Introduction to the Last Planner System®

Lean Construction Institute
Immersive Education Program

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INTRODUCTIONS

Introductions

1. Name
2. Company
3. Role
4. Give one example of a unique challenge when scheduling and planning projects

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LCI Course:
Introduction to Last Planner System®
4 CEU

Sign the sign-in sheet for credit

AIA Approved Continuing Education

3

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Rules of Engagement

- This is a safe zone
- Everyone has equal status
- Speak up and share your ideas
- Actively listen to others
- One conversation at a time
- Use E.L.M.O.
  Enough, **L**et's **M**ove **O**n
- Silence phones
- Be focused and engaged
- Stay on time
- Have fun!

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INTRODUCTION TO LAST PLANNER SYSTEM

Learning Objectives

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- 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.

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Lean Journey to Mastery

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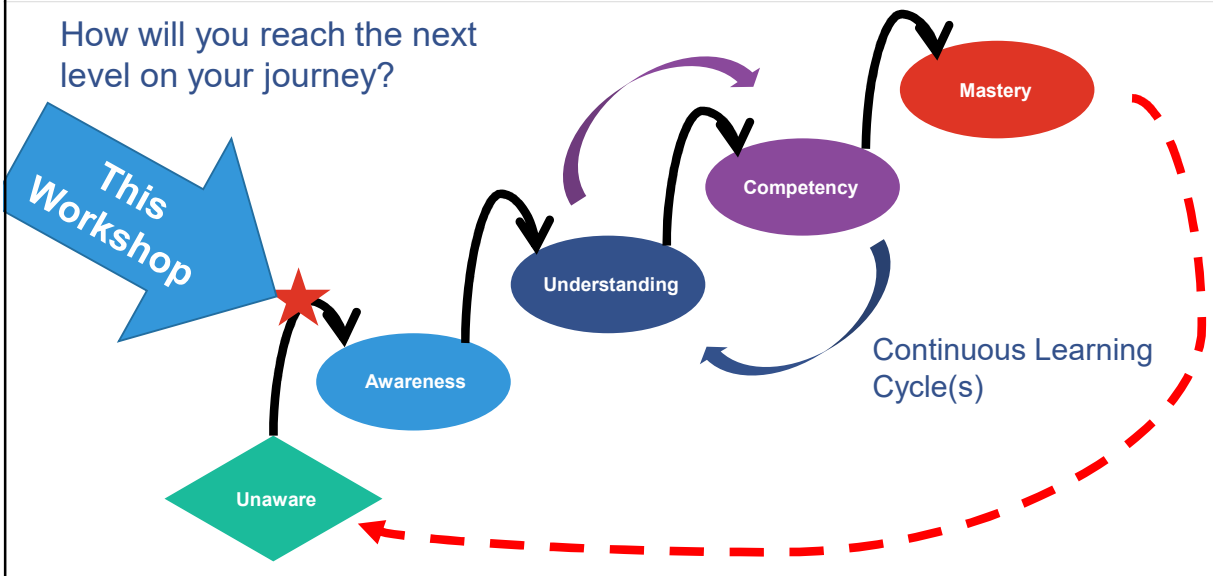

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INTRODUCTION TO LAST PLANNER SYSTEM

Learning Overview

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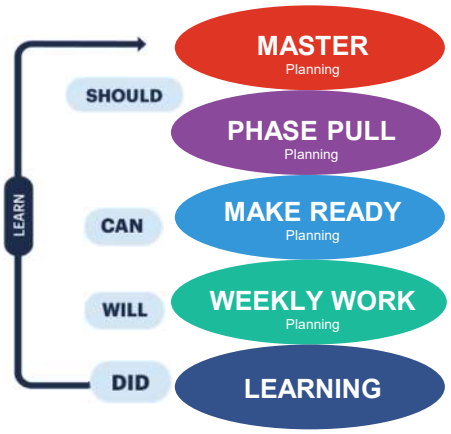
1. Why Last Planner System
2. LPS Overview
3. Master Planning
4. Phase Pull Planning
5. Lookahead Planning
6. Weekly Work Planning
7. Learning

5 Connected Conversations



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Work Plan – Guideline Agenda

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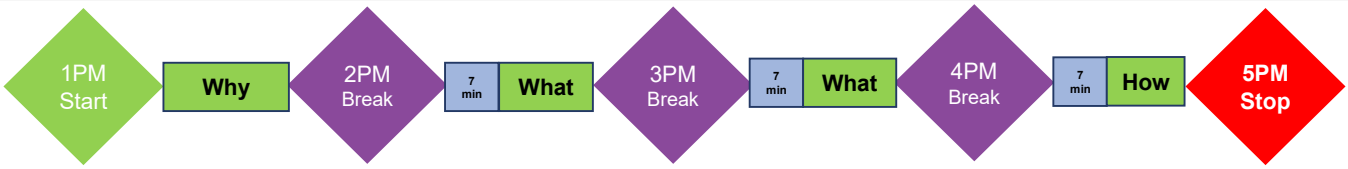

7 minute breaks – Breaks will have a visual timer measured from the time coach dismisses to break and the time coach restarts topic.

8

Discussion Question

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

ANY THING TO ADD TO THE FLIP CHART LIST FROM THE INTRODUCTIONS?

Large Group Discussion 5 min

COACH ADDS NEW ITEMS ON THE FLIP CHART

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Parade of Trades

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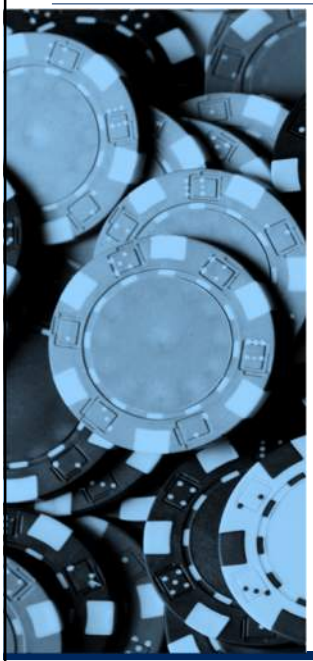
Workflow: The Parade of Trades Exercise



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? Show of hands…

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

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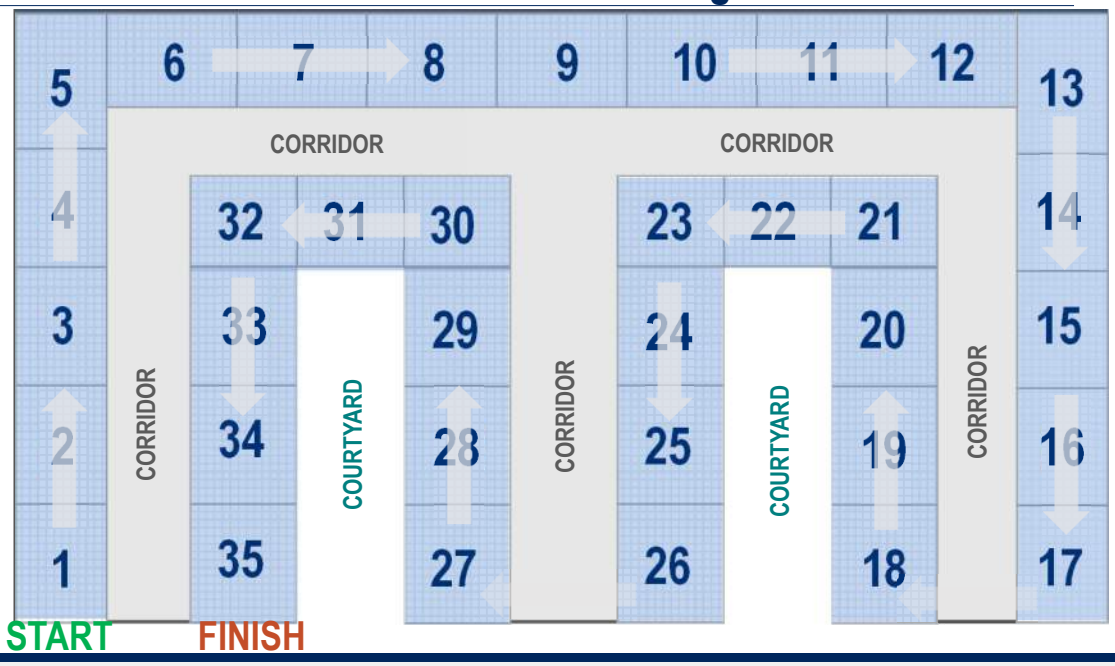
Scope of Work: 35 School Classroom Wing - Fit Out



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Parade of Trades

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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.

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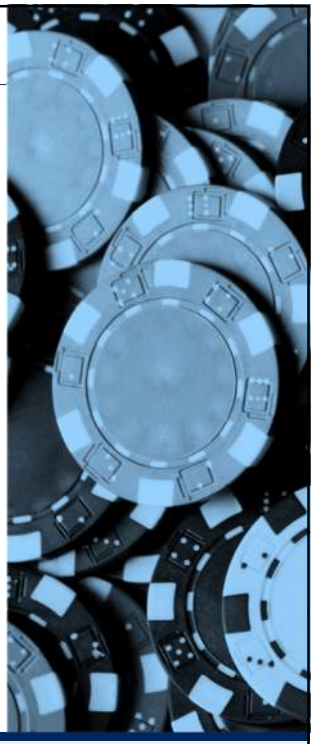
Parade of Trades - Rules

1. Each chip represents one classroom. (There are 35 chips at the starting point.)
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.



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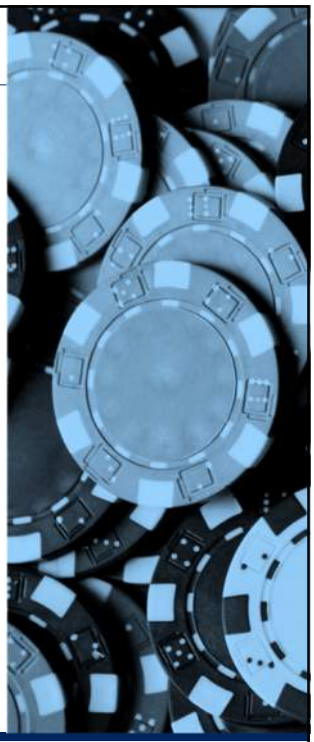
Scope of Work: In a Perfect World

- 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.**



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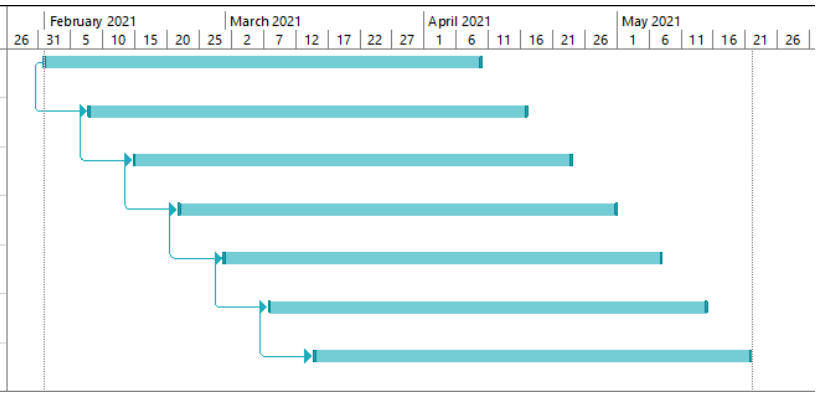
The Parade of Trades Workflow: Master Schedule

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



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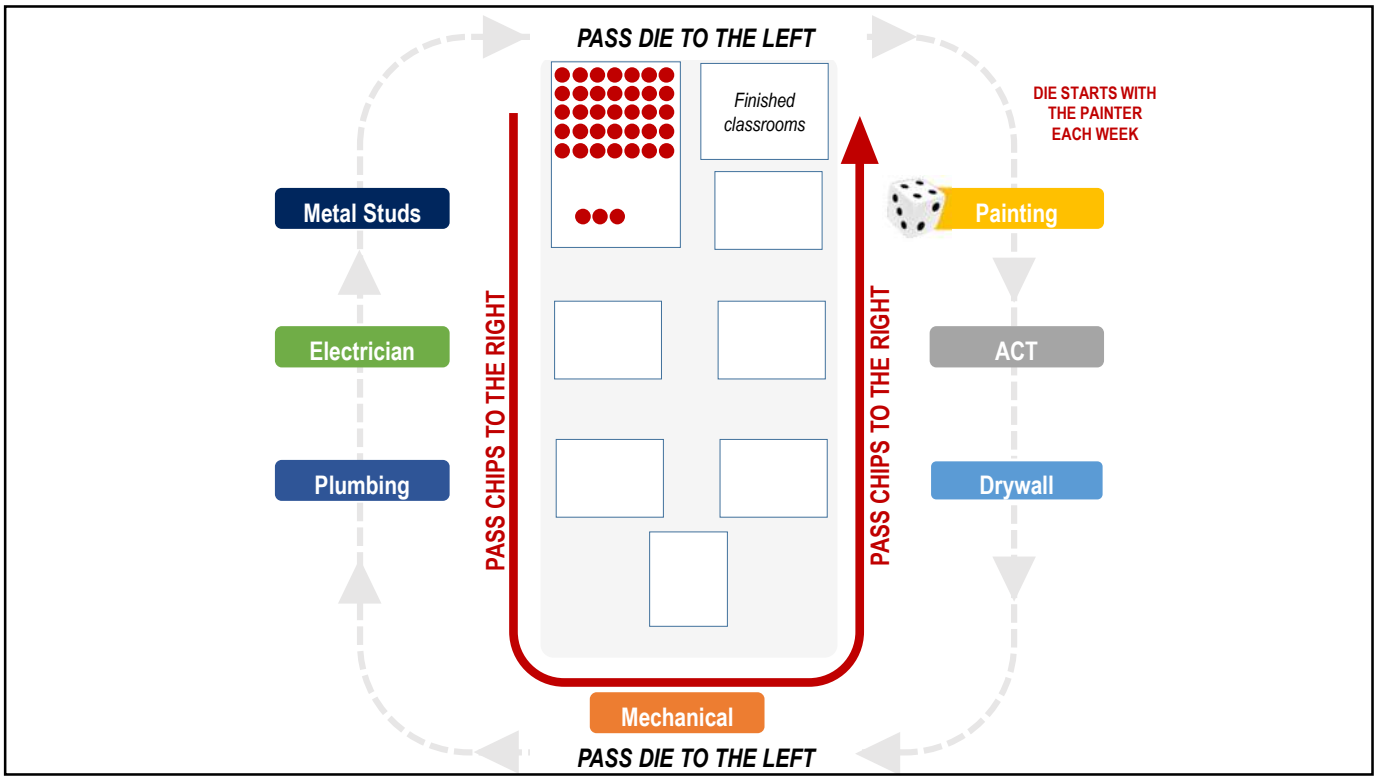

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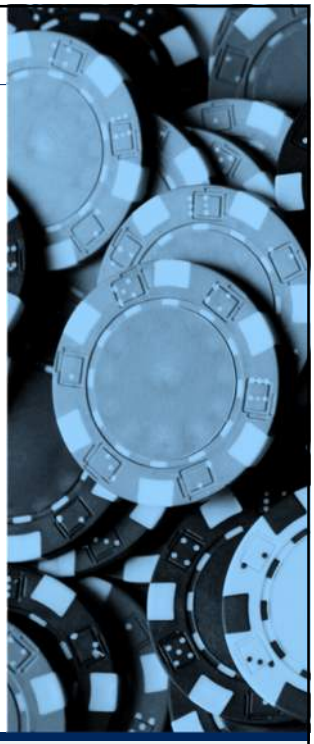
Scope of Work: In a Perfect World

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.**



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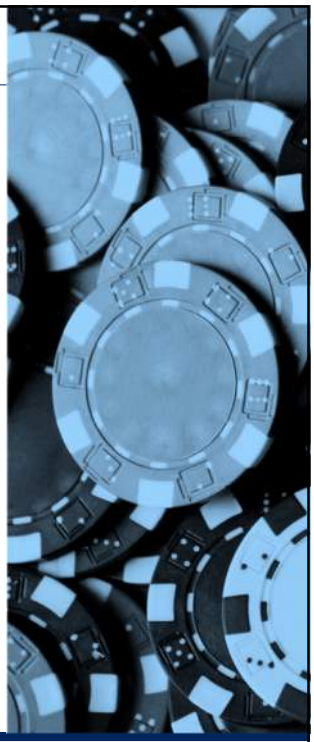
Scorecard

- 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.



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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

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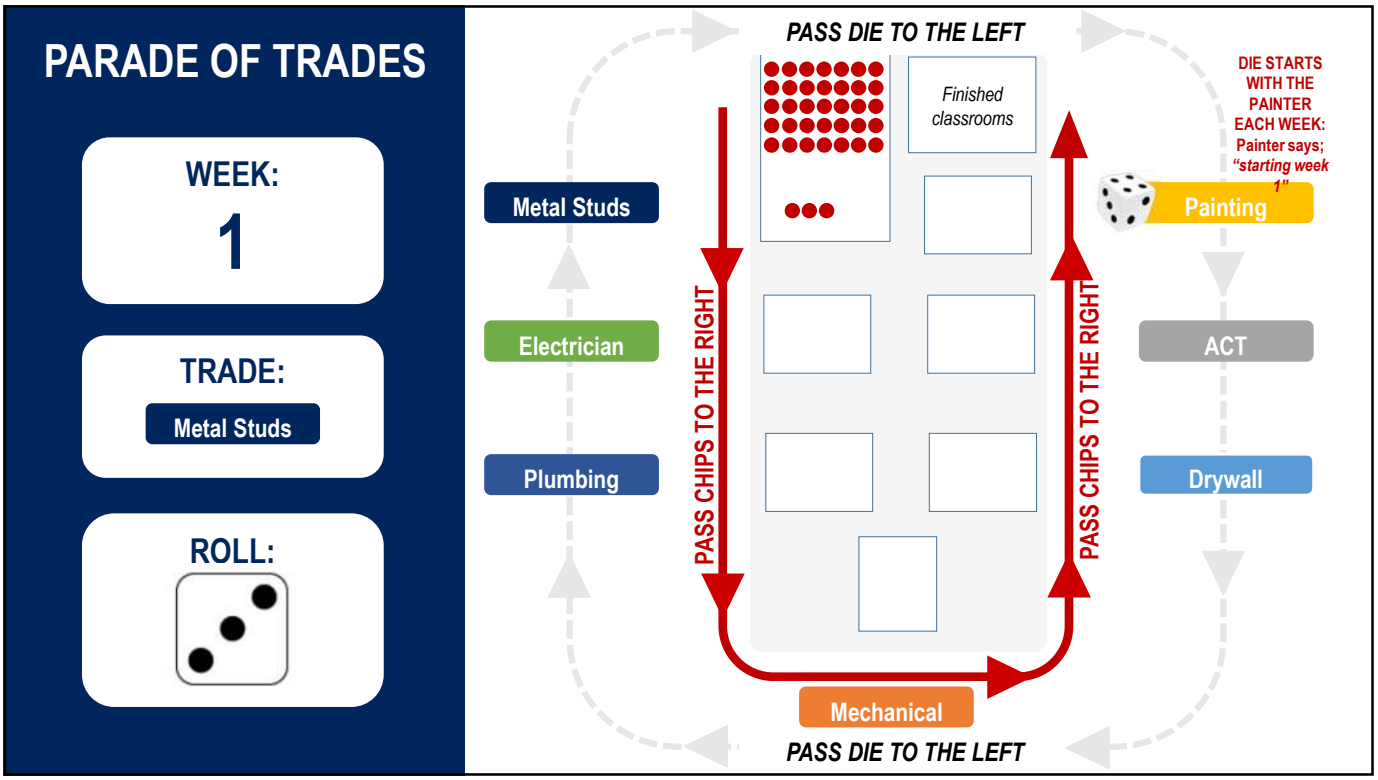

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Filling Out the Trade Scorecard
Example for Week 1: Metal Studs/Insulation

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

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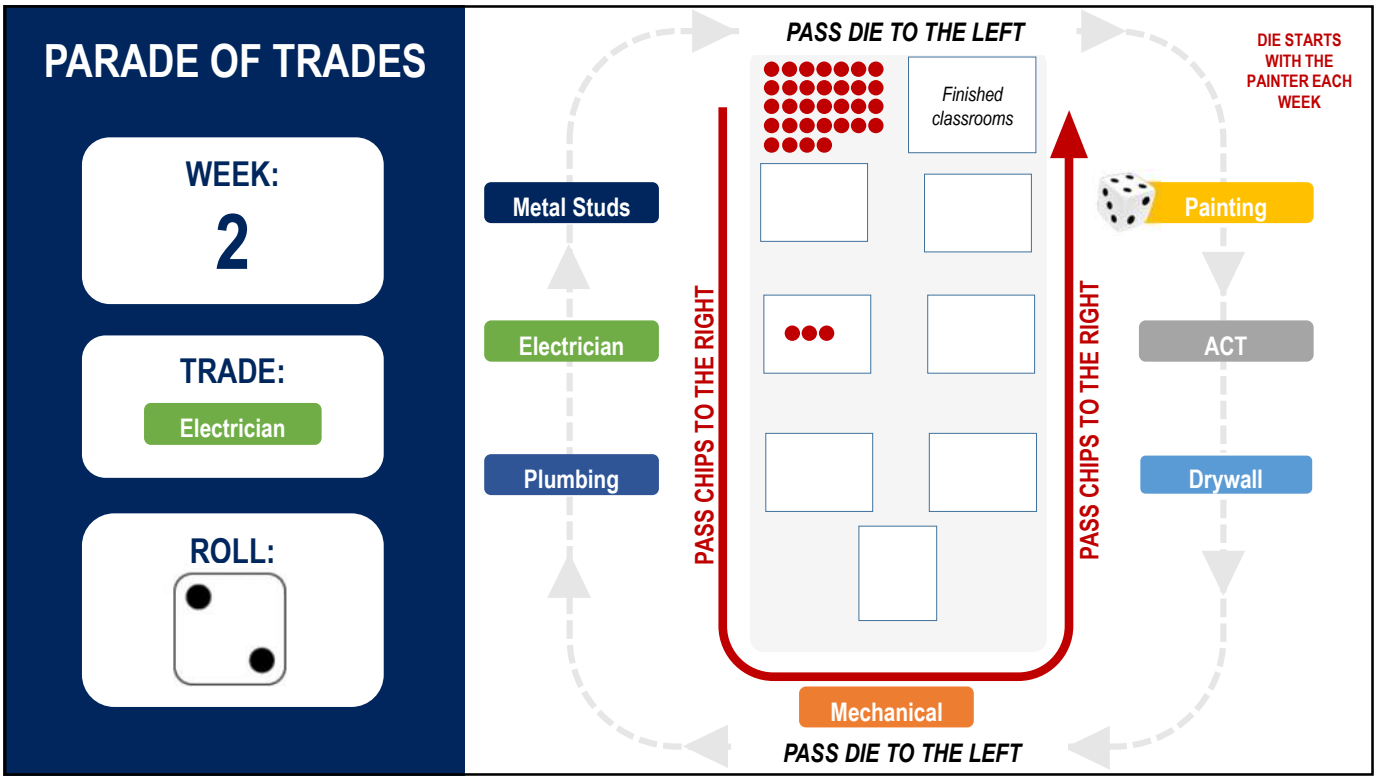

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Filling Out the Trade Scorecard
Example for Week 2: Electrical

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

Turn

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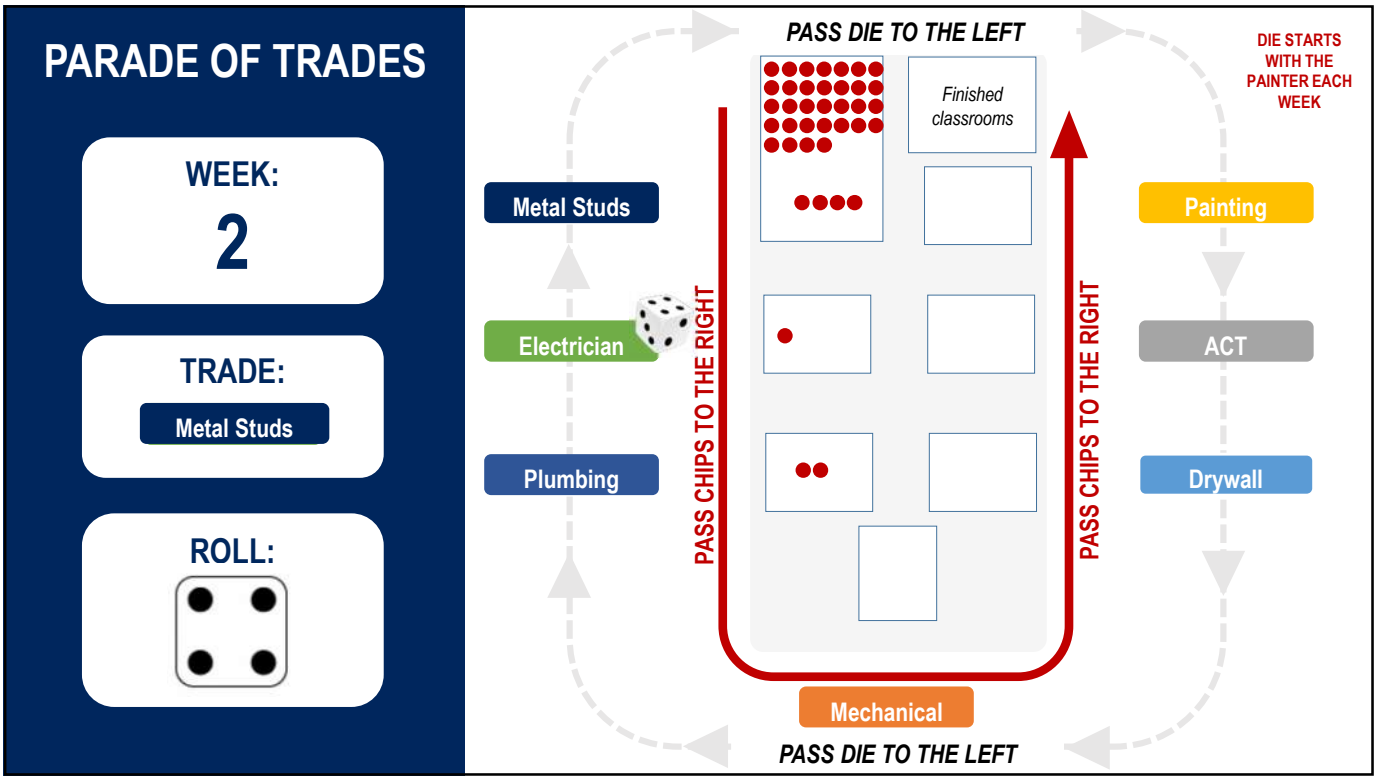

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Filling Out the Trade Scorecard
Example for Week 2: Metal Studs/Insulation

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

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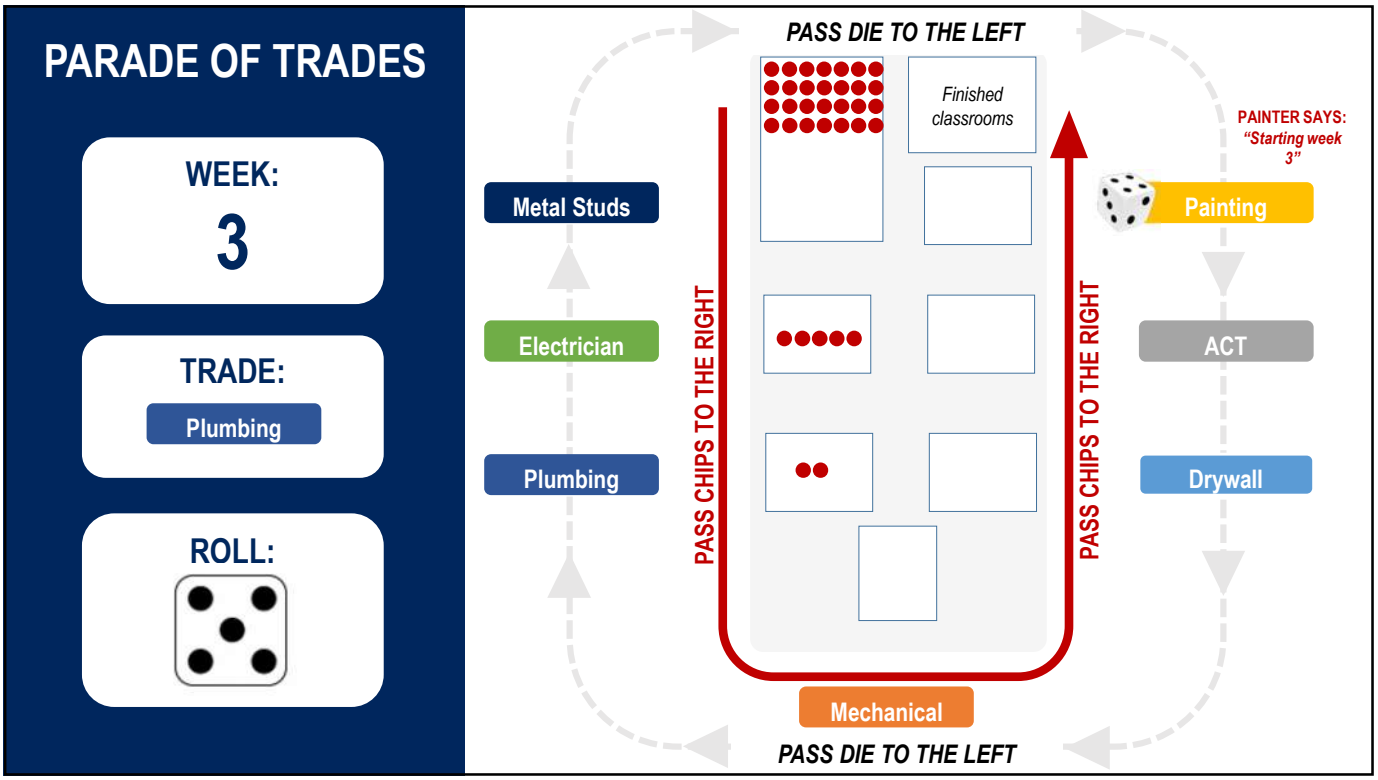

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Execute the Work: Filling Out the Trade Scorecard
Example for Week 3: Plumbing

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

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Round One: Go Slow at First! TIPS FOR SUCCESS

1. Roll with your left hand towards person on your LEFT. Respectful, safe, fast.
2. Your coach will help you fill in the scorecard correctly.
3. Each box and each column must be filled in with a number.
4. Follow your coach's directions.

START ROLLING!!

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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 progress.
   - As a superintendent, what would you tell this trade that they must do to catch up?

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Round One: Go Slow at First!

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

CONTINUE ROLLING!!

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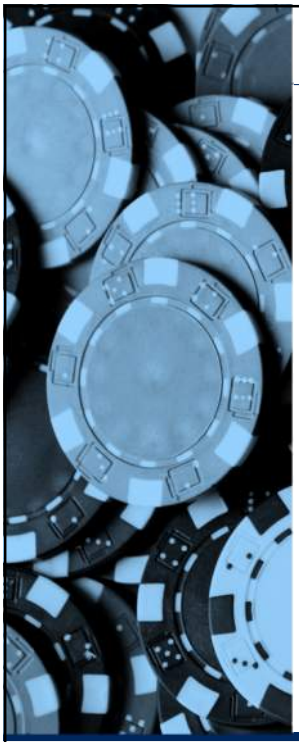

Final Results: Round One

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?

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BREAK # 1 - 7 minutes

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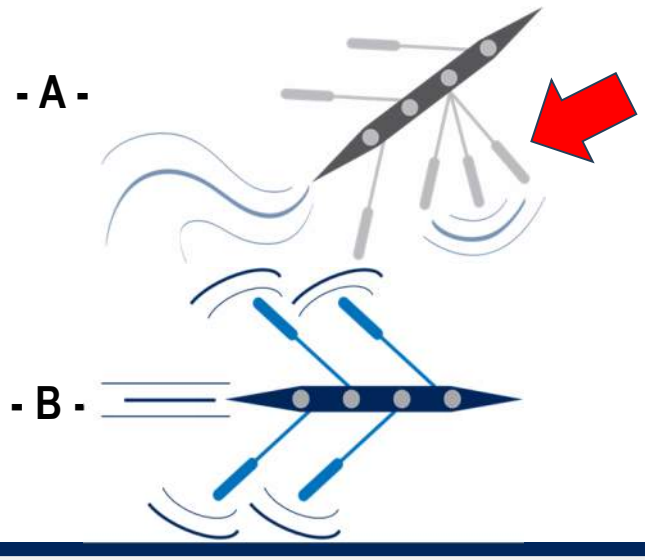
Execute the Work: Final Results: Round One

Which boat will get to the finish line first?

Finish Line -



Individual Efficiency
= *Sub-optimization*

System Efficiency
= *Optimal Value Stream Performance*

"Slow is Smooth; Smooth is Fast"

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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 variation?

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 3's and 4's
  - 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.

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. Based on this list of suggestions, which die DID 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?

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LCI's Six Tenets of Lean

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

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Last Planner System Trademark

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

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

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The Opportunity…

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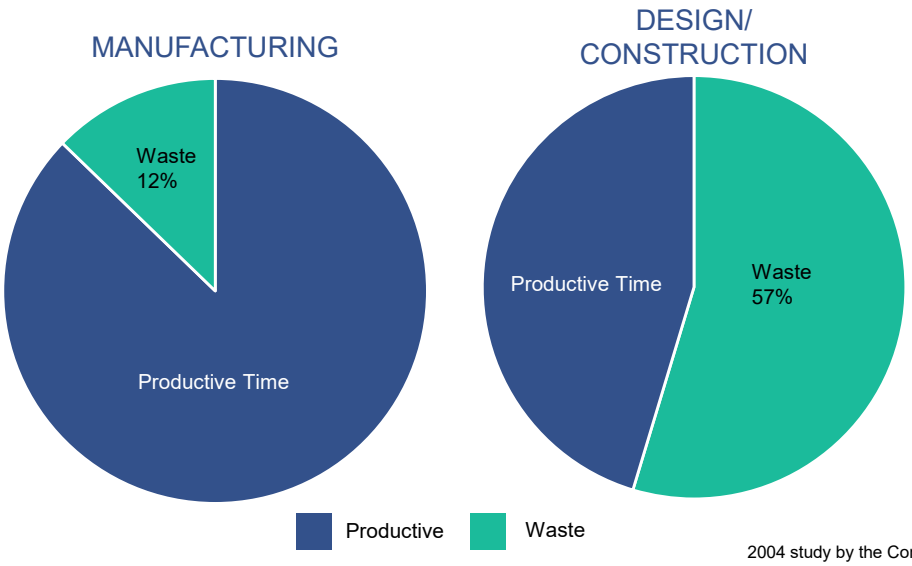

2004 study by the Construction Industry Institute

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Why Use Last Planner System?

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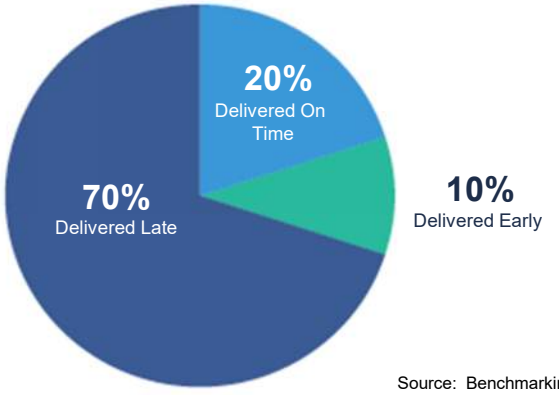
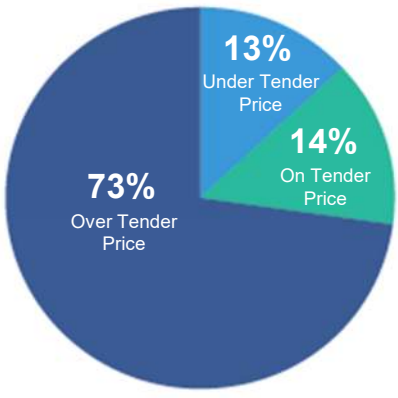
Time —
70% were delivered late



Cost —
73% were over budget



Source: Benchmarking the Government Client Stage Two Study December 1999

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Discussion Question

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

RAISE YOUR HAND TO VOTE ON ONE OF THESE VALUES

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

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Brief History of LPS – How reliable are we?

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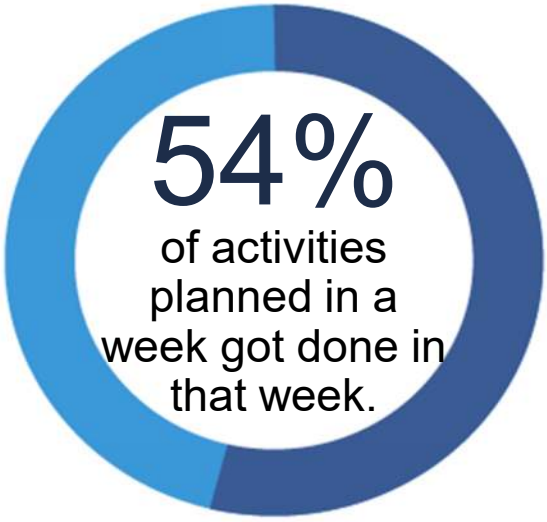

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Correlation of Lean

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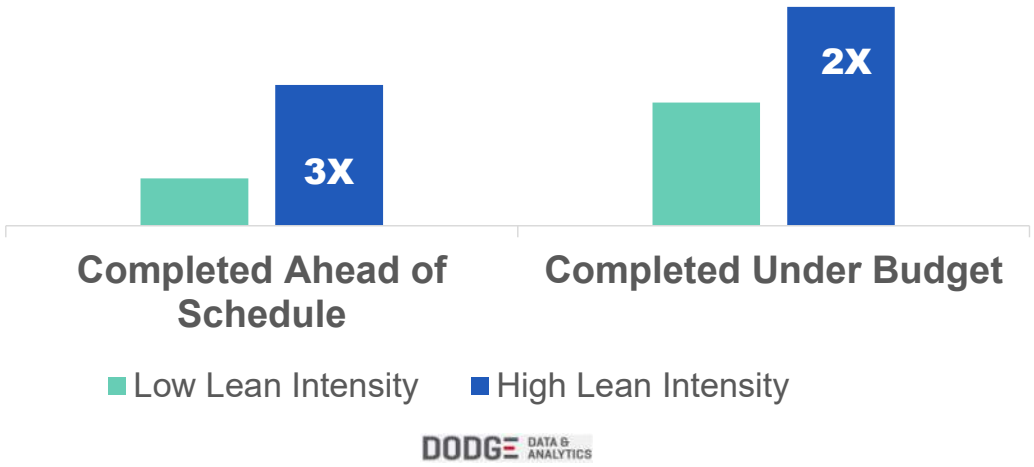
Correlation of Lean intensity to outcomes (% likelihood on best projects)



DODGE DATA & ANALYTICS

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Workflow and Risk

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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.

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Last Planner System Defined

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

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Why Status Quo Isn't Working

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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.

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Benefits

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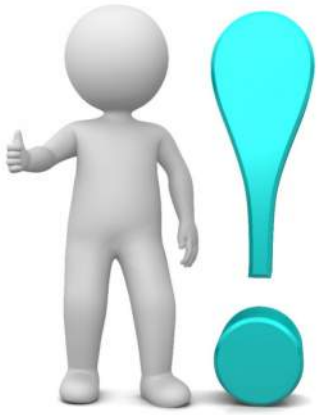
1. Improves communication & reliability.
2. Fosters an enjoyable environment, trust, and collaboration.
3. Promotes early stakeholder engagement.
4. Improves visibility of the project plan (transparency).
5. Creates team alignment.
6. Rapid learning through metrics, revealing areas for improvement.
7.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



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Consider the Project As A Promise

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- All groups can be viewed as operating as a *network of promises* or commitments, whether done well or done 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.

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Elements Of A Promise

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- *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.

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Basic Action Workflow Of A Promise

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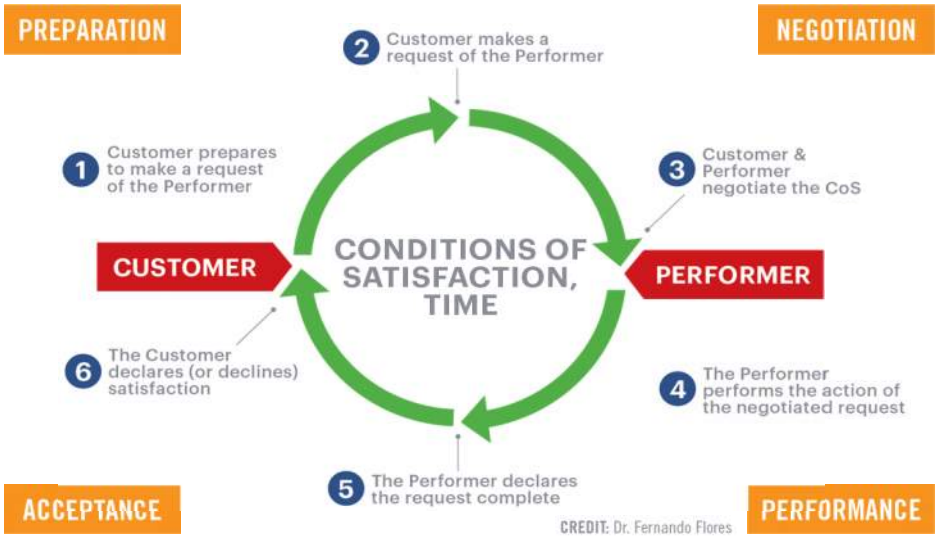

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5 Connected Conversations Of LPS

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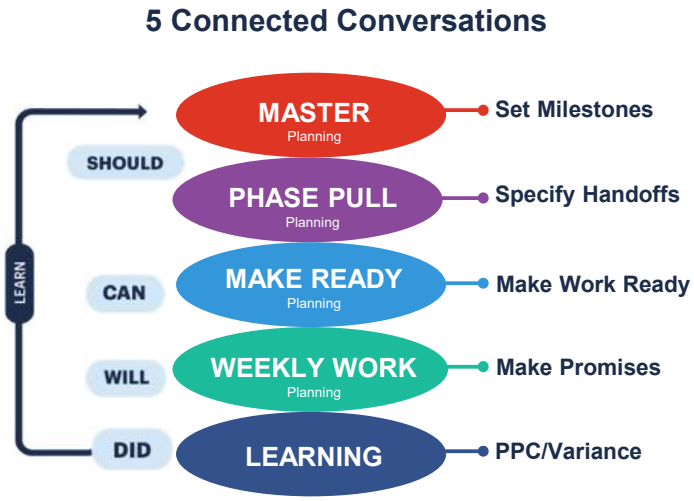
The LPS is a commitment-based system integrating 5 connected planning conversations:

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



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Last Planner System Overview

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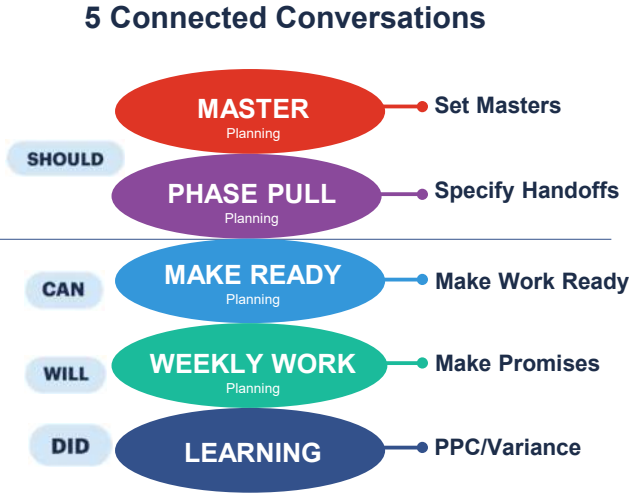
Collaborative Planning

As - Needed

Work Management
Continuous Improvement

Weekly



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Last Planner System Overview

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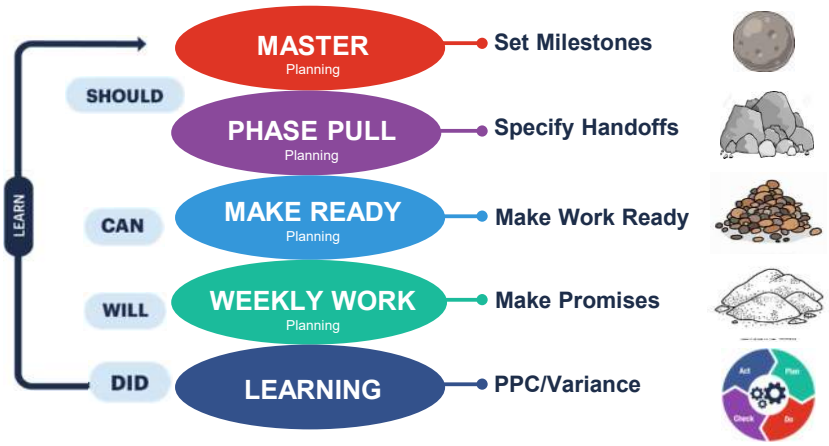
5 Connected Conversations



INTRODUCTION TO LAST PLANNER SYSTEM

System Defined

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

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System for Planning

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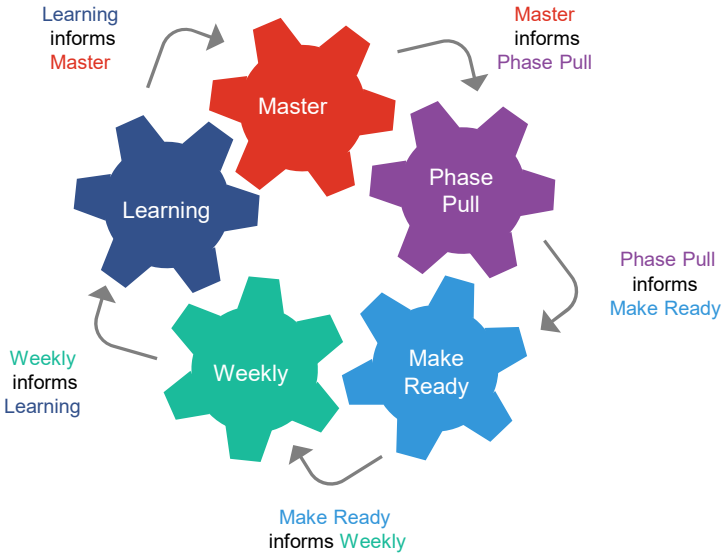

INTRODUCTION TO LAST PLANNER SYSTEM

Continuous Improvement

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Lean thinking demands a mindset of continuous improvement.

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

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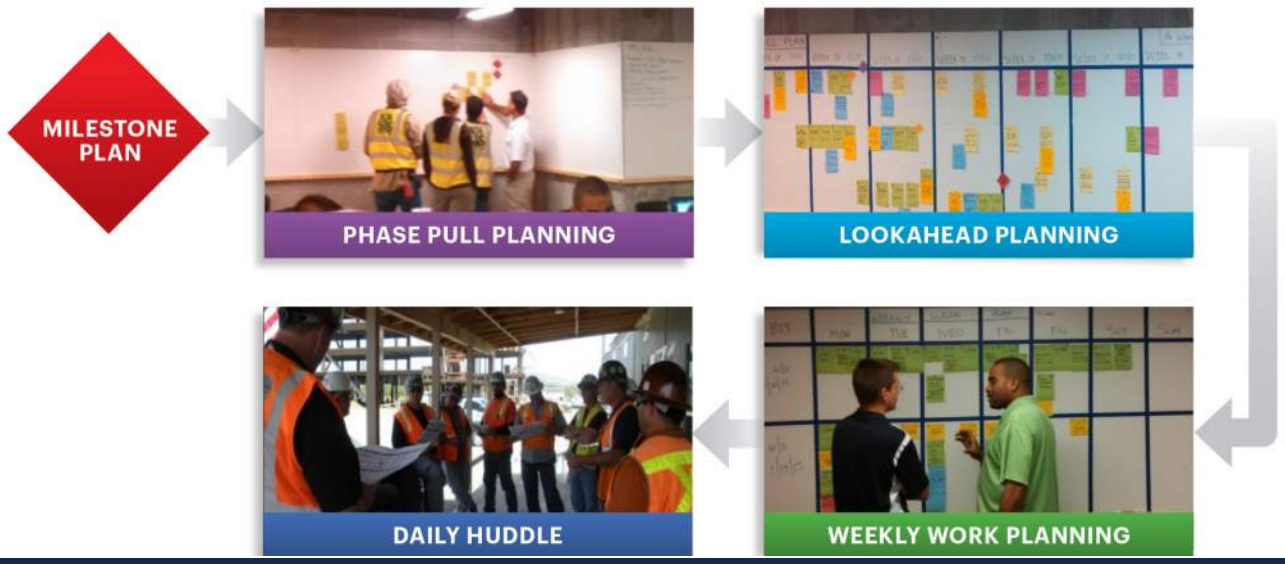
Last Planner System Flow



57

BREAK #2 - 7 minutes

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INTRODUCTION TO LAST PLANNER SYSTEM

Who Is The Last Planner

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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

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INTRODUCTION TO LAST PLANNER SYSTEM

Master Planning

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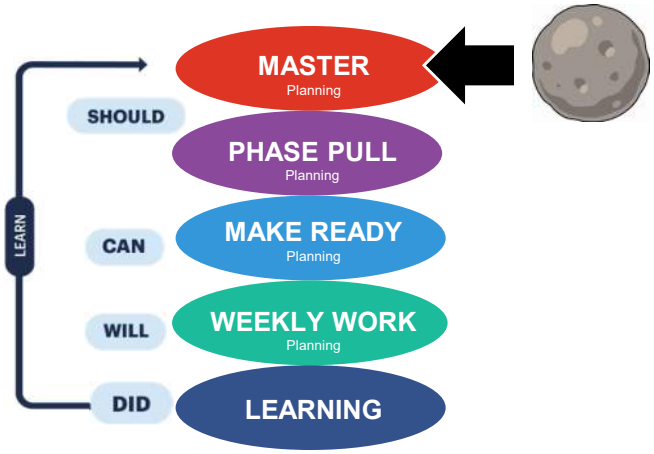
The first conversation of LPS is *Master Planning*.

The goal of Master 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



60

60

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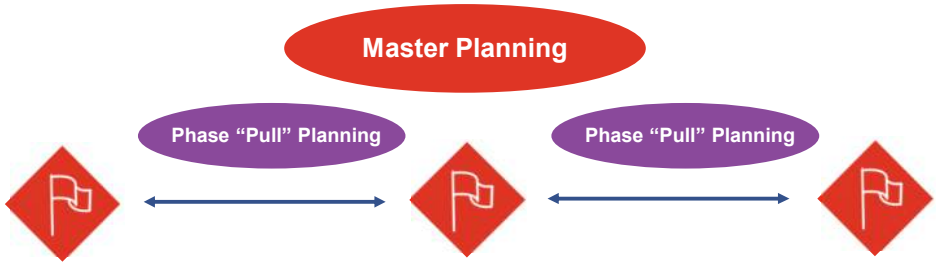

Define the overall road map and gain alignment

Identify milestones important to client and stakeholders – especially immovable dates

Informs the Phase Pull Planning

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Milestone Example Tag

Color Code
Orient as Diamond or other distinguishing manner

Add dates or durations

Add intermediate milestones to create small batch phases of 8-12 weeks duration

Add intermediate milestones for date to pull each phase

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Milestone Example Tag

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Milestone Example Tag

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Creating The Milestone Plan

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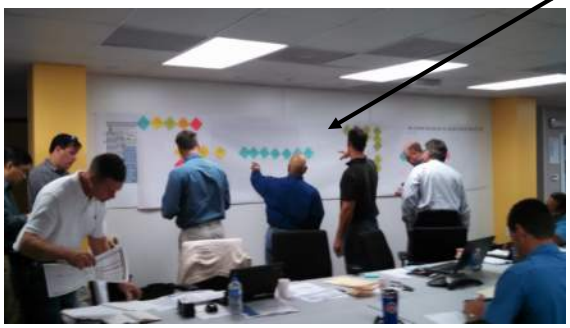
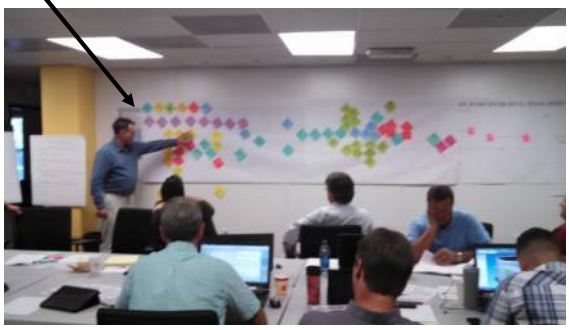
Developing the milestones to structure the flow. The next step will be to add estimated durations.



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

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Results

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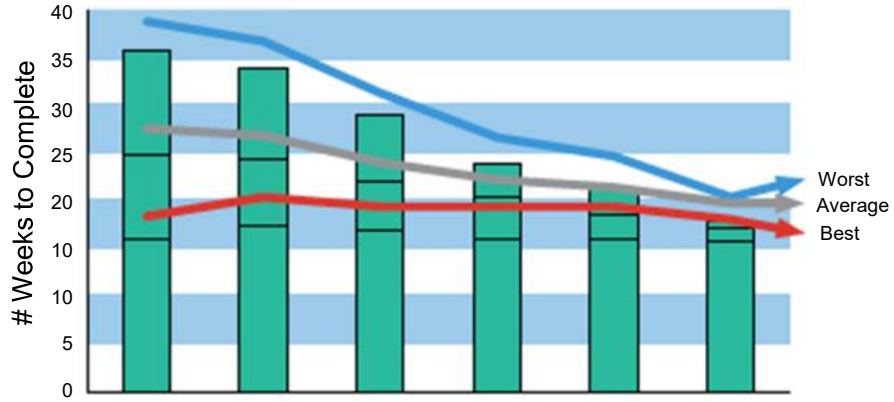
If a computer simulated each dice configuration 1,000 times, this is the outcome:



Dice configuration-->	1.1.1.6.6.6	1.2.2.5.5.6	1.2.3.4.5.6	2.2.3.4.5.5	2.3.3.4.4.5	3.3.3.4.4.4
Average Loss	115.8	97.6	75.3	51.2	37	17.3

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INTRODUCTION TO LAST PLANNER SYSTEM

Discussion Question

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What would be the specific advantages of improved work flow reliability on your projects?

Group discussion 10 min

INTRODUCTION TO LAST PLANNER SYSTEM

Phase Pull Planning

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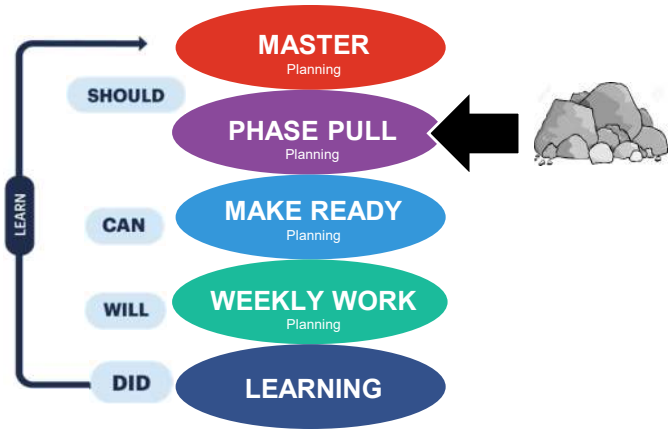
The second conversation of LPS is *Phase Pull Planning*.

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



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Phase Pull Planning

Courtesy of : PCL

- Phase of the work (~6 - 8 weeks)
- Informed by the Master Plan
- Work out the sequence and durations
- After – add dates and transfer to the Production Plan

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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:

- Advancing 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.

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Pull: Creating Flow

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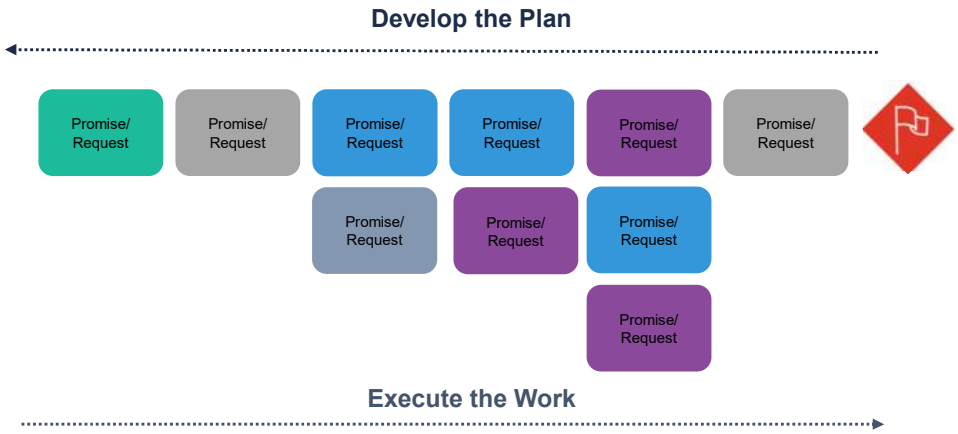

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Phase Pull Planning: Example Tag

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Name of person making the commitment

Description of the activity

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

Name	# People	# Days

MY PROMISE / ACTIVITY

- What I will Deliver
- Be specific
- Small batch

Work Zone / Area

MY REQUEST / TRIGGER

- What Releases my Work?
- Be specific

Duration of the work in days

# of People for the work

Work zone or area

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

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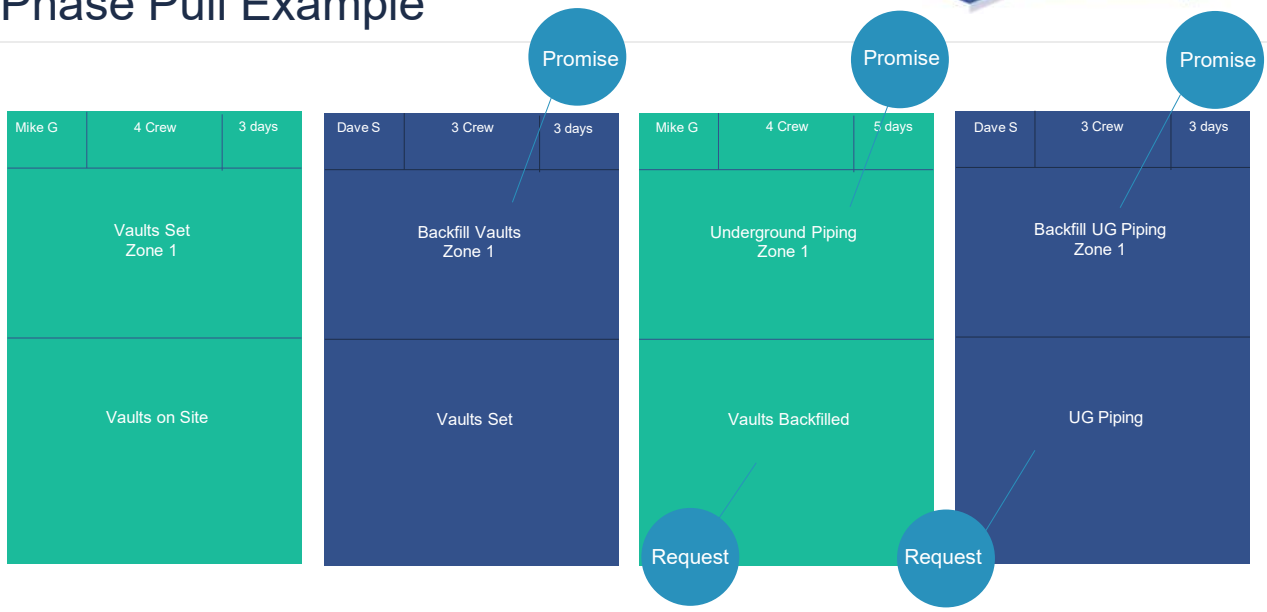
Phase Pull Example



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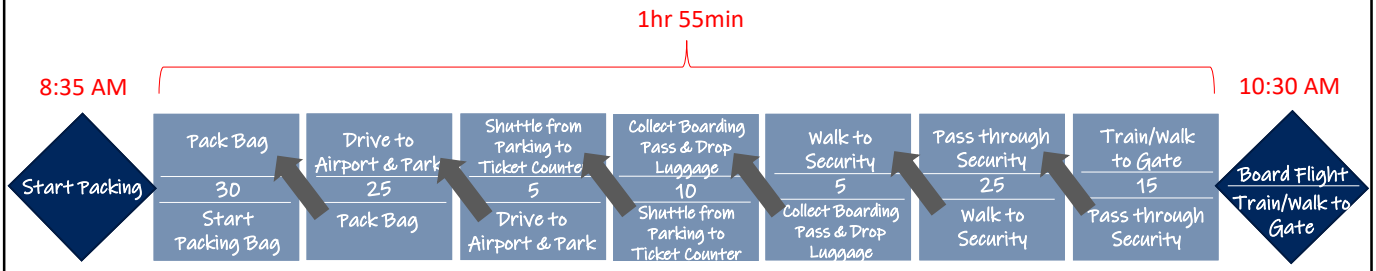
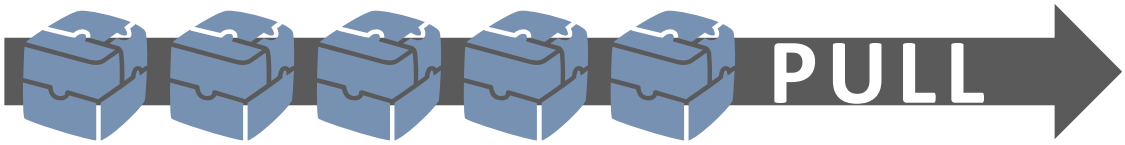
PHASE PULL EXAMPLE

CATCHING A FLIGHT



What can we do?

Current Time: 8:55



Pull is providing the customer exactly what they want, when they want it.

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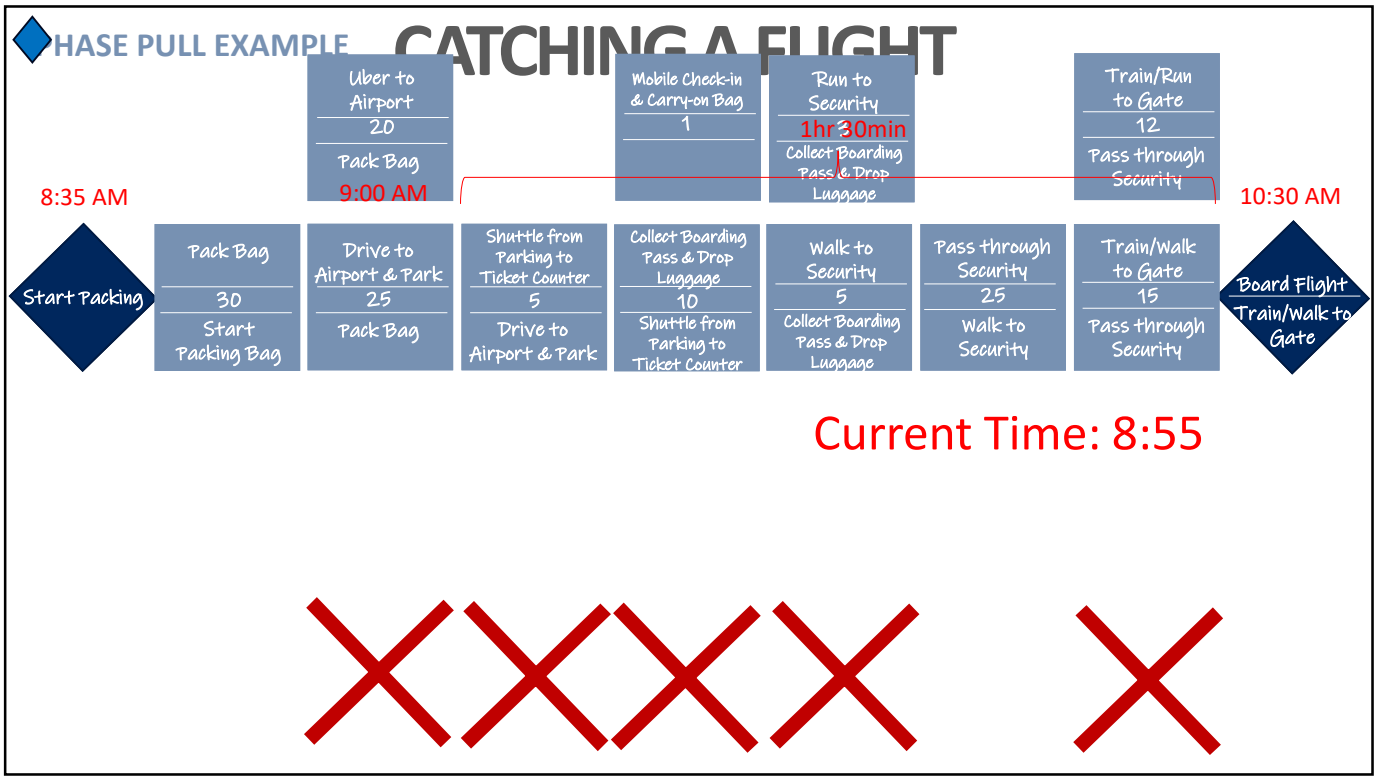
HASE PULL EXAMPLE
CATCHING A FLIGHT
Uber to Airport
20
Pack Bag
Mobile Check-in & Carry-on Bag
1
Run to Security
1hr 30min
Collect Boarding Pass & Drop Luggage
Train/Run to Gate
12
Pass through Security
8:35 AM
9:00 AM
10:30 AM
Start Packing
Pack Bag
30
Start Packing Bag
Drive to Airport & Park
25
Pack Bag
Shuttle from Parking to Ticket Counter
5
Drive to Airport & Park
Collect Boarding Pass & Drop Luggage
10
Shuttle from Parking to Ticket Counter
Walk to Security
5
Collect Boarding Pass & Drop Luggage
Pass through Security
25
Walk to Security
Train/Walk to Gate
15
Pass through Security
Board Flight
Train/Walk to Gate
Current Time: 8:55

75


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FreightTrain Visual Fragnet
SANTA CLARA VALLEY MEDICAL CENTER
Level 6
FreightTrain
HTS

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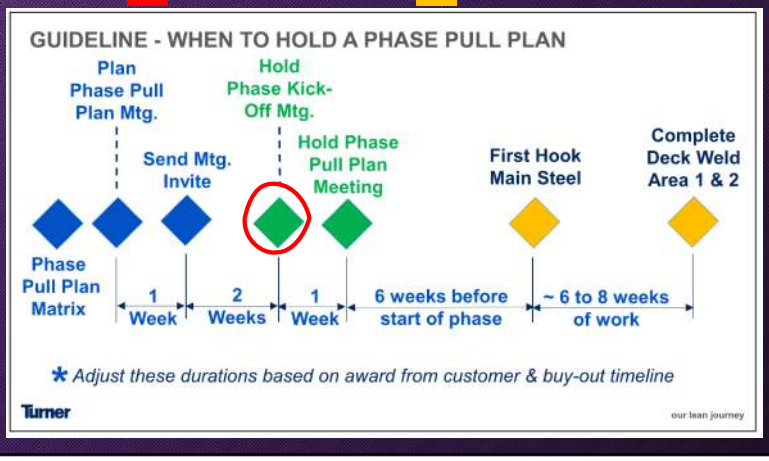
Don't Skip Pull Plan Preparation

Key to Success

KEY POINTS:

- Get ahead of the work. Leave yourselves time to clear constraints.
- Hold a Pre-Pull Meeting with trades to agree on batches and workflow.



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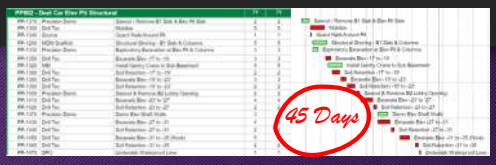
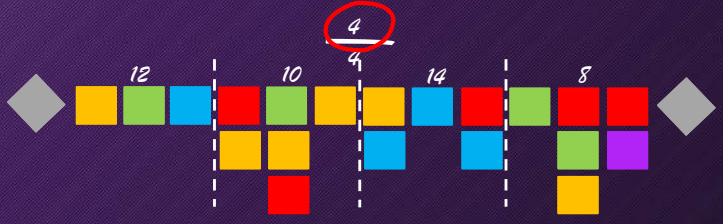
Don't Skip Pull Plan Preparation

Key to Success

KEY POINTS:

- Get ahead of the work. Leave yourselves time to clear constraints.
- Hold a Pre-Pull Meeting with trades to agree on batches and workflow.
- Know the target duration for the pull in advance.
- The pull plan isn't finished until you've calculated total duration and adjusted to hit your target.
- Keep a Pull Plan Matrix and review it in the Superintendent's Huddle 1/week.





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INTRODUCTION TO LAST PLANNER SYSTEM

Block Tower Exercise

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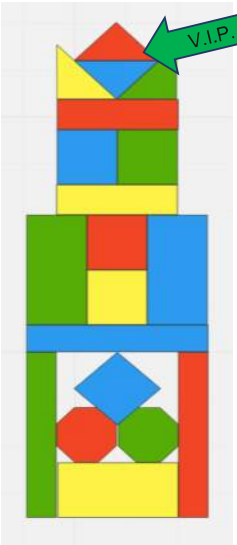

TASK

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)

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Phase Pull Plan: Start at End

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Phase Pull Plan: Pull The Work

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Phase Pull Plan: Review From The Start

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Innovative Pull Planning

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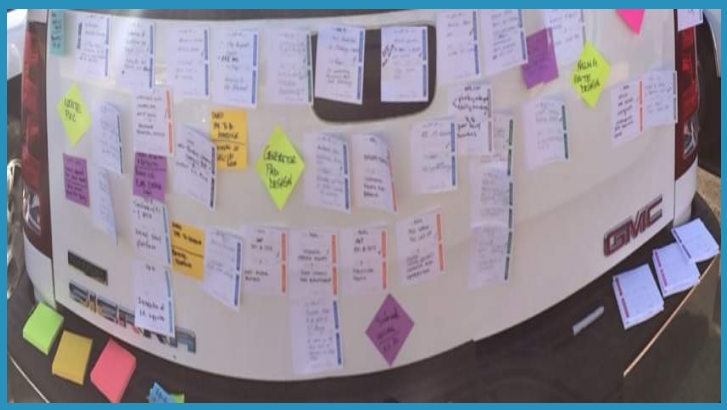

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BREAK # 3 - 7 minutes

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Make Ready Planning

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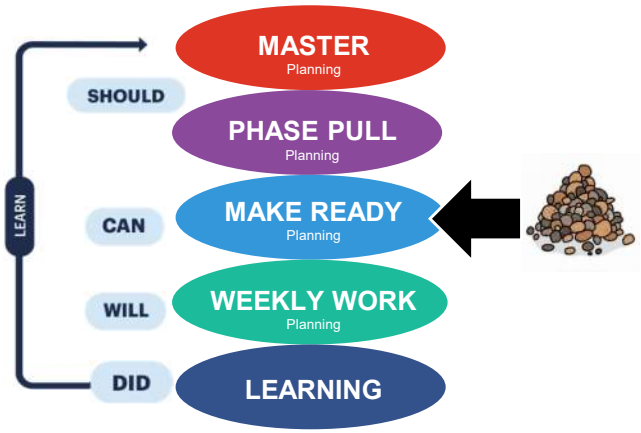
The third conversation of LPS is *Make Ready Planning.*

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



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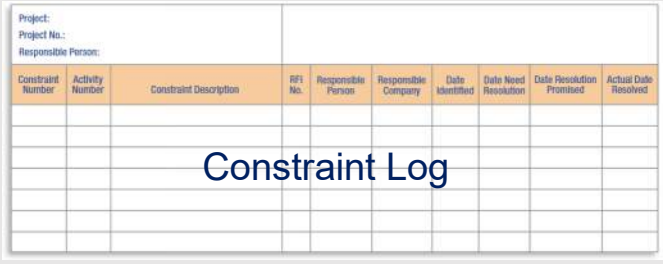

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Make Ready Planning

- Open a 6-week window onto the Production Plan
- Look ahead to tasks starting in 6 weeks to "make work ready"
- Supports Team Meeting to:
  - Identify Constraints – Constraint Log
  - Inform the Weekly Work Plan

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INTRODUCTION TO LAST PLANNER SYSTEM

Lookahead Planning Example

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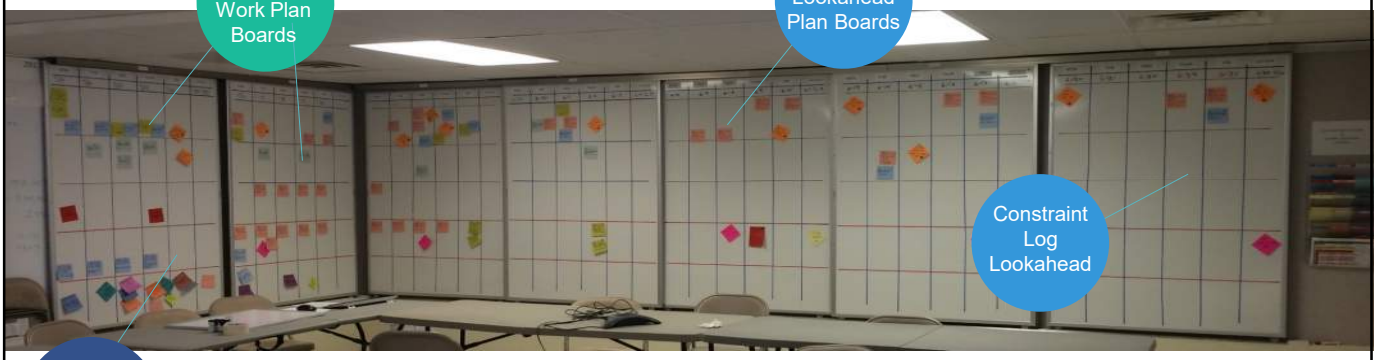

Courtesy of: Turner Construction

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INTRODUCTION TO LAST PLANNER SYSTEM

Lookahead – Make Ready Planning Options

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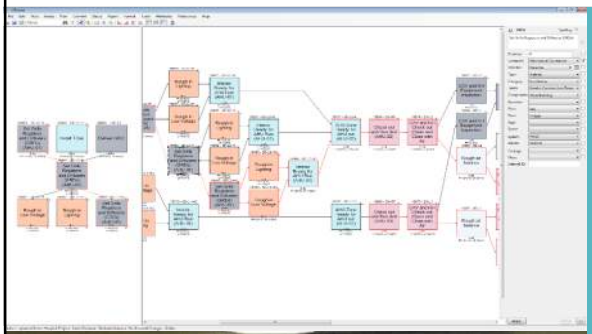

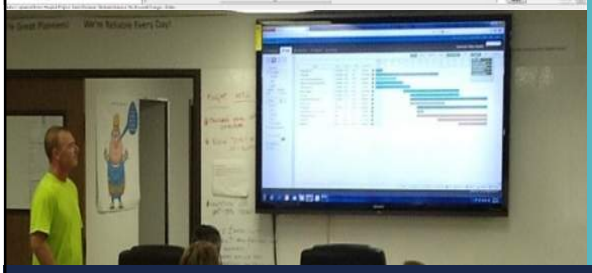

Electronic

- P6
- Microsoft Project
- TouchPlan
- Teamoty
- PlanGrid
- vPlanner
- Allucent
- Nialli
- LCM Digital

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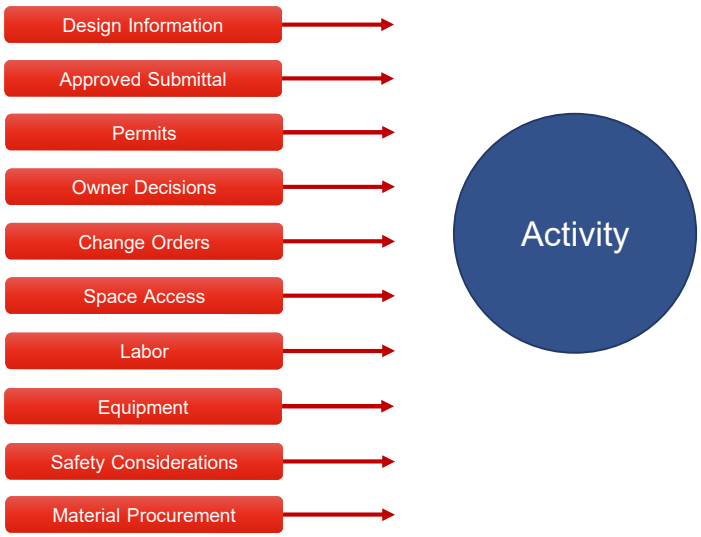
Constraint Defined

Constraint:
An item or requirement that will prevent a task from starting, advancing or completing as planned.



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Make Ready Planning – 2 Elements

Make Ready Planning = **PRODUCTION PLAN** + **CONSTRAINT ANALYSIS AND REMOVAL**

planning

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Make Ready Planning – The Real Power of the LPS

Future Work and the Constraint Log

Make future work ready to start and finish without stopping

and

Identify constraints to starting work and if a task is NOT READY, add the task to the CONSTRAINT LOG

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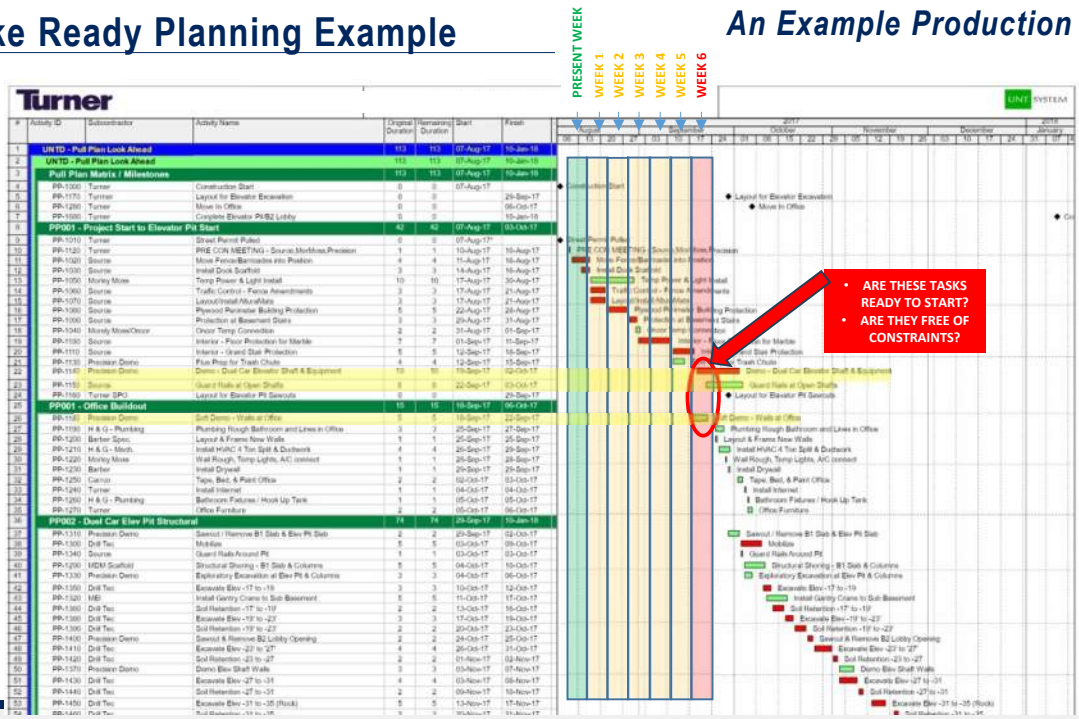
Make Ready Planning Example

An Example Production Plan



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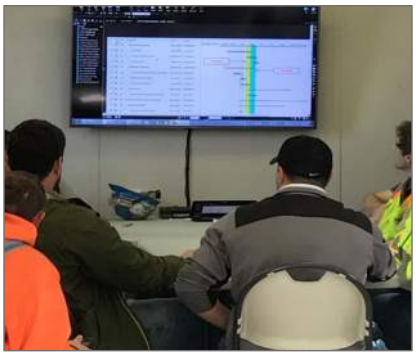
What does Make Ready Mean? Use The Make Ready Checklist

☐ 1. Has the trade crew leader, trade PM, and trade detailer built all the details for this task in their BIM model, shop drawings, or in a mock-up?

☐ 2. Does the Turner engineer have personal knowledge that all the details for this task can be assembled without changes or RFIs?

☐ 3. Are there zero open RFIs for this task?

☐ 4. Have change orders or other authorizations regarding this task been approved?



What does Make Ready Mean? Use The Make Ready Checklist (Continued)

☐ 5. Has the work for this task received all the necessary building permits?

☐ 6. Has the trade ordered the materials and material delivery will be made by this date?

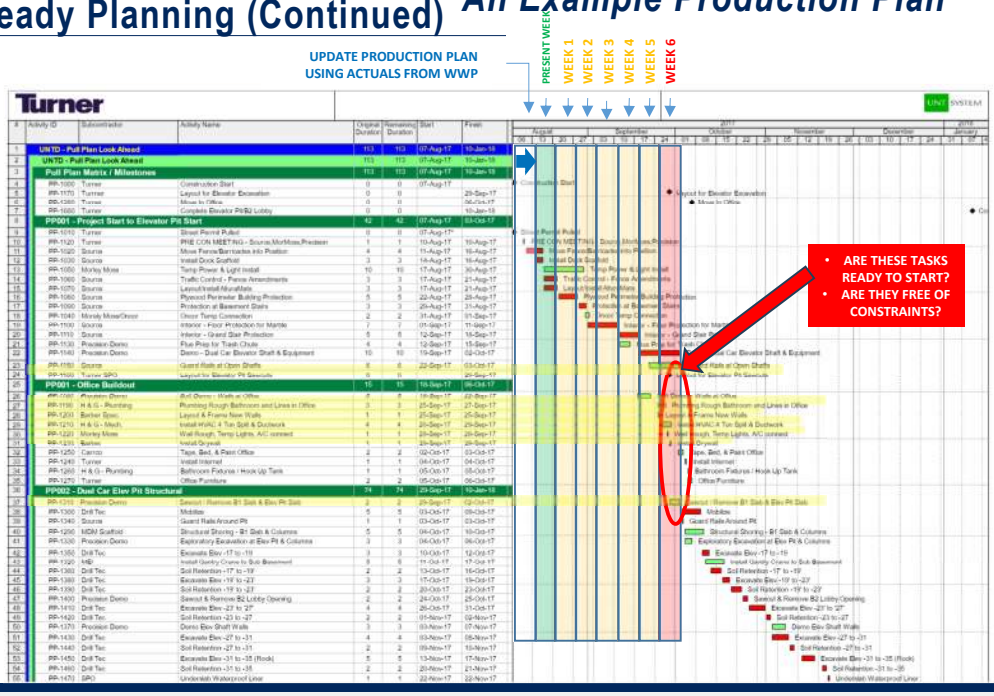
☐ 7. Has special worker testing, training, certifications, inspection requirements, quality pre-install meeting, tools, and equipment been arranged for this task?

What does Make Ready Mean? Use The Make Ready Checklist (Continued)

☐ 8. Can this task start and be completed without interruption?

☐ 9. Has all safety planning and associated documentation including insurance, premobilization submittals, Job Hazard Analysis (JHAs), and Pre-Task Planning (PTP) been approved for this task?

Make Ready Planning (Continued) *An Example Production Plan*



Make Ready Planning Checklist

- Repeat the use of the Make Ready Planning checklist previously shown.

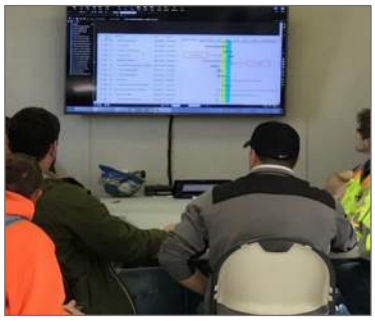
What are some of the challenges of identifying constraints six weeks out?

Make-Ready Planning Checklist

What Does "READY" Mean?

1. ☐ Has the trade crew leader, trade PM, and trade detailer built all the details for this task in their BIM model / shop drawings or in a mock-up?
2. ☐ Does the Turner Engineer have personal knowledge that all the details for this task can be assembled without changes or RFIs?
3. ☐ Are there are zero open RFIs for this task?
4. ☐ Have change orders or other authorizations regarding this task been approved?
5. ☐ Has the work for this task received all the necessary building permits?
6. ☐ Has the trade ordered the materials and material delivery will be made by this date?
7. ☐ Has special worker testing, training, certifications, inspection requirements, quality pre-install meeting, tools, and equipment been arranged for this task?
8. ☐ Can this task start and be completed without interruption?
9. ☐ Has all safety planning and associated documentation including insurance, Premobilization submittals, Job Hazard Analysis (JHAs) and Pre-Task Planning (PTP) been approved for this task?

Make Ready Planning: Example Large Project Separate Meeting



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Constraint Log Example

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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

DATE PROMISED

CONSTRAINT DESCRIPTION

RESPONSIBLE PERSON & CO

DATE IDENTIFIED

DATE NEEDED

DATE RESOLVED

Constraint Management Maturity – Reduce Firefighting

Date Identified:

Requestor Date Needed:

09/30/24 ⟷ 11/12/24

30 days

09/30/24 ⟷ 10/04/24

4 days

INTRODUCTION TO LAST PLANNER SYSTEM

Discussion Question

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How will looking ahead to remove constraints help your projects?

5 Minute Large Group Discussion

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INTRODUCTION TO LAST PLANNER SYSTEM

Weekly Work Planning

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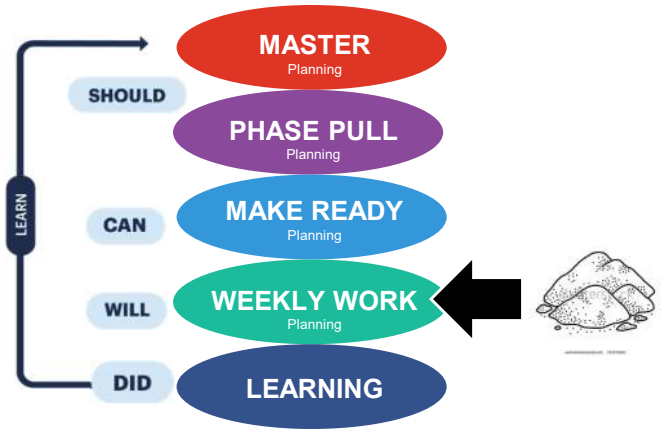
The fourth conversation of LPS is *Weekly Work Planning.*

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



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INTRODUCTION TO LAST PLANNER SYSTEM

Weekly Work Planning

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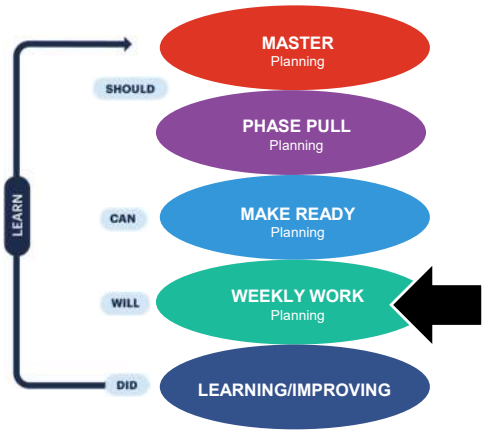
This is the level that the team identifies the *promised task completions* agreed upon by the *Performers* for the upcoming week.

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.*

5 Connected Conversations



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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

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Weekly Work Planning

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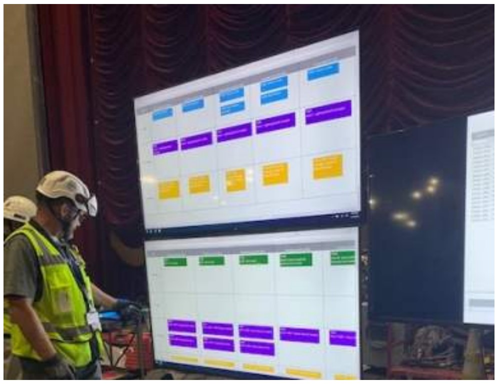
Weekly Work Plan Informs the Daily Huddle



Courtesy of : Turner Construction

Courtesy of : Turner/DPR JV

INTRODUCTION TO LAST PLANNER SYSTEM

Weekly Work Planning Example

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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	Mon (Start Date 1\28)	Tue	Wed	Thu	Fri	Sat	Sun	DONE? YES	DONE? 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	2	3	3						
5	Install wainscoting on the first floor north side	B.A.M	[illegible]	4	3	4							
6													
7													
8	Pull wire for Chiller	Ryan	5										
9	Security rough-in on all floors	Ryan	[illegible]	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	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?

INTRODUCTION TO LAST PLANNER SYSTEM

Learning/Improving

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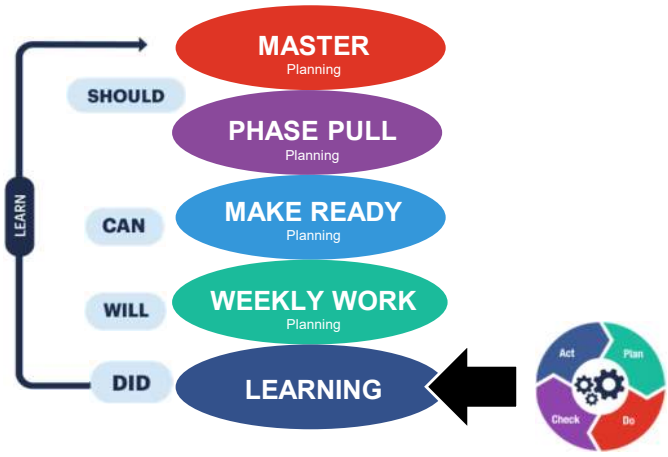
Immersive Education Program

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



INTRODUCTION TO LAST PLANNER SYSTEM

LPS Weekly Routine Example

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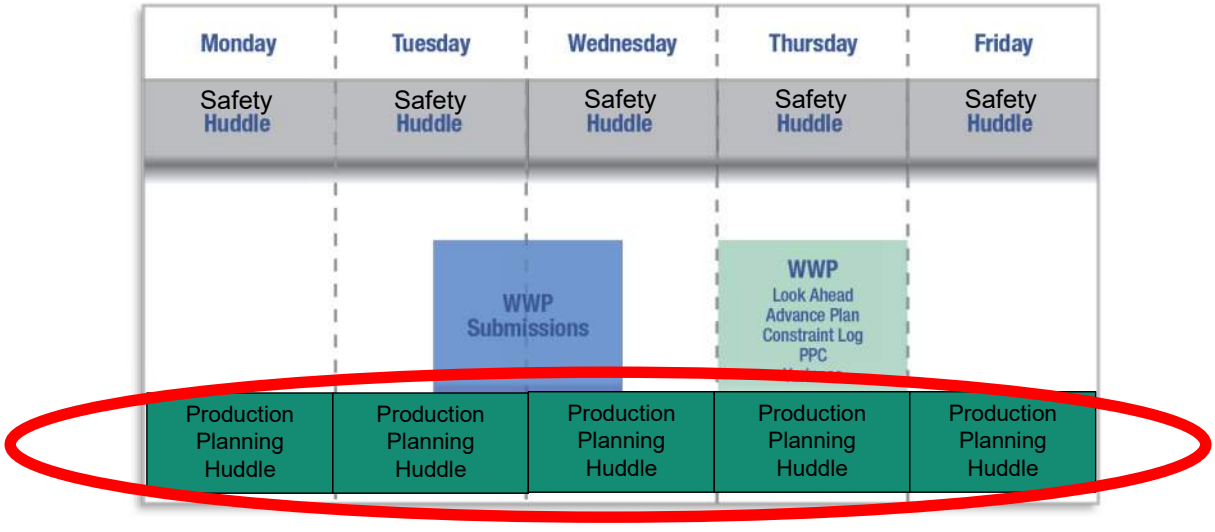
Immersive Education Program



INTRODUCTION TO LAST PLANNER SYSTEM

Daily Production Planning Huddle

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Immersive Education Program

1. Any new safety related issues since the morning pre-task plan?
2. Did you complete today's promised tasks?
3. Are tasks promised for tomorrow on track?
4. Any other task need help?
5. Any recovery? Lessons?

Courtesy of KHS&S

INTRODUCTION TO LAST PLANNER SYSTEM

Calculating PPC

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

INTRODUCTION TO LAST PLANNER SYSTEM

Learning From Daily Huddles

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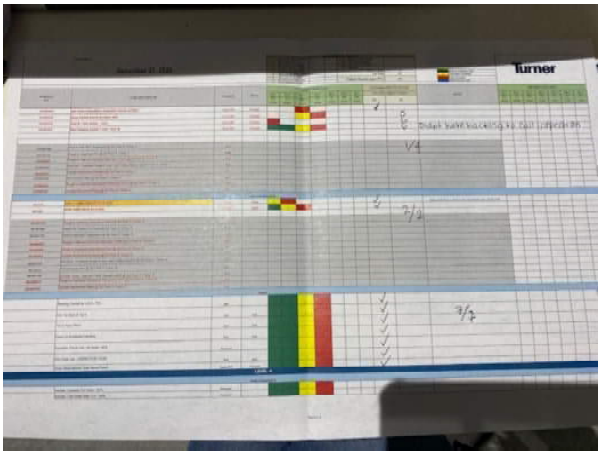
The *Percent Plan Complete* (PPC) is calculated for the period or week.

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



Courtesy of : Turner Construction

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INTRODUCTION TO LAST PLANNER SYSTEM

Percent Plan Complete (Plan Percent Complete)

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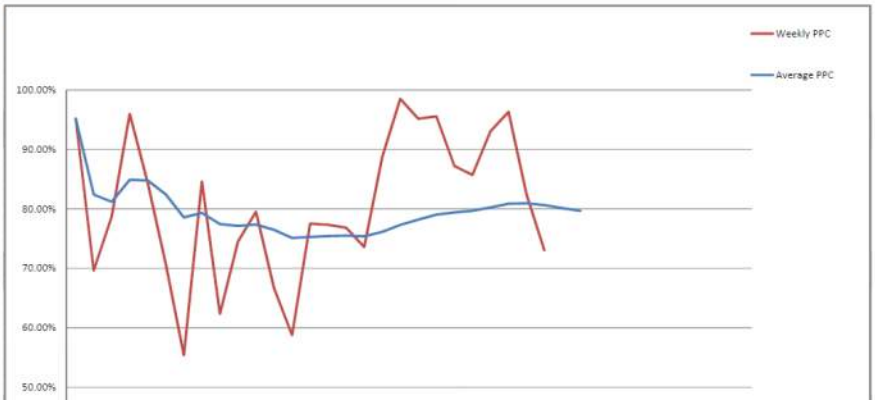
PROJECT AREA
THEATERS

OVERALL PLAN PERCENT COMPLETE

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



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INTRODUCTION TO LAST PLANNER SYSTEM

Reasons For Variance

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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.

INTRODUCTION TO LAST PLANNER SYSTEM

Taking Action For Variance

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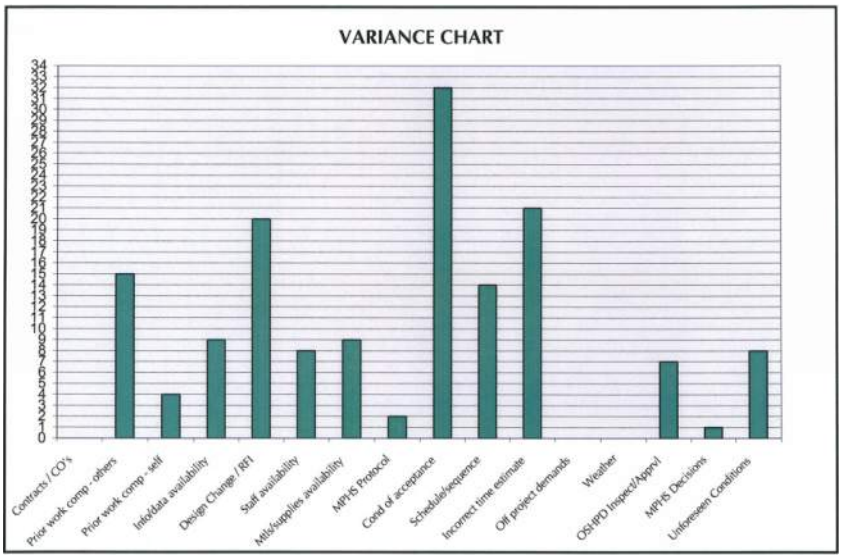
When a variance or failure occurs, the team must discuss the likelihood of it occurring again and determine actions to prevent reoccurrence.



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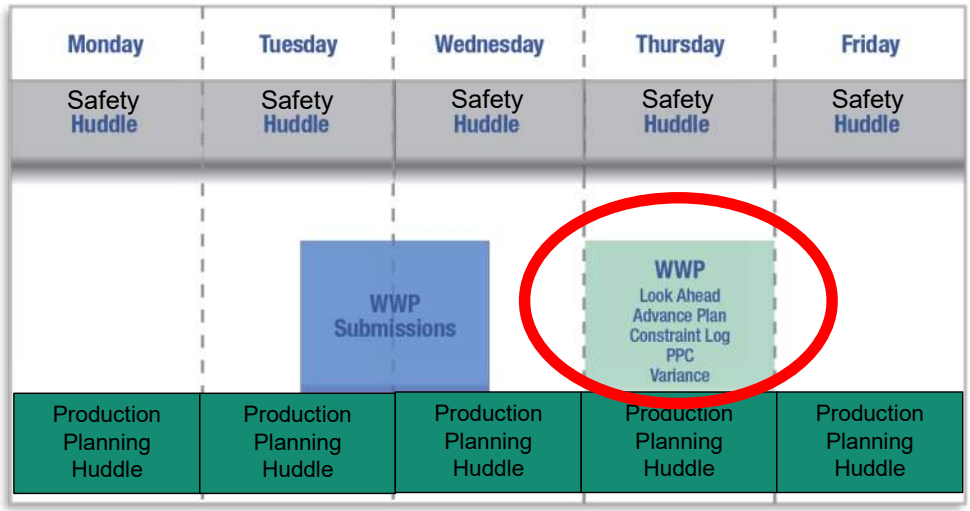
Contractor Coordination Meeting Routine



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Contractor Coordination Meeting Agenda

1. (2 Min) Delta review - Improvements
2. (5 Min) Safety and logistics, 5S
3. (5 Min) Review PPC and Variances
4. (15 Min) Make Ready Planning
   a. Review existing Constraint Log
   b. Identify new constraints
   c. Enter new constraints/commitments on Constraint Log
5. (30 Min) Finalize Weekly Work Plan for Next Week & Make Commitments
6. (3 Min) Plus/Delta

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Productivity & Planning

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Production Goals as informed by Estimates

- Informs phase planning duration
- Breaks weekly targets into daily goals on WWP
- E.G. 4 day activity, how far should be be end of day 1

SHEETMETAL				
RECTANGULAR DUCT	10014	LF	180	642
		MH	241	795
		LF/MD	6.0	6.5
ROUND DUCT	10016	LF	1060	5487
		MH	274	1175
		LF/MD	30.9	37.4
FINISH	10028	EA	0	0
		MH	0	0
		EA/MD	#DIV/0!	#DIV/0!
EQUIPMENT SET	10038	EA	0	0
		MH	0	0

Standard Work Available @ LeanConstruction.org

Lean Construction Institute
Immersive Education Program

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

Last Planner System®
Standard Work
3_Planning Session Preparation

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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.

INTRODUCTION TO LAST PLANNER SYSTEM

LPS Modified For Design

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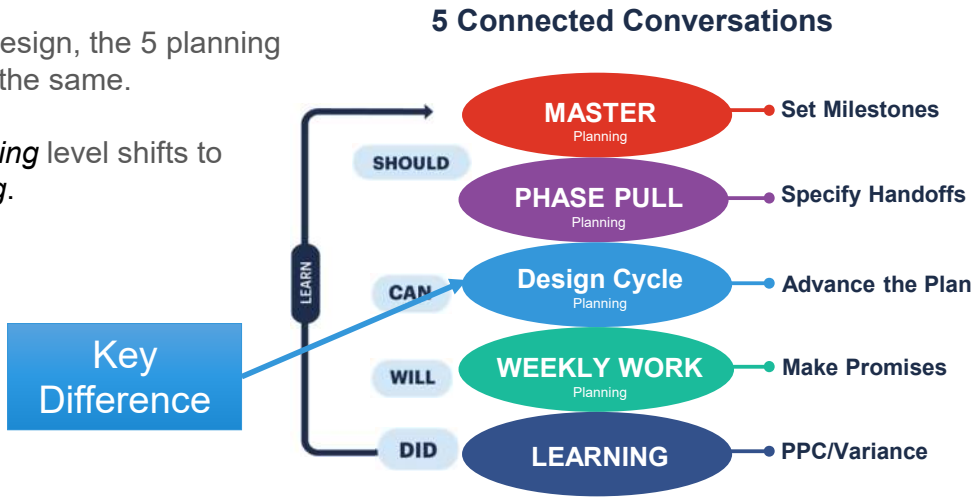
In modifying LPS for design, the 5 planning conversations remain the same.

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



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INTRODUCTION TO LAST PLANNER SYSTEM

Design Considerations

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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 learned or decided.
- 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.

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INTRODUCTION TO LAST PLANNER SYSTEM

Creating The Phase Pull Plan

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Color-coded milestones on the Phase Pull Plan

Pull to date of handoff needed

Involve key discipline leads

Future milestone remain on the Master Plan

UHS Temecula Valley Hospital Team

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INTRODUCTION TO LAST PLANNER SYSTEM

Discussion Question

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

Write down on Take Away Sheet (5 minutes)

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INTRODUCTION TO LAST PLANNER SYSTEM

Lean Journey to Mastery

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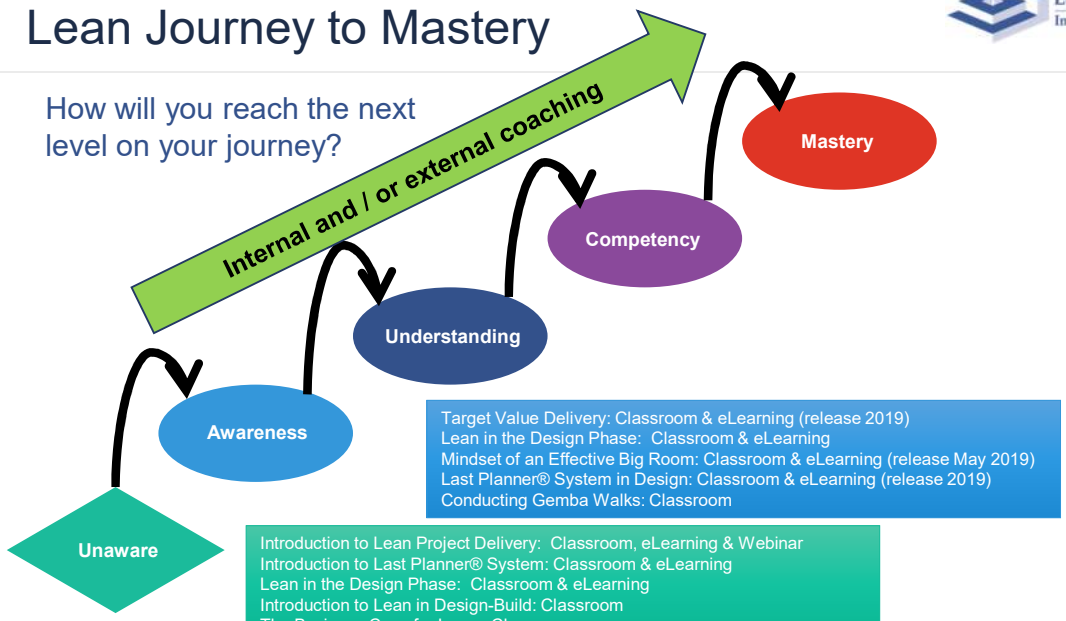
How will you reach the next level on your journey?



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

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INTRODUCTION TO LAST PLANNER SYSTEM

More on Learning

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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

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eLearning

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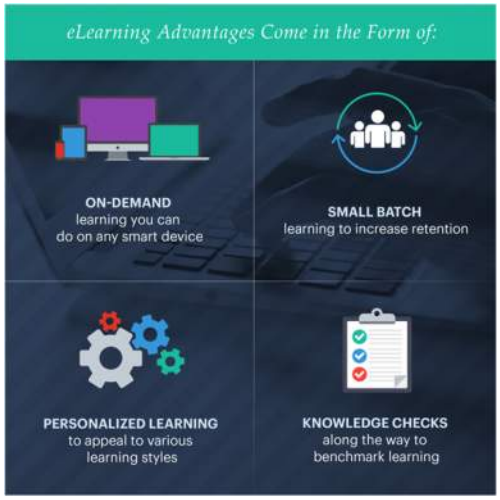
- **Learn on your own time** without taking time off project work
- **Increase knowledge retention by up to 60%** with interactive, small-batch learning
- **Access field resources** to use with teams
- **Earn 1.5 CEUs** (self report to AGC CM-Lean and/or AIA)
- **Incentivize with LCI badging credentials** for email signatures and a certificate of completion
- **Save money** by eliminating instructor and travel expenses
  - *LCI corporate member volume discounts of up to **75% off***
  - *Reduced member pricing is available in addition to standard non-member pricing*



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eLearning Courses

Lean Construction Institute
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- 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

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INTRODUCTION TO LAST PLANNER SYSTEM

Learning Objectives Review

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- 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.

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Questions?

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INTRODUCTION TO LAST PLANNER SYSTEM

Conduct Plus/Delta

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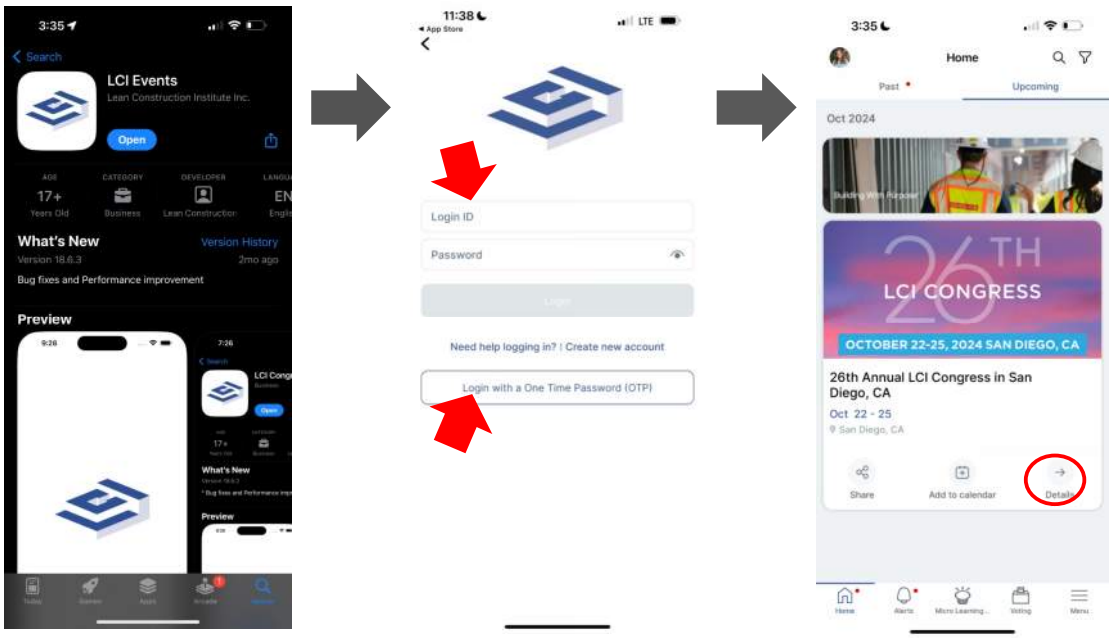
Plus: What produced *value* during the session?

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

+	Δ	Who	When

Download the Congress event app



Download the Congress event app

- Plan your schedule in your personal agenda
- Browse all available sessions
- Read speaker profiles
- Navigate to your session on the venue map

Scan this QR Code to download the app

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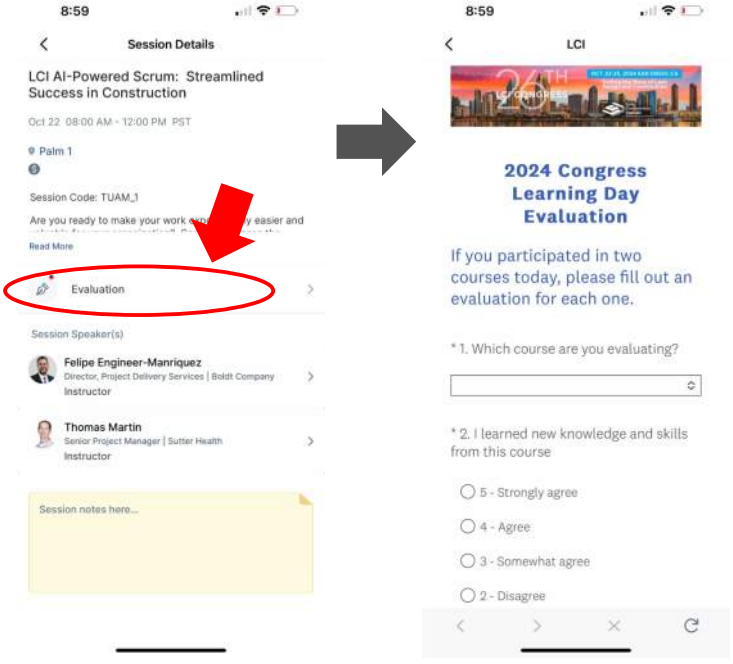
Rate Session In Event App

Plan to evaluate each session you attend in the event mobile app!



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LCI Contact Information

Membership: iGoldberg@leanconstruction.org

eLearning: eLearningdiscounts@leanconstruction.org

LCI Website: www.leanconstruction.org

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Instructor Std. Work – Dice and Chip Kits

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