



Unite Design and Construction with Prefabrication

Welcome

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Inaugural SW Ohio Roundtable



Cogence Introduction

(5 minutes)



Pre-Fabrication Background

(25-30 minutes)



Roundtable

Break-out Discussions in Groups

(20-25 minutes)

Debrief of Group Discussions

(15-20 minutes)



Final Comments

(10 minutes)

Plan for Session

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Mission + Purpose

Cogence *(Latin)*

“To drive together” or “Thinking that is well organized”

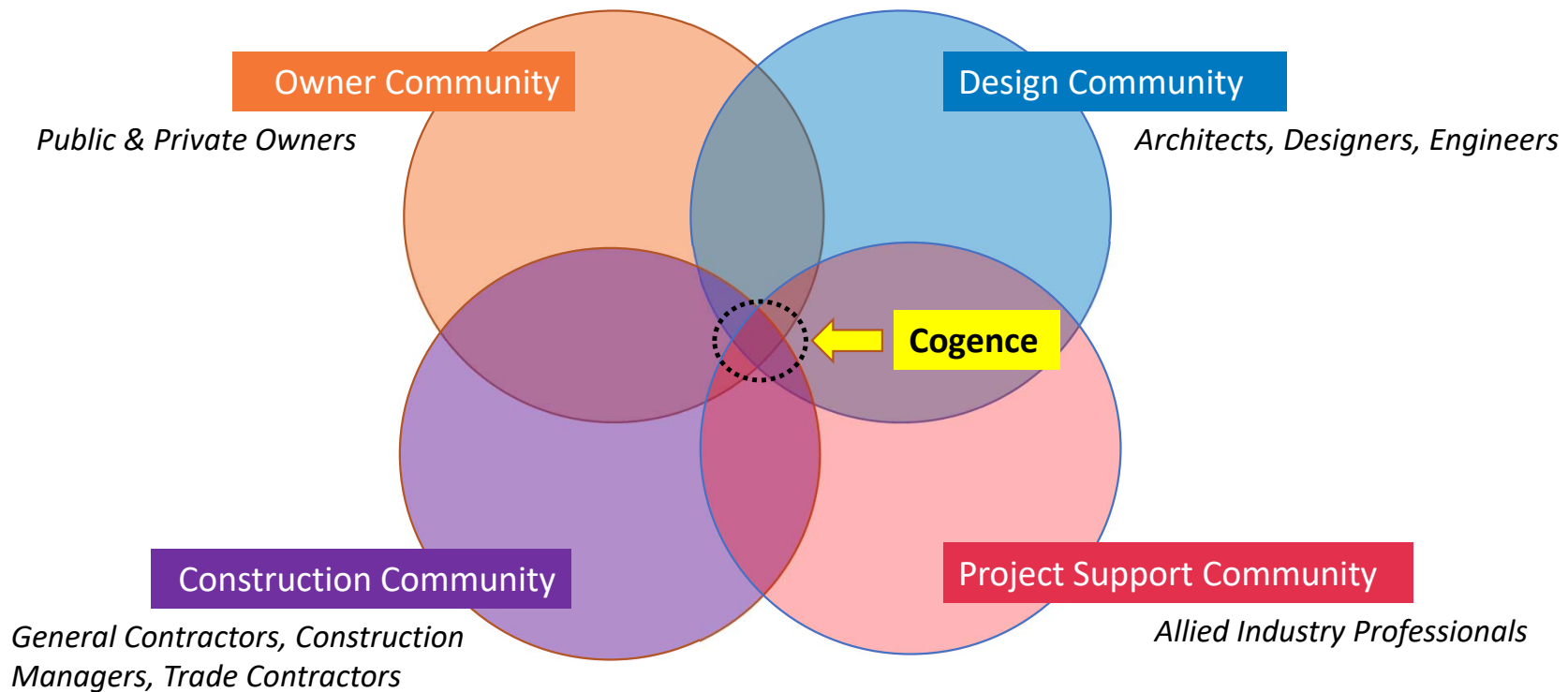
The purpose of the Alliance is to bring Owners and Developers, Architects and Engineers, Construction Managers and Contractors, and Allied Industry Professionals together to **advocate** and be a **resource** for improved project delivery.

For more information visit us at www.cogence.org

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What is Cogence Alliance?



Intersection of project stakeholders represents integrative ambitions of Cogence Alliance.

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Welcome to Inaugural SW Ohio Roundtable



Roundtable meetings are common gathering for Cogence Alliance



Attendees share views (and learn from each other) on session's topic of mutual interest



First topic was selected from poll of chapter's "launch committee"

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Quick Introduction

- Name
- Company
- Years of Project Experience
- Favorite Halloween Candy



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Pre-Fabrication Construction Background



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Presenters

Alex Jonovski

Demain

- » Currently serves as CEO of Demain - a consortium of contractors and design professionals focused on industrializing the delivery of the built environment
- » Jonovski is an engineer by trade, and previously served as Principal and VP of Strategic Growth for KLH Engineers

Jerry Klanac

University of Dayton

- » Faculty of Practice, Director of Construction Engineering and Management Program – Department of Civil and Environmental Engineering and Engineering Management

PMA Consultants LLC

- » Consultant Emeritus, over 40 years of project/construction management experience.
- » As part of schedule reviews and quantitative risk engagements for projects around the world, has seen alternate construction execution strategies applied in many ways.



Near-Term Challenges for SW Ohio Projects

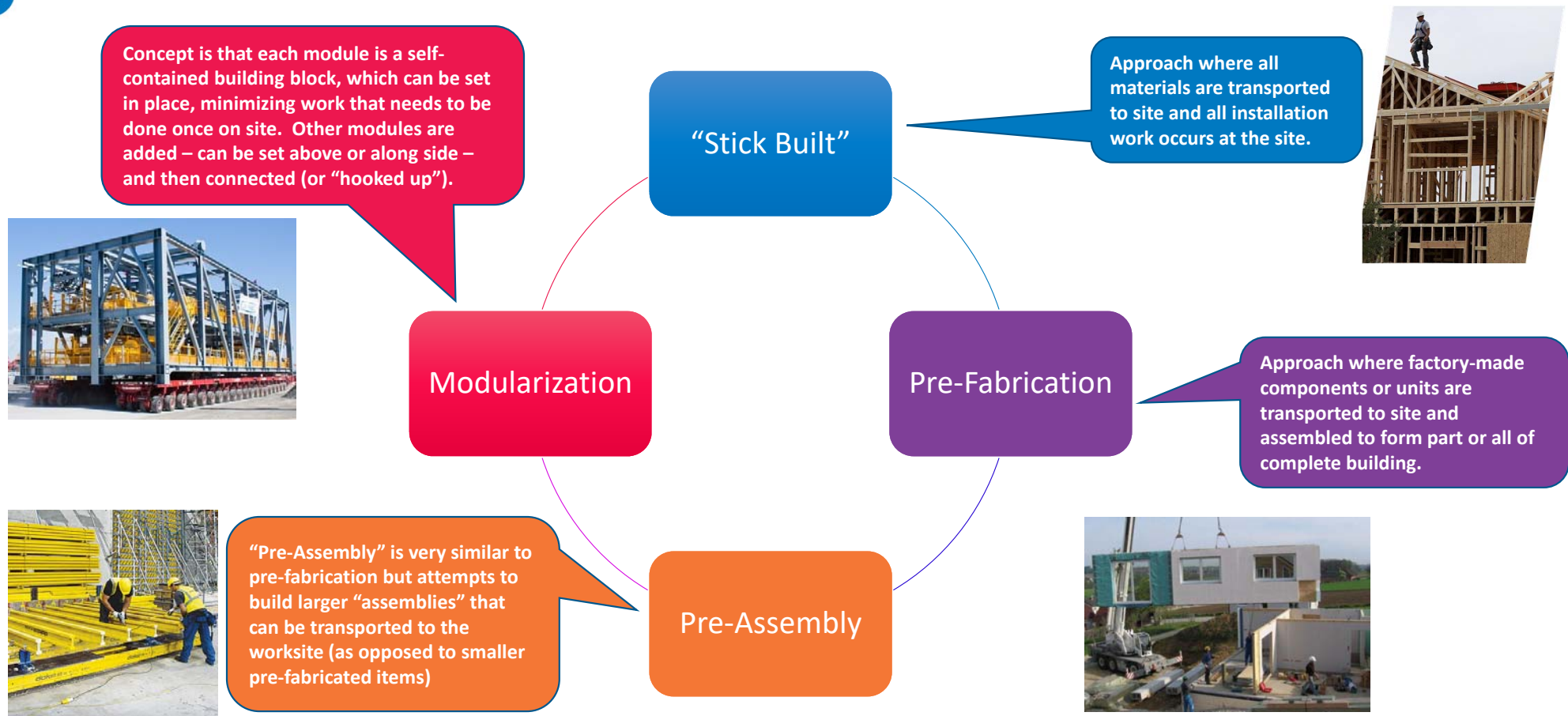
- Supply-Chain Disruptions
- U.S. Economy Changes
- Projected High Construction Labor Demand Caused by Intel Manufacturing Plant Mega-Project and Other Projects in the Region
- Construction Labor Pool Challenges:
 - Changing Demographics
 - Organic Growth Not in Step with Demand



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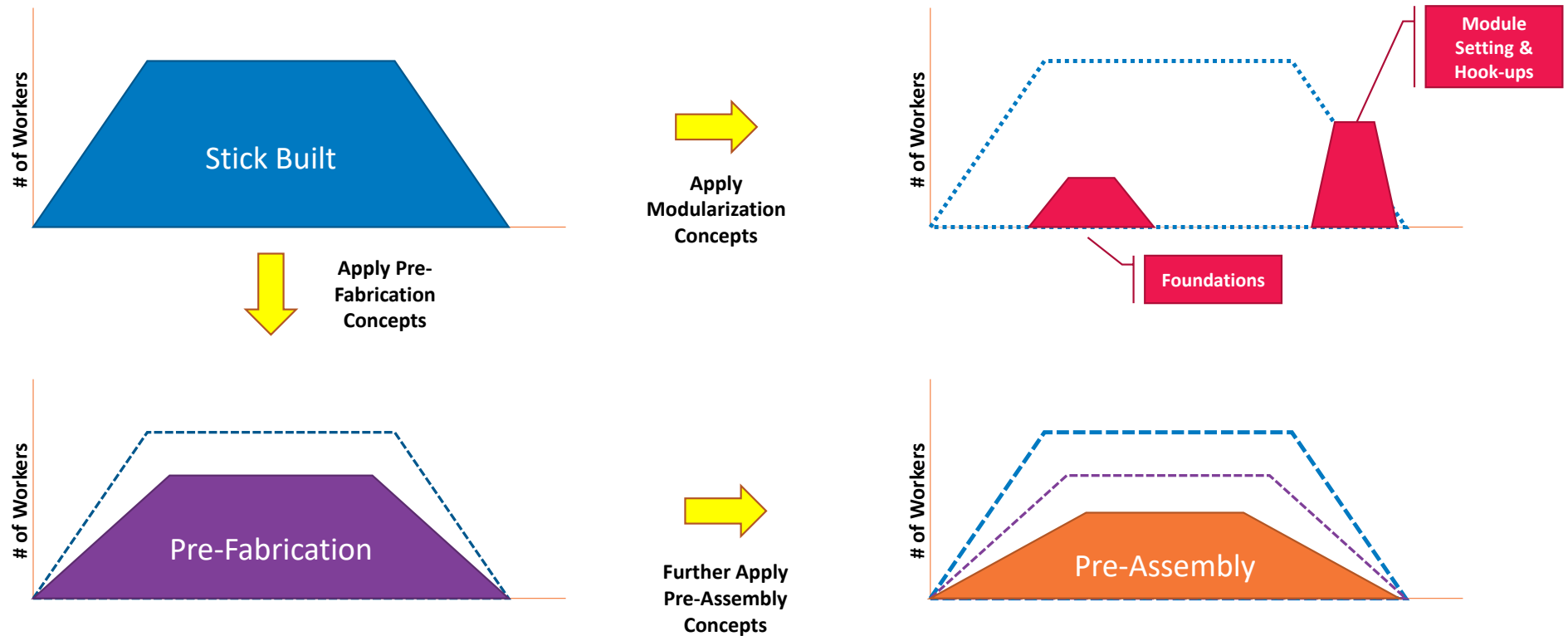
Possible Construction Execution Strategies



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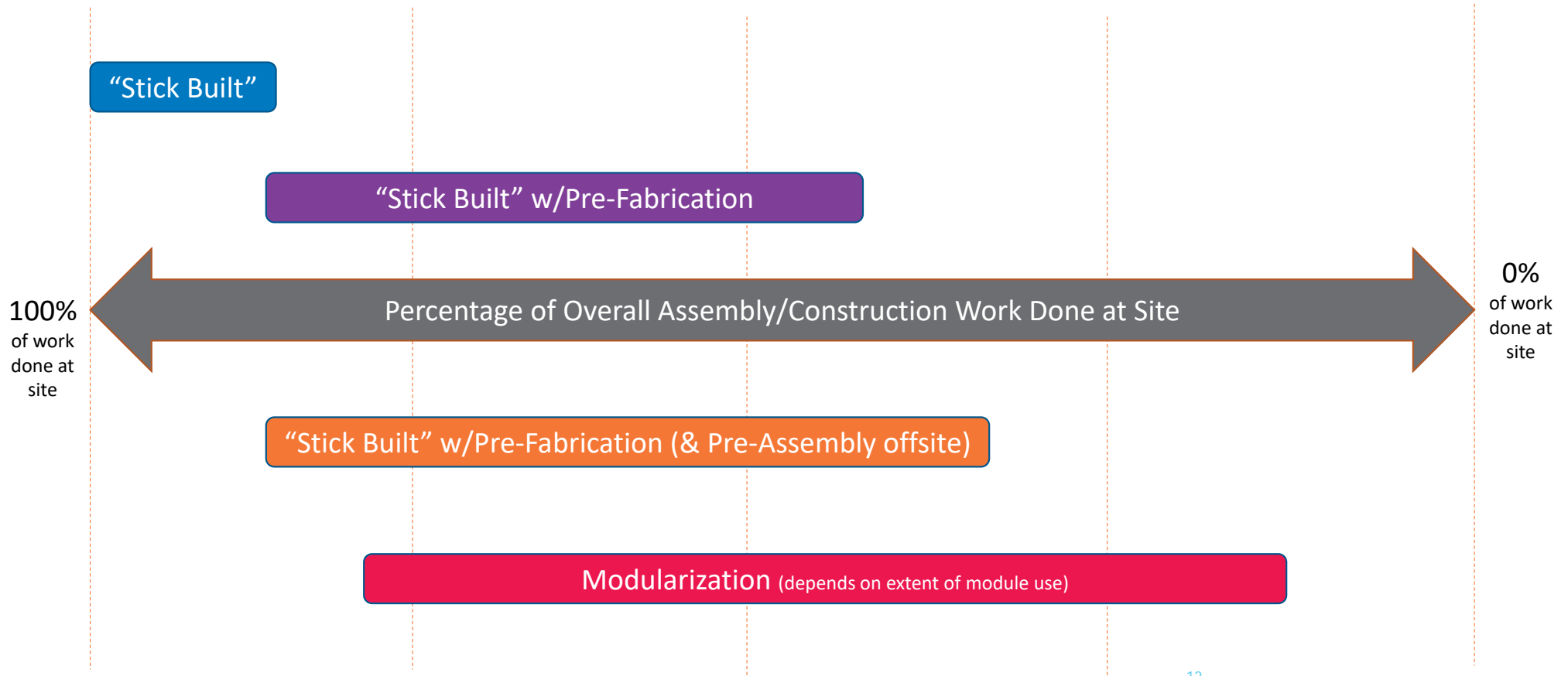
How Approaches Reduce Demand of Labor at Site



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How Approaches Reduce Demand of Labor at Site





Defining Terms (Academia)

- *Standardization* is use of standard components or modules
 - Development and production overhead costs of which are shared across a number of construction projects,
- *Pre-Assembly* is pre-fabrication and/or assembly of components into sub-assemblies
 - Either off-site in a factory (or fabrication yard) or on-site in a dedicated facility (removed from the direct work face), prior to its final installation in place.
- *Mass Customization* is the combination of the two
 - Where standardized module kits are configured to meet needs of a particular project and pre-assembled for installation at site.

Standardization Benefits:

- The aim of standardization is to push up the volumes of identical components so that *economies of scale* in design and production can be achieved - like what happens when lean production methods are applied in manufacturing.
- If the work can be performed in a more controlled environment (say in a factory) as opposed to the challenges of a construction site, *the standard for quality of the work is likely easier to achieve.*

Source: Adapted from *Managing Construction Projects*, 2nd Edition, Graham M. Winch, pg. 336-7

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4 Basic Approaches to Standardization and Pre-Assembly in Construction

- **Component Manufacture & Sub-Assembly:** This is basic level of standardization & pre-assembly and widely used.



Door assembly with frame + door is an example of component manufacture

- **Non-Volumetric Pre-Assembly:** Creating “flat-pack” sub-assemblies which can be quickly erected on site.



Do-it-yourself house furnishings at Ikea apply this concept.

- **Volumetric Pre-Assembly:** Where a whole enclosed space is built in the factory and installed on site complete. Classic example are the hotel rooms with Hotel Ibis chain – where “bathroom pods” are used.



Example of a “pod” to get consistency in quality and enable faster construction.

- **Modular Buildings:** Where the entire building is supplied on a volumetric basis, perhaps with only the addition of a brick cladding. McDonald’s uses this technique world-wide.



Transportable pre-fabricated retail building

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What is Prefabrication? (Practice View)



**content courtesy of Heapy*

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Prefabrication is ...

- Produce something **in sections**: to manufacture sections of something, especially a building, that can be transported to a site and easily assembled there
- Produce something **in standardized form**: to produce something in an unoriginal or standardized way.



**content courtesy of Heapy*

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Prefabrication is ...

Sections:

- » Stairs
- » MEP Racks
- » Pump packages
- » Electrical rooms
- » Exterior Skin
- » Central Energy Plants

Standardized Forms:

- » Toilet Rooms
- » Headwalls
- » Electrical Rough-ins



**content courtesy of Heapy*

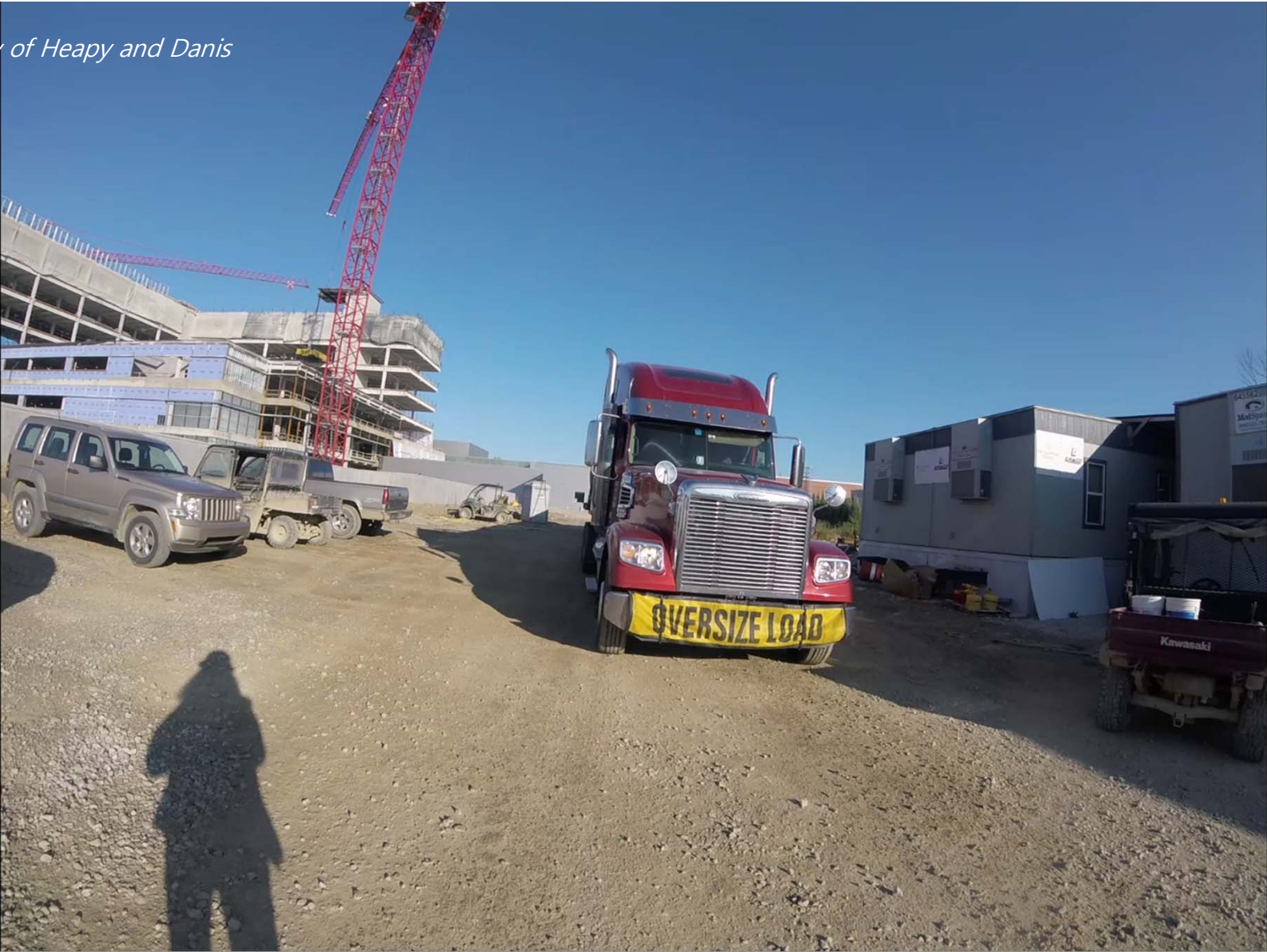
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Case studies

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**content courtesy of Heapy and Danis*





Mercy Health – West Hospital

Project Overview:

- » ~634,000 SF green field hospital
- » 250 beds
- » \$180 million construction cost
- » 2 acres of green roof



**content courtesy of Heapy*

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Mercy Health – West Hospital

● Prefabricated Packages:

- » Corridor Racks
- » Toilet Pods



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Mercy Health – West Hospital

- » Corridor racks represented about 60% of MEP systems on a patient floor
- » The racks included dry wall for part of the corridor as well as the lighting soffit for lighting the corridor



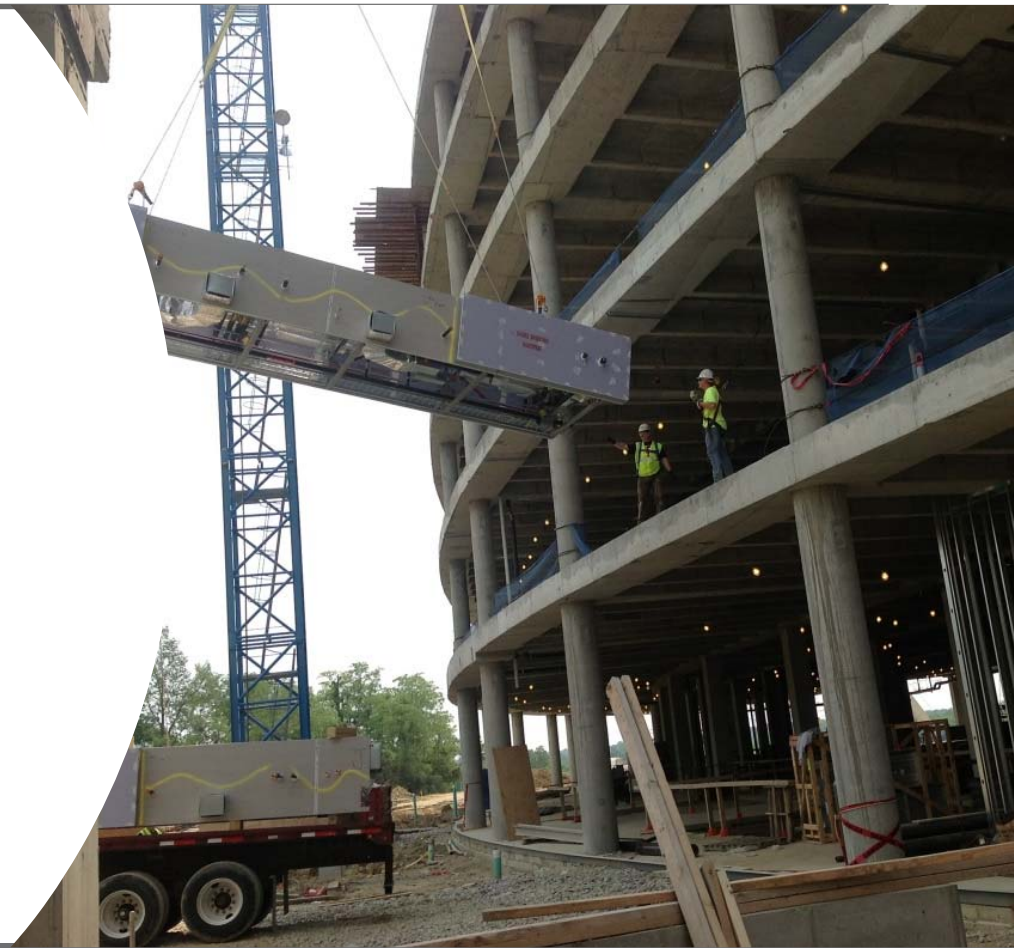
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Mercy Health – West Hospital

- » All of the racks were assembled by approximately the time the building was topping out
- » All of those systems could be installed in approximately 2-3 weeks



**content courtesy of Heapy*

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Mercy Health – West Hospital

- » A early release package was created for the toilet pods
- » 18 different configurations for 241 prefabricated bathroom pods



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Mercy Health – West Hospital

- » Needed to account for structural impacts of transport
- » A few challenges related to drain locations



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Confidential EV Manufacturer



Pre-Project Collaboration

- » Align on pipe/duct application schedule
- » Clear definition on:
 - o Materials, valves, hangers, insulation
- » Dictate the fabrication part availability

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*content courtesy of Demain

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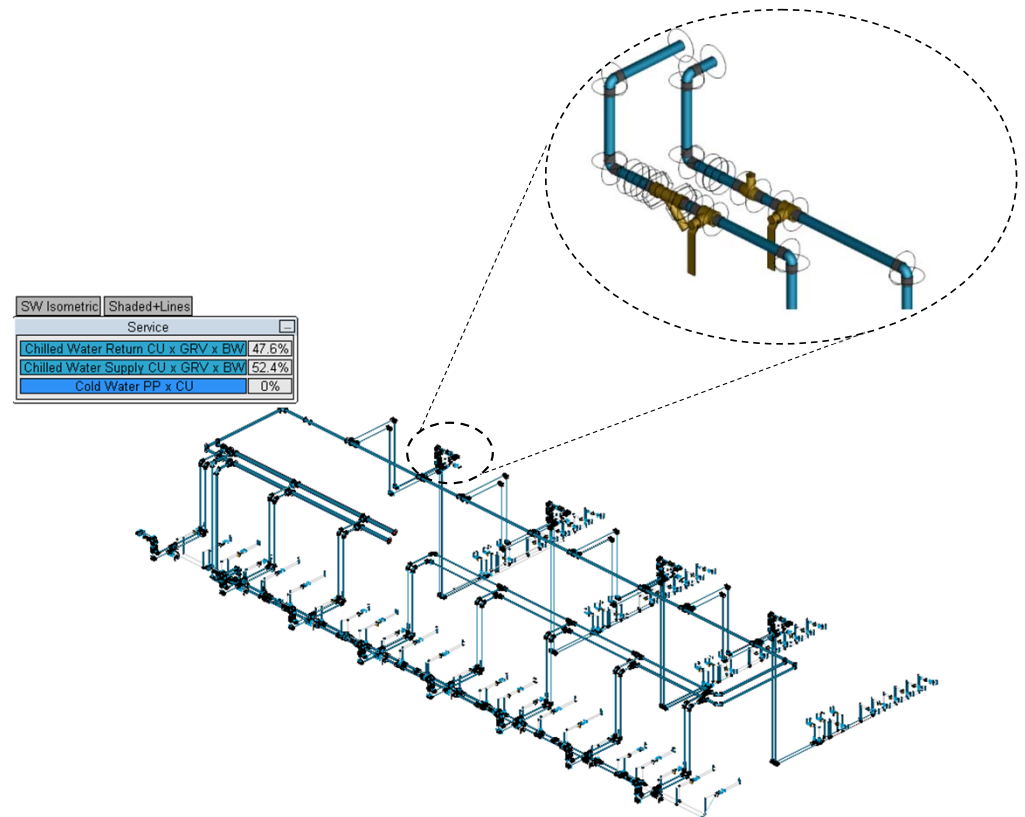
Confidential EV Manufacturer

Opportunities

- Shop drives design
- Prefab library is uploaded to support engineering
- Cost database is linked

Benefits

- Engineered model is constructable
- Eliminate manual take-off



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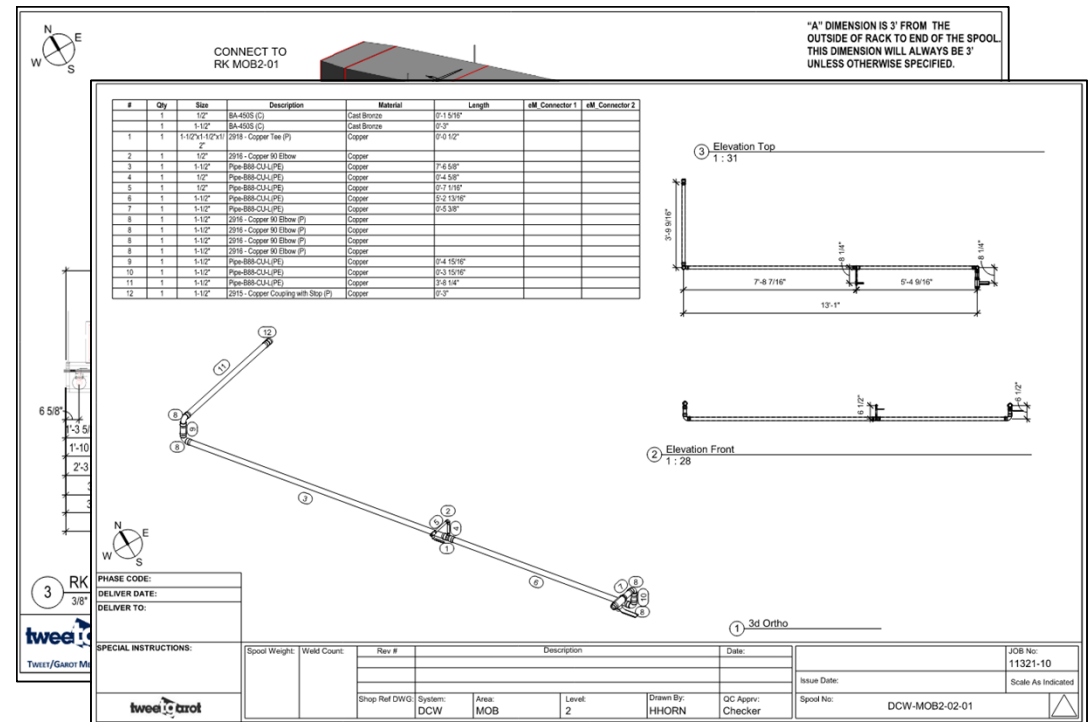
Confidential EV Manufacturer

Opportunities

- Pipe Spools
- Duct Spools
- Multi-trade racking
- Loose material kitting

Benefits

- Factory inspection and testing
- Just-in-time shipping
- Model data exports to shop fabrication equipment



*content courtesy of Demain

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Utility Scale Solar

Typical BOM

- Fuses ~40,000
- ZipRing™ ~800,000
- Zip Ties ~150,000
- Wire Management Hangers ~750,000
- Ground Jumper Wires ~10,000
- Splitters ~25,000
- Over 200,000 individual wires!



**content courtesy of Demain*

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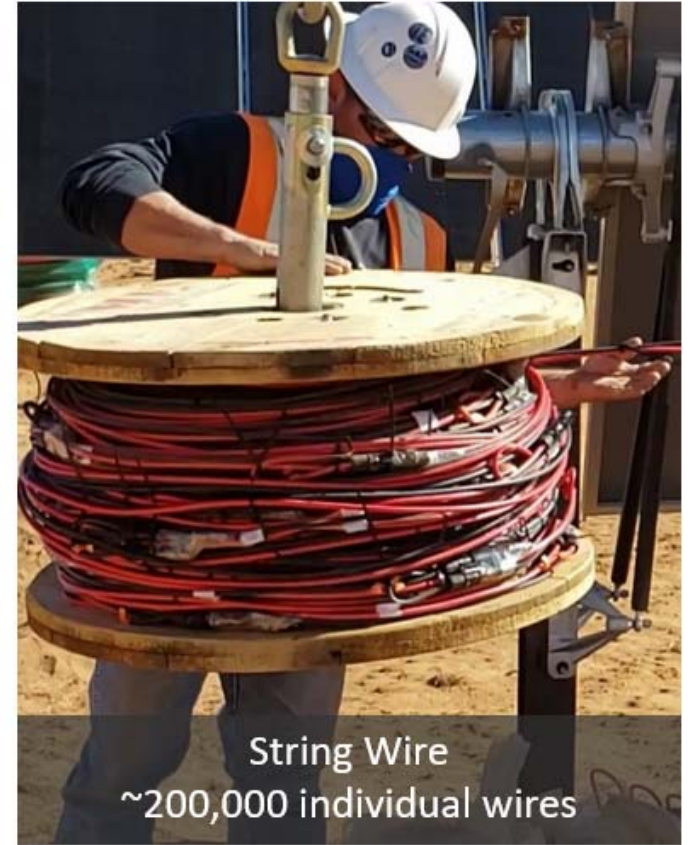
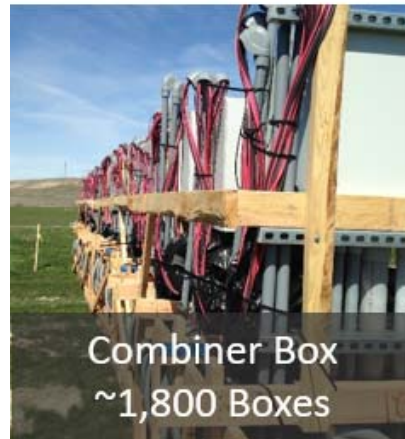
Utility Scale Solar

Opportunities

- String wire harnesses
- Feeder harnesses
- Combiner box assemblies
- Loose material kitting

Benefits

- Factory inspection/testing
- Just-in-time shipping
- Predictable cost
- Consistent quality



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Roundtable Set-Up



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Roundtable Set-Up

- Team Assignments (see next slide)
- Team will have up to 25 minutes to discuss the assigned topic
 - Spend a few minutes to get to know each other in team
 - Discuss suggested questions that accompany the topic
 - Can add additional thinking to the initial questions
- Use whiteboards to capture notes to use for your team's debrief of discussion to the entire audience. Nominate presenter from within team
- Allowing 3-5 minutes per team to present results and have general discussion of the topic



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Roundtable Groups

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6
Robert Bell	Ted Christian	Anna Hedley	Chris Knueven	Ron Masella	Edward Melvin
Bryan Greene	Nicholas Rittinger	Nathan Lewis	Steve Korte	Chris Speier	Melissa Lutz
Brian Lacon	Elizabeth Breitenstein	Chris Hopper	Amanda Doenges	Greg Fox	Brian Lacon
Gino Napuri	Jacob Roby	Chloe Altman	Steve Lawson	Allison Hudson	Kit Houston
Joe Cleves					

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Group Topics

1. Project Delivery Methods and Contract Strategies
2. Managing Underlying Technology: Getting Right Info to Fabricator
3. The Benefits and Challenges to Pre-fabrication
4. Managing Risks Related to Pre-Fabrication Approach
5. Prefabrication & Construction Logistics, including Transportation
6. Managing Quality of Pre-Fabricated Items



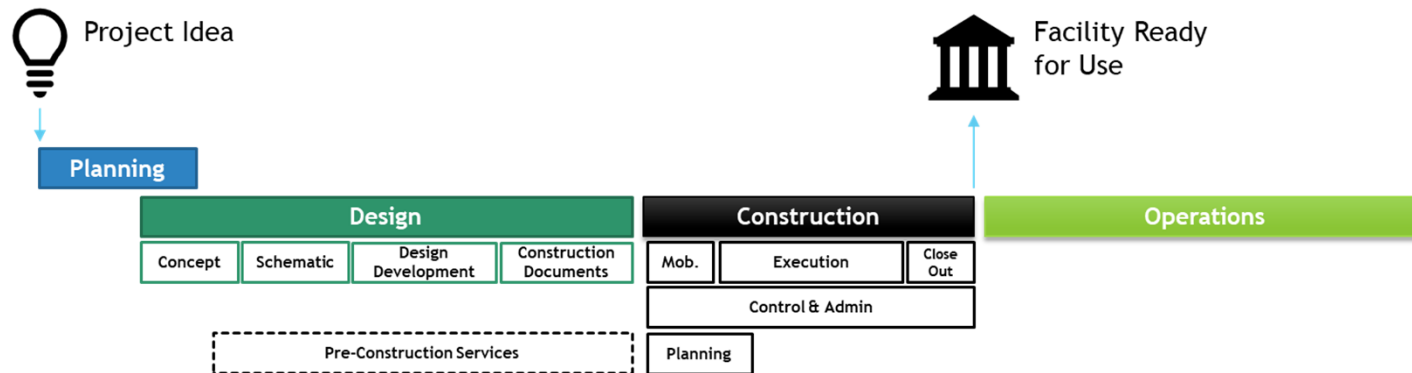
Roundtable Details

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Project Delivery Methods and Contract Strategies

1. Within a project life-cycle, **when is the best time** to incorporate prefabrication into the project? Consider this project life-cycle for Built-Environment projects.



2. What **contractual arrangements** would be best to allow and take advantage of prefabrication? What adjustments to contract or procurement strategies would be needed?



Managing Underlying Technology:

Getting Right Info to Fabricator

1. What **type of design deliverables** would best provide the essential information to the fabricator?
2. **Who should define** what that design deliverable shall contain or depict?





The Benefits and Challenges to Pre-fabrication

1. What **benefits** result from pre-fabrication?
2. What **challenges** are presented with pre-fabrication?





Managing Risks Related to Pre-fabrication

1. What are the **key risks** associated with use of pre-fabrication?
2. How do these risks of prefabrication **compare to the risks of a traditional delivery**?
3. What are some **mitigation strategies** to dealing with the risks of prefabrication?





Pre-Fabrication/Construction Logistics

1. What **logistical requirements** would require particular attention for prefabrication?
Consider the following:

- Transportation to Site
- Storage at Site
- Materials to Fabricator
- Installation

2. What **logistical benefits** arise from prefabrication?





Managing Quality of Pre-fabrication

1. How can prefabrication **uniquely increase quality** on a project?
2. What are **some strategies on how to manage quality** with a prefabrication deployment?





Roundtable "Debriefs"

1. Project Delivery Methods and Contract Strategies
2. Managing Underlying Technology: Getting Right Info to Fabricator
3. The Benefits and Challenges to pre-fabrication
4. Managing Risks Related to Pre-Fabrication Approach
5. Construction Logistics, including Transportation
6. Managing Quality of Pre-Fabricated Items



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Open Discussion

- Any other thoughts on application of prefabrication on upcoming SW Ohio projects?
- Did anything you heard today challenge your thinking?
- Any other questions?



Alternate Title of Session - "Prefabrication: It's a Team Game!"

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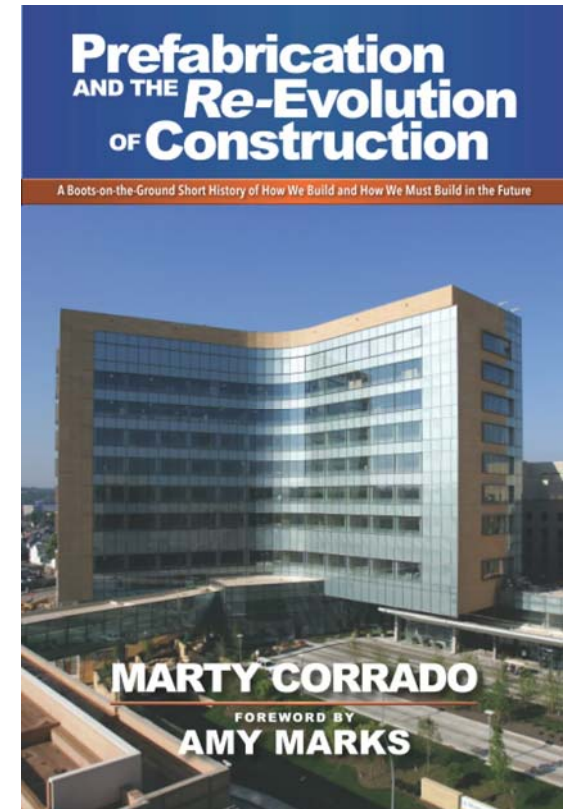
Possible Further Reading

- Here is a possible resource, if you are looking for more examples and ideas related to use of prefabrication.

» *Prefabrication and the Re-Evolution of Construction: A Boots-on-the-Ground Short History of How We Build and How We Must Build in the Future*

» Author: Marty Corrado

» ISBN-13 : 979-8532126534





Session Conclusion

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What's Next

- We are a start-up chapter and looking to build momentum
- However, due to upcoming holidays, not planning any SW Ohio Cogence gatherings until 2023
- Planning for at least 5 roundtable meetings in 2023, starting in February

