

Development of Innovative MODular Building System with Enhanced Fire, Environmental, Structural and Thermal Performance (MOD-FEST)

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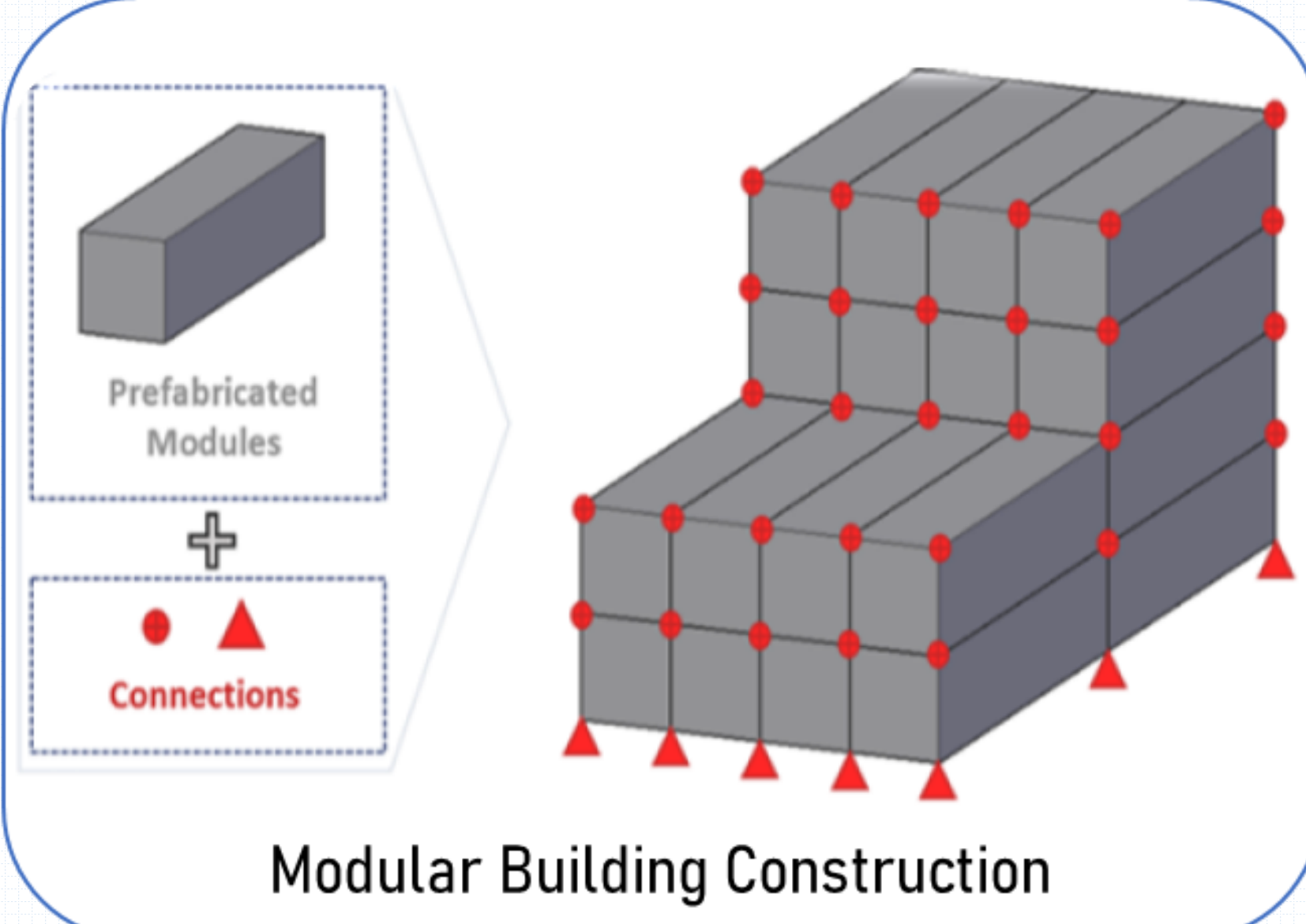
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Project Objectives

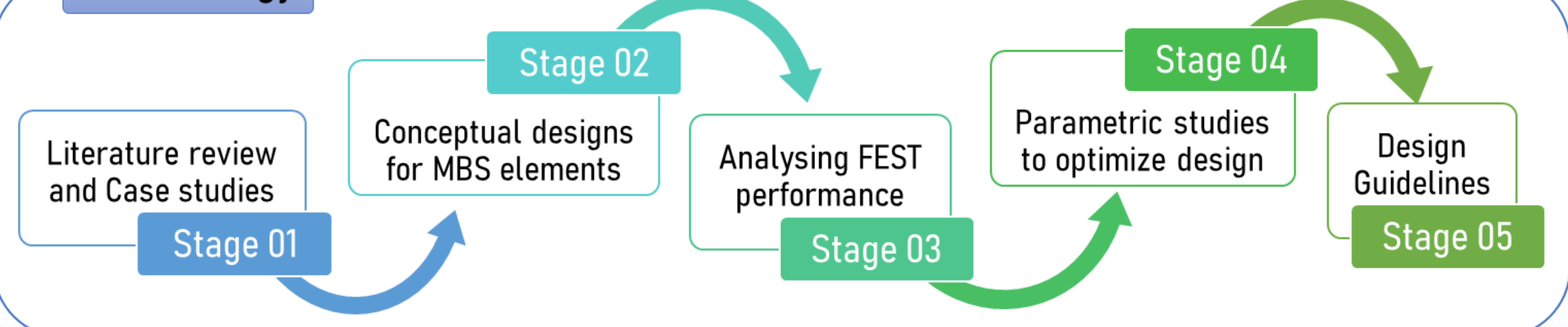
- Develop an engineering design knowledge base (with regard to FEST performance) for MBS components using experimental, theoretical and FE Analysis.
- Identify the optimum, cost-effective and sustainable design configurations of MBS elements based on parametric studies and LCA.
- Propose an innovative, sustainable MBS design with enhanced FEST performance. And to develop building design guidelines which will provide comprehensive structural and energy data.



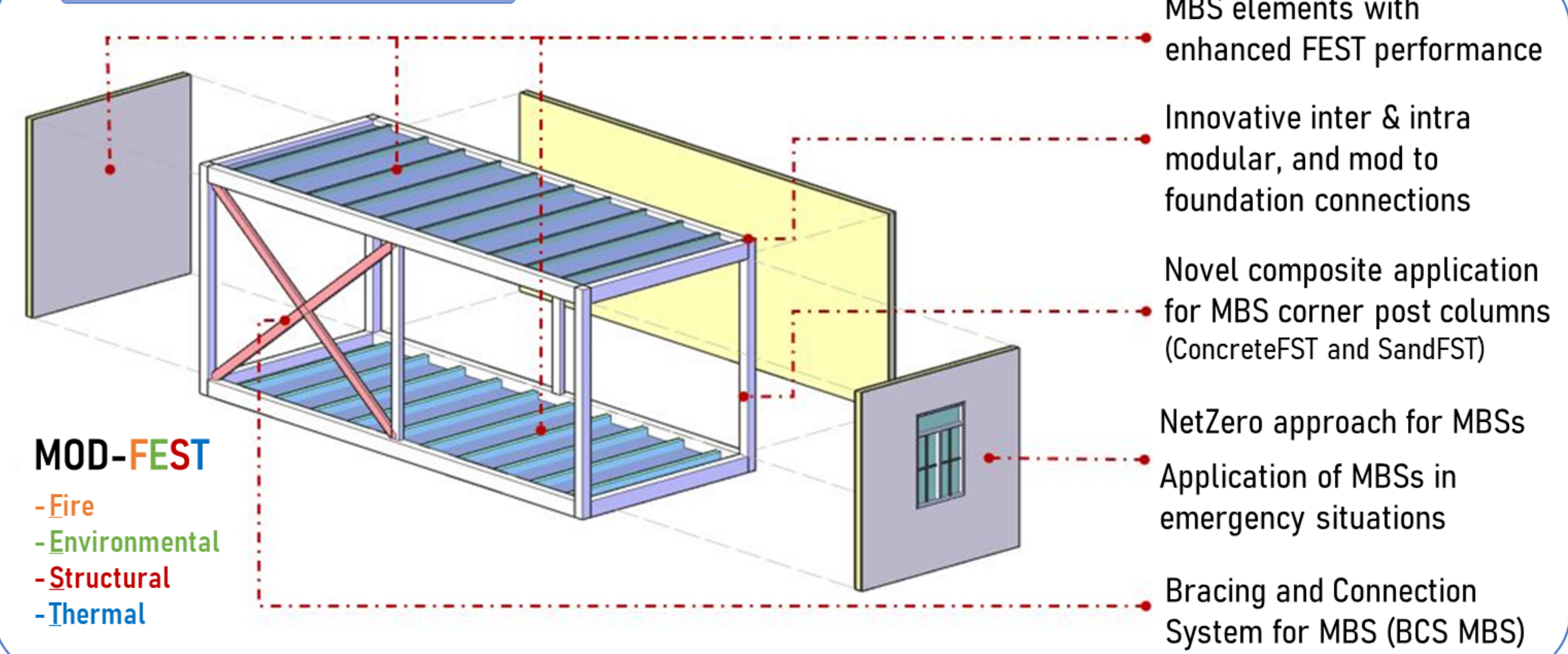
Existing Research Gap

- Lack of knowledge and research on,
- Sustainable use of materials (mostly Over-designed)
 - Connection design (mainly 3 types)
 - Energy performance of MBS units and structure.
 - Fire resistance of structural elements, separation and protection
- Limited knowledge/focus on aligning with NetZero plans.
Unavailability of specific Design Standards/ Guidelines.

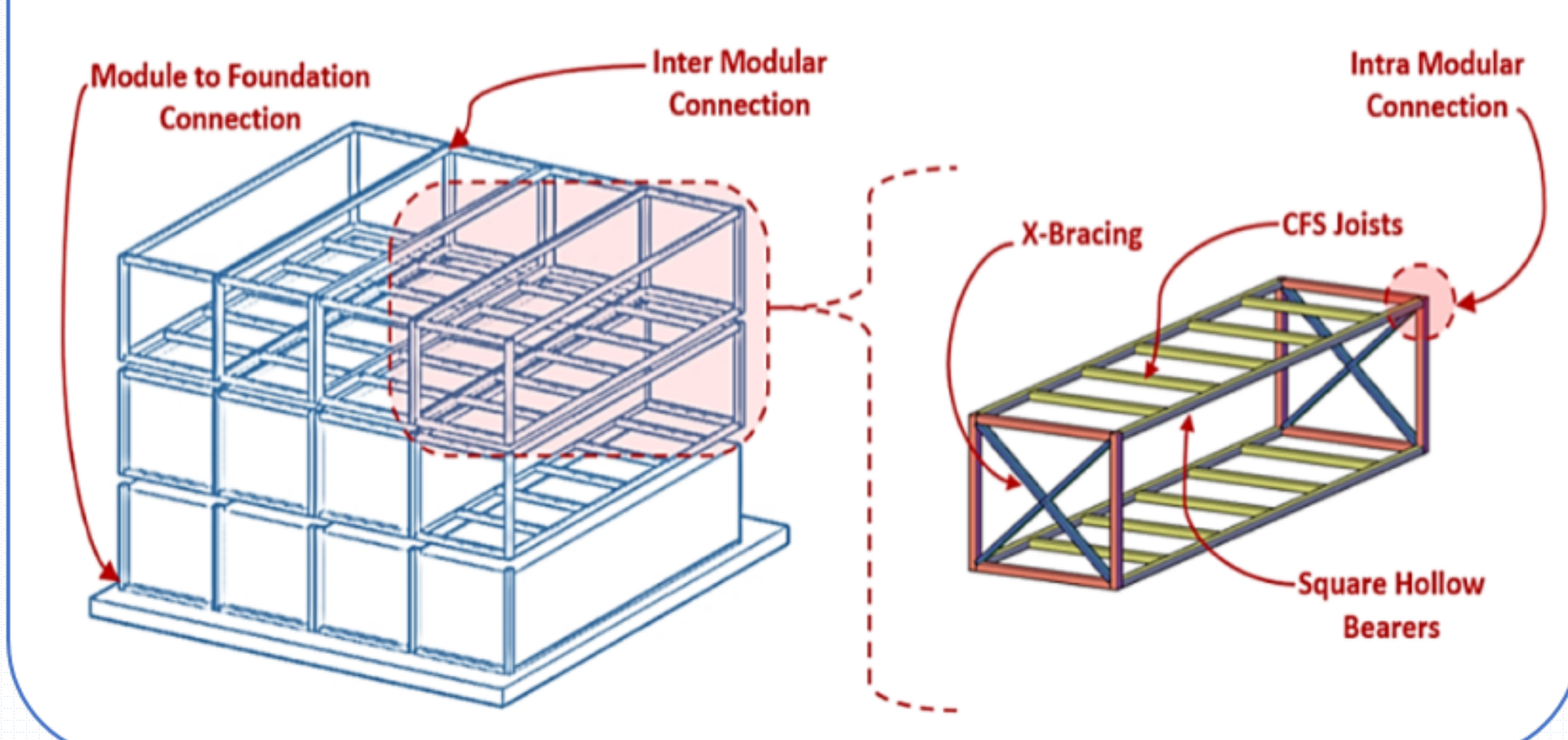
Methodology



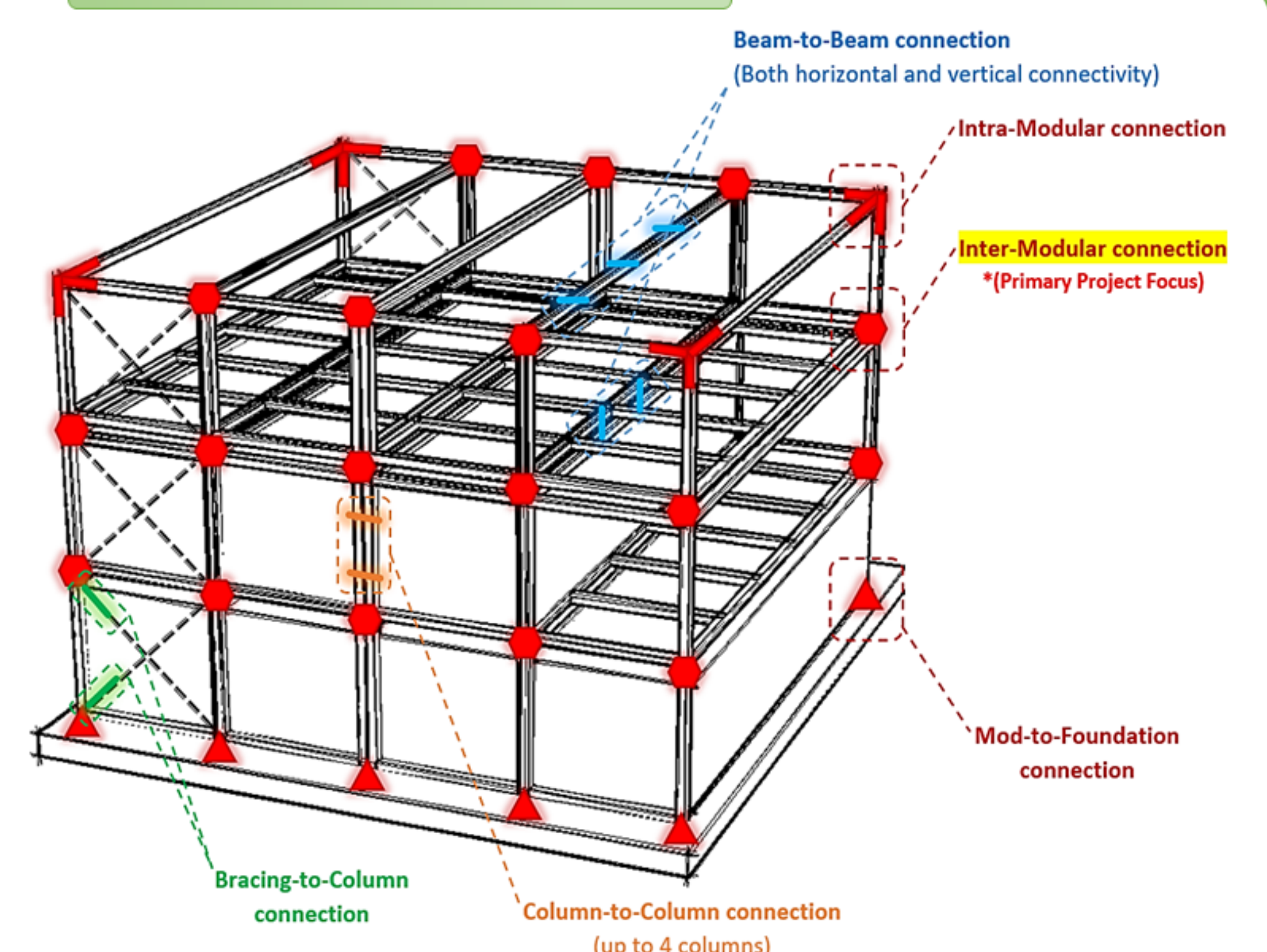
Research Highlights (RH)



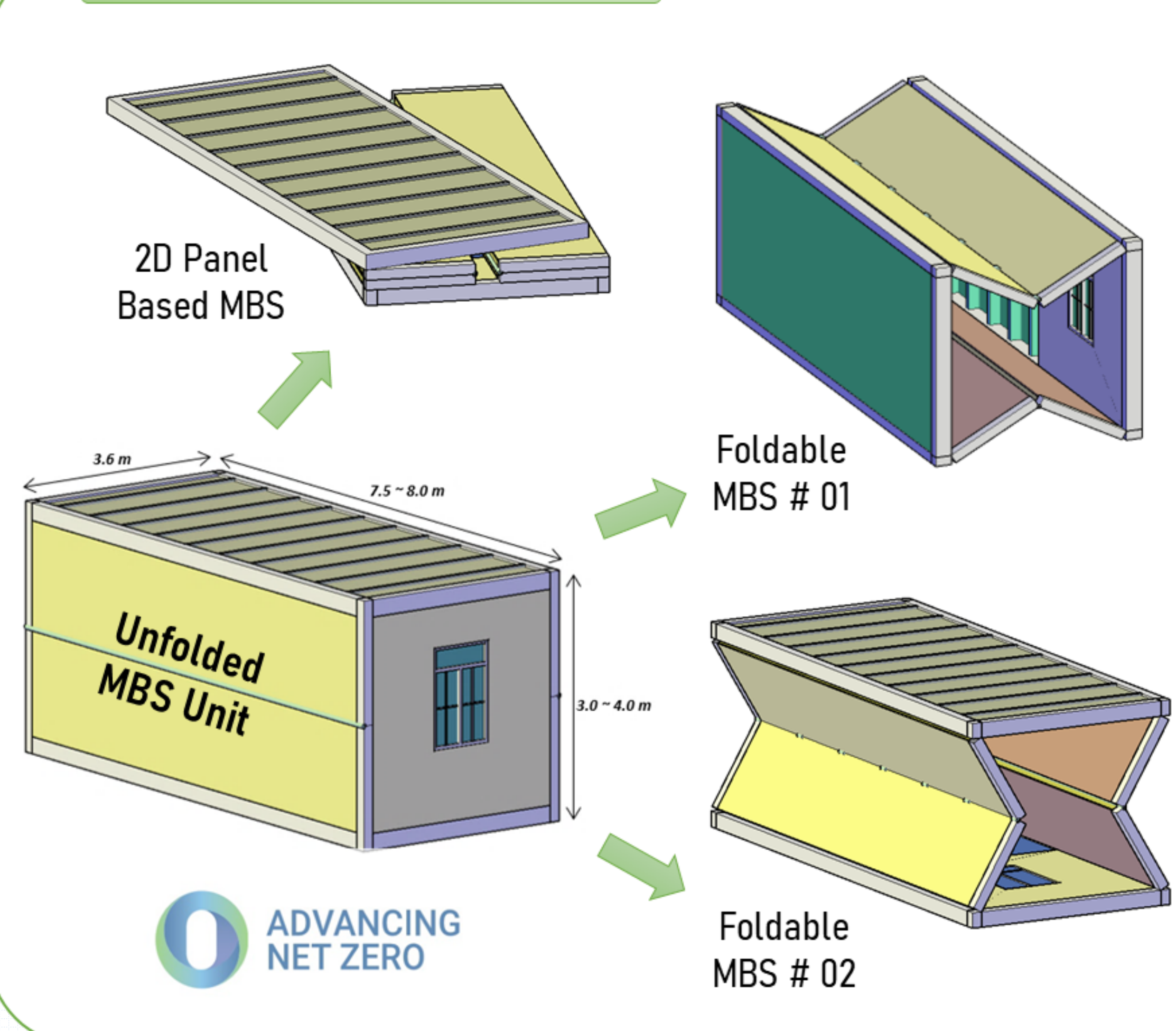
$$\sum \{ \text{Developed MBS Elements} \} = \text{MBS with Enhanced FEST performance}$$



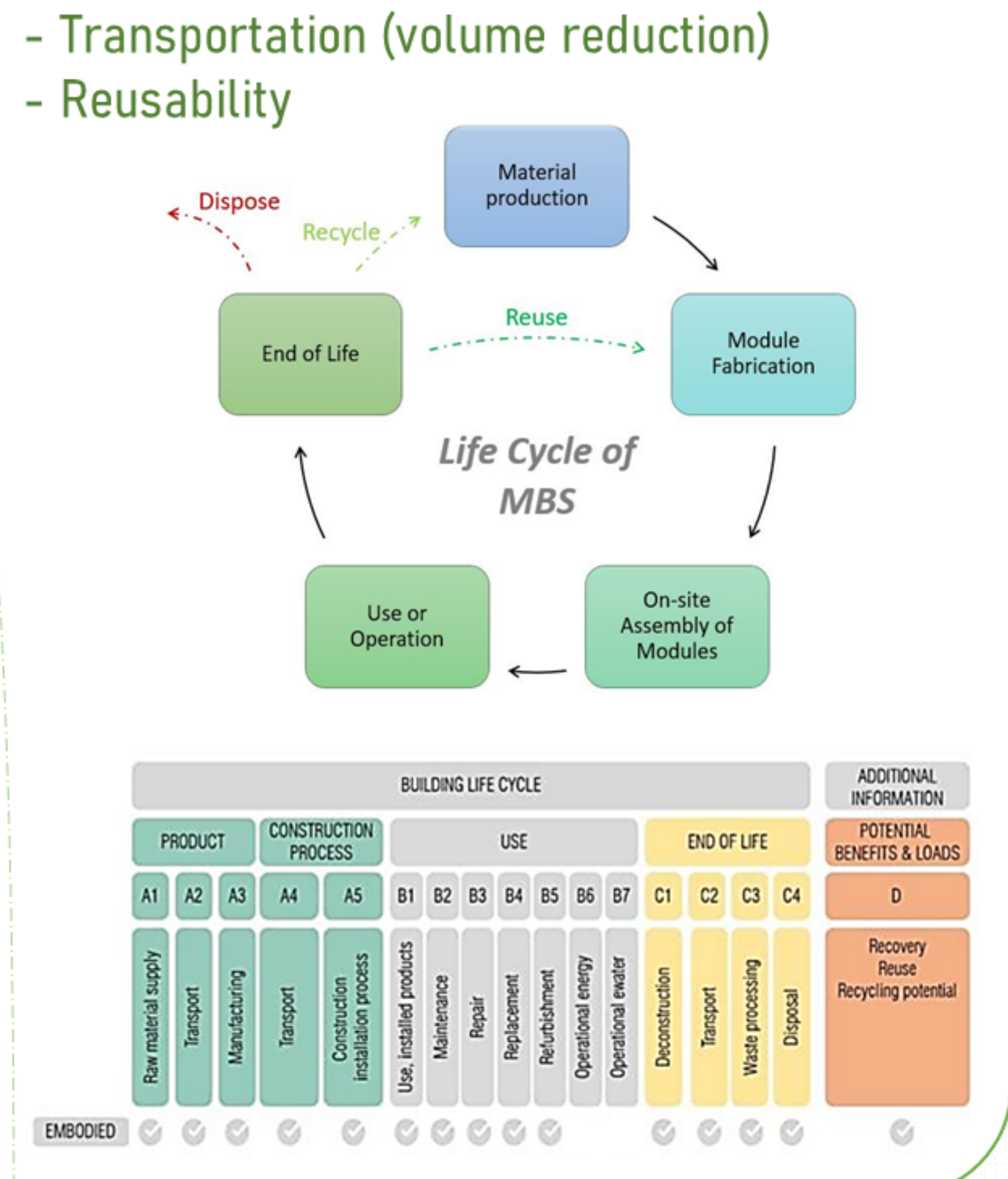
(RH) - MBS Connections



(RH) - MBS NZ Approach



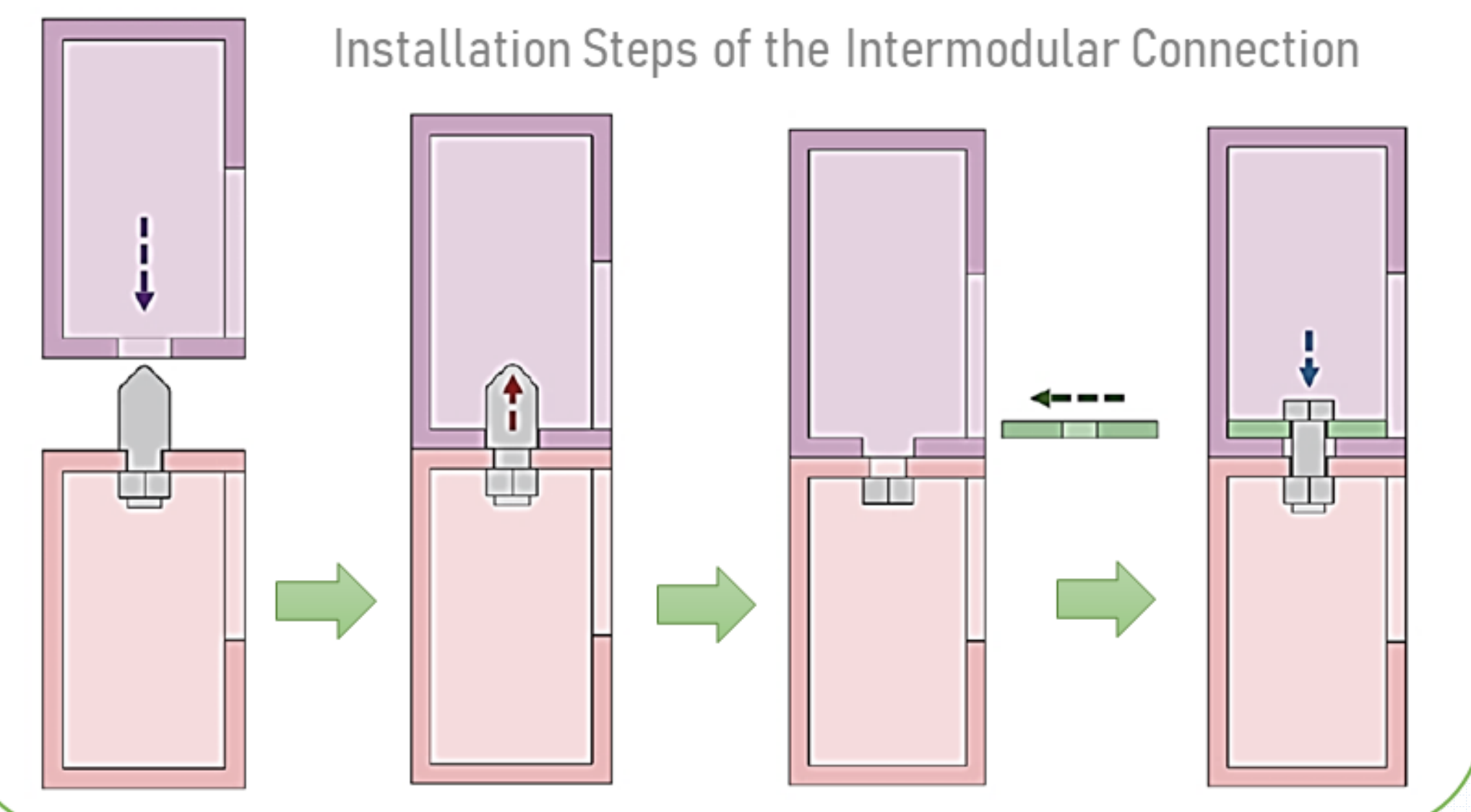
Flat-Pack MBS in EC Reduction



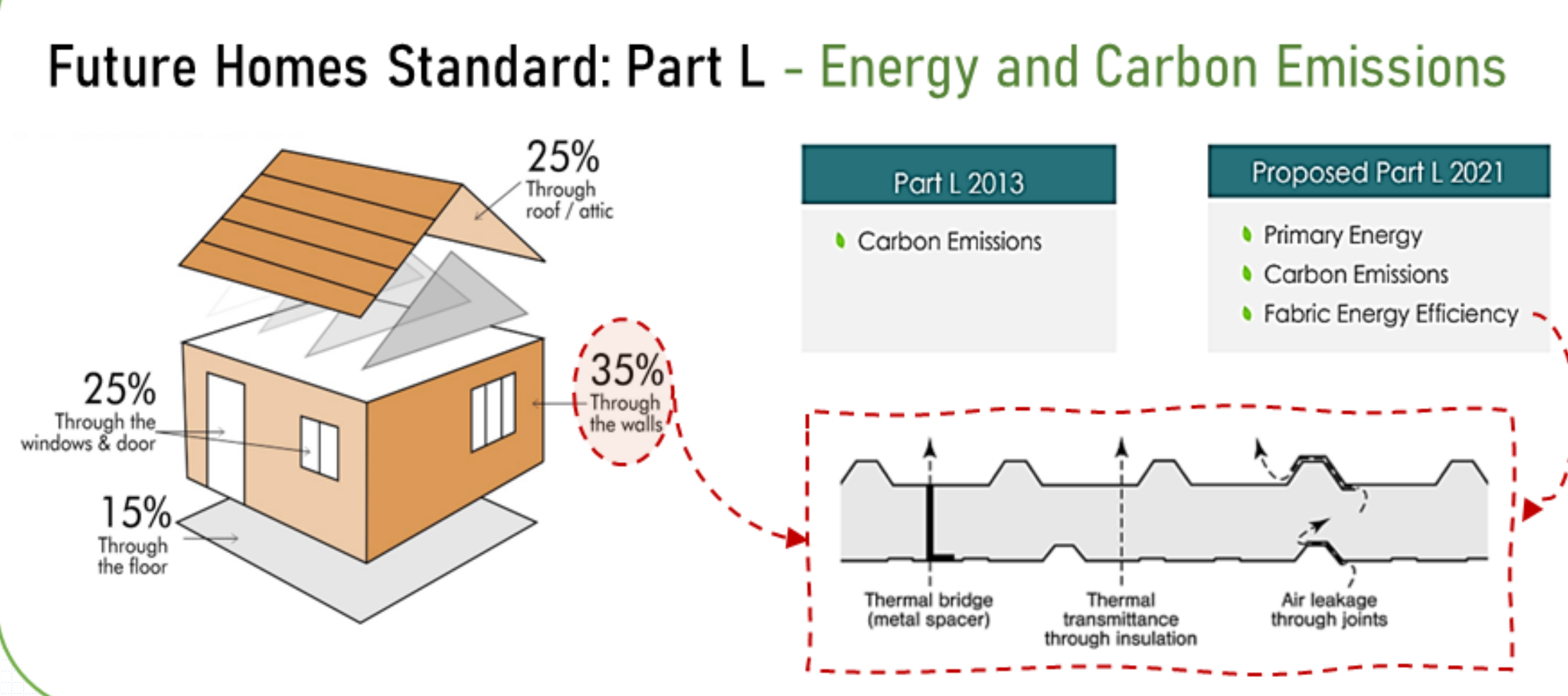
- ✓ Reduce number of onsite connections by prioritizing intermodular connections.

MBS Intermodular Connection

- ✓ Reusable connections and locator pins
- ✓ Reduced onsite Installation difficulties
- ✓ Reduced construction time and cost
- ✓ Enhanced installation and operation safety



(RH) - Thermal Performance



Expected Outcomes

- Promote the use of novel **high-quality, sustainable & affordable MBSs** with enhanced structural and fire performance and reduced lifecycle carbon emissions.
 - ✓ Reduce wastage
 - ✓ promote Recycling
 - ✓ encourage Reusing
- Advancing the knowledge for future **NZ MBS**.

Keywords

FEST : Fire, Environmental, Structural and Thermal
FE : Finite Element
LCA : Life Cycle Analysis
FST : Filled Steel Tubes
MBS : Modular Building Structure

NZ : Net Zero
EC : Embodied Carbon
LCA : Life Cycle Analysis
3Rs : Reduce, Reuse & Recycle

