit analysis prompts, risk assessments, and procurement model alignment, allowing for a transparent and repeatable evaluation process. Importantly, the framework should be embedded into business case development, design briefing, and procurement planning stages to ensure MMC is not treated as an afterthought.

By equipping decision-makers with clear, evidence-based tools, jurisdictions can better identify when MMC offers the greatest value and create a more deliberate and consistent pathway for its integration into public health infrastructure delivery.

Table 4 MMC Project Type Suitability

Project Type	High MMC Suitability	Low MMC Suitability
Temporary Facilities	Rapid deployment is essential; layouts are simple and repeatable. Ideal for 3D (Volumetric) or 2D Panelised solutions.	Where ongoing or complex servicing is required, or facilities are intended for long-term high-complexity clinical operations.
Regional & Remote	Limited local workforce and difficult site access make offsite construction highly advantageous.	Locations with strong local supply chains and established trades may not benefit from MMC advantages.
Residential	Key worker and aged care accommodation with repeatable units are ideal for 3D (Volumetric) or 2D Panelised systems.	Custom, high-end residential care with unique design requirements or high site-specific variation.
Low Acuity Facilities	Outpatient, community health, and ambulance stations are standardised and can be delivered quickly via 3D (Volumetric) systems.	Specialist clinics with complex workflows or irregular layouts that require bespoke architectural solutions.
High Acuity Facilities	MMC is applicable for select components (prefabricated bathrooms, plantrooms). Hybrid approaches are feasible.	Full modular delivery is generally unsuitable for ICUs, operating theatres, or high-spec hospital zones with complex services.
Congested Urban Sites	MMC reduces site time, congestion, noise, and disruption. Especially useful where construction must occur near live clinical settings.	Sites with ample staging space, low sensitivity to disruption, or where MMC transport logistics are overly constrained.

Risks & Issues for MMC implementation

To enable a consistent, considered and evolving approach to MMC implementation it is important to consider the key risks and issues that may and have been experienced. Appendix 9 Risks and Issues, is provided to support Jurisdictions through all phases of projects.

4.2 Opportunities for Standardisation

Standardisation is widely recognised as a key enabler of more effective and scalable use of MMC in healthcare infrastructure.

It is commonly acknowledged that a large proportion of health facilities are composed of repeatable, standardised elements with a smaller number of project or clinically specific elements. Focusing standardisation on the repeatable elements is essential to achieving efficiencies without compromising clinical functionality.

Opportunities for standardisation include the use of spatial “kits of parts”, modular room templates, repeatable floorplates, and consistent grid layouts that align with manufacturing constraints. Standardising key clinical spaces (consultation rooms, inpatient bedrooms, ensuites, medical services panels) and building systems (e.g. service risers, structural modules, wall panels) can reduce design time, lower manufacturing costs, and support cross-jurisdictional procurement.

It is noted that projects can benefit from aligning AusHFG guidelines and existing room data sheets to inform modular typologies. While some variability is necessary to respond to site and service-specific needs, greater national alignment on core building blocks would significantly increase MMC feasibility, quality assurance, and supply chain confidence, paving the way for more consistent and cost-effective healthcare delivery across Australia and New Zealand.

In addition, standardised structural grids, wall panels, floor cassettes, and façade systems are critical components that could streamline manufacturing, improve cost certainty, and reduce design duplication across projects. By creating a suite of interoperable components, health jurisdictions could more readily achieve MMC suitability while maintaining flexibility to respond to site-specific and clinical variability.

To support MMC initiatives, there is significant value in the development of a national library of standardised MMC components and layouts, linked to BIM and DfMA workflows, to support consistent detailing and faster design coordination. Embedding these elements into early design stages would enable project teams to assess MMC suitability with greater clarity and would also improve market confidence by giving manufacturers a clear, repeatable product to deliver at scale.

4.3 Procurement and Policy Recommendations

To enable more effective integration of MMC, jurisdictions are encouraged to adopt flexible, innovation-friendly procurement models that support early planning, collaboration, and engagement with MMC suppliers. This includes shifting toward Early Contractor Involvement (ECI) and two-stage Design and Construct models that allow for manufacturing input during the design phase. Collaborative contracting approaches, such as Managing Contractor and Alliance Contracting, can further reduce risk and foster shared outcomes between government, designers, and industry.

Establishing standing offer arrangements or prequalification panels for MMC providers would streamline procurement and give manufacturers greater confidence to invest in capability and capacity. To strengthen competition and reduce costs, jurisdictions should also support long-term pipeline visibility and incorporate performance-based specifications that allow contractors flexibility in how outcomes are achieved, rather than prescribing construction methods.

These agreements need to look at a recalibration of risk, creating a fair spread across all parties, shifting to an interest-based approach for the integrated project delivery to be successful. The procurement process should be focused on building a collaborative environment, where everybody works together to deliver optimal performance through greater supply chain management.

To better support the adoption and effectiveness of MMC, jurisdictions should consider procurement models which promote early collaboration, flexibility, and innovation. The following approaches are recommended:

Table 5 Procurement Models

Type	Description
Framework Agreements and Prequalification Panels for MMC Suppliers	Establishing standing offers agreement (SOA) or preferred supplier lists for certified MMC manufacturers can reduce procurement lead times, improve market confidence, and ensure consistent quality across projects.
Early Contractor Involvement (ECI)	Early Contractor Involvement (ECI) brings contractors and MMC suppliers into the project during early design and planning stages to inform module design, construction sequencing, and logistics. Structured in two stages, ECI begins with collaborative design development and cost planning (Stage 1), followed by a formal delivery agreement, typically Design & Construct (D&C), with a Gross Maximum Price (GMP) or fixed lump sum (Stage 2). This approach supports DfMA principles and helps de-risk later project stages.
Two-Stage D&C or Managing Contractor with MMC Incentives	A two-stage approach allows time for detailed MMC integration during Stage 1 before price locking in Stage 2. This enables better alignment between clinical design, manufacturing timelines, and site works.
Alliance Contracting or Integrated Project Delivery (IPD)	Collaborative contracting models share risk and reward across parties and promote a "one team" approach. These are ideal for MMC projects, where coordination between design consultants, manufacturers, and installers is essential to project success.

Pilot programs to demonstrate capability and improve cost perceptions

To overcome persistent cost perception barriers and build confidence in MMC, health jurisdictions should continue to support the implementation of targeted pilot programs. These pilots offer a controlled opportunity to test MMC approaches from the earliest stages of project development, allowing accurate cost comparisons, performance tracking, and lessons learned to be documented and shared.

Pilots can be particularly effective when focused on repeatable, lower-complexity facility types such as community health centres, mental health units, or staff accommodation, where standardised design and prefabrication are most applicable.

By integrating MMC from the outset, these projects can demonstrate the real value of early contractor involvement, optimised Design for Manufacture and Assembly (DfMA), and streamlined construction timelines. Importantly, pilot programs also create space to refine procurement models, assess supply chain capability, and validate whole-of-life performance metrics.

When supported by transparent reporting and cross-jurisdictional knowledge sharing, these initiatives can challenge existing assumptions, reduce risk aversion, and pave the way for broader, more confident MMC adoption in health infrastructure delivery.

Addressing regulatory barriers

Regulatory frameworks across Australia and New Zealand are generally structured around traditional, site-based construction methods, which can present challenges for the adoption of Modern Methods of Construction (MMC). Planning approvals, building codes, and certification pathways may not adequately reflect the nuances of offsite manufacturing, leading to ambiguity regarding compliance processes, particularly when prefabricated components are transported across state or national borders. These gaps can result in duplicated assessments, delays, and uncertainty for project stakeholders.

Further complicating MMC adoption is the limited availability of formal guidance on key compliance issues such as quality assurance, fire safety, structural integrity, and infection control within prefabricated healthcare settings. Certifying authorities and regulatory bodies may lack familiarity with the specific characteristics of MMC systems, increasing the likelihood of conservative interpretations or additional evidence requests. To reduce risk and increase confidence in MMC, it will be important to clarify compliance protocols, align regulatory interpretation with modern construction methods, and embed MMC within relevant national codes and planning instruments.

Recommendations to address Regulatory Barriers to MMC Adoption:

- **Establish Clear Compliance Pathways for MMC Components:** Develop nationally consistent guidance on how MMC solutions, particularly offsite manufactured elements, are assessed for compliance with the National Construction Code (NCC) and NZ Building Code (NZBC), relevant state building codes, and local planning frameworks. This includes clarifying responsibilities for certification of components fabricated interstate or offshore.
- **Develop Technical Guidance for Prefabricated Health Facilities:** Produce supplementary materials or addenda to the AusHFG or equivalent standards that outline how regulatory requirements (fire safety, structural performance, acoustic ratings, infection control) can be met using MMC systems. Focus particularly on high-risk or complex areas such as inpatient units or procedure rooms.
- **Pilot MMC-Specific Regulatory Reviews:** Use pilot projects to document regulatory hurdles, identify inconsistencies, and demonstrate compliant MMC solutions. These can inform the development of case-based precedents and improve regulator confidence.

Integration into Business Case Development

MMC is often not systematically integrated into the early stages of business case development, limiting its effectiveness as a strategic delivery option. In many cases, it is introduced only after key decisions around design and delivery methodology have been made, reducing opportunities to leverage the program, cost, and quality advantages associated with MMC.

Standard business case templates and evaluation frameworks do not consistently prompt consideration of MMC, contributing to a default reliance on conventional construction. This can inhibit early engagement with MMC suppliers, reduce the use of Design for Manufacture and Assembly (DfMA) principles, and result in suboptimal outcomes. Embedding MMC considerations within the business case process, including during option analysis, procurement strategy, and risk planning, would support more informed and deliberate decisions. Normalising MMC as a standard consideration in business case development will help improve delivery performance and support its broader adoption across the health infrastructure sector.

Recommendations to embed MMC in Business Case Development:

- **Mandate MMC Consideration in Business Case Templates:** Update business case templates and supporting tools to explicitly prompt assessment of MMC as part of the options analysis, delivery methodology, and procurement strategy sections.
- **Provide MMC Cost-Benefit and Risk Assessment Tools:** Develop simple decision-making frameworks, checklists, and benchmarking tools to assist project teams in evaluating the suitability of MMC based on project type, location, delivery timeframe, and market conditions.
- **Enable Early Engagement with MMC Suppliers and Contractors:** Modify procurement planning guidance to allow for early market sounding or preliminary supplier input where MMC is under consideration. This supports better alignment of clinical design with manufacturing and logistics constraints.
- **Include MMC in Investment Assurance and Gateway Reviews:** Ensure gateway review processes (business case reviews, investment assurance panels) include scrutiny of whether MMC has been appropriately considered, particularly where repeatable or remote projects are proposed.
- **Build an MMC Business Case Evidence Base:** Collect and publish data on the performance, cost, and outcomes of MMC health projects to inform future business case development. Include case studies highlighting successful integration of MMC from project inception.

4.4 Strengthening Industry Capability

Strengthening industry capability and capacity is essential to scaling the use of MMC in healthcare infrastructure. Early and ongoing collaboration with industry, including MMC manufacturers, suppliers, designers, and installers, is important for health jurisdictions to build a shared understanding of project requirements, manufacturing constraints, and innovation opportunities.

Transparent procurement strategies, such as standing offer agreements, prequalification panels, and early market engagement, can create greater certainty for suppliers and encourage investment in skills, equipment, and production capacity.

Establishing a clear and consistent pipeline of upcoming MMC-suitable projects would give industry the confidence to scale operations and support long-term workforce planning. In parallel, partnerships with training providers and industry bodies are needed to develop targeted upskilling programs for site-based and factory-based roles, supporting the shift from traditional to digitally enabled, offsite-focused construction.

A national approach to industry engagement and knowledge exchange, including forums, pilot evaluations, and cross-sector working groups, would help accelerate learning, address capability gaps, and align expectations between government and industry stakeholders, ensuring the MMC ecosystem can mature to meet future health infrastructure demands.

Figure 14 Inpatient Ward (MMC Category 1), Redland Hospital, Queensland Health

5 Implementation Guidance

5.1 Project Phase Considerations

To successfully implement MMC in healthcare projects, it is essential to consider MMC opportunities from the earliest stages and maintain alignment throughout design, procurement, delivery, and post-occupancy.

Each of the seven MMC categories presents different requirements and benefits depending on the phase of the project. Early consideration, particularly during the business case and concept design phases, is critical to realising the full value of MMC, including faster delivery, reduced disruption, and improved quality.

This section provides guidance on when each MMC category should be explored and embedded across the nine key phases of a typical healthcare capital works project, supporting project teams to make informed, strategic decisions throughout the lifecycle.

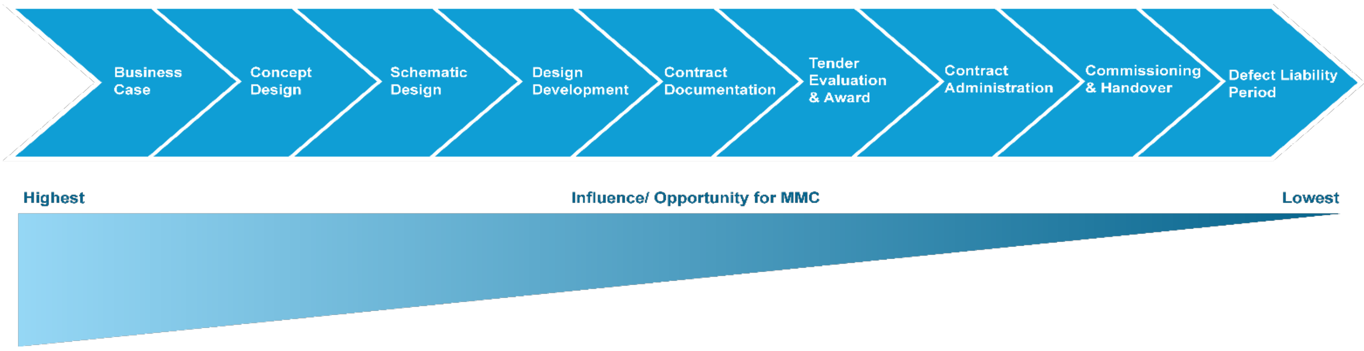


Table 6 MMC Project Phase Considerations

Phase	Type	Project Considerations

1	**Business Case**	**Critical for Categories 1–5**
		• Identify project drivers that align with MMC benefits (speed, site constraints, remote delivery).
		• Assess market capacity and capability and opportunities for the application of MMC
		• Conduct early suitability assessments for:
		  ○ **Category 1** (Volumetric) – for rapid deployment, standardisation needs.
		  ○ **Category 2** (Panelised) – for flexible layouts or façade systems.
		  ○ **Category 3 & 5** – for repeatable components (e.g. bathrooms, risers).
		  ○ **Category 4** – flag potential innovation use cases (e.g. additive prototypes).
		• Include MMC options in delivery strategy, risk assessment, cost plan, programme and procurement sections of final business case.

2	**Concept Design**	**Key for setting up Categories 1–5 + start Category 6** • Project Consultant Scope of Services to include MMC requirements and expertise • Within project design principles, clearly identify objectives around the consideration of MMC into project design and delivery. • Integrate MMC-aligned layouts: modular grids, standardised rooms. • Initiate early engagement with potential MMC suppliers or manufacturers. • Establish site visits to assess feasibility of Concept Design, consolidate lessons learnt, and supplier requirements. • Consider structural spans and spatial planning for modules/panels. • Flag areas for sub-assemblies (e.g. pods, plant skids). • Define common components that can be standardised across projects and/or jurisdictions. • Programme & Cost assessment based on the concept to determine MMC suitability. • Begin specifying traditional product improvements (Category 6) that align with MMC.
3	**Schematic Design**	**Crucial for Categories 1–6** • Project Consultant Scope of Services to include MMC requirements and expertise • Within schematic design report, clearly articulate project objectives around MMC and initiatives undertaken to promote their implementation in project delivery.

Phase	Type	Project Considerations
		• Document meetings and records of any industry MMC engagement undertaken for project knowledge transfer. • Finalise modular strategies (volumetric, panelised, hybrid). • Confirm design tolerances, loading, and transportation constraints. • Embed sub-assembly/component dimensions and fixings into layouts. • Ensure structural and MEP coordination is progressing to support offsite fabrication. • Finalise common components to be standardised and to be delivered by MMC. • Refine traditional product selections to support lean construction on-site. • Consider or utilise buildability reviews to maximise opportunities to promote use of MMC into project delivery.
4	**Design Development**	**Full definition of Categories 1–6** • Project Consultant Scope of Services to include MMC requirements and expertise. • Within design development reports and drawings, document proposed delivery methodology and areas to be delivered by MMC. • Conformance of design and MMC with AusHFG eg Infection Prevention & Control. • Confirm interface points and tolerances for all MMC elements. • Produce manufacturer-ready documentation for prefabricated components. • Finalise DfMA detailing, including BIM coordination for offsite sequencing. • Confirm QA/QC standards for factory-based fabrication. • Consider early contractor involvement to validate MMC detailing and project staging.
5	**Contract Documentation**	**Apply to all Categories** • Include MMC requirements in specifications, schedules, and drawings. • Finalise staging plans and delivery sequencing for MMC components including BIM coordination • Detail compliance and certification pathways for prefabricated elements. • Define acceptance criteria for offsite manufacturing QA/QC. • Embed MMC-aligned milestones into program and payment structures. • Include digital deliverables (e.g. BIM models for Category 7).
6	**Tender Evaluation & Award**	**Apply to all Categories** • Evaluate suppliers/contractors based on evaluation criteria that includes MMC capability (Categories 1–5). • Assess value-add through use of improved products (Category 6). • Consider digital delivery and site process innovations (Category 7) in scoring. • Review previous MMC performance, factory capacity, and quality control systems.
7	**Contract Administration**	**Active across Categories 1–7** • Oversee factory inspections and offsite QA/QC (1–5). • Monitor delivery sequencing and site readiness (1–3). • Manage integration of MMC components with in-situ works. • Apply lean construction and just-in-time delivery strategies (Category 7). • Maintain digital records (e.g. installation QA, as-built BIM models).
8	**Commissioning and Handover**	**Focus on Categories 1, 5, 6, and 7** • Validate prefabricated MEP systems and connections (Category 5). • Confirm operability and clinical compliance of modular components (1, 3, 5). • Review documentation from factory QA processes. • Handover digital assets, including 3D models and digital twins (Category 7). • Capture lessons learned and the benefits of MMC for the project.
9	**Defect Liability Period**	**Relevant for Categories 1, 5, 6, and 7** • Monitor performance of prefabricated systems for durability and integration issues. • Review long-term reliability of improved traditional products (Category 6). • Use digital tools to manage defects and asset tracking (Category 7). • Post Occupancy Evaluation (PoE) assessment to include MMC considerations to develop project case study and inform future MMC improvements.

5.2 Design Guidance

Integrating MMC into healthcare infrastructure requires deliberate design decisions that align with the unique characteristics of each project. This section provides practical design guidance mapped to the seven MMC categories, helping project teams understand how to optimise layouts, components, and systems for offsite delivery.

By embedding MMC principles early, during briefing, concept design, and procurement planning, health projects can unlock efficiencies in time, cost, quality, and sustainability while meeting the rigorous clinical and operational standards of healthcare environments.

Table 7 MMC Design Guidance

Category	Type	Design Guidance
1	**Pre-Manufacturing – 3D Primary Structural Systems**	Designing for volumetric modular construction requires early coordination of structural grid layouts, ensuring they align with standardised module dimensions to optimise transport and assembly. • Align structural grids with standardised module dimensions for transport and cranage. • Use repeatable room templates (e.g. wards, consultation rooms, staff accommodation). • Design modules to accommodate MEP integration and structural connections. • Consideration must be given to transport and cranage requirements, lifting points, protective structural bracing and onsite access constraints, particularly in constrained hospital sites. • Reference AusHFG room data sheets to maintain clinical compliance and standardisation. Aligning these designs with AusHFG room data sheets and standard components enhances manufacturability and clinical compliance while reducing construction time and site disruption.
2	**Pre-Manufacturing – 2D Primary Structural Systems**	Panelised construction methods are most effective when room layouts and façade configurations are standardised to support consistent module widths and floor heights. In healthcare settings, this is particularly relevant for building envelopes and internal partitions. • Standardise wall and floor panel dimensions for efficient offsite production. • Designs should incorporate provisions for factory-installed services, insulation, and cladding where possible, enabling rapid on-site assembly. • Design façades and structural interfaces with defined tolerances for assembly. • Design lifting points, rigging requirements, and access logistics for large prefabricated elements. • Use consistent grid sizes and stacking logic to simplify manufacturing. • Prioritise early design coordination for thermal, acoustic, and infection control compliance. Clear tolerances and interface detailing between panels and the structural frame are essential to ensure compliance with infection control, acoustic separation, and thermal performance requirements typically found in clinical environments.
3	**Pre-Manufacturing Components – Non-Systemised Primary Structure**	To maximise the benefits of Category 3, early structural planning is essential, with particular attention to modular grid layouts, lifting logistics, and site access constraints. Designs should accommodate consistent spans, minimised onsite adjustments, and clearly detailed connection tolerances between components. • Identify early opportunities for prefabricated structural elements such as driven piles, pile caps, ring beams, columns, beams, slabs, and staircases.

Category	Type	Design Guidance
		• Plan structural grids and spans to support efficient offsite fabrication and transport. • Design lifting points, rigging requirements, and access logistics for large prefabricated elements. • Minimise onsite adjustments by detailing tolerances and connection methods precisely. • Coordinate structural elements early with MEP services to avoid service clashes during onsite installation. • Standardise repetitive elements such as beams, columns, and floor slabs where possible to maximise manufacturing efficiencies. • Integrate prefabricated stair cores and roof truss assemblies to accelerate vertical and roof construction stages. • Ensure that prefabricated structural elements meet seismic, fire rating, acoustic separation, and durability requirements relevant to healthcare environments.
4	**Pre-Manufacturing – Additive Manufacturing**	While still emerging, additive manufacturing presents new opportunities for healthcare facilities in creating bespoke yet standardised components such as brackets, joinery elements, or ergonomic supports in clinical spaces. • Design teams should identify small-scale elements that could benefit from rapid prototyping or 3D printing, especially where traditional fabrication is time-consuming or cost prohibitive. Ensuring these components meet fire safety, durability, and infection control standards is essential. DfMA principles should guide the integration of such elements to align with broader project tolerances and construction sequencing.
5	**Pre-Manufacturing – Sub-Assemblies and Components**	Sub-assemblies such as bathroom pods, mechanical plant skids, and prefabricated service risers should be embedded into the design from the earliest stages. • Plan early for integration of bathroom pods, plant skids, and service risers. • Design layouts to allow for lifting, installation, and future maintenance access. • Coordinate MEP connection points and sequencing with traditional construction elements. • Use sub-assemblies to reduce on-site labour intensity in high-service areas. • Ensure spatial and structural allowances are built in for offsite-manufactured components. These components should be positioned to enable maintenance access and future flexibility, particularly in high-use areas like wards or emergency departments. Alignment with plant room design and services reticulation strategies will help maximise offsite fabrication potential and reduce site-based risks.
6	**Traditional Building Product Improvements**	Enhanced traditional products like pre-insulated ductwork, prefabricated cable trays, or advanced cladding systems should be considered to reduce labour intensity and install time. These elements should be assessed for compliance with clinical and building performance requirements, including infection control and acoustic treatment. • Specify advanced products like pre-insulated ductwork and cable trays to reduce install time. • Ensure improved products comply with AusHFG and hygiene standards. • Detail all interfaces clearly to avoid site-based clashes or rework. • Prioritise tested, certified systems to minimise on-site coordination risk. • Use these components in both traditional and hybrid MMC delivery models. Where used, interface details must be clearly documented in design packages to ensure seamless integration with other construction elements, especially in hybrid projects combining prefabrication and conventional methods.

Category	Type	Design Guidance
7	**Site Process Improvements and Technology**	Healthcare projects can greatly benefit from integrating site-based process improvements and digital tools. • Use BIM for design coordination, clash detection, and manufacturing integration. • Plan site layouts for lean workflows and just-in-time delivery. • Leverage digital twins and QR-tracking for construction and FM integration. • Enable remote QA of prefabricated elements (e.g., webcams in factories). • Apply site-level productivity tools (e.g., drones, logistics tracking) to reduce disruption. Onsite, lean construction principles should guide site layout planning to reduce material handling and congestion, especially in live hospital environments. Technologies like drone mapping, remote QA via factory webcams, and just-in-time delivery scheduling can further reduce disruption and improve overall project certainty.

Figure 15 Broken Hill Health Service (MMC Category 1), NSW Health Infrastructure

5.3 Decision Making Framework

MMC Category Consideration Based on Project Phases

This table outlines the recommended timing for considering each MMC category during the planning, design, procurement, and delivery phases of a healthcare infrastructure project. The successful integration of MMC relies not only on selecting the right techniques for the project but also on introducing them at the appropriate time in the lifecycle.

Categories 1 through 5, which involve structural systems, components, and assemblies, must be embedded early, during the business case and design phases, to allow for design optimisation, cost benchmarking, and alignment with procurement models. Later stages, such as tender evaluation, contract administration, and commissioning, focus more on delivery assurance and quality control, particularly for site process improvements and digital integration (Category 7). This phased approach ensures that MMC is not treated as an afterthought, but rather as a core delivery strategy from the outset, supporting efficient, high-quality, and coordinated healthcare outcomes.

Table 8 MMC Category Consideration Based on Project Phases

Category	Type	Phase 1 Business Case	Phase 2 Concept Design	Phase 3 Schematic Design	Phase 4 Design Development	Phase 5 Contract Documentation	Phase 6 Tender Evaluation and Award	Phase 7 Contract Administration	Phase 8 Commissioning and Handover	Phase 9 Defect Liability Period
1	Pre-Manufacturing – 3D Primary Structural Systems	✓	✓	✓						
2	Pre-Manufacturing – 2D Primary Structural Systems	✓	✓	✓	✓	✓	✓	✓		
3	Pre-Manufacturing Components – Non-Systemised Primary Structure	✓		✓	✓	✓				
4	Pre-Manufacturing – Additive Manufacturing	✓		✓						
5	Pre-Manufacturing – Sub-Assemblies and Components	✓	✓	✓	✓	✓				
6	Traditional Building Product Improvements				✓	✓	✓	✓		
7	Site Process Improvements and Technology				✓	✓	✓	✓	✓	

*✓**MMC category should be actively considered and integrated during this phase:** This may include design coordination, cost-benefit evaluation, specification development, supplier engagement, or QA oversight—depending on the phase and MMC category.*

MMC Category Consideration Based on Project Types

The matrix below outlines the relative suitability of each MMC category across common healthcare facility types, including temporary facilities, remote and regional health projects, residential accommodation, and high-and low-acuity clinical settings. It serves as a practical reference to help project teams quickly assess where MMC methods are likely to offer the most benefit. High suitability indicates a strong fit with the design, delivery, or operational characteristics of the facility type, such as repetitive layouts, access constraints, or the need for accelerated delivery.

Conversely, limited or no suitability reflects contexts where MMC may present integration challenges, offer limited value, or be cost-ineffective. This tool supports early option analysis and business case development, reinforcing the importance of aligning MMC decisions with project drivers from the outset. As the MMC industry evolves and develops, the suitability of project types and MMC categories may adapt from this listed below.

Table 9 MMC Category Consideration Based on Project Types

Category	Type	Temporary Facilities	Regional and Remote	Residential	Low Acuity Facilities	High Acuity Facilities	Congested Urban Sites
1	Pre-Manufacturing – 3D Primary Structural Systems	✓✓✓	✓✓✓	✓✓	✓✓	✓	✓
2	Pre-Manufacturing – 2D Primary Structural Systems	✓✓	✓✓	✓✓✓	✓✓✓	✓✓	✓✓
3	Pre-Manufacturing Components – Non-Systemised Primary Structure	✓	✓	✓	✓✓	✓✓	✓✓
4	Pre-Manufacturing – Additive Manufacturing	X	✓	✓	✓	✓	✓
5	Pre-Manufacturing – Sub-Assemblies and Components	✓	✓✓	✓✓	✓✓	✓✓	✓✓
6	Traditional Building Product Improvements	✓	✓	✓✓	✓✓✓	✓✓✓	✓✓✓
7	Site Process Improvements and Technology	✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓

- *✓✓✓ **High Suitability:** Strong alignment between project typology and MMC category. Likely to achieve benefits if integrated early.*
- *✓✓ **Moderate Suitability:** MMC category may be appropriate for parts of the project or specific components.*
- *✓ **Low Suitability:** MMC category may be viable for selected elements but should be approached with caution or piloted in a limited way.*
- *X **Not Suitable:** MMC Category is generally not appropriate for this project type, at this time. This is due to project constraints and industry limitations.*

MMC Category Consideration Based on Procurement Model

The effectiveness of MMC in healthcare projects is closely tied to the choice of procurement model. This table outlines the relative suitability of common public sector procurement pathways, such as Construct Only, Design & Construct, Early Contractor Involvement (ECI), Managing Contractor, Alliance Contracting, and Standing Offer Agreements, against each of the seven MMC categories. The more integrated and collaborative the procurement model, the greater the opportunity to leverage the benefits of offsite manufacturing, design standardisation, and early supply chain engagement.

Volumetric systems (Category 1) and sub-assemblies (Category 5) require early contractor input and design alignment, making ECI, Managing Contractor, or Alliance models more appropriate. Conversely, traditional product improvements (Category 6) and site-based process technologies (Category 7) can often be implemented under simpler delivery models, including Construct Only. This table provides a high-level reference to help clients and delivery teams align procurement strategies with their chosen MMC pathways and ensure that contract structures enable, rather than constrain, MMC adoption.

Table 10 MMC Category Consideration Based on Procurement Model

Category	Type	Construct Only	Design and Construct	Early Contractor Involvement	Managing Contractor	Alliance Contracting	Standing Offer Agreement
1	**Pre-Manufacturing – 3D Primary Structural Systems**	✓	✓✓	✓✓	✓✓✓	✓✓	✓✓✓
2	**Pre-Manufacturing – 2D Primary Structural Systems**	✓✓	✓✓	✓✓✓	✓✓✓	✓✓	✓✓
3	**Pre-Manufacturing Components – Non-Systemised Primary Structure**	✓	✓	✓	✓✓	✓✓	✓✓
4	**Pre-Manufacturing – Additive Manufacturing**	X	✓	✓	✓	✓	✓
5	**Pre-Manufacturing – Sub-Assemblies and Components**	✓	✓✓	✓✓	✓✓	✓✓	✓✓✓
6	**Traditional Building Product Improvements**	✓✓	✓✓✓	✓✓	✓✓	✓✓	✓
7	**Site Process Improvements and Technology**	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓	✓✓✓

- ✓✓✓ ***High Suitability:*** *Procurement model is well-aligned with the MMC category, supporting early engagement, design coordination, and delivery certainty.*
- ✓✓ ***Moderate Suitability:*** *Model may be effective with the right planning and scoping, but may have limitations for integration or flexibility.*
- ✓ ***Low Suitability:*** *MMC use may be limited or constrained under this model. Consider only for minor elements or with strict alignment.*
- X ***Not Suitable:*** *Procurement model does not support the successful integration of this MMC category and should be avoided for that purpose.*

Appendices

6 Case Studies and Lessons Learnt

6.1 Case Study #01 – VIC – Pathway 144

Project Overview

The Victorian Government urgently responded to the recommendations put forward by the Royal Commission into Victoria's Mental Health System with a $801 million investment to deliver 260 new acute public mental health beds as part of the Mental Health Beds Expansion Program (MHBEP).

To address the urgent need for acute public mental health beds identified by the Royal Commission, four mental health facility projects were fast tracked to deliver 120 hospital-based beds in Geelong, Epping, St Albans and Parkville, as well as 24 home-based beds. The four new facilities are being delivered by VHBA through the $492.2 million Pathway 144 (P144) program which sit within MHBEP. These sites are:

Figure 16 VHBA Pathway 144 - Northern Hospital

- Northern Hospital, Epping – Four-storey volumetric modular
- Sunshine Hospital, St Albans – Three-storey volumetric modular
- McKellar Centre, Geelong – Single-storey volumetric modular
- The Royal Melbourne Hospital, Parkville – Traditional construction

MMC Approach Used

The P144 program utilised **Category 1: Pre-Manufacturing – 3D Primary Structural Systems (Volumetric Modular Construction)** for the Northern, Sunshine, and McKellar sites. The modular design enabled full offsite fabrication of structural units, complete with integrated services and interior fitouts, before transport to site for rapid assembly.

The project was delivered under a Managing Contractor model, allowing early engagement of two modular manufacturers to produce and install the building components across the three sites concurrently. This enabled delivery timelines to align with the urgent policy response required under the Royal Commission's findings.

Key Takeaways and Benefits

To assist the co-design process, a number of prototypes were constructed to assist the team in experiencing the spaces, the design outcome presented a facility purposely designed to look and feel more homely and less like a hospital. The program had incredibly tight timeframes for deliver and the use of MMC enabled this to happen. Funding was announced in November 2020, and the projects were delivered by the end of 2023.

Figure 17 VHBA P144 - Northern Hospital

Figure 18 VHBA P144 Sunshine Hospital

Figure 19 VHBA P144 McKellar Centre.

6.2 Case Study #02 – NSW - Broken Hill Community Health Centre

Project Overview

The new integrated Broken Hill Community Health Centre includes a five-chair dental health facility; child, family and community health services; and new staff offices. These services are located throughout the two-level building in the centre of Broken Hill. The building was constructed off site at Hutchinson Builders Toowoomba manufacturing facility. The forty-two modules that form the 3000m^2 building were transported by road to their permanent location in Broken Hill. This is where the modules were reassembled, and all the services connections and internal finishes were completed.

Figure 20 Broken Hill Community Health Centre

MMC Approach Used

The project utilised **Category 1: Pre-Manufacturing – 3D Primary Structural Systems (Volumetric Modular Construction).** This method enabled the complete offsite fabrication of fully enclosed building modules in a controlled manufacturing environment. The approach was selected to reduce the reliance on local construction trades, ensure delivery certainty, and maintain a high standard of quality control for clinical environments.

The modular solution allowed for parallel construction activities, while foundations and site works were undertaken at Broken Hill, modules were manufactured and assembled offsite, streamlining the overall delivery process.

Key Takeaways and Benefits

- The project was delivered two months ahead of schedule, thanks to the efficiency of concurrent offsite and onsite works.
- With limited skilled trades available in Broken Hill, modular construction significantly reduced the need for importing labour, minimising accommodation costs and travel impacts.
- Factory-based construction ensured a high-quality finish and consistency across all modules, supporting strict healthcare compliance standards.
- Onsite assembly was rapid and low impact, making the approach ideal for a regional setting with operational healthcare facilities nearby.
- The standardised module design supports replication for future projects, reducing design time and improving procurement efficiency across regional health infrastructure.

Figure 23 Broken Hill Community Health Centre

Figure 22 Broken Hill Community Health Centre

Figure 21 Broken Hill Community Health Centre

6.3 Case Study #03 – VIC - Alcohol and Other Drugs (AOD) Facilities

Project Overview

In response to growing demand for specialist rehabilitation services in regional areas, the Victorian Government invested $52 million into Stage 2 and 3 of its Regional Alcohol and Drug Residential Rehabilitation Services Program. This program delivered new purpose-built facilities in the Barwon, Hume, and Gippsland regions, aimed at supporting individuals dealing with alcohol and drug dependency through residential care and treatment.

Figure 24 AOD Traralgon Facility

Delivered by the Victorian Health Building Authority (VHBA), the facilities provide a consistent clinical model of care across sites, while catering to local community needs. The program was driven by the urgent need for increased access to services in rural areas and faced constraints related to workforce availability and delivery timeframes.

MMC Approach Used

The program adopted **Category 1: Pre-Manufacturing – 3D Primary Structural Systems (Volumetric Modular Construction)** under the MMC framework. This approach involved:

- Offsite fabrication of fully enclosed structural modules with internal finishes and services pre-installed.
- Parallel site preparation and factory production, enabling time savings and reduced disruption to sensitive community environments.
- Delivery of a turn-key modular solution under a two-part Early Contractor Involvement (ECI) model.

Although the modules were successfully installed ahead of schedule, the project encountered delays completing civil and onsite works, highlighting the importance of coordinated delivery between modular and traditional construction components.

Key Takeaways and Benefits

- Modular construction enabled simultaneous manufacturing and site works, accelerating delivery to meet urgent service needs.
- Repeatable modular designs ensured consistency in clinical function and quality across the three regional locations.
- Offsite fabrication minimised construction disruption in communities with limited trades availability and infrastructure.
- The two-stage ECI model supported early planning, design development with MMC integration, and selection of an MMC-capable delivery partner.
- While offsite elements were delivered efficiently, project teams identified the need for better alignment of onsite works to avoid downstream delays, a key consideration for future hybrid MMC programs.

Figure 25 AOD Wangaratta Facility

Figure 26 AOD Corio Facility

Figure 27 AOD Corio Facility

6.4 Case Study #04 – WA - Inpatient Surge Facilities

Project Overview

In response to increased healthcare demand during the COVID-19 pandemic, the Western Australian Government delivered a series of modular inpatient surge wards to rapidly expand hospital capacity across the state.

The program involved the design and delivery of four 30-bed inpatient wards across multiple health service providers, strategically located at both metropolitan and regional hospital sites. Each facility was integrated into existing hospital campuses and tailored to meet specific operational, clinical, and spatial requirements.

Figure 28 WA Inpatient Surge Facility

The initiative provided essential inpatient infrastructure to support low-to-medium acuity patients, while reducing pressure on core hospital services during pandemic peaks.

MMC Approach Used

The project primarily utilised **Category 1: Pre-Manufacturing – 3D Primary Structural Systems (Volumetric Modular Construction)** with three of the four. Each ward was manufactured offsite in prefabricated modules and transported to site for rapid assembly. The fourth ward utilised Category 2: Pre-Manufacturing – 2D Primary Structural Systems with prefabricated walls and roof built offsite. All sites undertook parallel forward works onsite.

Key Takeaways and Benefits

- All four wards were completed and operational within 11 months, demonstrating MMC's capacity for rapid infrastructure deployment.
- Offsite construction reduced onsite activity, allowing health services to continue uninterrupted during critical periods of demand.
- Factory-controlled environments ensured consistent quality, infection control compliance, and reduced rework.
- The modular design was flexible enough to accommodate varying site conditions and clinical requirements across multiple locations.
- The successful delivery of these inpatient wards reinforced modular construction as a viable solution for future healthcare infrastructure, particularly for surge, remote, or time-constrained settings.

Figure 31 WA Inpatient Surge Facility

Figure 30 WA Inpatient Surge Facility

Figure 29 WA Inpatient Surge Facility

6.5 Case Study #05 – NSW - Key Worker Accommodation Program

Project Overview

The Key Worker Accommodation (KWA) Program aims to provide modern and sustainable short-term and long-term housing accommodation to health workers in Far West, Murrumbidgee and Southern NSW Local Health Districts.

The units are being built off-site and then delivered and installed onto established piers and suspended slabs on the hospital grounds of seven sites including; 20 units in Broken Hill, 4 units in Balranald, 6 units in Finley, 3 units in Leeton, 3 units in Narrandera, 3 units in West Wyalong, 12 units in Cooma.

The modules are made of modern, high-quality materials to produce a high-quality finish with minimal maintenance required. They are resilient to UV damage and are all prefinished to eliminate the need to repaint.

Figure 32 NSW Key Worker Accommodation

MMC Approach Used

The program adopted **Category 1: Pre-Manufacturing – 3D Primary Structural Systems (Volumetric Modular Construction).** Units were manufactured offsite and transported to the respective hospital grounds for installation on prepared piers or suspended slabs.

Key Takeaways and Benefits

- Offsite fabrication enabled the concurrent delivery and installation of units across seven hospital sites in three Local Health Districts.
- Providing modern, secure housing directly on hospital grounds improves the experience for temporary and relocating staff, reducing barriers to employment in rural areas.
- Fully furnished units reduce the burden on health staff, allowing them to "move straight in" with minimal setup, which is critical for short-term placements.
- Units are solar-ready, fully electrified, and constructed with durable, low-maintenance materials, supporting energy and water efficiency targets.
- Located on health campuses, the units foster a sense of connection and support among healthcare professionals while integrating seamlessly with the local environment.

Figure 34 NSW Key Worker Accommodation

Figure 33 NSW Key Worker Accommodation

Figure 35 NSW Key Worker Accommodation

6.6 Case Study #06 – QLD - Hervey Bay Hospital

Project Overview

To respond swiftly to growing healthcare demands in the Fraser Coast region, Wide Bay Hospital and Health Service delivered a new 24-bed general medical ward at Hervey Bay Hospital. The facility officially opened in March 2025, expanding inpatient capacity and supporting timely access to care for the local community.

The new ward was designed for seamless clinical integration with the existing hospital. An enclosed walkway connects the modular facility directly to the hospital's main corridor, enhancing patient flow, enabling efficient care delivery, and supporting operational continuity.

This project also supported local job creation, with 60 new staff recruited, including doctors, nurses, allied health professionals, and operational staff.

Figure 36 Hervey Bay Hospital

MMC Approach Used

The project applied **Category 1: Pre-Manufacturing – 3D Primary Structural Systems (Volumetric Modular Construction)**. A total of 17 prefabricated building modules were manufactured offsite and transported to Hervey Bay Hospital, where they were installed on a prepared hospital site.

Key Takeaways and Benefits

- The project provided urgently needed inpatient capacity to meet growing service demands on the Fraser Coast.
- Offsite manufacturing allowed design and construction to occur simultaneously, significantly reducing the overall program timeline.
- Trucking and installing the 17 modules onsite minimised interference with day-to-day hospital activities.
- The modular ward is fully connected to the existing hospital via an enclosed walkway, ensuring a smooth patient and staff transition between buildings.
- The expansion enabled the onboarding of more than 60 new staff, contributing to both healthcare delivery and regional employment.

Figure 39 Hervey Bay Hospital

Figure 38 Hervey Bay Hospital

Figure 37 Hervey Bay Hospital

6.7 Case Study #07 – QLD – Redland Hospital

Project Overview

As part of the Queensland Government's Accelerated Infrastructure Delivery Program, a new 28-bed inpatient ward was delivered at Redland Hospital using a modular construction approach. The ward supports adult acute medical patients, with capacity for Medical Assessment and Planning Unit (MAPU) functions, enhancing clinical flexibility and capacity within the hospital's existing infrastructure.

Figure 40 Redland Hospital

To support operational integration, the facility includes an elevated linkway, also constructed using MMC, which connects the new modular ward directly to the existing hospital. This project was undertaken in response to urgent service demand growth in the Metro South region.

MMC Approach Used

The project adopted **Category 1: Pre-Manufacturing – 3D Primary Structural Systems (Volumetric Modular Construction)**. Building modules were manufactured offsite and craned into place on hospital grounds, reducing onsite disruption and accelerating delivery.

Key Takeaways and Benefits

- The use of MMC enabled highly visible, fast-tracked installation. Local stakeholders observed substantial progress within days—supporting both community confidence and organisational reputation.
- The inclusion of a modular, elevated link enhanced functional integration with the existing hospital, improving clinical flows and connectivity.
- Design and offsite manufacturing occurred concurrently, streamlining the program and supporting early completion.
- While MMC accelerated delivery, the project team noted the importance of resolving service connections early, a common challenge that requires integrated planning between design and infrastructure teams.
- The project reinforced the need for early alignment between design documentation and modular construction methodology, ensuring that elements requiring resolution are programmed appropriately within the design workflow.

Figure 43 Redland Hospital

Figure 42 Redland Hospital

Figure 41 Redland Hospital

7 Current Jurisdictional Approaches to MMC

7.1 Methodology

The development of the AHIA Modern Methods of Construction (MMC) Guidance document has been informed by a collaborative approach designed to capture a diversity of perspectives and lived experience across Australia and New Zealand. The methodology combines direct engagement with AHIA jurisdictions, research, and case study analysis to ensure that the guidance is both practical and reflective of current challenges and opportunities.

Stakeholder engagement process

A central component of this project has been the engagement of key stakeholders from each AHIA jurisdiction. Stakeholders were nominated by their respective health infrastructure authorities and included representatives with direct experience in planning, procuring, and delivering healthcare projects using (or considering) MMC approaches. The engagement process was designed to be transparent, consistent, and respectful of each jurisdiction's unique context, while identifying common themes and opportunities for collaboration.

Jurisdictional interviews and Working Group discussions

Nine one-on-one interviews were conducted with each AHIA jurisdiction. These 60-minute sessions were structured around a consistent agenda that included:

- A briefing on MMC definitions, types, and benefits.
- An in-depth workshop discussion exploring each jurisdiction's experiences, challenges, current practices, and perceptions of MMC.
- Exploration of lessons learned, design standardisation opportunities, and potential case studies.

Meeting notes were prepared for each session and reviewed by participants to ensure accuracy and completeness. Insights from these interviews form the foundation of the guidance document.

To validate and refine emerging themes, two combined Working Group sessions were held with representatives from all AHIA jurisdictions. These 2-hour workshops facilitated cross-jurisdictional discussion and alignment, focusing on:

- Reviewing and refining the draft structure of the guidance document.
- Exploring shared challenges and benefits of MMC.
- Identifying opportunities for national collaboration and innovation.
- Testing the practicality and relevance of the emerging recommendations.

The collaborative nature of these sessions was critical in ensuring the guidance reflects not just individual jurisdictional perspectives but also shared priorities and aspirations.

Questionnaire Survey

To supplement the interview and workshop process, a structured follow-up questionnaire was distributed to all jurisdictions. The survey aimed to:

- Gather additional data on MMC adoption rates, typologies, and project examples.
- Identify policy and regulatory barriers.
- Understand attitudes toward standardisation and market development.
- Collect detailed case study inputs where applicable.

The questionnaire responses provided further quantitative and qualitative data to strengthen the findings of the report and ensure comprehensive jurisdictional representation.

Research and case study analysis

Desktop research was conducted to provide context and comparison against international and domestic MMC literature. This included:

- Reviewing national and international MMC frameworks and standards.
- Analysing MMC-related policy, procurement models, and legislative frameworks.
- Identifying evidence of best practice in modular healthcare construction.

Additionally, several case studies were selected from jurisdictional input to illustrate key themes, lessons learned, and the diversity of MMC applications across different healthcare contexts. These case studies serve to ground the guidance in lived experience and provide practical reference points for future projects.

7.2 Overview of MMC use in Healthcare Infrastructure

Modern Methods of Construction (MMC) are increasingly being explored and implemented across Australia and New Zealand to address key challenges in delivering healthcare infrastructure in both urban and regional contexts. While MMC adoption is still maturing across jurisdictions, several successful applications and common themes have emerged through consultation with AHIA member agencies and in recent project delivery.

Across the AHIA jurisdictions, MMC has been used most extensively in:

- Remote and regional areas, where traditional construction is logistically challenging or cost prohibitive.
- Short-stay or urgent infrastructure programs, where rapid deployment is critical.
- Low-complexity facilities, such as mental health units, outpatient clinics, and aged care or rehabilitation centres.

Adoption varies significantly, influenced by local procurement frameworks, supplier availability, internal expertise, and attitudes toward risk and innovation. Jurisdictions such as New South Wales, Western Australia, Queensland and Victoria have delivered multiple MMC projects, while others are still in early exploratory phases.

Key Observations from AHIA Jurisdictional Interviews

- MMC is best suited to health facilities with standardised room layouts, such as inpatient units, consultation suites, and support accommodation.
- Early-stage MMC design consideration (including DfMA and BIM) is critical to unlocking full benefits.
- Several jurisdictions noted ambiguity around compliance pathways, especially with planning authorities unfamiliar with MMC techniques.
- Traditional procurement models are often not conducive to early contractor involvement (ECI), which is vital for MMC success.
- Some stakeholders perceive MMC as more expensive, particularly when supply chains are immature. Others noted cost neutrality but improved program efficiency and quality control.
- There is a shared view that the MMC supply chain is underdeveloped, and greater investment is needed to grow the capability of local manufacturers and installers.
- There was a desire for greater design standardisation across jurisdictions.
- Clearer guidance on compliance and risk management for MMC projects.
- Stronger investment in supply chain development and workforce training.
- Case study libraries to share lessons learned and build internal confidence.

Barriers to MMC Adoption

- **Conservatism & Resistance to Change:** Many jurisdictions noted a reluctance to adopt new methodologies, preferring traditional construction methods.
- **Regulatory & Procurement Challenges:** Complex procurement processes, contract structures, and regulatory approvals can hinder MMC adoption.
- **Industry Maturity & Capability:** Some jurisdictions lack a mature MMC supply chain or sufficient skilled workforce to support MMC solutions.
- **Risk Appetite & Perception:** Concerns around reliability, quality, and long-term performance of MMC solutions, particularly among end users and maintenance staff.
- **Local Content Requirements:** Government policies that prioritise local suppliers and materials can limit the ability to procure MMC components from other states or overseas.
- **Cost & Financial Modelling Limitations:** Difficulty in benchmarking MMC costs compared to traditional construction, particularly in business case development.

MMC Benefits & Opportunities

- **Programme Efficiency & Faster Delivery:** MMC can reduce on-site construction time, improving project timelines.
- **Minimising Site Disruption:** Particularly beneficial for live environments like hospitals, reducing noise, dust, and operational downtime.
- **Labour & Skill Shortages:** MMC can help mitigate workforce shortages by shifting labour to off-site prefabrication environments.
- **Quality & Consistency:** Factory-controlled environments improve build quality and consistency across projects.
- **Safety & Reduced On-Site Risk:** MMC reduces site-based work, improving safety and lowering workplace incidents.
- **Potential for Cost Savings:** While initial costs can be higher, lifecycle and efficiency savings may offset this over time.
- **Sustainability & Waste Reduction:** MMC aligns with sustainability goals by minimising material waste and improving energy efficiency in construction.

Project Suitability for MMC

- **Regional & Remote Projects:** MMC is seen as a key enabler for remote locations with limited access to skilled labour and materials.
- **Health Infrastructure Applications:** Modular solutions are being explored for hospitals, particularly in low-acuity areas, outpatient clinics, and temporary health facilities.
- **Ambulance Stations & Key Worker Accommodation:** Identified as ideal for MMC due to repetitive design elements.
- **Mental Health & Aged Care Facilities:** Standardisation opportunities make MMC a good fit for these facility types.
- **Congested Urban Sites:** MMC reduces construction footprint and site disruption in dense metro areas.

Timing & Early Consideration of MMC

- **Early Planning & Business Case Inclusion:** MMC must be considered at the outset of project planning, rather than being retrofitted into traditional designs.
- **Design Standardisation & MMC Integration:** Standardising components (e.g., inpatient rooms, bed heads, service risers) can drive MMC feasibility.
- **Ensuring MMC is a Procurement Focus:** If not explicitly mentioned in tenders or business cases, industry is unlikely to respond with MMC solutions.

Standardisation & Scalability

- **Design Consistency Across Jurisdictions:** Standardised components can unlock efficiencies and enable a more predictable MMC pipeline.
- **Challenges in Standardisation:** Stakeholder engagement, unions, and end-user preferences often push for customisation, limiting MMC scalability.

- **Industry Collaboration & Knowledge Sharing:** A coordinated effort across jurisdictions could enhance MMC viability by creating demand consistency.

Contracting & Procurement Models

- **Early Contractor Engagement:** Collaboration with MMC suppliers in the early design phase improves project outcomes.
- **Managing Contractor & D&C Contracts:** Common procurement models may not always align with MMC methodologies.
- **Alternative Procurement Approaches Needed:** Some jurisdictions exploring frameworks or preferred supplier panels to streamline MMC adoption.

Lessons Learned & Key Case Studies

- **Existing MMC Use Cases:** Many jurisdictions are already using MMC in certain applications but not recognising it as such.
- **Importance of Capturing & Quantifying Benefits:** Need for better tracking of cost, programme, and quality outcomes from MMC projects.
- Sharing of Case Studies & Best Practices: Collaboration across states can accelerate MMC adoption by highlighting successful implementations.

7.3 MMC Procurement and Management Strategies

Across AHIA jurisdictions, healthcare infrastructure projects are primarily procured through traditional delivery models, including Design and Construct (D&C), Managing Contractor, and Construct Only contracts. These models have proven effective for conventional builds but often present challenges when applied to MMC, particularly due to the need for early integration of design, manufacturing, and assembly processes.

Most jurisdictions indicated that their current procurement strategies are not specifically tailored to MMC and often limit opportunities for early contractor or supplier involvement. This has led to missed opportunities for design optimisation, manufacturing efficiencies, and cost or program certainty. In several cases, MMC was introduced late in the process resulting in limited benefit realisation.

Risk-averse contracting frameworks, inflexible design briefs, and standard government procurement protocols were also identified as barriers to innovation. While some jurisdictions have started to explore prototype and pilot-based procurement, these remain isolated examples. The use of MMC in procurement has generally been reactive rather than strategic, and largely dependent on project-specific drivers (e.g. tight timeframes or remote site constraints) rather than being embedded as a core delivery consideration.

8 Lessons Learned

Summary of lessons learned specific to the delivery of MMC in healthcare projects.

Theme	Lesson Learned	Recommendation for Future Projects
Planning Phases	MMC is often considered too late in the project lifecycle.	Embed MMC early during feasibility and business case development.
Planning Phases	MMC methodology suits standardised layouts and constrained sites.	Use MMC for repetitive, time-critical, or access-restricted projects. Check cranage requirements.
Planning Phases	Design coordination often starts too late to support MMC integration.	Engage MMC consultants and contractors, engineers, and BIM teams during concept design. Establish a checklist to guide preliminary assessment.
Stakeholder Engagement	Misconceptions about MMC reduce support and buy-in.	Run stakeholder education campaigns, factory tours, establish prototypes and showcase MMC demonstration projects to build trust and familiarity.
Stakeholder Engagement	Late design changes disrupt manufacturing schedules and increase costs.	Confirm design sign-off prior to fabrication start. Finalise clinical sign-off before fabrication. Use VR walkthroughs or prototypes to de-risk design uncertainty. Provide suitable governance to support design lockdown.
Stakeholder Engagement	Facilities teams may be unfamiliar with MMC specific components.	Involve FM early and provide clear documentation and training. Run stakeholder education campaigns, factory tours, establish prototypes and showcase MMC demonstration projects to build trust and familiarity.
Compliance & Regulation	Confusion around approvals for offsite-manufactured components leads to delays.	Engage certifiers early; clarify regulatory responsibilities for factory-built elements; develop MMC-specific compliance guides. Develop and utilise standardised designs and components enabling compliance testing and certification.
Compliance & Regulation	Fire rating requirements can be complex for modular assemblies.	Coordinate fire strategy and material approvals early in design. Utilise previously developed solutions and establish consistent approach to solutions.
Design Phases	Air tightness and façade detailing at joints is challenging in MMC builds.	Plan for partial on-site façade works and avoid systems not suited to MMC formats. Develop consistent approach to façade detailing to enable supply chain capability growth.
Design Phases	Lack of standardisation limits MMC efficiency and scalability.	Develop standard room templates for MMC approaches aligned with AusHFG guidelines.

Theme	Lesson Learned	Recommendation for Future Projects
		Engage with Industry to develop standard component kit of parts (across Categories) that respond to MMC templates and AusHFG.
Design Phases	Specialist fire systems may require extended review and certification time.	Engage fire engineers early and allow time for non-standard system approvals. Develop a consistent approach to fire solutions.
Design Phases	Module size often increases during design due to code and structural requirements.	Include a design contingency for module growth during planning. Appreciate the best and maximum module sizing to guide design. Establish standardised designs aligning with AusHFG.
Design Phases	Structural connections between site-built and modular elements cause integration issues.	Define tolerances and responsibilities for interfaces early. Build prototypes and test connection details. Develop a consistent approach to connections.
Design Phases	Services design is often not optimised for MMC construction.	Minimise riser counts and align with MMC planning during early services design.
Design Phases	Transport logistics are frequently underestimated.	Develop transport and site access plans tailored to local jurisdiction traffic protocols MMC dimensions and delivery schedules. Build first in BIM before in factory and onsite. Early and continued liaison with transport authorities & contractors is recommended
Delivery Phases	Poor coordination between factory timelines and site readiness causes program misalignment and storage issues.	Integrate MMC delivery into a unified program, align factory milestones with site access, use early works packages to de-risk delivery. Factor storage allowance of up to 20 working days at supplier risk, client to cover >20days. Nominate in procurement docs cost for 20day and then extra over 'Delay costs' for storage of modules or parts.
Delivery Phases	Insufficient temporary waterproofing can delay works.	Scope and specify temporary weather protection for modules clearly. Both during temporary offsite storage, transport, installation and up to building watertight.
Workforce Capability	On-site contractors sometimes lack MMC assembly experience, risking defects and delays.	Prequalify contractors with MMC experience, provide training with MMC manufacturers, ensure robust on-site quality assurance processes. Identify to market the future requirement for these skills and how they will be required in the expected future delivery of heath infrastructure.
Procurement Phases	Traditional procurement models limit early MMC engagement.	Use procurement models that support early supplier input, such as ECI or two-stage D&C. Encourage industry engagement through design sprints early in project design to guide MMC opportunities and design constraints.

Theme	Lesson Learned	Recommendation for Future Projects
Procurement Phases	Limited local suppliers create cost and scheduling risks, particularly in smaller jurisdictions.	Support national MMC supplier panels or standing offers; share forward pipelines across jurisdictions to encourage investment in capability and scale.
Procurement Phases	Long lead times for key materials can delay modular production.	Pre-order long lead items during early project phases under separate agreements.
Procurement Phases	Repetitive work may be more efficient if performed directly by contractors.	Assess self-delivery options for routine works where appropriate.
Performance & Lessons Tracking	Lack of post-project review reduces learning opportunities.	Conduct structured post-completion and Post Occupancy evaluations. Encourage candour in issues and wins and how to mitigate or replicate. Share across jurisdictions.
Performance & Lessons Tracking	MMC benefits are not always tracked or quantified.	Benchmark performance and share findings to support broader adoption. Identify a matrix of potential benefits to assist assessment and expectations.
Perceived Cost Premiums	MMC perceived as more expensive due to late-stage adoption and lack of holistic cost evaluation.	Quantify whole-of-life costs, including reduced program duration, lower site disruption, and improved quality; use pilot programs to validate value proposition. Jurisdictions to record and share data for better analysis and understanding.
Perceived Cost Premiums	Project to Project cost of MMC is higher than conventional and or budget.	The value of MMC is derived by a consistency and volume. Establishing standardised designs and a program of works view will maximise value, including cost reductions.

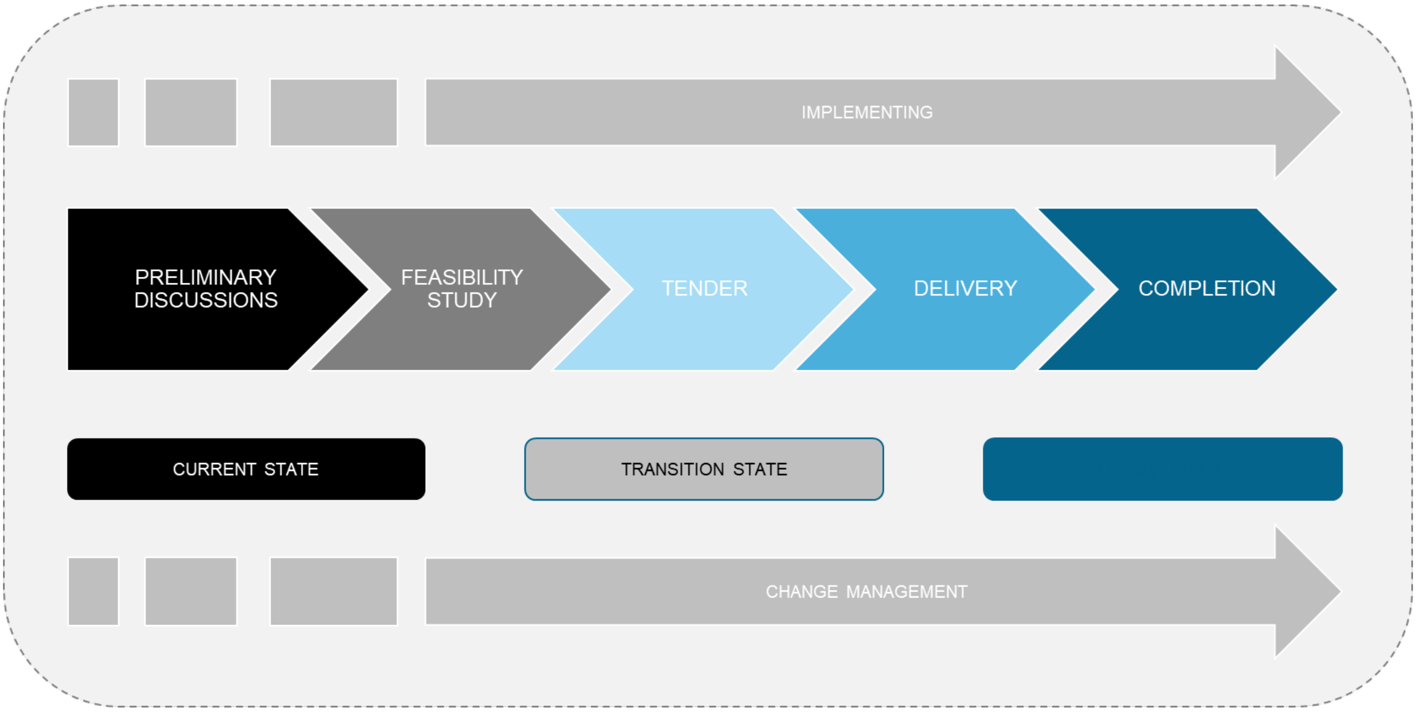


Figure 44 Change Management Implementation Process

9 Risks and Issues

Summary of risks and issues specific to the delivery of MMC in healthcare projects.

Risk Type	Risk Description	Mitigation Strategy
Regulatory Compliance	Inconsistent interpretation of offsite construction in planning, building code, and certification pathways.	Early engagement with certifiers and regulatory authorities; develop pre-approved MMC compliance pathways; clarify certification responsibilities between manufacturer and contractor. Involvement in 'Public Exhibition' of new policy frameworks to benefit Health projects.
Geographic Logistics	Delays or damage during transport of modules to remote/regional health sites due to distance, weather, or road constraints.	Confirm transport methodology during design; allow for early fabrication to account for logistics delays; conduct route surveys. Suitable weather protection and suitable structural bracing of modules and parts during transport and assembly.
Design Freeze Timing	Late decision-making delays MMC manufacture and creates rework, particularly when detailed design is not finalised early.	Use early contractor involvement (ECI) or two-stage procurement to lock in design. Development and use of standardised designs. Clear articulation to user groups for key decisions impacting manufacture. Describe how the process is different.
Site Integration Complexity	Difficulty integrating offsite components with existing infrastructure services, structure (floor to floor) on live hospital campuses.	Conduct detailed site survey and services coordination using BIM; include interface risk allocation in contractor responsibilities; retain design coordination role through project delivery. Potential of building separation to achieve level alignment (ramps).
Clinical Design Change Requests	Clinician-driven changes late in the process can compromise MMC efficiencies or require re-fabrication.	Embed user engagement early; use VR or mock-ups to sign-off on spatial layouts prior to fabrication; communicate change constraints clearly. Achieve agreed standardised designs during concept phase. Establishment of whole of jurisdiction best practice examples to alleviate user group concerns. Revised project governance to control late changes.
Stakeholder Resistance	Perception of MMC as low-quality or inflexible by clinicians, unions, or FM teams.	Undertake stakeholder education and site tours of existing MMC projects; provide lifecycle case studies and evidence of comparable performance. Establishment of whole of jurisdiction best practice examples to alleviate user group concerns. PoE of new projects to inform revisions to standardised designs and mock-ups.
Scope Demarcation Ambiguity	Overlap in responsibilities between MMC supplier, onsite contractor, and services installers leads to scope gaps or duplication.	Develop clear scope demarcation matrix; use contract exhibits to define interface zones; apply integrated project delivery or managing contractor model where beneficial.
Standardisation vs. Customisation	Tension between using standardised modules and site- or service-specific clinical needs.	Apply the 80/20 design rule (80% standard, 20% flexible); establish a kit-of-parts approach within AusHFG-aligned frameworks.
Supply Chain Constraints	Limited pool of certified MMC suppliers leads to price escalation, quality risk, or capacity issues.	Establish pre-qualified supplier panels; support long-term pipeline visibility; promote cross-jurisdictional collaboration and MMC-ready pipeline consistency.

Risk Type	Risk Description	Mitigation Strategy
		Co-ordinate industry workshops to lift understanding and share lessons learnt.
Programme Misalignment	Misalignment between factory timelines, onsite readiness, and approvals causes inefficiency or storage issues.	Coordinate integrated MMC delivery program; use milestone-based payment linked to delivery readiness; include early works package if required to de-risk site preparation. Factor storage allowance of up to 20 working days at supplier risk, client to cover >20days. Nominate in procurement docs cost for 20day and then extra over 'Delay costs' for storage of modules or parts.
Workforce Capability	Site-based contractors lack experience in assembling modular units, affecting programme and quality.	Mandate contractor MMC experience in procurement criteria; deliver training in collaboration with manufacturers; use experienced MMC assemblers for on-site works. Identify to market the future requirement for these skills and how they will be required in the expected future delivery of heath infrastructure.
Cost Perception & Budgeting	Perception that MMC is more expensive without clear evidence of lifecycle savings or faster return on investment.	Include MMC-specific cost-benefit analysis in business case; benchmark comparable projects; capture lifecycle and program savings including reduced operational disruption. Jurisdictions to record and share data for better analysis and understanding.
Cost Perception & Budgeting	Project to Project cost of MMC is higher than conventional and or budget.	The value of MMC is derived by a consistency and volume. Establishing standardised designs and a program of works view will maximise value, including cost reductions.
Procurement Rigidity	Traditional procurement models (Construct Only) do not support early supplier input, reducing MMC effectiveness.	Use procurement methods that enable early engagement (ECI, two-stage D&C, or MC); embed MMC considerations at business case stage; allow provisional MMC pricing where required. Encourage industry engagement through design sprints early in project design to guide MMC opportunities and design constraints.
Post-Handover Maintenance	Facility management teams are unfamiliar with MMC components, affecting long-term operation and maintenance performance.	Involve FM teams early; provide detailed O&M documentation and training from manufacturers; use common components that align with existing asset registers. Support inspections of factory during manufacturing process to identify issues early also support appreciation of offsite works. Develop FM Design based requirements and kit of parts which assist with future maintenance.