THE WHOLE BOX
Beyond Pre-Fabrication
Learning Objectives

- Identify design concepts of the current state of pre-fabrication
- Compare future opportunities of prefabricated pods versus prefabricated structural modules
- Discuss the time and cost savings from different design interventions and their effect on the construction schedule
- Consider how offsite strategies can be investigated and evaluated for health care construction
What’s the primary reason you’re considering pre-fabrication on your current projects?

A. Quality  B. Schedule  C. Cost  D. Site Constraints

To participate in poll:
Text to 22333 and type BALLINGER2017
Then text A, B, C, or D to respond to questions
What’s the primary reason you’re considering pre-fabrication on your current project?

Survey says:

- A. Quality: 18%
- B. Schedule: 55%
- C. Cost: 19%
- D. Site Constraints: 7%

Total responses: 66
GOALS AND POTENTIAL FOR PRE-FABRICATION
COST DRIVERS

Example NYC Project

- Construction Labor
- Site Constraints
- Regulatory/Codes
- Over-Investment in Building Systems
- Project Delivery Method
- Design Changes
- Market Conditions
- Traditional Approach to Schedule
- Customer Expectations
- User Expectations
Goals and Potential of Pre-Fabrication

- High Level of Quality Control
- Reduces On-Site Labor
- Reduces Overall Project Schedule/Speed to Market
- Standardization of Components + Consistent Quality
- Increase in Safety
- Reduces Waste
High Level of Quality Control

- Highly controlled QA/QC process
- Labor and materials in a climate-controlled environment
- BIM-driven robotic laser cutting possible for more precision
Reduces On-Site Labor + Overall Project Schedule

- Transfers labor hours from the job site to a lower cost factory setting
- Pre-fabrication of elements can begin early in construction cycle with early design decisions
- Interior finish components work concurrent with foundations
- Factories can operate 3 shifts 24/7 with small differential versus on-site premium time
- Production not affected by adverse weather conditions
Standardization of Components

- Full-scale mock-ups speed early design decisions
- Reduces number of unique component parts
- Reduces cost of ongoing maintenance
- Supports consistent LEAN operational process streams
Increase in Safety

• Factory environment inherently safer and controlled
• Limits on-site labor
• Reduces exposure to weather
• Lowers construction insurance costs
Reduces Waste

- Pre-assembled components
- Highly controlled dimensions
- Materials precisely ordered and cut to final size
- Assembly vs. field manufacturing
- Highly controlled sequence of trades
- Requires less on-site storage space and waste
Pre-Fabrication can…

- PROVIDE MORE COST + SCHEDULE CERTAINTY
- INCREASE SPEED TO MARKET
- REDUCE RISK
THE
PRE-FABRICATION SPECTRUM
Pre-Fabrication Spectrum

COMPONENTS
- Pre-Cut Conduit
- Intelligent Materials
- Pre-Formed GWB
- GFRC Enclosures
- Sleeves with Integrated Fire Stopping

PURCHASED ASSEMBLIES
- Curtainwall Panels
- Headwalls
- Partitions
- OR Ceilings
- Toilet Rooms

FABRICATED ASSEMBLIES
- MEP Racks
- PAWS (Pre-Fabricated Advanced Wall Sections)

STRUCTURED ASSEMBLIES
- Drop-In Elevators
- Stairs
- Penthouses
- Patient + Exam Rooms

STRUCTURAL MODULES
- Entire Finished Interiors + Exterior with Self-Supporting Structure
Components

INTEGRATED CONTROLS WIRING
TRADITIONAL INTEGRATED CONTROLS

WHIP KITS
Purchased Assemblies

PIPE RACK

OR CEILING SYSTEM
Fabricated Assemblies

NON-PROPRIETARY BATHROOM PODS

MECHANICAL ROOM

PAWS PRE-FABRICATED ADVANCED WALL SECTIONS
Structured Assemblies

DROP-IN ELEVATOR

STAIR

PENTHOUSE
Structural Modules

COMPLETE STRUCTURAL MODULE – THE WHOLE BOX
How far along on the spectrum are you currently?

**COMPONENTS**
- Pre-Cut Conduit
- Intelligent Materials
- Pre-Formed GWB
- GFRC Enclosures
- Sleeves with Integrated Fire Stopping

**PURCHASED ASSEMBLIES**
- Curtainwall Panels
- Headwalls
- Partitions
- OR Ceilings
- Toilet Rooms

**FABRICATED ASSEMBLIES**
- MEP Racks
- PAWS (Pre-Fabricated Advanced Wall Sections)

**STRUCTURED ASSEMBLAGES**
- Drop-In Elevators
- Stairs
- Penthouses
- Patient + Exam Rooms

**STRUCTURAL MODULES**
- Entire Finished Interiors + Exterior with Self-Supporting Structure

To participate in poll:
Text to 22333 and type BALLINGER2017
Then text A, B, C, D, or E to respond to questions.
How far along on the spectrum are you currently?

Survey says:

- A. Components: 15%
- B. Purchased Assemblies: 18%
- C. Fabricated Assemblies: 50%
- D. Structured Assemblies: 13%
- E. Structural Modules: 3%

Total responses: 60
CASE STUDIES

SUCCESSES + CHALLENGES OF PRE-FABRICATION
University of Maryland Medical Center
SHOCK TRAUMA CRITICAL CARE TOWER
Exterior Envelope
Reading Health System
N BUILDING
Penthouse

- Quality
- Schedule
- Cost
Reading Health System
HEALTHPLEX FOR ADVANCED SURGICAL + PATIENT CARE
Headwalls

STRUCTURED ASSEMBLIES

FABRICATED ASSEMBLIES

PURCHASED ASSEMBLIES

COMPONENTS

QUALITY

SCHEDULE

COST
MEP Rack
OR Plenum Ceilings

- Booms
- Lights
- Laminar flow
- Sprinklers
- Smoke detector
- Speakers
Cooper University Health Care
EMERGENCY DEPARTMENT
Structural Modules
Structural Modules
SITE PREP
Confidential Lab Project
Lift Slabs
461 Dean Street, Brooklyn, NY
Structural Modules
Structural Modules
What’s the primary barrier to completing a pre-fab project?

Survey says:

- A. Time: 3%
- B. Cost: 10%
- C. Owner unwilling to commit: 45%
- D. Lack of supplies/union issues: 6%
- E. Design limitations: 33%
- F. Too much risk: 3%

Total responses: 67
The Future of Pre-Fab in Healthcare
How do you determine if a project or a part of a project is right for pre-fabrication?

**CHALLENGES**
- Requires early funding commitment
- Requires starting coordination early
- All decisions must be made early

**BENEFITS**
- Speed to market
- Cost + schedule certainty
- Reduced risk
How do you determine if a project or a part of a project is right for pre-fabrication?

**Identify Drivers**
- What components lend themselves to pre-fab?
- Is there repetition?
- Is the scale appropriate for pre-fab?

**Process Evaluation**
- Collaborative Team (Owner/Designer/Construction)
- Ability to make decisions early + stick to them

**Possible Drivers**
- Speed to Market ✔
- Site Constraints ✔
- Construction Labor $
- Regulatory/Codes
- Market Conditions
- Schedule
- Future Flexibility for Change ✔

**Pre-Requisites**
- Speed to Market ✔
- Site Constraints ✔
- Construction Labor $
In-Patient Bed Tower
Strategies for Pre-Fab In-Patient Bed Rooms

PAWS

FULLY ASSEMBLED ROOM PODS

SELF STRUCTURED MODULES
PAWS Pre-Fabricated Advanced Wall Sections

A. Fully Assembled Bathroom Unit
B. Prefabricated Headwall
C. Prefabricated Exterior Wall Unit
Fully Assembled Patient Room Pods

A. Fully Assembled Non-Structural “Pod”

B. Conventional Structure

C. Prefab or Unitized Exterior Wall
Integrating Structural Modules

A. Structural Modules

B. Components Assembled Within Chassis

C. Prefab Bathroom Unit
Optimizing MEP Systems

SAMPLE TRADE COSTS

Site Work + Logistics
Foundation + Structure
Exterior Enclosure
Interior Fit-Out

MEP Systems
How likely are you to pursue Structural Modules?

Survey says:

- A. Very likely: 23%
- B. Likely: 30%
- C. Not sure: 19%
- D. Unlikely: 22%
- E. Very unlikely: 6%

Total responses: 64
Goals and Potential of Pre-Fabrication

- High Level of Quality Control
- Reduces On-Site Labor
- Reduces Overall Project Schedule/Speed to Market
- Standardization of Components + Consistent Quality
- Increase in Safety
- Reduces Waste
Where is your pre-fab sweet spot?