2024 CANADIAN MODULAR CONSTRUCTION INDUSTRY REPORT

MODULAR BUILDING INSTITUTE

THE MODULAR BUILDING INSTITUTE'S

Key Findings and Best Practices for Successful Modular Projects in Canada

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Cover Image: **Thompson Rivers University housing.**
Built by NRB Modular Solutions with TechCanada Contracting Ltd. and S2 Architecture. Kamloops, BC, Canada.

The images in this report represent some of the winners of the Modular Building Institute's 2024 Awards of Distinction. To see the complete list of winners and learn more about each project, visit modular.org/awards.

ABOUT THE MODULAR BUILDING INSTITUTE

Founded in 1983, the Modular Building Institute (MBI) is the only international nonprofit trade association serving the commercial modular construction industry. For more than 40 years, MBI has promoted the advantages of modular construction while advocating for the removal of barriers that limit growth opportunities. MBI represents nearly 600 member companies in 20 countries, including 71 in Canada.

MISSION

As the Voice of Commercial Modular Construction™, MBI works to fulfill its mission to expand the use of offsite and modular construction through innovative construction practices, outreach and education to the construction community and its customers, and recognition of high-quality modular designs and facilities.

MODULAR ADVOCACY PROGRAM

In September 2023, the MBI Board of Directors voted to embark on a multiyear, multimillion-dollar advocacy effort known as the Modular Advocacy Program (MAP). For far too long, the modular industry has been fragmented and seemingly content competing for less than 10 percent of the overall market share. This collaborative, united effort will not only target barriers to be removed, but also create new opportunities for modular construction. A key component of this initiative will be a focus on workforce development and creating paths for those interested in pursuing careers in modular construction.

MAP

MODULAR ADVOCACY PROGRAM

The Modular Advocacy Program ("MAP") is MBI's multiyear, multimillion-dollar campaign to spur investment in, and promote the greater adoption of, the commercial modular construction industry.

In order to meet the growing needs of its members and the greater modular construction industry, MBI's MAP Program will drive industry growth in the following areas:

1. Influencing government legislation, regulations, procurement, programs, and codes.
2. Creating new business opportunities for the industry.
3. Expanding outreach efforts to developers, architects, and code officials.
4. Attracting new employees to the industry, including nontraditional workers.

MBI, leveraging its growing international membership, plans to fund this program through a variety of initiatives.

Funding the Modular Industry's Most Important Initiative

Your company can support MBI's Modular Advocacy Program in three ways:

MBI Seals

MBI Seals are 4-inch square stickers that are meant to be affixed inside each module that MBI member manufacturers produce. Each MBI Seal costs $20. These costs are intended to be passed along to your customers, which means a net-zero cost to you.

Manufacturers — Order and affix an MBI Seal inside each module you manufacture.

Architects, Contractors, and Developers — Spec the MBI Seal on your future projects.

Fleet Owners — Ensure all new and existing units have the MBI Seal.

Sponsoring the MAP

Annual sponsorships for the MAP Program are available for $1,000. If you're not buying Seals, this is an ideal way to show your support of MBI and contribute to MAP funding.

With your annual sponsorship, your company will receive:

- sponsor recognition and logo inclusion in every MBI printed piece (magazines, annual reports, event brochures),
- a dedicated eblast thanking each sponsor, AND
- a special thanks at the next World of Modular annual conference, including logo inclusion in the opening presentation.

Voluntary Donations

- If Seals and MAP sponsorship don't match your company's current objectives, support the MAP by making a voluntary donation in any amount.
- In combination with the revenues from Seals and sponsorships, these donations will be used to grow and protect the commercial modular construction industry through government affairs advocacy, business development, expanding MBI's membership, and industry workforce development.

MBI Needs You to Support the MAP

Full member support of the Modular Advocacy Program will be critical to MBI's goals in 2024 and beyond. And if your company has not yet joined MBI, now is the perfect time. With more resources than ever, the Modular Building Institute is helping to build the future of modular construction. Join us!

ABOUT MODULAR CONSTRUCTION

Modular construction can be considered a hybrid between the construction and manufacturing industries. This method involves constructing buildings offsite in a factory-controlled environment, then transporting them to the final site for assembly, incorporating elements of both industries:

Construction: Modular construction involves traditional construction practices such as designing the building, planning the site, and assembling the modules into the final structure. Site preparation, foundation work, and utility connections are also part of the construction process.

Manufacturing: The fabrication of building components, such as walls, floors, and roofs, occurs in a factory setting using assembly-line production methods. This approach allows for standardized processes, quality control, and efficient use of materials and labour.

Company: Corner Cast Construction Inc.

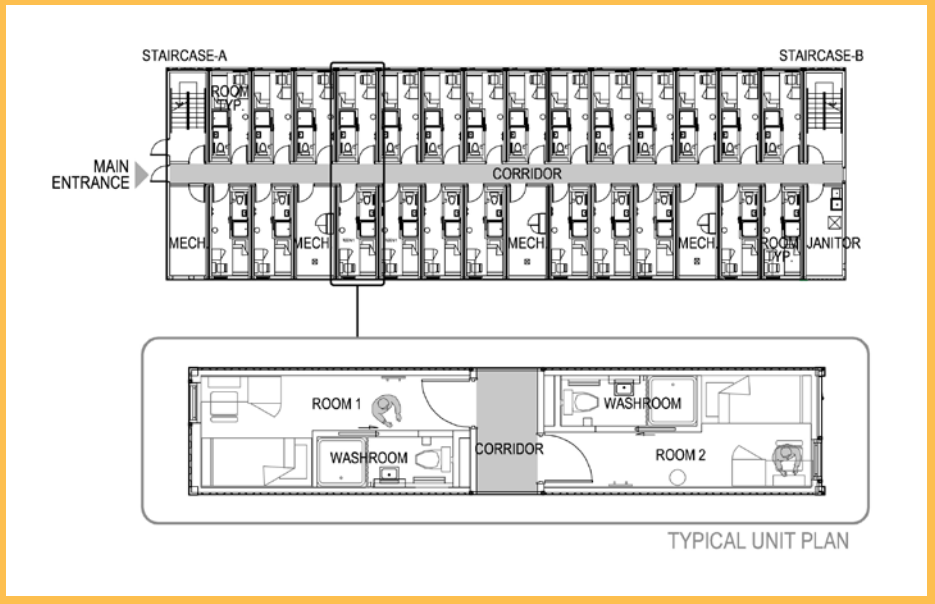
Location: Kangirsuk, QC, Canada

Gross Size of Project: 30,720 Square Feet

Days to Complete: 397

Number of Modules: 96

Corner Cast designed, engineered, manufactured, and shipped by maritime transport a workers' accommodation complex built with two wings of three stories each, housing a total of 160 bedrooms. This building was designed to withstand the harshest conditions of the Canadian North, with an exterior design temperature of -58 F.



In essence, modular construction bridges the gap between traditional construction and manufacturing by leveraging the benefits of both industries to streamline the building process.

Modular construction can be used for a variety of purposes, including single-family residential, multifamily, commercial, or industrial applications. MBI members commonly build for the multifamily and commercial markets.

MARKETS SERVED

The best market for a modular construction company in Canada can vary depending on several factors, including the company's specialization, target market, and competitive landscape. However, some regions and sectors have shown greater demand and potential for modular construction:

Urban Areas with High Housing Demand: Cities experiencing population growth, such as Toronto, Montreal, Vancouver, Calgary, and Edmonton, often have high demand for affordable housing solutions. Modular construction can offer a faster and more cost-effective way to build housing in these areas.

Affordable Housing Initiatives: Many provinces and municipalities have initiatives to address affordable housing shortages. Modular construction can be a preferred method due to its efficiency and cost-effectiveness, making it a good fit for markets with affordable housing needs.

Disaster Recovery and Resilience Projects: Regions prone to natural disasters like hurricanes, floods, and wildfires often require rapid rebuilding efforts. Modular construction can facilitate quick and efficient reconstruction, making it a valuable solution for disaster recovery projects.

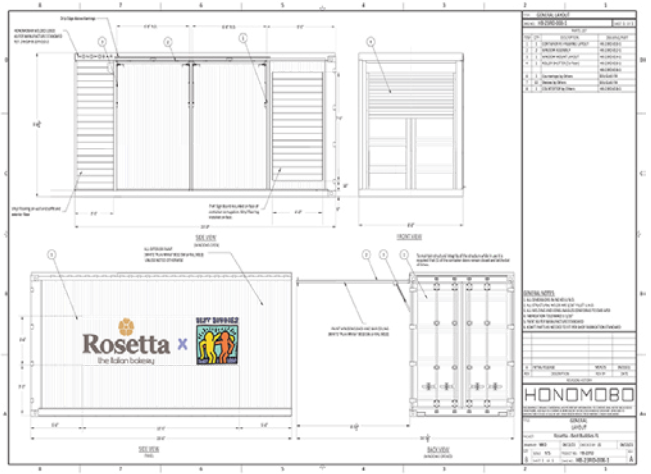
Commercial and Institutional Construction: Beyond residential construction, there is a growing demand for modular buildings in the commercial and institutional sectors, including schools, healthcare facilities, offices, and hotels. Markets with a strong presence of these industries can offer opportunities for modular construction companies.

Infrastructure Projects: Infrastructure development, such as transportation hubs, educational facilities, and government buildings, can benefit from modular construction's speed and efficiency. Regions with substantial infrastructure investments may present opportunities for modular construction firms.

Sustainability-Focused Markets: Modular construction's potential for reduced waste and energy efficiency aligns well with markets prioritizing sustainability. Regions with stringent environmental regulations or strong green building initiatives may favor modular construction methods.

Emerging Markets: Some regions within Canada may be relatively untapped or underserved by traditional construction methods, presenting opportunities for modular construction companies to establish a foothold.

Ultimately, the best market for a modular construction company depends on factors such as market demand, regulatory environment, competition, and the company's unique capabilities and offerings. Conducting thorough market research and identifying specific market niches or opportunities can help a modular construction company determine the most suitable markets to target.



Company: HONOMOBO

Location: Miami, FL, USA

Gross Size of Project: 430 Square Feet

Days to Complete: 60

Rosetta Bakery needed a portable bakery location that met both its business needs and Miami's aesthetic demands. We custom-fabricated a HONOMOBAR with two top-hinge doors that extend from the front service wall into a canopy, shading customers from the hot sun. Bright, white, and custom-painted to match Rosetta's company branding, this HONOMOBAR fittingly stands out in the city's Design District.

KEY ADVANTAGES

Cost Savings and Certainty

Is modular construction cheaper/less expensive than traditional construction methods?

Generally speaking, yes. There are numerous variables associated with modular projects, just as there are with conventional construction projects. Availability and cost of onsite labour are key factors. In larger urban areas where labour is scarce and/or more expensive, shifting construction to an offsite (often rural) location can yield significant cost savings.

The overall efficiency of the modular process can also lead to cost savings. With modular, fewer labour hours are needed to complete a comparable project, and waste is significantly reduced. The shortened modular construction schedule can reduce the time needed for a construction loan and dramatically advance the occupancy date—critical considerations for revenue-generating businesses such as hotels and fast-food restaurants.

According to a Smart Market Report titled "Prefabrication and Modularization: Increasing Productivity in the Construction Industry," published by McGraw-Hill in 2020, 91 percent of all general contractors reported a favorable impact from modular construction

Company: Northgate Industries Ltd.

Location: Tuktoyaktuk, NT, Canada

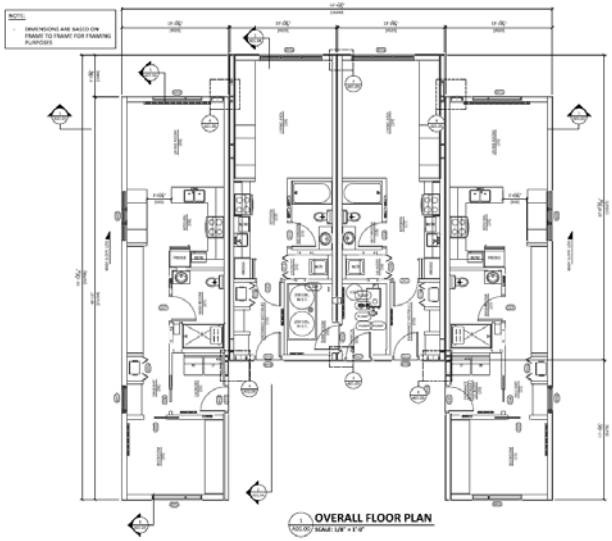
Gross Size of Project: 23,800 Square Feet

Days to Complete: 305

Number of Modules: 54

Affiliates: Northern Industrial Construction

Composed of 54 modular units, this project forms an elegant constellation of duplexes and fourplexes. With studios and one-bedroom suites ranging from 446-665 square feet, the design prioritizes spaciousness and natural light, featuring engineered floors and large windows.



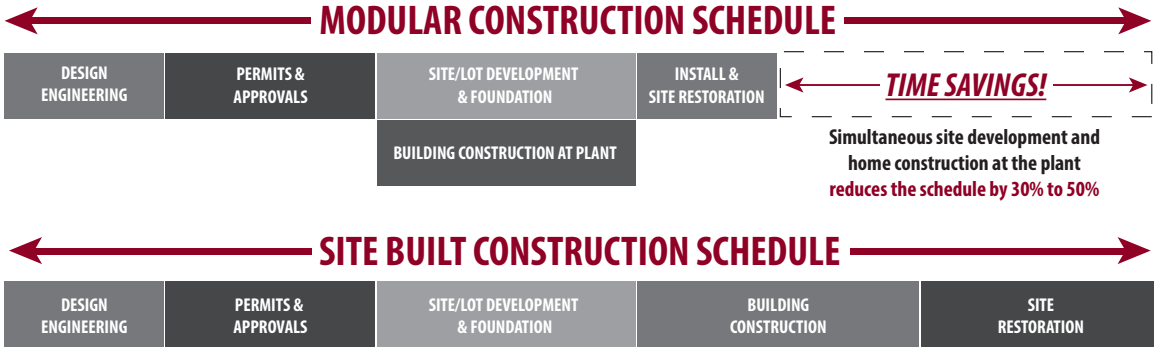
on project budget performance, with 48 percent indicating that costs decreased by more than 10 percent. More than two-thirds of respondents (68 percent) cited a positive budget impact of better than 5 percent.

In a recent 2023 study from the University of Nebraska's Durham School of Architectural Engineering and Construction, Professor Kevin Groskopf found construction costs for site-built projects in his study averaged $251 per square foot, while the cost for modular projects averaged $243 per square foot—approximately 4 percent less.

Site-built construction contracts, including firm, fixed-price contracts, usually have change orders and a contingency for unforeseen conditions. By comparison, modular contracts, which typically make up 40 percent or more of a project, are "locked in" prior to construction, with greatly reduced (or eliminated) change orders and contingency. The modular manufacturer can also consolidate the markups and contingencies of several subcontractors.

Schedule Savings and Certainty

According to the 2019 McKinsey & Company report "Modular construction: From projects to products," overruns of 25-50 percent of projected construction duration are common. By contrast, recent modular projects have already established a solid track record of *accelerating* project timelines by 20-50 percent. Since construction of modular building components occurs simultaneously with site work, projects can be completed in less time than with traditional construction. Additionally, 60-90 percent of modular construction is completed inside a factory, which mitigates the risk of weather delays. Buildings are occupied sooner, creating a faster return on investment.



Quality Control and Assurance

It is helpful to think of modular as a construction process rather than a building type. A modularly constructed building simply means that the materials were delivered to an offsite location (the modular manufacturing facility), assembled into components or three-dimensional building modules, and then transported to the final site for assembly. As such, a building constructed in this manner must still meet all the same building codes and requirements as if it were built onsite. In Canada, this is most commonly a version of the National Building Code.

The industry is regulated primarily at the provincial level through administrative agencies that implement and enforce the rules for building in that jurisdiction. The administrative rules of each agency provide for quality control, quality assurance, safety standards, and inspection procedures for industrialized building construction, design, and manufacture. The purpose of these rules is to provide minimum requirements to safeguard public health, safety, and general welfare, and to address societal and industry challenges for the inspection and regulatory compliance of offsite construction.

Industry Standards

Over the past several years, MBI has worked with CSA Group on the development of several industry standards and guidelines to help ensure quality and consistency on modular projects. These standards include:

A277-16 (R2021) Procedure for certification of prefabricated buildings, modules, and panels. This standard specifies the procedure for certification of prefabricated buildings, and partially or fully enclosed modules and panels for buildings of any occupancy. It provides requirements for a) certification of the factory quality program, b) certification of the prefabricated product, c) auditing of the factory quality program, and d) in-factory inspection of the prefabricated product.

CSA Z250:21 Process for delivery of volumetric modular buildings. This standard describes processes for the delivery of permanent volumetric modular buildings, where modules are constructed in a factory. It specifies the procedures for a) design; b) quality control in modular manufacturing; c) approvals; d) logistics, transportation, and storage; e) nonmodular and modular sitework; f) lifting, placement, and setting; g) installation and finishing; and h) commissioning and handover. Exclusions: This standard does not cover the procedure for in-factory certification of buildings, modules, or panels.

CSA Z252:23 Volumetric modular construction—guide to compliance and approval processes. This guide provides Canadian best practices for the process of inspecting, reviewing, and approving modular construction projects for partially or fully enclosed modules that are constructed in an offsite factory and transported and installed at the final location. These guidelines are intended for construction, inspection, and reviewing of permanent modular buildings of any size and occupancy. The guide includes information on a) plans preparation and review, b) permit application package inclusions, c) site/development permit inclusions, d) codes and standards applicable to modular construction, e) factory certification program procedures, f) third-party inspection agencies' roles and responsibilities, g) transportation and storage practices, and h) recommended onsite installation and inspection procedures.

CSA Group acknowledges that the development of this document was made possible, in part, by the financial support of Bird Construction, Groupe RCM, the Modular Building Institute, ROC Modular Inc., Stack Modular, and Z Modular Inc.

Environmental Impact

According to a March 2022 article by McKinsey & Company, the world will see a once-in-a-lifetime wave of capital spending on physical assets between now and 2027. This surge of investment—amounting to roughly $130 trillion—will flood into projects to decarbonize and renew critical infrastructure. Ninety-three percent of CEOs say that sustainability issues are important for the future success of their businesses, and 54 percent expect sustainability to be embedded within the core business strategies of most companies in the next decade.

From a sustainable and strategic perspective, modular construction has the potential to dramatically change how we build in four key areas:

- Significant waste reduction
- Lower carbon footprint
- Relocate, renovate, and repurpose
- Greater energy efficiency/ tighter building envelope

Several studies and reports have been conducted globally on the impact

that modular and prefabrication have on overall waste reduction. According to the groundbreaking "Prefabrication and Modular Construction 2020" report by Dodge Data and Analytics, 86 percent of architect, contractor, and developer respondents said that utilizing modular construction had a medium, high, or very high impact on reducing waste generated by construction activities.

Other research findings:

Comparative Study of Waste Reduction Practices in Multi-Family Construction: Modular Construction as a Circular Economic Solution—J. Killingsworth, J. Elliott, K. Bond

This study compared two multifamily housing projects, both wood-framed and both located in U.S. Mountain West states. The fundamental conclusion of this study is that offsite framing practices achieve the following notable results:

1. Reduce wood waste by at least 23 percent (compared by framed square footage)
2. Nearly eliminate ALL methane-producing landfill waste by practice
3. More effectively reuse wood cutoff waste by practice
4. Achieve higher "circularity" for wood cutoff waste.

In every comparison made, offsite framing produced less waste. Applying the highest density factors of wood-filled dumpsters from the U.S. Environmental Protection Agency (4.94 tons per 30-yard dumpster), the offsite-framed multifamily residence produced 22.4 percent less waste than equivalent site-built projects. Taking into account that all dumpsters may not be "densely packed," the average density of the modular roll-off waste was also calculated based on the site-built project's average of 3.67 tons per 30-yard dumpster. Using that figure, the results demonstrate that volumetric modular projects generate 42.4 percent less wood waste than site-built projects.

Quantifying Advantages of Modular Construction: Waste Generation—Loizos Loizou; Khalegh Barati; Xuesong Shen, ORCID; and Binghao Li, School of Civil and Environmental Engineering, University of New South Wales, Sydney, NSW 2052, Australia, November 2021

This paper focuses on modular construction as an offsite production system, proposing a framework to compare waste generation of modular and conventional, in-situ construction methods and aiming to quantify those differences. The framework relies on a comprehensive literature review to estimate the waste rates of building materials, which are then applied to realistic case studies to determine the differences in waste generation. Overall, modular construction reduces the overall weight of waste by up to 83.2 percent for the cases considered. **This corresponds to a 47.9 percent decrease in the cost of waste for large structures.**

Qualitative comparisons asserting that prefabrication reduces waste have also been verified. For quantitative comparisons, the results show greater waste reductions than most previous studies. **Quale et al.; Jaillon et al.; Kim, Jaillon, and Poon; and Hosseini et al. showed waste reductions of 20.1 percent, 52 percent, 60 percent, 65 percent, and 92 percent, respectively.**

Onsite Versus Offsite: Comparing environmental impacts—Quale et al.

The University of Virginia conducted a study (Quale et al.) using life-cycle assessment to quantify the environmental impacts of constructing a typical residential home using two methods, based on data from several modular construction companies and conventional homebuilders. The study, peer-reviewed and published in the *Journal of Industrial Ecology,* included impacts from material production and transport, offsite and onsite energy use, worker transport, and waste management.

In terms of materials usage and waste, homes constructed using a modular process were found to use about 20 percent less material overall. This included greater material use for modular mate lines and transportation, but significantly less material waste for modular. **In fact, the modular homes sent about 75 percent less wood and drywall waste to the landfill per project (1,380 pounds for modular versus 5,500 pounds for conventional).** Worker transport to the jobsite daily had a negative impact for conventional construction, while energy use in the factory reduced the environmental impact of modular construction projects.

Quantifying the waste reduction potential of using prefabrication in building construction in Hong Kong—L. Jaillon, C.S. Poon, and Y.H. Chiang

As Hong Kong is a compact city with limited available land and high land prices, the construction of high-rise buildings is prevalent. In 2005, about 21.5 million tonnes of construction waste were generated, of which 11 percent was disposed of in landfills and 89 percent in public filling areas. At the present rate, Hong Kong will run out of both public filling areas and landfill space within the next decade. The government is taking action to tackle the problem, such as by introducing a construction waste landfill charge and promoting prefabrication to reduce onsite waste generation. This paper reports an ongoing study on the use of prefabrication in buildings and its impact on waste reduction in Hong Kong. A questionnaire survey was administered to experienced professionals, and case studies of recently completed building projects were conducted. The results revealed that construction waste reduction is one of the major benefits of using prefabrication instead of conventional construction. The average waste reduction level was about 52 percent, implying that wider use of prefabrication could considerably reduce construction waste generation in Hong Kong and alleviate the burdens associated with its management.

A study conducted by the University of Alberta ("North Ridge CO2 Analysis Report"—Al-Hussein et al.) comparing modular and onsite construction noted even greater advantages for modular construction. The research found that by using modular construction, the overall schedule was shortened by four months on an 11-month project, and CO2 emissions were reduced by 43 percent.

From the Quale et al. research, the analysis revealed that environmental impacts from modular construction are, on average, lower than those from onsite construction, with total greenhouse gas emissions about 30 percent less for modular construction.

According to the National Renewable Energy Lab, "Industrialized construction has immense potential to address the growing need globally to build and upgrade the building stock to be affordable, energy-efficient, and resilient. It can also help achieve the United States' goal of a 50 percent reduction in U.S. greenhouse gas (GHG) emissions by 2030. The industrialized construction of Net Zero Energy (NZE), low-carbon modular buildings is an essential step for developing a transformational pathway for our clean energy future."

Modular Construction: Energy-Efficiency Field Study in Commercial and Multifamily Buildings—University of Nebraska-Lincoln, Colorado State University, and New Buildings Institute, July 9, 2020

A multiyear field study targeting four climate zones in three states (California, Pennsylvania, and Washington) documented the energy performance of 45 modular projects, with a focus on multifamily buildings. Prefabrication in a controlled factory setting has the potential to improve energy efficiency and performance, while streamlining related code-compliance processes and better enabling the integration of advanced technologies. When integrated, this approach may reduce total energy use by 50 percent when compared to comparable site-built construction.

BEST PRACTICES FOR IMPLEMENTING MODULAR CONSTRUCTION

When considering utilizing modular construction for a project, the best advice is to visit several factories, as the process is much easier to grasp visually. Factory capabilities, timing, workload, size, and specialty are all variables that need to match your project. MBI can assist in facilitating factory tours.

Deciding to consider modular construction for your next project is just the first step, however. Given that every aspect of construction was written for a site-built world, there are many differences and nuances to evaluate to help ensure that your first modular project is successful.

Here are some best practices:

Ask yourself these questions first: Are there any elements of this project that could be built offsite more efficiently? Are there repeating design elements or standard configurations? Is this project a "one-off," or will more projects similar to this one be considered? Answering these questions reframes the entire discussion about the project. Some elements of your project, such as guestrooms or offices, may be ideal for a factory setting, while other parts, such as large open spaces, lobbies and dining areas, may need to be site-built.

What do you hope to gain by using modular construction? More often than not, schedule considerations help drive the decision to use modular construction, given its significant positive impact on the overall schedule. Some, though, choose modular for better quality control and a safer work environment. If you are choosing modular only to save money, be sure to set realistic expectations. In general, cost savings of 5-10 percent are not uncommon. However, savings depend on several variables, including labour costs at the project site versus at the factory, the repeatability of the design elements, and the experience of the team in using modular construction. It is also not uncommon for a project utilizing modular construction to have a slightly higher upfront cost—particularly if it is your team's first modular project. It is best initially to assume cost neutrality.

Site Considerations

Is your project site irregular or located in a congested area? Are there barriers that would prevent or limit the ability of a company to deliver a module that is approximately 14-16 feet wide and 14 feet high? Modular projects often reduce the amount of space required for "laydown" or onsite operations, but they do require trucks and cranes to be set up to stack the building. Is there a nearby area that can be used as a staging area as the modules are delivered? What size crane will be needed for the installation? While all of these factors can be mitigated, it is far better to know about them in advance.

Design Phase

If modular construction is even a remote possibility, find an architect in your area who understands the process. MBI has more than 60 architect firms in its membership, all well versed in modular construction. Also, the modular factory would likely recommend an architect they have worked with successfully in the past who understands modular and can help you avoid some pitfalls along the way.

Procurement—Issuing the Request for Proposal/Request for Quotation (RFP/RFQ)

The sooner you can involve the modular manufacturer in the project discussion, the greater overall success you are likely to achieve. As such, procurement methods such as design-bid-build are generally not as favorable to the industry, as the modular provider is late to the conversation. Design-build and integrated project delivery are more industry-friendly processes for public projects.

However, a modular project is more often a negotiated, collaborative process with a factory that fits the project, rather than the lowest bidder on the list. It's extremely valuable to have a factory join the stakeholder meetings during the conceptual phase of a project to provide valuable input to the design.

How many experienced and interested parties responded to your RFP/RFQ? Are they approved to do business in the region where the project will take place? How far away is the factory from the site? Is transportation of the modules included in the quoted price?

Roles and Scopes of Services

Communication, communication, communication! Most general contractors are not familiar with the modular construction process. As a result, it can be common for gaps or overlaps in scopes of service—neither of which contributes to a successful project. Occasionally, the modular manufacturer will also serve as the general contractor on a project. These "direct" or "integrated" manufacturers provide turnkey construction services. But more commonly, the modular manufacturer will serve the role of a subcontractor to the general contractor.

Financing a Modular Project

One of the key advantages of a modular project is a shorter overall construction schedule, which allows for quicker building occupancy and quicker return on investment. In some cases, when a site-built project won't "pencil out" given a long construction schedule, shifting to a modular project and advancing revenue streams ahead several months can allow the project to proceed.

Perhaps one trade-off to quicker occupancy is the need for more funding on the front end of a modular project. Typically, a modular manufacturer will require a larger initial draw to begin work. Initial draws of 30-40 percent of the modular portion of the project are not uncommon, since the manufacturer will need to procure ALL the materials required for the project. However, early, bulk procurement of materials provides both economies of scale and surety against material shortages during the process.

Design Freeze

Once a project's design has been agreed upon, it is important for all parties to agree to a "design freeze" date. Since the modular manufacturer acquires all the materials for the project in advance, it is much more costly to make changes to the layout once production starts in the factory.

Quality Control, Inspections, and Progress Updates

Once factory production begins, it is prudent to schedule times for regular factory visits to check on the progress of your building. Draws can be scheduled in part based on progress made in the factory. If traveling to the factory is not possible, ask the factory rep to conduct a virtual tour/inspection with you. Often an owner will hire a third-party inspection company to represent them for quality and payment inspections. It's important to inspect the units for quality prior to leaving the factory. Additionally, once the modules arrive onsite, it is essential to inspect them for possible damage that may have occurred either in the factory or during transport.

Work with the modular manufacturer to coordinate and understand site install requirements, including foundations, utility hookups, mechanical, low voltage, and other site conditions.

Lastly, communicate, communicate, communicate!

DESIGN FOR MODULAR MANUFACTURING

In 2019, MBI worked with the American Institute of Architects to help develop "Design for Modular Construction: An Introduction for Architects," which serves as a primer on the modular approach for architects. The document can be downloaded from the MBI Resources page at www.modular.org/research-whitepapers-studies/.

In general, the architect's role in a construction project is critical to its overall success. The decision to utilize modular construction should be made prior to design and should factor in the following considerations:

- Three-dimensional modules have widths that are typically nominal 8, 10, 12, 14, and 16 feet, with 12 and 14 feet being the most common. Framing dimensions are typically 2 inches less than nominal size.
- Module lengths are up to 70 feet, usually in 2-foot increments.
- Module heights vary from approximately 11 feet, 6 inches to 13 feet, not including the height of the unit's transport trailer or frame.
- Wood-frame construction is the most common type of construction; however, manufacturers also build with steel and concrete and can meet the requirements for Type I, II, and III construction.
- Multistorey modular buildings can be built up to the maximum storeys allowed by code. While most modular buildings contain one to four storeys, more projects have exceeded 10 storeys in recent years, including a 32-storey project in New York.
- Restroom areas should be designed so that a module "marriage line" does not split the space.
- Multiple roof-framing styles are available. Some can be completed in the factory, while others may require the installation of trusses onsite.
- Modular buildings can be configured using modules of various lengths and widths.
- Design elements (e.g., paint colour) need to be decided earlier in the process, since the offsite construction process begins earlier and is completed more quickly.

Download *Design for Modular Construction: An Introduction for Architects* here.

CANADIAN MARKET SHARE AND PROJECT DATA

MBI received revenue data from 12 of the 26 Canadian modular manufacturer members, with an average revenue of CAD 26,514,794.

MBI estimates that there are 40 total modular manufacturers serving Canada. Based on this estimate, the total Canadian modular market is approximately CAD 2.5 billion, or about 6.55 percent of the markets MBI members regularly serve.

MBI also analyzed 13 Canadian projects completed in 2023. On average these projects contained 3,348 square meters, consisted of 47 modules, and took an average of 331 days to complete. Most of these projects (8) were for the multifamily market, with one project each in the retail, office, correctional, education, and workforce housing markets.

While new housing starts across Canada remained relatively stable at around 140,000 units, there was a noticeable shift from single-family detached homes to apartment complexes from year-end 2022 to year-end 2023. Regionally, this difference in this shift from single-family homes to apartments was greatest in Vancouver at 43 percent, Calgary at 16.6 percent, and Toronto at 15 percent. Montreal and Edmonton saw a decline in overall apartment construction. Various levels of government have implemented or announced new programs to stimulate the supply of new rental housing, and there was a high takeup of these programs by developers *(Source: Canada Mortgage and Housing Corporation Housing Supply Report, Spring 2024).*

The top three markets for Canada in 2024-25, as forecast by Construct Connect, are multifamily, healthcare, and educational facilities, combining for approximately CAD 33-35 billion annually.

Key Takeaways

The total Canadian modular market is approximately CAD 2.5 billion.

The top three markets for Canada in 2024-25 are multifamily, healthcare, and educational facilities, combining for approximately CAD 33-35 billion annually.

The average revenue for Canadian modular manufacturers in 2023 was CAD 26,514,794.

CANADA MORTGAGE AND HOUSING CORPORATION
BANKS ON MODULAR CONSTRUCTION

MBI's connection with the Canada Mortgage and Housing Corporation (CMHC) began in December 2018, when MBI's government affairs director reached out to CMHC leadership about stringent underwriting guidelines that mostly eliminated the opportunity for modular projects to be financed. In February 2019, then-CMHC CEO Evan Siddal confirmed that CMHC would revise its underwriting criteria to essentially mirror that of site-built construction, opening up more opportunities for modular projects to be financed.

In October 2020, CMHC contacted MBI for assistance in the implementation of its Rapid Housing Initiative. In 2021, after several months of working to help CMHC understand the modular industry and its financing challenges, CMHC launched the Rapid Housing Initiative with a CAD 1.2 billion budget.

The first round of funding created 10,000 new housing units in 24 months, and since then the program has accumulated CAD 7.2 billion in funding. The first two years of the program were exclusive to modular-only projects, due to the speed to market the modular industry could provide. In year three, CMHC began allowing other types of construction, in addition to modular, to allow for the refurbishment and conversion of existing structures like office buildings into affordable housing units.

Earlier in 2024, the Canadian Housing Secretary launched the Housing Catalog Initiative with CAD 11.6 million in funding, based on a post-World War II program intended to create a "catalog" of available home designs that cities, municipalities, and indigenous communities can choose from to quickly create new housing. This initiative was pushed on CMHC by the secretary but has fallen behind on implementation.

In June 2024, CMHC announced a new Co-op Housing Development Program to give nonprofit entities across Canada access to CAD 1.5 billion in new funds. Additionally, CMHC recently announced a CAD 6 billion Housing Infrastructure Fund, with CAD 5 billion going toward new affordable housing development.

All told, since 2018 MBI has helped create underwriting guidelines to allow modular financing that previously didn't exist and has coordinated more than CAD 13.8 billion in new funding for affordable housing in Canada.

"Since 2018, we've created underwriting guidelines to allow modular financing which previously didn't exist and coordinated over $13.8 billion in new funding for affordable housing in Canada."

— Jon Hannah-Spacagna, MBI Government Affairs Director

IN THE NEWS

Bird Construction Wins Contract to Build Modular Tower in Canada

Bird Construction has secured a construction management contract to build a 13-storey modular tower in British Columbia. The Stack Modular business of Bird Construction will deliver the project, which will be Bird's second multistorey modular construction project.

This modular project, located on West 8th Avenue in Vancouver, is part of a permanent supportive housing initiative formed between BC Housing, the city of Vancouver, and the Canada Mortgage and Housing Corporation.

The initiative aims to build approximately 300 housing units on five city-owned sites to address the community's rising need for supportive housing. The volumetric modular construction design solution enables replication and standardization across all residential floors, cost-effectiveness, logistical ease, and faster completion for the program.

(Source: World Construction Network)

ATCO Structures Signs Deal to Buy Modular Building Market NRB Ltd. for $40 Million

CALGARY—The structures division of ATCO Ltd. has signed a deal to buy NRB Ltd., a maker of modular buildings, for $40 million in cash. ATCO says the acquisition of NRB is part of its plan to expand its manufacturing, operations, and sales footprint.

Adam Beattie, president of ATCO Structures, says the company is excited about the opportunity to expand NRB's modular business capabilities, particularly in the manufacturing of multifamily and affordable housing. NRB has nearly 400 employees, as well as four manufacturing facilities across Canada.

(Source: Canada Press)

University of Windsor to Tackle Housing Crisis with $1 Million Zekelman Research Donation

With a local industrialist's million-dollar donation, the University of Windsor is setting up a new center focused on innovative construction solutions to the housing crisis.

The commitment from Zekelman Industries, through its Z Modular construction division, will create an industrial research chair position and establish the Zekelman Centre of Modular Innovation and Sustainable Construction.

The center, which will focus on research using innovative materials, designs, and support systems in modular housing construction, will be chaired by Sreekanta Das, associate dean of research and graduate studies at the university's faculty of engineering.

(Source: Windsor Star)

Modular Construction Can Help Address Canada's Housing Crisis, New Report Finds

Canada is experiencing a housing crisis. Currently, the country needs 4.3 million more homes for students, people with low incomes, and those who are unsheltered, and will require 199,000 new beds in long-term care facilities by 2035. However, an estimated 700,000 workers in the skilled trades are expected to retire by 2028, and construction costs have risen by 51 percent in recent years. With that in mind, policymakers are under pressure to build new infrastructure—and quickly—to catch up to rising demand as the population grows and the skilled labour force shrinks. Innovative construction methods need to be explored to address these mounting issues.

CSA Public Policy Centre's new report, "Seizing the Modular Opportunity," highlights how consideration needs to be given to modular construction—the practice of fabricating building components, or modules, in a factory-controlled environment. These modules can range from individual rooms to entire building sections, which are then transported to construction sites and assembled.

"Demand for modular construction is growing significantly, and we need our policies and regulations to keep pace in order to unleash its full potential," says Tom Hardiman, executive director of the Modular Building Institute. "We need enabling building codes, efficient approvals, and governments that know how to procure and finance modular projects to reap maximum benefits."

(Source: ReNew Canada)

SPOTLIGHTING THE NEXT GENERATION OF CANADA'S OFFSITE CONSTRUCTION INDUSTRY

For the third year in a row, the University of New Brunswick's Off-site Construction Research Centre, a research group dedicated to optimizing alternate solutions to onsite construction, presented its Off-site Construction Student Design Competition. Presented again by the Modular Building Institute, the competition showcased student design innovation in modular, prefabricated, panelized, and other types of offsite construction, featuring entries from dozens of interdisciplinary collegiate teams across Canada.

The objective of the competition was simple: to introduce students to offsite construction and to encourage interdisciplinary collaboration. It was also an opportunity to showcase how offsite construction's many benefits, including reduced construction timelines, improved safety, and improved construction quality, can benefit the construction industry.

For this most recent competition, teams were tasked with developing a modular design for a housing unit that will be "open-source," to be used by manufacturers to meet the demand for affordable housing in New Brunswick. The design needed to focus on a repeatable volumetric module that could be used to combat the "missing middle housing" problem.

First Place: Transition

Team members: Kateryna Stokoz, Luke De Bartolo, Stefan Giro (Toronto Metropolitan University)

The first-place prize in 2023 went to Transition, a project designed by a

Second Place: Simplex

Team members: Til Schmitt-Ulms, Aryan Star, Gashtiyar Fathullah (University of New Brunswick)

With perhaps the most professional experience of the participating teams, this three-student group brought diverse backgrounds to the table. Gashtiyar Fathullah and Aryan Star, both recent graduates of the University of New Brunswick and now involved with Kent Homes, have direct experience in modular construction and automation. Til Schmitt-Ulms, a civil engineering student at the University of British Colombia, contributed a fresh academic perspective and hands-on experience from Stack Modular.

"The focus for this project," said Schmitt-Ulms, "was on reducing transportation costs and enabling modular manufacturers to access a larger market by developing standardized modules (wet modules with MEPs and normal modules) with shipping container sizes, so that they can be transported by trucks, trains, and ships."

three-student team from Toronto Metropolitan University. Their idea aims to revolutionize the concept of transitional housing for youth leaving the child welfare system, going beyond traditional social housing models and offering young individuals nurturing spaces in which to grow and thrive.

"Our approach started with a thorough understanding of New Brunswick's specific needs for affordable housing, aiming for a tailored solution that also aligned with the principles of open-source development," said team member Kateryna Stokoz. "When we learned about young adults' struggles leaving the child welfare system, it became clear that our focus should be on designing affordable housing specifically for this demographic."

CASE STUDIES

Company: ROC Modular, Inc.
Affiliates: MPE Engineering Ltd., Synergy Projects Ltd., FWBA Architects
Location: Red Deer, AB, Canada
Gross Size of Project: 45,477 Square Feet
Days to Complete: 266

Architectural Excellence

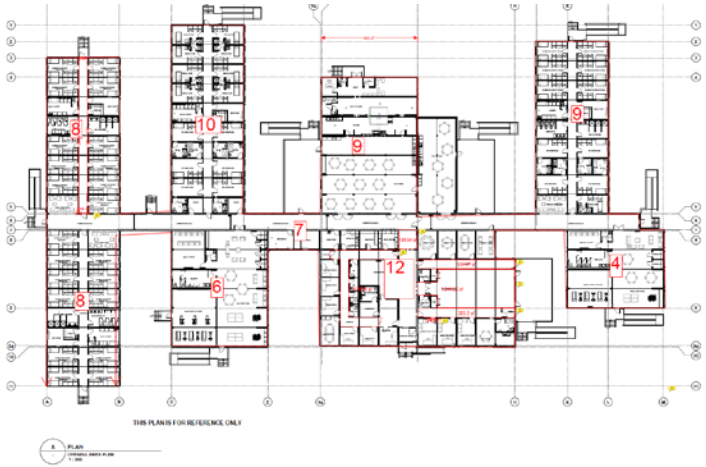
The Red Deer Recovery Community is a highly complex modular construction project for a mental health and addiction recovery facility that will provide long-term holistic residential treatment for Albertans with addiction and mental health challenges. Part of the Canada Mortgage and Housing Corporation's Rapid Housing Program, the 75-bed treatment center project was completed for Alberta Infrastructure. MPE Engineering spearheaded the design for this innovative project, with Synergy Projects Inc. as the general contractor and ROC Modular as the modular supplier. The facility is a government-funded, independently run addiction treatment center with an expert staff of clinicians, medical professionals, counselors, and an indigenous liaison. Composed of 73 modules, the 45,477-square-foot facility contains 75 treatment beds and offers long-term residential treatment that focuses on supporting people who are pursuing recovery. The exterior design has a unique, modern aesthetic.

Technical Innovation and Sustainability

Modular construction facilitated an expedited schedule. The climate location required the building to be designed for extreme cold weather and to include features to improve energy efficiency and reduce its carbon footprint. The project includes several thermal performance upgrades, such as triple-glazed windows and exterior insulation to increase R-values, as well as high-performance HVAC systems for heating, and achieved exceptional ratings for energy efficiency and environmental design. Utilizing a modular construction process allowed for a faster schedule while minimizing waste and maximizing efficiency. The project was also designed with durability and low maintenance in mind. The outside of the building features an attractive amenity/gathering area, promoting community and social togetherness. The exterior uses a unique design, with mixed styles of cladding and elevated roof lines.

Cost-Effectiveness

The innovative modular project was led by the team at MPE Engineering, with the intention of being able to replicate the design on future projects, utilizing standardized modules for rapid production at scale to help expedite design, procurement, and construction. The design maximized the use of offsite modular factory production, with 100 percent of the building completed in the ROC Modular factory, providing time and labour cost savings. Durable finishes and fixtures were used to reduce operating and maintenance costs, as well as overall life-cycle operating costs. As soon as the site was prepared by the general contractor, the modular units were brought in and the crane was set. The result is a modern modular solution to help meet Alberta's drug-recovery and mental health needs, providing treatment and support for years to come.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CASE STUDIES *cont'd*

Company: NRB Modular Solutions
Location: Kamloops, BC, Canada
Gross Size of Project:
43,184 Square Feet

Architectural Excellence

The Thompson Rivers University student housing project, the newest addition to the university's East Village, was funded as part of the Homes for BC initiative, which aims to add 8,000 on-campus beds to postsecondary institutes across the province. The project's 52 modules were manufactured in close proximity to the building site, at NRB's Kamloops facility. Across four storeys, the building consists of 80 rooms and accommodates 148 student beds. Each floor is 10,796 square feet, resulting in a completed structure with more than 40,000 square feet.

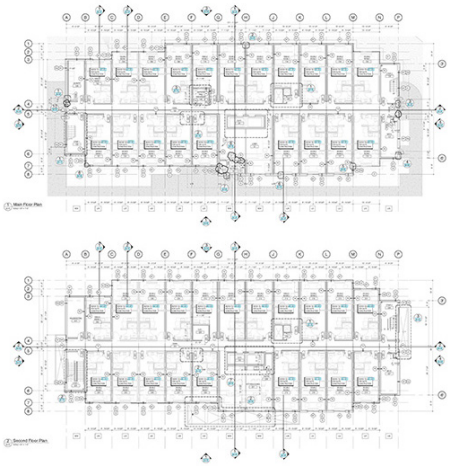
Technical Innovation and Sustainability

A key sustainability consideration for this project was the method of energy sourcing. No gas lines were utilized for the building, and all power is electrical. All mechanical components, from the heat-pump units in the residence to the PTAC units in individual rooms, are electric.

Cost-Effectiveness

This building incorporated renovated modules originally built for use in hotels, along with brand-new units manufactured specifically for the student dormitories. Reusing modules reduced manufacturing costs and eliminated disposal costs for the unused units. Cost savings were passed on to the client by pricing the renovated modules at a discounted rate.

Where can I learn more about modular construction?
The Modular Building Institute website at **www.modular.org** is loaded with case studies, research, articles, and links to companies in your area.



DEFINITIONS

MBI adopted the definitions contained in the ICC/ANSI standard 1200 and 1205 for consistency. Sources for other terms not used in the standard include state administrative programs and the National Institute for Building Sciences.

Accessory dwelling unit (ADU). A smaller, independent residential dwelling unit located on the same lot as a stand-alone (i.e., detached) single-family home. (Source: American Planning Association).

Authority Having Jurisdiction (AHJ). Organization, political subdivision, office, or individual charged with the responsibility of administering and enforcing the provisions of the applicable building code. The authority having jurisdiction shall include a state agency or local building department.

Building Envelope. As the physical separator between the interior and exterior environments of a building, the building envelope serves as the outer shell to help maintain the indoor environment (together with the mechanical conditioning systems) and facilitate its climate control. Building envelope design is a specialized area of architectural and engineering practice that draws from all areas of building science and indoor climate control.

Building Site. A lot, the entire tract, subdivision, or parcel of land on which industrialized housing or buildings are sited.

Building System. The design and/or method of assembly of modules or modular components represented in the plans, specifications, and other documentation, which may include structural, electrical, mechanical, plumbing, fire protection, and other systems affecting health and safety.

Certification Label. A decal, insignia, or alteration decal.

Closed Construction. A building, component, assembly, subassembly, or system manufactured in such a manner that all portions cannot be readily inspected at the installation site without disassembly or destruction thereof.

Commercial Structure. An industrialized building classified by the building codes for occupancy and use groups other than residential for one or more families.

Compliance Assurance Program. Procedures that state the guiding principles and define the framework for ensuring that construction documents approved by a design review agency, or that modular buildings inspected by a third-party inspection agency, comply with the applicable building codes.

Compliance (or Quality) Control Program. The manufacturer's system, documentation, and methods of ensuring that industrialized housing, buildings, and modular components, including their manufacture, storage, handling, and transportation, conform with this chapter.

Component. A subassembly, subsystem, or combination of elements for use as a part of a building system or part of a modular component that is not structurally independent, but may be part of structural, plumbing, mechanical, electrical, fire protection, or other systems affecting life safety.

Data Plate. A plate attached by the manufacturer or installer to a modular building or modular component that contains identifying information, allowing code officials or end-users to determine if the structure is suitable for installation in their jurisdiction, location, or project.

Decal. The approved form of certification issued by the authority having jurisdiction, to be permanently attached to the modular building, modular component, or panelized system, indicating that it has been constructed to meet or exceed the applicable building code requirements.

Deconstruction. The process of taking apart a building or structure, or a portion thereof, with the intent of repurposing, reusing, recycling, or salvaging as many of the materials, products, components, assemblies, or modules as possible.

Design Package. The aggregate of all plans, designs, specifications, and documentation required by these sections to be submitted by the manufacturer to the design review agency or required by the design review agency for compliance review, including the compliance control manual and the onsite construction documentation. Unique or site-specific foundation drawings and special onsite construction details prepared for specific projects are not a part of the design package.

Erection/Installation/Set. The process of blocking, leveling, and anchoring a modular building unit on the building site upon delivery.

Industrialized Building. A commercial structure constructed in one or more modules, or constructed using one or more modular components, that is built at a location other than the commercial site and designed to be used as a commercial building when the module or modular component is transported to the commercial site and erected or installed.

Industrialized Housing. A residential structure designed for the occupancy of one or more families that is constructed in one or more modules or constructed using one or more modular components, and is built at a location other that the permanent site and designed to be used as a permanent residential structure when the module or modular component is transported to the permanent site and erected or installed on a permanent foundation system.

Insignia. The approved form of certification issued by the authority having jurisdiction to the manufacturer to be attached to the modular building, modular component, or panelized system, indicating that it has been constructed to meet or exceed the applicable building code requirements.

Manufacturer. The entity responsible for the manufacturing of assemblies, panelized systems, modular buildings, or modular components.

Manufacturing Plant. The location, other than the building site, at which modular buildings, modular components, modules, panels, or tiny houses are assembled or manufactured prior to transport to the final construction site.

Marriage Wall/Crossover Connections. The joint between the modules in a complex, commonly called a mate-line or mod-line.

Modular Component. A subassembly, subsystem, or combination of elements, including panelized systems, building shells or bathroom pods, for use as a part of a modular building that is not structurally independent, but is a part of structural, plumbing, mechanical, electrical, fire protection, or other systems affecting life safety.

Offsite Construction. The planning, design, fabrication, and assembly of building elements at a location other than their final installed location to support the rapid and efficient construction of a permanent structure. Such building elements may be prefabricated at a different location and transported to the site or prefabricated on the construction site and then transported to their final location. Offsite construction is characterized by an integrated planning and supply chain optimization strategy. (Source: National Institute of Building Science)

Open Construction. A modular building, modular component, panelized system, or tiny house manufactured in such a manner that all portions can be readily inspected at the building site without disassembly, damage, or destruction thereof.

Permanent Modular Construction (PMC). An innovative, sustainable construction delivery method utilizing offsite, lean manufacturing techniques to prefabricate single- or multistorey whole building solutions in deliverable module sections. PMC buildings are manufactured in a safe, controlled setting and can be constructed of wood, steel, or concrete. PMC modules can be integrated into site-built projects or stand alone

DEFINITIONS

as a turnkey solution, and can be delivered with mechanical, electrical, and plumbing (MEP); fixtures; and interior finishes in less time, and with less waste and higher quality control than projects utilizing only traditional site construction.

Prefabricated. The manufacture or fabrication of sections of a building at an offsite location that are delivered to and assembled at the building site.

Quality Control. Controls and inspections implemented by the manufacturer, as applicable, to ensure that the material provided and work performed meet the requirements of the approved construction documents and referenced standards-applicable building codes.

Registered Design Professional. An individual who is registered or licenced to practice their design profession, as defined by the statutory requirements of the professional registration laws of the state or jurisdiction in which the project is to be constructed.

Relocatable/Industrialized building. A partially or completely assembled building that complies with applicable codes and state regulations and is constructed in a building manufacturing facility using a modular construction process. Relocatable modular buildings are designed to be reused or repurposed multiple times and transported to different sites.

Site or Building Site. A lot, the entire tract, subdivision, or parcel of land on which industrialized housing or buildings are sited.

Third-Party Inspector. An approved person determined by applicable statutory requirements to be qualified by reason of experience, demonstrated reliability, and independence of judgment to inspect modular buildings, and portions thereof, for compliance with the construction documents, compliance control program, and applicable building codes. A third-party inspector works under the direction of a third-party inspection agency.

2024 CANADIAN MODULAR CONSTRUCTION INDUSTRY REPORT

MODULAR BUILDING INSTITUTE

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