Instructor Orientation

Unit 7: Problem-solving Principles and Tools
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Webinar Learning Objectives

Following this webinar, participants will have the ability to:

- Discuss AGC’s Lean Construction Education Program.
- Explain the Unit 7 course learning objectives.
- Identify the target course audience and how to adapt the course to fit a wide range of participants.
- Recognize qualifications of a Unit 7 instructor and understand the approval process.
- Identify the topics covered in the course and key instructional design elements.
- Deliver the activities and discussions included in the course.
Instructor Qualifications

Instructors must have:

• Have applied lean problem-solving principles and tools on a construction project, and have used the tools to solve problems in a lean manner as part of a cross-functional team.

• Experience with forms of waste, including how to identify and reduce them at both the field and management levels.
Instructor Approval Process

• Prior to approval, potential instructors must:
  – Review the entire instructor’s guide.
  – View this instructor orientation webinar.
  – Submit qualifications forms and bio to AGC of America.

• Once approved, applicants will be notified and their name will be included on the national list of approved instructors.

• Applications can be found at: http://www.agc.org/cs/lcep/instructor_resources
Additional Materials

• In addition to an LCD projector, screen, power cords, laptop computer, laser pointer and flipchart, instructors will need the following materials in order to complete the activities in Problem-solving Principles and Tools:
• A marker for each participant.
• Enough large sheets of paper (flipchart size works best) for recording participant responses and capturing topics participants request to be covered.
• Balls for Lean Ball Game (Approximately 50 balls)
• At least three A3 forms for each participant for note-taking and the A3 activity in Session 3.
Icon Key

A number of symbols are used throughout the course to indicate:

- Activity
- Animation on slide
- Discussion
- Learning objectives
- Note
- Questions to ask the class
- Review from a previous course
- Time allocated
## Today’s Course Schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
<th>Topic/Activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>8:00 – 8:15 a.m.</td>
<td>–</td>
<td>Welcome and Orientation</td>
</tr>
<tr>
<td>8:15 – 10:30 a.m.</td>
<td>1</td>
<td>Team Problem Solving</td>
</tr>
<tr>
<td>10:30 – 10:45 a.m.</td>
<td>–</td>
<td>Break</td>
</tr>
<tr>
<td>10:45 – 12:30 p.m.</td>
<td>2</td>
<td>Lean Construction Problem Solving Tools</td>
</tr>
<tr>
<td>12:30 – 1:30 p.m.</td>
<td>–</td>
<td>Lunch</td>
</tr>
<tr>
<td>1:30 – 3:00 p.m.</td>
<td>3</td>
<td>Using the Tools</td>
</tr>
<tr>
<td>3:00 – 3:15 p.m.</td>
<td>–</td>
<td>Break</td>
</tr>
<tr>
<td>3:15 – 4:20 p.m.</td>
<td>3 - Activity</td>
<td>A3 Creation, Review of other Tools</td>
</tr>
<tr>
<td>4:20 – 4:35 p.m.</td>
<td>–</td>
<td>Unit 7 Summary and Closing Activities</td>
</tr>
</tbody>
</table>
Session 1 Learning Objectives

Following this session, you will be able to:

• Define the difference between traditional and lean problem solving.
• Describe how to create a team environment to solve problems.
• Explain how to create trust to avoid problems.
• Describe Observation Walks.
• Identify root causes of problems.
Traditional Problem Solving

- Ready
- Fire
- Aim
Lean Problem Solving Model

Know What Questions to Ask
Understand What is of Value
Virtual Construction
Lean Project Delivery
Employee Development
Observe Walks
Office Procedures

Implement Solution and Review

Problem Solving Culture

Continuous Improvement

Figure 1.2 Image courtesy of the Lean Construction Institute, www.leanconstruction.org
Using Trust
Observation Walk

Efficient & Effective Work

Project Environment

Corporate Culture

Crews

Project Leaders

Company Executives & Support Staff

Work Face

Resource Management

Information

Tools

Materials

Space

People

Equipment

Figure 1.3
Brainstorming Causes

• Identify as many potential causes as possible.
• Use the hints provided.
  – Ideas recorded.
  – Quantity of ideas.
  – No discussion or judgment.
  – No one opposes outright.
Session 2 Learning Objectives

Following this session, you will be able to:

- Explain how to use the Plan-Do-Check-Act methodology.
- Explain how to define problems.
- Identify the use of the 5 Whys for root cause analysis.
Define the Problem

- Obtain history of problem.
- Observe process where problem is occurring (Observation Walk).
- Identify place in process where problem originates.
Root Cause Analysis: 5 Whys

Why did the auto accident happen?
One Possible Explanation

1. Why was there a rear-end collision?
   A: Snow-covered road
2. Why did the snow on the road cause the accident?
   A: The tires skid on slippery snow
3. Why did the tires skid?
   A: The anti-lock brakes didn’t work right
4. Why didn’t the anti-lock brakes work right?
   A: Hit brakes too fast
5. Why did the driver hit the brakes so fast?
   A: Driving too close for the conditions
Root Cause Analysis: 5 Whys

- **Why?** Wasn’t the drywall installed in room 101?
- **Why?** Elec./Comm. conduit not completed.
- **Why?** Wasn’t the conduit installed?
- **Why?** Did not have material needed to complete work.
- **Why?** Wasn’t the material available?
- **Why?** Open RFI regarding a discrepancy in plans/specs.
- **Why?** Did the RFI remain open?
- **Why?** Were materials ordered late?
- **Why?** Materials ordered late.
- **Why?** RFI submitted late, lack of urgency.

Figure 2.1
First Run Studies
Plan – Do – Check – Act
Lean Ball Game Instructions

• You are all on the same team.
• The ball must travel through the air.
• No ball can go to the person next to you on either side.
• The starting point is also the finish.
• Each round is 2 minutes.
• Brainstorming time between rounds is 1 minute.
• We will complete 5 rounds
Debrief

• What happened?
• Which round felt best, why?
• Were you able to get into a flow/rhythm?
• How were you able to apply PDCA?
PDCA in Practice

• What problem can you focus on?

• Determine:
  - Where we are.
  - Where we need to be.
  - How will we close this gap.

• Identify potential solutions.
Session 3 Learning Objectives

Following this session, you will be able to:

• Explain how to use problem solving tools:
  – Value Stream Mapping.
  – Spaghetti Diagram.
  – Pareto Charts.
  – Fishbone diagram.
  – Brainstorming.
  – A3.

• Complete an A3.
Value Stream Mapping (VSM)

- Creates a one-page picture of all company processes.
- Depicts flow of information and material.
- Shows value-added and non-value added (waste) process steps to help streamline.
  - Note: Figures 3.1 and 3.2 at the back of the Participant’s Manual so they could be seen at full page size.
Spaghetti Diagrams

- Track path of person/product.
- Identify travel distances between key process steps.

![Spaghetti Diagram](image-url)
Pareto Chart

Reasons Why Planned Work is Not Done

Figure 3.5

Image courtesy of the Lean Construction Institute, www.leanconstruction.org
Fishbone Diagram

- People
- Assessment
- Material
- Problem or Desired Solution
- Space
- Equipment
- Methods

Figure 3.7
A3 Overview

• A3 Definition
• A3 Process
• A3 Standard Format
• A3 Questions
• A3 Problem Solving Thinking
A3 Process

A3 standard process:

• Makes easier to
  – Engage others.
  – Understand others.

• Encourages communication.

• Develops thinking problem-solvers.
A3 Process

- Links problems ➔ countermeasures.
- Serves as organizational learning tool.
- Effective countermeasures and solutions based on facts/data.
- Encourages PDCA (Plan➔Do➔Check➔Act).
Creating Problem Statements

• Problem Statement = What is happening
  – The pipes are leaking

• Goal Statement = What should be happening
  – The pipes don’t leak
<table>
<thead>
<tr>
<th>Title: What are you talking about?</th>
<th>Owner / Date</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>BACKGROUND (1)</strong></td>
<td></td>
</tr>
<tr>
<td>Why are you talking about it?</td>
<td></td>
</tr>
</tbody>
</table>

| **CURRENT CONDITIONS (2)** | |
| Where do things stand today? | |
| * Show visually using charts, graphs, drawings, maps, etc | |
| What is the problem? | |

| **GOALS / TARGET (3)** | |
| What specific outcomes are required? | |

| **ANALYSIS (4)** | |
| What is the root cause(s) of the problem? | |
| * Choose the simplest problem-analysis tool that clearly shows the cause-and-effect relationship | |

| **COUNTERMEASURES (5)** | |
| 1. What is your proposal to reach the future state, the target condition? | |
| 2. How will your recommended countermeasures affect the root cause to achieve the target? | |

| **PLAN (6)** | |
| 1. What activities will be required for implementation and who will be responsible for what and when? | |
| 2. What are the indicators of performance or progress? | |
| * Incorporate a chart or diagram that shows actions/outcomes, timeline, & responsibilities. May include details on specific means of implementation (schedule). | |

| **FOLLOW-UP (7)** | |
| What issues can be anticipated? | |
| * Ensure ongoing PDCA | |
| * Capture & share learning | |
NO-HUB Installation & Testing Procedures 2010 (2009)

Background
- No-Hub testing was taking longer than the manufacturer said testing should take.
- Testers were finding leaks in all No-Hub systems checked with air.
- Installers were using different installation practices at various sites.
- Testers were using different processes at various sites.
- Manufacturer states testing with air is not recommended.
- Testers are required to secure the system with wire before air testing.

Current Condition

No Hub Test Failure Rate First Attempt

<table>
<thead>
<tr>
<th>Cause of First Test Failure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Failed</td>
</tr>
<tr>
<td>Failed</td>
</tr>
</tbody>
</table>

Goals
- Improve First Test Pass Rate To 80% by March 2010.
- Reduce Band Failure To 10% Of Tests by March 2010.

Root Cause Analysis

- Wrong Torque
- Improper Positioning
- Check For Cracks
- Poor Equipment
- Drill Torque to High
- Test Ball Leak
- Cracked Test Equipment
- No Standard Procedure
- Cracked Pipe
- Cracked Fitting
- Pipe Irregularities
- Thin Tub
- High Humidity
- Multiple Methods
- No Set Standard MPI
- Material
- Method

Proposed Countermeasures

<table>
<thead>
<tr>
<th>Suspected Cause</th>
<th>Action Item</th>
<th>Responsible</th>
<th>Result by January 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Pinched Bands</td>
<td>Incorrect Installation</td>
<td>Use proper tighten procedure</td>
<td>Installer</td>
</tr>
<tr>
<td>2 Bad Seal Bands</td>
<td>Pipe Irregularities</td>
<td>Check pipe for variance or tar</td>
<td>Installer</td>
</tr>
<tr>
<td>3a Incorrect Alignment</td>
<td>Incorrect Installation</td>
<td>Check Hanger heights</td>
<td>Installer</td>
</tr>
<tr>
<td>3b Incorrect Alignment</td>
<td>Pipe Irregularities</td>
<td>Rotate re-install, grind high spot</td>
<td>Installer</td>
</tr>
<tr>
<td>4 Damaged Material</td>
<td>Trade Misconduct</td>
<td>Raise concern with foreman</td>
<td>Installer</td>
</tr>
<tr>
<td>5 Cracked Pipe</td>
<td>Manufacturer Issue</td>
<td>Tap with hammer listen for tone</td>
<td>Installer</td>
</tr>
<tr>
<td>6 Cracked Fitting</td>
<td>Manufacturer Issue</td>
<td>Tap with hammer listen for tone</td>
<td>Installer</td>
</tr>
<tr>
<td>7 Tar bumps on end</td>
<td>Manufacturer Issue</td>
<td>File smooth</td>
<td>Installer</td>
</tr>
<tr>
<td>8 Test Ball Leak</td>
<td>Incorrect Installation</td>
<td>Check test ball after installation</td>
<td>Tester</td>
</tr>
<tr>
<td>9 Test Gauge leak</td>
<td>Equipment failure</td>
<td>Check test equipment</td>
<td>Tester</td>
</tr>
</tbody>
</table>

Plan
- Test the use of a chuck assembly for No Hub installation & testing. Shop tested successfully; Field test failed (installers said they had to hand tighten all fittings); will redo field test with better supervision. April 2010
- Sent a chuck assembly from vendor. Waiting until next No-Hub project.

Follow Up Actions
- Waiting for next No-Hub project to retest May 2010.
Lean Instructor Resources Page

Resources and guidance are provided here to help Lean Construction Education Program instructors and understand the instructor approval process and their responsibilities in delivering training.

- All instructors must be approved by AGC of America to facilitate each Lean Construction Education Program unit separately prior to delivering that unit.
  - Following approval instructors will receive a letter acknowledging their approval and have their name placed on the instructor roster that is distributed to AGC Chapters and other training institutions.
- Each requirements form must be submitted with a copy of your most recent biographical sketch and curriculum vitae, highlighting your Lean Construction experience to AGC of America at curriculum@agc.org or fax it to (703) 837-5402 for approval.
  - Unit 1: Variation in Production Systems - Instructor Requirements
  - Unit 2: Pull in Production - Instructor Requirements
  - Unit 3: Lean Workstructuring - Instructor Requirements
  - Unit 4: The Last Planner® System - Instructor Requirements
  - Unit 5: Lean Supply Chain and Delivery - Instructor Requirements
  - Unit 6: Lean Design and Pre-Construction - Instructor Requirements
  - Unit 7: Problem-Solving Principles and Tools - Instructor Requirements

- Instructor Orientations. As part of the approval process all potential instructors are required to view the Instructor Orientation for that unit.
  - Unit 1: Variation in Production Systems - Instructor Orientation
  - Unit 2: Pull in Production - Instructor Orientation
  - Unit 3: Lean Workstructuring - Instructor Orientation
  - Unit 4: The Last Planner® System - Instructor Orientation
  - Unit 5: Lean Supply Chain and Assembly - Instructor Orientation
  - Unit 6: Lean Design and Pre-Construction - Instructor Orientation

Resources:
Blank A3 for LCEP Unit 7
Participants Complete A3

• Title.

• Complete Boxes 1 - 7

• Share their A3 with their neighbor.
A3 Detail

**Title / Theme:**

- What changes or improvements are you talking about?
A3 Detail

Background (1):

• What are you talking about & why?
• Purpose: What is business reason?
Current Conditions (2):

- Where do things stand now?
- What is problem or need, gap?
- What is happening vs. needs to happen?
- **State the problem in one concise statement.**
A3 Detail

Goals / Target (3):

- What specific outcome required?
- What specific improvement needed?
- Must be measurable.
A3 Detail

Analysis (4):

• Why problem exists?
• What indicates gap, need exists?
• What prevents goals?
• Use simple problem solving tools.
Countermeasures (5):

- Must fix root cause (Box 4).
- Must address gaps and improve.
- Compare effectiveness.
- Which option recommended and why.
Plan (6): (A Construction Schedule)

• Specifically, how implement?
  – What.
  – Who.
  – When.
  – Constraints.
A3 Detail

Follow-Up (7)

- Apply PDC A.
- Focus on continuous improvement.
- Share learning.
Closing Activities

• Plus/delta review.

• Please fill out your *Unit 7: Problem-solving Principles and Tools* Participant’s Registration Form.
  - Submit this form to your instructor or mail it in yourself (with your instructor’s signature) to AGC of America.
  - This signed form must be received for you to obtain credit for attending this course.

• Be sure to go online and fill out the course evaluation at [www.agc.org/LCEP/Evaluations](http://www.agc.org/LCEP/Evaluations).
Questions?

• Contact AGC of America at curriculum@agc.org for further information.

• *Lean Design and Pre-construction* participant’s manuals and instructor’s guides are available for purchase at [http://store.agc.org/](http://store.agc.org/) now.

• Visit [http://agcleanforum.org/](http://agcleanforum.org/) for more information about the AGC Lean Forum and its resources.