Advancements in Modular Design and Construction...
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MODULAR BUILDING INSTITUTE

PIVOTek

CHANGING THE WAY THE WORLD BUILDS

GREENER FASTER SMARTER

BIMFORUM #BIMandPrefab
What is Modular Building...

<table>
<thead>
<tr>
<th>Permanent</th>
<th>Relocatable</th>
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<tbody>
<tr>
<td>About half of the industry builds permanent space</td>
<td>About half of the industry revenue is generated from the sale or lease of temporary space</td>
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<td>Provides markets with permanence and performance of conventional construction in roughly half the time</td>
<td>Provides market with instant relief for space needs</td>
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<td><strong>Permanent installation with a life cycle expectancy identical to conventional</strong></td>
<td><strong>Generally 1 – 7 year requirements on a site</strong></td>
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<td>Competitively priced with site built</td>
<td><strong>Lower cost/price driven</strong></td>
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<tr>
<td>Design considerations are higher</td>
<td>Stock/fleet space often available</td>
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<tr>
<td>Can be Type II or Type V</td>
<td>Economy and speed of delivery are key</td>
</tr>
<tr>
<td></td>
<td>Design considerations are lower</td>
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Markets Served

Permanent Modular Construction

- EDUCATION
- HEALTHCARE
- HOSPITALITY & RETAIL
- COMMERCIAL HOUSING
- OFFICE & ADMINISTRATION
- SECURITY

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Permanent Modular Construction…

Building Modules

• Complete Building Structures
• Buildings are constructed in “modules” that when put together on site, reflect the identical design intent and specifications of the most sophisticated traditionally built facility – without compromise.

Building Components

• Smaller repeated portions of a building
  • Bathroom PODs
  • Headwalls
  • Corridor and Vertical mechanical rack systems
• Structural Systems
• Exterior wall systems
Building Modules…

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Advantages of Building Modules…

**Building Modules**

- Perform more complex designs
- Aesthetically pleasing designs
- Utilization of architect specified products
- With added complexity comes a better schedule advantage
- Single Source coordination
- Maximize SF to fullest occupancy potential
Building Component/Off-Site Prefabrication...
Advantages of Building Components…

Building Components- Single Source Off-Site

- Greater Design Control
- Adaptable to all project deliver models and building styles and designs.
- Easily integrated into Type 1 Building Structures
- Improved speed-to-market
- Improved cost control and contingency protection.
IMPLEMENTATION- There are many levels of detail that need to be added to the design to bridge the gap between the drawing intent and the final design and installation of a product. The responsibility of adding this detail is falling on the subs and vendors.
An estimated $4.9 Billion of cost is spent on Inadequate Interoperability in the Construction Phase of Work alone.

National Institute of Standards and Technology
Why Now…

Architect/Engineer

CM/GC

Single Source Modular Provider

APPROVAL REQUESTS
Why is Now the Time for Modular...

• **IMPLEMENTATION** - There are many levels of detail that need to be added to the design to bridge the gap between the drawing intent and the final design and installation of a product. The responsibility of adding this detail is falling on the subs and vendors.

• **TOOLS** - General and Subcontracting industries are becoming more advanced in design systems and tools.

  - **TOLERANCES** - Advancement and use of Total Station and GPS layout systems has allowed for better and more efficient coordination and placement.

  - **BROADER REACH** - BIM Coordination beyond MEP systems.

• **VALUE** - Better way of doing business
  - Less waste, more control, repeatable tolerances and standards

• **NEED** - Declining number of skilled trades

• **AVAILABILITY** - Improvement in Modular Building Products
Why is Now the Time for Modular…

AEC Bytes- Labor-Productivity Declines in the Construction Industry, March 2013
Why is Now the Time for Modular…

Value Added per Employee
2005 dollars

AEC Bytes- Labor-Productivity Declines in the Construction Industry, March 2013

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“The major opportunities for positive change include better use of BIM enabled processes and procurement contracts that allow improved collaboration, design for constructability, greater use of prefabrication and use of virtual design and construction to support enhanced understanding, and efficiency. The industry needs to reduce its use of low-tech “stick built” approach and learn to take advantage of IT enabled practices closer to those used in the manufacturing industry.”

Paul Teicholz
Professor Emeritus, Stanford University
Large Opportunity in the Type 1 Building Construction and Commercial Markets

- 72% of our Members work is Type 5 wood construction; 28% is Type 2 Steel Construction

BIM Design to Manufactured Unit

- Current Capabilities
  - Generate a Bill of Materials
  - Final coordinated Design
  - Detail production sheets for manufacturing

- Current Issues
  - Issues with Automated integration
  - Large library of products
  - Limits on raw material cut sheets
What’s Next…

Architects will Specify Modular Systems as part of their projects
• Actively facilitate the Modular Design and Manufacturing Process

Building tolerances will be impacted by the standard use of Modular Technologies
• Accuracy and consistency of Structural Placement
What is Next…

Single Source **Modular Building Modules** and **Building Components** provide the most effective means to utilize all of the measures necessary to improve the productivity of construction without reducing initial value or life cycle costs. These measures include improvements in…

- Trade processes
- Management and Coordination
- Architectural and Engineering Designs
- Accurate Communications
- Early Design and Build Team Coordination
- Fragmentation of information and work functions