Efficiency at Scale

Applying Prefabrication and Modular Construction Principles to Commercial Bathroom Installation

CAROMA

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Introduction

In today's competitive landscape, there are many issues impacting the cost of construction. While building and infrastructure demand continues to rise, supply chain constraints are placing pressure on property prices and the cost of materials. Some key building materials, notably timber for framing, are in short supply. A shortage in skilled labour across the country is also constricting productivity.

There is significant pressure on the industry to find new innovations in systems and processes to help meet the growing backlog of new building developments. While cost-effective products are available, real game-changing savings can be found in the adoption of emerging and highly-efficient building methods, particularly for large-scale commercial projects with consistent product specifications.

This is where prefabrication and modular construction principles provide an answer. Modular construction refers to a process involving the prefabrication of building elements in a controlled factory environment, using the same materials and designing to the same performance standards as traditionally-built structures, except in half the time.[1] Prefabrication, in particular, has proven to be a reliable way to speed up the construction process, without additional labour and skills requirements, for individual sections or components of a building.

In this whitepaper, we examine how these methods can be applied to medium to large scale bathroom installation projects to reduce overall costs without reducing quality or performance.

Challenges in commercial bathroom installation

In commercial projects, the main factors driving costs include the complexity of the bathroom design, how many bathrooms and toilets are needed, whether any structural work is needed, the cost of materials and products, and plumbing requirements.

If your commercial bathroom project requires significant plumbing work or waterproofing, it will be necessary to engage with skilled sub-contractors for these specific areas. The current skilled labour shortage makes this difficult to not only find experts but also schedule them when they are needed. Performing skilled qualified work on-site will inevitably have higher costs than the same work completed off-site in factory-controlled conditions.

The larger an installation project becomes, the harder it is to maintain repeatability and consistency of results.

In medium to large scale projects where multiple bathrooms are being worked on, each bathroom space may have different dimensions and layouts and specific requirements for accessibility, safety and durability. The introduction of variables in layout as well as mixing and matching bathroom products and fixtures from multiple suppliers can increase the risk of defects. Even the use of timber for noggins and frames can introduce variations to the construction process.

In this scenario, ensuring all aspects of the bathroom are fit-for-purpose and compliant with Australian building codes and standards is extremely difficult. These factors can also increase the risk of poor quality and incomplete work, requiring re-work that can represent a significant cost and delay to the project.

Managing the rough-in stage

One of the most important stages in bathroom installation is the plumbing and electrical “rough-in”. The rough-in stage is when mechanical, plumbing and electrical sub-contractors enter the project to install major components and services for the building. Rough-in plumbing involves installing the initial plumbing lines inside the walls before plasterboard is applied over them.

Rough-in work can be challenging to manage. It requires working in shared reduced spaces with separate building systems. Coordination between subcontractors is essential. Timing the installation of each building system is also critical. In general, the rough-in process can only begin once walls, floors and ceilings are partially built. Any mistakes during this stage are costly as remediating defective work will involve removing tiles, breaking through walls and rectifying waterproofing.

Walls and floors cannot be completed until the rough-in stage is complete. Any delays during rough-in will cascade throughout the project and affect all stakeholders. If an installation is complex, even seasoned experts can make mistakes.

Prefabrication and modular construction for bathroom projects

Modular construction refers to an approach to building wherein construction elements and modules are produced off-site in a factory-like setting, then transported to the building site and installed there. The prefabricated elements may be smaller components of the building, or entire sections, such as a factory-fitted bathroom.

The terms “prefabrication” and “modular construction” are often used interchangeably; however they are not exactly the same concept. Prefabrication is the process of manufacturing construction elements away from the construction site. In principle, these prefabricated elements can be designed and customised for a specific project but must be produced off-site. Modular construction, on the other hand, broadly describes the overall process from design to prefabrication to assembly. It can be used to describe instances where all construction elements are standardised.

Europe has championed modular construction for many years, and its popularity is growing in countries like Australia. In the bathroom installation sector, prefabricated bathroom pods have emerged as a viable option in construction projects and a significant contributor to productivity.

A prefabricated bathroom pod is a fully-equipped bathroom unit that is completely manufactured in a controlled factory environment. Bathrooms, particularly those for commercial settings, are typically subject to strict rules and regulations in relation to strength, durability, functionality, safety and accessibility. A bathroom manufactured off-site can be rigorously tested before it is transported to the site, after which it is installed and ready for use.

Advantages of off-site manufacturing

The key aspect of prefabrication and modular construction methods is the benefits of off-site manufacturing compared to traditional on-site building. Prefabricated building elements are made in controlled manufacturing environments, typically with standardised procedures and components, all of which reduce variability and ensure a consistent level of quality. Moreover, each component is subject to rigid quality assurance processes, internal inspections and performance testing to ensure the finished product is of the highest standard and meets all the relevant regulatory requirements.

The off-site manufacturing efficiencies gained through prefabrication minimise on-site construction activity and labour requirements. Most modular building elements are designed for rapid on-site installation. The leading systems can be installed without specialist trades and heavy equipment, saving valuable time and avoiding costly project delays.

Another benefit of prefabrication is better control in waste management, which can be done off-site as well. Material supplies and scheduling are easier to control in a factory, allowing manufacturers to reduce waste and implement sustainability measures to reduce their environmental impact. Removing waste from a site is difficult and expensive. It can also be onerous for subcontractors, who are required to take greater responsibility for their own waste under increasing ESG (environmental, social and corporate governance) mandates.

In the bathroom installation field, prefabrication and modular systems streamline the specification process. Rather than sourcing fixtures from different suppliers and running the risk of incompatibility issues, the entire process can be completed using one supplier. Any special requirements and installation issues can be worked out early in the process. In addition, there is only one point of contact for product issues, which can help quickly resolve defects or find replacement parts in a timely manner.

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What are the cost and resource benefits?

While the below figures apply to the modular construction of buildings in general, similar benefits apply on a smaller scale for bathroom installation projects.

- Lower construction costs. In the right environment, modular construction can deliver 20% cost savings over traditional on-site construction.[2]
- Faster construction timelines. Recent modular projects have reported that construction timelines can be accelerated 20-50%.[3] Shorter construction periods means properties are quicker to occupancy and thus quicker to revenue.
- Fewer on-site risks. There is no need to store bathroom components on site and distribute them across multiple floors.
- Higher quality installation. Prefabricating off-site results in higher quality installation and reduces call-backs to rectify issues.
- Superior sustainability. Modular structures leverage the latest lean off-site manufacturing techniques, resulting in less material waste and energy consumption.[4]

In a recent notable modular project, the Grange University Hospital project in South Wales increased productivity by 45% and saved nearly 240,000 hours of on-site labour by adopting off-site construction methods.[5] Bringing completely manufactured elements, such as bathroom pods, instead of individual materials, also reduced vehicle movements by 30% which in turn resulted in lower project-related emissions.[6]

A modular approach to fixture installation

Caroma Modular Frame Installation Solution

Australian-owned and operated, leading bathroom product provider Caroma has now joined the “prefab revolution” by developing a suite of prefabricated in-wall framing systems called CAMFIS (Caroma Modular Frame Installation Solution), which allows for plumbers to run their own prefabricated production lines and help solve their labour crisis and drive growth.

By simplifying the prefabrication process down to pre-roughed in-wall units that support and connect Caroma bathroom products, plumbing businesses can install and fit off bathrooms in commercial applications with reduced on-site labour.

With prefabricated assembled frames delivered to their door, plumbers can rough-in prior to site delivery on a standardised frame in factory conditions, deliver to site, and then simply click them in to minimise on-site labour, reduce costs and alleviate the headache of coordinating on-site personnel.

How it works

CAMFIS is a series of prefabricated in-wall frames that support Caroma bathroom fixtures behind the wall to enable fast, reliable installation of Caroma products in high-volume commercial projects. Caroma has developed the frames in collaboration with leading commercial plumbing contractors in Australia to ensure stability and versatility so that a vast array of Caroma products can be installed quickly and hassle-free with repeatable results. Given the many variables that plumbers face during most projects, the frames also offer a level of flexibility in their set-up to account for unplanned but necessary adjustments on site. CAMFIS, therefore, provides an ideal solution for projects where a high volume of bathrooms of similar layout are specified, such as hospital or aged care facilities.

The frames are made up of an arrangement of galvanised steel supports and brackets, which allow for water pipe fittings to be pre-mounted and roughed in by the plumber in their workshop offsite, so that when attached to the on-site wall frames, they are immediately ready to be sealed, with front-of-wall components attached and commissioned following a quick connection to the hot and cold supply lines and waste drainage. This avoids time-consuming and, in some cases, difficult rough-in works on-site, which can often be marred by difficulties in scheduling with other trades and quality assurance.

By conducting rough-in work off site prior to the installation phase, the contractor can reduce on-site waste and minimise the disruption on site, saving money and time for themselves and the builder. Prefabricated frames can also be pressure-tested quickly and easily prior to site delivery to ensure units are 100% leak-proof, providing peace of mind for all parties.

Supports range of products

Caroma has a suite of frames available that support a range of basins, tapware, showers, and toilet suites, including the renowned Invisi II in-wall cistern with adjustable flush pipe.

The frames are designed to click in perfectly into the structural steel framing, providing high stability for bathroom components without impacting the wall stability.

With ever-growing pressures on plumbing contractors to complete projects on time and on budget with limited resources, Caroma’s Modular Framework systems offers an innovative and sustainable solution to install bathrooms quickly and consistently with minimal on-site labour.

To find out more about Caroma’s Modular Framework System get in touch with your local Caroma representative.

REFERENCES

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5 WSP. “The Grange University Hospital.” WSP. https://www.wsp.com/en-au/projects/the-grange-university-hospital (accessed 22 March 2023).

6 Ibid.

All information provided correct as of April 2023

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