Is Prefab Making You Money?

Application of Industrialization in Electrical Construction

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Following this session, you will be able to:

• Describe ways to improve productivity in the construction industry.
• Identify steps necessary to implement an effective prefabrication process and other means of externalizing work.
• List tools that can be used to save time, cost, and improve work processes.

Continuing Education Credits

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Topics

• What is happening in construction
• How is Externalizing Work through Prefabrication leading into Industrialization of Construction™
• How to apply industrialization from other industries, specifically manufacturing to construction
• What will construction look like
What is Happening in Construction

We are about you®

70% Industrial
50% Commercial
30% Residential

Electrical Market Shifted 40 Years Later

We are about you®

工业 60%
商业 50%
住宅 40%

Necan Market Studies

Chapters / Locals Studied | Market Share | Market Segments
-------------------------|--------------|------------------
|                          |              | Industrial / Commercial / Residential |
| Maryland (2010)          | 24%          | 0 25 50 75 100 |
| Western Washington       | 51%          | 0 25 50 75 100 |
| (2010)                  |              |                  |
| NYC (2011)               | 55%          | 0 25 50 75 100 |
| OR-Columbia (2011)       | 57%          | 0 25 50 75 100 |
| (68% without hi-tech)    |              |                  |
| Northern N.J. (2011)     | 68%          | 0 25 50 75 100 |
| Atlanta / LU 613 (2011) | 33%          | 0 25 50 75 100 |
| Illinois (2011)          | 46%          | 0 25 50 75 100 |
| (51% non-NECA)           |              |                  |
| Santa Clara Valley (2011)| 61%          | 0 25 50 75 100 |

The Market Has Shifted

U.S. Manufacturing vs. All Industries
Value-Added in Current Dollars
(gross output - intermediate inputs used to produce)

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What is Happening in Construction?

- Market is changing
- Less specialization is required
- Unionization is declining
- Types of markets are changing
- System Productivity is the main difference

The First Sparks of Industrialization

Job Site Realities
Previous Research

The 10 main costly causes of non-productive “Wait Time”

1. Waiting for material – warehouse or offsite
2. Waiting for tools and equipments
3. Waiting for equipment breakdowns to be fixed
4. Rework due to design, prefabrication or field errors
5. Interface from other crews
6. Overcrowded work areas
7. Work place changes
8. Waiting on permits
9. Waiting for instructions
10. Other delays. The most common of which is waiting for scaffolding to be put up or taken down

On site time that could be Prefab

Job site clutter reduces productivity
Material on the jobsite that is not needed for nine months:

Jobsite clutter

Prefab can help reduce damages

40% of the Labor’s Recoverable Lost Time is in Material Handling
Material Handling is:
1. Ordering
2. Receiving
3. Waiting
4. Unloading
5. Sorting
6. Moving to accommodate jobsite
7. Returns
8. Delivery mistakes
9. Dealing damages
10. Storage to be used later

Prefabication Can Help To Reduce The Material Handling Cost Driver

Industrialization in Construction™ Can Only Happen Through:
1. Management of Labor
2. Management of work
3. Lean Operations
4. Modeling and Simulation
5. Feedback from the source

Industrialization of Construction™
- Labor & work needs to be managed (Taylor)
- Segregation of work (Ford)
- Lean (Toyota)
- Modeling & simulation
  - First product (BIM)
  - Then process (JPAC®, SIS®, EAE®, CPAC®, DELMIA, CATIA)
  - Then information & social networks / interactions (ENOVIA)
Managing Work and Labor = Agile Construction®

Segregation of Work = WBS

Effectiveness of Labor = Externalizing Work®

Application of SPC through ASTM E2691

Branch conduit = 27% of job
Branch wire = 12% of job
Application of SPC through ASTM E2691

Feedback from the Source leading to more effective use of labor

Types of Prefabrication

1. On Site
   - Standard Items
   - Special Items
   - Crib
   - Packaging
   - Staging

2. Off Site – EC or Vendor
   - Standard Items – Non Job Related
     - Boxes
     - Flex Cables
     - Etc.
   - Standard Items – Job Related
     - Fixtures
     - Assemblies
     - Etc.
   - Job Specific Items
     - Pipes
     - Wires
     - Bending
     - Etc.
     - Crib
     - Packaging
     - Staging
Internal & External Prefab
Shrink-Wrapped Vs. Just Getting it There

Prefabrication
Transferring Offsite Effort to Onsite Progress

Prefabrication:
Externalization of work:
• Physical construction tasks performed away from the installation site
  • To reduce cost and effort by
    – Streamlining,
    – Simplifying, or
    – Entirely eliminating activities from the burden on the jobsite

Benefits
• Consistency
• Reliability
• Safety
• Savings: Reduced Cost AND Effort
  • Less material handling
  • Fewer material returns
  • Less wasted material
  • Improved labor efficiency
  • Improved labor productivity
Successful Phase Completion

- Planning
- Availability of Resources
  - Manpower
    - Required skill levels
  - Materials
  - Tools and equipment
- Site conditions
- Work flow
- Communication

Measuring Progress

- Identify what is to be prefabricated
  - Separate prefab from overall job plan
- How to measure its progress
  - Break down prefab to detailed level as needed
  - Track prefab subtasks by % complete
- Incorporate prefab progress as a line item task completion towards overall job progress

WBS

- Planning
- Design/CAD
- Materials (Ordering, receiving, etc)
- Assembly
- Kitting / Packaging
- Delivery

Tracking

- Basic
  - Common items
  - Standard, on hand materials
  - Tracked by quantity (assembly only)
- Field Specific
  - Frequent items
  - Multiple jobsites
- Specialty
Systematic Measuring

- Progress measured by % complete
  - Real job progress (% complete) observed by foremen
- Efforts (% complete) allocated in multiple cost codes
- Automatic % completion distribution between cost code and relevant job efforts

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Thank You