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Quality People. Quality Projects.

Lean Construction Results & Benefits at Messer Construction

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Messer
WeAreBuilding.

Messer Construction Company History

- Regional/Family-Owned Builder Founded in 1932
- ESOP 1990 (1 Office - $100M/yr Revenue)
- 2002 $400M/yr with 5 Offices
- 2009 $700M/yr with 8 Offices

Messer Construction Company Lean Conversion

- **2002 Lean Construction Institute & Last Planner System (LPS)**
- **Employee Ownership Mentality Drove Change (Not an owner request or mandate)**
- **Lean & LPS Fit Messer Personality**
  - Decentralized Planning
  - Flexibility
  - Leadership Driven & Supported

Messer Construction Company Lean Conversion – 1st Steps

- Create Roadmap for Change
- Pilot Project Successes
- Company-Wide Training Program

Messer Construction Company Lean Conversion – 1st Steps

Messer Advanced Planning Process (MAPP)
Implementation Matrix

	TEAM READY	1st SUCCESS	TEAM ENTRENCHED	CHANGE COMPANY BEHAVIOR
COMPELLING NARRATIVE	➢ Communicate the need to implement (benefits, predictability) ➢ Feedback from pilot projects – articulate value ➢ Inform Sr. Management group – create informational program - get Sr. Management buy in	➢ Educate project team – get buy in ➢ Sell possibilities and previous successes ➢ Communicate with owners – benefits and incentives ➢ Communicate to subcontractor executives	➢ Bring champions (successful teams)to sell process to new teams ➢ Communicate message – theory and possibilities	➢ Define how "Lean" integrates with other initiaves ➢ Customize Messer "MAPP" process ➢ "MAPP" becomes normal
SHOW BEHAVIOR	➢ Understand the process (educate yourself) ➢ Consistency / reliability must be in the process (inherent) ➢ Be an example (walk the talk) ➢ Observe other projects ➢ Develop a mind set	➢ Be involved in contractors meetings ➢ Critique the process ➢ Set time lines for meetings ➢ Observe other projects	➢ Ask subs for feed back (+/Δ) ➢ Make strategic adjustments to process or schedule ➢ Other teams observe / critique us ➢ Team displays positive attitude	➢ Sell it to subs ➢ Celebrate successes ➢ Advertise as a "Lean" project in bid documents ➢ Testimonials from subs ➢ Document lessons learned
COACH BEHAVIOR	➢ Share successes of pilot projects ➢ Identify what we are trying to accomplish (goals) ➢ Identify time commitments / identify what time it saves ➢ Train management (top/down) ➢ Identify a champion who can help train	➢ Provide consistent management support (clear path re: who to ask for help with process) ➢ Reinforce successes ➢ Identify individual responsibilities ➢ Executive level personal involvement to get participants involved and prepared	➢ Step back to review successes and failures ➢ Timely meetings and information reporting ➢ Review goals ➢ Have tough discussions with non-participants (subs or Messer) demonstrate success ➢ Look to optimize/customize forms	➢ Support the success of decentralized decision making ➢ Demo success and provide support ➢ Bring groups together – "Best Practices" meetings ➢ Have champions at all levels (officer to foreman)
PRODUCE ALIGNMENT	➢ Additional company training required (SPE's) ➢ Executive level commitment statement ➢ SPE guidance at beginning of project ➢ SPE's review successes / failures ➢ Team members must share and be open to change	➢ Independent audit at early stages of project ➢ Market VP to implement review ➢ Notify subcontractors of Messer's intent to implement	➢ Measure results and compare to other jobs ➢ On site project leader in charge of meetings ➢ Independent audits ➢ Market interim meetings to discuss process and share status report ➢ Determine why our jobs are different	➢ Completed team trains a beginning team ➢ Rewards / penalties ➢ Debrief at completion with all team members ➢ Compile summaries for all to read ➢ Interim company meetings to discuss process
CONTINUOUS IMPROVEMENT	➢ Share past successes (pilot projects) with PM's and SPE's ➢ Define criteria to measure – benchmarks established ➢ Set team incentives ➢ Share challenges and failures	➢ Provide executive level support where process is struggling ➢ Revisit criteria and adjust benchmarks (teams) ➢ Roundtable communication between groups (Prof. Dev.) to identify successes	➢ Revisit criteria and drop steps that add no value (definition of "Lean") ➢ Adjust commitments and schedule to reflect all parties working at maximum efficiency of team	➢ Rewards and recognition of team and subs as a group & individually ➢ Round table to share learnings ➢ Make part of annual review of employees

Messer Construction Company Lean Conversion – 1st Steps

- **3 Pilot Projects**
  - Teams that would succeed
  - Best Practices learned/shared
  - Create advocates within company (supported by leadership)
- **Key Learnings**
  - Schedules more reliable
  - Projects less congested (work where necessary)
  - Reduced manager stress

Messer Construction Company Lean Conversion – 1st Steps

- **Messer Training Project**
  - Session 1 What is Lean Construction & why is it important to Messer?
  - Session 2 How do we do Last Planner?
  - Session 3 Continuous Improvement & new concepts
- **Format**
  - Messer Senior Managers as teachers
  - Messer created curriculum
  - Three ½ day sessions – 1 month between classes

Messer Training

- **Session 1 What is Lean Construction & why is it important to Messer?**
  - Airplane Game
  - Review Pre-Reading Assignments
    - Center of Excellence – Intro to Lean Construction
    - Center of Excellence – Last Planner – Reliable Promises & Linguistics
  - Present Results of Pre-Reading Assignments
  - In-Class Reading Assignments
  - Context Discussion
  - Field Assignment # 1 and +/△
    - Observing Commitments

Messer Training

- **Session 2 How do we do Last Planner?**
  - Review Field Assignment # 1 Findings
  - Present Results to the Class
  - Video Presentation – Cincinnati PM Meetings
    - Last Planner – “Mock” Weekly Work Planning Meeting
  - Review Pre-Reading Assignments
    - Center of Excellence – Last Planner
      - LCI Paper – A Guide to the Last Planner
    - Center of Excellence
      - LCI Paper – Reverse Phase Scheduling
  - Present Results of Pre-Reading Assignments to Class
  - Review Forms and Examples
  - Field Assignment #2 and +/△
    - Observe Weekly Work Planning Meeting

Messer Training

- **Session 3 Where do we go from here?**
  - Review Field Assignment # 2 Findings
  - Present Results to the Class
  - Review Pre-Reading Assignments
    - Center of Excellence – Uncertainty Theory
    - Center of Excellence – Contracting Guidelines
  - Present Results of Pre-Reading Assignments to Class
  - Mastery Presentation/Discussion
  - Advanced Lean Opportunities/Discussion
  - Field Assignment # 3 and +/△

Messer Construction Company
Lean – Next Steps

- **Convert Lean Manufacturing Ideas to Construction**
  - 1st Run Studies
  - 5s Project Sites
  - Increased Visualization
  - Daily Huddles
- **Building Information Modeling**
- **Integrated Project Delivery**
- **Pre-Fabrication & Modularization**

Lean Construction Results & Benefits

- **Site Leaders**
  - A repeatable process that provides site leaders a way to succeed – accountability
  - Less workers on site, less conflicts to resolve, less stress
  - More time for planning – less time required to solve problems
  - Increased job satisfaction – less burnout

Lean Construction Results & Benefits

- **Subcontractors**
  - More “say” in the plan
  - Peer pressure of subs causes performance, better commitment, better coordination
  - Better results (asking for LPS on other projects)

Lean Construction Results & Benefits

- **Owners (Cost Plus Projects)**

  &

- **Contractors (Lump Sum Projects)**
  - Impacts to Cost/Quality/Safety & Schedule
    - Schedule Reliability
    - Safety Results through Accountability & Daily Huddles
    - Quality through Exterior Commissioning
    - Cost Performance
      - Specific Examples

Lean Construction Results & Benefits

- **Last Planner System**

Cincinnati Financial Center Cost Savings

Column Construction:	***Tower # 1***	***Tower # 2***	***Tower # 3***	***Total Savings***
Total Cost of Round Cols. Form/Pour with Inflation Adjustment	N/A	$222,385	$266,135	
Number of Round Cols.	496	494	654	
Cost Per Round Cols.	N/A	$450.17/Column	$406.93/Column	**$28,280**
Wall Construction:				
Total Cost of 8'-16' (15") Conc. Wall - Form/Pour with Inflation Adjustment	N/A	$356,781	$713,399	
Total lineal footage of 8'-16' (15") Concrete Wall	N/A	1,499lf	5,075lf	
Cost Per If (15") wall	N/A	$238.01/lf	$140.57/lf	**$494,500**
			Total	***$522,780***

Lean Construction Results & Benefits

- **Last Planner System**

  Cincinnati Financial Center Schedule Savings

Frame Production	Tower # 1	Tower # 2	Tower # 3	Total Savings
Square Feet of Frame	357,450sf	361,920sf	485,350sf	
Days to Finish	151 days	156 days	161 days	
Square Feet Per Day	2,367sf/day	2,371sf/day	3,015sf/day	44 work days

Lean Construction Results & Benefits

- **Last Planner System**

Cincinnati Financial Center

Schedule Related Cost Savings

Tower Crane Rental	$22,500	Buck Hoist Rental (2 months)	$12,500
Tower Crane Operator	$12,000	Buck Hoist Operator (2 months)	$8,500
Winter Heat	$51,000	Winter Heat (sys on before winter '07)	$40,000
Concrete Additives/Hot Water Charges	$2,000	Temp Electric Saved (Perm Systems on)	$12,000
Messer Direct Work Equipment Rental	$20,000	Messer Direct Work Equipment Rental	$15,000
Admin. (Layout Eng. Released Early)	$11,000	Trailer related GC's	$25,000
		Admin. (Released Staff Early)	$125,000
Total Estimated Cost Savings:	***$118,500***		***$238,000***

Total Cost Savings $356,500

Lean Construction Results & Benefits

- **First Run Studies**

Xavier University – Learning Commons

Meva formwork, 32’ high walls

- Initial wall pour – 69 sf/hr
- Wall pours after implementing improvements – avg 98 sf/hr
- 42% Improvement

Gates formwork , 14’ high walls

- Initial wall pour – 69 sf/hr
- Wall pours after implementing improvements – avg 80.5 sf/hr
- 17% Improvement

Lean Construction Results & Benefits

- **First Run Studies**

  Xavier University – College of Business

  Gates formwork, 15' high walls

  - Initial wall pour – 75 sf/hr
  - Wall pours after implementing improvements – avg 87.5 sf/hr
  - 16% Improvement

  Norton Brownsboro Hospital

  Total Accessory Installation

  - Initial installation – 18 rooms/week
  - After implementing improvements Week 2 – 23 rooms/week
  - After implementing improvements Week 3 – 27 rooms/week
  - 28% Improvement Week 1-2
  - 17% Improvement Week 2-3

Lean Construction Results & Benefits

- **First Run Studies**

  Xavier University – Central Utility Plant

  Meva formwork, 21' high walls

  - Initial wall pour – 13.23 sf/mh
  - Wall pours after implementing improvements – avg 14.07 sf/mh
  - 6% Improvement

  IU Incubator Building

  Door Frame Installation

  - Initial installation – 1 Door Frame every 13 minutes
  - After implementing improvements – 1 Door Frame every 10 minutes
  - 30% Improvement