Offsite Construction

the process to achieve quality, speed and sustainability.

Offsite Focus

James Broadhead

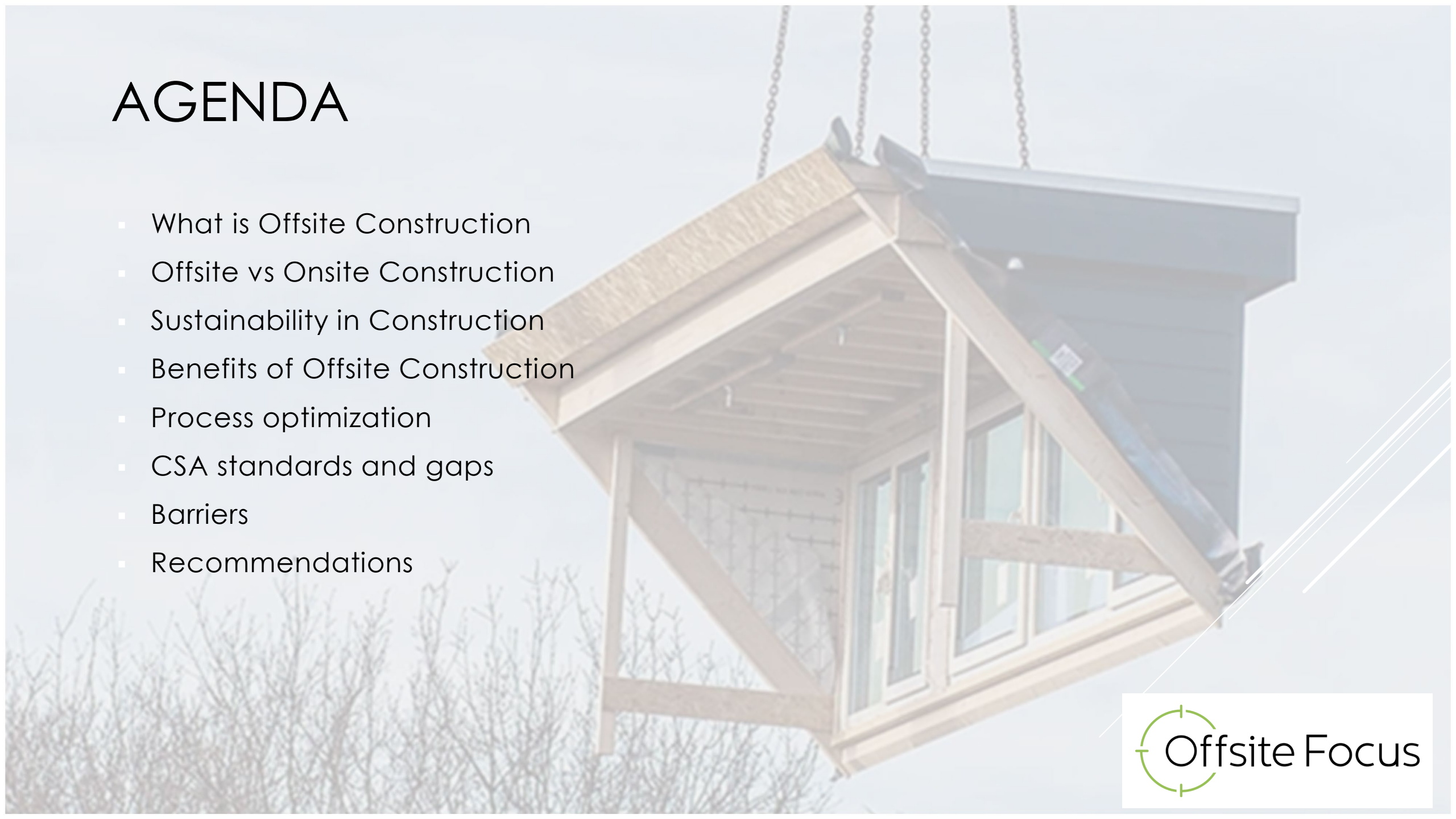
- Offsite Construction background:
  - Temporary modular
  - Permanent construction
    - *Education, housing, healthcare, commercial*
  - Offsite General Contractor
  - Owners' representation
  - Consulting

- MSc Offsite Housing Construction
  - Dissertation: Affordable Housing optimization
  - Journal publication
  - Academic paper

Offsite Focus

AGENDA

- What is Offsite Construction
- Offsite vs Onsite Construction
- Sustainability in Construction
- Benefits of Offsite Construction
- Process optimization
- CSA standards and gaps
- Barriers
- Recommendations



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Offsite construction

Refers to construction methods of building components such as walls, floors, roof trusses, and even entire room modules

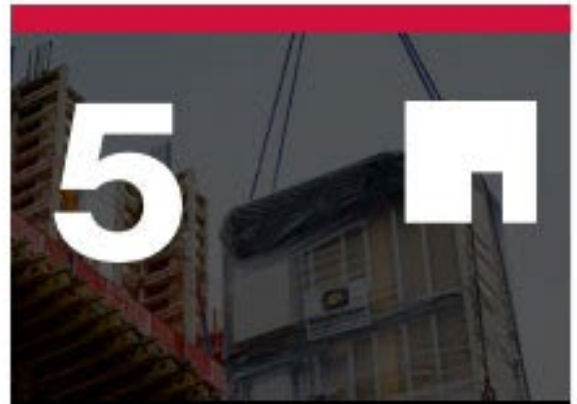
CATEGORY DEFINITION

Pre-manufacturing (3D primary structural systems)

Pre-manufacturing (2D primary structural systems)

Pre-manufacturing components (non-systemised primary structure)

Additive manufacturing (structural and non-structural)



Pre-manufacturing (non structural assemblies & sub-assemblies)

Traditional building product led site labour reduction / productivity improvements

Site process led site labour reduction / productivity / assurance improvements

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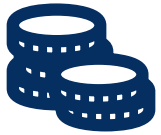
Construction is about $10 trillion industry



13% of global spending

1% growth annually

$1.6 trillion in efficiency potential

WHY IS PREFABRICATION IN THE CONVERSATION

BC Construction labour force:

- 4th largest industry in BC
- 78% of workers retiring in the next 10 years

Onsite vs Offsite Construction

Similarities

- Building Codes and Regulations
- Construction labour
- Construction Components
- Project Management

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Onsite vs Offsite Construction

Differences

- Location and Environment
- Construction Process
- Time Efficiency
- Quality Control
- Cost Considerations
- Flexibility and Customization

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Optimizing the Construction Process for Offsite Projects: Key Considerations

- **DfMA**

  Design for Manufacture and Assembly (DfMA) is a process that focuses on the design of products to be manufactured in an efficient and cost-effective manner.

- **Supply Chain**

  The supply chain is the network of suppliers, manufacturers, distributors, and retailers that are involved in the production and sale of a product.

- **Production Planning**

  Production planning is the process of organizing and scheduling the production of goods or services.

- **Quality Control Procedure**

  Quality control procedures are processes used to ensure that products meet certain standards of quality.

- **Logistics and Transportation**

  Logistics and transportation are the processes of planning, organizing, and managing the movement of goods from one place to another.

- **Sustainability**

  Sustainability is the practice of using resources in a way that meets current needs without compromising the ability of future generations to meet their own needs.

Advancing Sustainability through Offsite Construction

- **Resource efficiency**

  Offsite construction has enabled the use of fewer resources, such as materials and labor, to complete projects.

- **Controlled environment**

  The controlled environment of offsite construction has allowed for more precise construction processes.

- **Material selection**

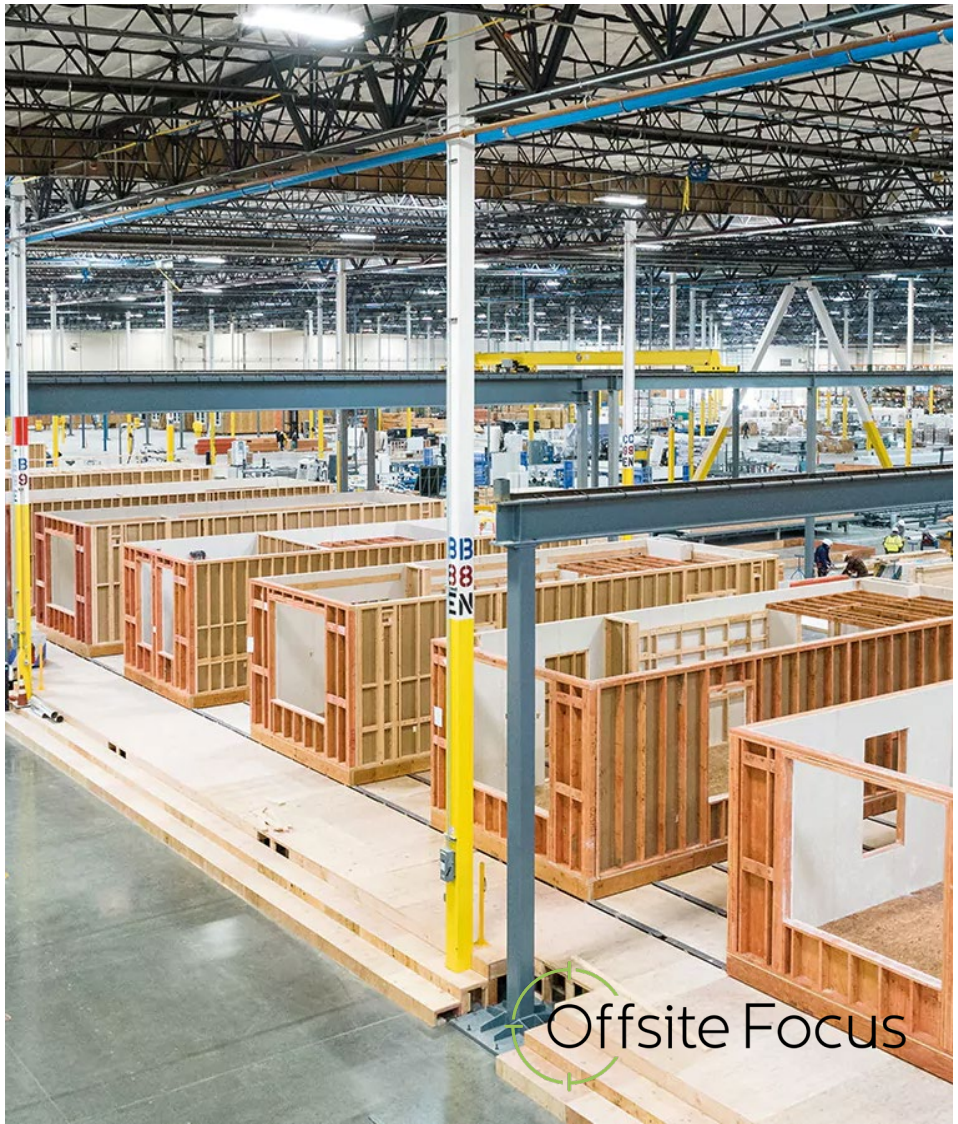
  The selection of materials used in offsite construction has been optimized for sustainability.

- **Waste management**

  Offsite construction has enabled the efficient management of waste materials.

- **Factory power**

  The use of factory power in offsite construction has reduced the amount of energy used on-site.



Optimizing Construction with Design for Manufacture and Assembly (DfMA)

- **Standardization**

  Standardization involves creating components that are interchangeable and can be used in multiple applications.

- **Simplification and Rationalization**

  Simplification and Rationalization involves reducing the number of components and simplifying the design to reduce complexity.

- **Design Optimization**

  Design Optimization involves optimizing the design to reduce costs and improve performance.

- **Design for Transport**

  Design for Transport involves designing components that are easy to transport and assemble.

- **Design Collaboration**

  Design Collaboration involves working with stakeholders to ensure the design meets their needs.

- **Quality Control**

  Quality Control involves ensuring that the components meet the required standards of quality.

- **Integration of Building Systems**

  such as electrical , plumbing and mechanical systems into the factory delivered components

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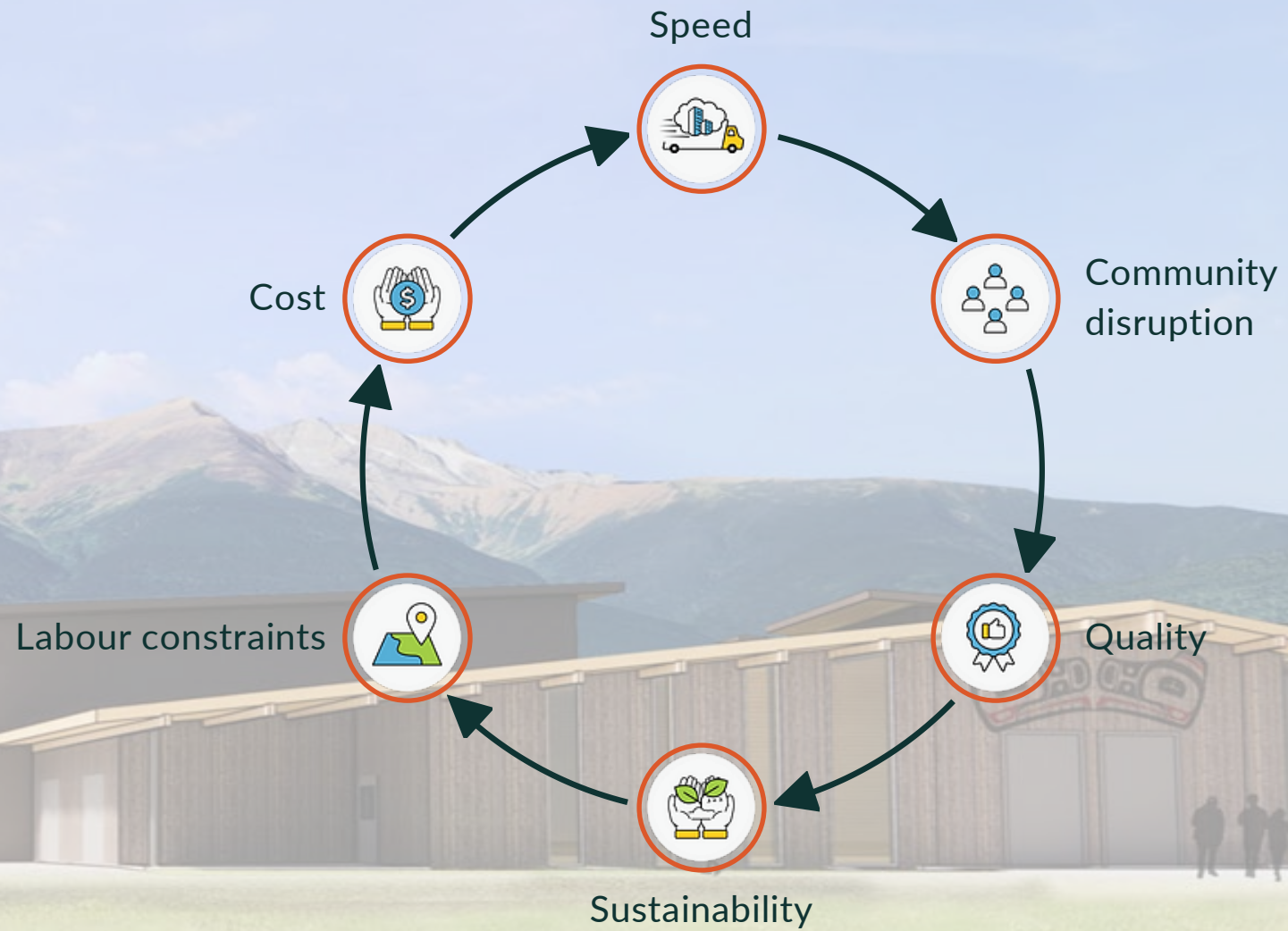
Offsite construction advantages



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Time Savings

Source: Modular Building Institute (MBI)

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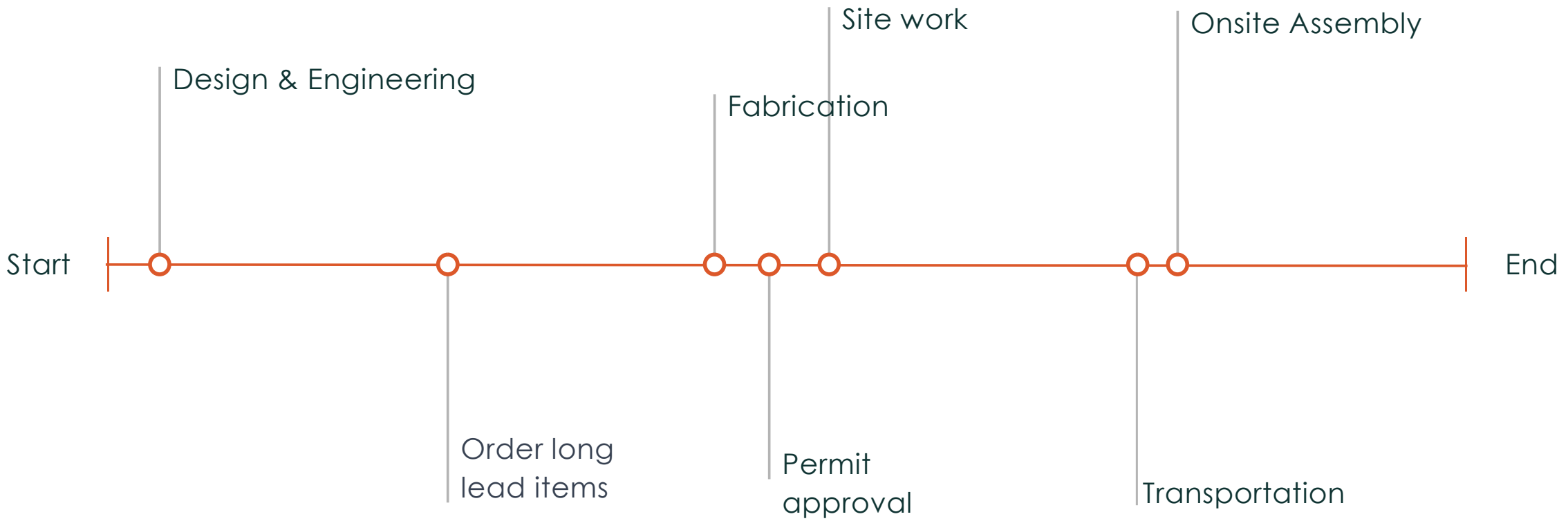
Permit timing



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Rapid Housing

CMHC RHI funded

- $440 sqft
- 3 bed units
- CCDC 14
- March 2022 (Completed)
- 12 months from award to occupancy
- Designed to Step Code 3

Challenges

- Weather delays for barging
- Fabrication space limited at time of ordering
- New design
- Limited trades in region
- Barge access
- Volatile supply chain

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Standardization

Case for

- Reduced design cost
- Faster design process
- Faster manufacturing
- Faster construction speed
- Efficiency in repeatability
- Forces design freeze
- Improves supplier buying power
- Enables prebuilding prior to approval
- Potential to reduce regulatory review time

Case against

- Reduced customisation
- Limited use of lot
- Additional Architect constraint
- Lack of architectural expression
- Requires more rigor in design

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CSA Standards

CSA A277

Procedure for certification of prefabricated buildings, modules and panels;

- Certification of factory quality program
- Certification of prefabricated products
- Auditing a factory's quality program
- In-factory inspections of prefabrication

CSA A250

Process for delivery of volumetric modular buildings;

- Design
- Quality control in manufacturing
- Approvals
- Logistics, transport, storage
- Non-modular and modular site work
- Craning, placement, setting
- Installation and finishing
- Handover

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CSA Standards

CSA Z240 MH - Manufactured Homes

CSA Z240 RV – Recreational Vehicles

CSA Z241 – Park models

CSA A252 – coming soon

A modular construction guide to best practices in obtaining permits, facilitating inspections, and issuing approval;

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CSA gaps

Inadequate documentation of the construction process

The lack of documentation of the construction process can lead to a lack of understanding of the quality of the modular construction

Site Specific inspections

Inspections focus on fabrication but do not address on-site inspections during assembly

Acoustic Performance

Acoustic performance, including sound insulation and noise control, may not be extensively covered

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Barriers to Widespread Adoption of Offsite Construction

- **Perception**
  Perception of offsite construction as a less reliable option
- **Industry Knowledge**
  Lack of knowledge and understanding of offsite construction techniques
- **Regulatory Challenges**
  Difficulty in meeting local building codes and regulations
- **Procurement Timing**
  Longer lead times for procurement of materials and components
- **Capital Investment**
  High initial capital investment required for offsite construction
- **Site Constraints**
  Limitations due to site conditions and access restrictions
- **Higher Degree of Co-ordination**
  Increased complexity in coordination between multiple stakeholders

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Unlocking the Potential of Offsite Construction with Municipal Process

- **Streamlining Approvals and Permits**
  Reducing the time and complexity of the approval process for offsite construction projects.
- **Updating Building Codes and Standards**
  Ensuring that offsite construction methods are included in building codes and standards.
- **Educating Municipal Staff**
  Providing training and resources to municipal staff to increase their understanding of offsite construction.
- **Establishing Offsite Construction Guidelines**
  Creating guidelines for offsite construction projects to ensure safety and quality.
- **Collaborating with Industry Stakeholders**
  Engaging with industry stakeholders to identify opportunities for improvement.
- **Showcasing Successful Projects**
  Highlighting successful offsite construction projects to encourage adoption.
- **Providing Financial Incentives**
  Offering financial incentives to encourage the use of offsite construction methods.
- **Collaborating with Other Municipalities**
  Sharing best practices and resources with other municipalities to promote offsite construction.

RECOMMENDATIONS

- Consider standardized deign preapprovals
- Review CSA 252 and CSA A277 to reduce site inspections
- Focus on the site, foundation, interconnects
- Develop offsite friendly design guidelines
- Consider variance to height and massing that enable offsite construction
- Encourage prefabrication projects
- Consider if your own projects are a fit for offsite construction

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Thank you for your time
• ANY QUESTIONS?
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Contact Us

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