Lean Construction Institute
Immersive Education Program

Introduction to the Last Planner System®

George Zettel, Turner Construction Co.

gzettel@tcco.com

Nishel'le Dickerson, Turner Construction Co.

ndickerson@tcco.com

October 18, 2022

INTRODUCTIONS

Introductions

1. Name
2. Company
3. Role
4. City & State you spent High School Days In

Lean Construction Institute
Immersive Education Program

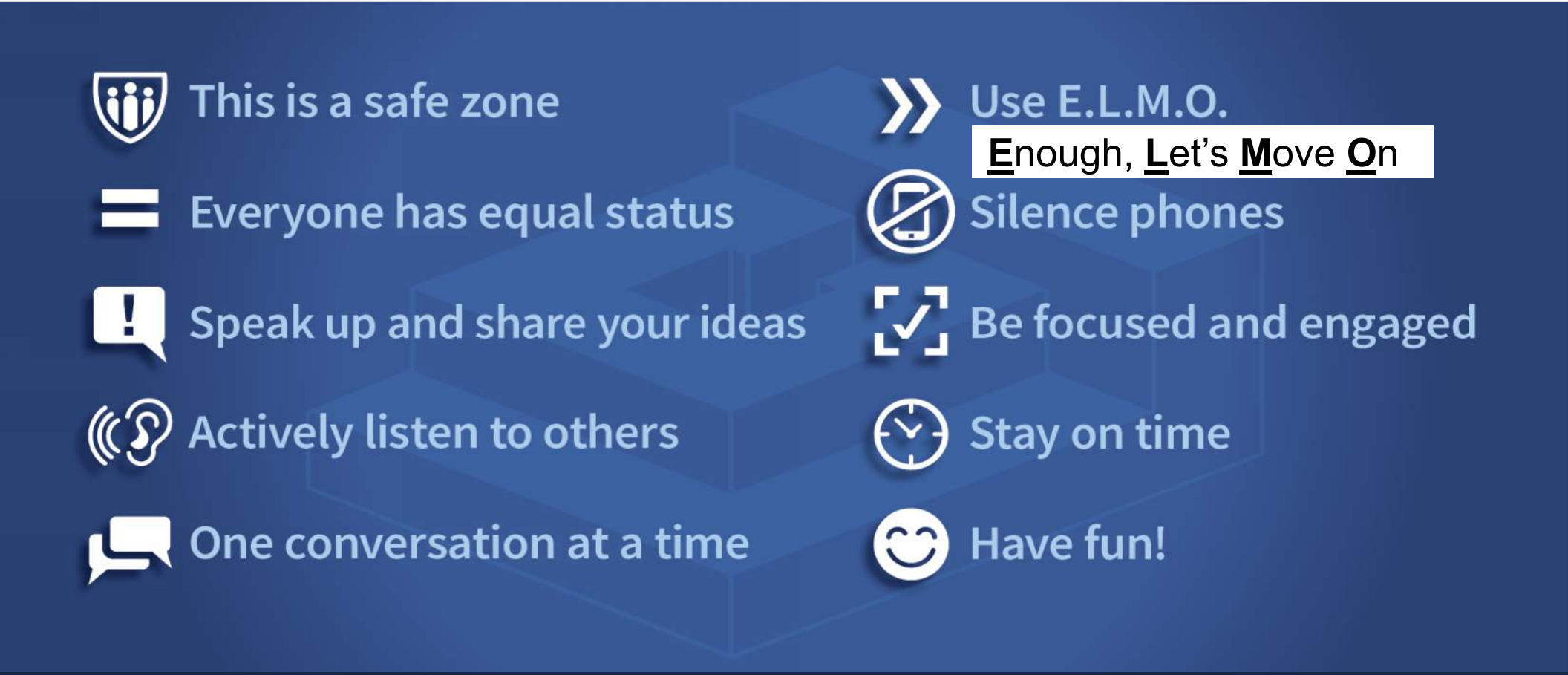
LCI Course:
Introduction to Last Planner System®
4 CEU

Sign the sign-in sheet for credit

AIA Approved Continuing Education

Lean Construction Institute
Immersive Education Program

Rules of Engagement



Learning Objectives

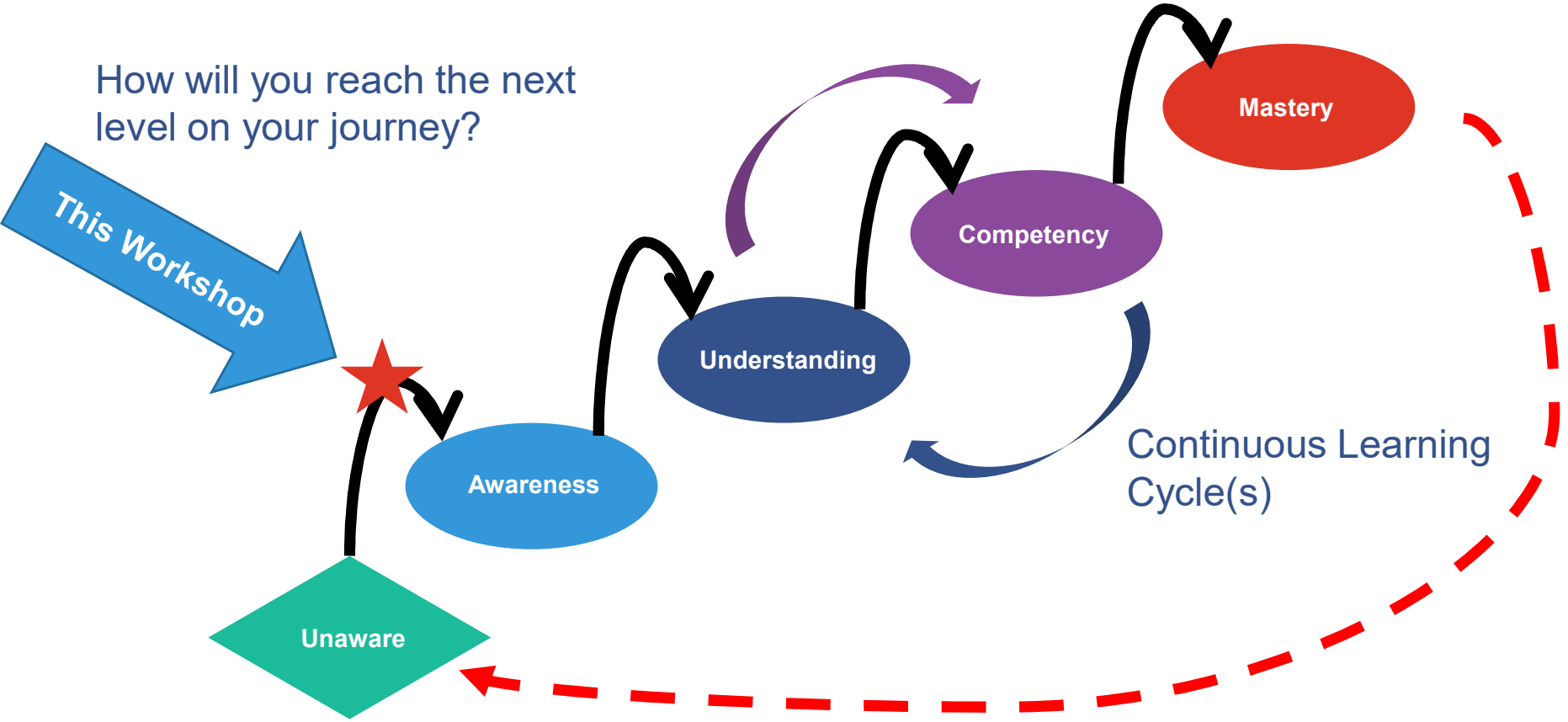
Lean Construction Institute
Immersive Education Program

- Recognize the need for predictability on projects and how LPS creates more predictable outcomes.
- Gain an overview understanding of each of the five connected planning conversations of LPS and how they interrelate.
- Discover the basic mechanics of LPS including the foundational base of reliable commitments.
- Understand the need for continuous learning and for measuring reliability to improve predictability.

Lean Journey to Mastery

Lean Construction Institute
Immersive Education Program

How will you reach the next level on your journey?

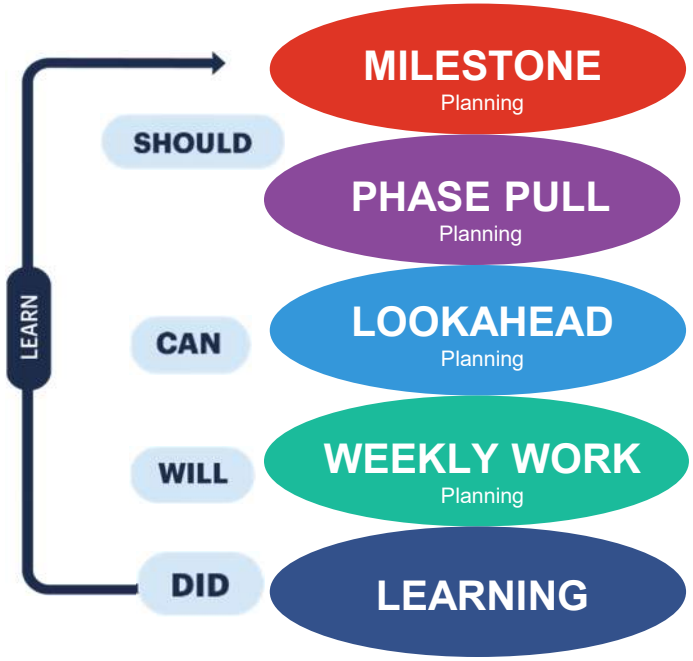


Learning Overview

Lean Construction Institute
Immersive Education Program

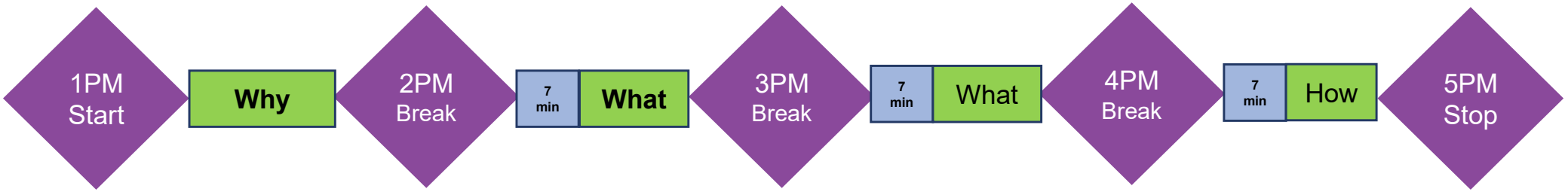
1. Why Last Planner System
2. LPS Overview
3. Milestone Planning
4. Phase Pull Planning
5. Lookahead Planning
6. Weekly Work Planning
7. Learning

5 Connected Conversations



Work Plan – Guideline Agenda

Lean Construction Institute
Immersive Education Program



7 minute breaks – Breaks will have a visual timer measured from the time coach dismisses to break and the time coach restarts topic.

Discussion Question

Lean Construction Institute
Immersive Education Program

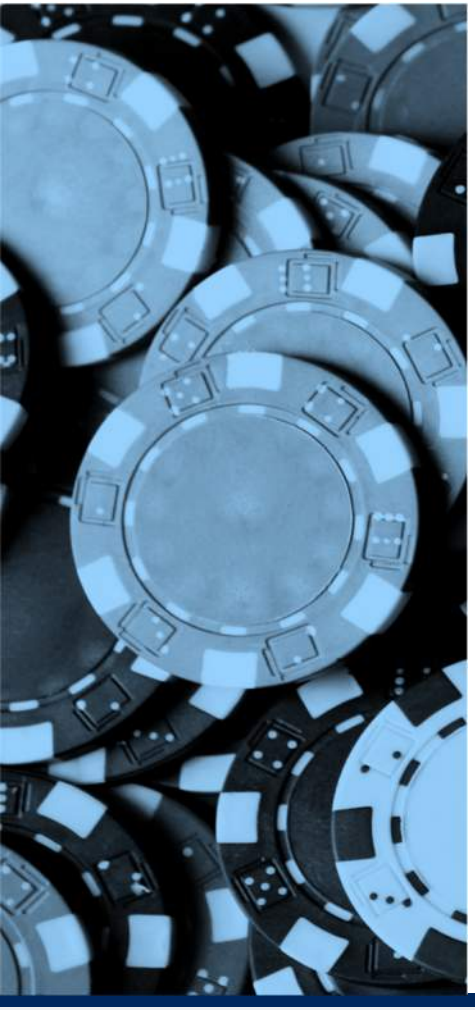
What are your dissatisfactions with the way projects are currently planned?

Large Group Discussion 5 min

Lean Construction Institute
Immersive Education Program

Parade of Trades

Workflow: The Parade of Trades Exercise



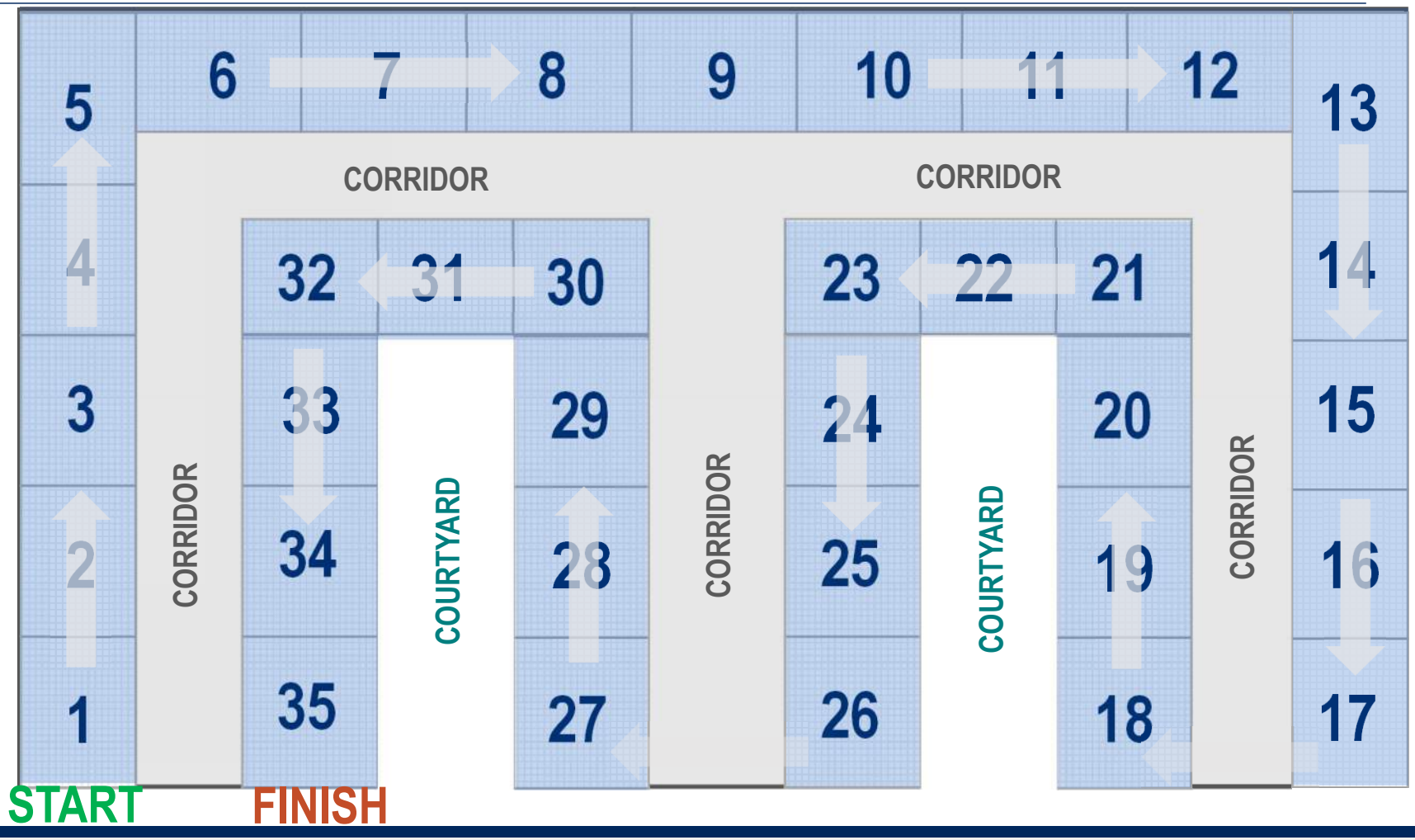
Parade of Trades is a simulation to illustrate what is more important for advancing our work the most efficiently, smoothly, and safely with the highest productivity and highest quality.

What is more important on your project?

Point speed
Pushing each party on the project to go as fast as they can on each task

System reliability
Planning the work so that every handoff happens as it was promised

Scope of Work: 35 Classroom School Fit Out



Parade of Trades

Lean Construction Institute
Immersive Education Program

01. The building has 35 rooms.

02. There are seven trades.

03. Each trade has work in every room.

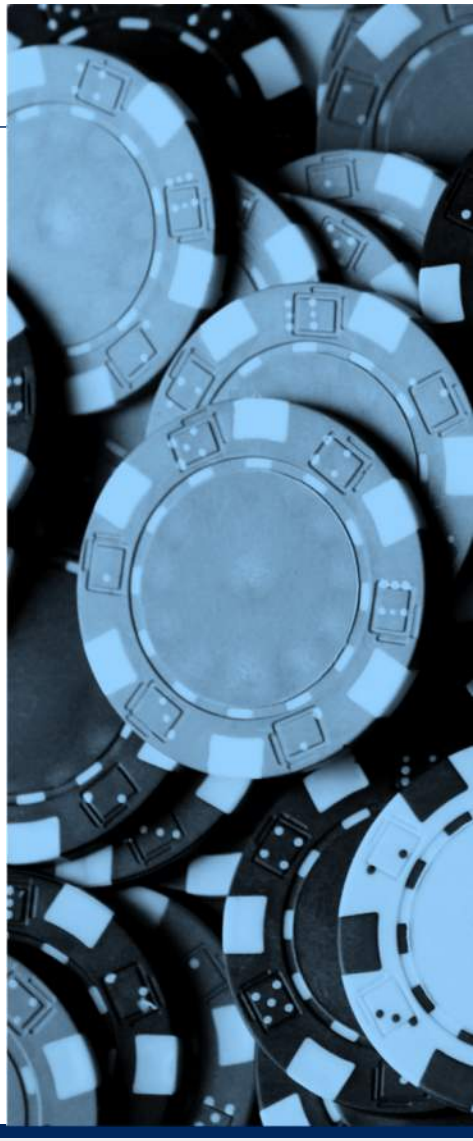
04. The work must be done in sequence, with each trade only able to work on those rooms that have been given to them by the previous trade.

05. The trades mobilize to the site one week apart.

Parade of Trades - Rules

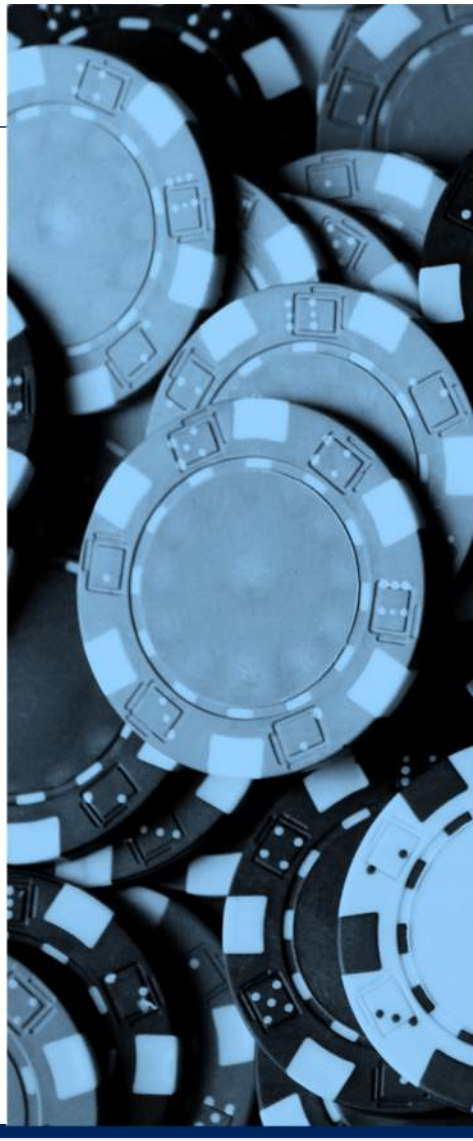
Rules:

1. Each chip represents one classroom. (There are 35 chips at the starting block.)
2. You roll the “die” to advance work to the next trade in line.
3. One roll equals one week’s worth of work.
4. Each dot on the “die” represents one unit (classroom).
5. The cost to complete one unit is $1K.



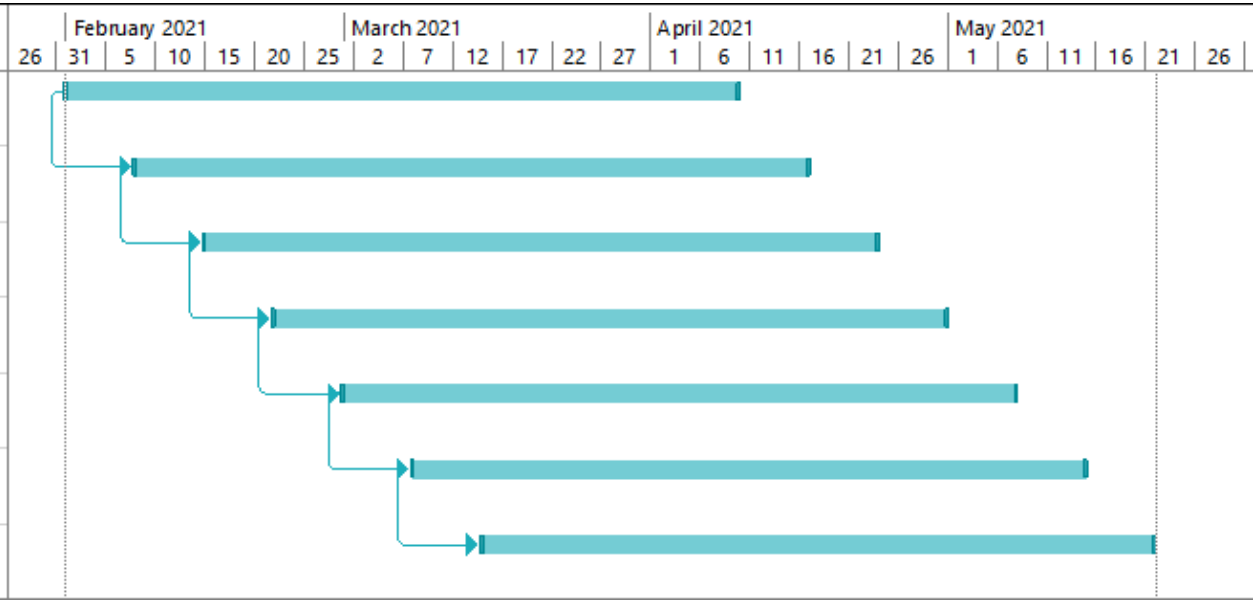
Scope of Work: In a Perfect World

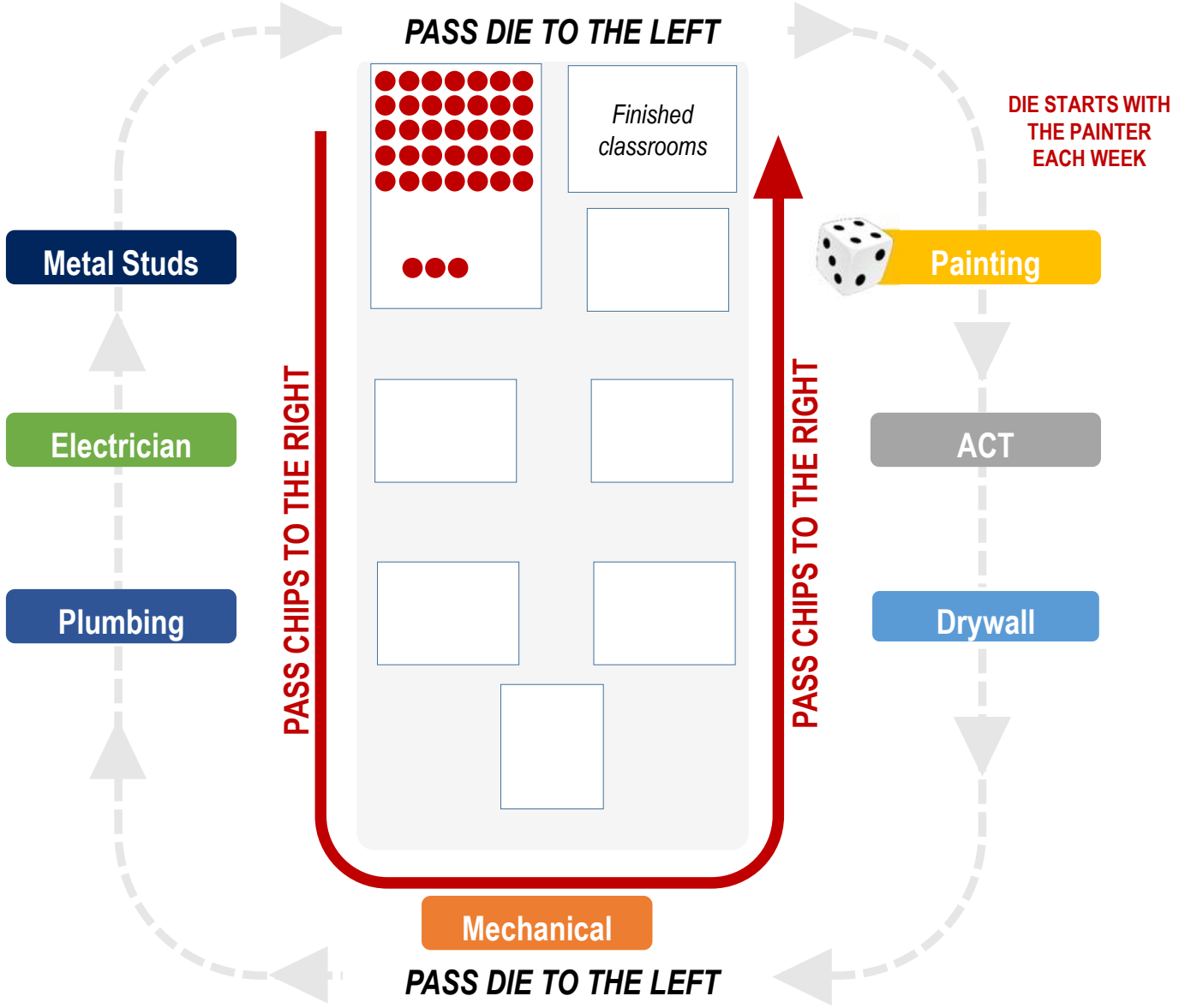
- What is the average roll on a die? (Your average capacity for a given week.)
  - 1+2+3+4+5+6 = 21 / 6 = **3.5 classrooms/week**
- How many weeks will it take each trade to finish their work in 35 classrooms?
  - 35 classrooms / 3.5 average classrooms per week = **10 weeks**
- How many weeks will it take all seven trades to finish 35 classrooms?
  - Trade one takes 10 weeks. The second trade should finish one week later (week 11), etc. **The seventh station finishes on Week 16.**



The Parade of Trades Workflow: Master Schedule

ID	Task Name	Duration	Start	Finish
1	Metal Studs/Insulation	50 days	2/1	4/9
2	Electrical	50 days	2/8	4/16
3	Plumbing	50 days	2/15	4/23
4	Mechancial	50 days	2/22	4/30
5	Gyp Board/Tape	50 days	3/1	5/7
6	ACT	50 days	3/8	5/14
7	Paint	50 days	3/15	5/21

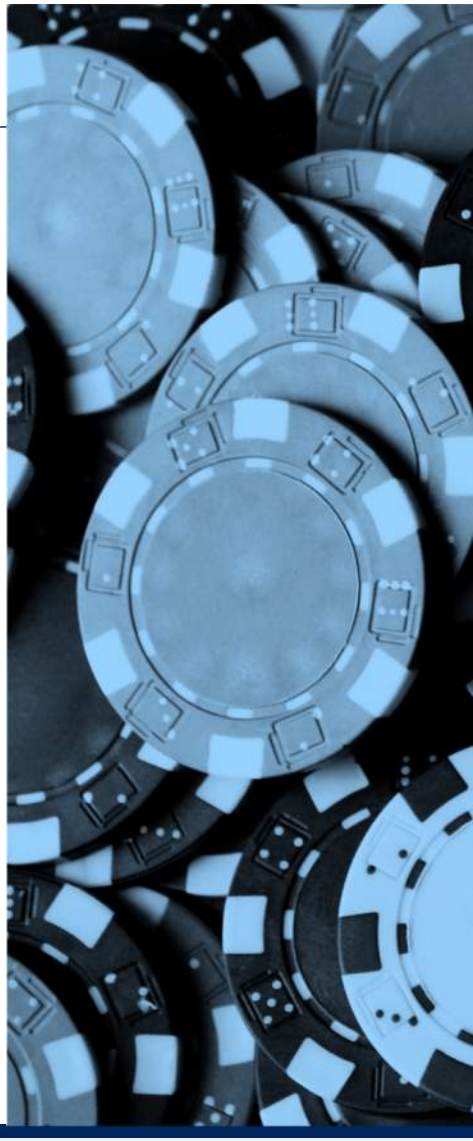



PASS DIE TO THE LEFT
Finished classrooms
DIE STARTS WITH THE PAINTER EACH WEEK
Metal Studs
Painting
Electrician
ACT
Plumbing
Drywall
PASS CHIPS TO THE RIGHT
PASS CHIPS TO THE RIGHT
Mechanical
PASS DIE TO THE LEFT

Scope of Work: In a Perfect World

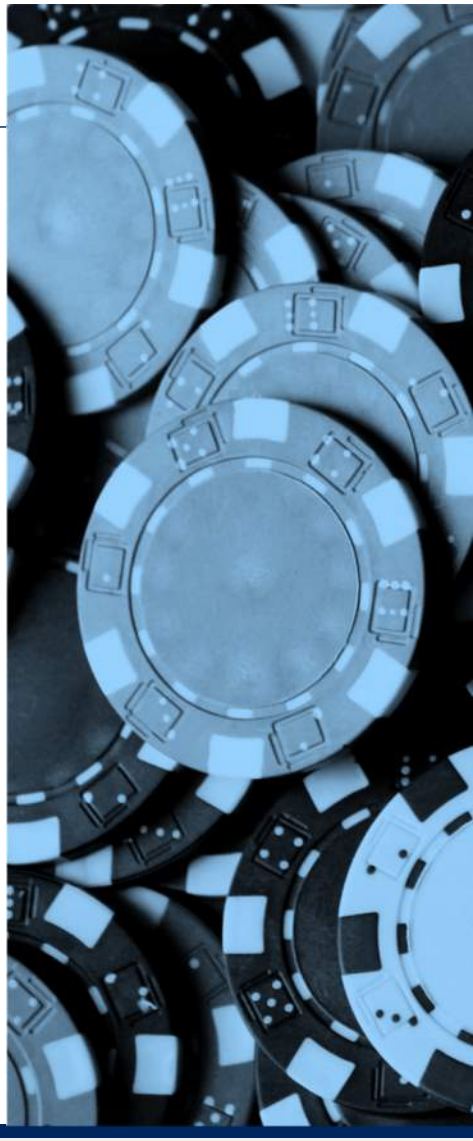
What Would You Bid?

- Ideally, how much capacity, or the sum of every trades' die rolls, is needed to finish?
  - Each trade completes an average of 3.5 rooms per week.
  - Each trade completes their work in 10 weeks.
  - Seven trades will each be working 10 weeks.
  - 3.5 roll x 10 weeks x seven trade = **245**
- If it costs us $1K per unit (classroom) x 245 = $245K, what would you add for profit?
  - Let's just say 15%.
  - Fifteen percent would be $37K + $245K = **$282,000.**



Scorecard

- Look at your scorecard and notice that it starts on the week you first show up to do the work.
  - For example, the “Plumbing” trade starts work on week 3, so plumbing does not have a week 1 or 2 on the scorecard. Therefore, they do not roll on weeks 1 and 2.
- For the first 7 weeks, your station number is the same as the number of the week in which you make your first roll.
  - Station 1: Metal Studs/Insulation starts rolling and rolls first in Week 1.
  - Station 2: Electrical starts rolling and rolls first in Week 2.
  - Station 3: Plumbing starts rolling and rolls first in Week 3.



Each Trade's First Week Onsite

Trade	Week 1	Week 2	Week 3	Week 4	Week 5	Week 6	Week 7
Metal Studs	First Roll	Roll	Roll	Roll	Roll	Roll	Roll
Electrical	No Roll	First Roll	Roll	Roll	Roll	Roll	Roll
Plumbing	No Roll	No Roll	First Roll	Roll	Roll	Roll	Roll
Mechanical	No Roll	No Roll	No Roll	First Roll	Roll	Roll	Roll
Drywall	No Roll	No Roll	No Roll	No Roll	First Roll	Roll	Roll
ACT	No Roll	No Roll	No Roll	No Roll	No Roll	First Roll	Roll
Paint	No Roll	No Roll	No Roll	No Roll	No Roll	No Roll	First Roll

PARADE OF TRADES

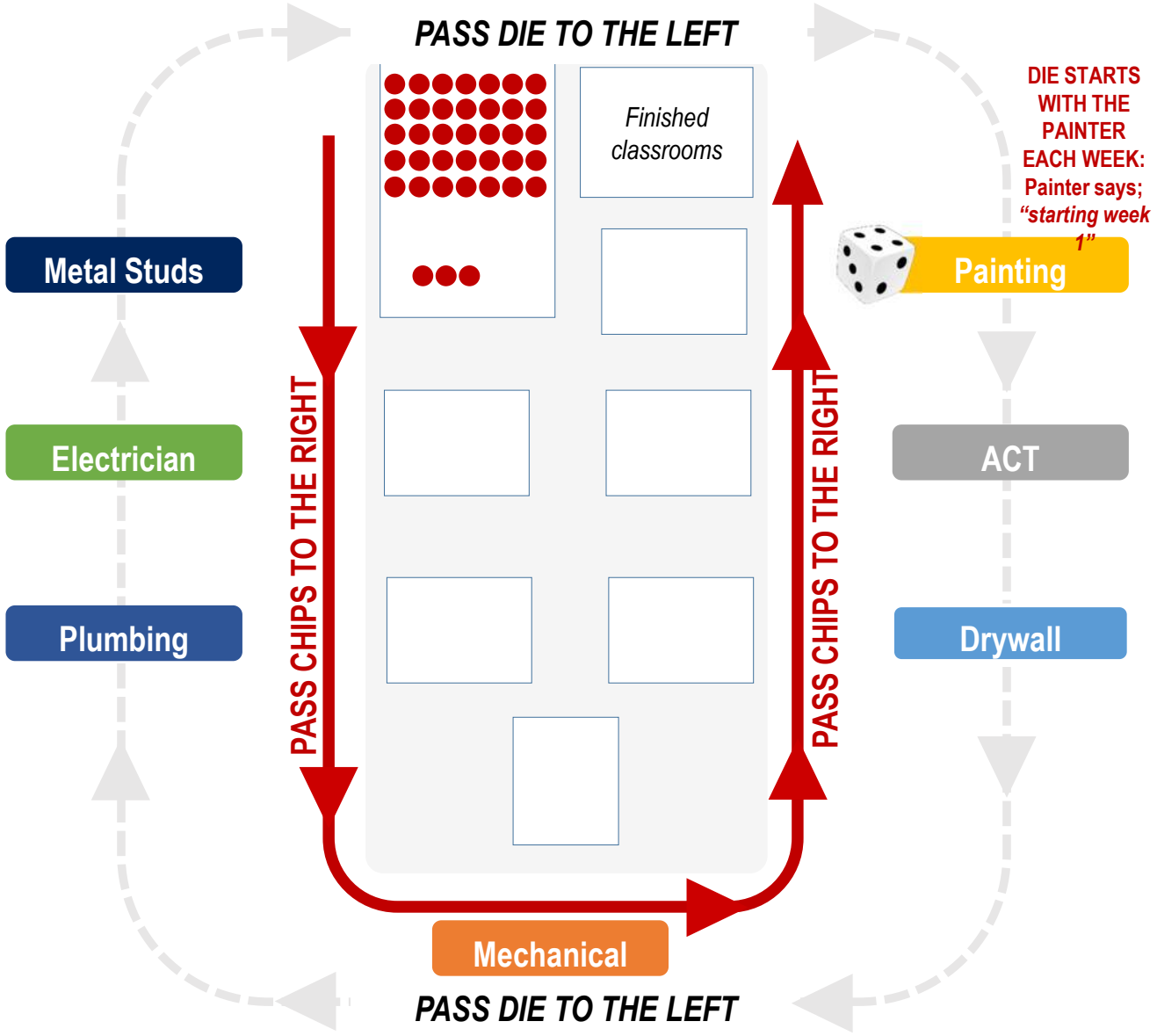
WEEK:

1

TRADE:

Metal Studs

ROLL:



Filling Out the Trade Scorecard
Example for Week 1: Metal Studs/Insulation

Metal Studs

35

"Available" Work

Week	A Capacity B	Passed	C Remaining inventory
	Number on die you rolled	*Number of chips you can pass*	*Available chips minus chips passed*
1	3	3 *35 minus 3 = 32*	32
2			

A. Capacity: the number of classrooms your crew could complete in that week
B. Passed: the number of classrooms you completed in the given week and made ready for the next trade
C. Remaining inventory: the number of classrooms you were not able to complete in that week

PARADE OF TRADES

WEEK:

2

TRADE:

Electrician

ROLL:

PASS DIE TO THE LEFT

DIE STARTS WITH THE PAINTER EACH WEEK

Finished classrooms

Metal Studs

Electrician

Plumbing

PASS CHIPS TO THE RIGHT

PASS CHIPS TO THE RIGHT

Painting

ACT

Drywall

Mechanical

PASS DIE TO THE LEFT

Filling Out the Trade Scorecard
Example for Week 2: Electrical

Electrical

3*

"Available" Work

** 3 came from Metal Studs done week #1*

Week	A Capacity B	Passed	C Remaining inventory
	Number on die you rolled	*Number of chips you can pass*	*Available chips minus chips passed*
1	*No roll*	*pass the*	*die left*
2	2	2	*3 minus 2 = 1* 1

A. Capacity: the number of classrooms your crew could complete in that week
B. Passed: the number of classrooms you completed in the given week and made ready for the next trade
C. Remaining inventory: the number of classrooms you were not able to complete in that week

PARADE OF TRADES

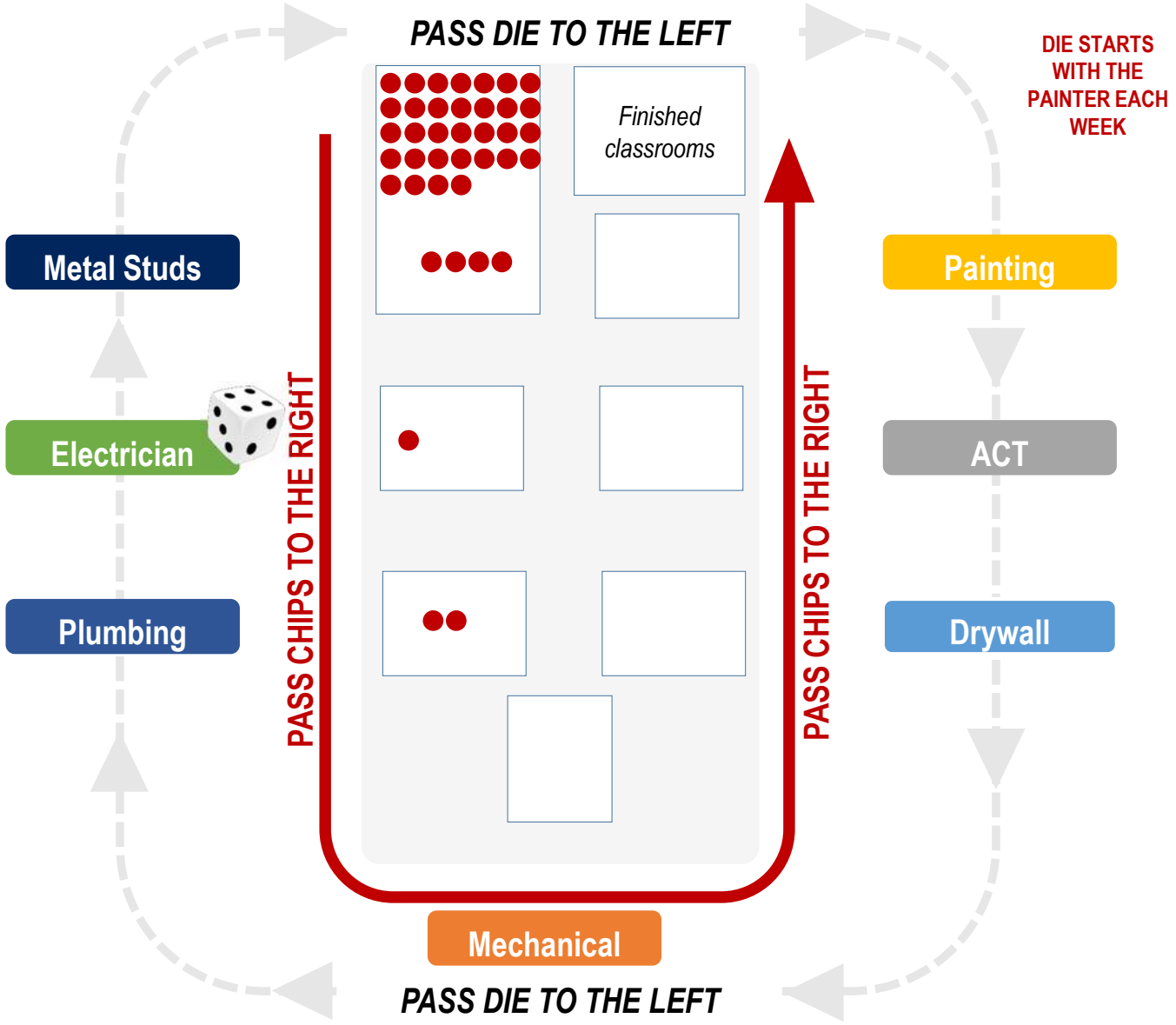
WEEK:

2

TRADE:

Metal Studs

ROLL:



Filling Out the Trade Scorecard
Example for Week 2: Metal Studs/Insulation

Metal Studs

32

"Available" Work

Week	A Capacity	B Passed	C Remaining inventory
	Number on die you rolled	*Number of chips you can pass*	*Available chips minus chips passed*
1	3	3	32
2	4	4	*32 minus 4 = 28* 28

A. Capacity: the number of classrooms your crew could complete in that week
B. Passed: the number of classrooms you completed in the given week and made ready for the next trade
C. Remaining inventory: the number of classrooms you were not able to complete in that week

PARADE OF TRADES

WEEK:

3

TRADE:

Plumbing

ROLL:

PASS DIE TO THE LEFT

Finished classrooms

PAINTER SAYS: *"Starting week 3"*

Metal Studs

Painting

Electrician

ACT

Plumbing

Drywall

PASS CHIPS TO THE RIGHT

PASS CHIPS TO THE RIGHT

Mechanical

PASS DIE TO THE LEFT

Execute the Work: Filling Out the Trade Scorecard
Example for Week 3: Plumbing

What happens if you roll more than the number of chips you have available?

Plumbing

2*

"Available" Work

*2 came from Electrical week # 2

Week #	*A* Capacity	*B* Passed	Remaining Incoming Inventory
	Number on die you rolled	*Number of chips you can pass*	*Available chips minus chips passed*
1	*No roll*	*pass the*	*die left*
2	*No roll*	*pass the*	*die left*
3	5	2	*2 minus 2 = 0* 0

Round One: Go Slow at First!

- Your coach will help you fill in the scorecard correctly.
- Each box and each column must be filled in with a number.
- Follow your coach's directions.

START ROLLING!!

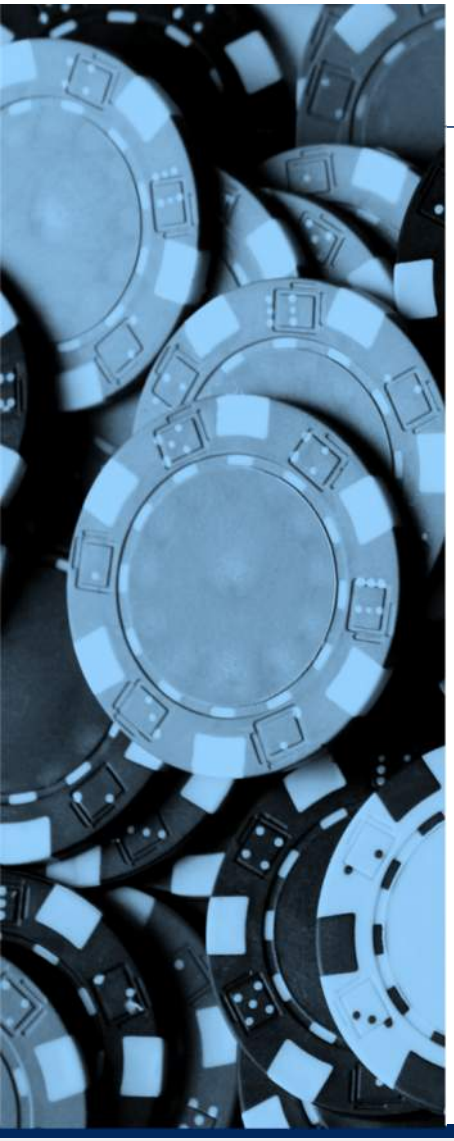
ROLE PLAYING – Biggest Pile of Chips

1. At this point, who has the most chips waiting to pass at your table?
2. How many chips does this person have and which trade are they?
3. Ask for a volunteer to play the role of the superintendent
   - You can see this trade has a big pile of classrooms that need to be worked on and they are not making any progress.
   - As a superintendent, what would you tell this trade that they must do to catch up?
   - *Instructor record the things a Superintendent would say*

Round One: Go Slow at First!

- Roll until all the chips are in the painter's done pile.

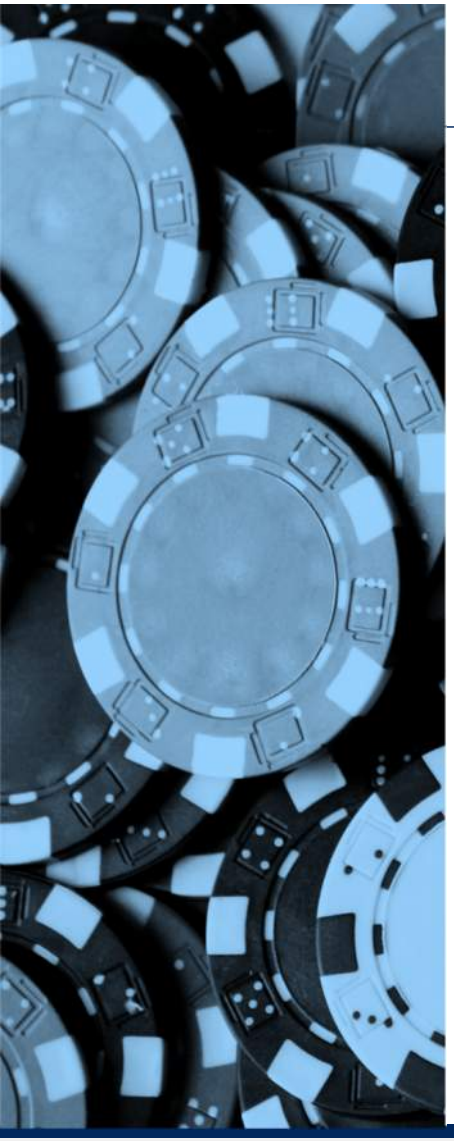
CONTINUE ROLLING!!



Final Results: Round One

1. Did we finish on time?
   A. Complete all classrooms by week 16 per our baseline schedule.
2. Did we make money?
   A. Our team's ideal capacity was 245. total of 7 trades average roll
   B. We bid $282 K ($1,000 per dot on die + 15% profit).
   C. What was your profit or was there a loss?
3. Did anyone win?
4. What, or who was the problem?

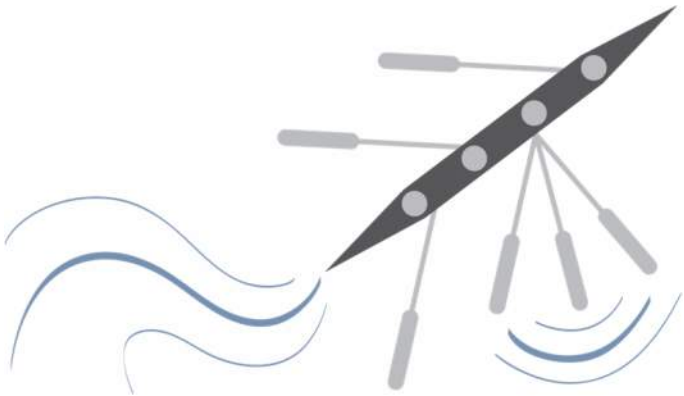
BREAK - 7 minutes



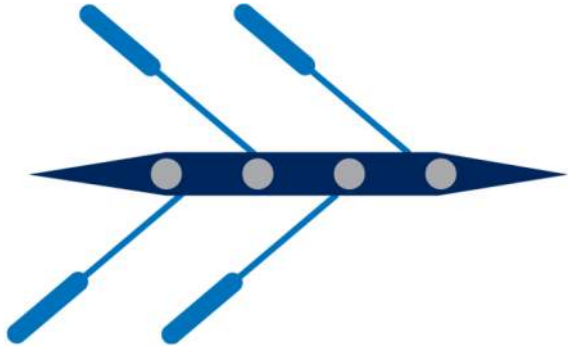
Execute the Work: Final Results: Round One

- Which boat are we in this round - the boat on the left or on the right?

Individual Efficiency
= Sub-optimization



System Efficiency
= Optimal Value Stream Performance



"Slow is Smooth. Smooth is ***Fast***"

Round Two: Experiment to Improve The Results

- Keeping the average of the die the same, how might we modify the die, so we roll to reduce variance?

CURRENT DIE

1 + 2 + 3 + 4 + 5 + 6 = 21 / 6 = 3.5 avg. roll

ROUND 2 DIE

3 + 3 + 3 + 4 + 4 + 4 = 21 / 6 = 3.5 avg. roll

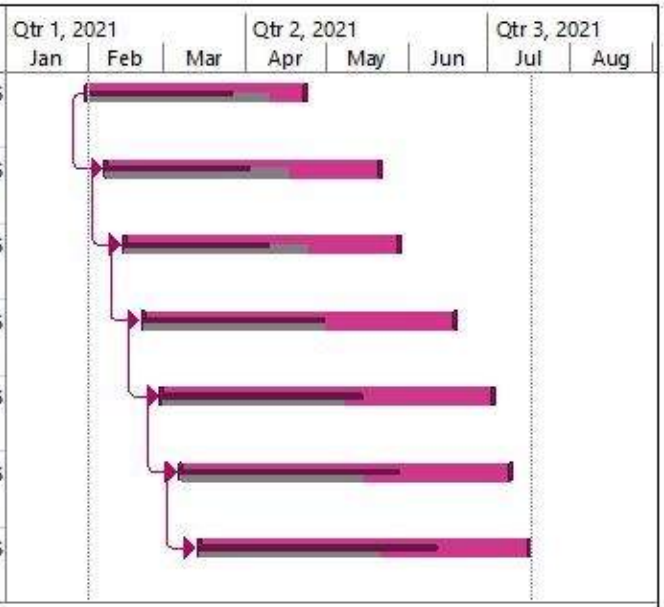
- To continue with ROUND 2, we will only roll 3s and 4s
  - Every time you roll a 1, 2, or 3 it will be logged as a 3.
  - Every time you roll a 4, 5, or 6 it will be logged as a 4.

The roles for Round 2 are changed and are shown on the Miro Board

Final Results: Round Two

- Did we finish on time?

ID	Task Name	Start	Finish	Baseline Start	Baseline Finish	Start Var.	Finish Var.
1	Metal Studs/Insulation	2/1	4/23	2/1	4/9	0 days	10 days
2	Electrical	2/8	5/21	2/8	4/16	0 days	25 days
3	Plumbing	2/15	5/28	2/15	4/23	0 days	25 days
4	Mechancial	2/22	6/18	2/22	4/30	0 days	35 days
5	Gyp Board/Tape	3/1	7/2	3/1	5/7	0 days	40 days
6	ACT	3/8	7/9	3/8	5/14	0 days	40 days
7	Paint	3/15	7/16	3/15	5/21	0 days	40 days



This is the actual results comparing the baseline schedule to actual results of Round 1 during the 9/15/2021 lean workshop

REFLECTION

1. Which die do you think best represents how our jobs are typically run: round 1 or 2?
2. Which die would you rather use: round 1 or 2?
3. Which die is more likely to have a safety issue: round 1 or 2? Why?
4. Which die is more likely to have quality issues: round 1 or 2?
5. Can we have all four business fundamentals?
6. When we had a pile of classrooms available, the superintendent made some suggestions/requests. Which die did the we give to the trade with the biggest pile of backlog: Round 1 die? Or round 2 die?
7. Is GC superintendent the only one that must focus on managing work in a way that the job is rolling 3's & 4's

Six Tenets of Lean

Lean Construction Institute
Immersive Education Program

1. Respect for people
2. Optimize the Whole
3. Generate Value
4. Eliminate Waste
5. Focus on Flow
6. Continuous Improvement

Last Planner System Trademark

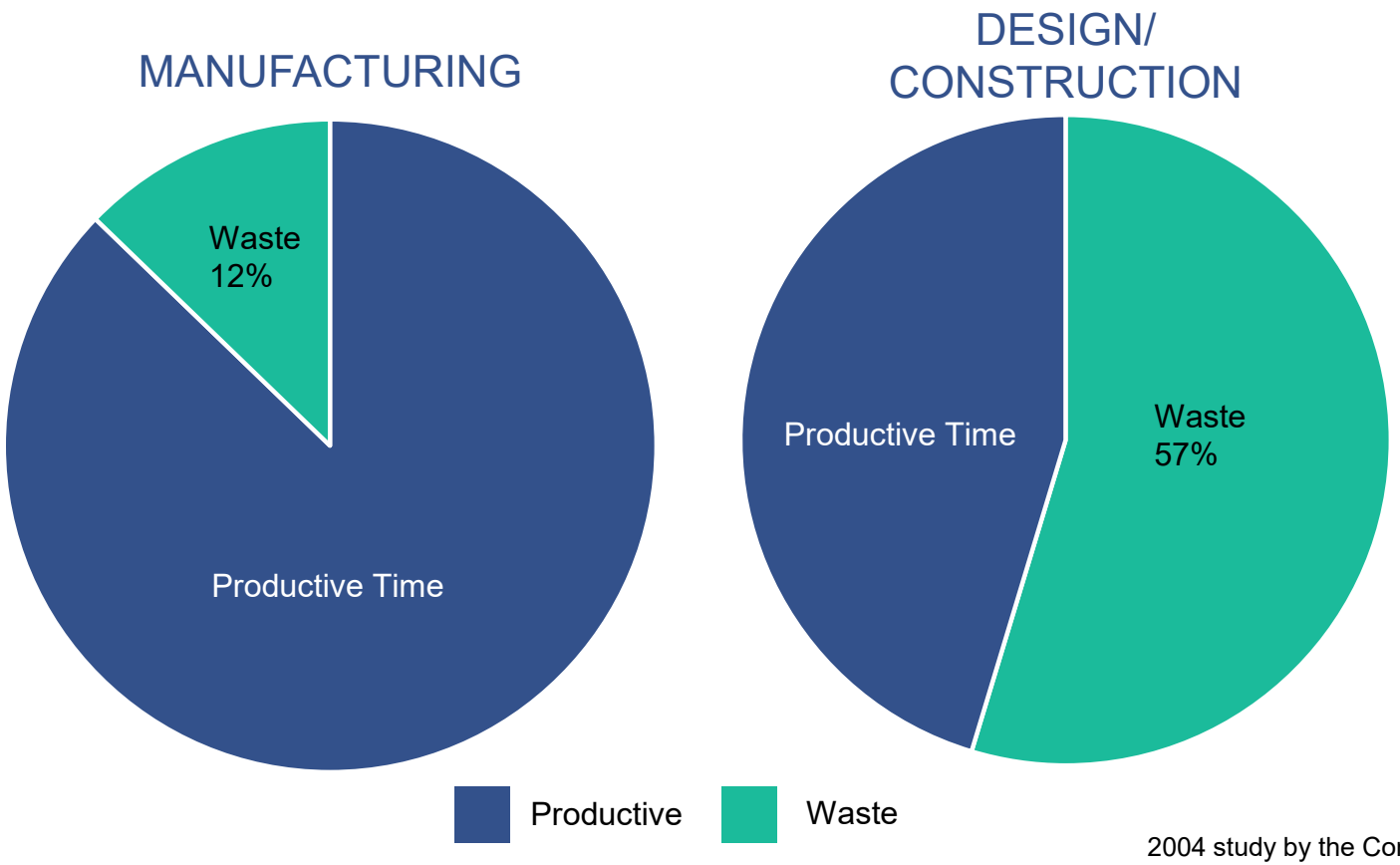
Lean Construction Institute
Immersive Education Program

The Last Planner System® is a registered trademark of the *Lean Construction Institute*:

- Last Planner System®
- LPS®
- Last Planner® (In reference to the person not the system)

The Opportunity…

Lean Construction Institute
Immersive Education Program

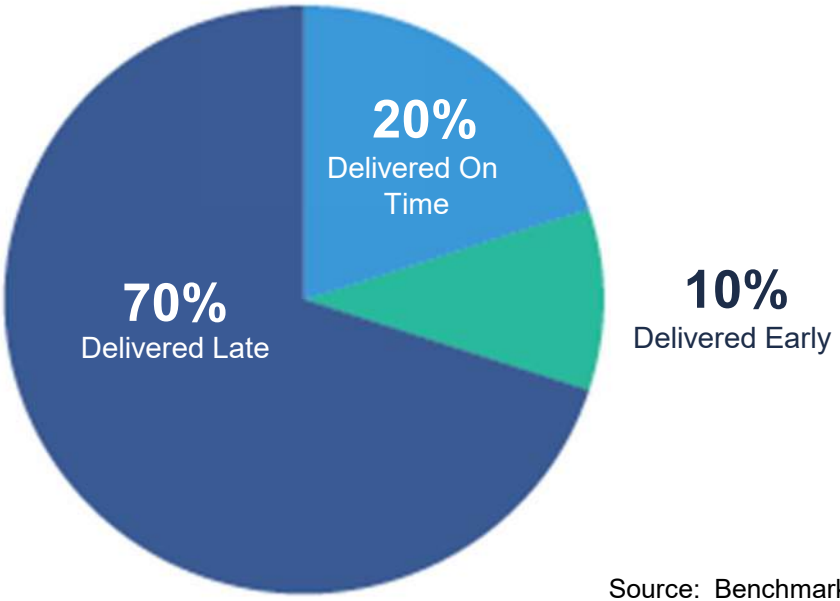


2004 study by the Construction Industry Institute

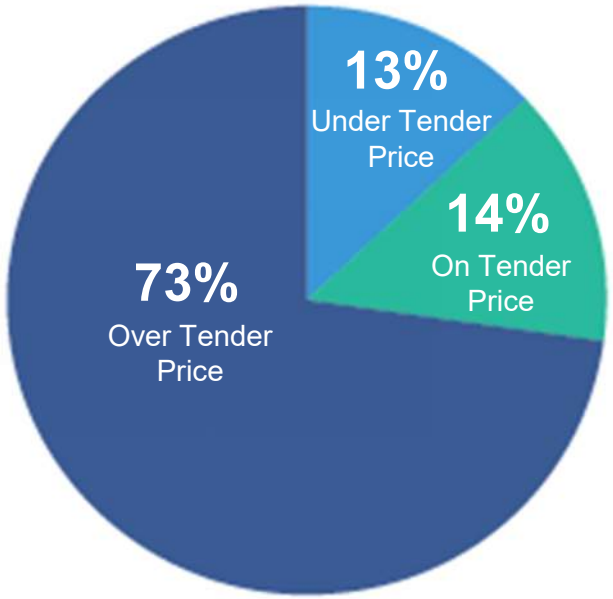
Why Use Last Planner System?

Lean Construction Institute
Immersive Education Program

Time —
70% were delivered late



Cost —
73% were over budget



Source: Benchmarking the Government Client Stage Two Study December 1999

Discussion Question

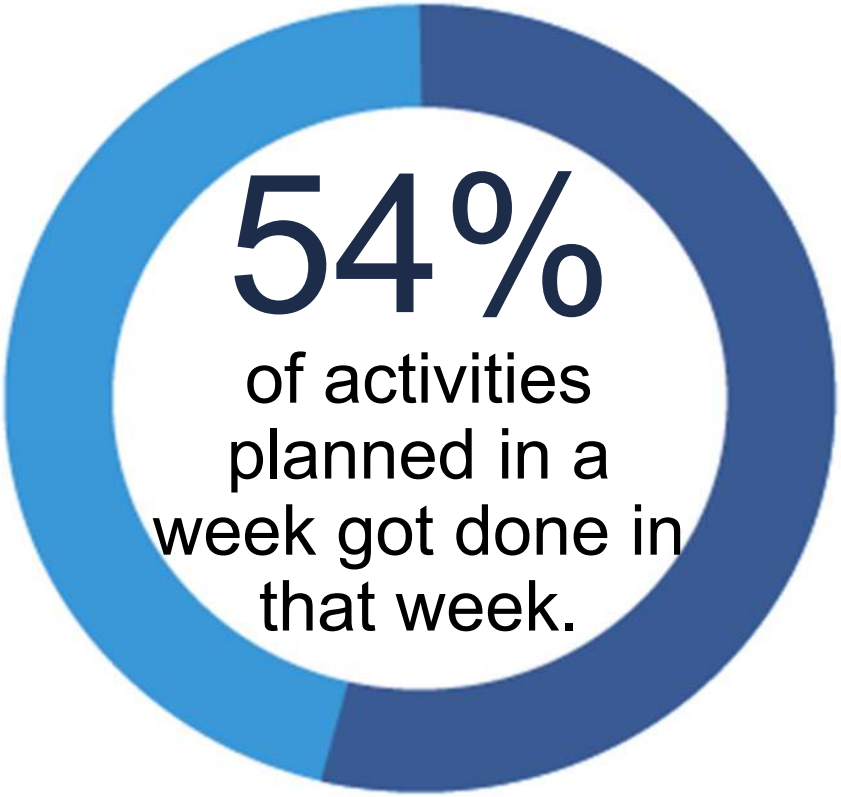
Lean Construction Institute
Immersive Education Program

If this group promised to finish 10 tasks on specific days next week, how many tasks would finish on the day promised?

- ALL 10 tasks
- 8 tasks
- 6 tasks
- 5 tasks
- 4 tasks
- 3 or less

Brief History of LPS – How reliable are we?

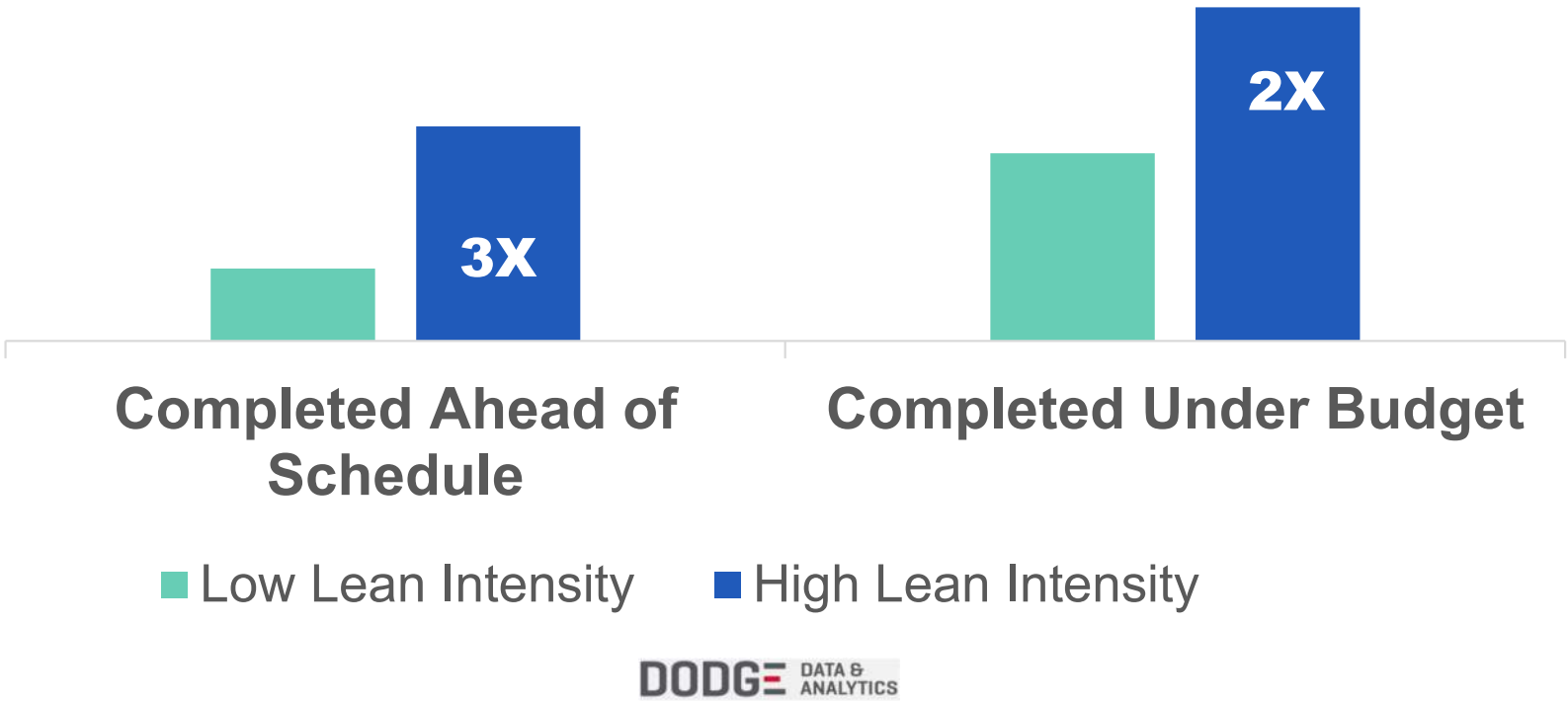
Lean Construction Institute
Immersive Education Program



Correlation of Lean

Lean Construction Institute
Immersive Education Program

Correlation of Lean intensity to outcomes (% likelihood on best projects)



DODGE DATA & ANALYTICS

BREAK - 7 minutes

Workflow and Risk

Lean Construction Institute
Immersive Education Program

1. Workflow losses are real, lead to adversarial relations, and are difficult to quantify, so…
2. Everyone protects themselves by adding contingency and/or holding back labor to keep utilization high.
3. This further reduces workflow predictability and increases project risk
4. By their/our actions, we increase that risk and shift it along.

Last Planner System Defined

Lean Construction Institute
Immersive Education Program

- Production planning system
- Predictable work flow
- Rapid learning in
- Programming, design, construction and commissioning of projects.

Why Status Quo Isn't Working

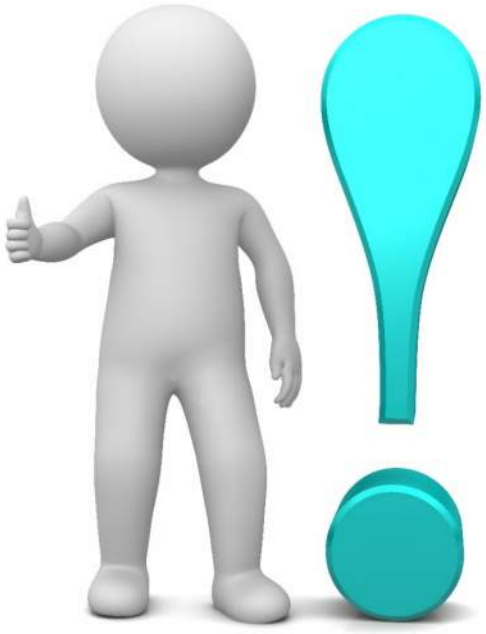
Lean Construction Institute
Immersive Education Program

1. Traditional planning systems are unable to produce a predictable workflow.
2. Workflow reliability directly affects system speed and cost.
3. All plans are forecasts, all forecasts are wrong.
   - The further in advance, the more wrong.
   - The more detail, the more wrong.

Benefits

Lean Construction Institute
Immersive Education Program

1. Improves communication & reliability.
2. Fosters an enjoyable environment, trust, and collaboration.
3. Promotes early stakeholder engagement.
4. Improves visibility of the project plan (transparency).
5. Creates team alignment.
6. Rapid learning through metrics, revealing areas for improvement.
7. Improves planning in both design & construction phases.



Consider the Project As A Promise

Lean Construction Institute
Immersive Education Program

- All groups can be viewed as operating as a *network of promises* or commitments, whether done well or poorly.
- The goal is *improving the quality* of commitments and to *actively take responsibility* for managing them.
- LPS is a planning system based on developing a *network of promises*, then delivering on the commitments.

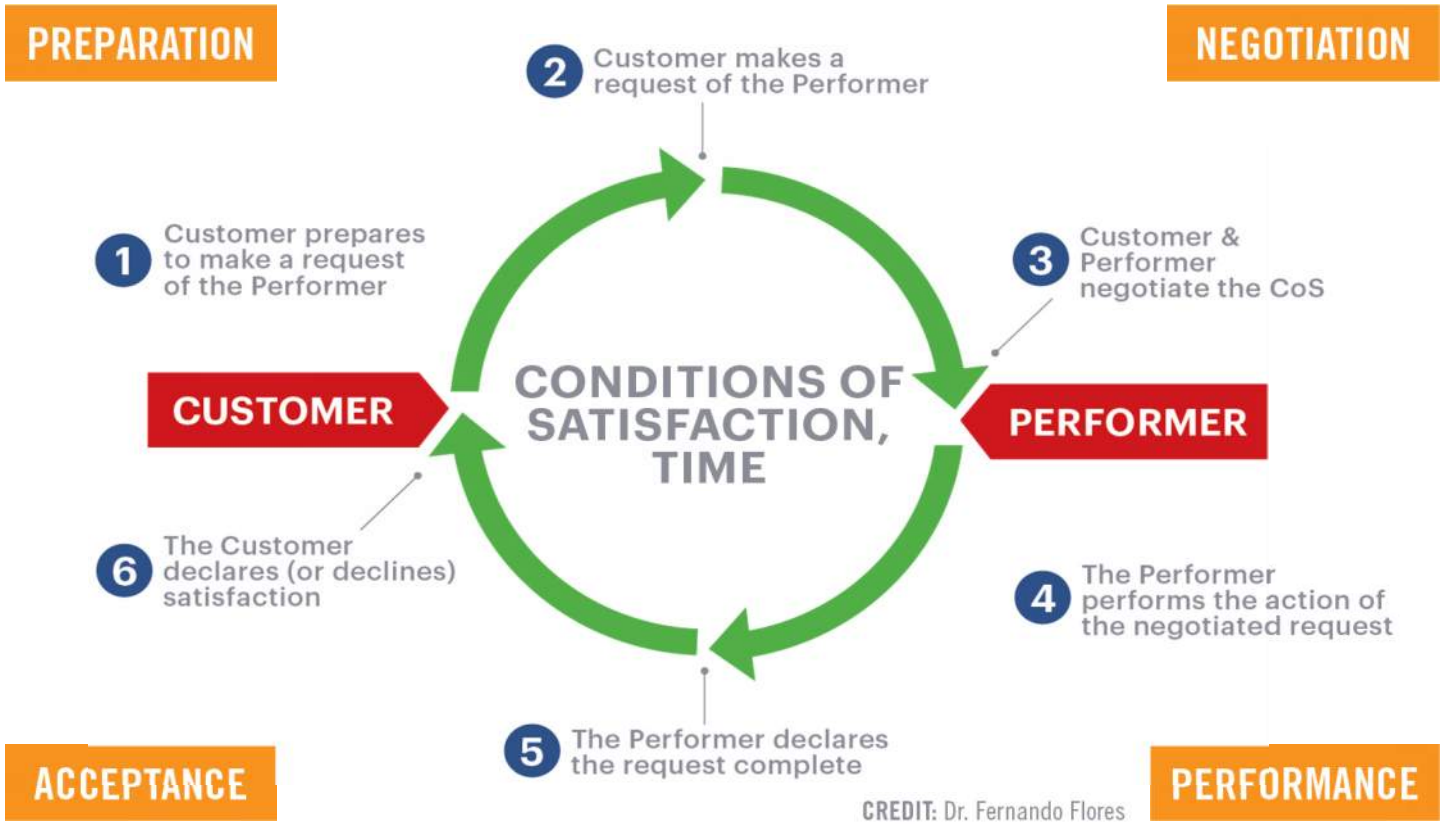
Elements Of A Promise

Lean Construction Institute
Immersive Education Program

- *The Customer:* The person making the request.
- *The Performer:* The person fulfilling the request.
- *Negotiated Conditions of Satisfaction (CoS):*
  - Are part of the language act of making a promise.
  - Are developed by the people involved in the request and promise.
  - Are mutually agreed to, measurable statements, that help to define the success of the project.
  - Inform the decision-making process.
  - Include a time frame.

Basic Action Workflow Of A Promise

Lean Construction Institute
Immersive Education Program

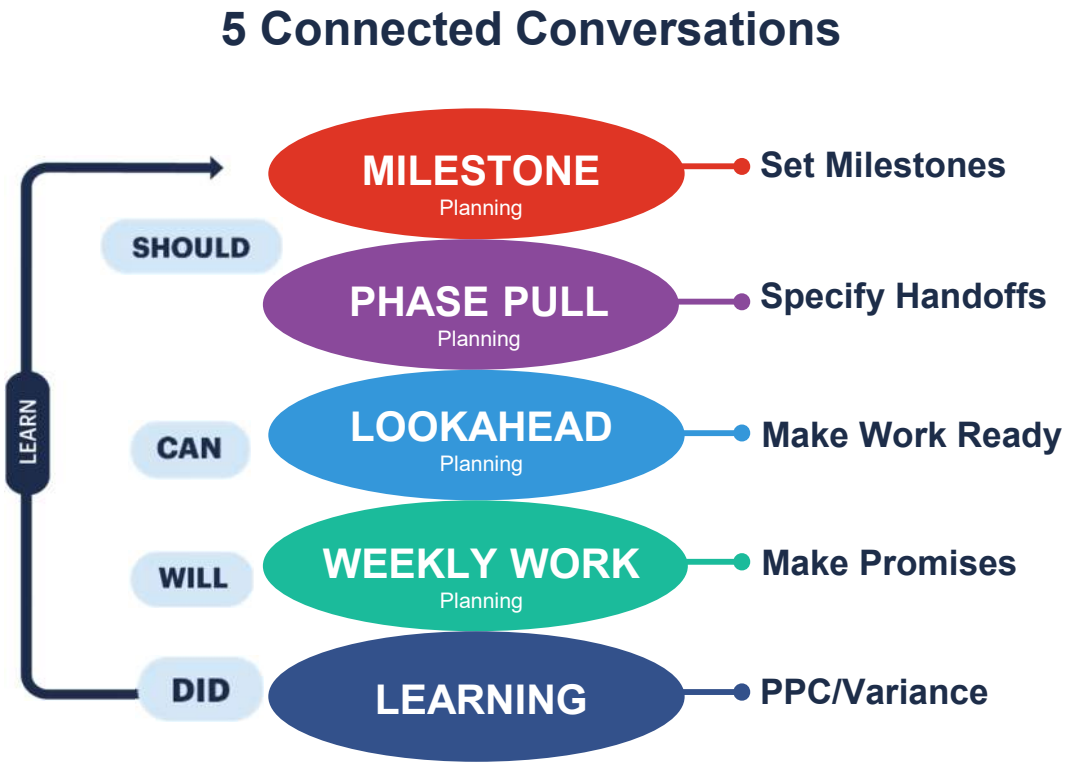


5 Connected Conversations Of LPS

Lean Construction Institute
Immersive Education Program

The LPS is a commitment-based system integrating 5 connected planning conversations:

1. Milestone Planning (Should)
2. Phase Pull Planning (Should)
3. Lookahead Planning (Can)
4. Weekly Work Planning (Will)
5. Learning (Did/Learn)



Last Planner System Overview

Lean Construction Institute
Immersive Education Program

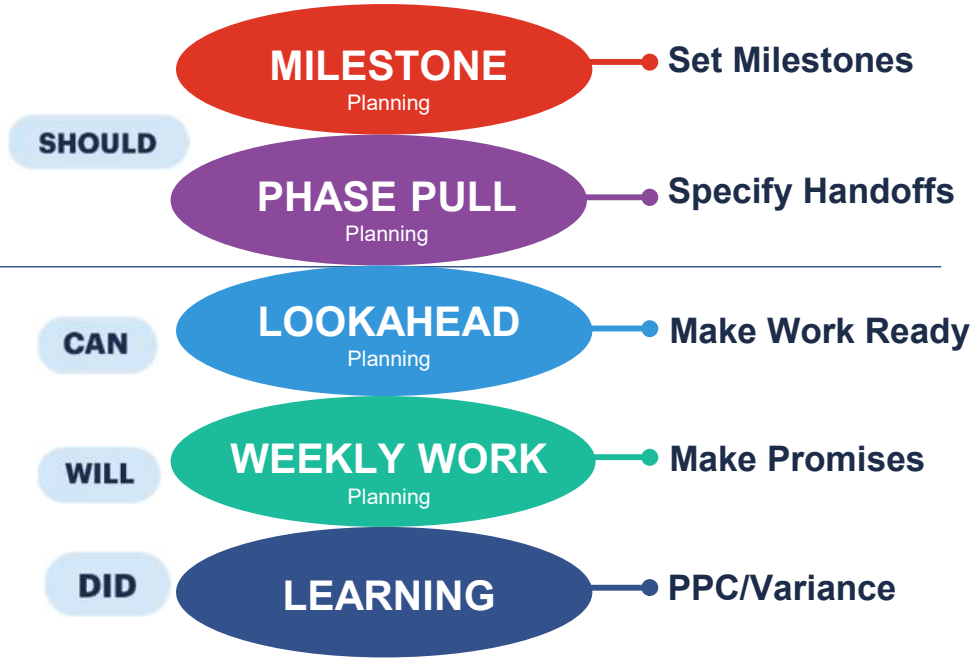
Collaborative Planning

As - Needed

Work Management
Continuous Improvement

Weekly

5 Connected Conversations



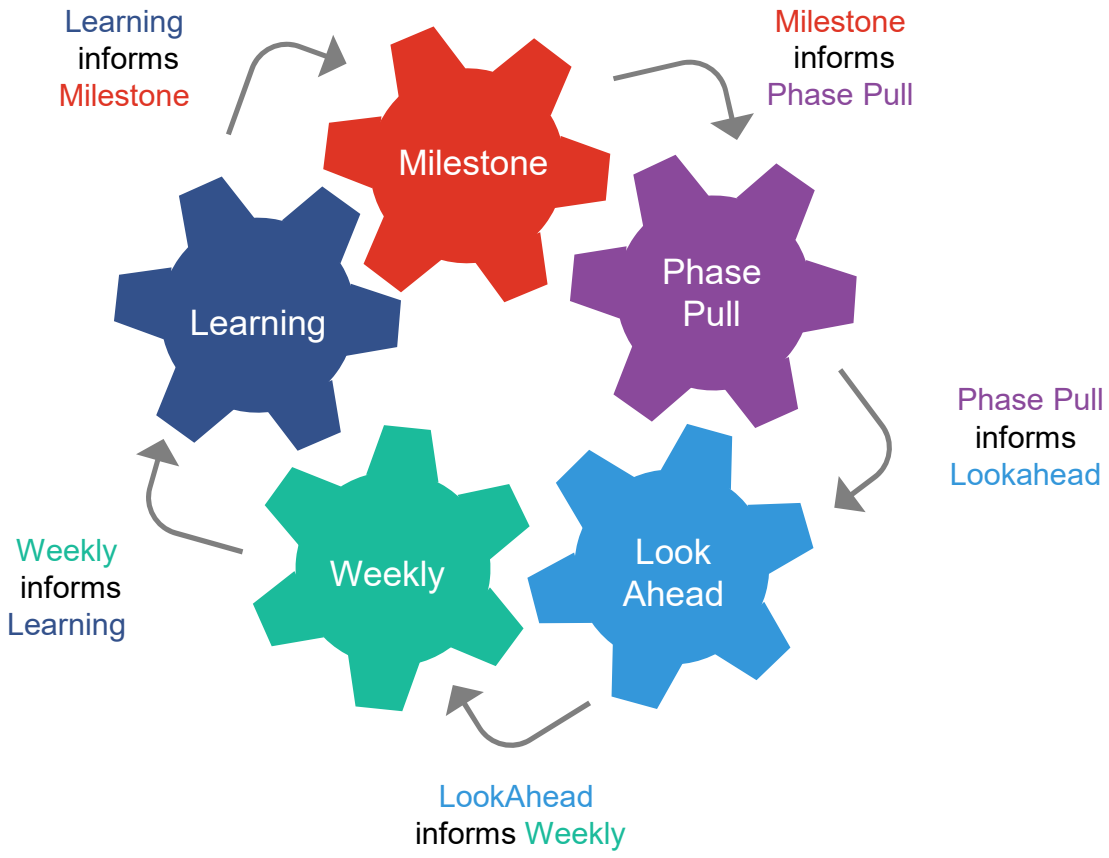
System Defined

Lean Construction Institute
Immersive Education Program

A system is a group of interacting or interrelated entities that form a unified whole.

System for Planning

Lean Construction Institute
Immersive Education Program



Lean Construction Institute
Immersive Education Program

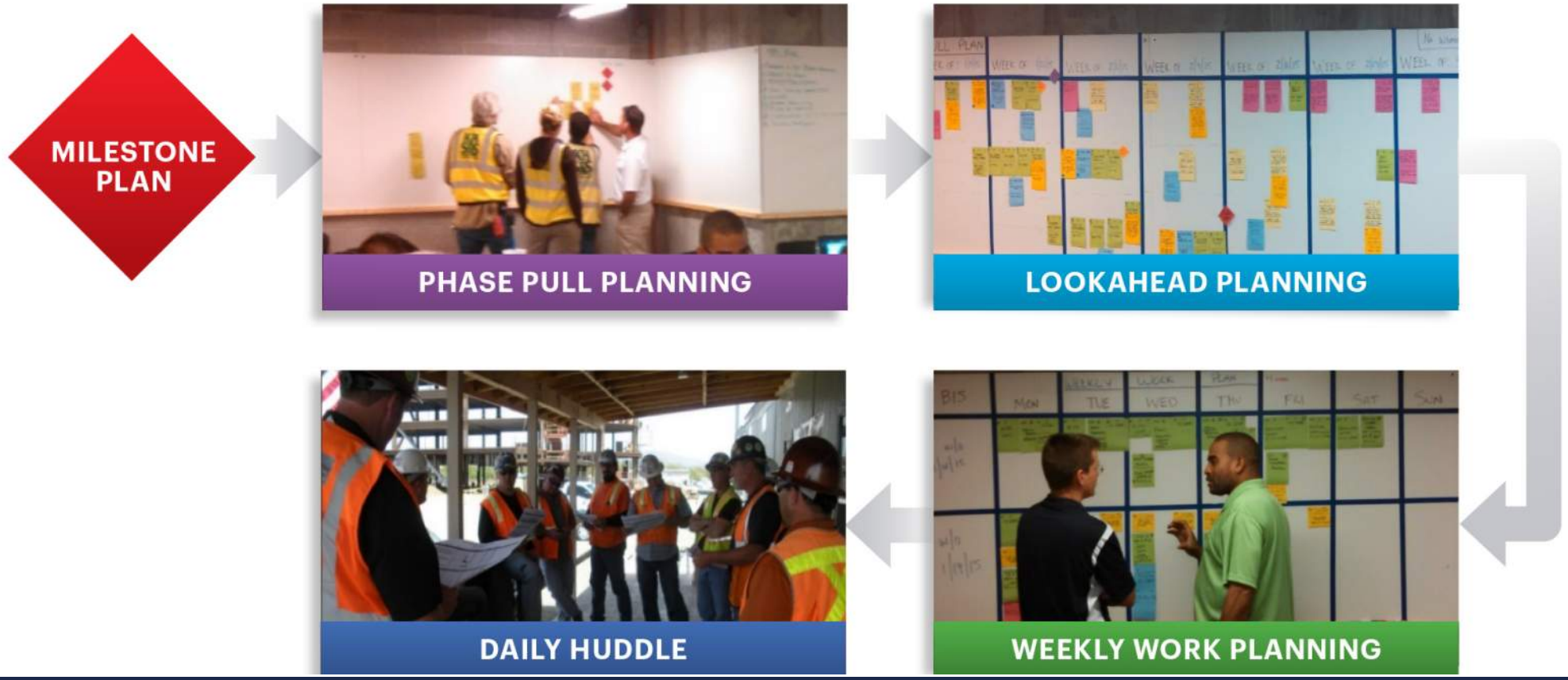
Continuous Improvement

Lean thinking demands a mindset of continuous improvement.

This requires an environment where we can discuss what's not working well and find fixes.

Lean Construction Institute
Immersive Education Program

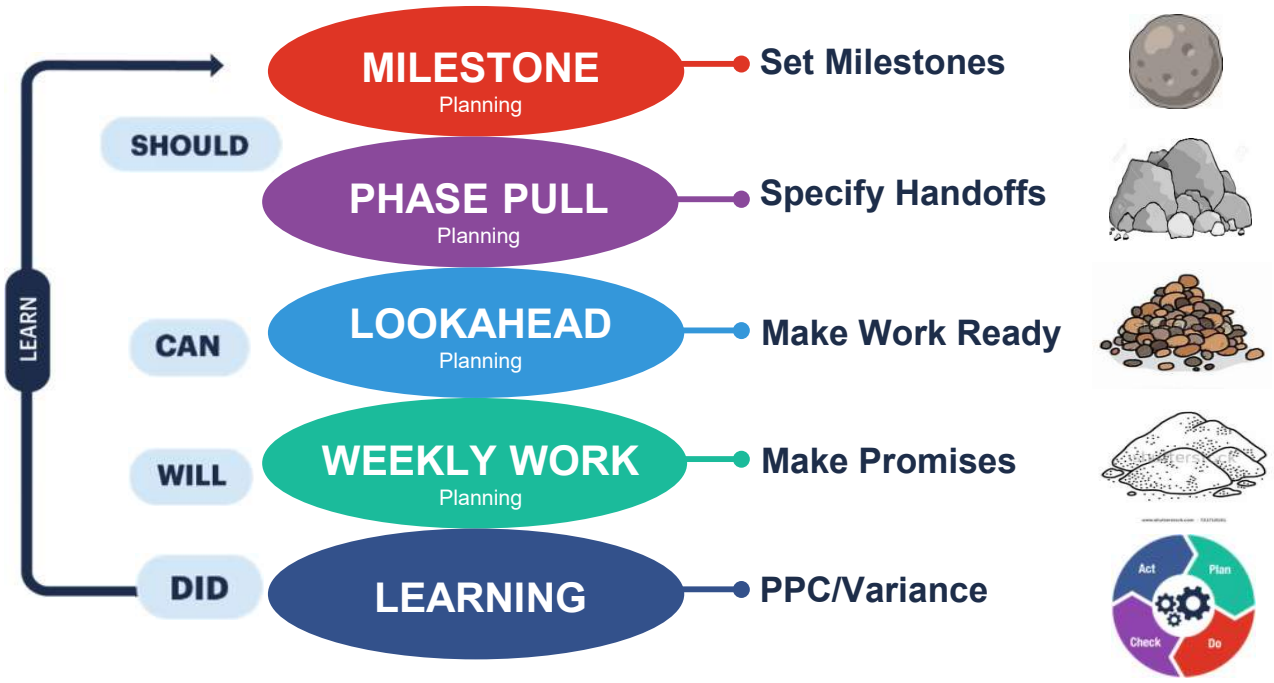
Last Planner System Flow



Last Planner System Overview

Lean Construction Institute
Immersive Education Program

5 Connected Conversations



BREAK - 7 minutes

Who Is The Last Planner

Lean Construction Institute
Immersive Education Program

The *Last Planner*® is the person closest to work with authority to make decisions regarding the schedule and to make reliable commitments to complete the work of their discipline.

This may include the lead architect or project manager, the lead engineer, owner's project representative and the constructors as appropriate.

Last Planners

Milestone Planning

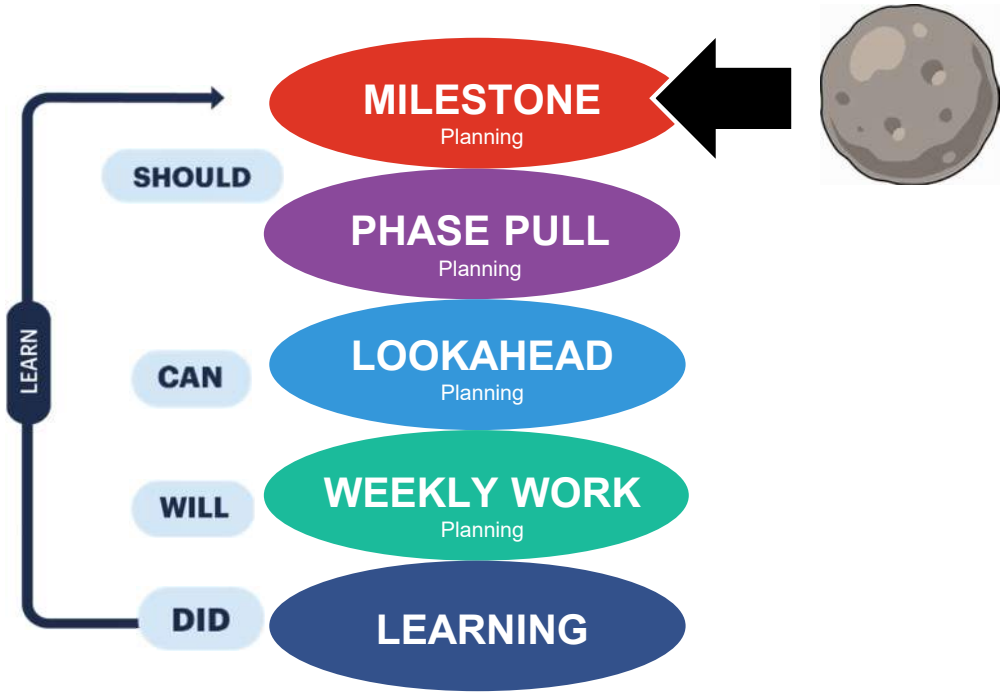
Lean Construction Institute
Immersive Education Program

The first conversation of LPS is *Milestone Planning*.

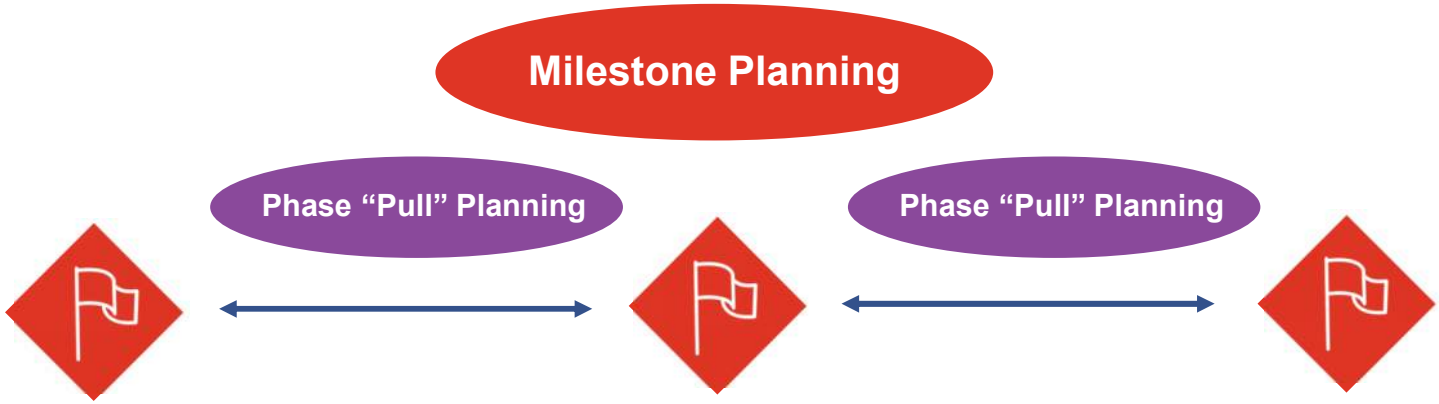
The goal of Milestone Planning is for the team to align on and *set the milestones* for the project.

This starts the we *"should"* be able to do conversation.

5 Connected Conversations



Lean Construction Institute
Immersive Education Program



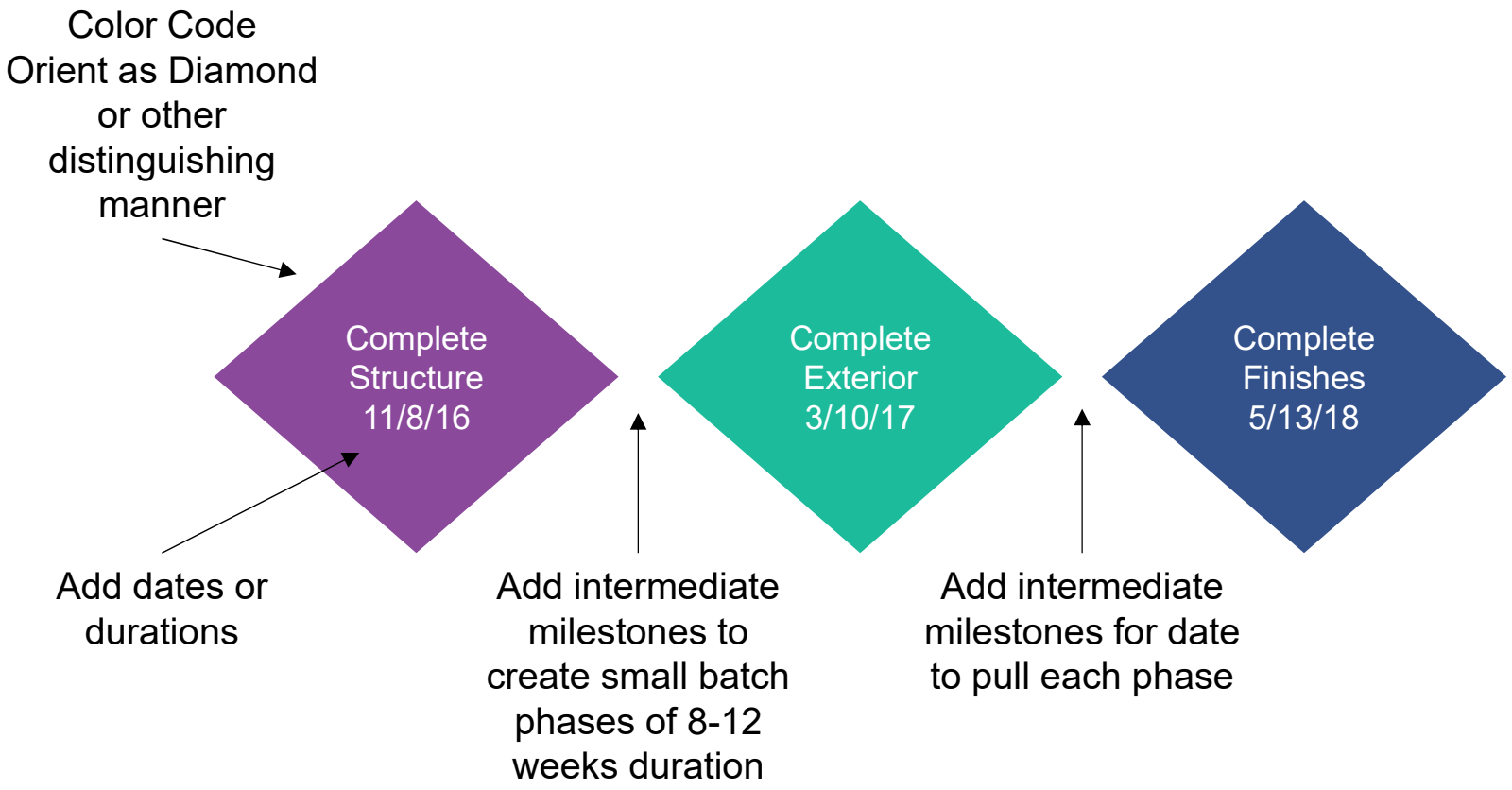
Define the overall road map and gain alignment

Identify milestones important to client and stakeholders – especially immovable dates

Informs the Phase Pull Planning

Lean Construction Institute
Immersive Education Program

Milestone Planning Example Tag



Lean Construction Institute
Immersive Education Program

Milestone Planning Example Tag

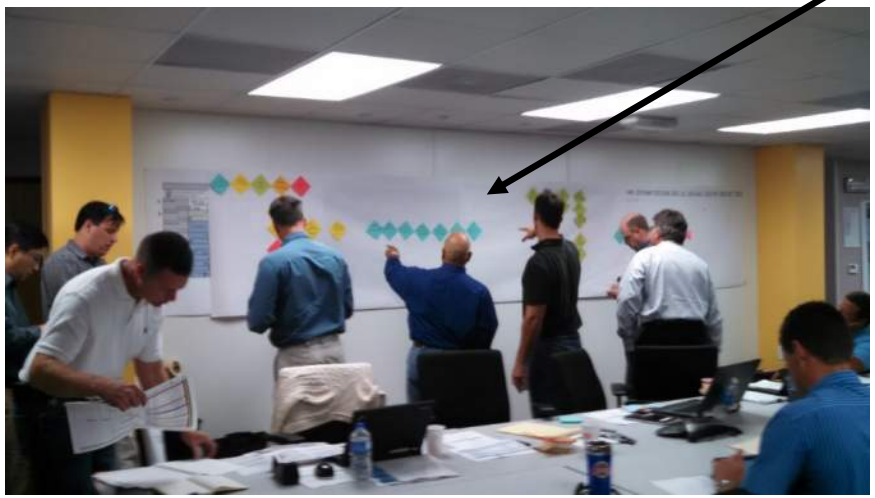
Lean Construction Institute
Immersive Education Program

Milestone Planning Example Tag

Creating The Milestone Plan

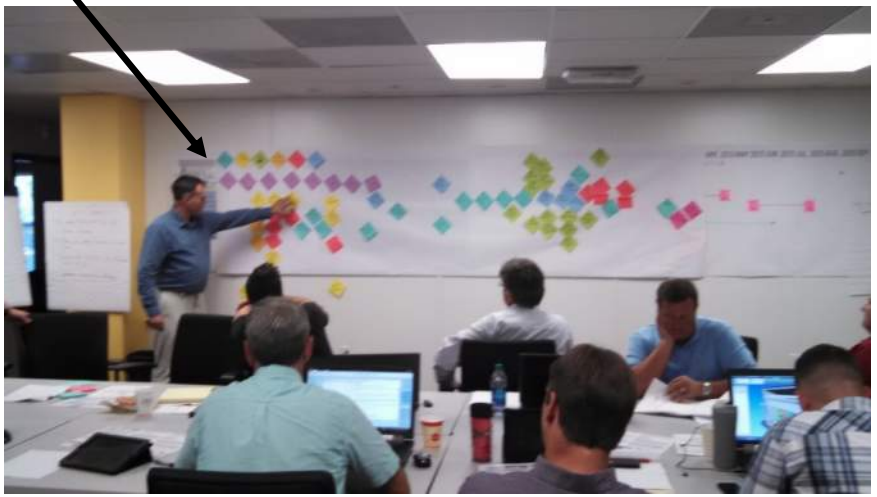
Lean Construction Institute
Immersive Education Program

Developing the milestones to structure the flow. The next step will to add estimated durations.



Collaboratively creating the plan

Color coding for different aspects of the plan, i.e. design, approval processes, key decisions, construction, turnover, activation.



Reviewing the plan

Courtesy of: InsideOut Consulting

Creating The Milestone Plan

Lean Construction Institute
Immersive Education Program

Developing the milestones to structure the flow.
The next step is to add estimated durations.

Courtesy of : The ReAlignment Group of California

Phase Pull Planning

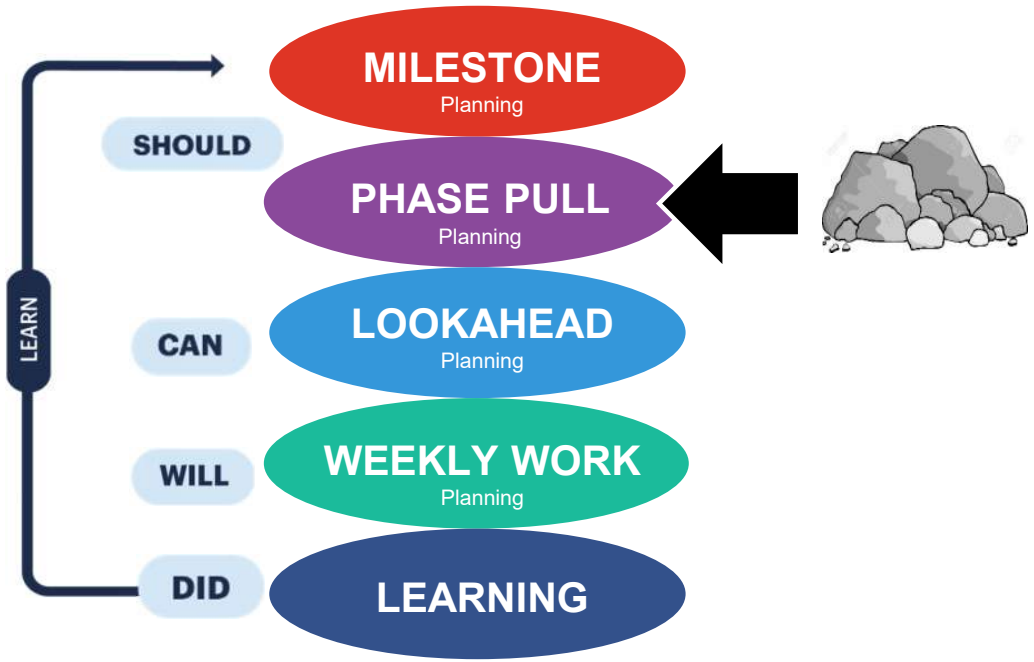
Lean Construction Institute
Immersive Education Program

The second conversation of LPS is *Phase Pull Planning.*

The goal of Phase Pull Planning is for the team to determine the key *handoffs* of work or information needed to deliver a milestone.

This continues the we *"should"* be able to do conversation.

5 Connected Conversations



Lean Construction Institute
Immersive Education Program

Courtesy of : PCL

- Phase of the work (~6 - 8 weeks)
- Informed by the Milestone Plan
- Work out the structure and durations
- After – add dates and transfer to the Look Ahead Plan

Lean Construction Institute
Immersive Education Program

Push vs. Pull

Push:

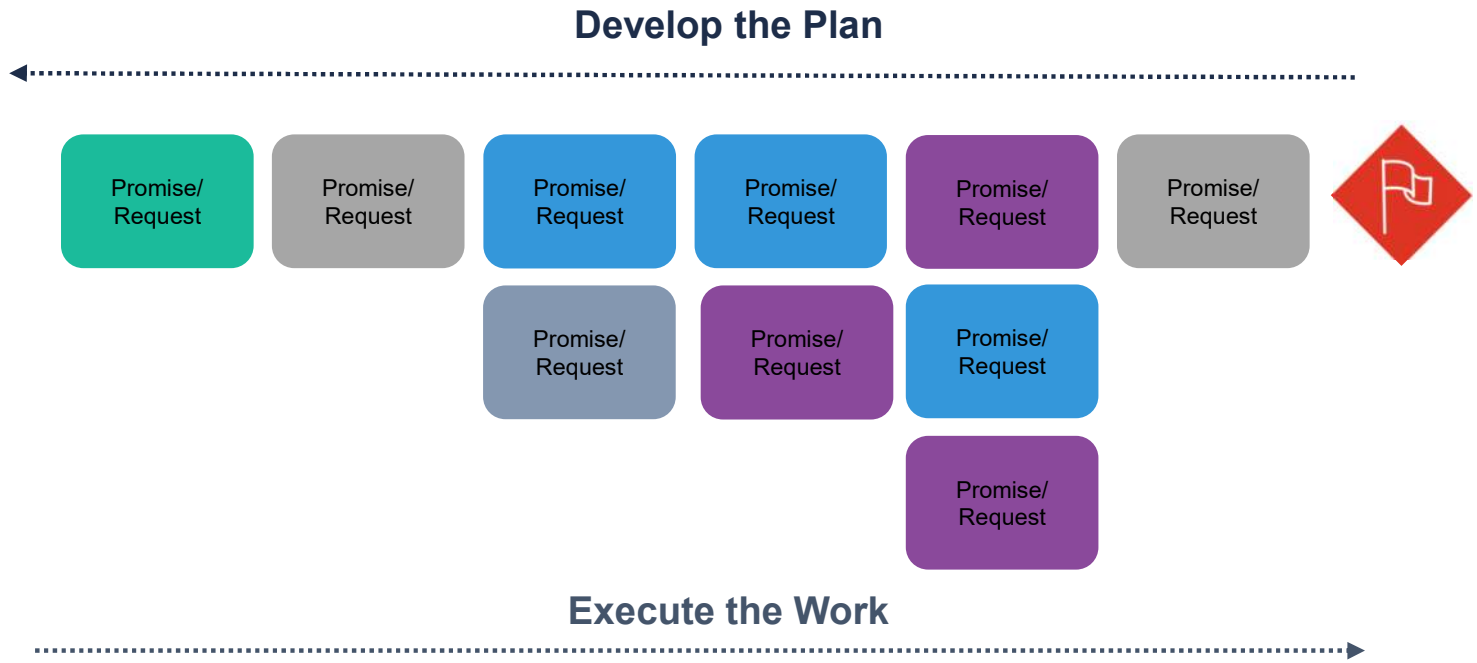
- Advancing work based on central schedule.
- Releasing materials, information, or directives possibly according to a plan, but irrespective of whether or not the downstream process is ready to process them.

Pull:

- **A**dvancing work when the next in line customer is ready.
- A “Request” from the customer signals that the work is needed and is “pulled” from the performer.

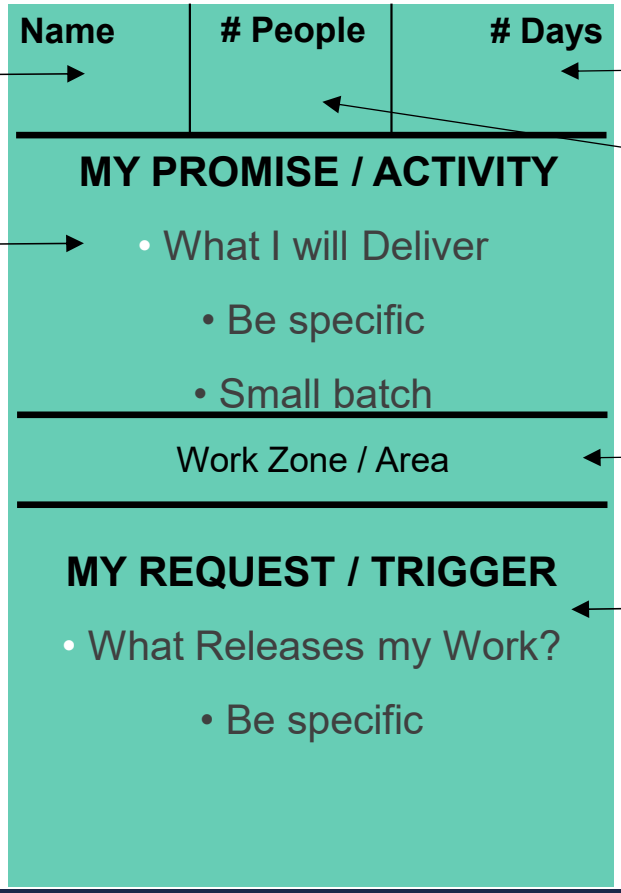
Pull: Creating Flow

Lean Construction Institute
Immersive Education Program



Phase Pull Planning: Example Tag

Lean Construction Institute
Immersive Education Program



Name of person making the commitment

Duration of the work in days

# of People for the work

Description of the activity

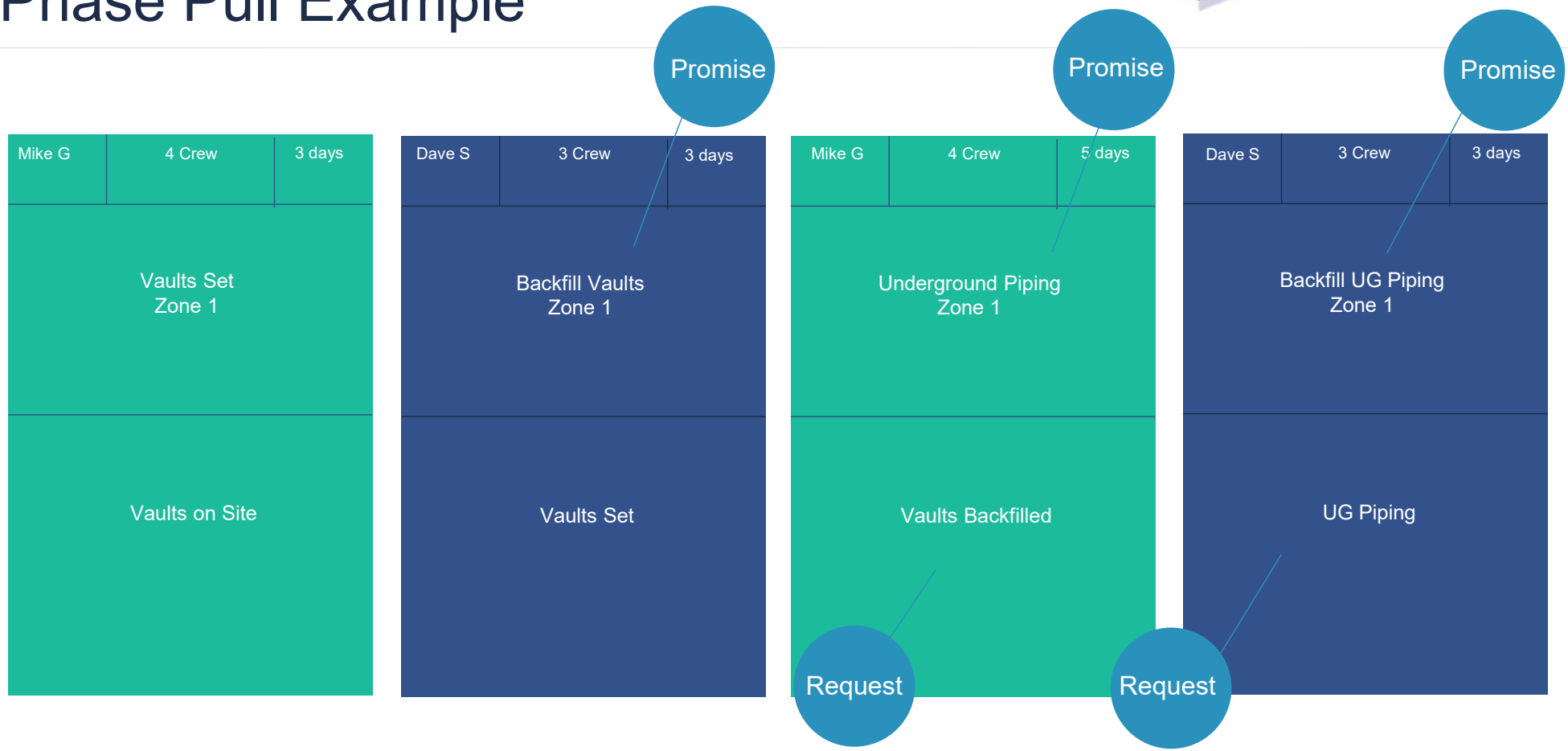
Work zone or area

Description of the predecessor activity or work that releases the start of your activity

- Format tag to best fit your team needs
- Add more information as valued
- Color code by trade or discipline

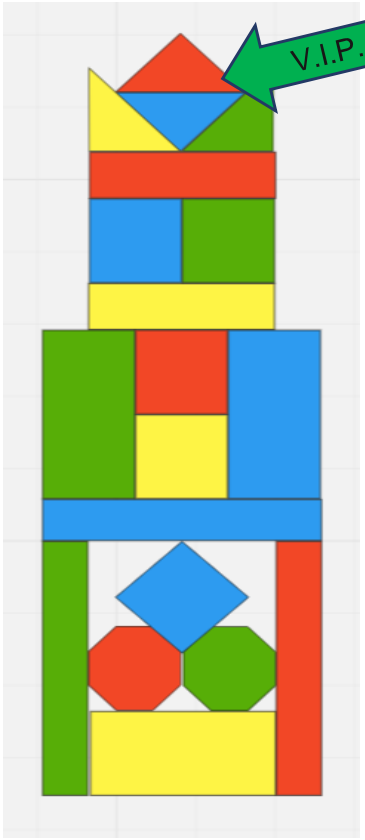
Phase Pull Example

Lean Construction Institute
Immersive Education Program



Block Tower Exercise

Lean Construction Institute
Immersive Education Program



TASK

FINISH MILESTONE

Red triangle install

1

Blue triangle install

Owner ready to move into the VIP suite at top of tower

Red triangle install (The V.I.P. Suite)

Lean Construction Institute
Immersive Education Program

Phase Pull Plan: Start at End

Phase Pull Plan: Pull The Work

Lean Construction Institute
Immersive Education Program

Phase Pull Plan: Review From The Start

BREAK - 7 minutes

Lookahead Planning

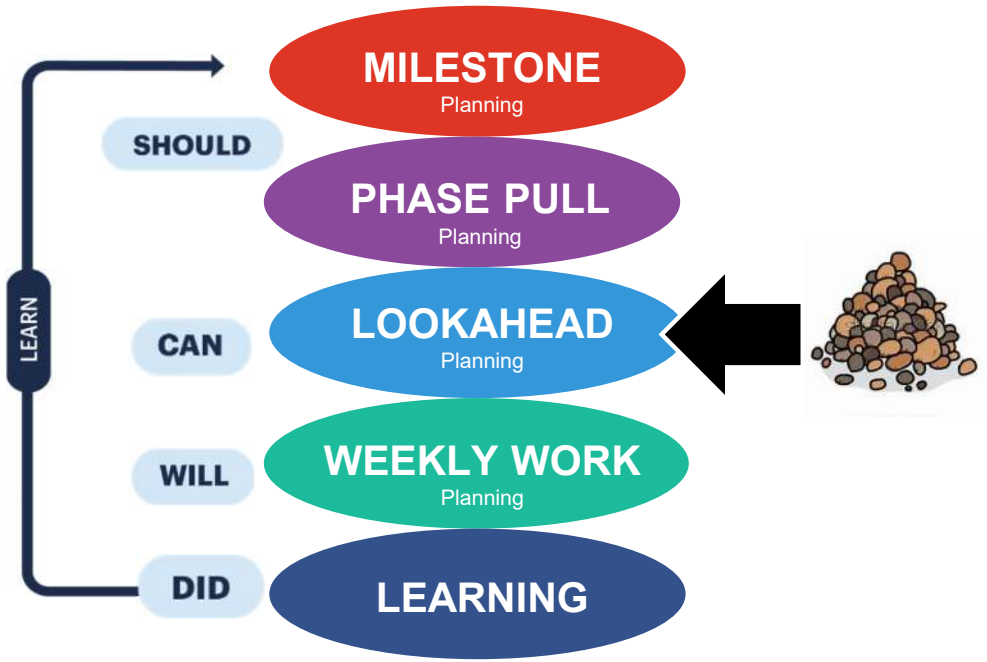
Lean Construction Institute
Immersive Education Program

The third conversation of LPS is *Lookahead Planning.*

This level focuses on making work ready or assuring that the work that *should* be done, *can* be done by identifying and ***removing constraints*** in advance of need.

The conversation is we *"can"* do this.

5 Connected Conversations



Lean Construction Institute
Immersive Education Program

Project:
Project No.:
Responsible Person:

Constraint Number	Activity Number	Constraint Description	RFI No.	Responsible Person	Responsible Company	Date Identified	Date Need Resolution	Date Resolution Promised	Actual Date Resolved

Constraint Log

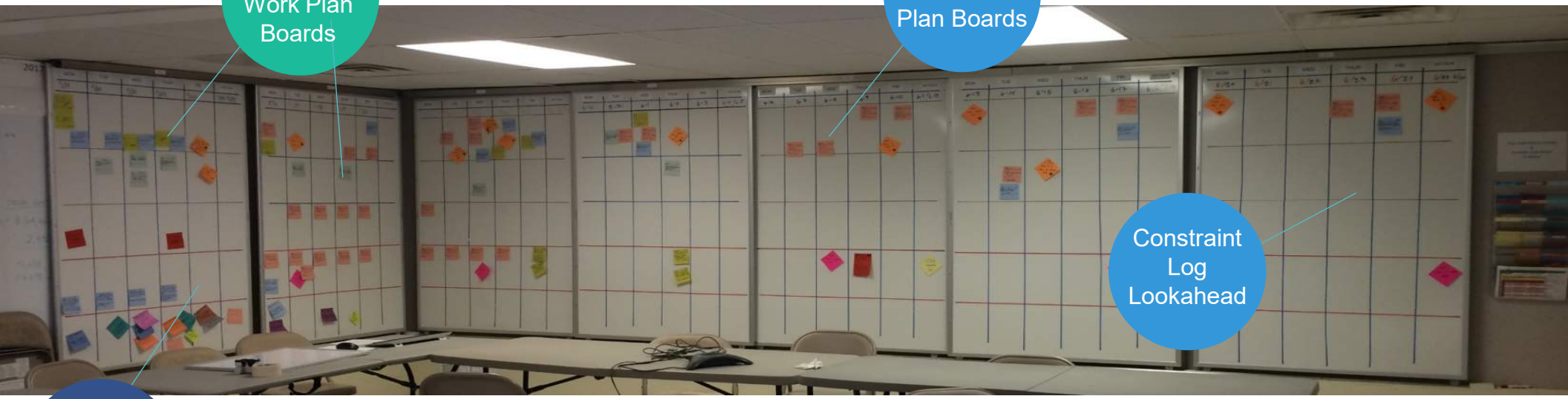
98

Lookahead Planning

- Transferred from the **Phase Pull Plan** to a plan with dates/weeks
- Boards, P6 or other software documentation
- Rolling (6-10 weeks) Look ahead to "make work ready"
- Supports Team Meeting Discussion/Action for:
- Identify Risk – **Risk Log**
- Identify Constraints – **Constraint Log**
- Informs the **Weekly Work Plan**

Lookahead Planning Example

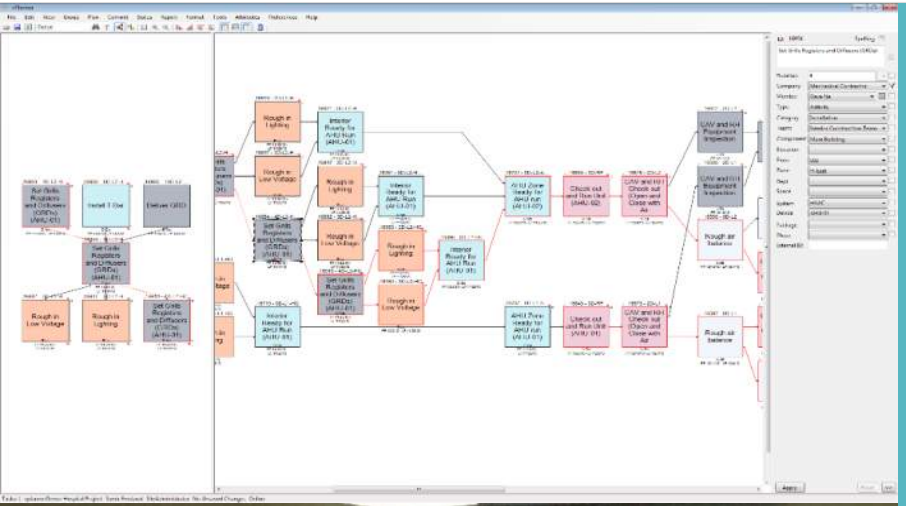
Lean Construction Institute
Immersive Education Program

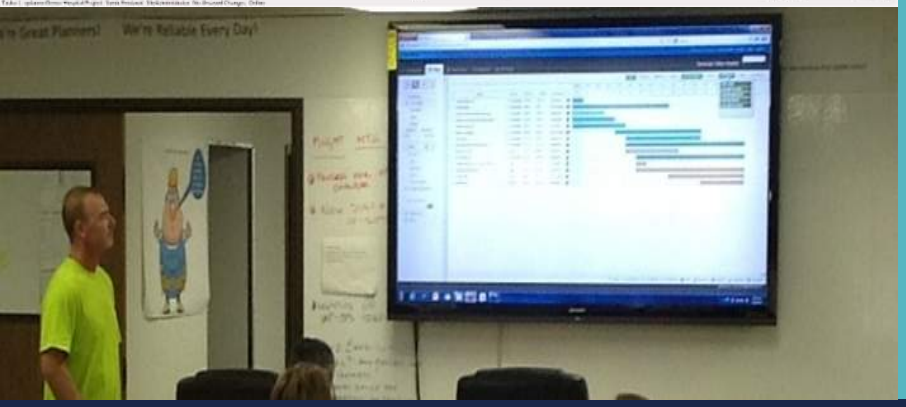


Courtesy of: Turner Construction

Lookahead Planning Options

Lean Construction Institute
Immersive Education Program





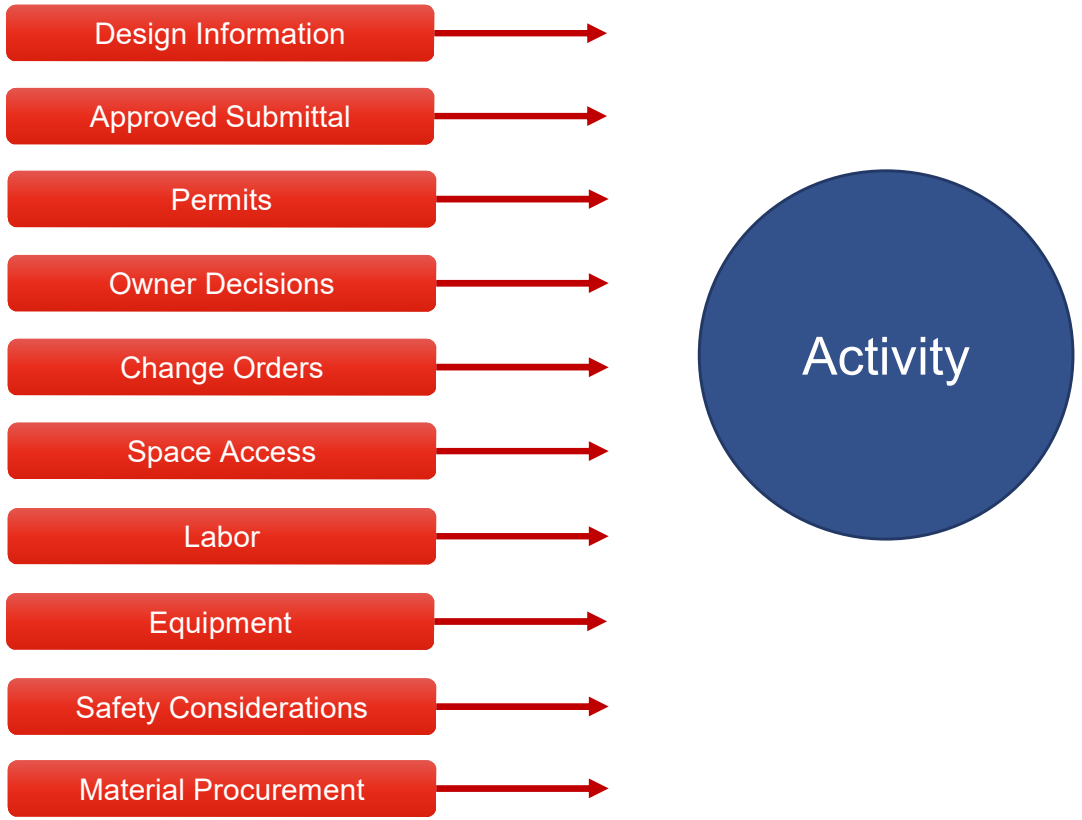
Electronic

- P6
- Microsoft Project
- TouchPlan
- PlanGrid
- vPlanner
- Allucent
- Others

Lean Construction Institute
Immersive Education Program

Constraint Defined

Constraint:
An item or requirement that **will prevent an activity** from starting, advancing or completing as planned.



Constraint Log Example

Lean Construction Institute
Immersive Education Program

Project: Project No.: Responsible Person:									
Constraint Number	Activity Number	Constraint Description	RFI No.	Responsible Person	Responsible Company	Date Identified	Date Need Resolution	Date Resolution Promised	Actual Date Resolved

CONSTRAINT DESCRIPTION

RESPONSIBLE PERSON & CO

DATE IDENTIFIED

DATE NEEDED

DATE PROMISED

DATE RESOLVED

Discussion Question

Lean Construction Institute
Immersive Education Program

How will looking ahead to remove constraints help your projects?

5 Minute Large Group Discussion

Weekly Work Planning

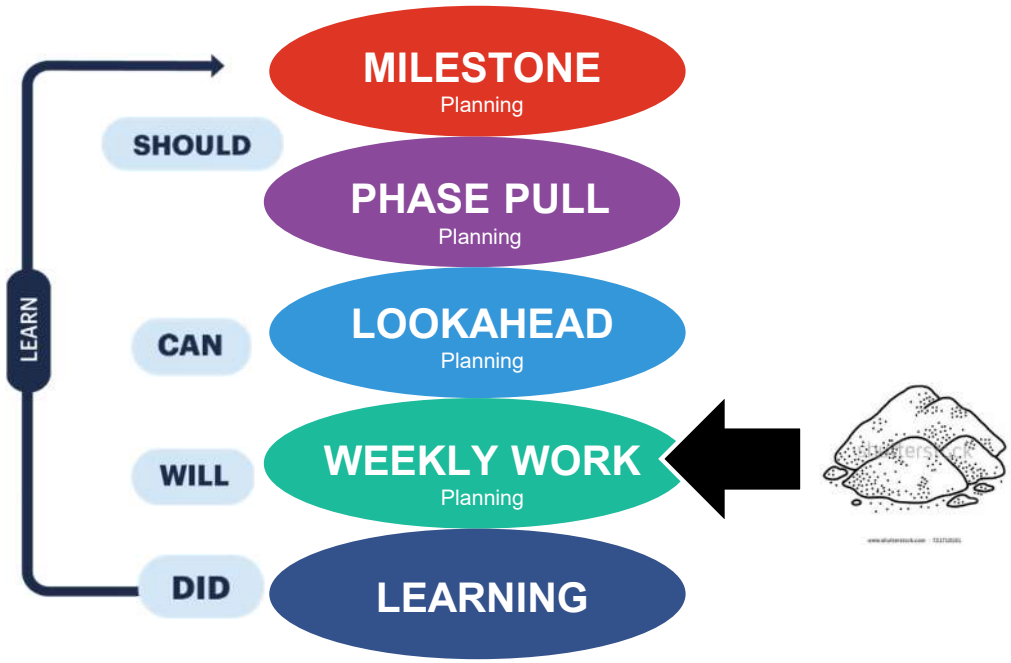
Lean Construction Institute
Immersive Education Program

The fourth conversation of LPS is *Weekly Work Planning.*

The goal of this level is for the Last Planners to ***establish the plan*** for the upcoming week at the daily level.

The conversation is I *"will"* do this.

5 Connected Conversations



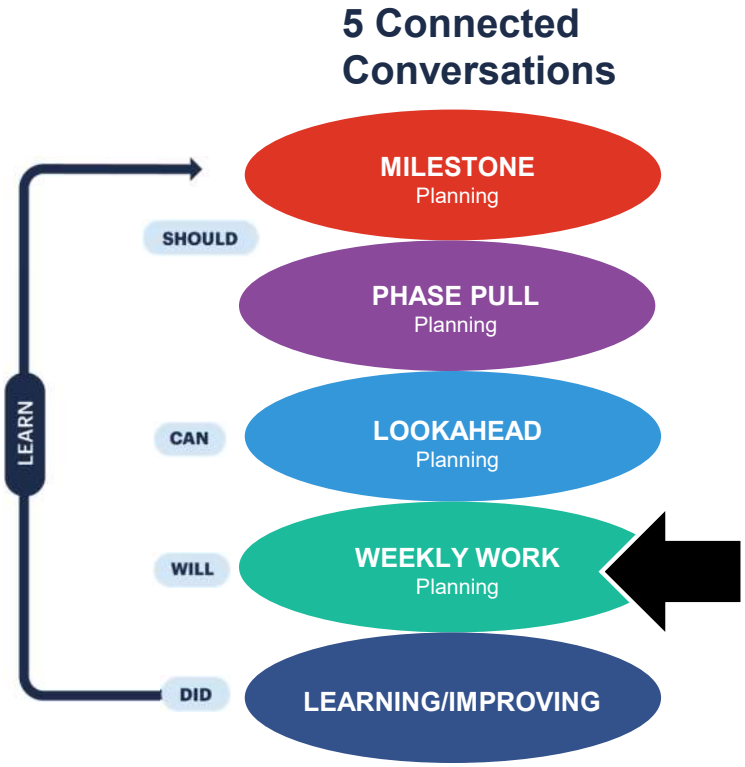
Weekly Work Planning

Lean Construction Institute
Immersive Education Program

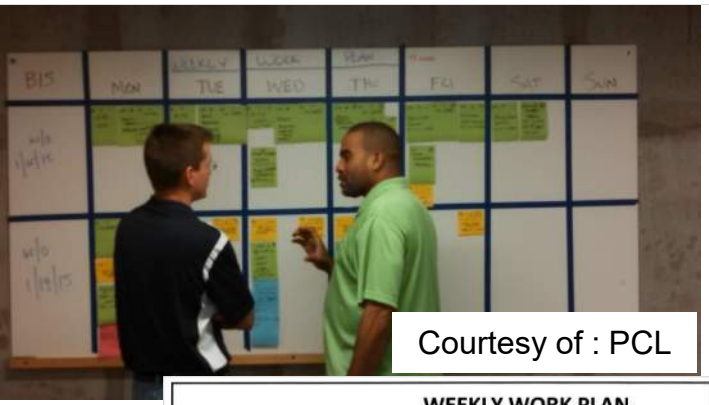
This is the level that the team identifies the *promised task completions* agreed upon by the *Performers* for the upcoming week.

The WWP is used to determine the *success* of the planning effort and to determine what *factors limit performance*. And is the basis of measuring PPC (Percent Plan Complete).

This is done during a *Check-in Session or Huddle.*



Lean Construction Institute
Immersive Education Program



Courtesy of : PCL

Weekly Work Planning

- Informed by the Look Ahead Plan
- Detail work by trade at the Daily Level
- Detailing of the next week
- Informs the Daily Huddle
- Take to the field

WEEKLY WORK PLAN

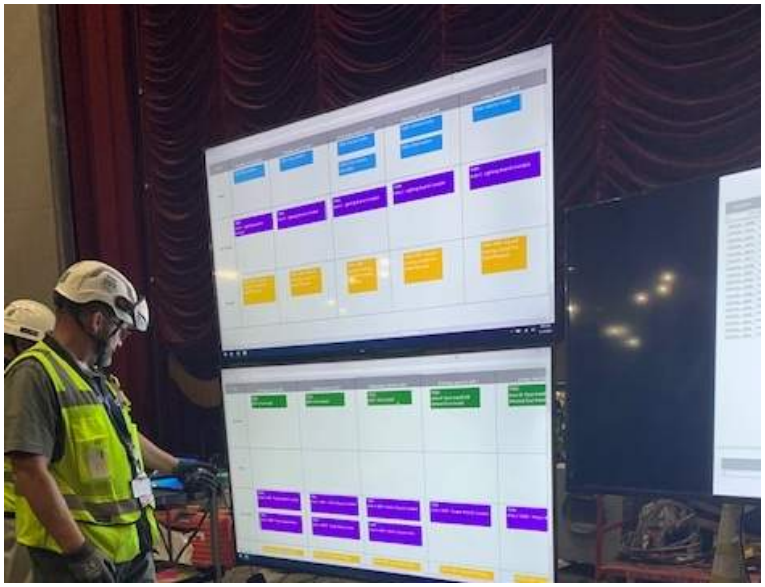
Area:		CATEGORY* OF PLAN FAILURE					TOTAL ACTIVITIES	10
Contractor:		1 Coordination	5 Prerequisite Work	9 Submittals	13 Space		ACTIVITIES COMPLETED	5
Shift:		2 Design	6 Labor	10 Approvals	14 Site Conditions		PERCENT PLAN COMPLETE (PPC)	50%
Last Planner:		3 Owner Decision	7 Materials	11 Equipment	15			
		4 Weather	8 Contracts/COs	12 RFIs	16			

Activity ID	ASSIGNMENT DESCRIPTION (Safe · Defined · Sound · Proper Sequence · Right Size · Able to Learn)	Responsible Person	Start Date		05-Oct-09					DONE?		LEARNING	
			Mon	Tue	Wed	Thu	Fri	Sat	Sun	YES	NO	REASONS FOR PLAN FAILURE	Category*
	Column Grid A1 - G8												
	Joes Framing	Bill											
7055	Top Track Install		4	4						1			
7060	Framing Walls			4	4					1			
7065	Backing Install				4	4					0	IOR not available	10
	Sparky's Electrical	Jim											
1605	Rough in Walls			2	2	2	2			1			
1610	Rough in Ceilings					2	2	2			0	Need grid elevation layout	5
	Acme Mechanical												
1505	Plumbing - in wall rough in - Install				2						0	Walls not inspected	10
1510	Plumbing - ceiling rough in - Install					2					0		
	Column Grid G9 - J 12 Kitchen servery												
	Joes Framing	Bill											
7055	Top Track Install						4			1			
7060	Framing Walls							4		1			
7065	Backing Install							2			0	room not available	1
	Workable Backlog (My "Plan B": What work can I do without affecting other trades if above plan breaks down?)									5			

Weekly Work Planning

Lean Construction Institute
Immersive Education Program

Weekly Work Plan Informs the Daily Huddle



Courtesy of : Turner Construction

Courtesy of : Turner/DPR JV

Weekly Work Planning Example

Lean Construction Institute
Immersive Education Program

"What, Where, Who & When"

WEEKLY WORK PLAN

Work Beginning:

Area:		CATEGORIES OF PLAN FAILURE				TOTAL ACTIVITIES	31
Contractor:		1 Coordination	5 Prerequisite Work	9 Submittals	13 Space	ACTIVITIES COMPLETED	
Shift:		2 Eng/Design	6 Labor	10 Approvals	14 Site Conditions	PERCENT PLANNED COMPLETE	0%
Last Planner:		3 Owner Decision	7 Materials	11 Equipment	15		
		4 Weather	8 Contracts/COs	12 RFIs	16		

Activity ID	Commitment Description (Safe - Defined - Sound - Proper Sequence - Right Size - Able to Learn)	Responsible Person	Start Date 1\28 Mon	Tue	Wed	Thu	Fri	Sat	Sun	DONE? YES	NO	LEARNING REASONS FOR PLAN FAILURE	Category
1	Pour new moat floor on the south side of the building	B.A.M	4	4									
2	Adjust (4) down spouts on the south side of the building	B.A.M	2	2	2								
3	Patch masonry around 6 conducter boxes on the roof	B.A.M	1	1	1	1	1						
4	Install base on 2nd floor in the south side class rooms	B.A.M		3		3	3						
5	Install wainscoting on the first floor north side	B.A.M		4	3	4							
6													
7													
8	Pull wire for Chiller	Ryan	5										
9	Security rough-in on all floors	Ryan		3	3	3	3						
10	Basement rough-in complete	Ryan	4	4	4	4	4						
11													
12	Hang and finish all rated chases	Fred			3	3							
13	Reframe and hang dry wall in hallway 121	Fred	4	4	4	3	5						
14	Sand dry wall in hallway 139	Fred	2	2									
15	Finish dry wall in west class room 107,144	Fred	3	3		3							
16													
17													
18	Rough-in media center ceiling	Troy	5										
19	Get fresh air duct inspected in attic	Troy				6							
20	Get north west chase duct inspected	Troy				6							
21	Insulate north west chase duct	Troy			4								
22	Tie in vav boxes in the attic	Troy	3	3	3								
23	Start tying in vav boxes in the east wing 1st and 2nd floors	Troy	4	4	4	4							

What & Where?

Crew Size?

Who?

When will it be done?

Learning/Improving

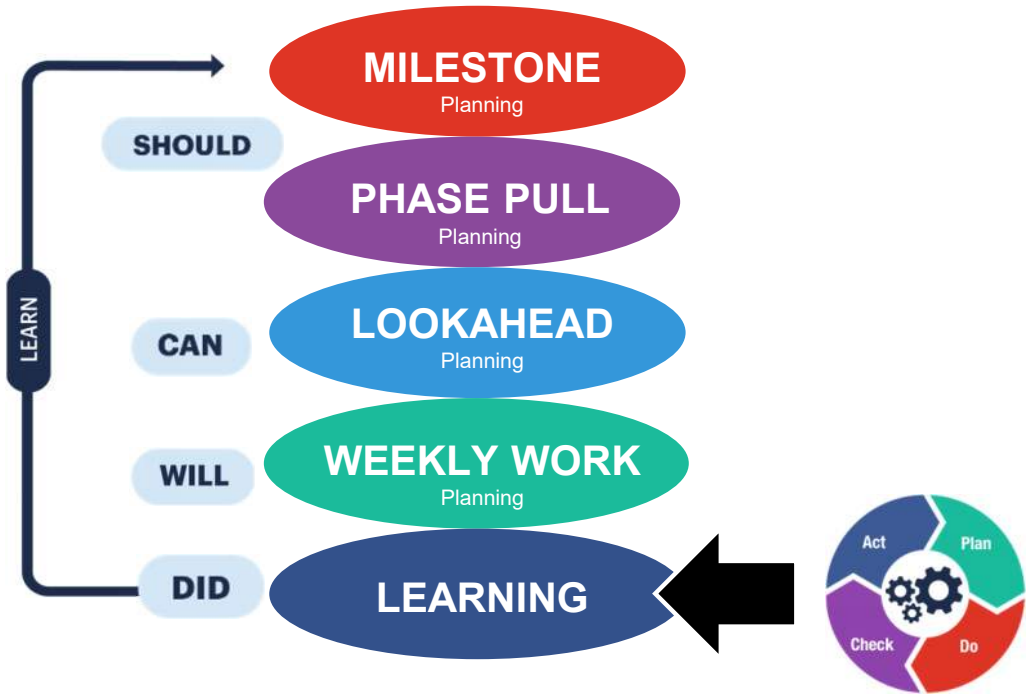
Lean Construction Institute
Immersive Education Program

The fifth conversation is *Learning/Improving*.

The goal is for the team to *learn* from the cycle and take *actions for improving* going forward fulfilling PDCA.

The conversation is what we *"Did"* and *"Learned"*.

5 Connected Conversations



Daily Huddle

Lean Construction Institute
Immersive Education Program

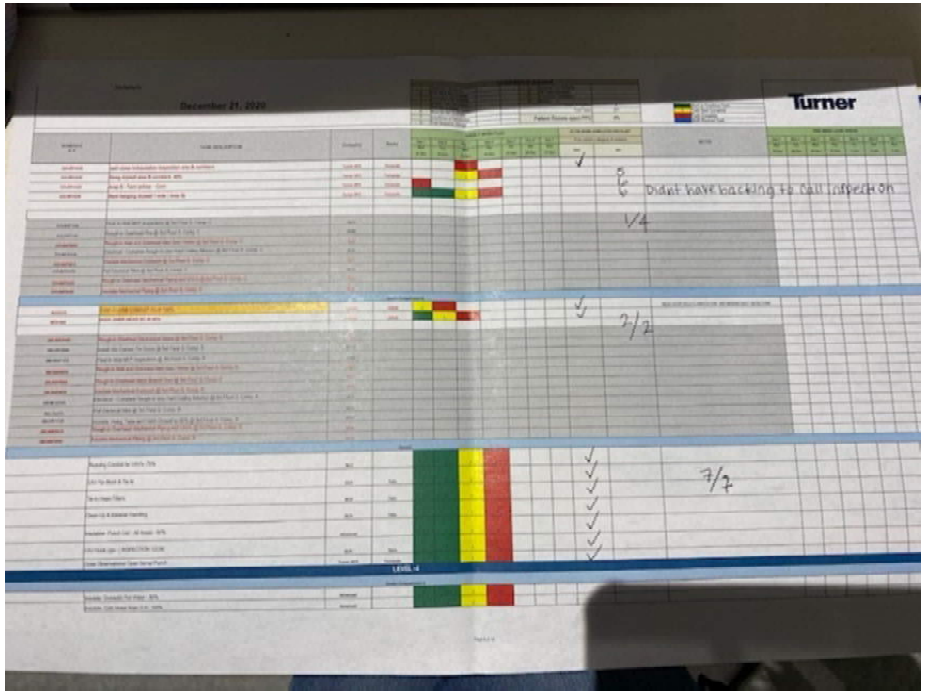
1. What did I complete?
2. What will I complete?
3. What needs to be re-planned?
4. How can we prevent this from happening again?

Learning From Daily Huddles

Lean Construction Institute
Immersive Education Program

The *Percent Plan Complete* (PPC) is calculated for the period or week.

PPC is the basic measure of how well the *planning system is working.*



Courtesy of : Turner Construction

Lean Construction Institute
Immersive Education Program

Calculating PPC

$$\text{WEEKLY PPC} = \frac{\#\ \text{Completed Activities}}{\#\ \text{Planned Activities}} = \frac{16}{20} = 80\%$$

Percent Plan Complete (Plan Percent Complete)

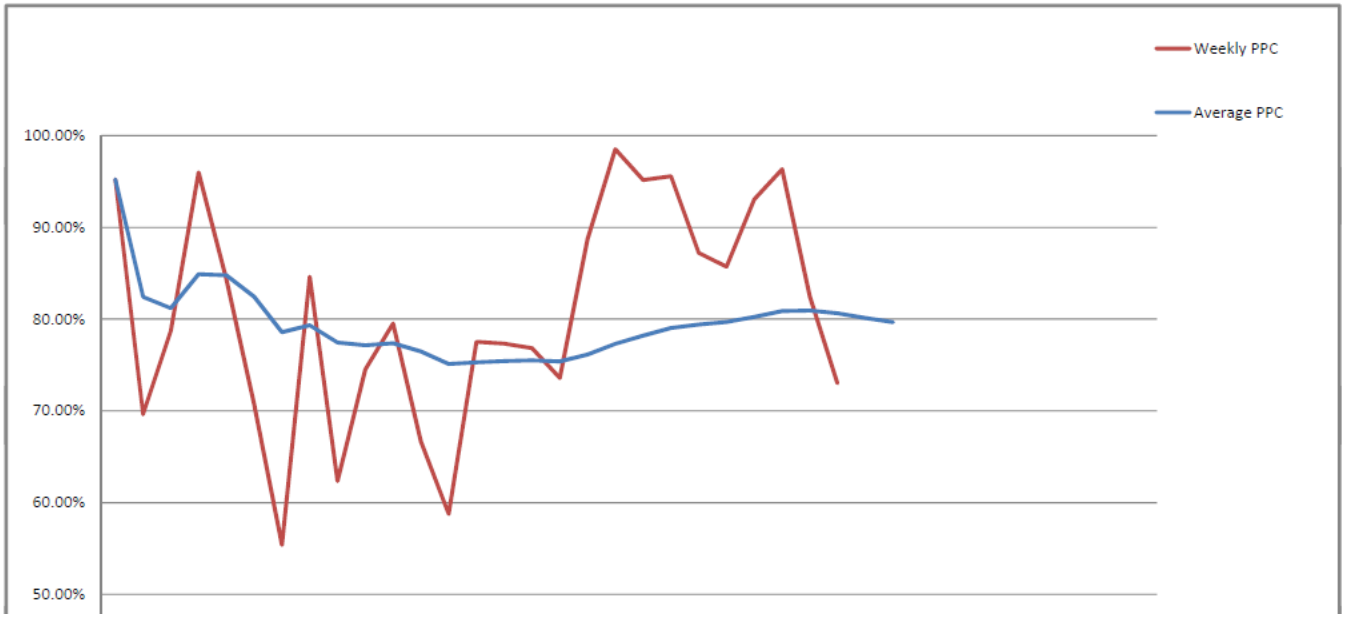
Lean Construction Institute
Immersive Education Program

OVERALL PLAN PERCENT COMPLETE

PROJECT AREA
THEATERS

Current Overall PPC = 79.67%
As of: 6/1/2014

Week #	Week Ending	Number of Tasks	Number Completed	PPC	Average	Tasks Not Done
1	11/17/2013	21	20	95.24%	95.24%	1
2	11/24/2013	79	55	69.62%	82.43%	24
3	12/1/2013	47	37	78.72%	81.19%	10
4	12/8/2013	50	48	96.00%	84.90%	2
5	12/15/2013	83	70	84.34%	84.78%	13
6	12/22/2013	99	70	70.71%	82.44%	29
7	12/29/2013	65	36	55.38%	78.57%	29
8	1/5/2014	52	44	84.62%	79.33%	8
9	1/12/2014	85	53	62.35%	77.44%	32
10	1/19/2014	98	73	74.49%	77.15%	25
11	1/26/2014	83	66	79.52%	77.36%	17
12	2/2/2014	66	44	66.67%	76.47%	22
13	2/9/2014	97	57	58.76%	75.11%	40
14	2/16/2014	89	69	77.53%	75.28%	20
15	2/23/2014	97	75	77.32%	75.42%	22
16	3/2/2014	82	63	76.83%	75.51%	19
17	3/9/2014	106	78	73.58%	75.39%	28
18	3/16/2014	80	71	88.75%	76.13%	9
19	3/23/2014	67	66	98.51%	77.31%	1



Reasons For Variance

Lean Construction Institute
Immersive Education Program

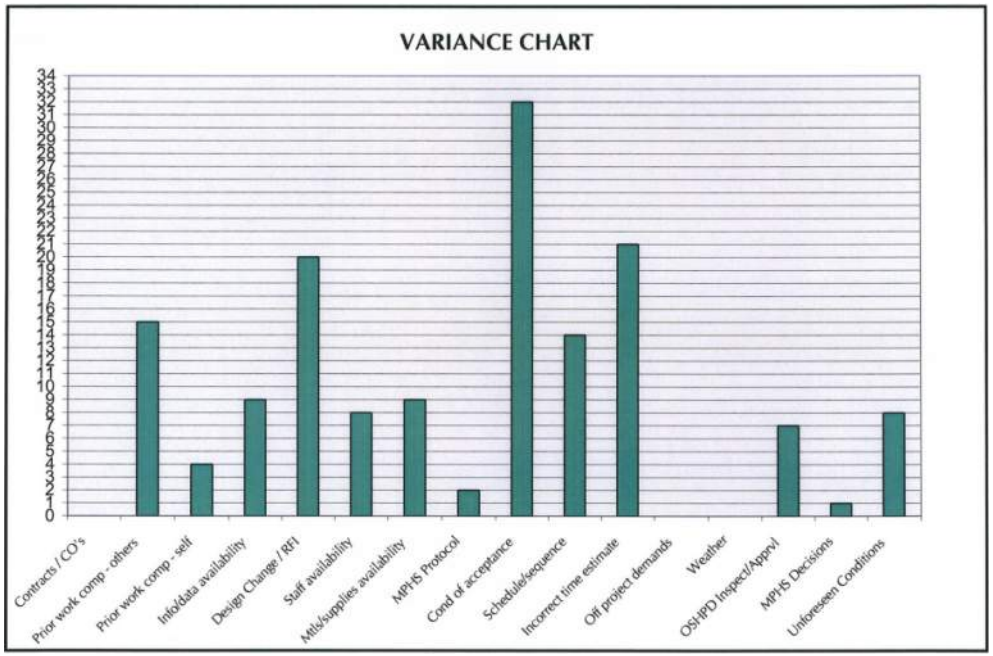
Reason for Variance:

- Factors that prevented a task from being completed as promised.
- Used by the team to promote learning concerning the failure of the planning system to produce predictable workflow.
- Assigned a category of variance.
- Enable a team to identify those areas of recurring failure that require additional reflection and analysis.

Lean Construction Institute
Immersive Education Program

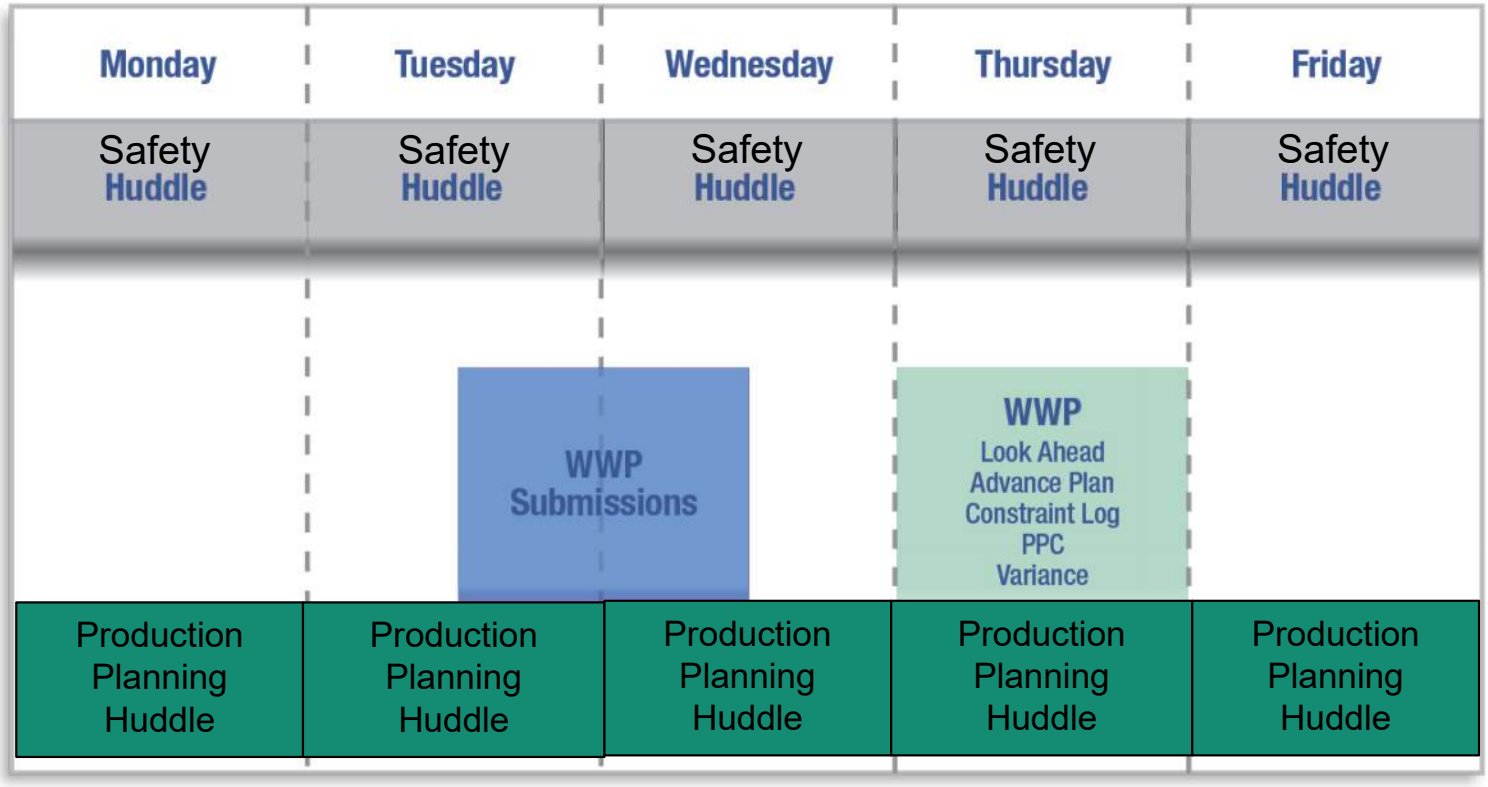
Taking Action For Variance

When a variance or failure occurs, the team must discuss the likelihood of it occurring again and determine actions to mitigate such.



Lean Construction Institute
Immersive Education Program

LPS Weekly Routine Example



WWP Meeting Agenda

Lean Construction Institute
Immersive Education Program

1. [15 Min] Review Weekly Work Plan
   a. Review last week plan completion, reliability
   b. Compute PPC
   c. Check & track variances - discuss countermeasures
   d. Review tasks moving forward and figure out how to complete that work without affecting a milestone
2. [15 Min] Update Six Week Look Ahead, Make-Ready & Constraints
   a. Update Plan week 5 or 6 Review Constraint Log
   b. Identify/Review constraints
   c. Determine solution or path forward
   d. Check in on previous path forwards to ensure completion by the committed date
3. [15 Min] Finalize Weekly Work Plan for Next Week & Make Commitments
4. [5 Min] Plus/Delta & Improvement Ideas

WWP Meeting Agenda

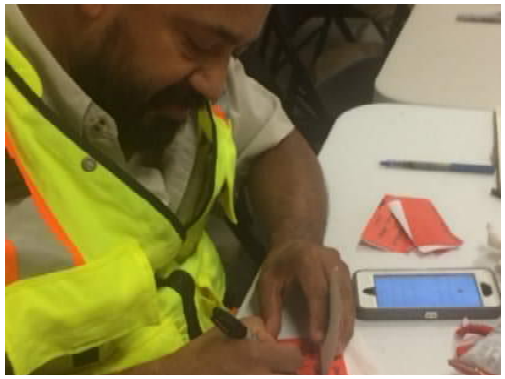
Lean Construction Institute
Immersive Education Program

Area 1 Level 1							Add Task
Industrial- Sprinkler head relocation (01.5712)	Mo	Tu	We	Th	Fr	Sa	Su
Mader- Repair hard ceiling from sprinkler head relocation.	Mo	Tu	We	Th	Fr	Sa	Su
Area 2 Level 1							**Add Task**
ISEC- Trust Travel 5772 Edge Banding and Sidesplash	Mo	Tu	We	Th	Fr	Sa	Su
Cleveland- Punchlist at CBP Areas	Mo	Tu	We	Th	Fr	Sa	Su
ISEC- Punchlist at CBP Areas	Mo	Tu	We	Th	Fr	Sa	Su
MC Dean Punchlist CBP	Mo	Tu	We	Th	Fr	Sa	Su
Randall- Punchlist at CBP Areas	Mo	Tu	We	Th	Fr	Sa	Su
Service Painting- Punchlist at CBP Areas	Mo	Tu	We	Th	Fr	Sa	Su

Lean Construction Institute
Immersive Education Program

Standard Work Available @ LeanConstruction.org

https://www.leanconstruction.org/membership/corporate-members-center/last-planner-system/

Last Planner System®
Standard Work
3_Planning Session Preparation

Lean Construction Institute
Immersive Education Program

Outcome:
The Last Planner System® organizer will be able to prepare for a planning session by arranging to have the spatial and material requirements for a successful session.

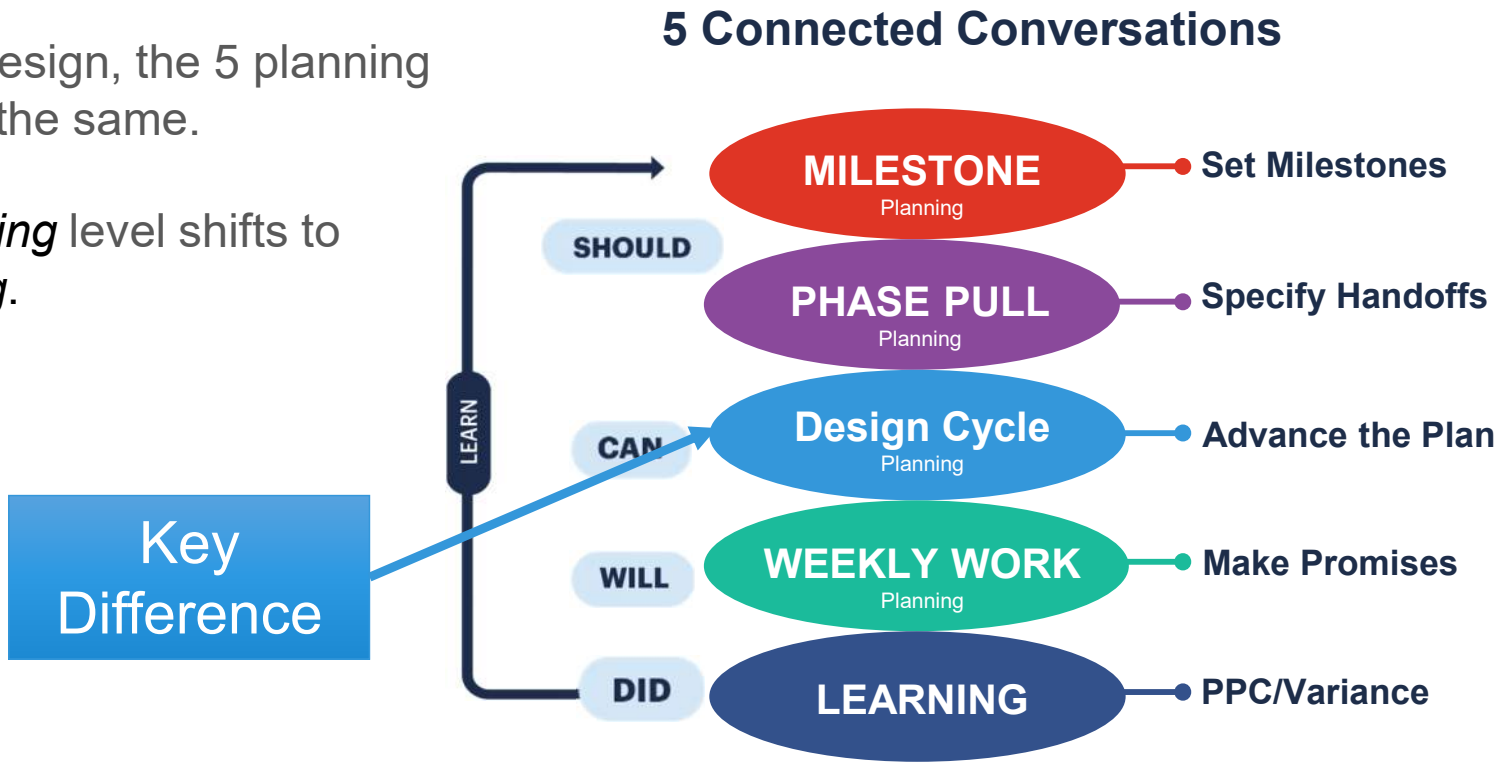
Process:
Prior to the pull planning session, arrange for appropriate space, room set-up and materials to be in place. The session outcome is dependent on this.

LPS Modified For Design

Lean Construction Institute
Immersive Education Program

In modifying LPS for design, the 5 planning conversations remain the same.

The *Lookahead Planning* level shifts to *Design Cycle Planning*.



Design Considerations

Lean Construction Institute
Immersive Education Program

While the Last Planner System is used in construction, it is highly applicable and useful in design. Some key differences to keep in mind include:

Design:

- Is emerging based on new information and the flow is “information”.
- Milestones are clearly defined by expected outcome which should describe what needs to be known.
- Milestones are often “decision points”.

Construction:

- Is linear in nature and the flow is “tangible materials”.
- Milestones are clearly defined by expected outcome which will be observable in the field.

Discussion Question

Lean Construction Institute
Immersive Education Program

What new actions or ideas that you learned today can you take back to your project?

Write down on Take Away Sheet (5 minutes)

Lean Journey to Mastery

Lean Construction Institute
Immersive Education Program

How will you reach the next level on your journey?

Target Value Delivery: Classroom & eLearning (release 2019)
Lean in the Design Phase: Classroom & eLearning
Mindset of an Effective Big Room: Classroom & eLearning (release May 2019)
Last Planner® System in Design: Classroom & eLearning (release 2019)
Conducting Gemba Walks: Classroom

Introduction to Lean Project Delivery: Classroom, eLearning & Webinar
Introduction to Last Planner® System: Classroom & eLearning
Lean in the Design Phase: Classroom & eLearning
Introduction to Lean in Design-Build: Classroom
The Business Case for Learn: Classroom

More on Learning

Lean Construction Institute
Immersive Education Program

Books:

Events:

- Local Community of Practice
- Congress (October)
- Design Forum (May)

eLearning:

Learn on your own time without taking time off project work.

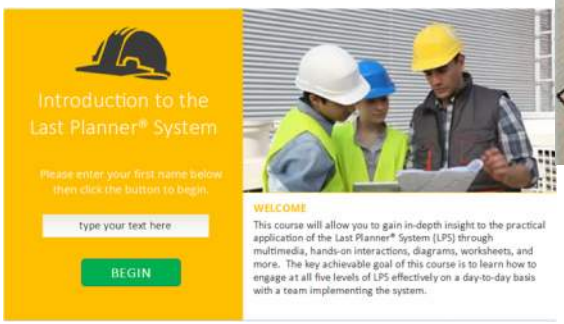
Start learning now:

www.LeanConstruction.org

eLearning Courses

Lean Construction Institute
Immersive Education Program

- Introduction to the Last Planner System®
- Introduction to Lean Project Delivery
- Lean in the Design Phase
- Effective Big Room
- Target Value Delivery
- Last Planner System® in Design



More on Learning

Lean Construction Institute
Immersive Education Program

Books:

Events:

- Local Community of Practice
- Congress (October)
- Design Forum (May)

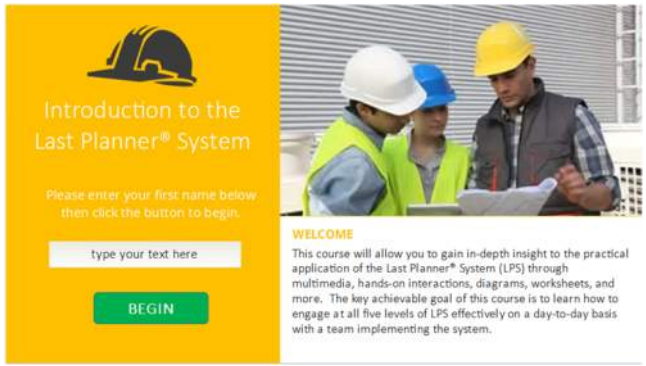
Start learning now:
www.LeanConstruction.org

eLearning Courses

Lean Construction Institute
Immersive Education Program

Available now:

- Introduction to the Last Planner System®
- Introduction to Lean Project Delivery
- Lean in the Design Phase
- Effective Big Room
- Target Value Delivery



Questions?

Learning Objectives Review

Lean Construction Institute
Immersive Education Program

Recognize the need for predictability on projects and how LPS creates more predictable outcomes.

Gain an overview understanding of each of the five connected planning conversations of LPS and how they interrelate.

Discover the basic mechanics of LPS including the foundational base of reliable commitments.

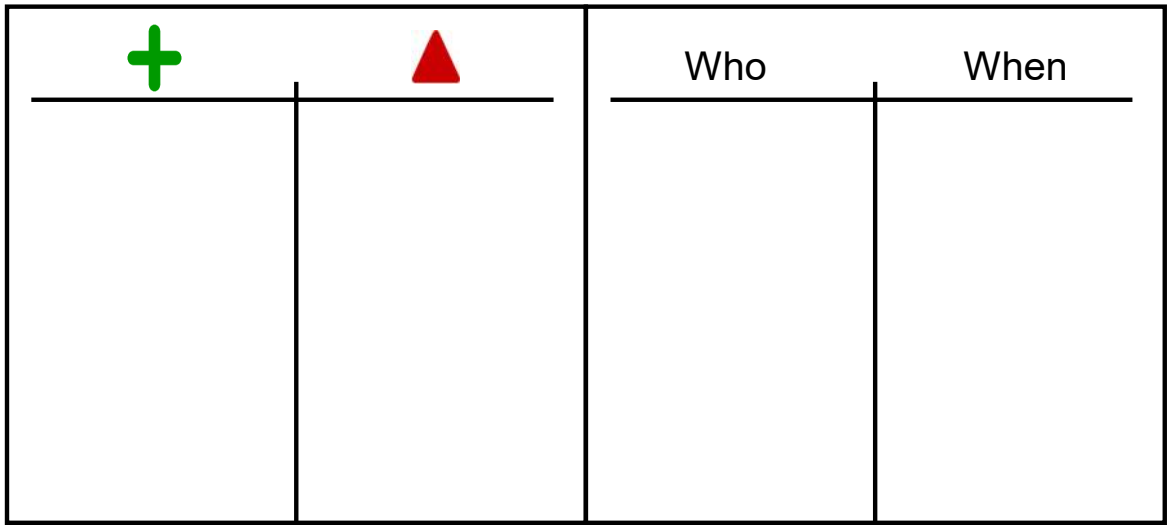
Understand the need for continuous learning and for measuring reliability to improve predictability.

Conduct Plus/Delta

Lean Construction Institute
Immersive Education Program

Plus: What produced *value* during the session?

Delta: What could we *change to improve* the process or outcome?



Fill Out Course Survey before you leave

Lean Construction Institute
Immersive Education Program

Your feedback is very important to help us improve the content and experience for future learners.

Please fill out the LCI Congress Survey in the Congress App before moving to your next event.