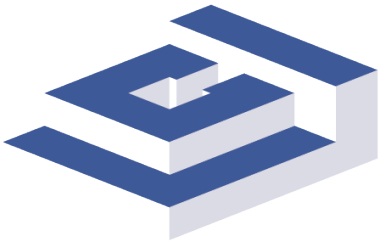

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LAST PLANNER SYSTEM®
STANDARD WORK

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INTRODUCTION:

The Last Planner System® (LPS®) promotes conversations between trade foremen and site-management at appropriate levels of detail and before issues become critical. These conversations increase the chances that work flows reliably, and recognizes that personal relationships and peer pressure are critical to that process.

Last Planner System® of Production Control was developed to make planning processes and workflow highly reliable and to build necessary trust within a collaborative team environment. The Last Planner System® makes detailed plans by those whom execute the work. It reviews the plan near its execution, specifically for collaborative planning to remove constraints as a team and verify that the promises made are tied to milestones and that these commitments are firm, timely and without ambiguity.

It is a planning, monitoring and production control system that follows Lean construction principles such as Just-In-Time (JIT) delivery, value stream mapping (VSM) and pull planning.

Pull planning itself is a procedure of creating a milestone plan, a LookAhead plan and a commitment-based weekly work plan through front-end planning using Lean construction planning techniques.

Weekly work planning is referred to as “commitment planning” because specific resource assignments need to be made at this stage so that work can actually be performed. Effective weekly work planning is the foundation upon which trust within the team is built.

The primary function of LPS® is the collaborative planning process that involves Last Planner®s (LP™) for planning in greater detail as a team gets closer to doing the work. The Last Planner System® is an opposite way of thinking when compared to conventional “push scheduling” principles where the work that SHOULD be done is planned in weekly meetings emphasizing adherence to the master schedule milestones.

In contrast, LPS® incorporates pull planning principles where only the work that CAN and WILL be done is considered and promised by Last Planner®s (LP™) themselves.

Because at its core, LPS® is a “system view” versus “local optimization,” the Last Planner®s’ active engagement in this systematic process is fundamentally *a requirement*. In other words, the Last Planner System® is a team sport.

Constraint analysis is an integral part of LPS® that is applied as a proactive approach to problem solving as a team, despite the typical challenges faced on construction projects.

PRINCIPLES OF LAST PLANNER SYSTEM®:

1. Plan in greater detail as you get closer to doing the work.
2. Produce plans collaboratively with those who will do the work.
3. Reveal and remove constraints on planned tasks as a team.
4. Make and secure reliable promises.
5. Measure promises kept (planning capabilities, PPC) in order to improve by learning from variance (workflow disruptions).
6. Continuously improve as a team, remove waste and adjust performance based on what has been learned as a means to optimize workflows.

Figure 1: Last Planner System® Overview

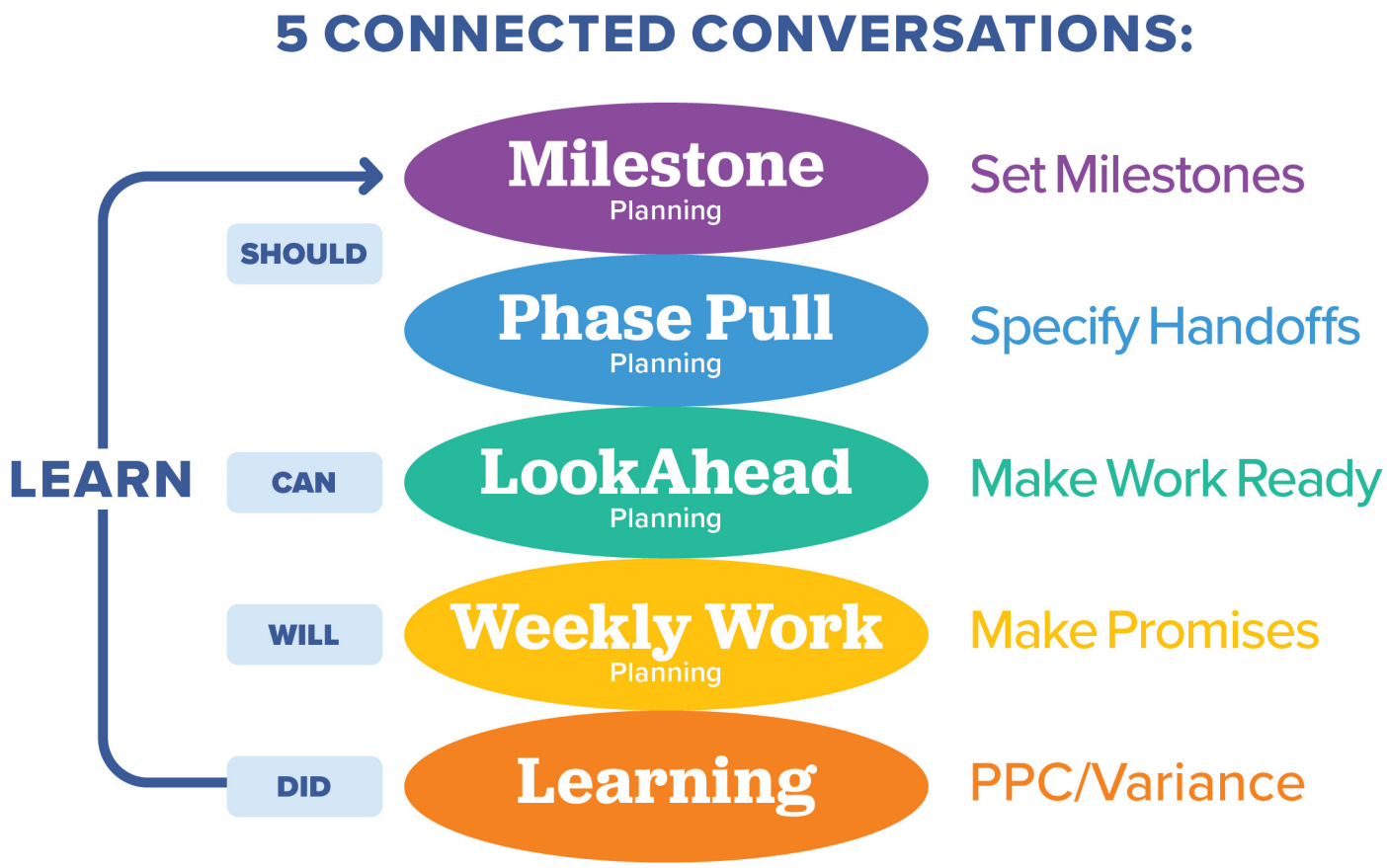

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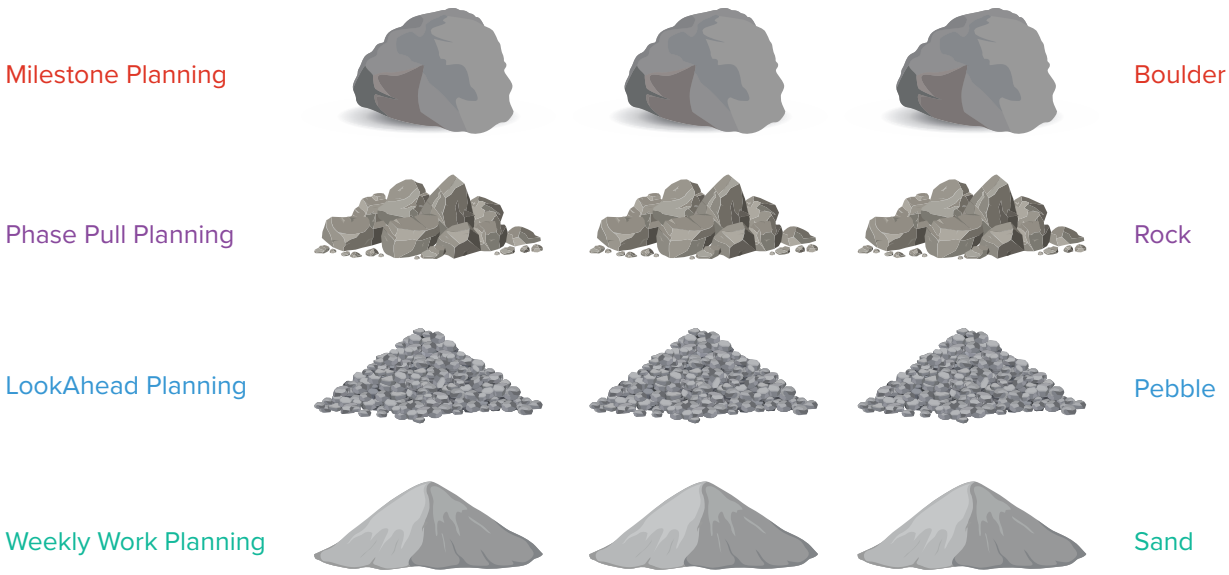
Figure 2: Levels of Granularity



Last Planner System®
Standard Work
2_Pull Planning Session Invitation

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OUTCOME:

A well- executed invitation to a Phase Pull Planning session will support a more successful session.

PROCESS:

At least a week prior to the Phase Pull Planning session, send out an email invite to all stakeholder participants.

Actions	What's Critical	Why It's Important
1) Send invite to expected participants via email and announce in regular weekly meetings.	• Allow enough time for them to clear other calendar obligations or not double book their schedule. • Send it via email.	• Respect that some participants may have other commitments. • Email invites help lower confusion by ensuring it is on all calendars.
2) Include the time frame for the session.	• Allow enough time for them to clear other calendar obligations or not double book their schedule. • Send it via email.	• Often not enough time is allowed to properly discuss and pull a phase. This results in frustration of either running over time and interfering with other's plans or having to reschedule time to complete.
3) Include all required participants and require responses to the invite.	• Be clear on who is required and who may be optional. Be inclusive. • Require and monitor accepted responses.	• When one key person/trade is absent a session, it affects the whole team.
4) Include a description of the milestone to be pulled.	• Describe the milestone enough for the trades to understand their inclusive work. "Dry-in" does not offer enough description. Give a description of what "dry-in" will look like.	• Trades all have different perspectives around even traditional milestones. It is important to be clear about the state of the work at the end of the milestone.
5) Request that the trades come with an understanding of their work for the milestone.	• When trades are in the session really looking at their work for the phase for the first time, the session takes longer, and the likelihood of missing something is higher.	• Pull sessions take long enough when trades are prepared and deeply knowledgeable about their work for the phase. When even just one trades needs to digest their work, it frustrates and bogs down the other participants.
6) Send reminders closer to the session.	• It is critical that all required participants show up. Reminders help.	· Until the team is high performing and highly disciplined with LPS®, it is helpful to send reminders.

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.

Actions	What's Critical	Why It's Important
1) The space must have an accessible blank wall long enough to accommodate the phase pull. This is often at least 6-8 feet long with an area of 4+ feet to access the wall.	• The wall needs to be unencumbered by items, power and other cords, and furniture. It needs to have space to accommodate many of the participants at the wall working together.	• The wall is where the "work happens." If the team does not have enough space to work, it impedes the amount of time it takes and can impede the actual outcome. The team needs the room to work.
2) Have a writing work space for the team.	• Some sort of writing work space is needed for the team to create the sticky notes. Clip boards work well as an alternative to a table. Often a table becomes a barrier to the team getting to the wall to work.	• Writing work space is important, but it is equally important that it not impede the working area of the wall or become a way for the team to be less engaged.
3) Have an area to project information about the project phase such as plans, BIM model, etc., or area to pin up materials to reference.	• Having information about the project phase for the team to reference for discussion and marking up in an accessible manner is critical.	• The team is working out how they are going to deliver a phase of the project. They need to be able to talk about the phase to sequence the work and get alignment prior to starting to prepare the sticky notes. • Having all information available and able to be marked up is important.
4) Have a person responsible for supplying the project phase information for discussion per the action above.	• A person must be responsible for supplying the project information in a manner that the team can reference and use.	• If no one is responsible to supply the information, it may not be there.
5) Materials –Name tags at all sessions with new participants. Paper stick-on is fine.	• The new participants need to be able to build a rapport with the team and refer to each other.	• Pull planning is about the conversation and building trust. Getting to know each other by name supports this. It is too easy to forget names upon a simple introduction in a group.

Actions	What's Critical	Why It's Important
6) Materials–Paper	• Roll paper is best to have and can be plotter or butcher paper. The wider the paper the better. Shiny coated paper is not good	• The paper length needs to accommodate the length of the phase being pulled. This is often 6-8 feet. It is important to have extra paper to make the area longer or wider as needed. The paper should never impede the plan needs.
7) Materials –Sharpie pens in fine point, black. Have at least 1 per participant doing the planning. A few extras are helpful.	• Everyone preparing the sticky notes needs to have a pen. The writing needs to be legible from a little distance and may need to be photographed.	• Regular pens tend to lead to small print that is hard to read and certainly can't be photographed. Similar pens help the plan to be overall more organized looking.
8) Materials –Super Sticky Post-it Notes in enough colors for each trade represented. 4x6" is preferred.	• Super Sticky type. The sticky notes are assigned by color to each trade, owner, architect, etc., that will be participating. 4x6" size allows for the proper amount of information to be written in a legible size. Note: teams use different sizes but to some degree of loss of information or legibility.	• The sticky notes need to stay on the wall. Super Sticky aids in this the best. Sometimes it is necessary to tape the notes after the plan to keep them adhered (especially in humid conditions). • Color coding is an important part of "visual control" (Lean principle #7). • The size of the sticky supports legibility and amount of information.

MILESTONE PLAN:

The result of a collaborative conversation with trades doing the work that becomes the milestone roadmap for the project. It should be kept visible in the trailer.

OUTCOME:

To understand how Milestone Planning Phase relates to the overall implementation of Last Planner System® (LPS®).

PROCESS:

Use the master schedule to identify milestones to be used with Last Planner System®.

Actions	What's Critical	Why It's Important
1) Reference the master schedule that has been created prior (If one exists) to pull key milestones for the milestone plan	• Start with any existing schedule that has been created as a guide.	• The schedule is needed to confirm the flow of work and to identify the required steps to accomplish the overall project.
2) Start to layout the milestone plan working backwards from the final milestone aligning on key milestones, general durations and flow.	• The group builds a milestone plan together using tags on the wall to make the plan visible.	• To gain alignment by building the plan together understanding the work of each trade at a high level.
3) Identify areas/milestones that carry risk and start a risk log with plans to mitigate the risk.	• The group starts to be transparent about possible risk early on so steps can be taken to mitigate the risks.	• Paying attention to risk early allow for mitigation plans to take action. It also builds trust to start to engage in transparent conversations.
4) Add milestones for Phase Pull Planning sessions.	• Planning ahead for the sessions allows for ensuring the right trades on board in time to have input.	• Missing a key trade in any Phase Pull Planning session can result in waste for all others in the session.

Courtesy of The ReAlignment Group

Courtesy of JE Dunn

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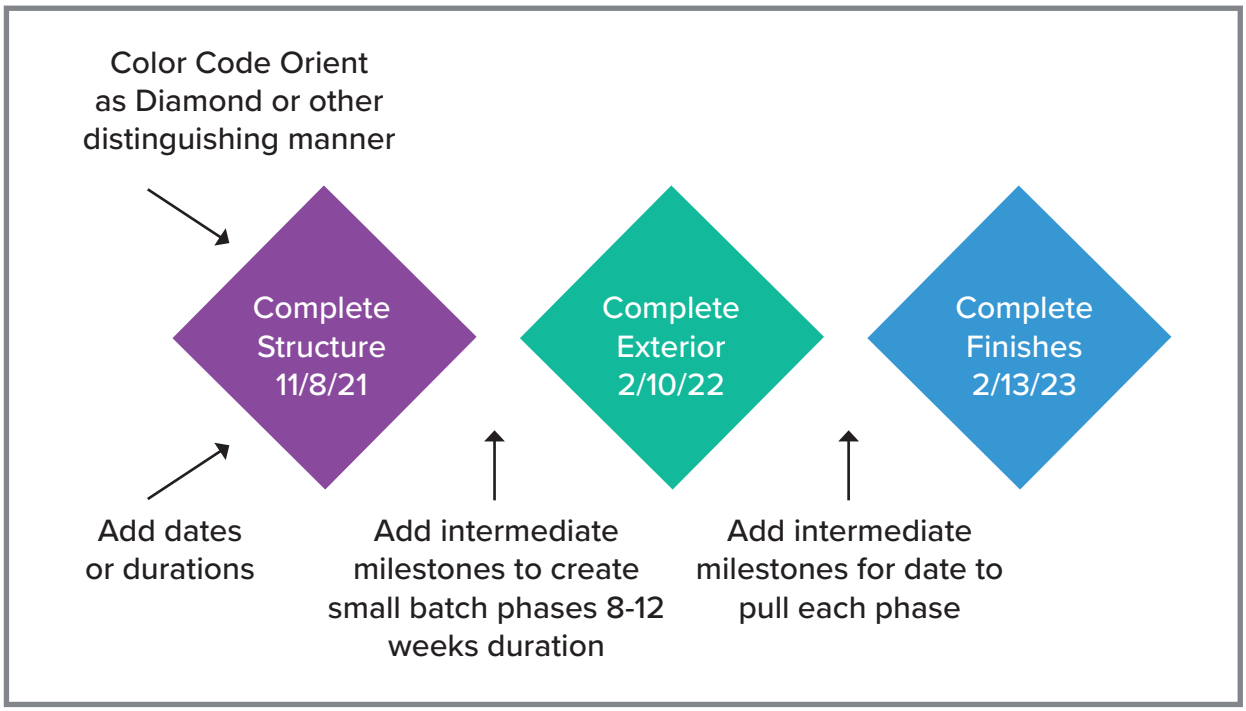
EXAMPLES OF MILESTONE TAGS:



PHASE PULL PLANNING LCI DEFINITION:

The portion of the Last Planner System®(LPS®) that focuses on Phase Pull Planning, which is a plan for executing a specific phase of a project using a pull technique to determine hand-offs. It is prepared by the team actually responsible for doing the work through conversation. Work is planned at the "request" of a downstream "customer."

OUTCOME:

Team alignment on a strategy for delivering a phase of the work designated between two milestones.

PROCESS:

The foreman representing each trade for a phase of work gather to produce a plan to do the work needed to meet the milestone. The plan is developed backwards through conversation based in requests and promises, creating "pull" starting with the finish milestone and identifying the next required activity. Work tasks, information flow and material deliveries are planned based on the request (or pull) of downstream customers. Pull planning will often expose the need for smaller batches, Just-in-Time delivery, improved leveling of resources and reduced lead times.

Workflow becomes more reliable and efficient as the waste of waiting, redundancy and over processing are eliminated.

Actions	What's Critical	Why It's Important
1) The Superintendent leads a conversation to gain alignment and understanding of the expected outcome of the phase milestone pull session along with the start and finish milestones.	• Trade-wide alignment of the state of the work at the defined milestone.	• Each trade may have a differing understanding of a milestone from their perspective. It is important to have team-wide understanding of the goal.
2) The Superintendent leads a conversation with the foreman to determine an overall strategy to deliver to the milestone using visuals as needed (plans, models, etc.).	• The team needs to have an overall sense of the phase of work they are delivering and the relationship of their work to others.	• Trying to understand the overall flow while actually executing the plan slows the planning process. It is best to have an overall strategy, then start to work out the detail of the strategy in using "pull."
3) While discussing the overall strategy in the previous action, the Superintendent captures the perceived risks associated with the work by each trade. This collection of perceived risks can be done via flip chart, smart board or other visible means.	• Gaining insight to the possible risks and ranking them as high, medium or low puts a focus on mitigating the risks as part of the pull plan. For instance, a trade may identify a long lead item as a risk. The delivery and ordering of the item could be integrated into the plan instead of waiting for the LookAhead Phase.	• Everyone on the project is trying to manage their risk. By transparently identifying the risk, teams are better equipped to mitigate it as part of the team's plan.

4) To commence with the pull plan, the Superintendent places the milestone tag note at the far right side of the planning surface (paper). This is usually a 3”x3”different color tag placed in a diamond orientation.	• The pull starts from the expected outcome which is the milestone.	• The pull is created by making promises and requests to identify predecessor work. This is to ensure doing the right work at the right time in just the right amount to balance the overall plan and work of others.
5) The Trade Foreman that will be responsible for the final piece of work that completes the milestone prepares the first tag per the Standard Work for tag notes and places it immediately to the left of the milestone tag.	• Every milestone has an action or work that will identify it as complete.	• That work starts the pull session conversation and placement of tags by the other trades.
6) Per the *request* of the prior tag, the appropriate Trade Foreman prepares a promise to deliver the work of the request. This tag is placed on the wall by the Trade Foreman to the left of the prior request.	• Every request for prerequisite work to be in place must have a promise to meet the request. Each Trade Foreman is responsible for preparing his/her tag for the promise. It is the responsibility of the “requestor” to ensure that their request is met with a promise from another trade.	• The promise and request cycles must be complete to ensure proper structuring of the work. The tighter the plan is, the smoother the work will go during implementation. • It is important that the Trade Foreman who will be leading the work of each promise prepare the actual tag note AND place it on the wall. This act is part of making the promise and ensures alignment with the plan.
7) Apply durations to each activity with no contingency or float.	• At this point, the focus is on the structuring of the work and most realistic time frames.	• This step is the first pass. Optimization of the plan comes later.
8) Continue the request and promise cycles until the plan is complete.	• Ensure that all Trade Foremen are placing their tags and staying actively engaged in the planning conversation.	• If the Trade Foremen are not staying actively engaged, items can be missed or miscommunication can occur.
9) Add numbers to each tag note.	• Identifying each tag with a number allows for easier tracking of predecessor activities.	• Accurately identifying predecessor activities is critical to the promises made / promises kept cycle.

Actions	What's Critical	Why It's Important
10) As work can be performed simultaneously to other work, stack the tags vertical with the longest activity at the top of the stack.	• It is important to identify work that can happen simultaneously to shorten the schedule and to meet the milestone.	• It is important to identify when a trade can commence with work following a previous trade. This identification is often a gap with traditional scheduling methods. The purpose of conversational planning is to close this gap to ensure a smooth flow of work between the trades.
11) As the plan is developing, the Superintendent may challenge the emerging network of dependencies and times.	• It is the leadership role of the Superintendent to challenge the team and to help drive innovation.	• Most teams will lay out a logical plan that often will expand the time frame of the milestone.
12) Once the plan is considered complete, the team, led by the Superintendent, should walk through the plan together. Re-examine the logic and challenge the team to shorten the overall duration (if appropriate). Question if the plan is optimized to produce flow and if it represents the best use of time and resources.	• Now is the time to check if the logic makes sense, if every request is met with a promise, and if the time frame meets the milestone time frame. This conversation of questioning and challenging each other determines where optimization can occur.	• Often the logic and/or time frame needs adjustment. This step is often the discussion that leads to innovation.
13) Identify areas of risk in the plan and rank the level and impact as high, medium or low.	• Determine a plan to minimize the risk which may include allowing appropriate buffers to the plan. It is best to identify the constraints to the activity and take action to remove the constraint. See LookAhead Planning (LPS® document #7).	• It is important to remain transparent about and focused on areas of risk. It is often easy to fall to buffers as the answer, but innovation and focus can help mitigate risk with a plan.
14) The Superintendent calls an end to the session.	• All Trade Foremen for the phase must stay present until the plan is considered complete and accepted by the team.	• If trades leave the room, their work may need to be adjusted and it is their responsibility to make the adjustments in order to ensure alignment and agreement.

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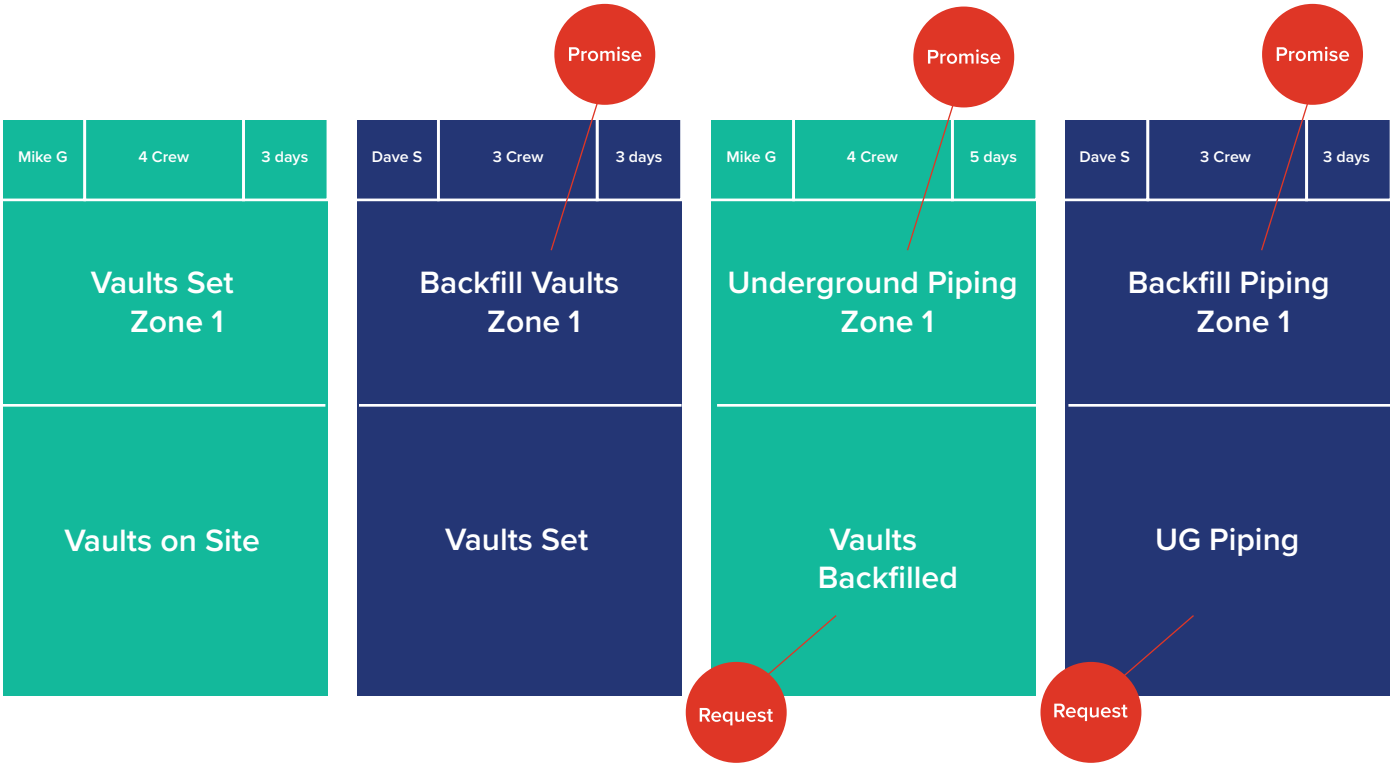
PHASE PULL PLAN EXAMPLE:



TEAM PHASE PULL PLANNING:

Courtesy of JE Dunn

OUTCOME:

Clear legible complete sticky note tags, color-coded to designate each party, for a successful pull plan.

PROCESS:

In the leadership role, the team leader should align the team on the structure of the tag to create consistency and common understanding. It is important to be able to find information quickly and to not be confused by the information.

Note: the different companies/teams will use a different format. It is the base content that is important along with the format each team agrees to use.

Actions	What's Critical	Why It's Important
1) Provide each participant with a different color sticky note pad, (4"x6" is a common size which allows room to write).	• The different colors will aid in making the structure of the work more visible.	• A Lean principle is to make work visible to help identify problems.
2) Create a Legend for the plan based on the colors.	• It is helpful to remember which color each trade is assigned for this plan and future planning sessions.	• It adds clarity.
3) The next steps outline base content of the tags.		
4) Trade Foreman writes his or her name or initials on the tag.	• This identification helps to identify who made the tag and who is responsible for the work.	• The act of making the tag leads to the act of making the promise. • Additionally, there is often more than one person from a trade in the room.
5) Foreman writes a tag to deliver a clearly defined piece of the work.	• This tag should be clear and done in a "small batch" manner. Rule of thumb, if a piece of work is more than a week, it needs to be broken down. • Be very clear about the describing the work and the area the work will be performed in.	• The more defined the work can be, the more a team can see opportunities to optimize the overall plan.

5) Foreman writes a tag to deliver a clearly defined piece of the work.	• This tag should be clear and done in a "small batch" manner. Rule of thumb, if a piece of work is more than a week, it needs to be broken down. • Be very clear about the describing the work and the area the work will be performed in.	• The more defined the work can be, the more a team can see opportunities to optimize the overall plan.
6) Foreman writes a tag to deliver a clearly defined piece of the work.	• This identification should be clear and done in a "small batch" manner. This step should include conditions for being able to accept the previous work and put their work in place.	• The more defined the work can be, the more a team can see opportunities to optimize the overall plan.
7) Add duration of the work (better practice is in number of days).	• This step should be done in a "small batch" manner. Rule of thumb, if a piece of work is more than a week it needs to be broken down.	• The more defined the work can be, the more a team can see opportunities to optimize the overall plan. Ultimately the work will need to align with a Weekly Work Plan so this aids with the future step.
8) Identify the number of people on the crew for the work being planned to align with the duration.	• Identify the amount of resources needed to execute the plan per the tag.	• This manpower identification allows for alignment with the trades' original expectations and allows for the team to remember how the plan was determined in the future.
9) Other useful information varies by project. Some options include: activity number, immediate identification of constraints, risk levels.	• Teams may choose to add information that helps to make the plan more useful.	• If information makes the plan more useful, use it.

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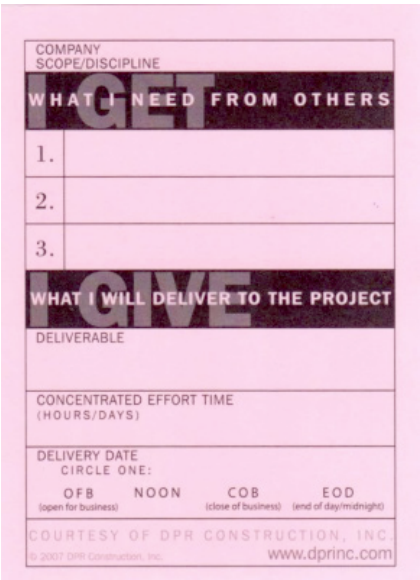
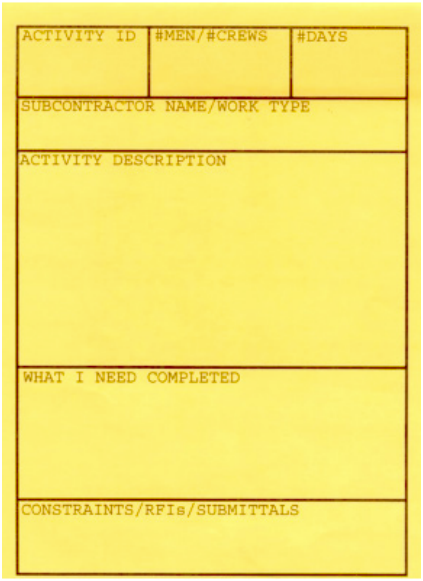
PHASE PULL PLANNING TAG EXAMPLES:

Name	# People	# Days 1 week max
MY PROMISE / ACTIVITY • WHAT I WILL DELIVER • BE SPECIFIC • SMALL BATCH		
WORK ZONE / AREA		
MY REQUEST / TRIGGER • WHAT RELEASES MY WORK • BE SPECIFIC		
CONSTRAINT		





LOOKAHEAD PLANNING LCI DEFINITION:

The portion of the Last Planner System® (LPS®) that focuses on making work ready – assuring that work that should be done, can be done by identifying and removing constraints in advance of need. To "make ready" is to take actions needed to remove constraints from assignments to ensure the work can be done as planned.

LOOKAHEAD PLAN:

A short interval plan, based on the pull/phase plan, that identifies all the activities to be performed in the next 6 (or other) weeks. The 6-Week LookAhead Schedule (LAS) is updated each week – always identifying new activities coming 6 weeks out so that the project management team can make appropriate arrangements to assure that the work will be ready to be performed in the week indicated.

LOOKAHEAD WINDOW:

The duration associated with LookAhead Planning. Typically LookAhead windows extend from 3 to 12 weeks into the future, with 6 weeks preferred on most projects.

OUTCOME:

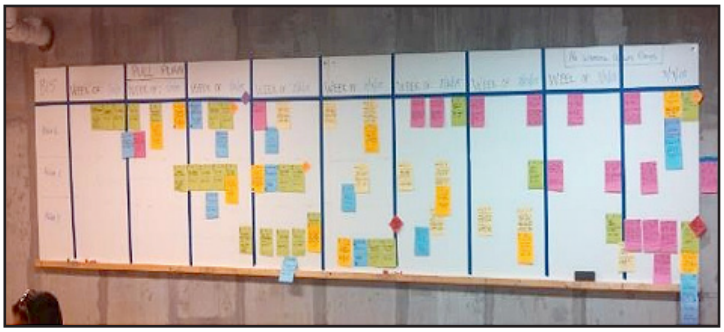
The 6-Week LookAhead Plan outlines what can occur in the coming weeks based upon the progress of the job. Utilize this plan to identify and subsequently remove constraints proactively prior to an impact on the job.

PROCESS:

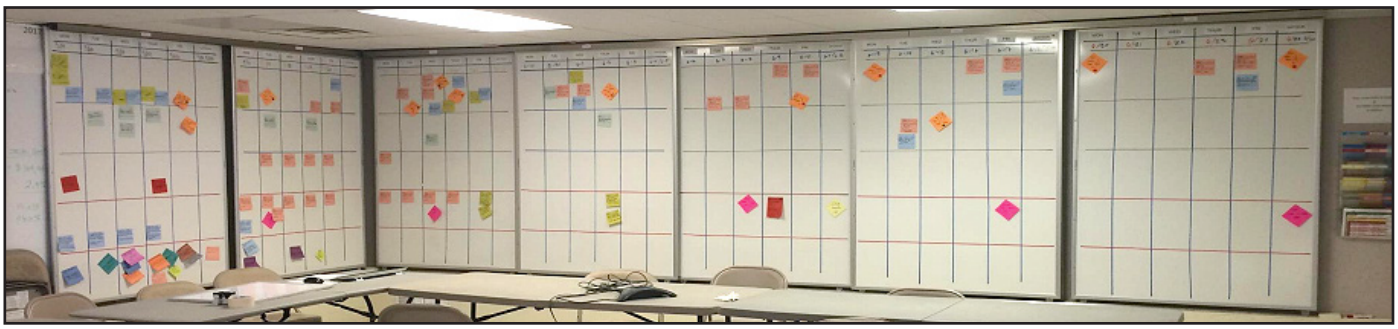
Based upon the information in the Phase Pull, focus on the activities that occur in the next 6 weeks. Collectively determine if any new activities are required and if the sequence (or handoffs) are still accurate. Once the sequence is deemed correct, study the activities and determine if any constraints exist or may arise that would impede flow. Add these constraints to the Constraint Log (see LPS® document 8).

Actions	What's Critical	Why It's Important
1) Isolate the activities from the Phase Pull that will occur in the next 6 weeks (or appropriate time frame for the project).	• Study the activities that can occur in the next 6 weeks.	• Proactively looking at activities in the coming weeks allows time to identify constraints and remove them before the work flow is impacted.
2) Determine if any new activities are required and if the sequence or handoffs are still accurate.	• Confirm the information from the Phase Pull is correct.	• Collaboratively agreeing upon the sequence and handoffs for the next 6 weeks as a team allows the group to focus on those critical activities which move the project forward.
3) Study the activities and determine if any constraints exist or may arise that would impede flow.	• Use the collective wisdom of the team to identify all possible constraints to the activities listed on the tags.	• Identifying the constraints early allows any potential impact to surface with typically enough time to remove the hurdle before the Weekly Work Plan (WWP) is created.

LOOKAHEAD PLANNING PLANNING BOARD EXAMPLES:



Courtesy of PCL Construction



Courtesy of Turner Construction Company

CONSTRAINT AND CONSTRAINT LOG LCI DEFINITIONS:

1. Constraint - An item or requirement that will prevent an activity from starting, advancing or completing as planned. Something that stands in the way of a task being executable. It is not a preceding element of work already shown on the LookAhead plan, but something that is not shown such as a new client requirement, a contract that must be issued prior to work beginning, approval from an architect to change a design, etc.
2. Constraint Log - A list of constraints with identification of an individual promising to resolve the item by an agreed date. Typically developed during a review of the 6-Week LookAhead Plan when it is discovered that activities are not constraint free.

OUTCOME:

Systematically identify possible constraints to any activity that has been posted to the work plan before the constraint can impact the completion of the activity, and subsequently the flow of the project.

PROCESS:

During the 6-Week Make Ready Plan review, the team discusses each activity to determine if any known constraints exist that may prohibit the activity from occurring as planned. If a constraint is identified, it is added to the Constraint Log along with the team member's name that has committed to champion its resolution and the date by which the constraint will be removed.

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Actions	What's Critical	Why It's Important
1) Review the activities posted in the 6-Week LookAhead Plan and identify constraints.	• Systematically review the activities 1 week out, then 2 weeks out, etc., until all activities listed during the sixth week out are reviewed.	• Looking ahead is important because it provides an opportunity for the team to remove barriers to flow before the activity becomes critical.
2) Each time a constraint is identified by the team, place the item into the Constraint Log (i.e. Excel document).	• Capturing every legitimate constraint in the log.	• Maintaining reliable work flow is critical to a project's success. If a constraint is identified in advance, yet not placed into the Constraint Log and tracked, it is likely to go unresolved and impact work flow.
3) Identify a champion to resolve each constraint and include the champion on the Constraint Log.	• Ensuring a team member commits to serving as the champion to resolving the constraint.	• Without a champion that commits to the other team members that they are responsible, it is likely that the constraint will not get resolved and subsequently impact the work plan.
4) Include a resolution date in the Constraint Log for each constraint.	• Committing to a date in the meeting.	• Holding each other accountable is critical to the success of the Last Planner System® (LPS®).
5) Upon resolution of a constraint, denote the resolution as being completed.	• Denoting constraints that have been resolved.	• Keeping the Constraint Log accurate is important to keeping the team focused on active constraints.

CONSTRAIN LOG EXAMPLE:

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

WEEKLY WORK PLANNING LCI DEFINITION:

The commitment-level, "will" planning step of Last Planner System® (LPS®) is identifying the promised task completions agreed upon by the performers. The Weekly Work Plan (WWP) is used to determine the success of the planning effort and to determine what factors limit performance. It is a more detailed level than the LookAhead and is the basis of measuring PPC (Percent Plan Complete).

OUTCOME:

Create a WWP outlining the activities that will occur next week and that provides the basis for the determination of PPC in addition to what factors limit performance.

PROCESS:

The WWP is collaboratively developed by the team's Last Planner®s (LP™) via pull planning. Activities included in the WWP are those that will occur in the upcoming week. When posted, each activity represents a personal commitment from a team member based upon the promised completion (hand off) and acceptance of another activity in the WWP.

Actions	What's Critical	Why It's Important
1) Assemble the Last Planner®s (LP™) for the weekly meeting.	• Regular attendance by the LP™.	• Attendance is critical to ensure all parties are represented and have input into the WWP.
2) Transfer the activities in week 2 of the 6-Week LookAhead Plan into the new WWP. The WWP can be maintained electronically, possibly in Excel, or with tags on the wall (as long as the WWP can remain posted on the wall for all to see).	• Transferring the activities correctly.	• Transferring the thought process of prior meetings is important to avoid wasting time re-creating what has already been planned.
3) Review the activities in the new WWP and adjust the sequence as necessary based upon the progress of the project. Add additional detail at the daily level for each trade.	• Confirm that the sequence, duration and handoffs are correct.	• Prior to gaining a commitment from the LP™, it is important to gain consensus from the team members that all logic is correct.
4) Gain a commitment from the LP™ for each activity and the day(s) it will be worked on and completed.	• Personal commitment that the activities will occur (as part of the LookAhead Plan they were activities that could occur).	• LPS® is founded upon commitment based planning. Having the LP™ commit to each other creates trust and a collaborative effort.
5) Update the WWP with the commitments.	• Capturing the promises made.	• In order to calculate reliable and accurate PPC, the WWP needs to be accurate.

WEEKLY WORK PLAN EXCEL EXAMPLE:

WEEKLY WORK PLAN — Work Beginning:

Area:		CATEGORIES OF PLAN FAILURE										TOTAL ACTIVITIES	31			
Contractor:		1 Coordination	5 Prerequisite Work	9 Submittals		13 Space						ACTIVITIES COMPLETED				
Shift:		2 Eng/Design	6 Labor	10 Approvals		14 Site Conditions						PERCENT PLANNED COMPLETE	0%			
Last Planner:		3 Owner Decision	7 Materials	11 Equipment		15										
		4 Weather	8 Contracts/COs	12 RFIs		16										
Activity ID	Commitment Description Safe - Defined - Sound - Proper Sequence - Right Size - Able to Learn	Responsible Person	Start Date		11\28					DONE?		LEARNING	Category
			Mon	Tue	Wed	Thu	Fri	Sat	Sun	YES	NO	REASONS FOR PLAN FAILURE	
1	Pour new moat floor on the south side of the building	B.A.M	4	4									
2	Adjust (4) down spouts on the south side of the building	B.A.M	2	2	2								
3	Patch masonry around 6 conducter boxes on the roof	B.A.M	1	1	1	1	1						
4	Install base on 2nd floor in the south side class rooms	B.A.M		3	3	3	3						
5	Install wainscoting on the first floor north side	B.A.M		4	3	4							
6													
7													
8	Pull wire for Chiller	Ryan	5										
9	Security rough-in on all floors	Ryan		3	3	3	3						
10	Basement rough-in complete	Ryan	4	4	4	4	4						
11													
12	Hang and finish all rated chases	Fred			3	3							
13	Reframe and hang dry wall in hallway 121	Fred	4	4	4	3	5						
14	Sand dry wall in hallway 139	Fred	2	2									
15	Finish dry wall in west class room 107,144	Fred	3	3		3							
16													
17													
18	Rough-in media center ceiling	Troy	5										
19	Get fresh air duct inspected in attic	Troy				6							
20	Get north west chase duct inspected	Troy				6							
21	Insulate north west chase duct	Troy			4								
22	Tie in vav boxes in the attic	Troy	3	3	3								
23	Start tying in vav boxes in the east wing 1st and 2nd floors	Troy	4	4	4	4							

What & Where?

Crew Size?

Who?

When will it be done?

WEEKLY WORK PLAN BOARD EXAMPLE:

Courtesy of PCL Construction

OUTCOME:

This is a meeting of the Last Planner®s (LP™)(i.e. Trade Partner Foremen) with their customers – other Last Planner®s (LP™) – for the purpose of managing their promises to stay on plan and for learning and improving, particularly improving flow. As the construction manager, you are there to support Last Planner®s to engage with each other as performers and customers working in a Lean production system.

Note: Some people refer to this meeting as a "huddle." Huddles occur before we act. This meeting is an after-action review.

PROCESS:

The Last Planner System® (LPS®) organizer—often an area superintendent or that person's deputy—assembles the LP™ for a 5 to 8-minute stand-up meeting in the general area of their work. Have a copy of the Weekly Work Plan (WWP), or a tablet if you are using LPS® software, to discuss the tasks planned for that day.

- Status the promises during the conversation.
- Record reasons for any promised work that wasn't finished on time along with reasons for any work that was finished ahead of the promised date.
- For work that wasn't finished, ask the LP™ for a new promise. Offer help to get back on plan.
- Confirm or update the promises for work in the coming days.
- Ask for any new constraints identified in the course of doing the day's work. Promise the LP™ to report on your actions to remove those constraints.

In addition, use these questions to tightly couple learning with action:

1. What did you learn today?
2. What did you improve today?
3. What would make tomorrow go better?

Record the answers. Take action where you can. Share what you learned across the project.

Last Planner System®
Standard Work
10_Daily Stand-Up Meeting

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Actions	What's Critical	Why It's Important
1) Host a stand-up meeting at the end every day.	• Regularity of the meeting and limiting the meeting to 5 – 8 minutes, reserving the remaining time for following up individually.	• The intent of this meeting is for managing promises to each other and for continuous improvement.
2) Hold the meeting at the place of the work. Avoid taking LP™(s) away from their people.	• The up-to-date WWP	• Holding the meeting daily referencing the WWP provides an opportunity to monitor flow (and track Percent Promises Complete - PPC), identify constraints to flow and fosters a collaborative team environment.
3) Ensure the attendees stand up.	• Standing up (no chairs in the room).	• Standing at a meeting creates a shared feeling of getting things done quickly.
4) Ask each foreman to address their work for the day noting any risks.	• The foremen speak to their customers, other foremen, not the superintendent.	• This reinforces the customer mindset – that people are performing to take care of the next crew in that area.
5) Finish with the three continuous improvement questions.	• Go through the questions one at a time. Help people recognize learning and improving. Be open to changes that will make tomorrow better. Support the LP™ to make the change.	• Improvement is a habit. The routine use of the three questions helps the LP™ notice opportunities for learning and improving.

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TEAM IN A DAILY HUDDLE EXAMPLE:

PERCENT PLAN COMPLETE (PPC) LCI DEFINITION:

A basic measure of how well the planning system is working is calculated as the number of assignments completed on the day stated divided by the total number of assignments made for the week. It measures the percentage of assignments that are 100% complete as planned.

OUTCOME:

Calculate the reliability of the promises made by Last Planner®s (LP™) in the Weekly Work Plan (WWP). An expected outcome for PPC (high performing team average) falls within the range of 75-90 percent.

PROCESS:

The PPC metric is determined by dividing the number of activities completed by the total number of activities planned and turning that result into a percentage. The PPC is subsequently plotted on a bar chart and posted in a location that is visible to the entire team.

Actions	What's Critical	Why It's Important
1) Assemble the LP™ regularly in front of the WWP.	• Attendance of the team members that made the promises in the plan.	• Having regular meetings to instill accountability.
2) Determine the PPC for the time period since the last meeting.	• Agree upon which items are complete and not complete according to plan, then determine the PPC by dividing the number of activities completed by the total number of activities planned and turning that result into a percentage.	• Determining the PPC allows the team to monitor progress and identify reasons for variation/ constraints that prohibited items from being completed as planned.
3) Insert the PPC into a graph format and post in a location that is visible to the entire team.	• Updating the graph and posting in a visible location.	• Visible reporting of the team's progress encourages improvement and allows the team the ability to witness trends in the commitments being made.

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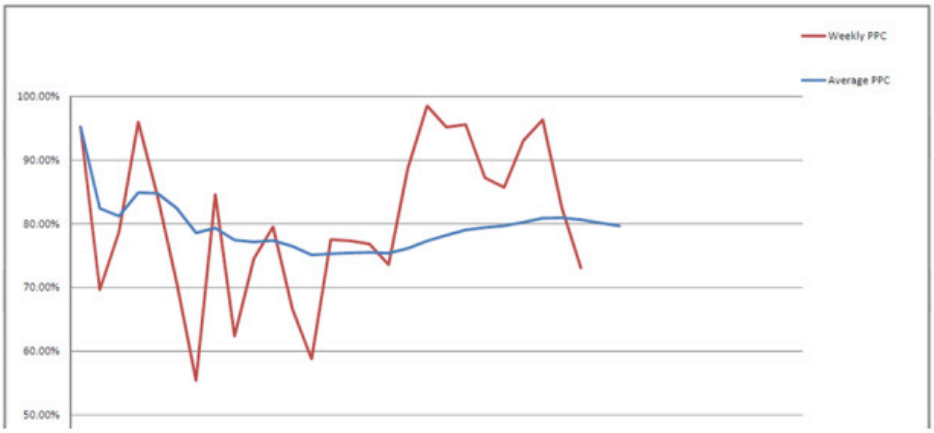
PERCENT PLAN COMPLETE TRACKING EXAMPLE:

OVERALL PLAN PERCENT COMPLETE

PROJECT AREA
THEATERS

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

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



PERCENT PLAN COMPLETE (PPC) LCI DEFINITION:

Factors that prevented an assignment from being completed as promised, used by the team to promote learning concerning the failure of the planning system to produce predictable workflow. By assigning a category of variance to each uncompleted task, a team is able to identify those areas of recurring failure that require additional reflection and analysis.

OUTCOME:

To promote learning concerning the failure of the planning in order to produce predictable workflow by identifying the reasons for failure, classifying trends and determining corrective action. This is the check and adjust phase of Plan-Do-Check-Adjust (Act) or PDCA.

PROCESS:

When a particular task has not been completed as promised, the individual whom made the promise will need to identify and communicate to the group why. The group needs to determine if new action is needed to keep reoccurring variance from continuing.

Last Planner System®
Standard Work
12_Reasons for Variance

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Actions	What's Critical	Why It's Important
1) Prior to the first check-in with the team, establish the reasons for variance.	• A comprehensive list that the team agrees will most likely be the reasons why a task is not completed as promised.	• At the first check-in, there will most likely be promises that have not been kept. The list needs to already be established so that at the first check-in the team can select the reason for variance.
2) Have the team agree upon what each reason means.	• The group understands when each reason would apply.	• In order to track and understand trends for variance, the team must be in agreement on what each reason means and when it applies.
3) Post the list on the wall near the Weekly Work Plan (WWP).	• The list needs to be the same list agreed upon in step 1 and needs to be legible for all to read.	• When a task is not able to be marked complete, the team needs to be able to quickly select the reason why and understand what each reason means.
4) If a task was not completed as planned, the reason for variance should be indicated on the particular tag.	• Using the agreed upon list to identify why the task was not completed as promised.	• In order to track trends, either by reason or by trade, the reason for variance must be easily identified on the specific task.
5) Memorialize the Reasons for Variance.	• Record the trade and the reason for variance.	• In order to improve the planning process instances of reoccurring failures need to be identified and resolved.

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LIST OF COMMON REASONS FOR VARIANCE:

1. Bad Planning
2. Prerequisite Work
3. Design Issue
4. Failed Inspection
5. Labor not Available
6. Materials not Available
7. Equipment not Available
8. Contracts / CO's / FCO's
9. Submittals
10. Weather
11. I Forgot
12. No Update (Missing Info: may or may not have been late)
13. Unforeseen Conditions

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REASONS FOR VARIANCE TRACKING EXAMPLE: