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MODULARIS

Modular Cold Climate Housing

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CanmetENERGY

Leadership in ecoInnovation



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Cold Climate Housing – Paradigm Shift



- Natural Resources Canada is developing an ultra energy efficient Do-It-Yourself housing solution for remote and northern communities
- Multi-modal transportation options
- Targeting less than 150 person hours of community labour to assemble building envelope
- Cost target half that of R-50 equivalent building envelope built on-site using current best practice

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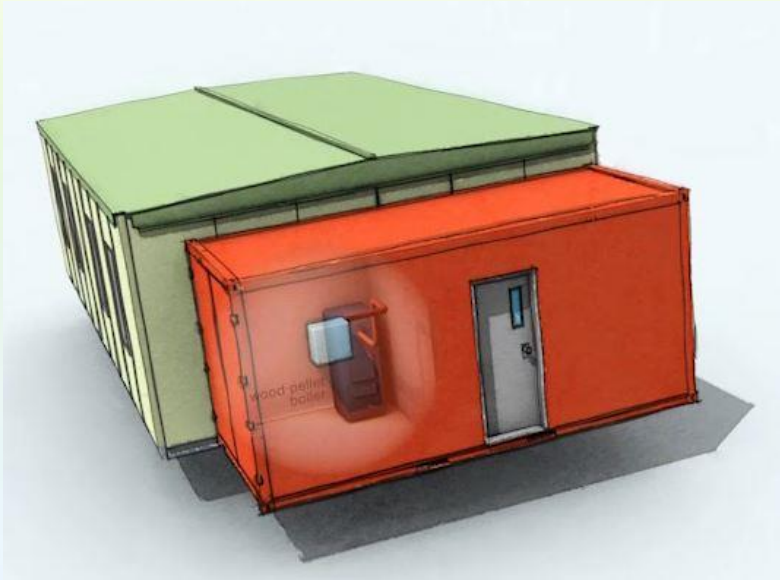
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MODULARIS – Concept

“MODULARIS” MODULAR Integrated System

- “the Bailey bridge of housing”: modular construction, scalable dimensions, interoperable components that are fully reusable
- Renewables friendly utilities module with outside contractor access serves essential power, air exchange and in-floor hydronic heating



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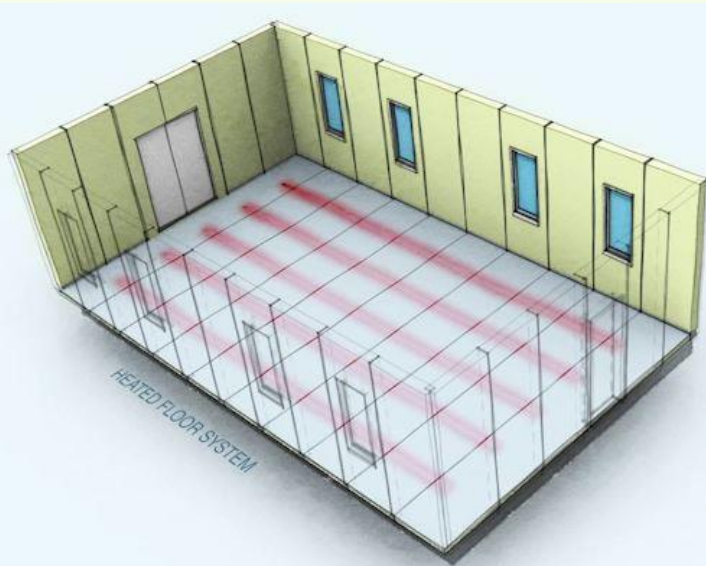


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MODULARIS – Concept



- Resilient pre-fabricated panels arrive on site flat-packed and ready to install; assembles by hand without fasteners, tools or a crane
- Latest concept to be prototyped north of 60° in 2018 using innovative joint procurement – licensing model

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MODULARIS – Logistics

- Resilient Building Panels:
 - can be rapidly deployed and/or stocked locally for emergencies
 - does not use wood products → can be exposed for long periods prior to use
 - use proprietary seals → can be dismantled for repair or replacement
 - building can be relocated several times during life of asset



MODULARIS – Logistics

- Lightweight Structural Framework:
 - components can be rapidly deployed and-or stocked locally for emergencies
 - extensive use of aluminum → all components can be positioned by hand
 - uses proprietary connectors → can be dismantled for repair or replacement
 - above ground foundation can be extended for other purposes

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MODULARIS – Risk

- Pre-engineering for all of Canada facilitates site specific approvals
- Use of conventional materials reduces cost-of-inputs
- Use of simple manufacturing processes avoids investment in tooling
- Use of standard parts results in costs being known a priori
- Minimization of field labor reduces variability of unintended costs

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MODULARIS – Advantages

- Government of Canada will act as lead adopter
- **Code approval** once for all of Canada is a whole-of-government approach
- **Standard layouts**, fit and finish can be specific to housing corporation needs
- Pre-ordering and **regional stocking** of components favours community engagement
- “Sweat Equity” component is **family-friendly**

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Utilities Module Approach

- Trades work under factory conditions, module arrives ready to use
- Goal is for one module to serve a “cluster” of buildings
- Spare parts, trouble shooting and maintenance can be rationalized
- Training programs can be developed to address local skill-sets
- Renewable energy options can be tuned for regional application

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