Provider Name: Lean Construction Institute

Provider Number – H561

Course Name:

Intro to The Last Planner® System

Course Number: 20131022PM1

Course Speakers:

Henry Nutt, Southland Industries George Zettel, Turner Construction Company

Course Date: October 22, 2013

Credit(s) earned (3) on completion of this course will be reported to AIA CES for AIA members. Certificates of Completion for both AIA members and non-AIA members are available upon request.

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Course Description

The Last Planner® (sometimes referred to as the Last Planner® System) is a production planning system designed to produce predictable work flow and rapid learning in programming, design, construction and commissioning of projects. Participants in this program will learn the basics of the system and how to implement it on their projects. They will learn specifics related to a Master Schedule, Pull Phase Schedule, and Make Ready Work Plans in different increments. Participants will learn about the value in measuring percent plan complete (PPC) and how tracking these measurements can increase reliability and bring consistent schedules to their clients.

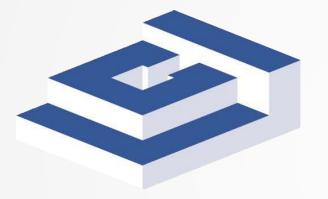


Learning Objectives

At the end of the this course:

- Participants will learn the value of the Last Planner System and its impact on projects in design and construction.
- Participants will learn the difference between Master
- Scheduling, Phase Scheduling, Make Ready Work Planning,
- Weekly Work Planning, Learning Improving Planning, and how to use those methods on their projects.
- Participants will begin to explore how to record tasks for a short interval production plan in a Weekly Work Plan form, and how improving plan reliability benefits the project.
- Participants will learn how to calculate percent plan complete
- (PPC) to measure the reliability of a team's work plan.





LEAN CONSTRUCTION INSTITUTE

The Last Planner System®

Welcome!!

Henry Nutt, III - Division Sheet Metal Superintendent,

Southland Industries – Northern California

- Started as an apprentice Sheet Metal Worker in Local 104.
- Quickly promoted to Foreman, General Foreman, Division Supt.
- Managed up to 150 shop and field employees.
- Assists teams with project scheduling, personnel assignments and training, tools and equipment management, project safety and interfacing with the Unions.
- Example projects include bio-pharmaceutical, advanced technology(data centers), commercial healthcare, industrial and municipal industries.
- Very involved with Southland's Lean construction delivery and is a frequent participant and trainer at the Lean Construction Institute (LCI).



Welcome!!

George Zettel, Manager, Lean Construction – Southwest USA

Turner Construction Co.

- Core Team of UHS Temecula Hospital and other UHS jobs
- Coaches project teams, departments, Senior leaders on lean and integrated delivery.
- Projects include bio-pharmaceutical, technology, Semi-conductor Mfg., healthcare, industrial, municipal, hospitality, & sports facilities
- Very involved with Turner's National Lean construction and integrated delivery services.
- Past National LCI Board Member and past Chair NorCal LCI CoP +
- AGC Lean Steering committee



Ground Rules

- 1 Keep an open mind
- 2 Turn off phones / devices
- 3 Engage the material
- 4 Be back from break on time
- 5 Have fun



OUTLINE

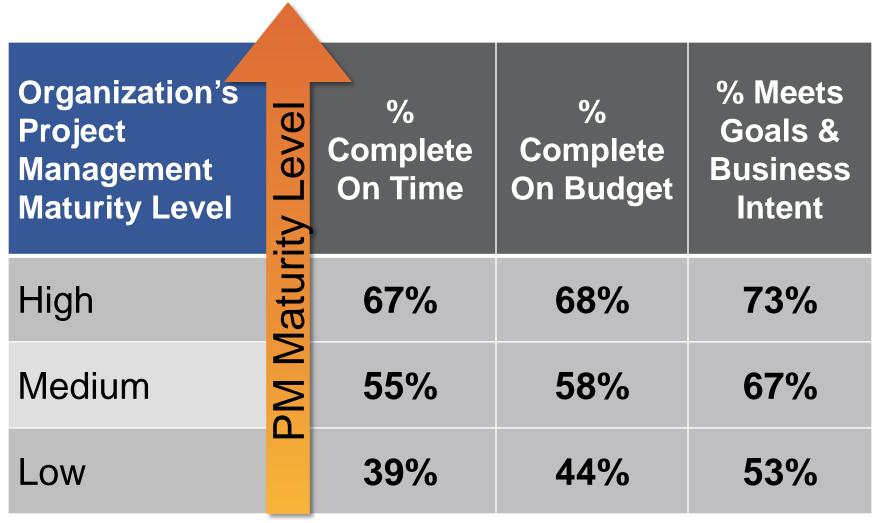
- 1 What's wrong with current practice?
- 2 LPS as a series of counter-measures
- 3 Establishing milestones and strategy
- 4 Developing a "Pull Plan"
- 5 Look Ahead Plan and Weekly Work Plan
- 6 Learning



CURRENT PRACTICE – WHY LPS?



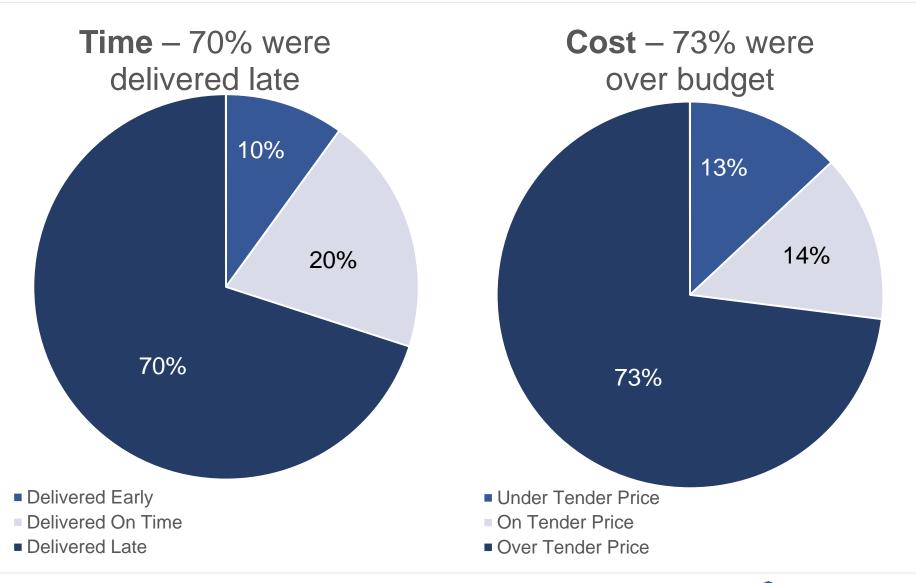
PROJECT MANAGEMENT INSTITUTE SAYS...



Source: PMI's Pulse Of The Profession March 2012



WHY USE LAST PLANNER SYSTEM?



WHY USE LAST PLANNER SYSTEM?

Work On New Veterans Affairs Medical Center In Aurora Could Stop

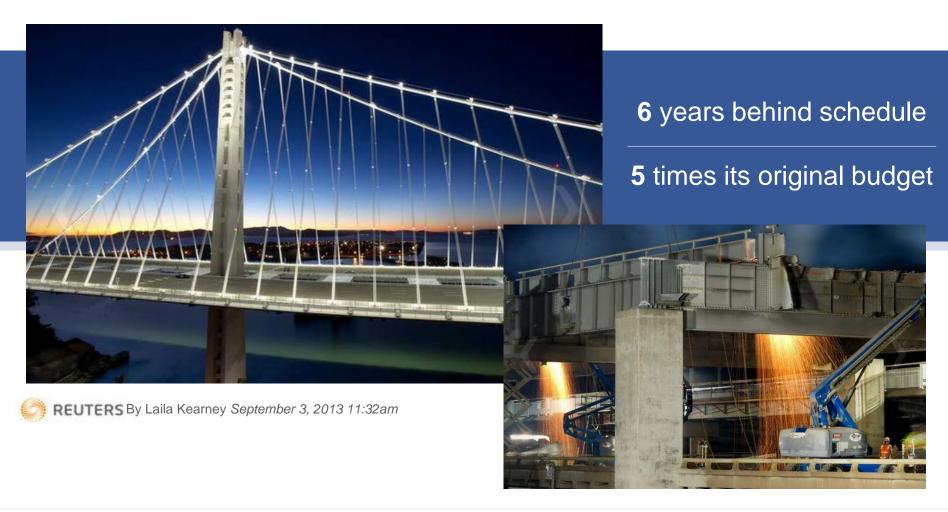


Posted on: 9:47pm, September 9, 2013, by Tak Landrock and Chris Koeberl, updated on: 07:53pm, September 10, 2013

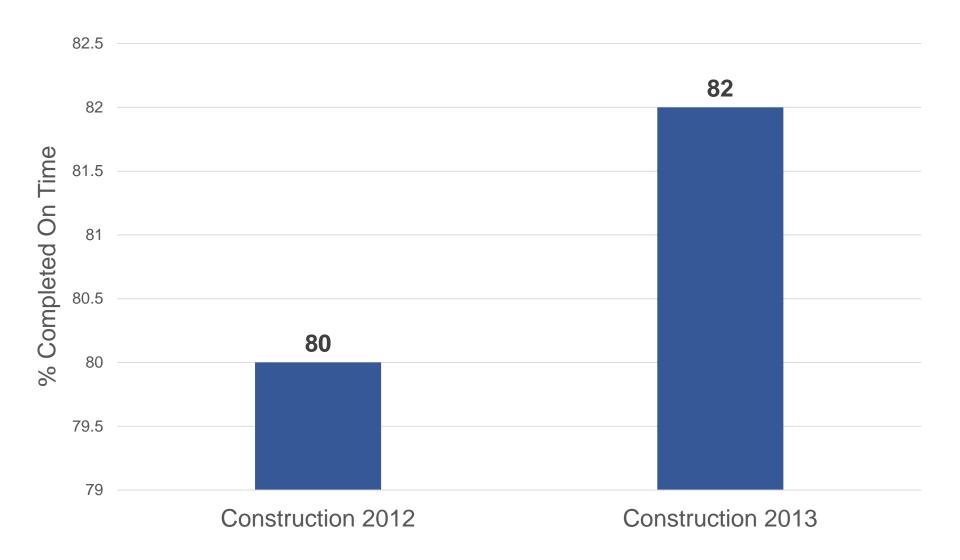


WHY USE LAST PLANNER SYSTEM?

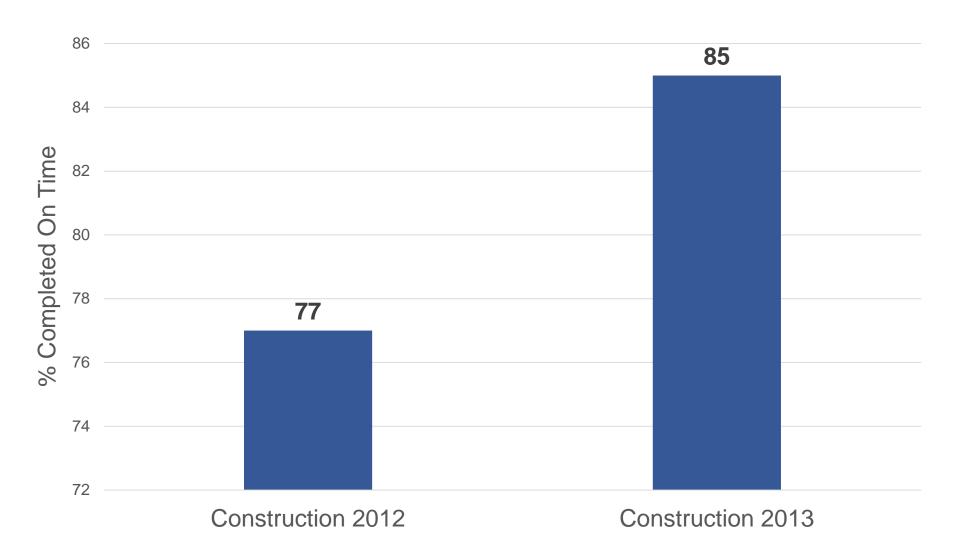
Record-breaking San Francisco bay bridge opens after delays



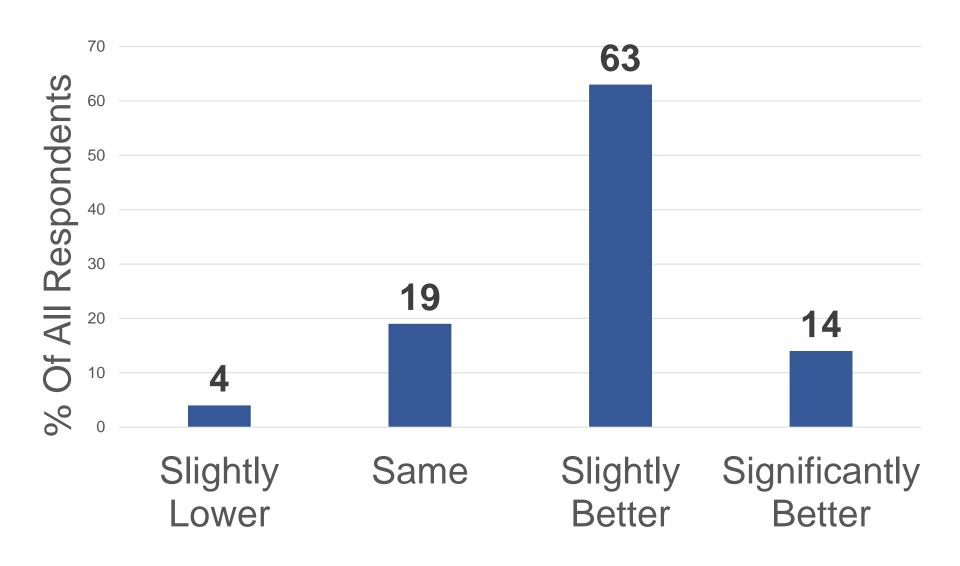
NEW YORK CITY PUBLIC BUILDING PROJECTS



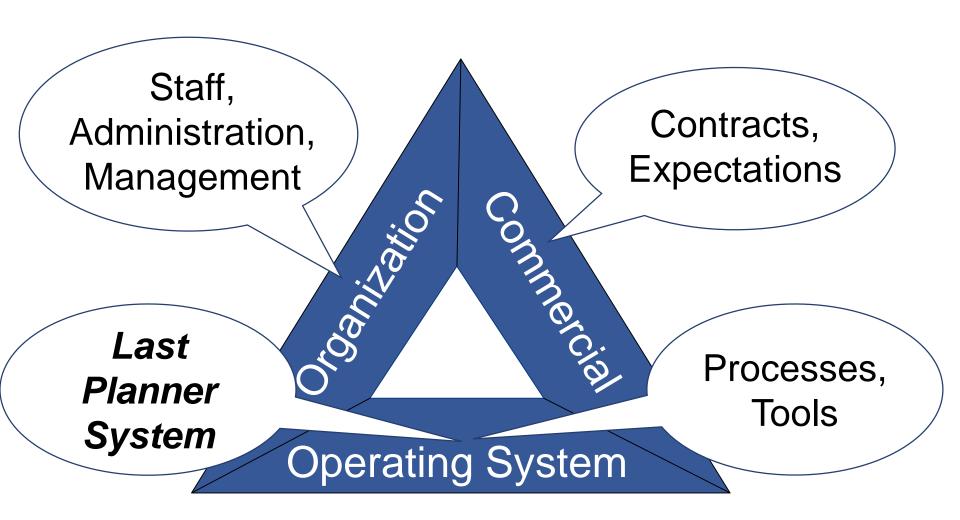
NORTH CAROLINA DEPARTMENT OF TRANSPORTATION



IN PROJECTS USING LEAN, PRODUCTIVITY...



THE THREE DOMAINS OF A PROJECT DELIVERY SYSTEM





Parade of TradesTM



PARADE OF TRADES ASSUMPTIONS

1

The project is complete when 35 units have been processed by each of seven trades in sequence.

2

The trades come onto the project a week apart. Work is completed and available to the next trade once a week.

(3)

The trades work in sequence, with each following trade able to work only on what was produced in the previous week by the prior trade.

4

Work is done by rolling a die (singular of 'dice') and passing the number of units rolled—up to the number of units the trade has to work on. (5)

The number rolled represents the number of workers brought to the site that week by the trade rolling the die. Each worker is able to process one unit of work in the week.

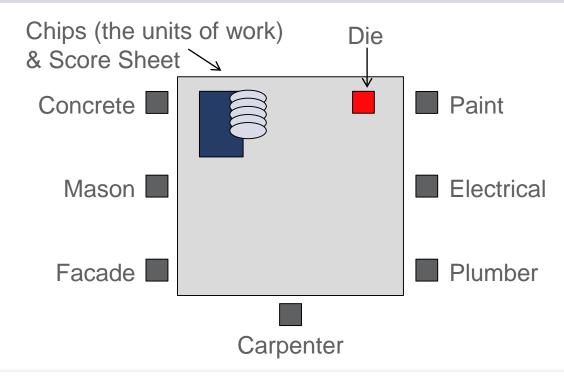


PARADE OF TRADES

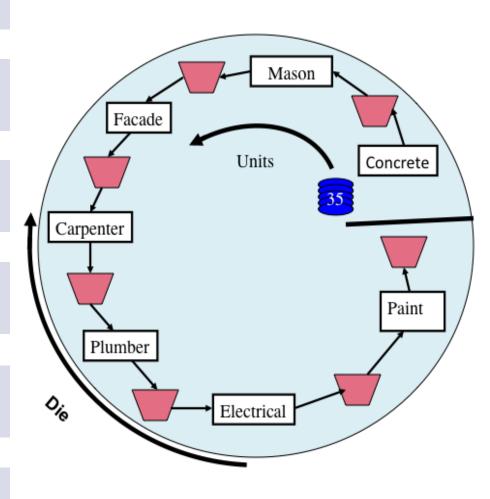
Move 35 units of work through 7 trades.

Work is completed at the end of the week and passed to next trade.

Place materials on table as shown.



- Distribute score sheets as directed
- Chips on the left of Concrete
- Establish queue spaces between each trade and cup at end
- Give die to Painter
- Painter says: "Beginning week 1"
- Painter hands die to Electrical...



SCHEDULING AND ESTIMATING

1

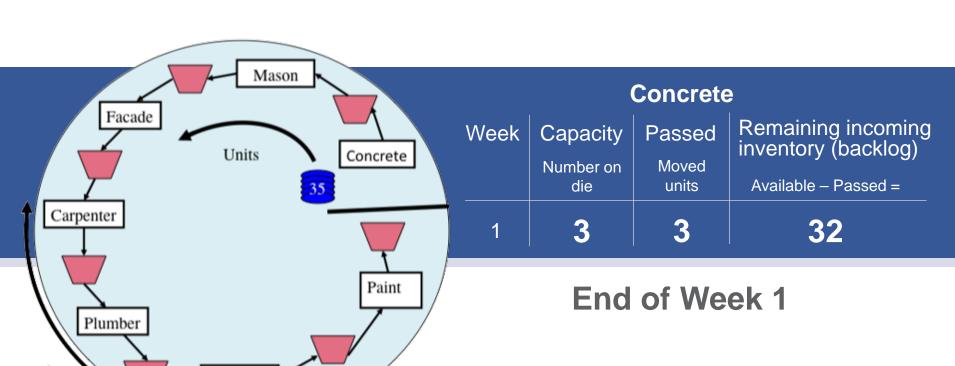
Moving one unit through one station requires 1 "crew" work unit costing \$1000. How much will unburdened labor cost will be required to complete the project? (Hint: 35 units of work are required at each station and there are 7 stations.) 2

What would you add as the markup on labor for making a bid?

3

A die has an average production of 3.5 units per roll (week). What duration would you propose?

Concrete rolls a 3 and moves 3 chips. Hands the die to the painter! Records the result.

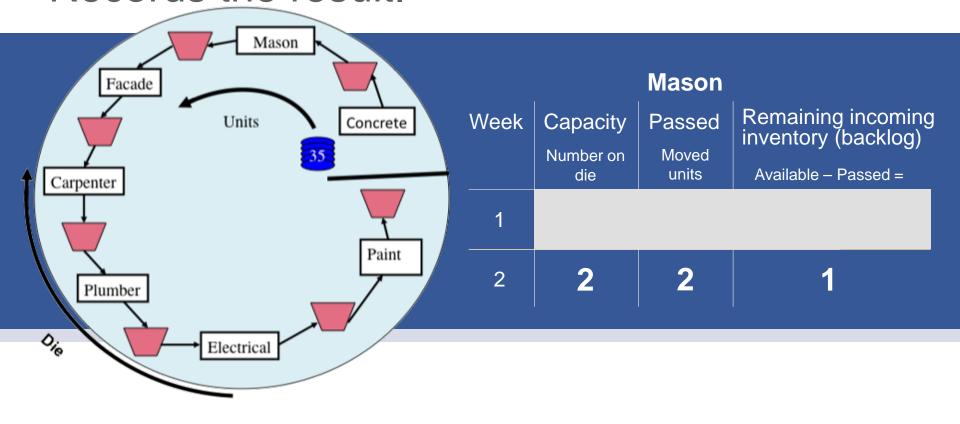


Painter says, "Beginning week 2" Die passes left to Mason.

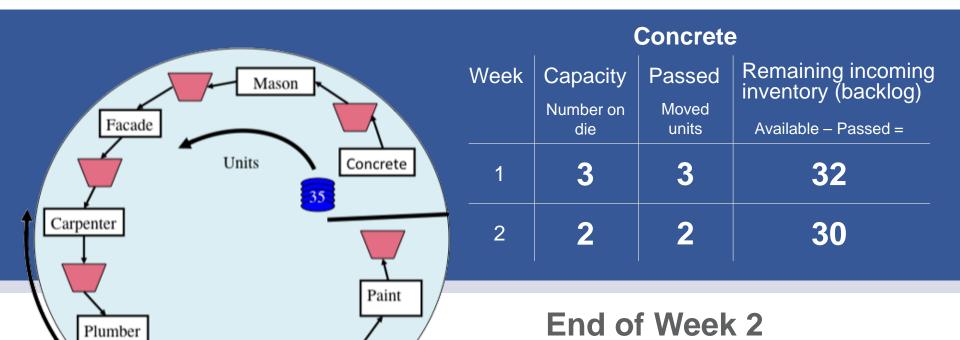


Electrical

Mason has 3 from concrete last weeks work rolls 2, moves 2, leaving 1 in inventory. Hands the die to Concrete. Records the result.



Week 2 continued. Mason hands die to Concrete.



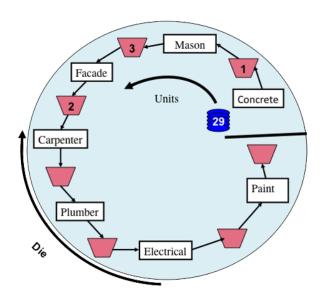
Concrete rolls 2, passes 2, records. Hands die to painter.

Painter says, "Beginning week 3."



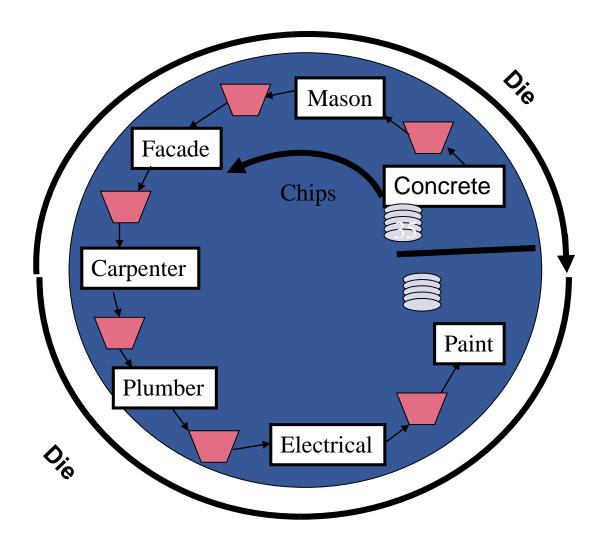
Electrical

Week 3: Facade rolls, passes & records. Hands die to Mason. Mason rolls, records and hands die to Concrete. And so it goes.



Facade										
	Week	Capacity Number on	Passed Moved	Remaining incoming inventory (backlog)						
		die	units	Available – Passed =						
	1									
	2									
	3	5	2	0						
Mason										
	Week	Capacity	Passed	Remaining incoming inventory (backlog)						
		Number on die	Moved units	Available – Passed =						
	1									
	2	2	2	1						
	3	5	3	0						
	Concrete									
	Week	Capacity	Passed	Remaining incoming inventory (backlog)						
		Number on die	Moved units	Available – Passed =						
	1	3	3	32						
	2	2	2	30						
	3	1	1	29						

Keep passing the die to the left!



WHEN WORK IS COMPLETE....

Record the week each Trade finishes. Sum and record the Available Capacity for all Trades. Sum and record the total Remaining Inventory for all Trades except Concrete. Note the highest amount of Inventory in any week for each trade. Bring die and score sheet to the front.

Craft	Week Complete	Total Capacity (Sum "Column 1")	Total Inventory (Column 3)	Highest inventory in any week for this trade
Concrete				
Mason				
Facade				
Carpenter				
Plumber				
Electrical				
Paint				
Sum of Column				

Circle Color of dots on Die

Blue

Black

Red





RESULTS: 1000 TIMES ON A COMPUTER





TYPICAL RESULTS

	Red 233,445	Black 123,456	Blue 122,556	333,333
Duration in Weeks	19	21	23	18
Total Capacity \$	294	332	361	252
Inventory in Units	55	112	120	0

RESEARCH FINDING FROM EARLY 90's

What percentage of the tasks that the foreman or designer PM said would be finished next week were actually completed on the days promised during that week?



QUESTION FOR DISCUSSION:

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

For a few minutes, discuss in table teams.

Select a spokesperson to report your findings if called upon.



KEY POINTS

1

Reducing workflow variability

- Improves total system performance
- Makes project outcomes more predictable
- Simplifies coordination
- Reveals new opportunities for improvement

2

Point speed and productivity of a single operation doesn't matter – throughput does.

3

Strategy: Reduce variation then go for speed to increase throughput.



KEY CONCEPTS

1

Traditional planning systems are unable to produce predictable workflow.

2

Workflow reliability directly affects system speed and cost.

3

All plans are forecasts, all forecasts are wrong, further in advance – more wrong, more detail – more wrong



LPS: A Series of Counter-Measures

5 - CONNECTED CONVERSATIONS

SHOULD

CAN

WILL

DID

Master Scheduling Milestones

Phase "Pull" Planning

Make Work Ready Planning

Weekly Work Planning

Learning

Set milestones & strategy Identify long lead items

Specify handoffs Identify operational conflicts

Make ready & Launch Replanning when needed

Promise

Measure PPC & act on reasons for failure to keep promises



5 - CONNECTED CONVERSATIONS

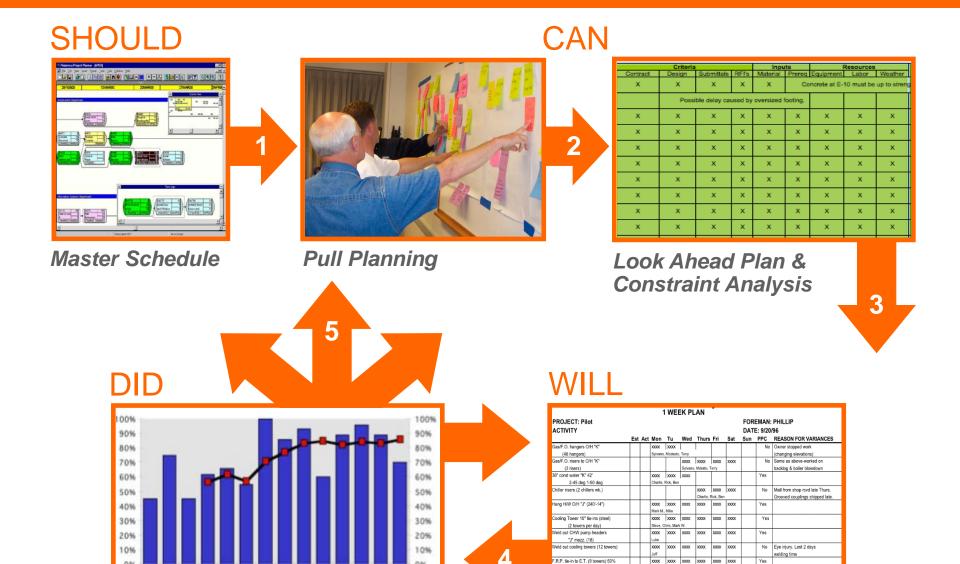
WILL	Weekly Work Planning	Promise
DID	Learning	Measure PPC & act on reasons for failure to keep promises

5 - CONNECTED CONVERSATIONS

CAN	Make Work Ready Planning	Make ready & Launch Replanning when needed
DID	Learning	Measure PPC & act on reasons for failure to keep promises

5 - CONNECTED CONVERSATIONS

SHOULD	Master Scheduling Milestones	Set milestones & strategy Identify long lead items
	Phase "Pull" Planning	Specify handoffs Identify operational conflicts
DID	Learning	Measure PPC & act on reasons for failure to keep promises



Percent Plan Complete

12- 20- 27- 3- 10- 17- 24- 21- 28- 5- 18- 9- 14- 21-

Mar Mar Mar Apr Apr Apr Apr May May Jun Jun Jul Jul Jul

Weekly Work Planning

WORKABLE BACKLOG Boiler blowdown-gas vents



WHO IS THE LAST PLANNER?



Person closest to work, with authority to make decisions and create assignments

At least one step closer to the physical work than traditional participant

Current projects are "Commitment Free Zone"



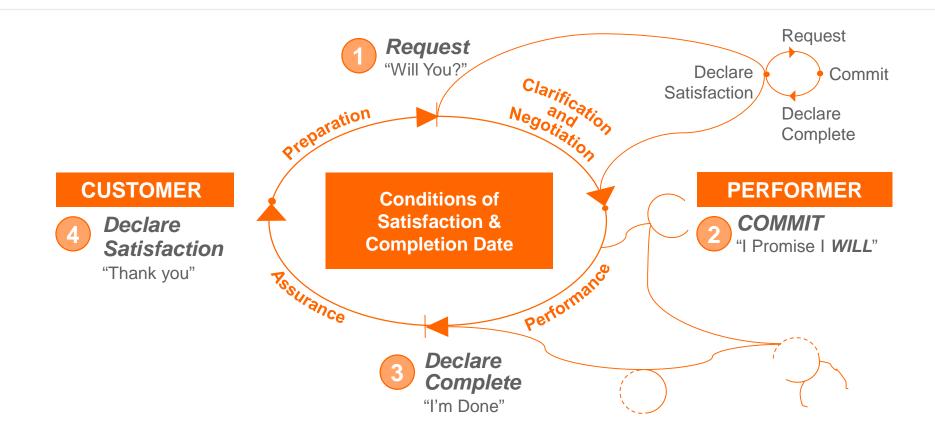






Reliable Promising

RELIABLE PROMISING CYCLE



Reliable Promising builds Trust!



RELIABLE PROMISING CYCLE



Reliable Promising builds Trust!



DEFINING CONDITIONS OF SATISFACTION

Phase (Milestone) Conditions of Satisfaction:

Get team together and ask each individual: "What will be the condition of the project when we complete this phase. What does 'done' look like?"

Write them down

Coordinate Team Member expectations with Customer Conditions of Satisfaction

Task Conditions of Satisfaction:

Customer sets the Conditions of Satisfaction

Customer = individual receiving the work (not necessarily traditional customer = owner)

Design Development · Bulk of design is Performed . all System selections are made · Building geometry is finalized · materials and sizes and quantities are determined . Ready to Bid cartain trades CD Phase · System selections are detailed

Elements of a Promise

Customer

Performer

Conditions of Satisfaction

Future action

Time for completion

Ways of Responding to a Request

Accept

Decline

Counteroffer

Ask for more information

Promise to promise later

"Yes," means nothing if you can't say NO!

5 KEY QUESTIONS FOR "RELIABILITY

- Am I CAPABLE to perform the task and have the resources to do it?
- Do I understand how much time it will take me to perform the task?
- Have I blocked out **TIME** in my calendar that I need to perform the task?
- Am I FREELY AND SINCERELY making this promise?
- Will I be **RESPONSIBLE** for any issues that would occur should I not be able to perform the task?



AVOID USING ANY OF THESE RESPONSES

"I THINK I CAN"

"MAYBE"

"PROBABLY"

"I WILL TRY"

"I SHOULD BE ABLE TO"

ANSWER THIS:

Can you complete the task? YES, NO or YES, if . . .



LAST PLANNER™ SYSTEM

Produce predictable workflow

Identify and manage constraints

Produce rapid learning

Focused on making work ready & using commitment based planning

BENEFITS

Improves communication

Fosters trust & collaboration

Promotes trade partner engagement and close coordination

Improves visibility of the project plan (transparency)

Promotes continuous improvement





Establishing Milestones

FUNCTION OF A MASTER SCHEDULE

1

Identify
milestones
important to
client and
stakeholders –
especially
immovable
dates.

2

Gauge the feasibility of completing work within the allotted time.

3

Establishes the sequential relationships between activities. 4

Test the overall project execution strategy



Developing a "Pull Plan"

WHAT IS PULL?

Planning in **REVERSE**:

- By beginning with end milestone/goal, and identifying activities required to be complete to start an activity, all activities and constraints are more easily identified
- Individuals work to secure commitments for completion of activities
- Focus on minimum required to start an activity, and can therefore look for schedule optimization opportunities

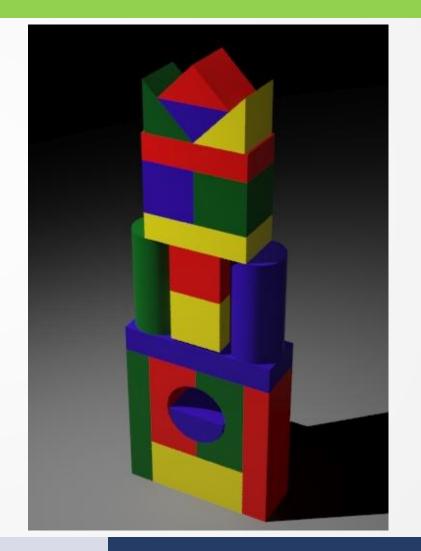
Planning COLLABORATIVELY:

- Commitment from all involved
- Ensures all required tasks captured
- Allows negotiations on size, format, content, method for hands off...
 removing waste





Tower Exercise



OVERVIEW

We will use Pull Planning to plan and construct a tower of children's blocks.

- Exercise will demonstrate LPS concepts of
 - Reliable Promises (commitments)
 - Pull
 - Flow
- Create a pull plan that allows the placement of each block to request (pull) the blocks that it needs

LOGISTICS & POLICIES



Groups of 6 - red and green have 2 people



Must plan & build collaboratively



Each color is a different trade/designer



Only allowed to touch your color blocks



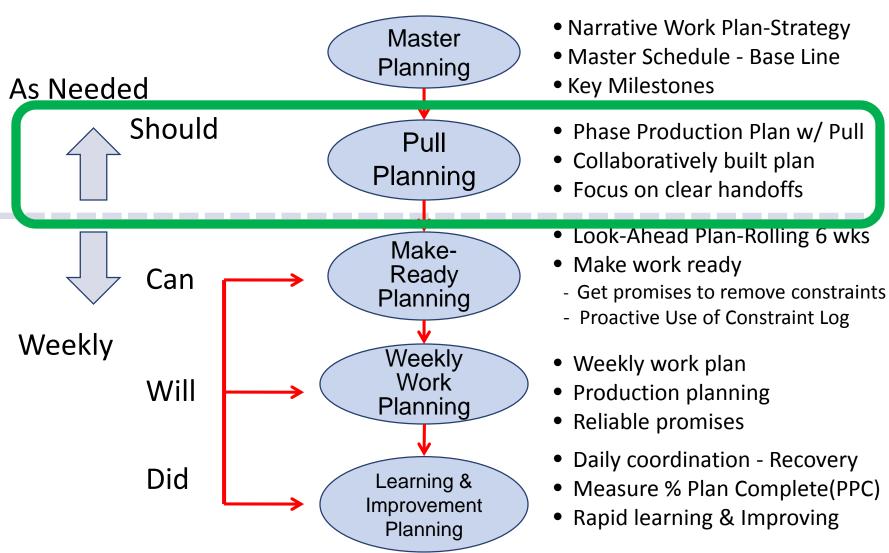
Not permitted to direct the work of another

Last Planner® Planning System

Should - Can - Will - Did Planning

1

Process and tools to create and maintain reliable workflow.

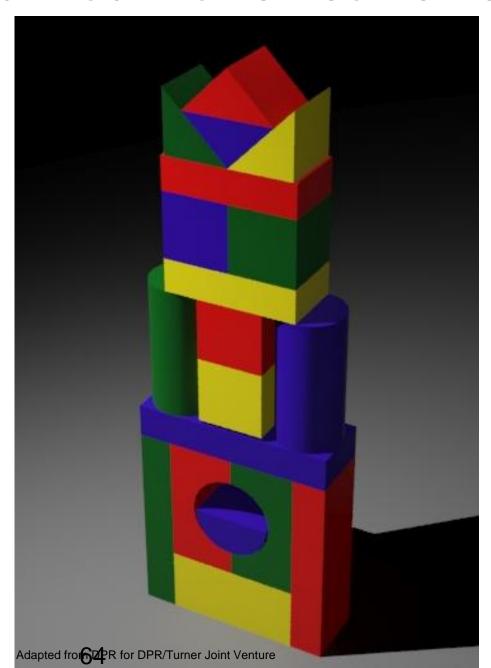


What Is The Question This Team Is Trying To Answer?

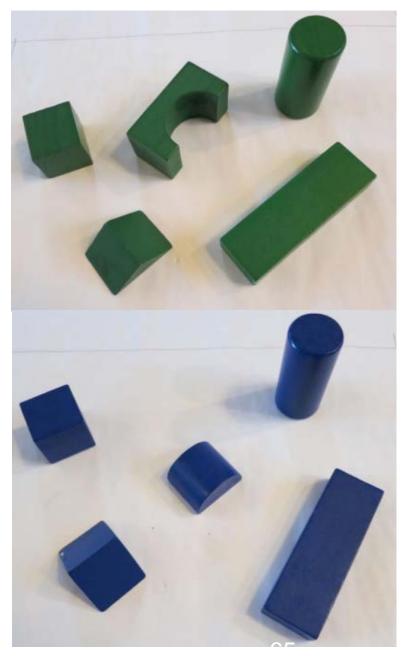


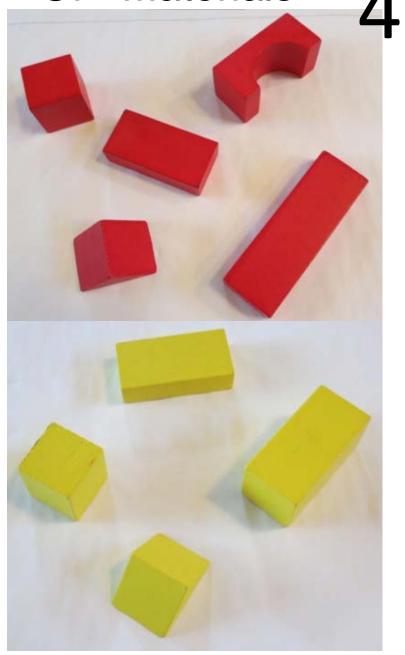
"How will we do our work to reach this milestone?" Injury Free, Quality, Efficiently, Reliably, On Time

Wood Block Tower Isometric



Wood Block Tower: Bill – Of - Materials

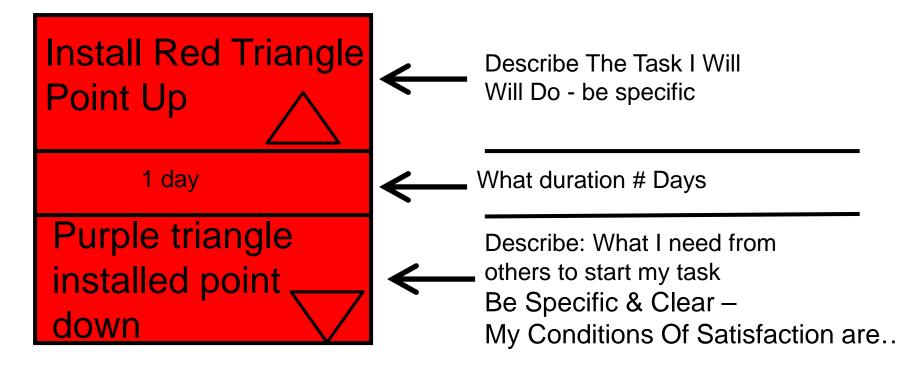




5

Each task gets one tag

EXAMPLE TAG /Post – it Note



Follow This Example For Your First 6
Two Tags
MILESTONE

Install Red Triangle with point up

1 day

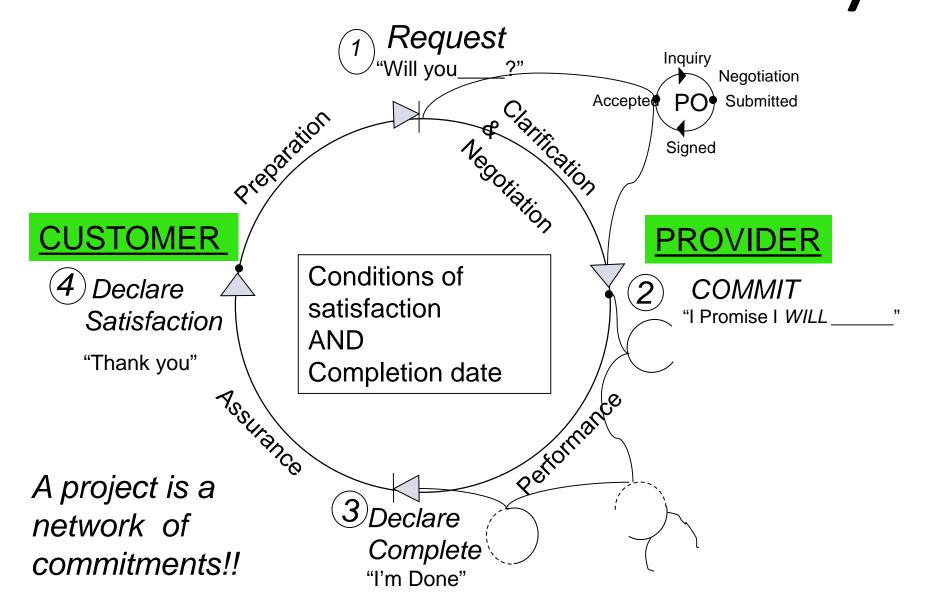
Purple Triangle installed with point down

Owner
Moves Into
VIP Suite
At Top Of Tower

Red Triangle
w/ point up

= "I confirmed that the supplier has a tag in our plan to install what I need so I can start."

Use Discussions To Coordinate Work 7



- Start with "target milestone activity" on the far right end.
- Add tags to left when requested by your "customer"
- Scheduler
- Superintendent
- Trades/Designers just to the left of this picture



 One by one, add tasks to left, work from right to left – using "pull mechanism". "To start this task, I must have XYZ task done." Ask, what one task really allows me to start?



Lets review the Pull Plans

LESSONS LEARNED

What are the key points or lessons for you?

How might these apply to designing and building?

How could you use what you have learned on your project?



LEVEL OF DETAIL

It's **NOT** about every task you will complete.

It **IS** about defining handoffs



Mapping enough of your workflow for others to follow



Absolutely no task duration longer than the Look Ahead Schedule, to ensure it gets on the Look Ahead Schedule in time.



Tasks specific enough to communicate clearly, verify completion, and conditions of satisfaction met



CONDITIONS OF SATISFACTION

Ensure they are clear and specific, and agreed to by all team members

Specific to a project – DISCUSS as a team

May be defined by contractual requirements

Examples Of Undefined Milestones:

Project Completion

Move in vs. substantial completion vs. using space for intended purpose

Complete DD Phase

What defines a DD phase for each designer

Start drywall production

First stud installed or first sheet of drywall hung?



HOMEWORK

Discover Work Flow Identify needs/ predecessor tasks Estimate activity durations, NOT completion dates



Pull Planning - Discipline Worksheet Project Name

Photo: Decipline Design Development Obsetveri Por training on an author of the region between purpose accomplete control agreement the beginning description.
 List to information payment from others (agreem) and the agreement data (agreement for present the security).

point factor.

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A. Committee on your make that are all there are the other decisions.

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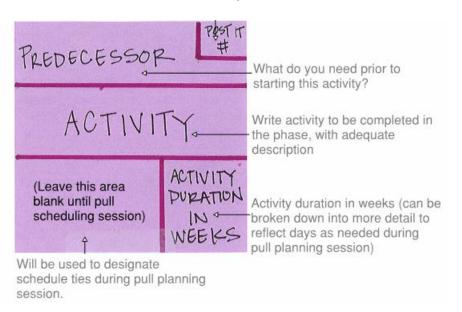


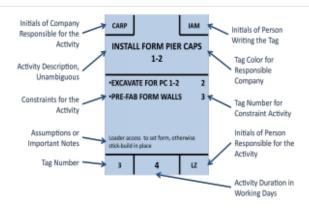
Firm Alasm Landscape Contractor / CW Owner

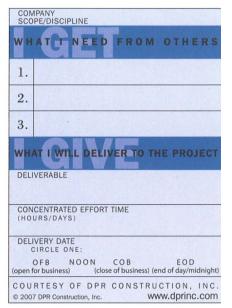
HOMEWORK

A Few Examples...

Post It #: 1,2,3... include letter to denote responsible party. i.e. 1A for architectural, 1E for electrical, 1L for landscape designer. Number does NOT need to match sequence of activities.







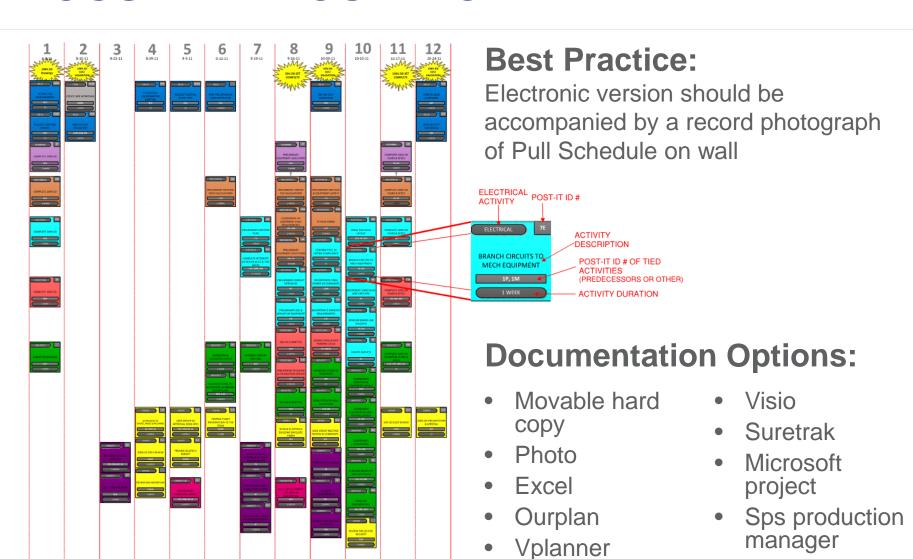
Examples courtesy of Pankow Builders, The REAlignment Group & DPR Construction



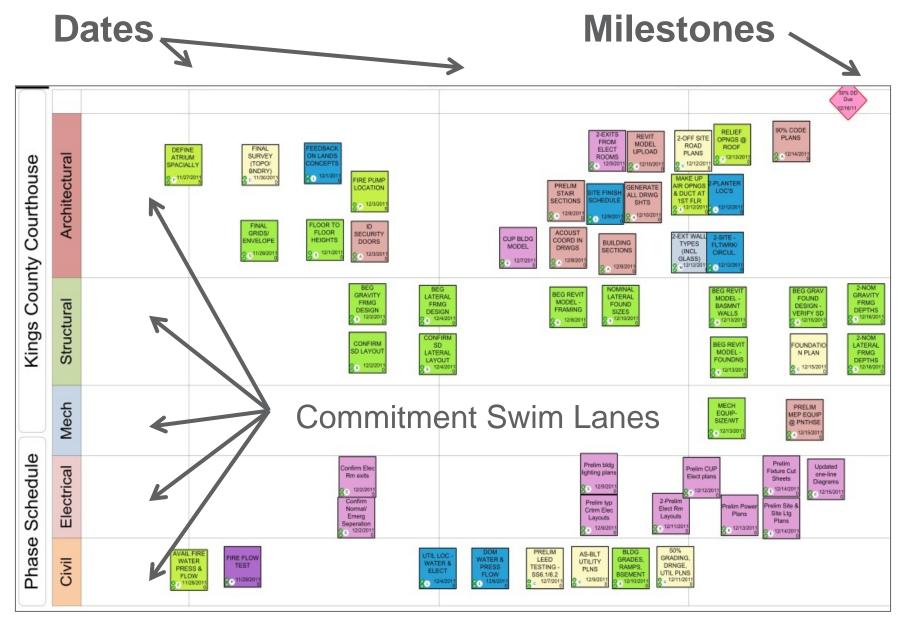
GET COLLABORATING!



DOCUMENT YOUR WORK



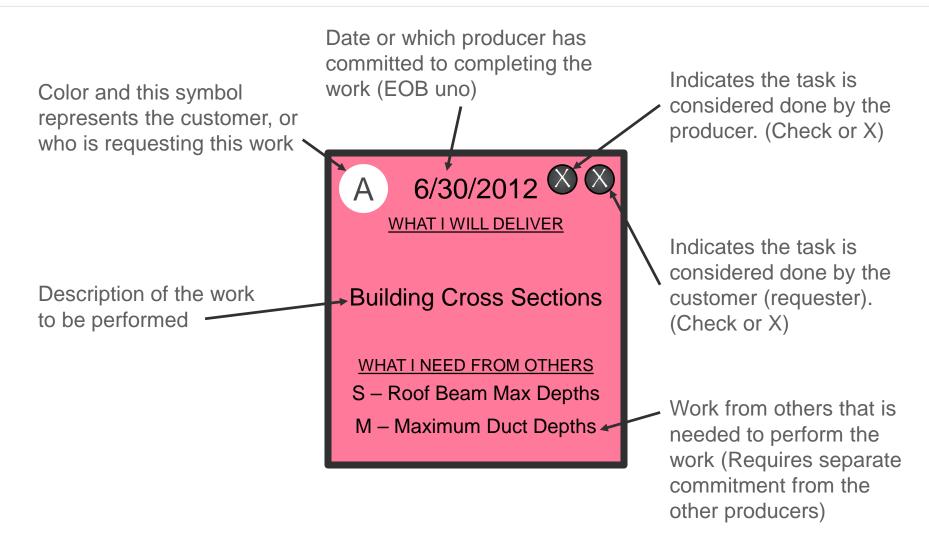
Example courtesy of Pankow Builders



Example courtesy of Buehler & Buehler Structural Engineers



PULL PLANNING SYMBOL ELEMENTS



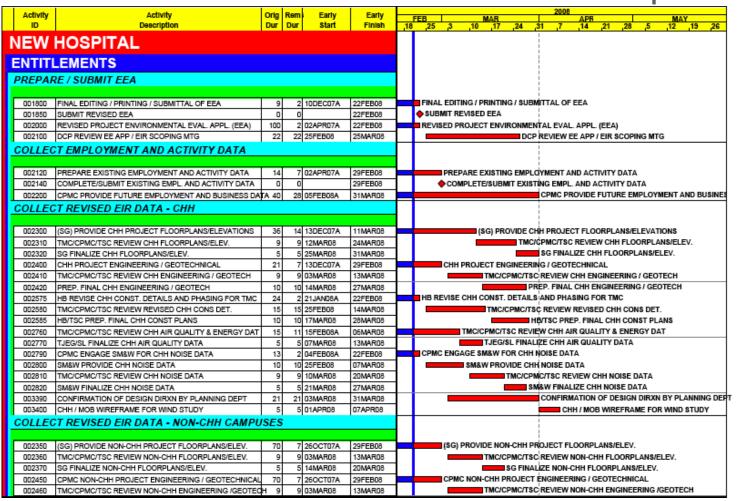
Example courtesy of Buehler & Buehler Structural Engineers



DOCUMENT YOUR WORK

Documentation Options:

This information represents one phase and information from the corresponding Pull Scheduling Session





DESIGN VS. CONSTRUCTION PHASE PLANS

Design:

- Criteria is not known and is in fact part of the product.
- Designers go through a cyclical process of prototype and test to establish the criteria for the design
- Unknown review and approval times (i.e. Owner, OSHPD, governing bodies) which make schedules difficult to predict
- Keep level of detail coarse to allow for flexibility in design iterations

Construction:

- Linear Process
 - You have to start from the ground up
- Known criteria (what is being built)
 - More predictable than design because all of the tasks are known
- Level of detail is fine because all tasks are knowable



TIPS TO A SUCCESFUL PHASE PLAN

Stay engaged
CONSIDER LEAVE ALL
ELECTRONICS AT THE DOOR
POLICY

Do the homework

To swim or not to swim?

GET A FACILITATOR

Ensure Plan aligns with Milestone Schedule

No more than 4 hours

Provide refreshments

Documentation

USE THE PLAN!



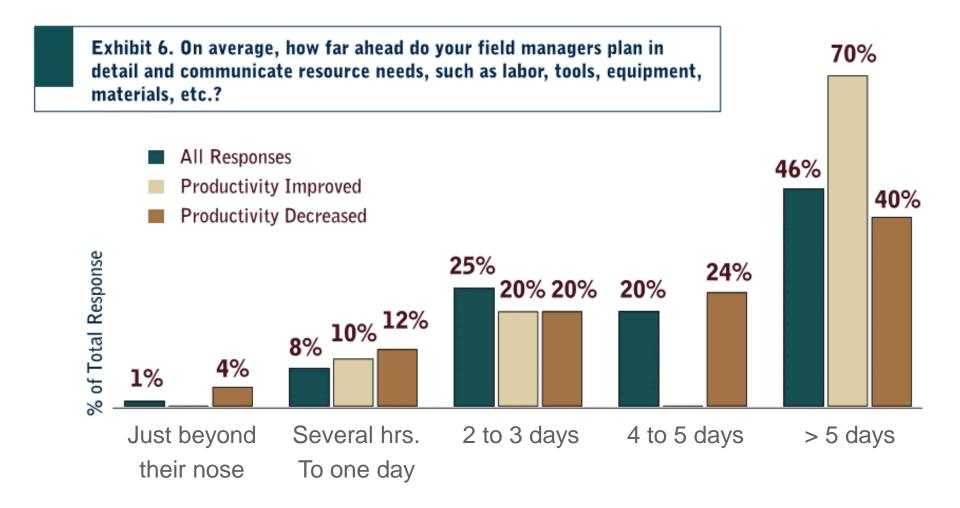




Looking Ahead & Weekly Work Planning

LOOKAHEAD PLANNING

(aka Make Work Ready Planning)



The 2012 U.S. Construction Industry FMI Productivity Report



LOOKAHEAD PLANNING

(aka Make Work Ready Planning)

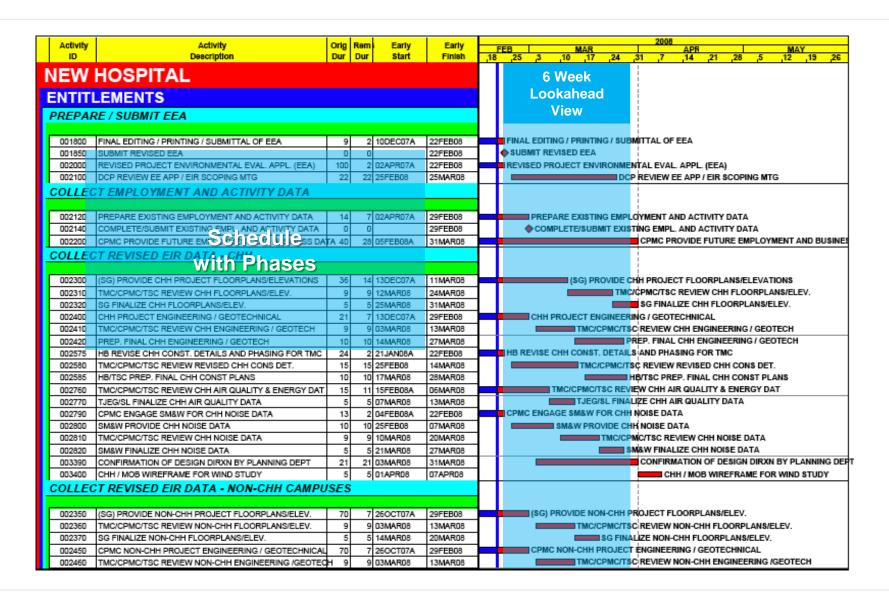


- Represents work planned to be completed in 2 weeks from now and later, and focuses on recognizing and clearing constraints
- LOOKAHEAD Plan is populated from Phase/Pull Plan & any additional commitments made in planning or execution
- Determines Tasks Anticipated (TA)
 Metric

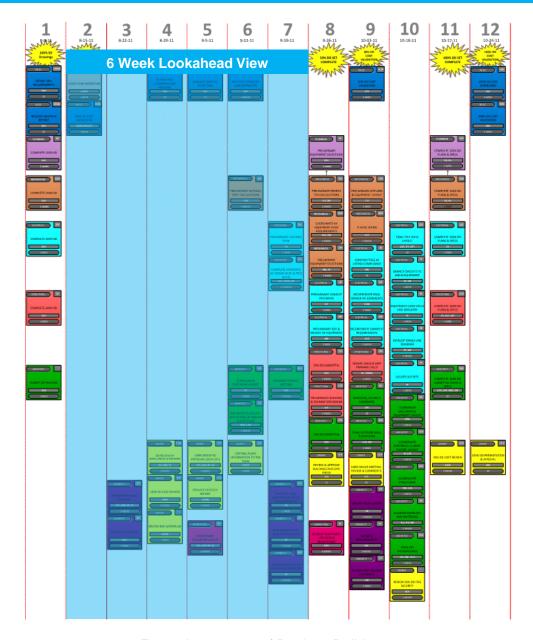
Involve the right people to ensure plan ownership



LOOKAHEAD







Example courtesy of Pankow Builders



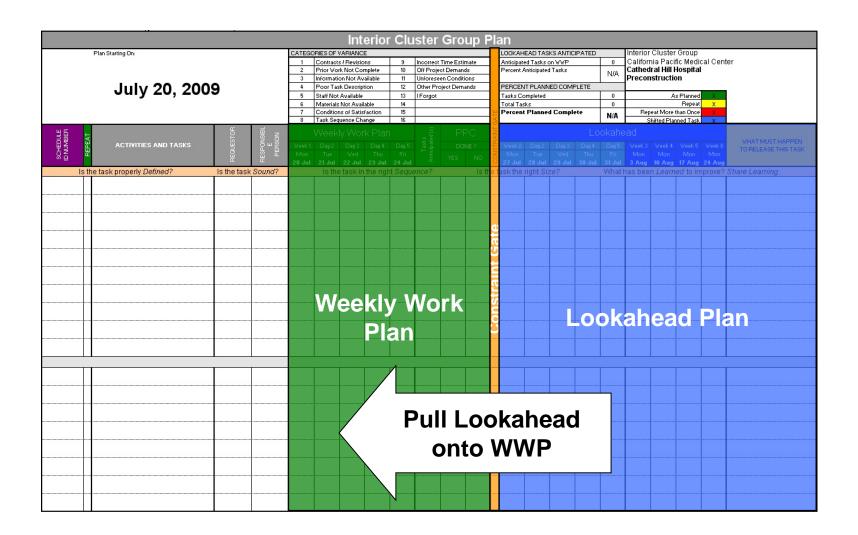
LOOK AHEAD EXAMPLE

THREE WEEK LOOK AHEAD SCHEDULE

	JOB NAME		· · ·					···	_			***		_			JOE			R		
	DATE ISSUED:	9/20)/201	2													FOF	REM	AN	SHEETMETAL		
			MAN - DAYS																			
					EK 1						EK 2						EK 3					
	A OTIVITY	M	E DA		28-Sep T F S		_		E DA		1-0c		_		E DAT		_	_	s	CONSTRAINTS	RESPONSIBLE	
_	ACTIVITY	M		W	-	-	- 5	М	- '	W	-		S	M	' '	VV	Т		5		PARTY	
1	LAYOUT VAV & LOWSIDE	1																		SUBM DETAILS	SI	
2	VAV INSTALL	1																		PREFAB COMPLETE MATL ORDERED & DELIVERED	SI	
3	LOWSIDE DUCT INSTALL		2	2	2															MATERIAL	SI	
4	LAYOUT MAINS					1														COORD, SUBM, DETAILS	SI	
5	HANGERS FOR MAINS					1		2		1										MATERIALS	SI	
6	DELIVERY OF MAINS								2	1										PREFAB COMPLETE MATL ORDERED & DELIVERED	SI	
7	INSTALL MAINS										2			2	2					ACCESS, MATL, COORD	SI	
8	INSPECTION															1				INSPECTION REQUEST	SI	
9	INSULATE																1			SUBCONTRACTOR SCHEDULED	SI	
	TOTAL MAN DAYS	2	2	2	2	2	0	2	2	2	2	0	0	2	2	1	1	0	0	MILESTONE = 10/19 CEILIN	G	

Example courtesy of Southland Industries





WEEKLY WORK PLAN (WWP)

Captures Tasks/Activities to be completed in the next week

Key Components:

Activity descriptions that are:

defined, sound, sized correctly & sequenced

Responsible person to complete task

Date activity will be complete (hand – off)

Constraints or Make Ready Needs Identified

Completed on time Y/N?

Learning – PPC, TA, 5 Why's, etc.

Which of these tasks is well defined:

- A. E-mail the geotechnical report to the structural engineer.
- B. Check Jay's calculations.
- C. Send 2 electricians to start grounding in area 2B.
- D. Explore curtain wall options.
- E. Spend 500 architect hours during Concept Design.
- F. Size the displacement air duct for the tower patient rooms.



MEETING ROLES & RESPONSIBILITIES

1

Production Manager

The production manager leads the meeting.

2

Process Facilitator

The process facilitator ensures documentation and thoroughness of process.

3

Last Planners

The Last Planners provide the technical input for task commitments and make commitments to the follow-on performers.



Documentation Methods:

Excel

Newforma

V-Planner

GamePlan

SPS

OurPlan

Visio

			1	WEE	K PL	AN									
PROJECT: Pilot									FOR	EMAN:	PHILLIP				
ACTIVITY	ΠVITY DATE: 9/20/96														
	Est	Act	Mon	Tu	Wed	Thurs	Fri	Sat	Sun	PPC	REASON FOR VARIANCES				
Gas/F.O. hangers O/H "K"			XXXX	XXXX						No	Owner stopped work				
(48 hangers)			Sylvano,	Modesto,	Тепу						(changing elevations)				
Gas/F.O. risers to O/H "K"					XXXX	XXXX	XXXX	XXXX		No	Same as above-worked on				
(3 risers)					Sylvano,	Mdesto, 1	Гепу				backlog & boiler blowdown				
36" cond water "K" 42'			XXXX	XXXX	XXXX					Yes					
2-45 deg 1-90 deg			Charlie,	Rick, Ben											
Chiller risers (2 chillers wk.)						XXXX	XXXX	XXXX		No	Matl from shop rcvd late Thurs.				
						Charlie, I	Rick, Ben				Grooved couplings shipped late.				
Hang H/W O/H "J" (240'-14")			XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		Yes					
			Mark M.,	Mike											
Cooling Tower 10" tie-ins (steel)			XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		Yes					
(2 towers per day)			Steve, C	hris, Mark	W.										
Weld out CHW pump headers			XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		Yes					
"J" mezz. (18)			Luke												
Weld out cooling towers (12 towers)			XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		No	Eye injury. Lost 2 days				
			Jeff								welding time				
F.R.P. tie-in to E.T. (9 towers) 50%			XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		Yes					
			Firt, Pad	ky, Torn											
WORKABLE BACKLOG															
Boiler blowdown-gas vents															
-rupture disks															



ONE WEEK LOOK AHEAD SCHEDULE

	JOB NAME :		JOB NUMBER :										
	WEEK ENDING:		CREV	/ SIZE	:								
	ACTIVITY	MAKE READY NEEDS	MON	TUE		I-DAYS		Y/N	REASON For VARIANCE				
		L	<u> </u>				PPC						
П		WOR	KABLE	BACK	LOG								
\vdash			+										
\vdash			+										
			_										
\vdash													
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Example courtesy of Southland Industries



		Commi	tment Lo	g			
Project:		Planne	d Percent	Comple	te		
Company:	Total Nur	mber of Tasks				52	
Project Number:	Tasks Cor	mpleted on Tim					
Coordinator: Larry Summerfield, B&B	PPC = Co	mpleted On Tir	ne/Total			81%	
Date: 1/12/2012		Today		4/17/	2012		Note: To answer "no", leave cells blank
COMMITMENT (TASK OR REQUEST)	PERFORMER	BY WHEN	REQUESTER	DONE?	ACCEPTED?	ON TIME?	COMMENTS
2-PRELIM MOTOR SHADES	A	12/9/2011	A				
AS-BLT UTILITY PLNS	С	12/9/2011	С	1	1	1	
Prelim bldg lighting plans	E	12/9/2011	E	1	1	1	
Prelim typ Crtrm Elec Layouts	E	12/9/2011	E	1	1	1	in building
SITE FINISH SCHEDULE	A	12/9/2011	L	1	1	1	
2-EXITS FROM ELECT ROOMS	Α	12/9/2011	E	1	1	1	for the CUP?
BUILDING SECTIONS	A	12/9/2011	Α	1	1	1	

Example courtesy of Buehler & Buehler Structural Engineers



Working Group	:	Architectural	Last Meeting Date: Next Meeting Date:	Wednesday, March 24, 2010 Wednesday, March 31, 2010			wo	RK	PLAI	N	completed	Code	Lpa:		L	оок	(- A I	H E A I	D PL	AN		
			Prepared By:	Dan Schneider		Thu		Neek Mon	1 Tue	Wed	E CO	riance C erdue?	cipat	Thu		eek 2 Mon			W3 V	N4 V	N5 W	16
ID	Working Group	Commitments & Promises	Requester	Promiser	Due Date	3/25			3/30		×	Vari Ove	=		4/2				4/14 4	/21 4	/28 5	/5
B100309-06	Architectural	Provide budget pricing for canopies	Andrew Beyer	Andrew DeMotte	03/23/10	0		•				•		0	•	•	0	•	•	•	5	
B100309-09	Architectural	Follow up with engineering department to determine if curtain wall can handle loads from handrail	Stacey Root	Andrew DeMotte	03/23/10	٠	۰	۰	۰	•		•	•	•	•	•	•	٠	•	•	•	•
B100309-12	Architectural	Provide Tipping Mar typical connection details used on previous projects, that are similar to details to be used on this project	Marc Steyer	Andrew DeMotte	03/23/10	0	۰	۰	۰	۰		•	•	۰	•	0	۰	٠	•			
B100309-01	Architectural	Coordinate edge of slab locations with GFRC system to eliminate small jogs in edge of slab	Curtis Chong	Stacey Root	03/26/10	•	•	۰	٠	۰		•	•	•	•	٠	٠	٠	•			
B100309-04	Architectural	Provide updated detail 7N-9 to Walters and Wolfe for review of using skin framing to support stone façade	Scott J. Campbell	Stacey Root	03/26/10	•	•	۰	۰	•		•	•	0	•	•	۰	۰	•			
B100323-05	Architectural	Confirm photometrics at plaza	Dan Schneider	Stacey Root	03/26/10	•	•		0			0	<u> </u>	•	•	0	•	•	•	<u> </u>	9 (
B100323-12	Architectural	Set up phone conf w/ Joan Marc & Stacy to discuss fine tuning current Davit locations.	Marc Steyer	Dan Schneider	03/30/10	•	۰	0	•			0	•		۰	۰	۰	۰	•			
B100323-01	Architectural	Provide cuts for Cedar pole lights, step lights and bollard lights	Kim Nguyen	Jacob Tobias	03/30/10	•			•					•	0	0		•	•		9	
B100323-04	Architectural	Provide lighting design options for the plaza, Geary & Van Ness pedestrian zones.	Dan Schneider	Stacey Root	03/31/10	•	۰	۰	۰	•		•	•	•	•	•	۰	•	•		9	
B100323-06	Architectural	Provide current light reading along Van Ness & Geary pedestrian zones.	Dan Schneider	Kim Nguyen	04/02/10		0	•	0	•		0	•	•	•	•	0	•	•	•	0 (D
B100323-11	Architectural	Provide sketch locating Davit Base locations of Option 1 or Option 2.	Curt Thon	Stacey Root	04/02/10	•	0	•	0	•		0	•	0	•	•	•	•	•	•	0 0	D
B100323-03	Architectural	Provide lighting design options for the plaza.	Dan Schneider	Jacob Tobias	04/06/10									0		0	•	0			0 (D.
B100323-07	Architectural	Send cut of possible exit stair lighting & wall packs at Mech Screen.	Stacey Root	Kim Nguyen	04/06/10	0					П						•	•	•	•	0 (
B100323-08	Architectural	Send cuts of sconce lights for Geary & Van Ness	Dan Schneider	Stacey Root	04/06/10		0					0	•		0	0	•		•		0 (
B100310-08	Architectural	First draft of spec sections due for all Trade Partners collated by Boulder and issued	Brian Olesz	Dan Schneider	04/07/10	0	0	0	0	•		0	•	0	•	•	•	•	•	•	• (•
B100323-10	Architectural	Provide preliminary layout for roof maintenance lighting	Dan Schneider	Kim Nguyen	04/07/10			0				0	•	0	0			•			0 (
B100310-09	Architectural	Return comments on first draft to Boulder in one week's time to be re-issued all Trade Partners	Brian Olesz	Dan Schneider	04/14/10	0	0	0	0	•		0	•	0	0	0	0	•	•	•	• (0
B100323-02	Architectural	Provide pricing for historic VN lighting, & typ street lights on Geary.	Andrew Beyer	Kim Nguyen	04/14/10						П						0		•	•	0 (-
B100309-08	Architectural	Add item to architectural cluster agenda on 04/20 to discuss locations that	Andrew Beyer	Stacey Root	04/16/10	0					\vdash	0	ᆘ				0		•	•	0 (•
B100323-09	Architectural	Provide locations for controls at parapetof LED lighting for cornice.	Kim Nguyen	Stacey Root	04/21/10	0					\vdash	0		0		0	0		•	•	0 (
B100310-10	Architectural	Second draft of spec sections due for all Trade Partners	Brian Olesz	Dan Schneider	05/05/10	0							•	0		0	0		0	0	0 (0
B100310-11	Architectural	Return comments on second draft to Boulder in one week's time to be re- issued all Trade Partners	Brian Olesz	Dan Schneider	05/12/10	•	0	•	0	0		•	•	0	•	•	•	•	•	•	• (
B100310-12	Architectural	Final edition of spec sections due for all Trade Partners	Brian Olesz	Dan Schneider	06/07/10						П	0		0	0		0			0	0 (
A100317-35	MEP	Determine level of data workspace buildout on G1	Brian McGrath	Dan Schneider	03/31/10	0	0		0	•		0		0	0	•	•	•	•	0	0 (5
A100317-36	MEP	Invite Ed Fixen to a TVD meeting to discuss code interpretation for eliminating fire smoke dampers in the garage	Brian McGrath	Dan Schneider	03/31/10	0		0	0	•		0	•		•	•	0	0	•	-		
A100317-38	MEP	Provide updated equipment schedule	Allan Giesbrecht	Tom Byers	03/31/10					•			-	0								5
A100317-38	IVILE	Follow-up with John Wolfe re: performace testing of CW - what	Alian diesbrecht	Totti byers	03/31/10	╫				_	\vdash		╁		\dashv	+			+	-	+	-
B100310-05	Structural	sections/types	Brian Olesz	Stacey Root	03/24/10	0				•				۰	0	0	9	•	•			
B100309-34	Structural	Harris Salinas outline Tekla model expectations from Tipping Mar	Marc Steyer	Jim Soule	04/05/10	0						0	•	0	0	•		•	0	0	0 (0
A100317-05	TVD	Commit to a date for completion of Walters and Wolf software change A3	Bret Firebaugh	Andrew DeMotte	03/19/10	0		0	•	۰		•	•	•	•	•	•	•	•	•	• 4	•
B100323-17	TVD	Confirm with Entitlement Group if the MRI chiller will be ok on the lot 7 roof or needs to be in mech screen.	Curtis Chong	Bret Firebaugh	03/25/10	•	•	•	•	•		•	•	•	•	•	•	•	•	•	•	

Example courtesy of Pankow Builders & Boulder Associates Architects



			WEEKLY WORK PLAN									
	COMPANY	McGuire & Heste	er				ORES 0					TOTAL ACTIVITIES
		Grading & Paving	1		Contrac				Protoco			ACTIVITIES COMPLETED
	PROJECT				Prior Wo					nd. Of Acceptance		PERCENT PLANNED
	PROJECT NUMBER	3209			Prior Wo				Schedu			COMPLETE
	RESPONSIBLE INDIVIDUAL	Johann Berg			Info/Data				Incorrec			
					Tools/So Qualified				Off Proj Weather		mands	
	ASSIGNMENT DESCRIPTION				Mat/Equ		allability		Site Con			
	Criteria for release of assignments Defined -	RESPONSIBLE	COMMENTS	STARTI			pr-12	- 1-7	Disc Col			PPC ANALYSIS
¥	Sound - Proper Sequence - Right Size - Able to Learn	PARTY		Mon	Tue	Wed	Thu	Fri	Sat	D/	ONE?	1107111121010
REPE	ovalie Tropel organice Tright one Table to Count			Mon	Tue	vied	inu	FII	Sat	-	UNE?	
				30-Apr	1-May	2-May	3-May	4-May	5-May	YES	NO	REASONS FOR VARIANCE
	Excavate Soil Sampling - 39EA/DAY	Rich Pereria								x		
	Construction Entrance - 1EA/DAY	Rich Pereria								x		
	GPS Setup - Base Station, Control	Bill Lee								х		
	Prep Trailer & Water Pad - 1EA/DAY	Victor Gonzales							•		×	
	Silt Fence - Aproximatly 750 LF, Starting at North West Corner Near Taylor Rd & Industrial Rd and Working East	Victor Gonzales		•						x		
	Straw Wattle - Aproximatly 1150 LF, Starting at North West Corner Near Taylor Rd and Working South	Victor Gonzales					•			×		
	Equipment Delivery	Rich Pereria								x		
	Build Shelving in Container (5S)	Dave Moyot									×	
_												

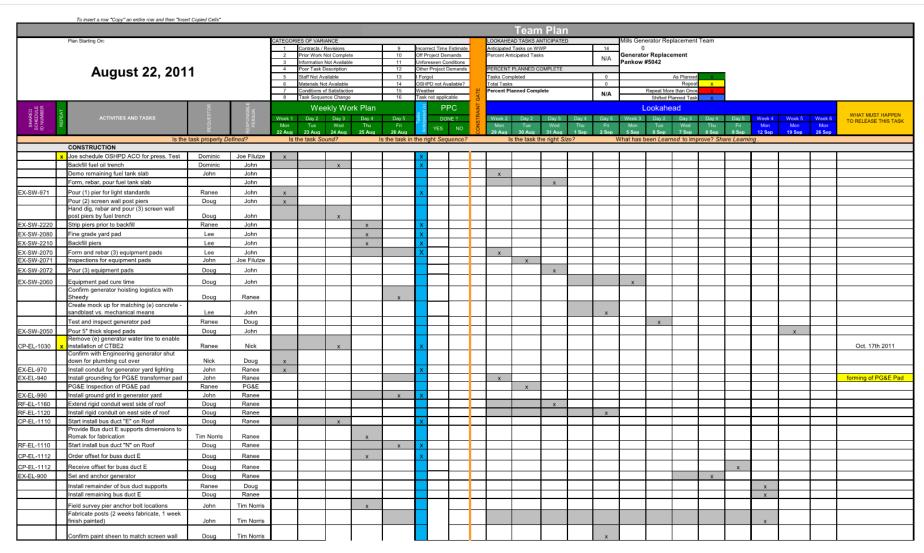
Example courtesy of McGuire & Hester and Skanska Building, USA



Trade Weekly Work Plan Scope: DRYWALL Company: DR Starting: Planner: TOP TRACK Ending I Give Starting Completing w T S Sn What Others Must Do Location Area Manpower Work to be Completed No. MTL STUD FRAMING RM. A15-A18 MTL STUD FRAMING 0% PERMIT & LAYOUT BLOGA 70% MONE BUGA RMS - AIII - A114 , A12/A , A122A FRAMING AID! -AIO9 BACKING INSTALLED IN ALL AREAS 100% NONE BLOG A N

Example courtesy of DPR Construction





Example courtesy of Pankow Builders



WWP TIPS

Hold WWP meetings on Thursdays or Friday mornings

Conduct daily updates of WWP during morning trade huddle (construction)

Workable Backlog known by crews/teams

Be on time.

Stay Focused:

- 1. Turn off cell phones, no texting, no email
- 2. No side conversations

Be Prepared:

- 1.Did you finish last week's commitments? Yes or No. If not, why?
- 2. What work is coming within the next six weeks?
- 3. What are your constraints?
- 4. What do you need from others?

Discuss constraints

Practice Trust and Respect

Promise Reliably

Use "Parking Lot"

End on Time.





METRICS

PPC – Planned Percent Complete

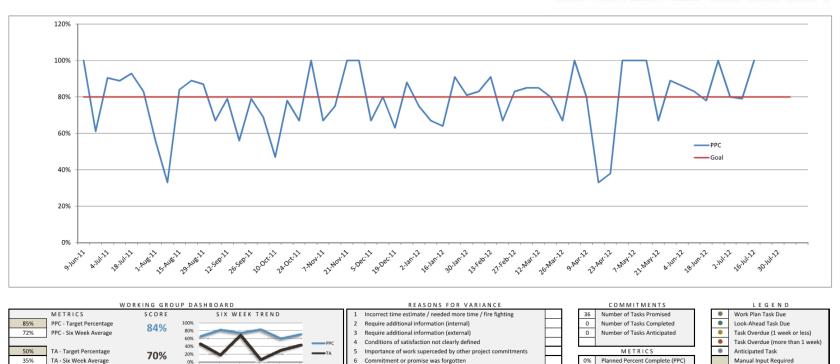
TA or TMR – Task Anticipated or Tasks Made Ready

2/17 2/24 3/3 3/10 3/17 3/24

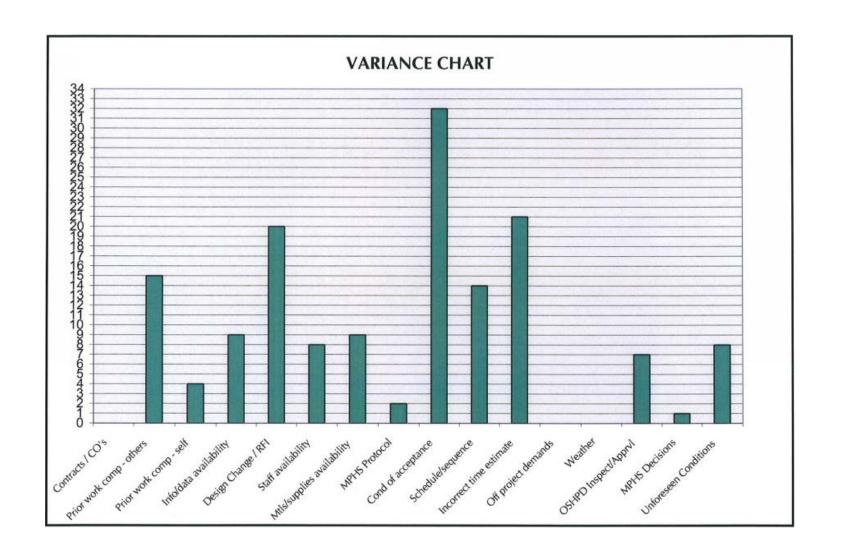


0%

Tasks Anticipated (TA)



METRICS





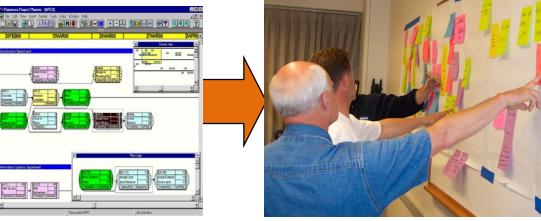


KEY TAKE AWAYS, QUESTIONS & PLUS/DELTA

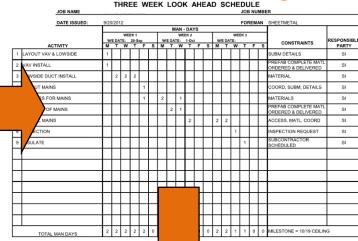


Exhibits - References

Last Planner® - Predictable workflow & rapid learning



Pull Planning



Lookahead Plan & Constraint Analysis



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6	•

-rupture disks

PROJECT: Pilot FOREMAN: PHILLIP
ACTIVITY DATE: 9/20/96

Est Act Mon. Tu. Wed. Thurs Eri. Sat. Sup. PDC. REASON

ACTIVITY									DATE: 9/20/96							
	Est	Act	Mon	Tu	Wed	Thurs	Fri	Sat	Sun	PPC	REASON FOR VARIANCES					
Gas/F.O. hangers O/H "K"			XXXX	XXXX						No	Owner stopped work					
(48 hangers)			Sylvano,	Modesto,	Terry						(changing elevations)					
Gas/F.O. risers to O/H "K"					xxxx	xxxx	xxxx	xxxx		No	Same as above-worked on					
(3 risers)					Sylvano	, Mdesto, T	erry				backlog & boiler blowdown					
36" cond water "K" 42'			XXXX	XXXX	XXXX					Yes						
2-45 deg 1-90 deg			Charlie,	Rick, Ben												
Chiller risers (2 chillers wk.)						XXXX	XXXX	XXXX		No	Matl from shop rcvd late Thurs.					
						Charlie, f	Rick, Ben				Grooved couplings shipped late.					
Hang H/W O/H "J" (240'-14")			xxxx	xxxx	xxxx	xxxx	xxxx	xxxx		Yes						
			Mark M.,	Mike												
Cooling Tower 10" tie-ins (steel)			XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		Yes						
(2 towers per day)			Steve, C	hris, Mark	W.											
Weld out CHW pump headers			XXXX	XXXX	XXXX	xxxx	xxxx	XXXX		Yes						
"J" mezz. (18)			Luke													
Weld out cooling towers (12 towers)			XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		No	Eye injury. Lost 2 days					
			Jeff								welding time					
F.R.P. tie-in to E.T. (9 towers) 50%			XXXX	XXXX	XXXX	XXXX	XXXX	XXXX		Yes						
			Firt, Pac	ky, Tom												
WORKABLE BACKLOG																
Boiler blowdown-gas vents																

Percent Plan Complete

Mar Mar Mar Apr Apr Apr Apr May May Jun Jun Jul Jul Jul

12-20-27-3-10-17-24-21-28-5-18-9-

Master Schedule

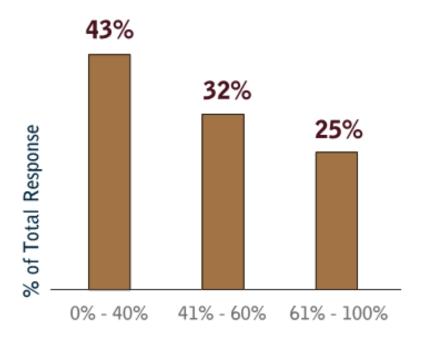
100%

90% 80% 70% 60% 50%

10%

WEEKLY WORK PLANNING The Method To Get Impeccable Coordination

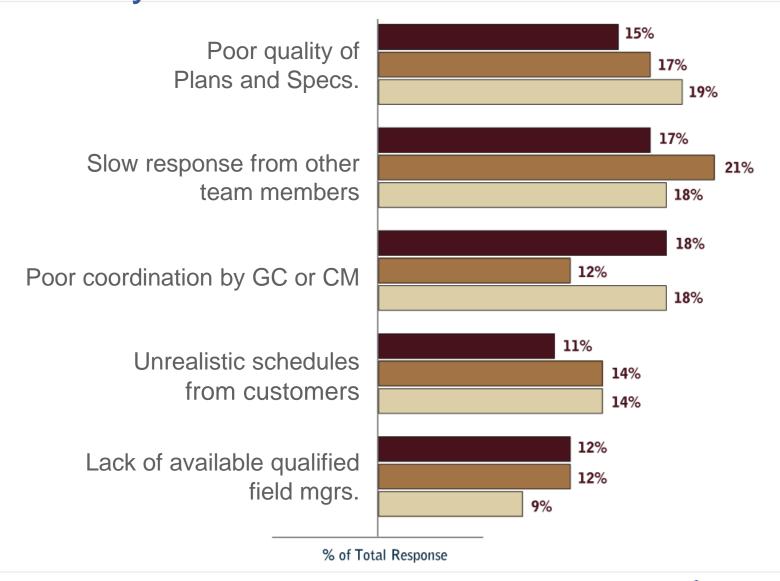
Exhibit 7. What percent of your field managers do you believe communicate a quantifiable or measurable production goal with their crew prior to starting work every day?



The 2012 U.S. Construction Industry FMI Productivity Report



EXHIBIT 12: Largest External Challenge to Productivity



FACILITATOR CONTACT INFORMATION:

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^{*} Leaders of 2014 LCI Congress Intro To Last Planner System.

This concludes The American Institute of Architects Continuing Education Systems Course

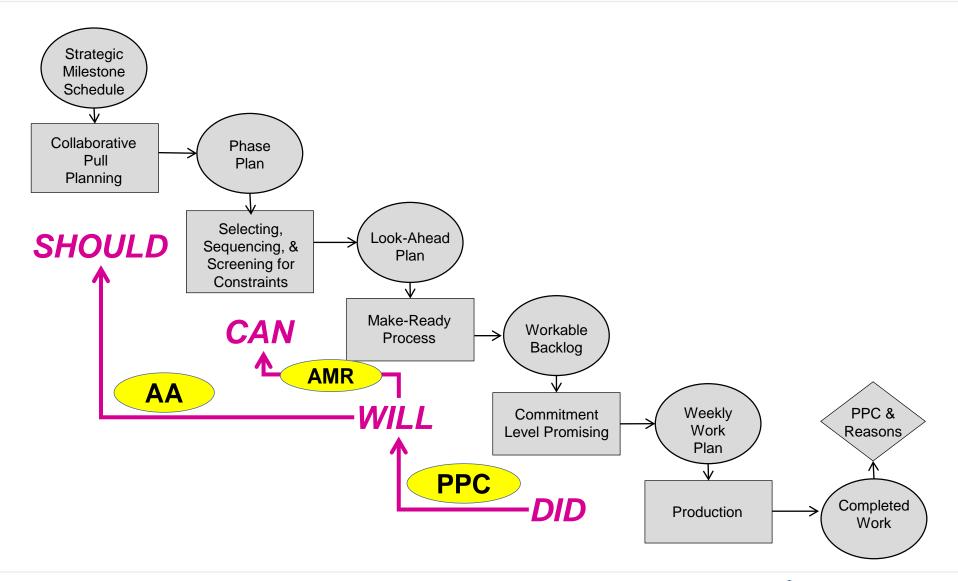
Lean Construction Institute



info@leanconstruction.org



PROJECT AND PRODUCTION CONTROLS





Look Ahead and WWP Examples

Coaching Notes – Key Points

- 1. Project work is affected by dependence and variation
- 2. System throughput directly impacts speed of delivery
- 3. Project work is coordinated in words
- 4. Work flow reliability is not addressed by current planning and control systems
- 5. All work plans are forecasts and all forecasts are wrong.
- The further in advance a forecast is made, the more wrong it will be.
- 7. The more detailed the forecast, the more wrong it will be.
- 8. Updating forecasts improves their reliability.
- 9. Improved reliability alone will typically improve speed
- 10. Improved reliability allows higher resource utilization without compromising speed, cost, or quality.
- 11. Improved reliability reduces risk when measured by potential magnitude of variation between best and worst outcomes

Coaching Notes – Key Points

- 12. Current practice and durations bury the effects of our "unreliable" experience in our current estimates of duration and cost
- 13. Improved reliability allows the time and cost contingencies to be extracted and strategically allocated by the team based upon an assessment of risk.
- 14. Language Action model provides a way of understanding and managing (improving) promise-based performance
- 15. Decomposition model has led to sub-optimization
- 16. Project complexity outstrips individual competence
- 17. Traditions of craft and contract constrain how work is conceived, designed, fabricated & installed
- 18. LPS was developed as a series of counter-measures to actual problems observed with existing planning and control mechanisms
- 19. LPS is designed to promote workflow reliability and rapid learning
- 20. "workable backlog" is used as a buffer to support high utilization when actual performance varies (either positively 10/5 negatively) from plan