Improving Productivity with Planning, Technology, & Sweat Equity

Dedicated to Customers, Co-workers & Suppliers of Wood, Iron, and Mud
Construction Industry Institute (CII) formed in 1983 to Construction Owner value driven research

Owners, Design and Construction Contractors, Academia

Research teams:
- Strategically formed
  - Member company participation on all teams
  - Supported by a primary investigator from academia
  - Publish research and implementation tools

Based on statistically significant research findings, 17 Best Practice Areas have been established –

Constructability is one of them
Constructability

Formal constructability programs have resulted in 6.1% cost reduction and 7.5% schedule gain

Front End Planning

Every $3 spent on Front End Planning has resulted in a $10 payback. Early supplier involvement has translated to cost saving of 4% - 8%.
By combining Front End Planning with Advanced Work Packaging an average of $8M will be saved on a $100M project.

An average of 3-5% of completed construction requires rework. Worse, inefficiencies and impacts during work execution are estimated at 40% - 50% waste.
Adoption of proven technology can improve productivity by 30-45%.

Use of Zero Incidents Techniques reduces Total Recordable Incident Rate 54-64%.
Mega Trend-1

Timing is Important!

Graph showing the relationship between stakeholder influence, risk, and uncertainty versus cost of changes over project time.
Mega Trend 2 – Construction Lags in Productivity

Constant $ of Contracts / Workhours of Hourly Workers
How Is This Possible With All These Advancements And Resources?

- Much Better Equipment
- Mechanical drafting / CAD / BIM
- Robotic Total Station Surveyors
- GPS Logistics, Laser Scanning
- Computer Software for Structural Designs
- Performance Based Designs & Specifications
- Collaborative Project Management Software
- ASCE, AGC, ABC, AIA, CII, FMI, ACI, ASCC

1930s - Grandfather Elmer Baker
2 CY Concrete Truck - 1951 Ford
1970s – Early Baker years
Empire State Building - 1931

Statistics

- Started March 17, 1930
  Complete April 11, 1931
- Tallest in the World at that Time
- On Schedule & under budget (12 days early - $40 M)
- Today - Still 30th tallest in the world - 1250 feet
- Built primarily by European immigrants and Mohawk Indian ironworkers
- 13 Months
Bank of America Tower - 2009

Statistics
- Started August, 2004
- Complete May, 2010
- $2 Billion - $700M in incentives
- Six years
Defining Our Challenges - A Comparison

Construction
- Fragmented industry
- Every building is unique
- Aging workforce
- Competition restricts means to invest in improvement

Manufacturing
- Mature industry
- Refined processes
- Many multigenerational firms
- Intensive investment into capital to reduce labor
Significant Barriers - Fragmentation

Fragmentation – Project Level:
Imagine organizing 50 different companies to work on a manufacturing floor.

Fragmentation – Industry Level
The concrete industry alone has over 50 industry associations that represent various stakeholders.
Significant Barriers - Risk Transference vs. Risk Mitigation

Design Bid Build (DBB)

- Competition: All stakeholders squeezed for fees

- Fewer resources to put into design detail and front end planning prior to the start of construction

- Often focus is on “contract coverage” instead of conversations that optimize overall project results

- Leads to each stakeholders managing their own spend and risk; rather than common project goals.

Risk Mitigation Is Better Than Risk Transference – No Losers and lower total cost
Significant Barriers - Information Flow

Design Document Quality is Deteriorating

Too much information that is often not relevant to the recipients.

Additive design responsibilities – design information developed too late in the construction process

Endless permutations of design during construction execution – Short circuiting planning processes
Why is Early Contractor Involvement in Design Necessary?

The Evolution of Design Documents

Designers are given: Time, $, Simplicity

Resulting in: Quality, % Complete, Coordination

Contractor - Design Assist Role

0% Design Completion -> 100% Mobilization

The Concrete Convention and Exposition
In a recent survey of CII member companies, high levels of safety program utilization was measured.
Safety Program Implementation Results

The diagram shows the total recordable incidence rate (TRIR) from 1989 to 2015, with a clear downward trend. The blue line represents the industry data, and the red line represents CII data. Both lines demonstrate a significant decrease over the years. The graph also indicates the impact of OSHA reporting changes, which are reflected in the data. The OSHA Construction Division, NAICS 236–238 (SIC 15-17), is referenced in the graph.
Five Typical Productivity Improvement Implementations

CII RT-340 Study Also Measured Member Company Implementation of 5 Key Productivity Focus Areas
Recognizing the five focus areas defined by CII RT 340, we further identified three primary threads related to improving productivity. These threads are interrelated and interdependent.

<table>
<thead>
<tr>
<th>Focus Area</th>
<th>Planning</th>
<th>Technology</th>
<th>Sweat Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leadership</td>
<td>Relationships</td>
<td>Tools</td>
<td>Co-workers</td>
</tr>
<tr>
<td>Resources</td>
<td>Communication</td>
<td>Knowledge</td>
<td>Leadership</td>
</tr>
<tr>
<td>Structure &amp; Communication</td>
<td>Processes</td>
<td>Metrics</td>
<td>Values</td>
</tr>
<tr>
<td>Planning</td>
<td></td>
<td></td>
<td>Culture</td>
</tr>
<tr>
<td>Monitoring &amp; Control</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Continuous Improvement</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4 Key Phases

1. Early BIM – Defining Project Conceptual Design and Path of Construction During Early Pre-Construction


3. Detailed Project Execution Plans Prior to Construction

4. LEAN – SSQP Meetings, Pull Planning, First Run Studies, and Thoughtful RFIs During Construction
Software Tools

- On-Screen - Take-Off & Site Logistics
- Timberline
- HCSS Civil
- P6 Scheduling
- Models – Synchro, Navis Works, Revit / Tekla
Types of Estimates

- Conceptual Estimate
- Preliminary Budget Estimate
- Lump Sum Estimate
- Unit Price Estimate
- Change Order Estimate
Models for Visualization

FOUNDATION LOOKING NORTH WEST

The Concrete Convention and Exposition
Planning Outputs

4 Key Engineering Interface Steps

1. Defining and Collaborating Work Breakdown Structure (WBS) With Project Stakeholders

4 Key Engineering Interface Steps

3. Constructability Assessment
   - Mix Designs
   - Detailing of Concrete Elements - Size
   - Reinforcing & Congestion
   - Simplification of Formwork
   - Other Value Engineering Submittals

4. Bringing BIM to the Field
   - Layout (Passing points, 2D CAD, 3D data imported to Collectors)
   - Robotic Total Stations
   - As-Built Conditions and Communication
Technology Tools for Rework Reduction

Mobility App – Connecting with the Workface, Reporting Events, Trending Events, Practice Improvement
Technology Tools for Real Time Productivity Reporting

11021 CAMP FRIEDLANDER SHELTR FNDN JTD
Feedback on items with weekly activity for payroll week ending 09/30/18

Overall JTD Labor Efficiency: 0%
JTD Cost/Hr: $.00 vs. $.00 target

Work Item: 985 T & M
985-001-00 2018 SHELTER FOUNDATIONS ()
JTD Efficiency: 0%. NO BUDGET
Budget: $0 JTD: $5,549 EAC: $5,549
VDC To Field Strategies
Baker’s VDC Content Generation Process

- S’s
- A’s
- EOS’s
- RFI’s
- Arch SK
- Struct SK
- Embeds

Baker VDC Translator

Correct Dims (LOD 400) and Total Station Data

Baker Dwg #1
Baker Dwg #2
Baker Dwg #3
Baker Dwg #X
Coordination Model+CAD
So What is Sweat Equity?

50 Years Above and Beyond the Call - Remarkable projects are made up of co-workers that have a sense that they are part of something much greater than themselves.

Glory belongs to the act of being constant to something greater than yourself, to a cause, to your principles, to the people on whom you rely and who rely on you in return.

Saturn

Frost Miami Science Center

Thyssen Krupp

John McCain

ExxonMobil Houston Campus

The Concrete Convention and Exposition
Sweat Equity Starts with Workforce – Current Condition

What will happen going forward?

- 11% workforce retirement (2018)
- 17% workforce retirement (2022)
- 28% workforce retirement (2027)
- 40% workforce retirement (2030)

- Enters Industry: New hire begins craft training
- Craft Training: ±4 years for minimal competency
- Journey-Level: Additional 3-5 years to become competent, productive & experienced
- Seasoned Professional: How long until journey-level workers are ready to replace retiring workers?

Source: Construction Industry Resources, LLC, 2018
Re-establish the Nation’s Commitment to the Equal Dignity of All Workers

“I believe in the dignity of labor...”

- John D. Rockefeller, 1941

The Concrete Convention and Exposition
Key Workforce Development Steps

1. Better Define Competencies by Co-worker Role
2. Leverage Existing and Continually Improve Knowledge Assets
3. Convert Knowledge Assets to Co-worker Role Specific Training Materials
4. Implement Training
5. Continually Assess, Update, and Improve
Always Remember
Concrete is hard work. We get paid to safely and productively form, place, and finish high quality concrete.

Key Leadership Values
1. Incident and Injury Free (IIF) Co-worker focus
2. Quality & Customer focus – “Expect More” mantra
3. SSQP- Safety, Schedule Quality & Productivity Mentality – Nothing less than 4 for 4
Respect and embrace technology, always strive for better planning, and remember that email has never pounded a single nail.