Precision in Prefabrication

Understanding the Benefits
for Construction Projects

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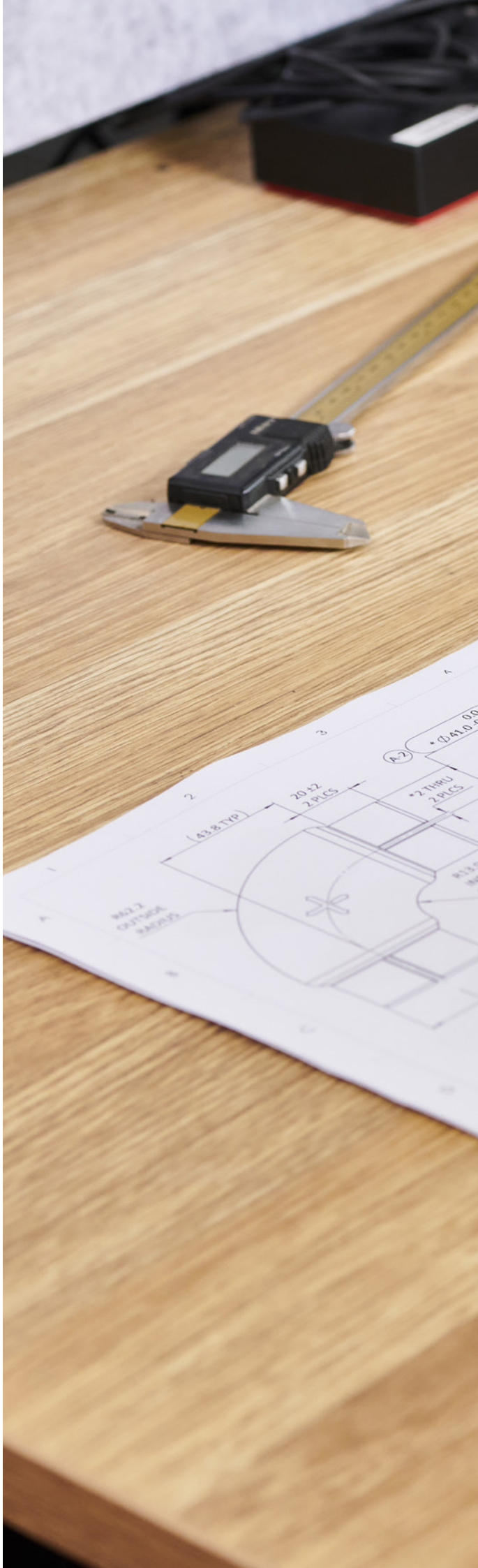
INTRODUCTION

Prefabrication in the construction industry refers to the manufacturing of building components in an off-site, controlled environment, followed by their transportation to the construction site for assembly. This method is gaining widespread use across residential, commercial, and industrial construction projects due to its efficiency and precision. Prefabrication techniques include modular construction, panelised systems, and prefabricated subcomponents such as walls, platforms, roofs, and critical safety features like barriers, ramps, and handrails.

The relevance of prefabrication in modern building practices is becoming increasingly significant as the demand for faster and more cost-effective construction solutions rises. Prefabrication addresses some of the key challenges in the construction industry by reducing labour requirements, speeding up construction and providing certainty in relation to compliance. Furthermore, the off-site production process supports sustainable building practices.

In this paper, we examine the benefits of prefabrication building systems for construction projects. Specifically, the prefabrication of barriers, ramps, and handrails plays a crucial role in ensuring compliance with safety and accessibility standards. The precision offered by prefabrication ensures that barriers and ramps meet the necessary safety regulations, such as AS/NZS 1170 and AS 1428, which govern structural and access requirements. Non-compliance with these standards can result in costly delays, legal issues, and the need for rework.

The consistency in quality and accuracy across all components reduces the risk of non-compliance, offering a higher standard of construction compared to traditional methods where variability is more common.

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EVOLUTION OF PREFABRICATION

Prefabrication has evolved significantly over time, offering an alternative to traditional construction by shifting much of the building activity away from the site. Historically, prefabrication gained popularity during postwar reconstruction efforts in the United States and the United Kingdom when the demand for rapid construction of social housing surged.[1] However, as economic conditions stabilised and concerns about safety arose, particularly following the collapse of a prefabricated apartment tower in 1968 in the UK, the method's popularity declined.

Prefabrication is currently seeing a resurgence, fueled by the development of new technologies, materials, systems, and services that have recently emerged in Australia.

Prefabrication takes various forms, ranging from small individual components to two-dimensional panels, three-dimensional modules, or hybrid systems. It can even encompass entire buildings. These prefabricated elements can be made from a variety of materials, including timber, concrete, metal, plastic, or any combination of the above.

Prefabricated construction in Australia has expanded from housing to sectors such as education, healthcare, transport, and commercial buildings. Currently, prefabrication accounts for 5% of Australia's AUD 150 billion construction industry, with projections to reach 15% by 2025. The market is expected to grow at a compound annual growth rate (CAGR) of 7.5% from 2016 to 2026.[2]

BENEFITS OF PREFABRICATION

Streamlined compliance

Prefabrication streamlines compliance with building codes and standards by leveraging the controlled conditions of off-site manufacturing. In a factory setting, advanced tools, automated machinery, and specialised equipment are used to achieve precise measurements and flawless finishes. The consistency in quality and accuracy across all components reduces the risk of non-compliance, offering a higher standard of construction compared to traditional methods where variability is more common.

Another advantage of prefabrication is the ability to conduct routine inspections and performance testing within the factory environment. Every component can be thoroughly inspected and tested before it leaves the facility, ensuring it meets or exceeds the requirements

outlined in building codes such as the National Construction Code (NCC). This proactive approach to quality control not only catches potential issues early but also prevents costly alterations or rework once components are on-site.

Additionally, prefabrication simplifies the approval process with certifiers and regulatory bodies. Since the documentation, testing, and quality assurance are completed in the factory before installation, projects face fewer delays during the inspection stages. The precision and thoroughness of prefabrication provide certifiers with the confidence that all components comply with the necessary codes.

Construction efficiency

Prefabrication offers significant advantages in reducing on-site labour and accelerating construction timelines by minimising the extent of work that needs to be done at the site. Because the majority of construction takes place in a controlled factory environment, the chances of errors are greatly reduced. With fewer labour-intensive tasks such as on-site welding and connection assembly required, construction efficiency is enhanced. Additionally, prefabrication reduces the need for truck movements and complex logistics while minimising the risks associated with weather delays that often hinder traditional construction methods.

Various studies illustrate the efficiency gains associated with prefabrication. For example, a recent study on a large hospital project demonstrated the cost- and time-saving benefits of prefabrication.[3] The project used prefabricated bathroom pods, exterior wall panels, overhead utility racks, and patient headwalls. Despite a 6% cost premium compared to traditional site-built methods, the prefabrication approach reduced the project schedule by 10% and diverted over 150,000 work hours from the job site. This reduction in on-site labour, combined with the schedule savings, can be quite significant when quantified.

A New Zealand study examining 30 light to medium building projects over a 12-month period also demonstrated a strong link between the proportion of prefabricated content and the cost and time performance of construction projects. It quantified the advantages of using prefabrication in light to medium commercial buildings, showing that incorporating 77% prefabrication can lead to 100% or greater improvement in cost performance.[4] Similarly, it was found that using 74% prefabricated content can result in a 100% or more improvement in time performance.[5]

Flexibility in design and customisation

Prefabricated construction offers a high degree of design flexibility, allowing for customisation within modular systems to meet the specific needs of a project. Builders can take advantage of this flexibility to modify designs, adjust layouts, or introduce new modules with relative ease, making it possible to accommodate changes during the construction process without causing major disruptions. This adaptability is especially useful for projects with tight deadlines or evolving requirements, where quick adjustments are necessary to keep the project on track.

One of the key benefits of prefabrication is the ability to reconfigure or relocate modules after installation. This modular approach enables buildings to be more adaptable over time, allowing components to be rearranged or expanded to meet future demands. Whether it's adjusting the layout of a commercial space or expanding a healthcare facility, prefabrication offers a scalable solution that can evolve with the project, making it a valuable tool for dynamic and long-term construction planning.

Sustainability and environmental impact

Prefabrication significantly reduces construction waste through precision manufacturing processes. Since components are produced in controlled environments, materials can be used more efficiently. Studies across 412 projects show that prefabrication can reduce construction waste by as much as 25.85%, making it a more sustainable option compared to traditional building methods where material waste is higher.[6]

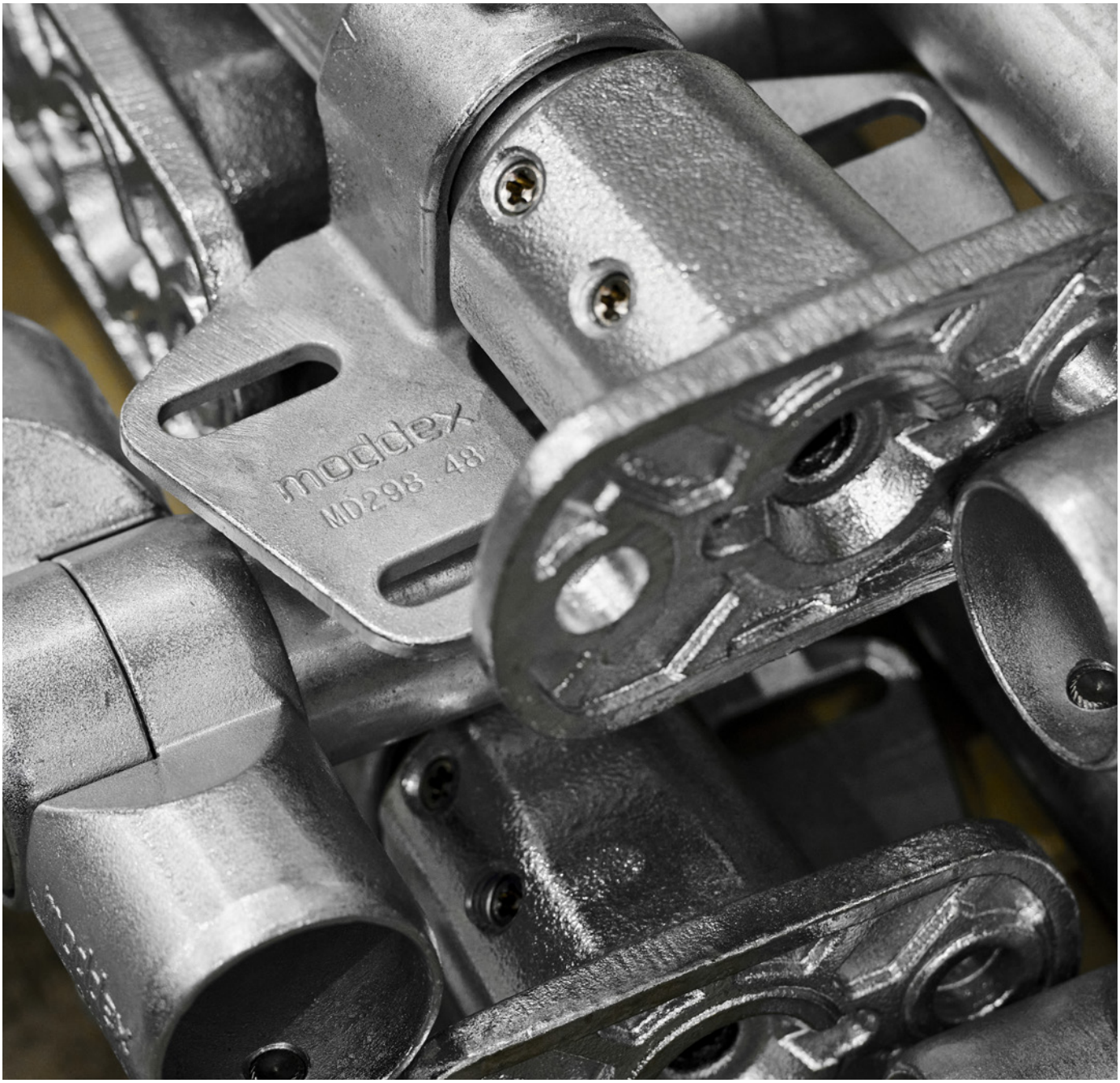
Prefabrication allows for the integration of sustainable materials, such as recycled metals or other low-embodied-carbon or renewable materials, offering both environmental and practical benefits. By reducing the need for virgin materials, this approach lessens the strain on natural resources and contributes to a more circular economy. Moreover, the use of eco-friendly materials elevates a project's sustainability profile, helping it meet stringent green building certifications such as LEED or Green Star.

Additionally, prefabrication contributes to a lower carbon footprint during construction. Research shows that prefabricated buildings can reduce carbon emissions by approximately 86 kg per square metre when compared to traditional cast-in-situ methods.[7] This reduction is achieved through fewer on-site activities, reduced energy consumption, and optimised transportation logistics.

THE FUTURE IS PREFABRICATED

The future of prefabrication is set to transform the construction industry, with a growing emphasis on modular construction for faster, more efficient building processes. As technologies like robotics and AI become more integrated, the precision and customisation capabilities of prefabrication will continue to expand, enabling the production of highly tailored designs without compromising on speed or efficiency. Additionally, the push toward sustainability will play a key role, with an increased focus on incorporating eco-friendly and recycled materials into prefabricated components.

In the coming years, hybrid construction methods, which combine prefabrication with traditional on-site techniques, are expected to gain momentum. Innovations in logistics and transportation will further streamline the delivery of prefabricated components, while advancements in 3D printing technology will allow for the creation of more complex and intricate building elements. The incorporation of smart materials and energy-efficient solutions into prefabricated systems will also be a significant trend as buildings become more intelligent and responsive to environmental conditions.



Moddex Ezibilt™ System

The Moddex Ezibilt™ Ramp, Stair, and Walkway System exemplifies the benefits of prefabrication in construction, providing a pre-engineered, off-site manufactured solution that streamlines project timelines and ensures compliance. As a modular system, it is designed for rapid delivery and installation, minimising site disruption and the need for skilled labour. Prefabrication enables the system to be produced with consistent quality and precision, significantly reducing on-site measuring and complex assembly tasks. This method accelerates the overall construction process, allowing for the completion of access ramps, stairs, and decks within days of delivery.

A key advantage of the Ezibilt™ system is its flexibility and adaptability to different project needs. It offers customisable options that can accommodate varying site heights and contours, making it suitable for a wide range of applications, including commercial buildings, public spaces, and infrastructure projects. Moreover, the system is relocatable, offering long-term sustainability benefits by enabling structures like ramps to be reused or reconfigured when buildings are relocated or repurposed. This adaptability not only supports sustainable construction practices but also reduces waste and extends the lifecycle of the structure, aligning with modern environmental goals.

Additionally, the Ezibilt™ system adheres to rigorous safety and compliance standards, such as AS/NZS 1170 and AS 1428, ensuring that accessibility requirements are met without compromising on performance. With a design life of up to 50 years, it provides a durable and reliable solution for access systems, while its compatibility with other Moddex handrail and balustrade systems enhances its versatility. By combining off-site manufacturing efficiency, design flexibility, and compliance assurance, the Ezibilt™ system is a prime example of how prefabrication can drive innovation and efficiency in modern construction projects.

About Moddex

Moddex is Australasia's leading manufacturer of no-weld, hot dip galvanised barrier systems. Pre-engineered for structural integrity, their proprietary systems are load tested and configured to Australian and New Zealand Standards (AS/NZS), Workplace Health and Safety guidelines (WHS/OSH), Australia's National Construction Code (NCC/BCA) and the New Zealand Building Code (NZBC).

To help you with design and installation, our team of Moddex technical experts are on hand with recommendations and compliance advice.

With fewer labour-intensive tasks such as on-site welding and connection assembly required, construction efficiency is enhanced.

Reference

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All information provided correct as of August 2024

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