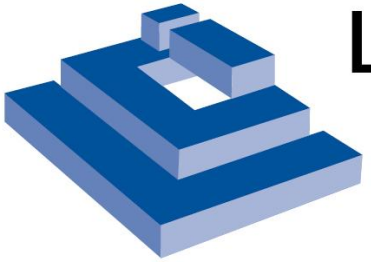


Lean Construction Institute

Building Knowledge in Design and Construction

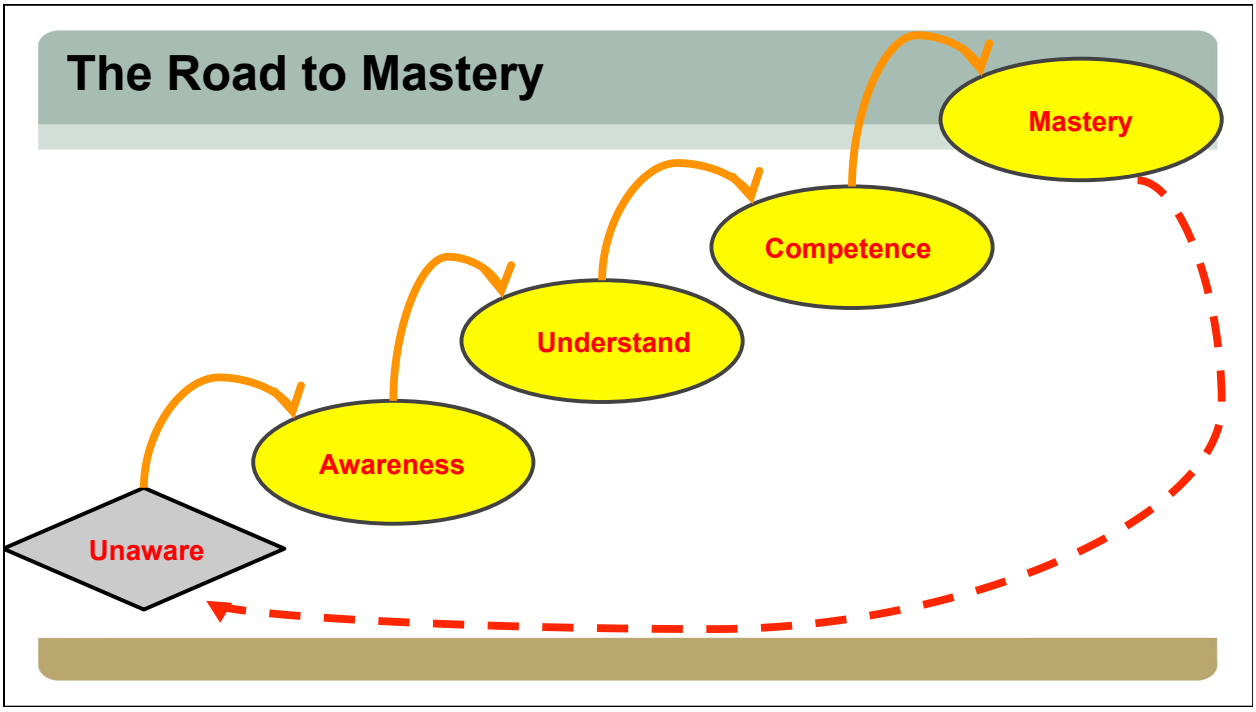
Lean Thinking: An Introduction for LCI-Wisconsin's Community of Practice

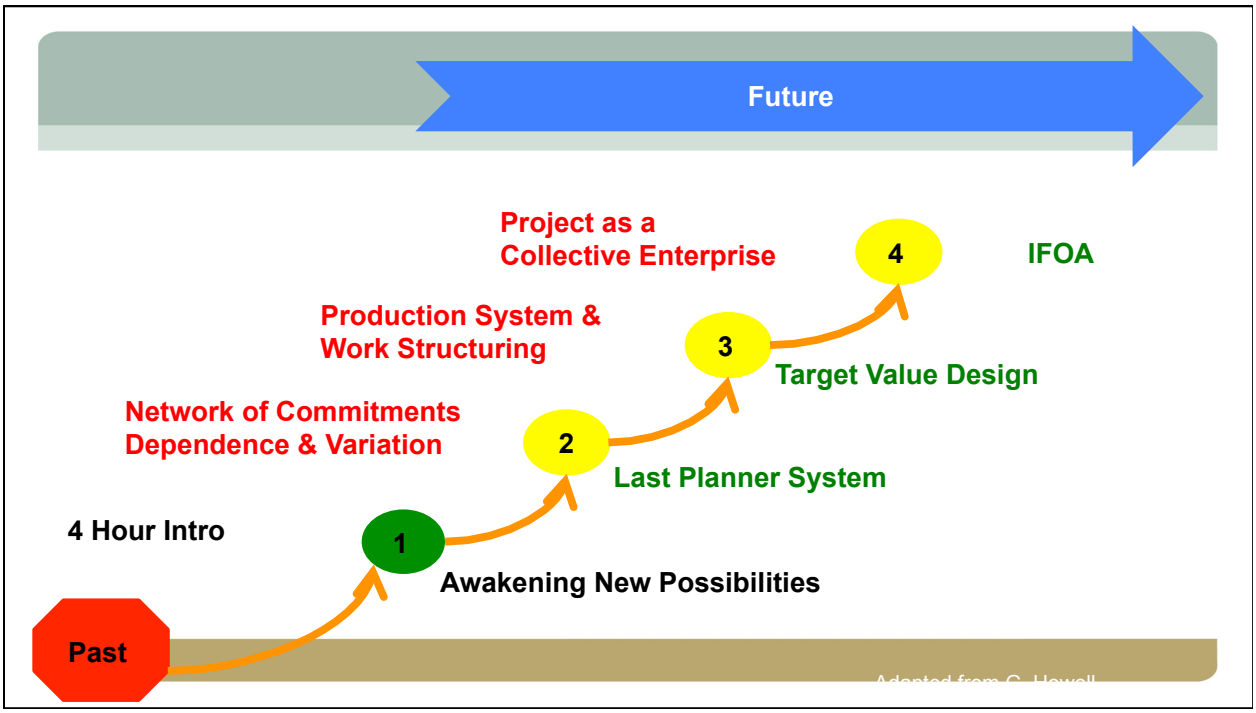
BOLDT

Will Lichtig
LCI Wisconsin
Milwaukee, Wisc.
March 1, 2011

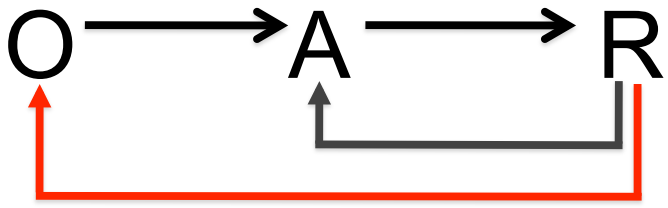
Purpose

- Common Vocabulary
- Fundamental Principles
- Basic Practices





Flipping the Tarp . . .



Change the observer

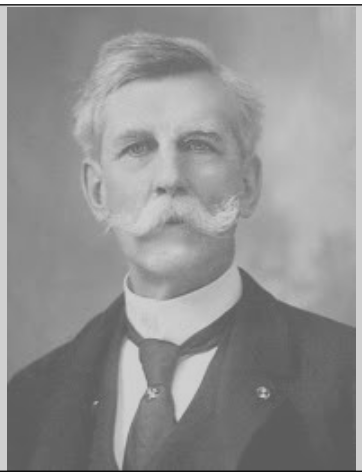
Ohno's World

So, what is Lean?

On Complexity & Simplicity

I would not give a fig for the simplicity this side of complexity, but I would give my life for the simplicity on the other side of complexity.

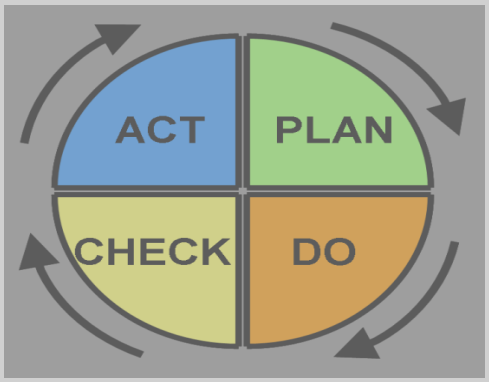
Oliver Wendell Holmes, Jr.



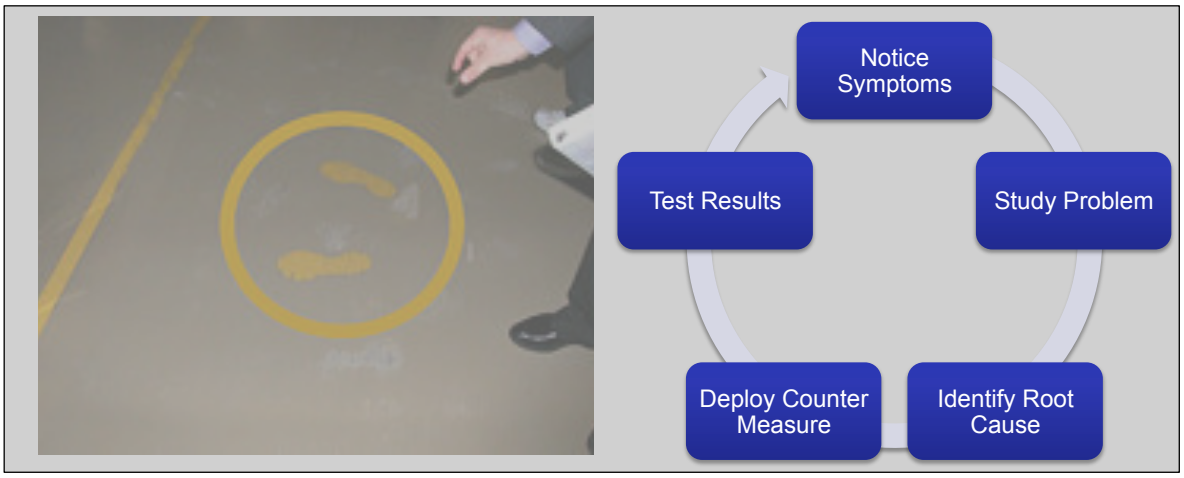
Basic Lean Principles

Complex systems must be managed to see problems, solve problems, and share what is learned, all while insisting that leaders cultivate these capabilities throughout the organization.

– Steven Spear

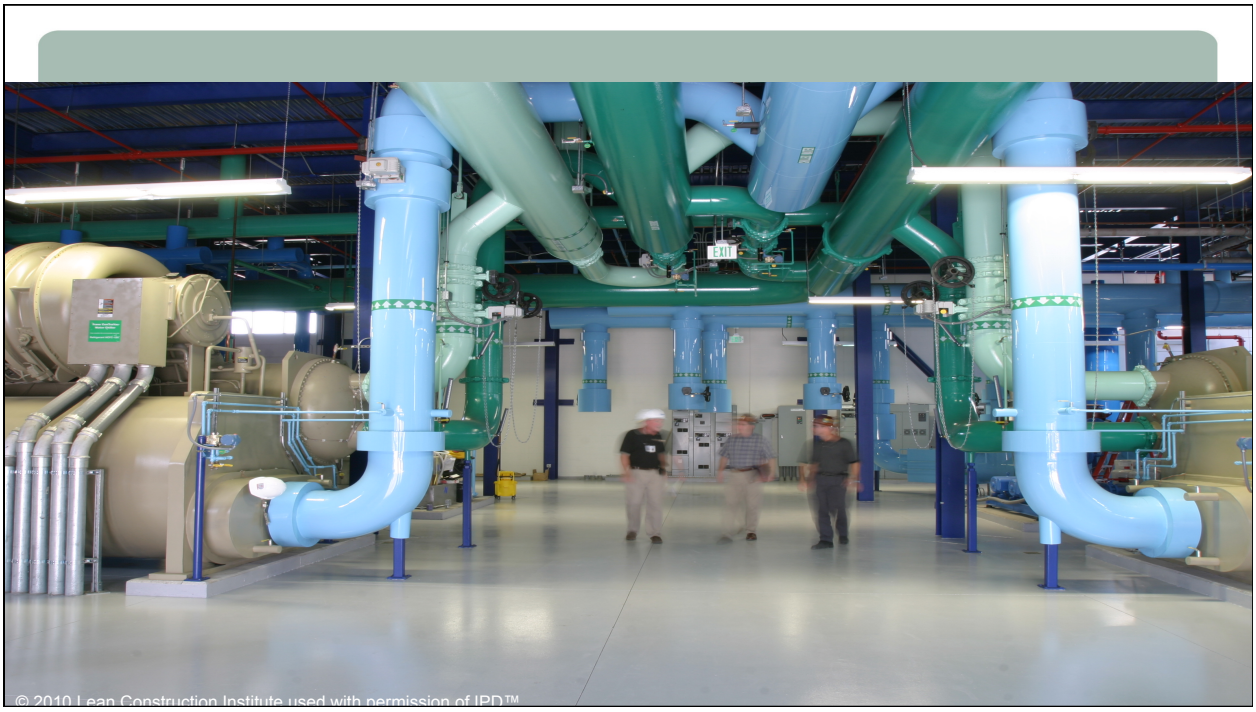


Ohno Circle



Engineer Ohno's 7 Types of Waste

1. Defects or errors
2. Overproduction of goods not needed
3. Inventories of goods awaiting processing or consumption
4. Over processing
5. Motion – people, equipment, tools
6. Transport of goods
7. Waiting



1,500 Ton Centrifugal Chiller

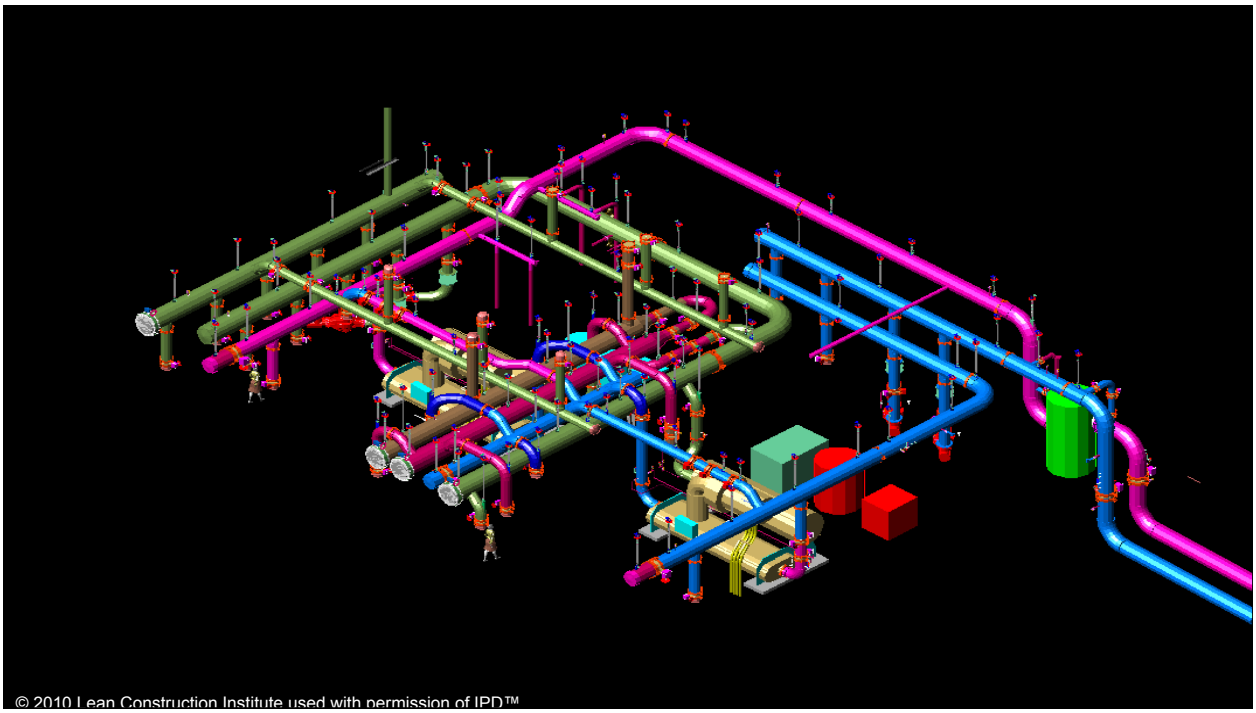
Planning Considerations

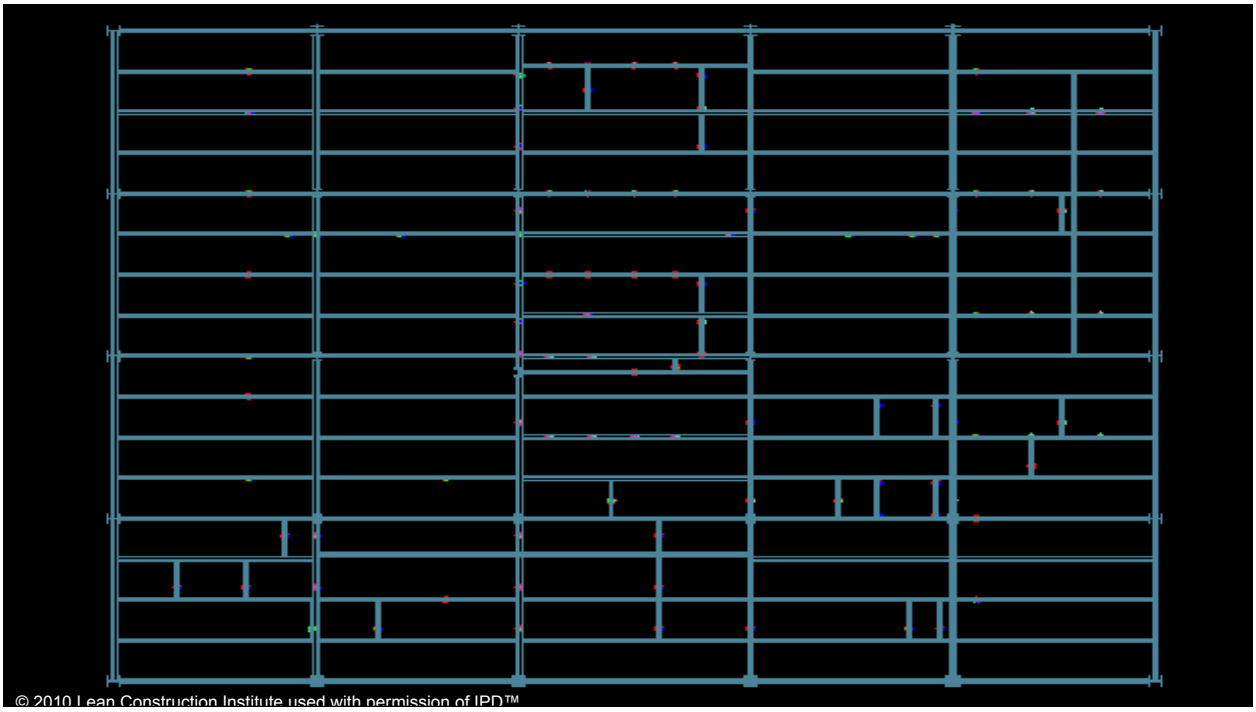
- Delay decisions to the last responsible moment
- Create pull schedules
- Only do work that releases downstream crews (important also in design)
- Focus on reliability of work flow

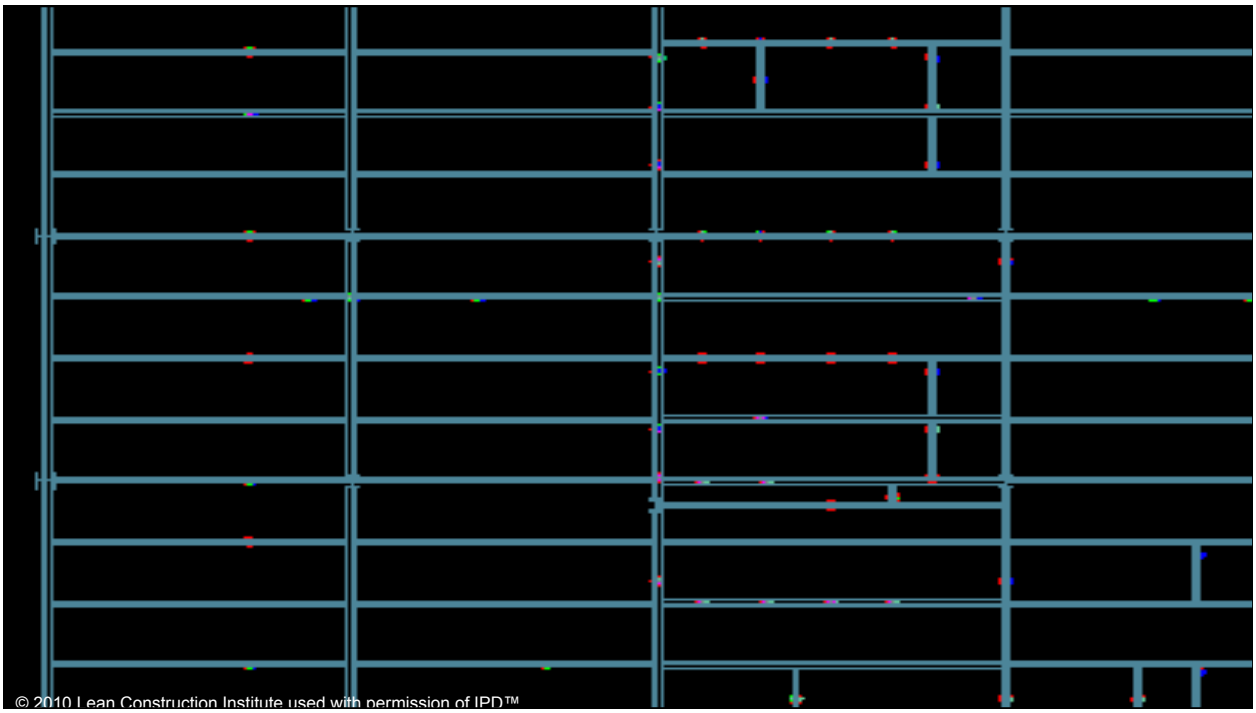
Site as it existed on November 30, 2003

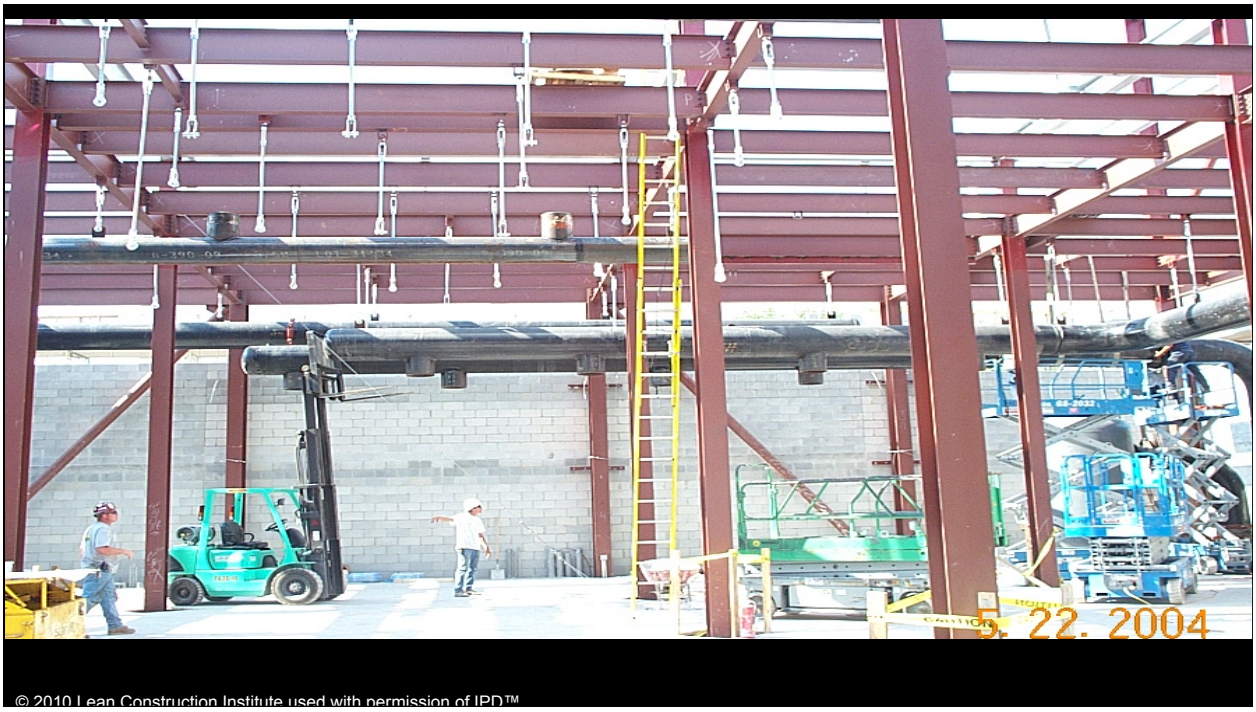
Your Predictions

- Duration – Design and Construction ?
- Cost – Design and Construction ?

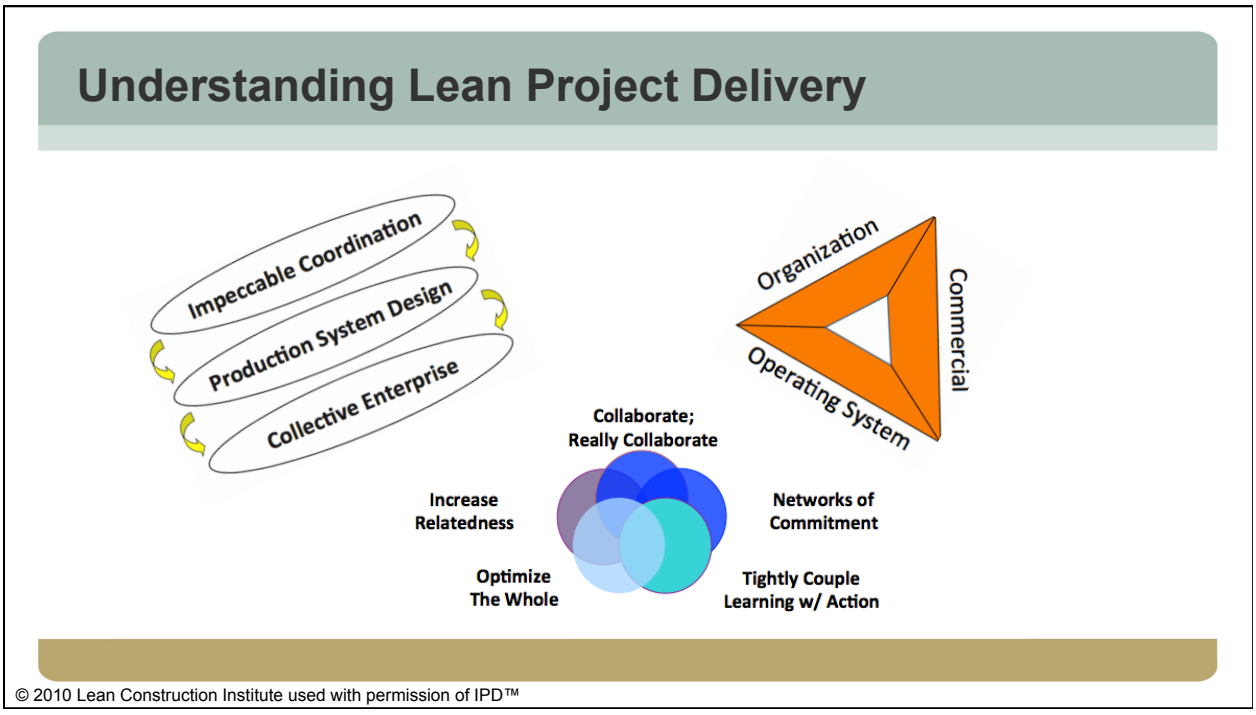




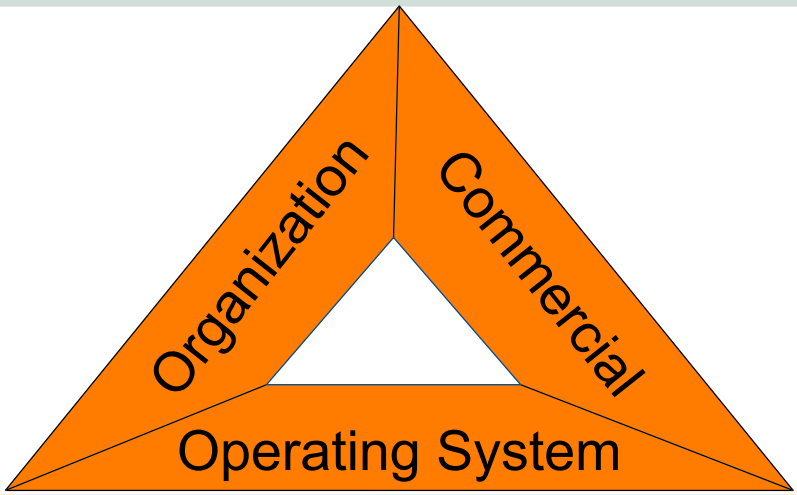




Contract Date	12/30/03
Permit Issued	4/14/04
Work Begins on Site	4/16/04
Plant Ready to Go	7/28/04
GMP	$6,000,000
Final cost with normal markup	$5,400,000
IPD savings against GMP	$600,000



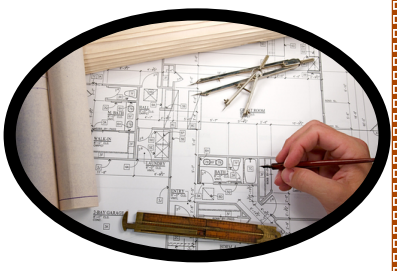
Three Domains



Today

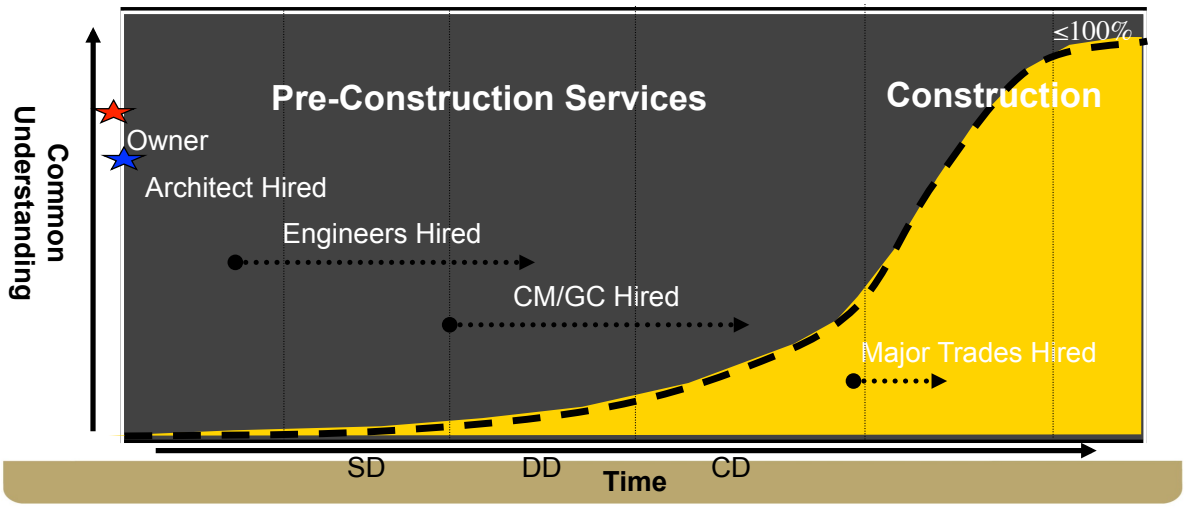
Why?

What?

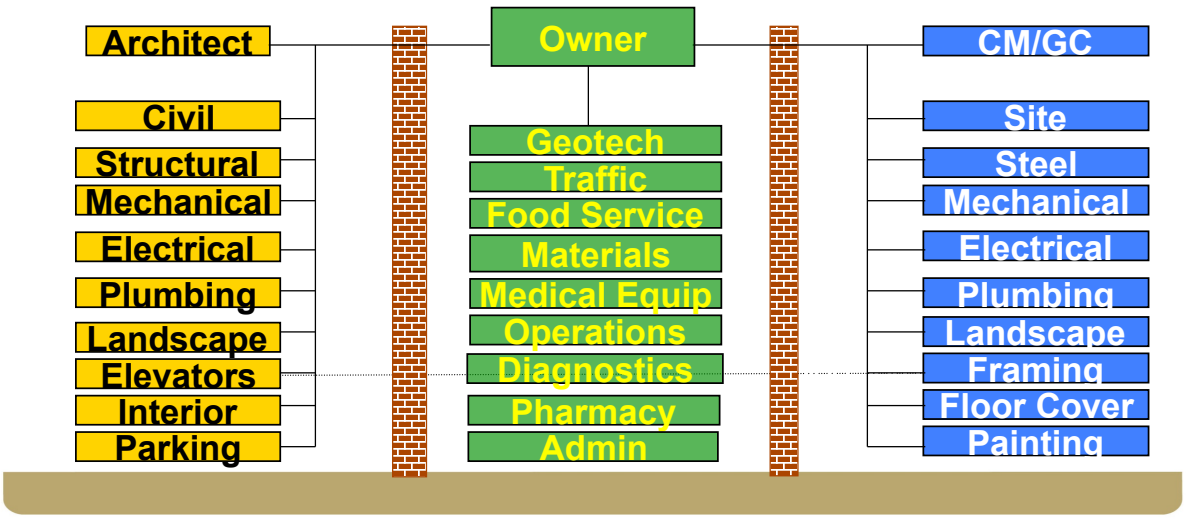


How?

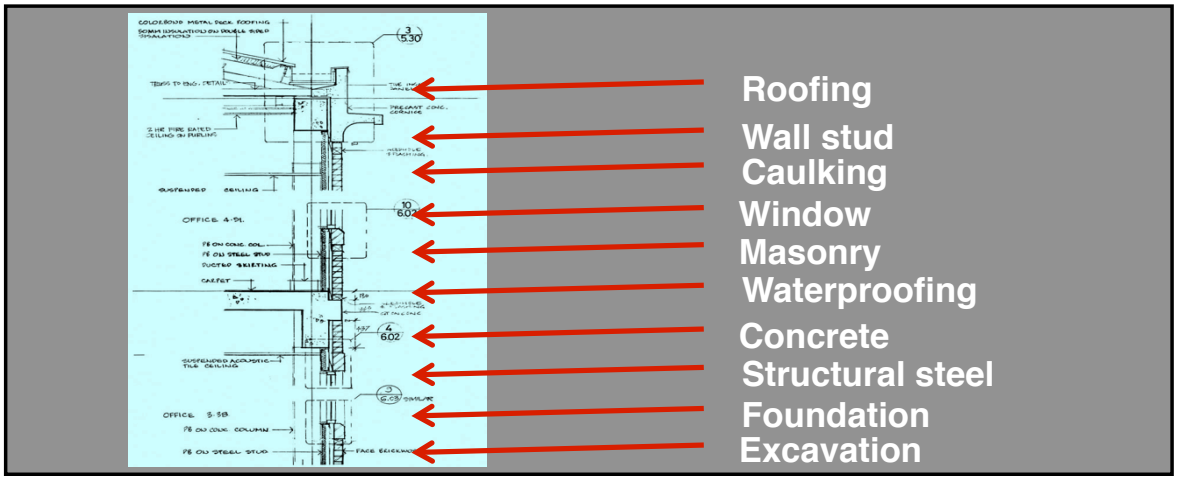
Traditional Level of Common Understanding



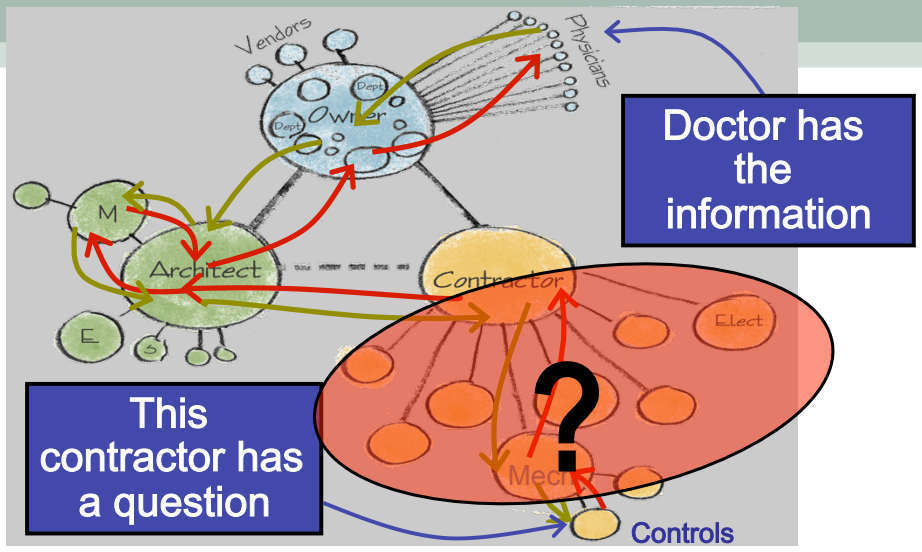
Traditional Organization



"Buildings Leak at the Intersection of Contracts"

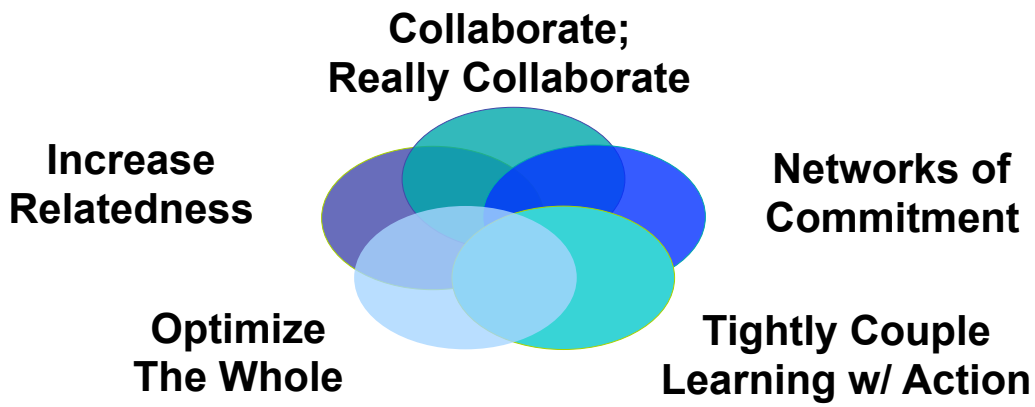


Todd Zabelle

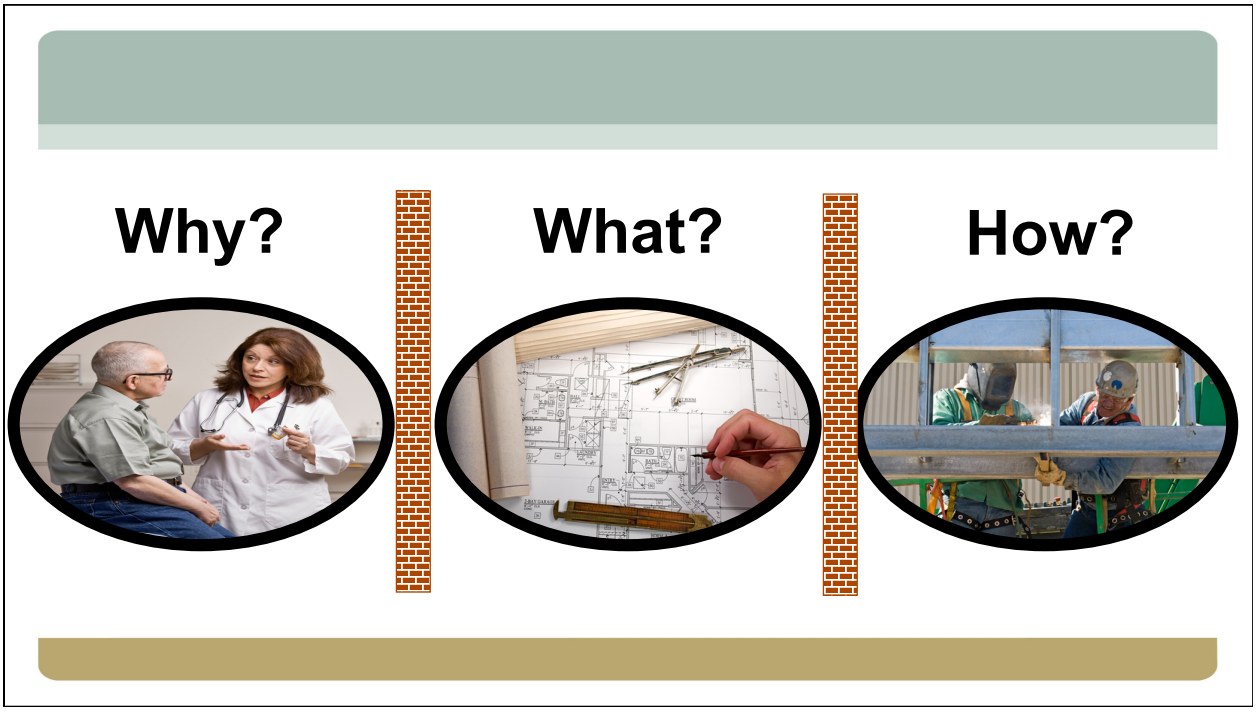


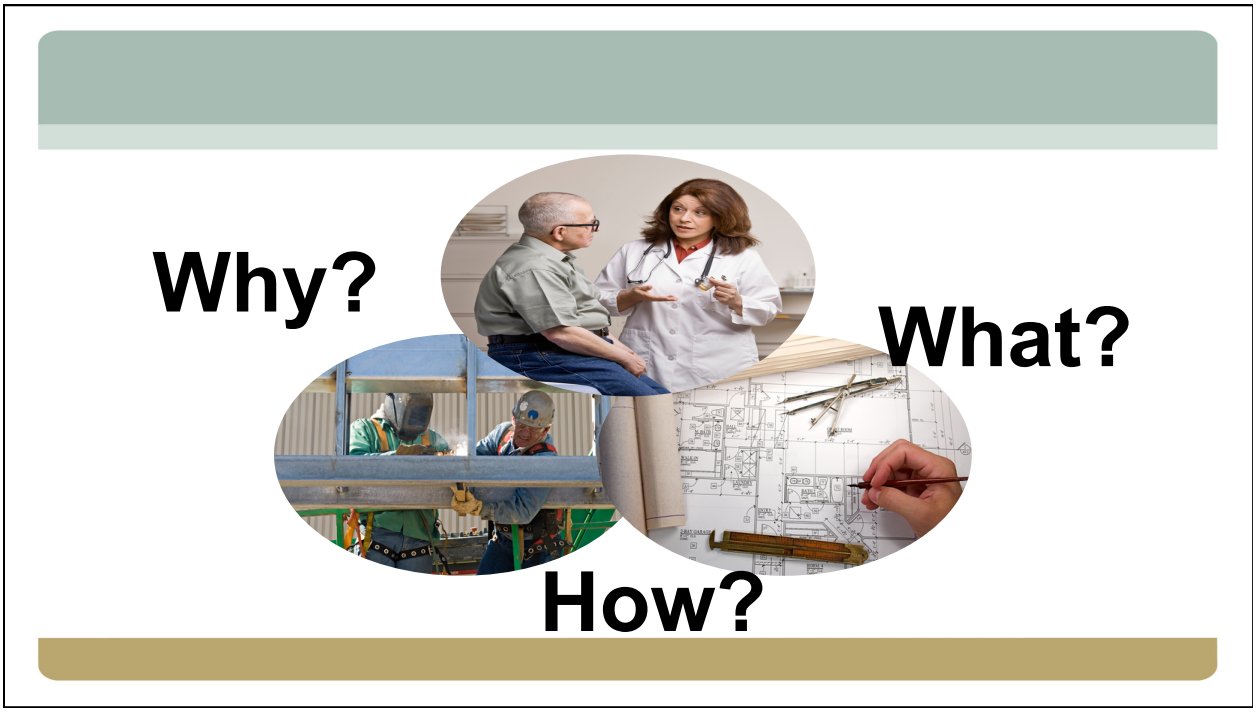
Courtesy of SSM Cardinal Glennon

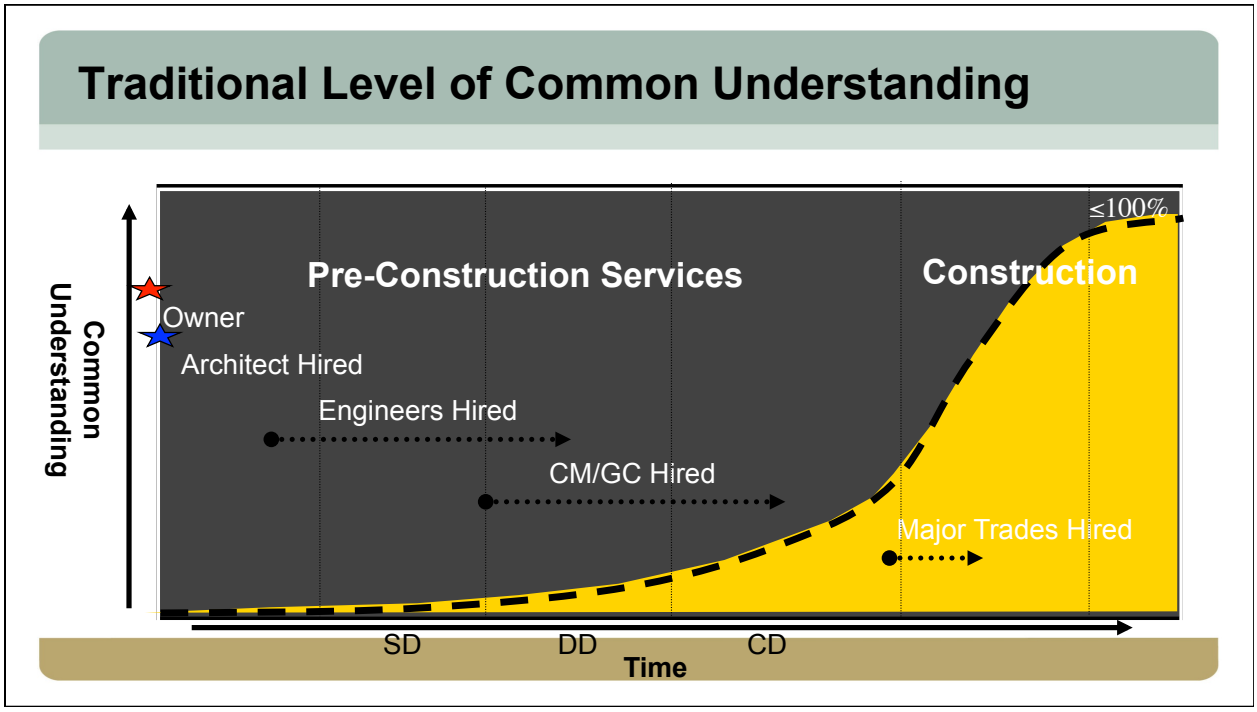
Five Big Ideas

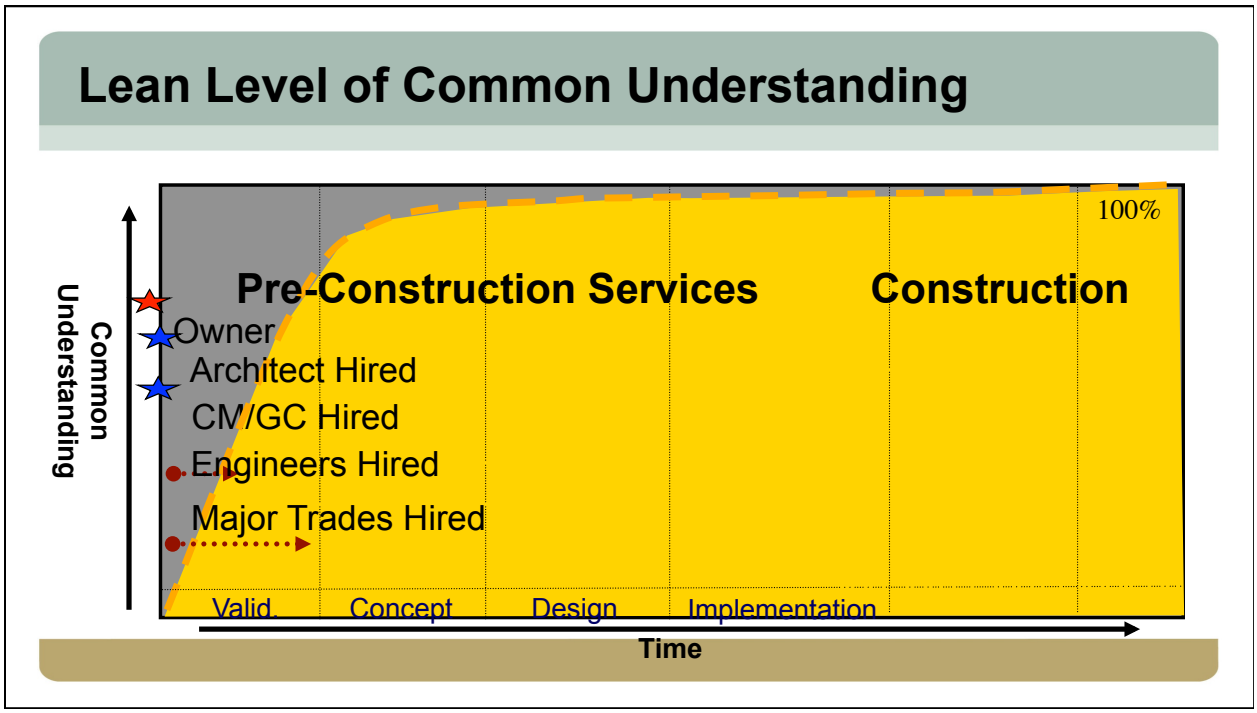


Courtesy LCI

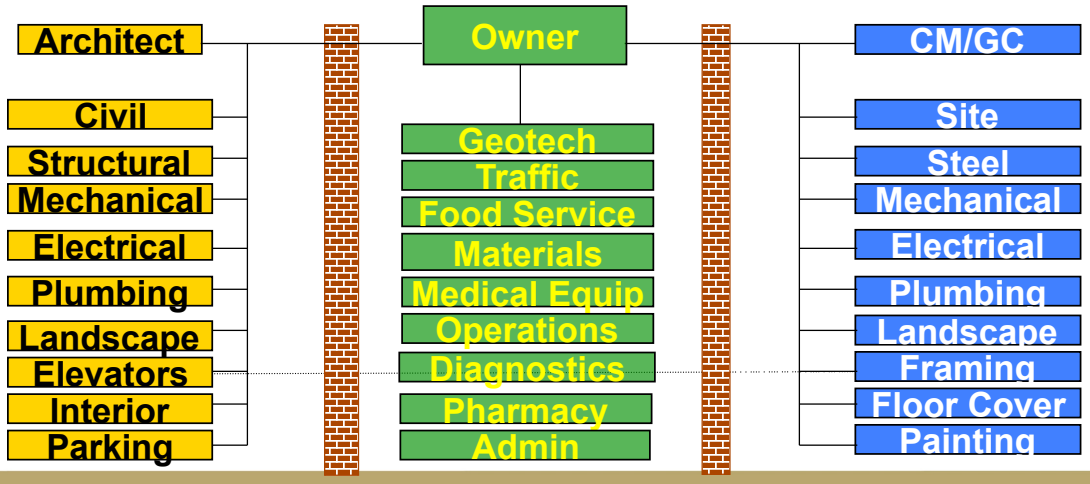




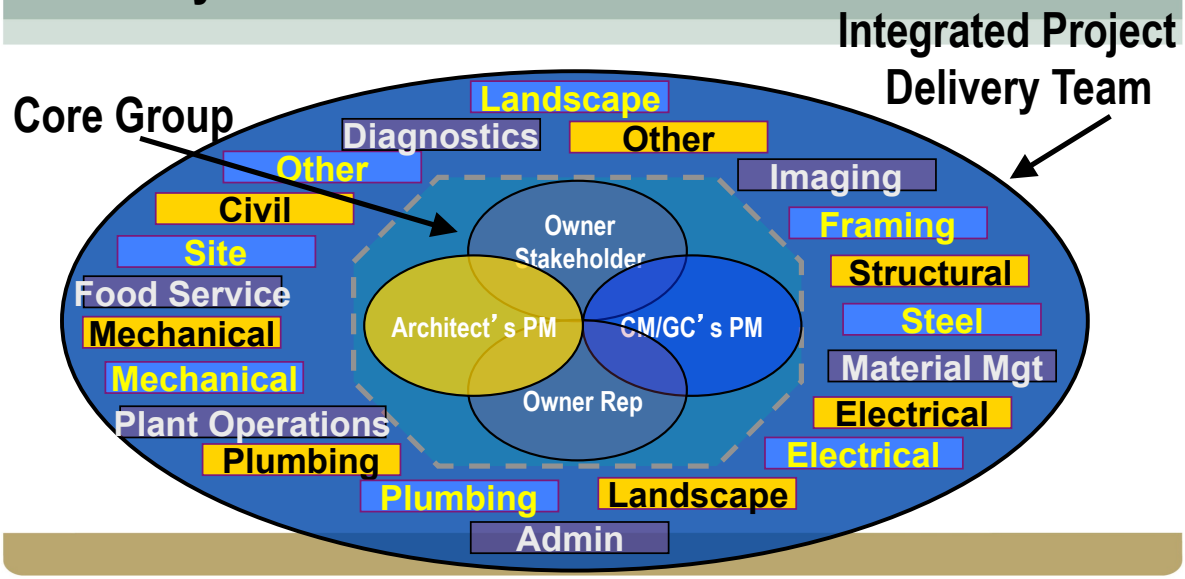


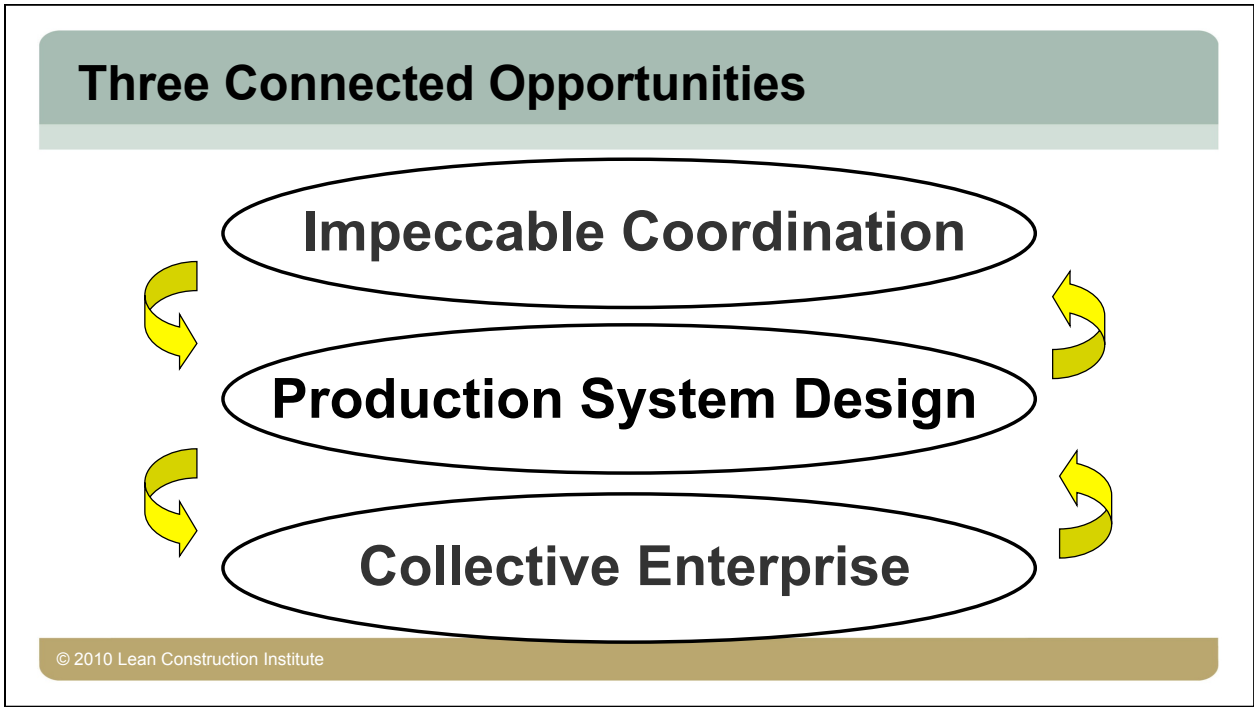


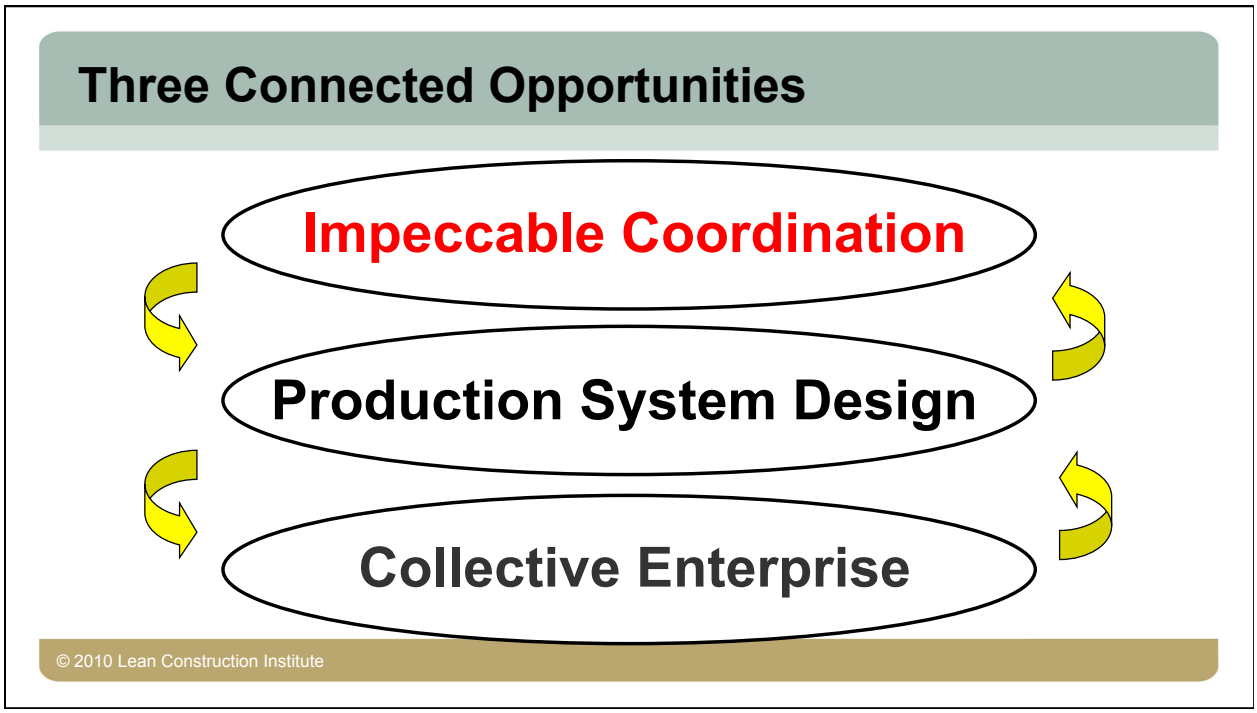
Traditional Organization



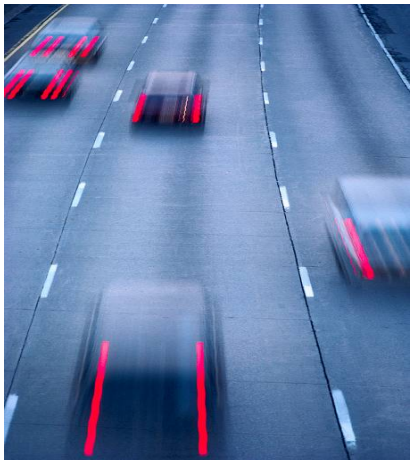
Delivery Team Structure







Dependence & Variation



The Parade of Trades™

Lean Comes to Construction – Towards Root Cause

Research Findings -- Problem

Average -- 54 %

Fundamental Principles

1. Dependence and variation affect system performance
2. Batch size affects system performance
3. Workflow reliability directly affects system speed and cost.
4. All plans are forecasts, all forecasts are wrong, further in advance – more wrong, more detail – more wrong.

Even bureaucratic command-and-control won't do; it is too difficult to know who should do what and who actually is doing what with enough clarity and timeliness to direct them appropriately in a top-down fashion.

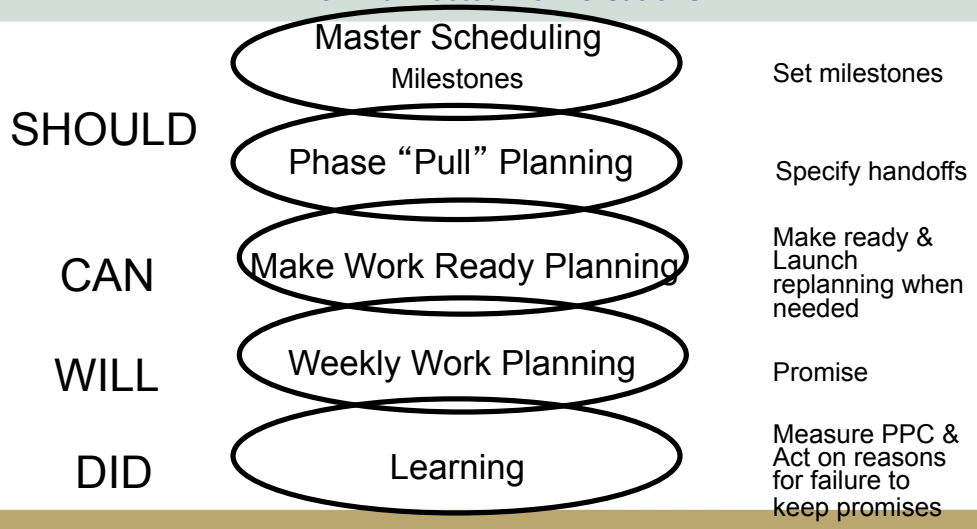
– Steven Spear

Last Planner™ System

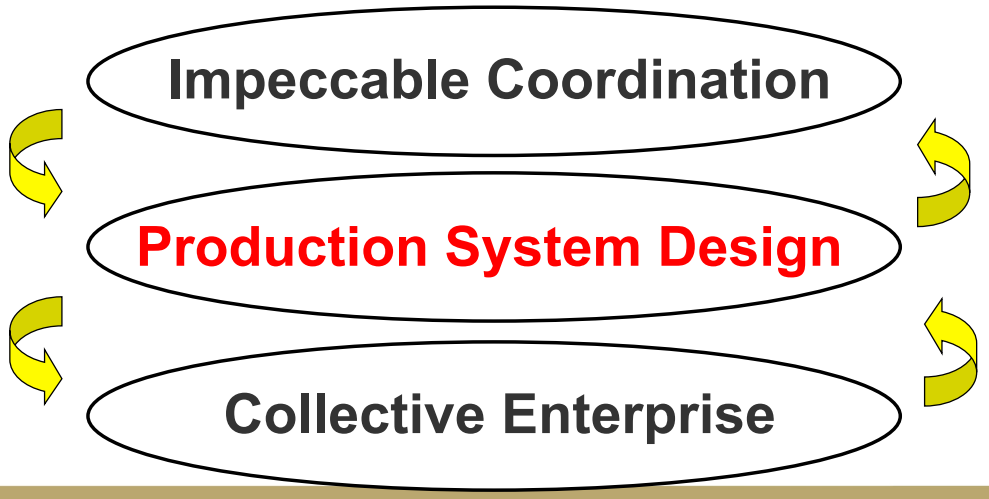
1. Produce predictable workflow
2. Produce rapid learning
3. Focused on making work ready and using commitment based planning

Last Planner® System

5 - Connected Conversations



Three Connected Opportunities



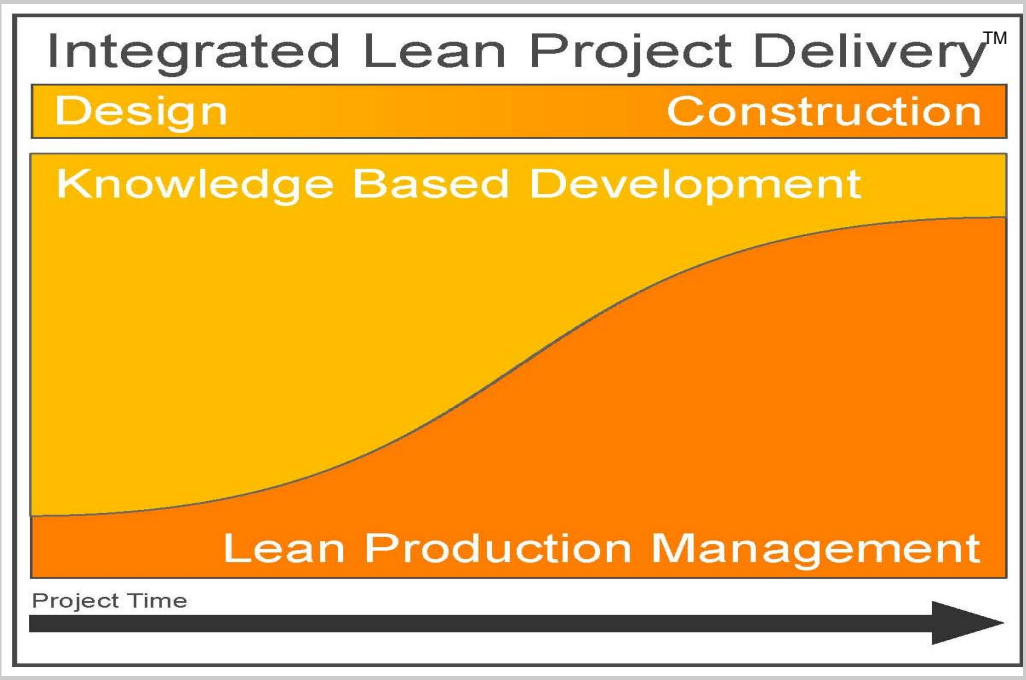
Fundamental Principles

1. "Makers" are customers who should participate in design.
2. Cost and constructability should be design criteria, rather than an outputs.
3. Project-wide optimization requires cross-functional participation.
4. The process of construction needs to be designed, as well as the product.

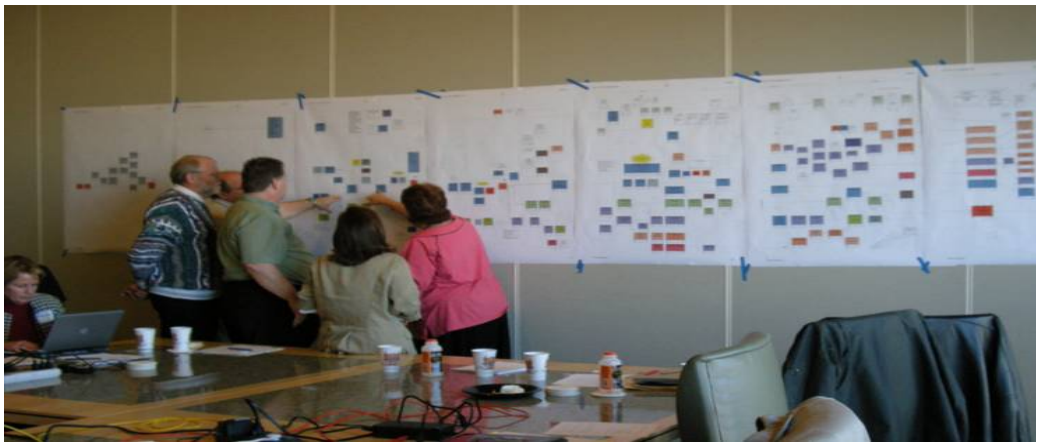
Design as Knowledge Development

The capacity to be faster and stronger in the design, operation and improvement of complex systems depends on seeing where knowledge is needed, generating new knowledge, and sharing and intermingling that new knowledge . . .

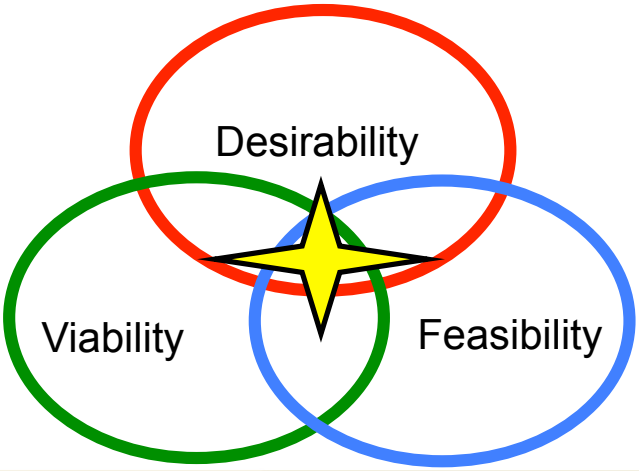
– Steven Spear



Pull Planning & Value Stream Mapping

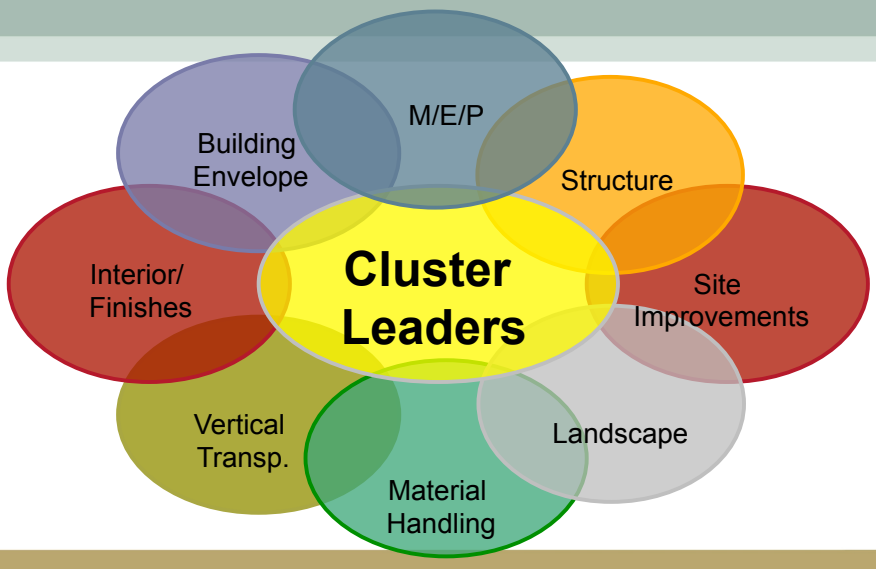


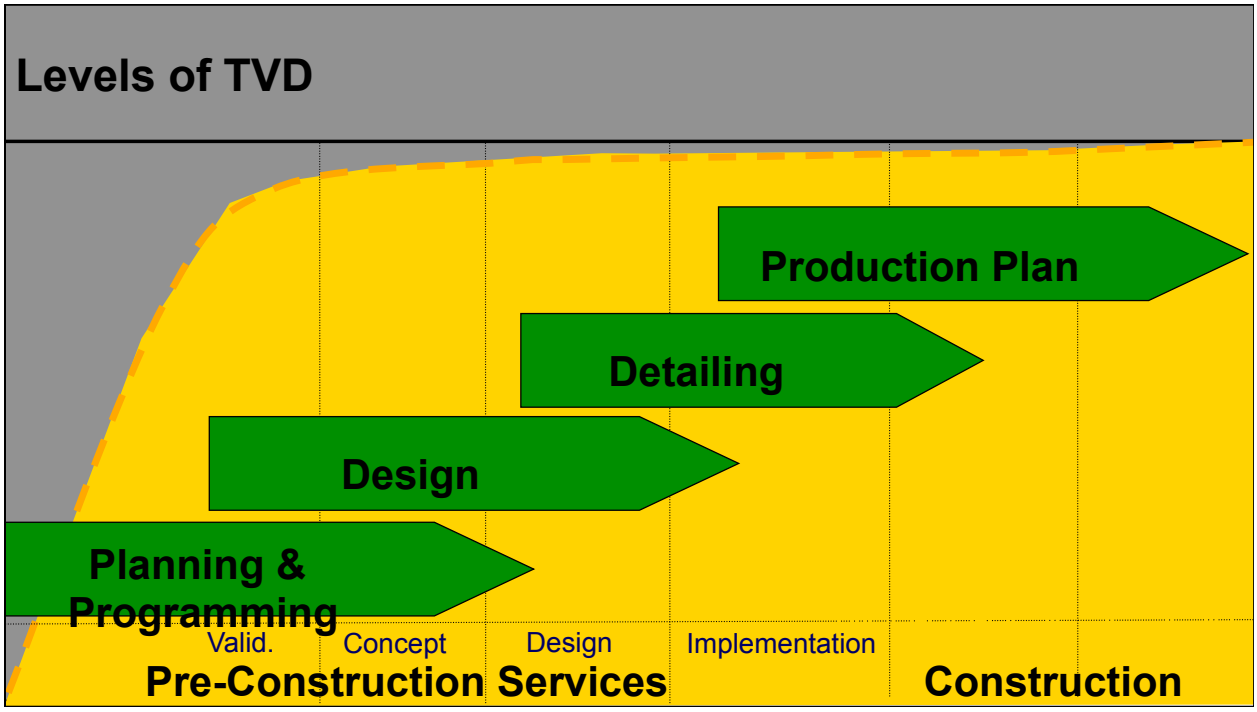
PDCA Thinking in Design

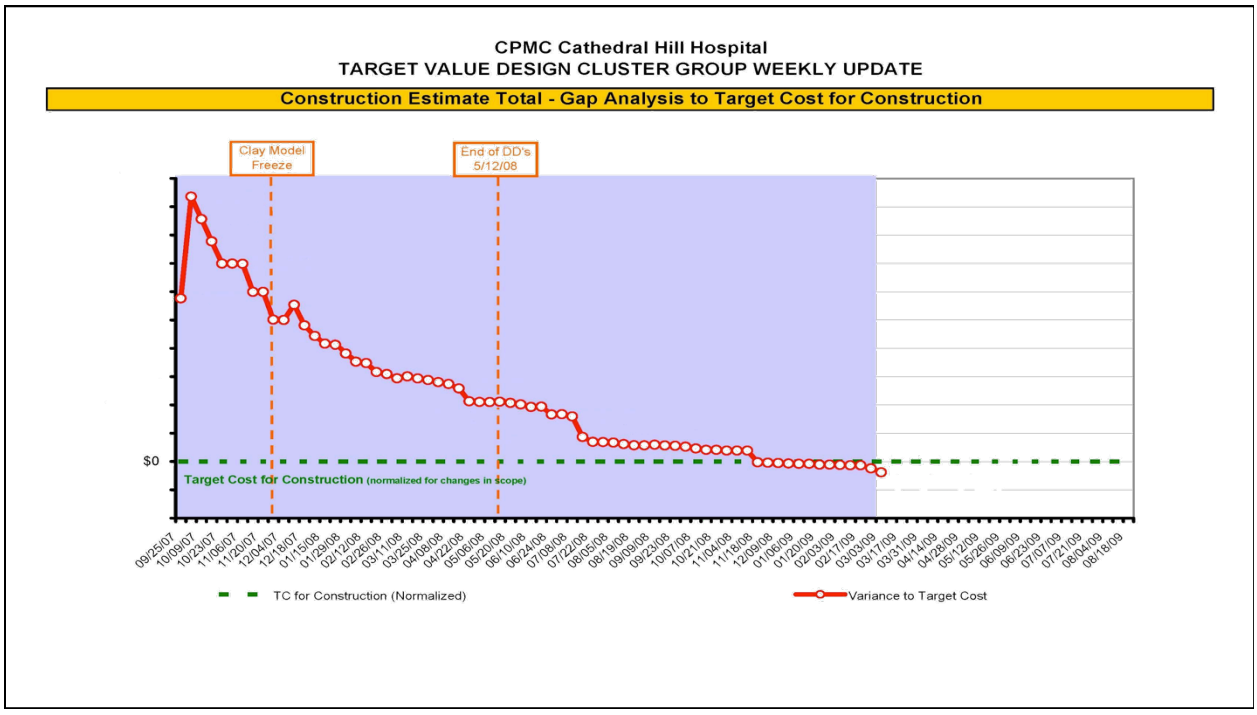


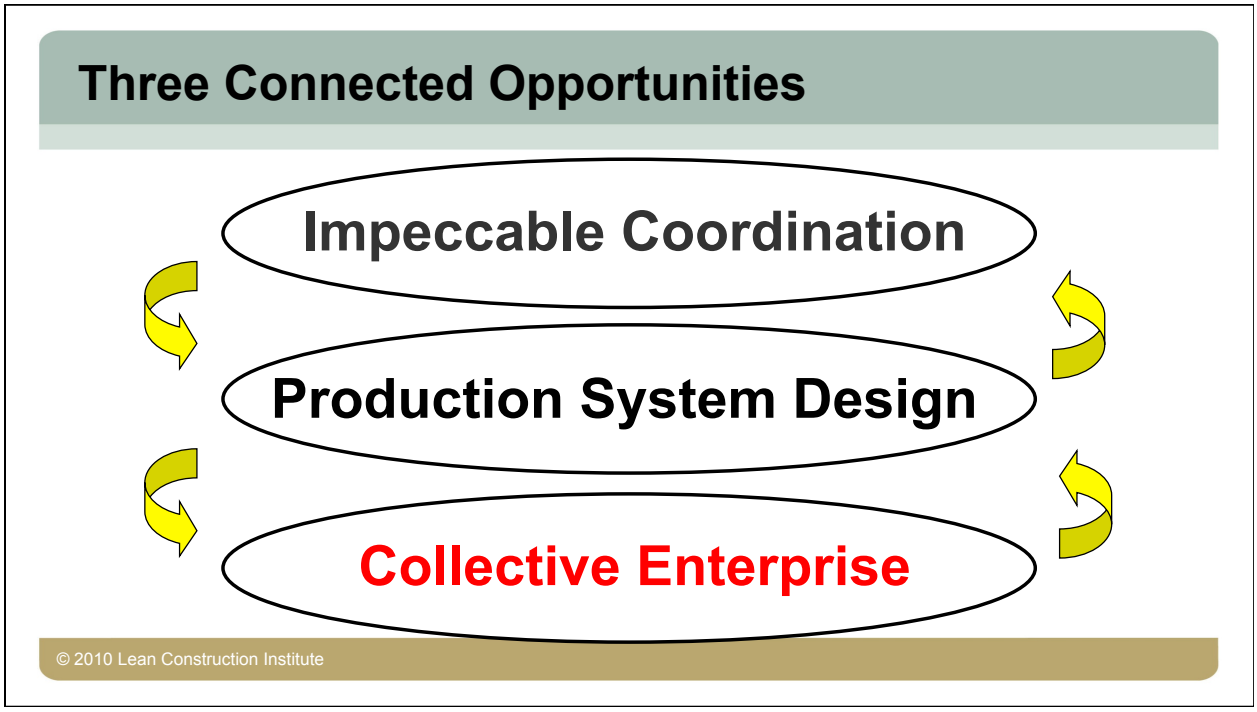
Change by Design

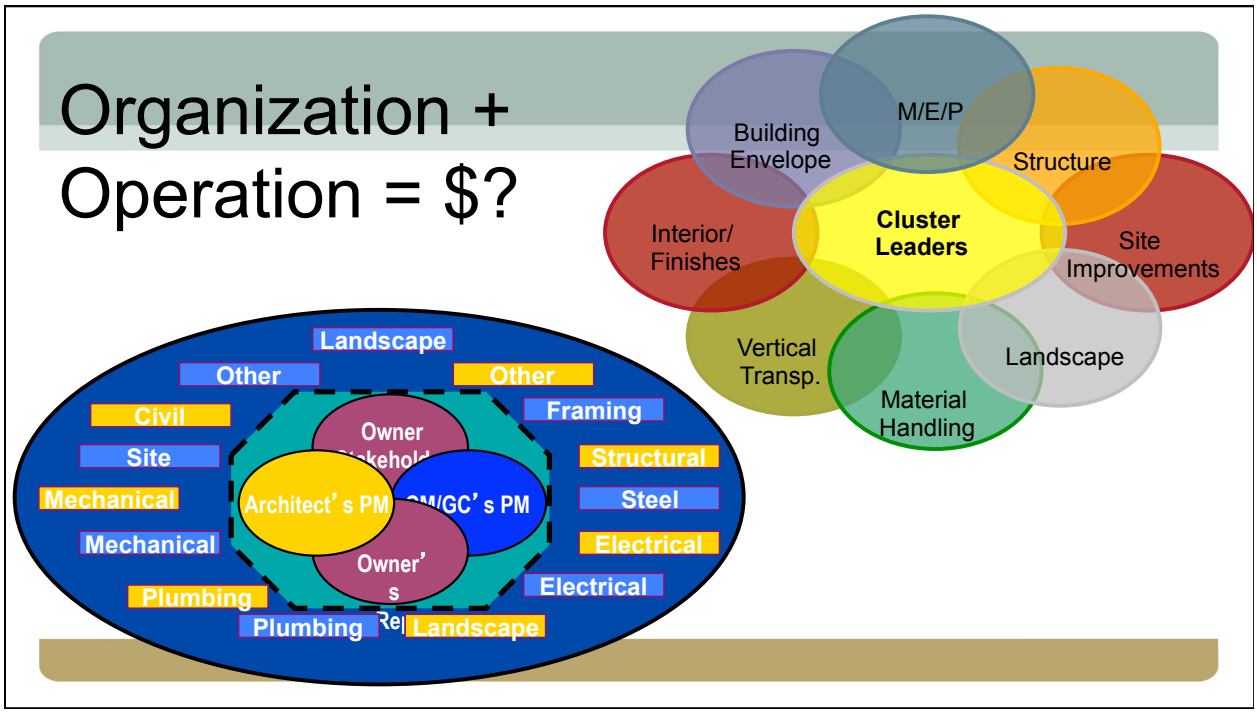
IPD Target Value Design Clusters







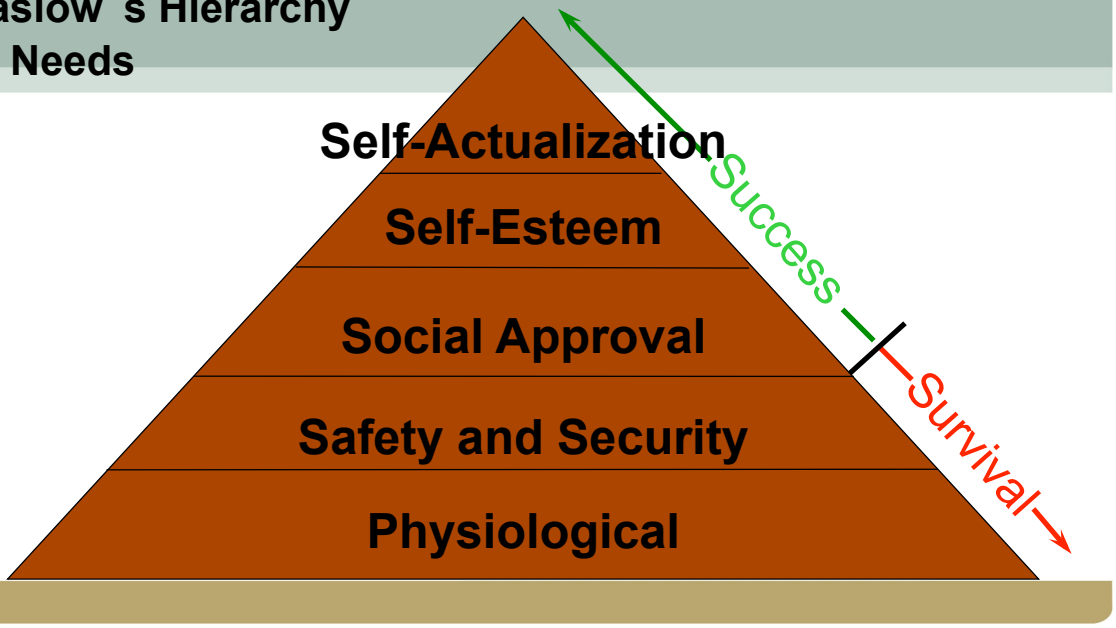




Fundamental Principles

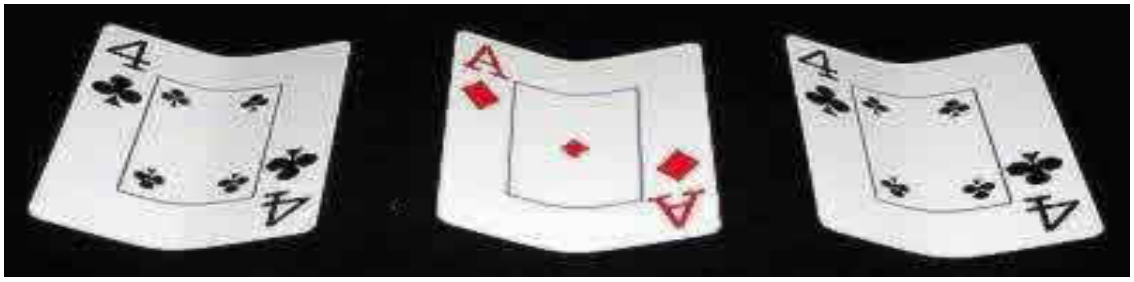
- The commercial system must be aligned with the other domains
- Lean calls for management by process, not by results
- Encourage Prudent Risk Taking
- Eliminate Hidden Contingency (Howell's new waste)

Maslow's Hierarchy Of Needs

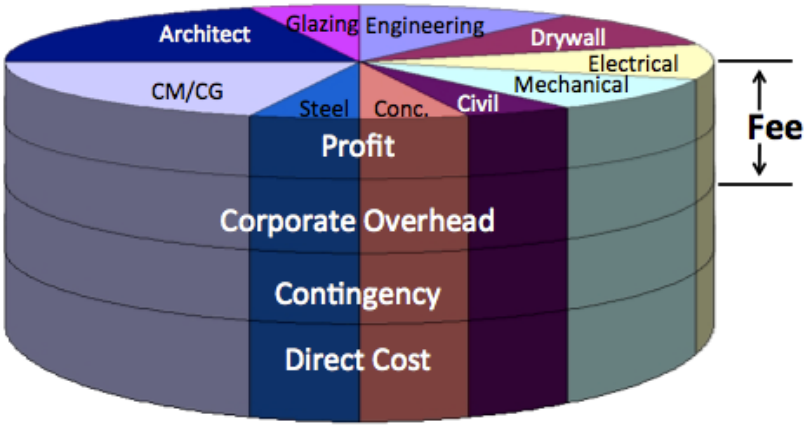


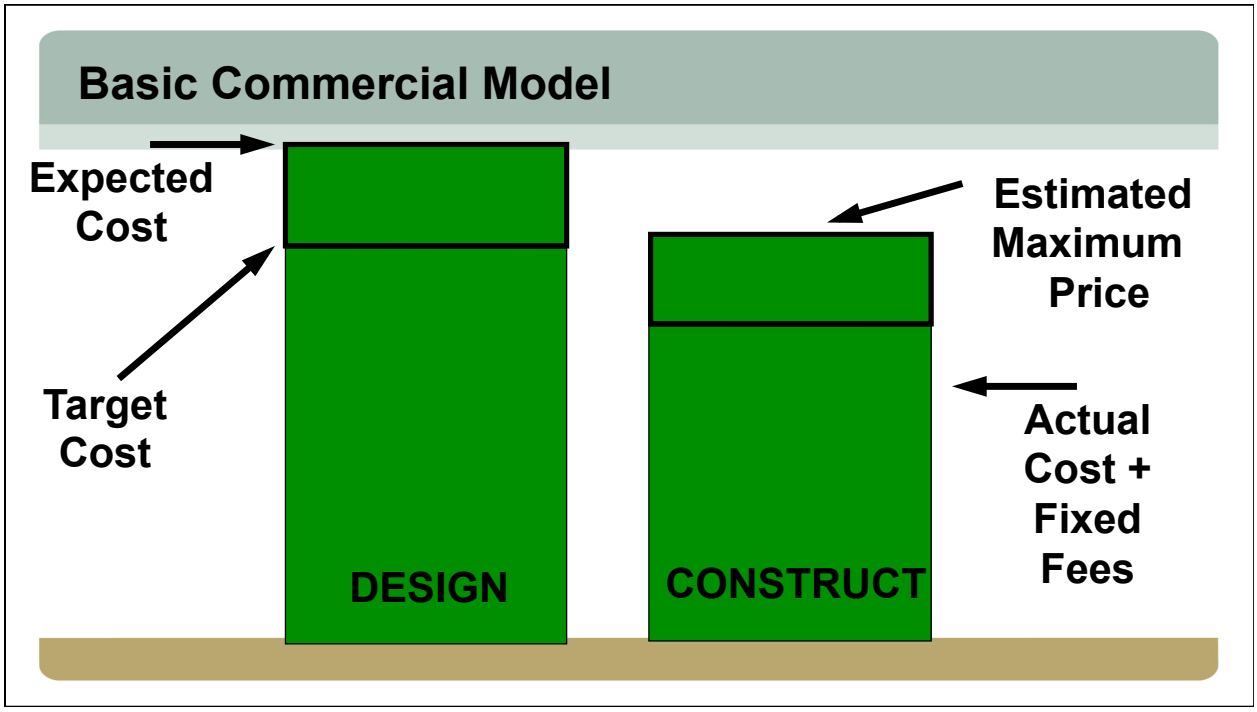
Traditional Risk Management

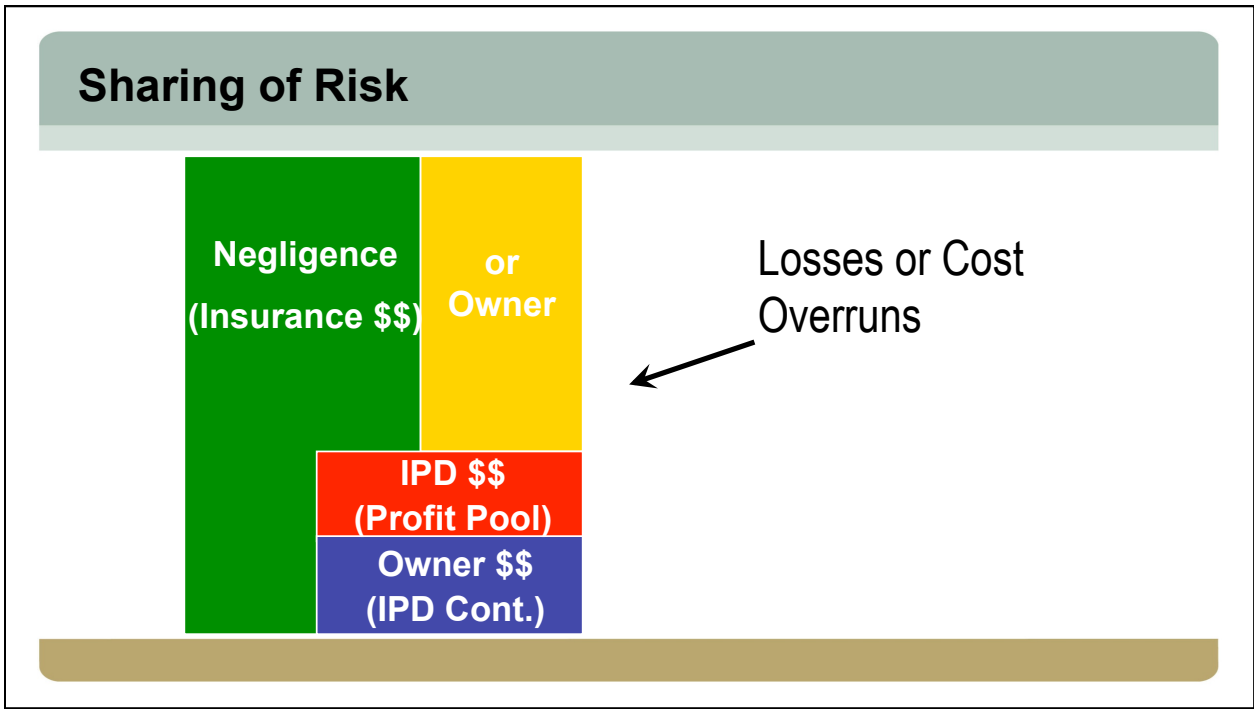
Open-Face Risk Management



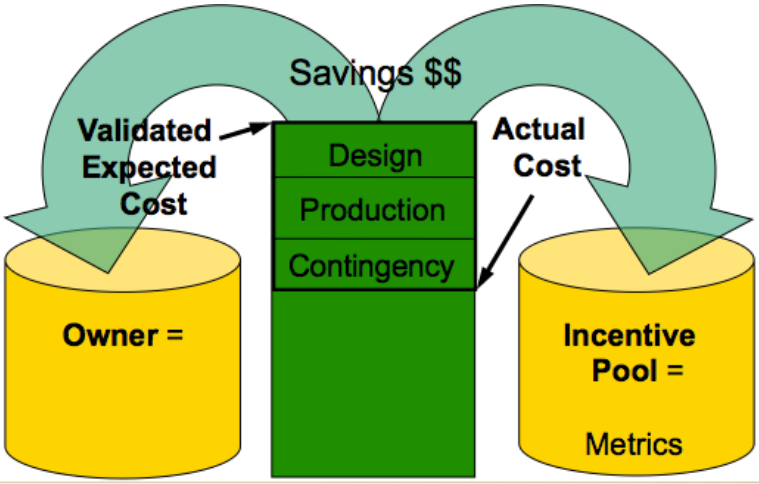
Profit Pool / Combined Contingency



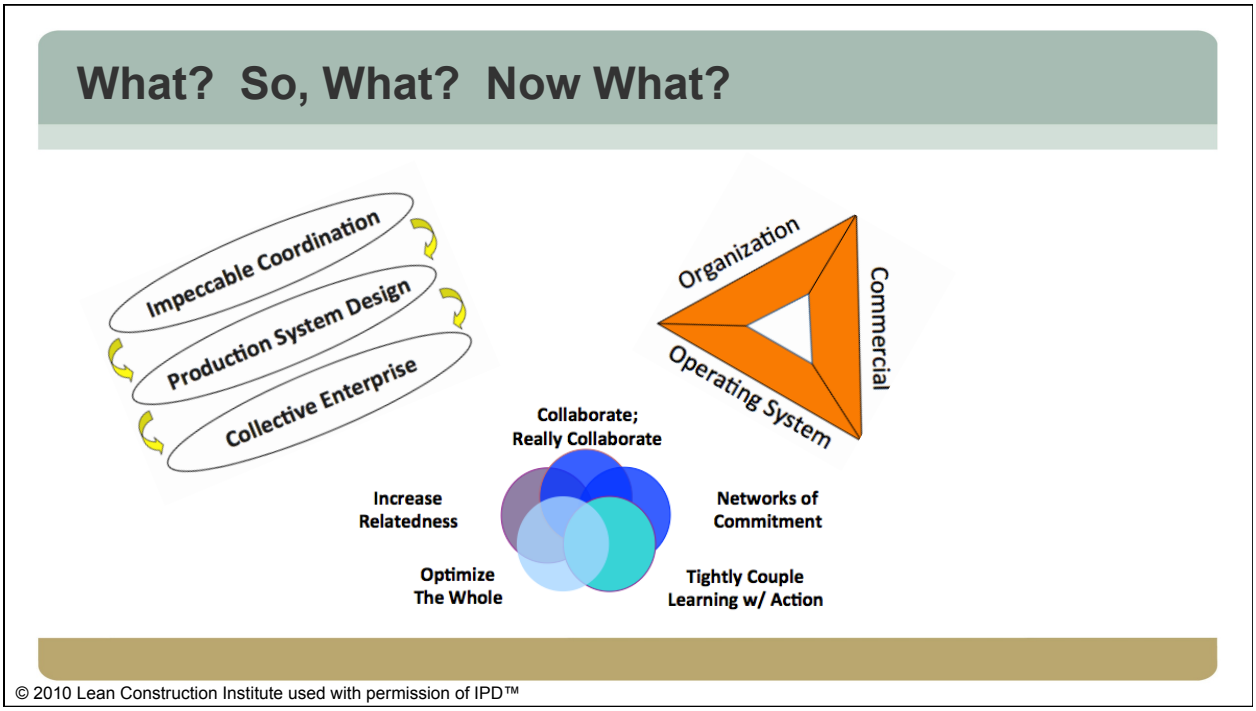


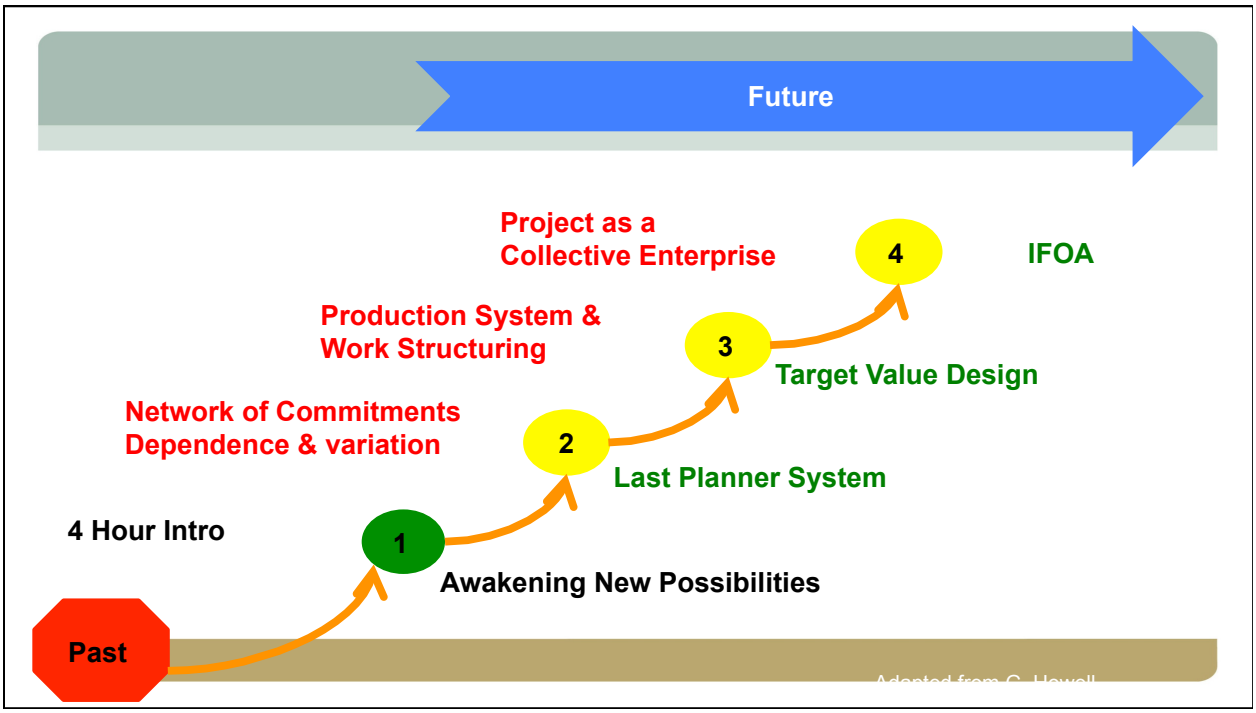


Sharing of Savings



Organization	Operating System	Commercial
Old	Hierarchical Siloed Command & Control	CPM Specialists Parts	Lump Sum Low Price
IPD	Collaborative Flat Consensus	Lean Sustainable BIM	Entrepreneurial Collective Best Value





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The Last Planner – Introduction and Examples

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BOLDT®

The Last Planner

- What is the Last Planner and why it is an important element of Lean Construction
- How the Last Planner works
- Examples of Last Planner Implementation

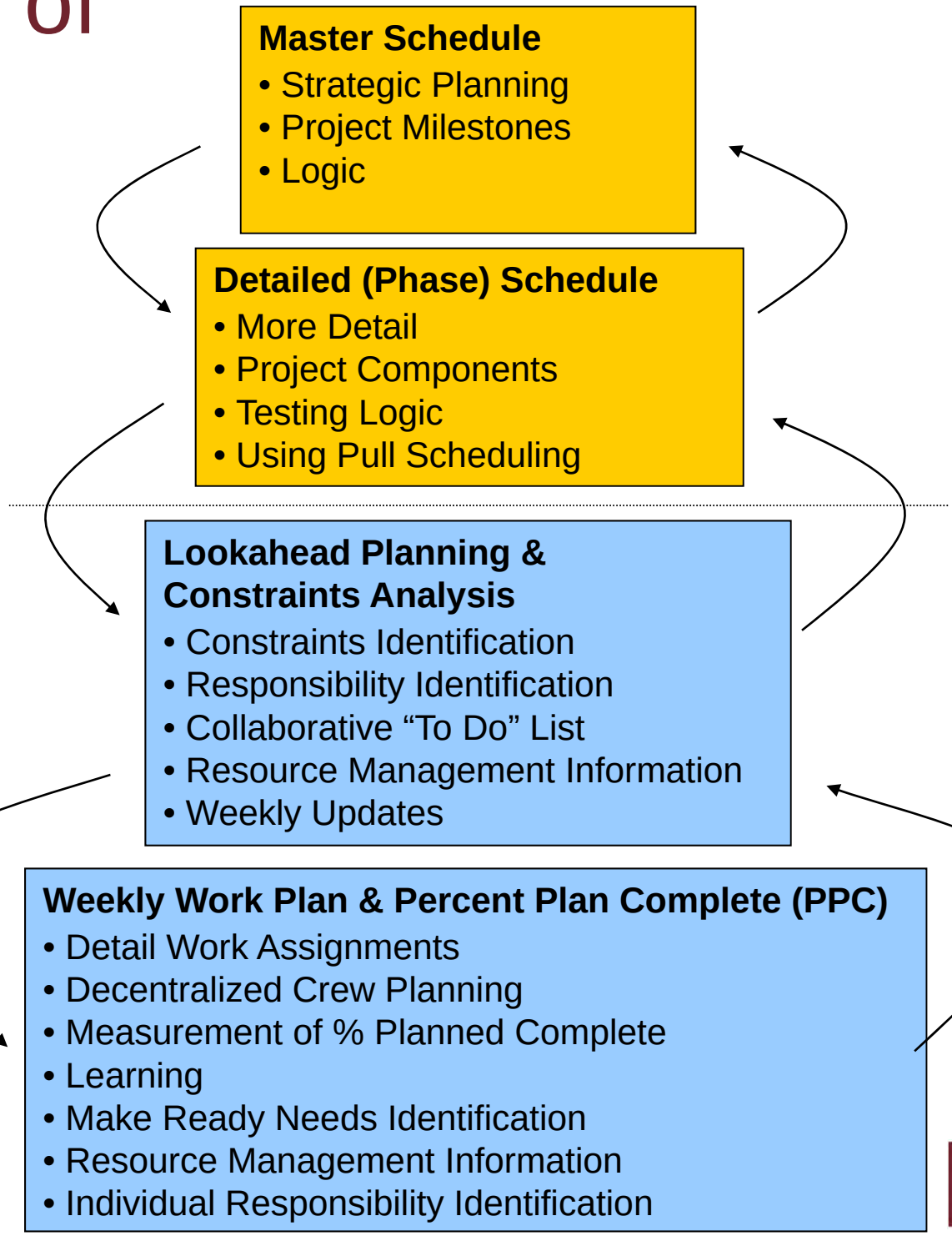
What is the “Last Planner”

- Weekly production planning meeting
- Not a traditional “progress meeting”
- Not traditional “scheduling”
- Who are the Last Planners?
  - The people doing the work
- Collaborative & participative meeting
- Learning environment

Why the Last Planner is a critical element in Lean Construction

- Objectives of the meeting
  - Create Flow
    - Identify constraints
    - Properly sequence work
  - Use Pull to do the right work at the right time
  - Eliminate Waste
  - Secure commitments (Reliable Promises)
  - Create individual accountability
  - Measure success (PPC)
  - Learn (continuous improvement)

Hierarchy of Planning System



Drilling Down From Strategic Scheduling Into Production Planning and Detailed Work Assignments (Magnification)

Adjusting the Plan Through Measured Progress and Lessons Learned

BOLDT™

Reliability Matters

- Traditional project meetings – commitment free zone?
- Construction industry – systemic lying?
- Typical superintendent – overly optimistic?

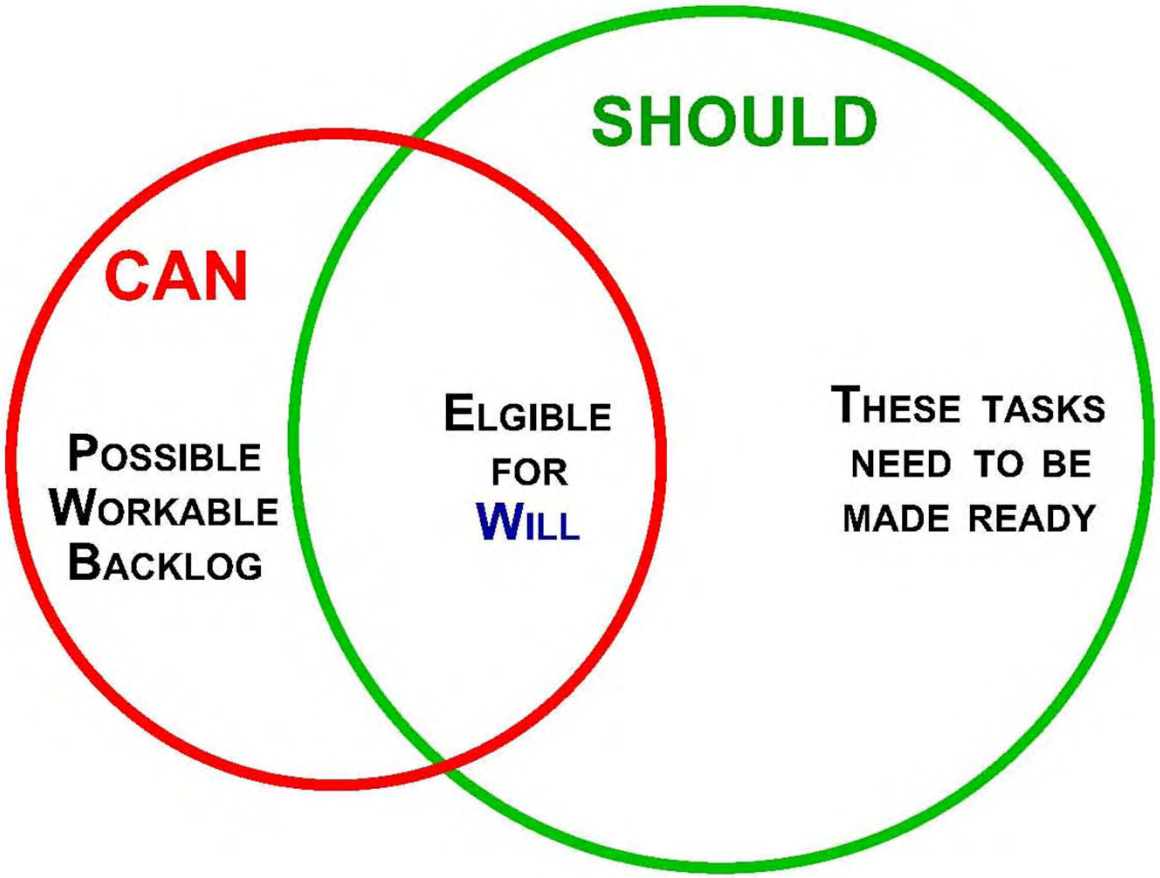
Traditional Management

Plan Reliability Data

Contractor 1	**33 %**
Contractor 2	**52 %**
Contractor 3	**61 %**
Contractor 4	**70 %**
Contractor 5	**64 %**
Contractor 6	**57 %**
Contractor 7	**45 %**
Average	**54 %**

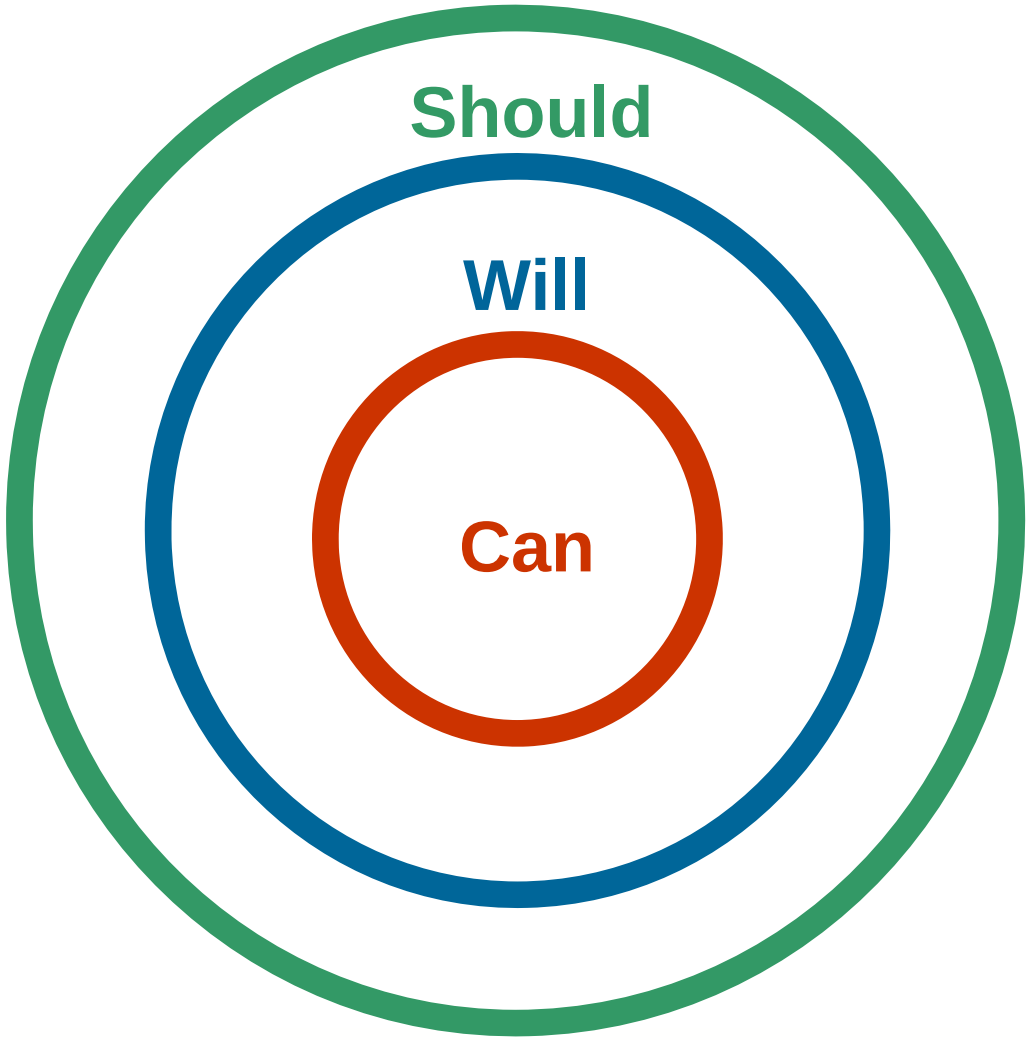
How many of the tasks you thought would be complete during the week actually got done?

Forming the Weekly Work Plan

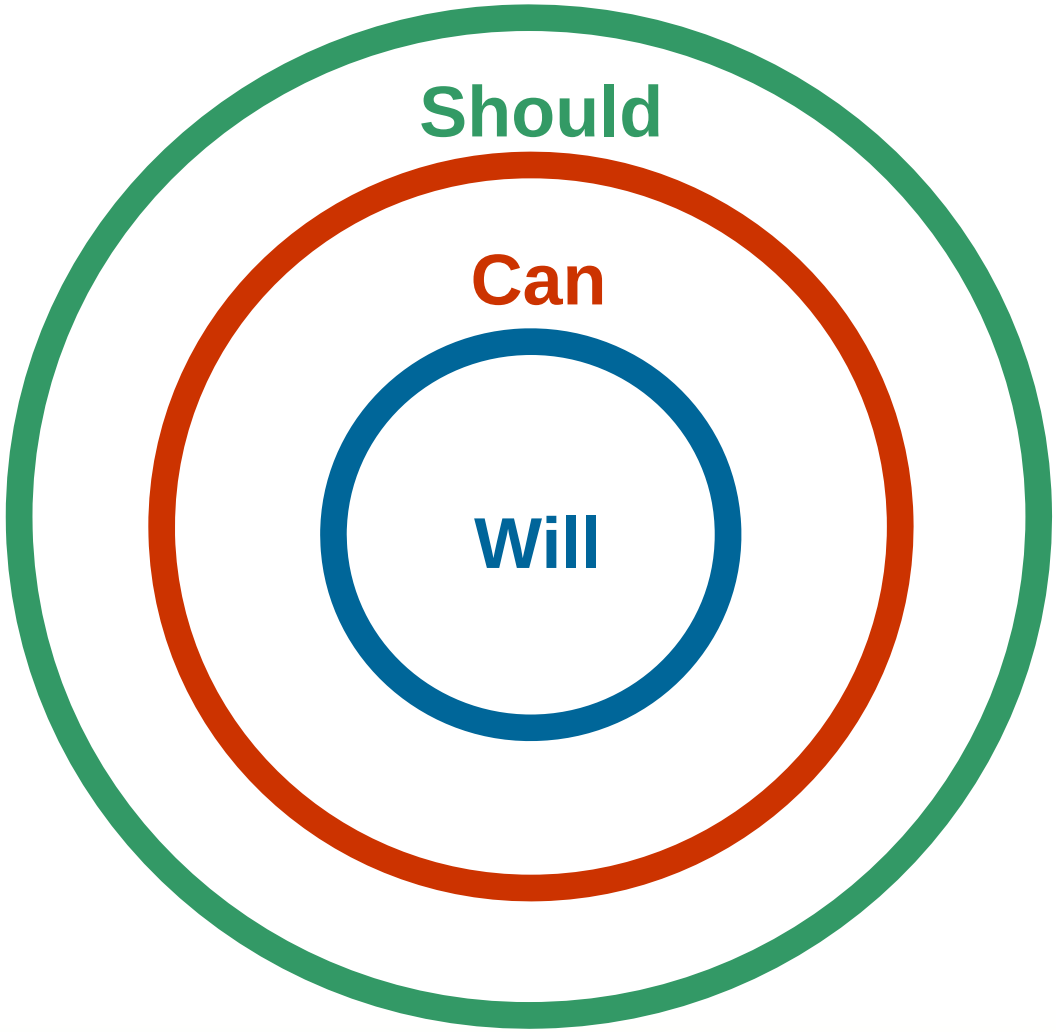


Unless commitment is made, there are only promises and hopes... but no plans. - Peter Drucker

Certainty of Failure



Highest Probability of Task Completion



Reliable Promises

Five Basic Elements of a Promise	Five Elements of a Reliable Promise
Speaker (performer) – This is you. Be clear that you are making the commitment, not someone else.	I am **competent** (able) to perform the task and have the wherewithal or I have access to both with the help of others.
Listener (customer) – This is the customer or someone depending on your performance. He or she already made a request.	I understand or **have estimated how much time** it will take me to perform this task.
Mutually understood Conditions of Satisfaction – Many breakdowns occur due to a misunderstanding of what is being requested. What is obvious to one is not obvious to the other, particularly when people may have just met each other.	I have (already) **blocked out time in my calendar** that I need (estimated) to perform the task.
Future action – When we make a promise we are saying that sometime in the future (before the due date) we will perform some action to bring about the desired outcome or conditions of satisfaction.	I am **freely and sincerely making this promise**. I am not having a private unspoken conversation to the contrary.
Due date – This is the second source of miscoordination. One person is thinking "now" while the other person is thinking "when I get around to it". Always err on the side of explicitly specifying the required date.	I know that when I make a promise I may not be able to fulfill it. I **will be responsible for any upset that occurs should I not be able to perform the task**, including any negative consequences that may come my way.

LeanProject consulting

How the Last Planner Works

- Three major elements in the Last Planner
  - Look ahead (typically 6 weeks)
    - Shape work flow
    - Identify constraints
  - Weekly work plan
    - Secure specific commitments for the coming week
  - Review PPC
    - Work that is not completed goes back in the lookahead schedule
    - This step includes learning by asking why

Sample Six Week Lookahead

BOLDT

Six Week Lookahead

Project: Sample Industrial Project

X = Repeated Items

Boldt Schedule Contact:
e-mail:
Phone:
Fax:

Constraints Analysis

Week of _____

SORT	Repeat	Activity	Responsible Party	5/14	5/21	5/28	6/4	6/11	6/18	Safety	Contracts / C.O.'s	Submittals/Eng	RFI's	Materials	Labor	Equipment	Prerequisite Work	Space	Explanation of Constraints	Action Required By:
1	X	Roof repair @ existing building	Boldt	X																
1		Install dye tanks	XL Mech	X										x	x	x			Verify installer	Brian T
1		Ext figs, walls, & col North H-L, 5-11	Boldt	X																
1		Underslab rough in	XL Mech/K&W	X								x		x						
1	X	Form & pour coater pits	Boldt	X										x	x				Excavation to be complete 5/11	John H
1		Prep existing parapet wall (East)	Boldt	X																
1		Erect col lines 5 & 6 - O to C	Boldt	X										x	x				Structural steel delivery	Matt H
1		Steam shower PLC panel modifications	K & W	X	X							x		x	x					
1		FRP machine track col lines 6 to 8 - I to M	Boldt	X	X									x	x				Rebar delivery	Matt H
1		Demo 6" carbon line	XL Mech	X	X															
1		Dye tank discharge pump installation	XL Mech	X	X															
1		Thaw with ground heaters	Boldt	X	X	X	X	X												
2		Install water units for #11 coaters in basement	XL Mech		X							x		x	x	x			Shipped from Harrisburg / 2nd Unit needed	
2		Figs, walls, & col A-C, 1-6	Boldt		X															
2		Install Roof Col Lines 5-6 O-C	Boldt		X									x	x				Structural steel delivery 5/11 AM	Matt H
2		FRP machine track col lines 6 to 8 - M to P	Boldt		X															
2		Erect steel col l ines 6 to 9 - I to A	Boldt		X															
2		Install roof col lines 5 & 6 - O to C	Boldt		X									x	x				Structural steel delivery	Matt H
2		FRP machine track col lines 6 to 8 - I to F	Boldt		X									x	x				Anchor bolt delivery	Matt H
2		Install siding col lines 6 - O to A	Boldt		X									x	x				Verify siding color & delivery	John H
2		FRP machine track col lines 6 to 8 - F to C	Boldt		X															
2		Complete reel foundations	Boldt		X	X						x		x						
2		FRP SOG col lines 5 & 6 - N to H	Boldt		X	X														
2		Cure concrete col lines 6 to 8 - I to M	Boldt		X	X														
2		Bench board PLC modifications	K & W		X	X	X					x		x	x				Need misc components to start	Mike L
2		Cure concrete col lines 6 to 8 - M to P	Boldt		X	X	X													
3		Erect steel col lines 6 to 9 - I to O	Boldt			X								x	x				Structural steel delivery	Matt H
3		Install siding col lines 6 to 9 - A to O	Boldt			X	X							x	x				Siding delivery	John H
3		Cure concrete col lines 6 to 8 - I to F	Boldt			X	X													
3		FRP SOG col lines 5 & 6 - H to C	Boldt			X	X													
4		Install sprinkler system	Boldt				X					x		x	x				Procurement - Need to expedite material	Jim B
4		Erect steel col lines 5 to 9 - O to Q	Boldt				X							x	x				Structural steel delivery	Matt H
4		Erect block house	Boldt				X	X				x		x	x					
4		Install roof col lines 6 to 9 - A to O	Boldt				X	X						x	x				Structural steel delivery	Matt H
4		Blockhouse masonry & roof	Boldt				X	X				x		x	x				RFC Blockhouse dwgs	Lee A
4		Install make up air ductwork	Bassett				X	X	X			x		x	x				Lead time for fab & delivery	Mike S
4		Install hi-bay lights	K & W				X	X	X			x		x	x				Specialty light delivery	Scott R
5		Install make up air unit	Bassett					X												

Oscar J. Boldt Construction

Sample Six Week Lookahead (page 2)

SORT	Repeat	Project: Sample Industrial Project X = Repeated Items Activity	Responsible Party	Boldt Schedule Contact: e-mail: Phone: Fax: 5/14	5/21	5/28	6/4	6/11	6/18	Safety	Contracts / C.O.'s	Submittals/Eng	RFI's	Materials	Labor	Equipment	Prerequisite Work	Space	Week of _____ Explanation of Constraints	Action Required By:
5		Ready temporary heat col lines 5 to 9 - A to Q	Boldt					X						x					Availibility of heaters	Matt H
5		Install siding & roof col lines 5 to 9 - O to Q	Boldt					X						x	x				Delivery of siding & structural steel	Matt H
5		Erect steel col lines 9 to 11 - F to Q	Boldt					X						x	x				Structural steel delivery	Matt H
5		Install roof curbs col lines 6 to 9 - A to Q	Boldt					X												
5		Install exhaust fans & skylights on roof curbs	Boldt					X						x	x				Exhaust fans & skylight delivery (Tinted glass)	John H
5		Energize temporary heat	Boldt					X						x	x					
5		Machine erection	Boldt					X	X					x	x				Verify delivery of equipment	John H
6		FRP SOG col lines 5 & 6 - N to Q	Boldt						X											
6		Install siding col lines 9 to 11 - F to Q	Boldt						X					x	x				Siding delivery	John H
6		Erect steel col lines 1 to 5 - A to C	Boldt						X					x	x				Structural steel delivery	Matt H
6		Install masonry parapet wall col lines 1 to 5 - C	Boldt						X					x	x				Availibilty of "Mason" manpower	John H
6		FRP SOG col lines 6 to 8 - P to Q	Boldt						X											
6		Erect coater program room	Boldt						X			x		x	x				Mill to approve dwgs	Steve B
6		Install building E & I	K & W						X			x		x	x				RFC Electrical dwgs 5/21	Lee A
6		Install gas piping AMU & unit heaters	XL Mech						X			x		x	x				Procurement of AMU & unit heaters	Jim B
6		Install drives/transformers/bus duct	K & W						X			x		x	x				Need miscellaneous components	Mike L
6		Install mill air	XL Mech						X			x		x	x				RFC Piping dwgs 5/15	Lee A
6		Install mill water	XL Mech						X			x		x	x				RFC Piping dwgs 5/15	Lee A
6		Install mill steam	XL Mech						X			x		x	x				RFC Piping dwgs 5/15	Lee A
6		Install gas piping to machine	XL Mech						X			x		x	x				RFC Piping dwgs 5/15	Lee A
6		Install instr & valves	XL Mech						X			x		x	x				Need submittals for valve procurement	Lee A

Sample Six Week Lookahead (blow-up)

BOLDT

Six Week Lookahead

Project: Sample Industrial Project

X = Repeated Items

Boldt Schedule Contact:
e-mail:
Phone:
Fax:

Constraints Analysis

Week of _____

SORT	Repeat	Activity	Responsible Party	5/14	5/21	5/28	6/4	6/11	6/18	Safety	Contracts / C.O.'s	Submittals/Eng	RFI's	Materials	Labor	Equipment	Prerequisite Work	Space	Explanation of Constraints	Action Required By:
1	X	Roof repair @ existing building	Boldt	X																
1		Install dye tanks	XL Mech	X										x	x	x			Verify installer	Brian T
1		Ext ftgs, walls, & col North H-L, 5-11	Boldt	X																
1		Underslab rough in	XL Mech/K&W	X								x		x						
1	X	Form & pour coater pits	Boldt	X										x	x				Excavation to be complete 5/11	John H
1		Prep existing parapet wall (East)	Boldt	X																
1		Erect col lines 5 & 6 - O to C	Boldt	X										x	x				Structural steel delivery	Matt H
1		Steam shower PLC panel modifications	K & W	X	X							x		x	x					
1		FRP machine track col lines 6 to 8 - I to M	Boldt	X	X									x	x				Rebar delivery	Matt H
1		Demo 6" carbon line	XL Mech	X	X															
1		Dye tank discharge pump installation	XL Mech	X	X															
1		Thaw with ground heaters	Boldt	X	X	X	X	X												
2		Install water units for #11 coaters in basement	XL Mech		X							x		x	x	x			Shipped from Harrisburg / 2nd Unit needed	
2		Ftgs, walls, & col A-C, 1-6	Boldt		X															
2		Install Roof Col Lines 5-6 O-C	Boldt		X									x	x				Structural steel delivery 5/11 AM	Matt H
2		FRP machine track col lines 6 to 8 - M to P	Boldt		X															
2		Erect steel col l ines 6 to 9 - I to A	Boldt		X															
2		Install roof col lines 5 & 6 - O to C	Boldt		X									x	x				Structural steel delivery	Matt H
2		FRP machine track col lines 6 to 8 - I to F	Boldt		X									x	x				Anchor bolt delivery	Matt H
2		Install siding col lines 6 - O to A	Boldt		X									x	x				Verify siding color & delivery	John H

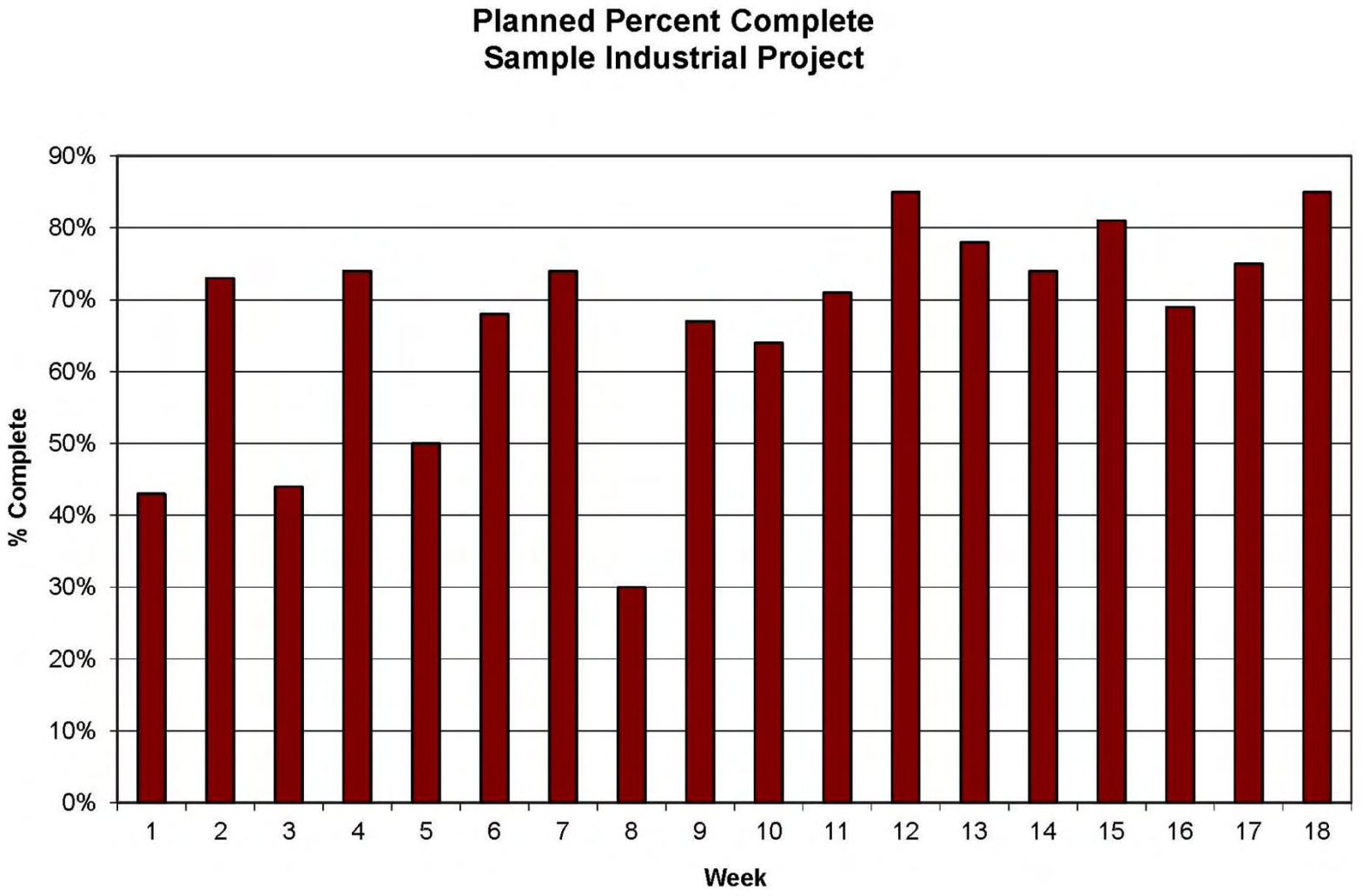
Sample Weekly Work Plan

	BOLDT			Boldt Schedule Contact: e-mail: Phone: Fax:							
	Project: Sample Industrial Project										
	Weekly Work Plan		X = Repeated Items	Week of							
	Assignment Description			**Make Ready Needs**							
Sort	Repeat	Remember the Five Criteria for Release of Assignments **Specific, Sound, Sequenced, Sized, Safe**	Responsible Party	Work that Must and Can Be Performed Prior to Release of this Assignment	M	T	W	T	F	S	Comments
1		Prep existing parapet wall (East)	Mitch N		x	x					
2		Roof repair @ existing building	Mitch N		x	x	x				
5		Ext figs, walls, & col North H-L, 5-11	Mitch N		x	x	x	x	x		
5	x	Form & pour coater pits	Mitch N		x	x	x	x	x		
5	x	Install dye tanks	Bob H		x	x	x	x	x		
5		Start FRP machine track col lines 6 to 8	Mitch N				x	x	x		
5		Steam shower PLC modifications from hood to nozzles	John W		x	x	x	x	x		
5		Underslab rough in - All	Bob H/JohnW		x	x	x	x	x		
5		Erect col lines 5 & 6 - O to C	Mitch N		x	x	x	x	x		
6		50% Dye tank discharge pump installation	Bob H		x	x	x	x	x	x	
6		Demo 6" carbon line from existing dye tank to #18	Bob H		x	x	x	x	x	x	

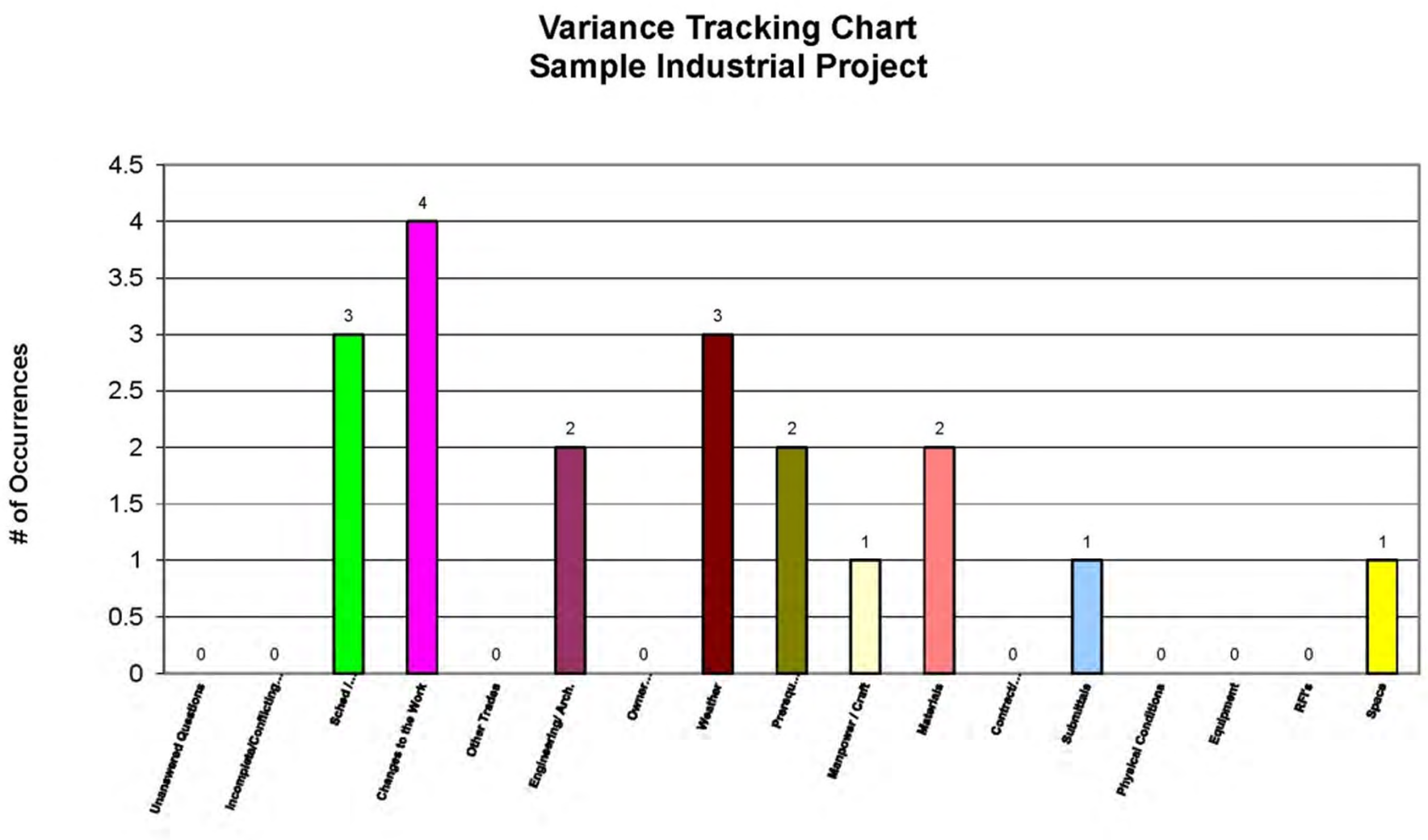
Sample Percent Planed Complete (PPC)

	BOLDT Project: Sample Industrial Project			**Boldt Schedule Contact:** **e-mail:** **Phone:** **Fax:**			Week of	
	Planned Percent Complete			**X = Repeated Items**			**PPC =**	**83%**
	Assignment Description			**Make Ready Needs**	**PPC Analysis**			
SORT	REPEAT	Remember the Five Criteria for Release of Assignments **Specific, Sound, Sequenced, Sized, Safe**	Responsible Party	Work that Must and Can Be Performed Prior to Release of this Assignment	Y	N	Reasons For Variance	
		Install grounding grid	John W		y			
	x	Backfill ext ftgs South 9-5, A	Mitch N		y			
		E, F, P remaining int column ftgs	Mitch N		y			
		Backfill ext ftgs South 11-9, A-F	Mitch N		y			
		Ext ftgs, walls, & col North M-Q, 5-11	Mitch N		y			
		Form & pour coater pits	Mitch N			n	Design Change	
		Install dye tanks	Bob H			n	Delivery Monday	
		Install roof drain piping	Bob H		y			
		3" Mill airline	Bob H		y			
		Run dye system tubing	Bob H		y			
		3" coating line from tank farms to #18 Bldg	Bob H		y			
		Install 1" Dye line returns	Bob H		y			

Sample PPC Tracking



Sample Plan Failure Analysis



Pull Scheduling Meeting

Last Planner Meetings

Wisconsin Institutes for Medical Research (WIMR)

WIMR Center Tower
Schedule Development Plan

Initial Week Planning:
Who: Construction Team
What: Develop daily tasks for Wk. 1 & Wk. 2 on Daily Huddle Boards based on Pull Schedule results.
How: Post-its on Daily Huddle Boards
*Daily tasks developed through mini-pull schedules.

Pull Schedule:
Who: Construction Team
What: Complete a Milestone Pull Schedule:
- 6 wks prior to every milestone
- at least 2 wks before end of pull schedule
How: Pull Schedule (Post-its) -> LP Excel
*Pull Schedule detailed to a weekly level.

Master Schedule:
Who: Boldt
What: Develop Milestone Master Schedule (MMS)
How: Sure Trak

Check:
Evaluate any changes to MMS resulting From LP mtg. results.

Distribution & Posting:
Who: Boldt
What: Post LP mtg. notes.
How: Excel, Website

Check:
1. Review previous day's tasks for completion.
2. Determine why tasks didn't complete.

Friday Daily Huddle:
Who: Superintendents/Foremen
What:
1. Check previous work.
2. Review current day's tasks.
3. Identify constraints.

How: Post-it notes on daily huddle boards

Monday Daily Huddle:
Who: Superintendents/Foremen
What:
1. Check previous work.
2. Review current day's tasks.
3. Identify constraints.

How: Post-it notes on daily huddle boards

Tuesday Daily Huddle:
Who: Superintendents/Foremen
What:
1. Check previous work.
2. Review current day's tasks.
3. Identify constraints.

How: Post-it notes on daily huddle boards

Wednesday Daily Huddle:
Who: Superintendents/Foremen
What:
1. Check previous work.
2. Review current day's tasks.
3. Identify constraints.

How: Post-it notes on daily huddle boards

Thursday Last Planner Meeting:
Who: Construction Team
What:
1. Complete typical Daily Huddle tasks for Thurs.
2. Review PPC from previous week and discuss Constraints Log.
3. Develop daily tasks for Wk 2.
4. Review pull schedule for milestone accuracy.

How: Daily Huddle Boards, Excel, & Pull Schedule

Wednesday Night:
Who: Boldt
What: Updates Daily Huddle Boards and preps for LP mtg.
How: Post-its and Excel
**Wk 2 becomes Wk 1*

Draft: January 14, 2011

Weekly Last Planner Meetings

BOLDT
WIMR Center Tower
University of Wisconsin-Madison

LAST PLANNER

General Outline

Who attends?	A Superintendent and/or a PM from each Subcontractor
When?	9:00 am Thursday
Where?	WIMR Conference Room
How long?	1 Hour

Procedure

1. Complete the Attendance Log.
2. Review the Top Three Safety Items of the Week.
3. Complete typical Daily Huddle
    a. Review Wednesday's tasks for completion.
    b. Review Thursday's scheduled work.
4. Review PPC.
5. Discuss Constraints Log.
6. Confirm tasks previously scheduled for Week 1 (formerly Week 2) are still accurate. Develop daily tasks for Week 2.
7. Review Pull Schedule for milestone accuracy.

Rules

- **Prior to reschedule, every incomplete task receives a:**
    - **Late sticker (with original date)**
    - **Reason for incompletion (constraint no.)**
- **If rescheduled tasks affect a Milestone Date, the team must adjust the Pull Schedule to maintain original dates or a separate meeting must be scheduled.**
- **Side conversations that focus on problem solving instead of project planning must be tabled and added to the Sidebar Log for later discussion.**

Goals

- **Make Reliable Commitments!**
- **Work to Eliminate Constraints!**

Weekly Last Planner Meetings

BOLDT
WIMR Center Tower
University of Wisconsin-Madison

LAST PLANNER

General Outline

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Procedure

1. Complete the Attendance Log.
2. Review the Top Three Safety Items of the Week.
3. Complete typical Daily Huddle
    a. Review Wednesday's tasks for completion.
    b. Review Thursday's scheduled work.
4. Review PPC.
5. Discuss Constraints Log.
6. Confirm tasks previously scheduled for Week 1 (formerly Week 2) are still accurate. Develop daily tasks for Week 2.
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Weekly Last Planner Meetings

Rules

- **Prior to reschedule, every incomplete task receives a:**
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- **Side conversations that focus on problem solving instead of project planning must be tabled and added to the Sidebar Log for later discussion.**

Goals

- **Make Reliable Commitments!**
- **Work to Eliminate Constraints!**

Daily Huddle

BOLDT
WIMR Center Tower
University of Wisconsin-Madison

DAILY HUDDLE

General Outline

Who attends?	A Superintendent or Forman from each Subcontractor
When?	6:45 am Monday, Tuesday, Wednesday, and Friday
Where?	Boldt jobsite plan area
How long?	No more than 15 minutes per meeting

Procedure

1. Complete the Attendance Log.
2. Review previous day's tasks for completion.
   - If a previous day's task was completed, the Subcontractor attaches a Completion Sticker to the tag and moves it to the Completed Column.
   - If the task was not completed, the Subcontractor provides a reason. If the reason is a constraint that requires resolve from outside the Daily Huddle, it must be entered on the Constraints Log.
3. Review current day's tasks and finalize any coordination required for successful completion.
4. Add/Remove constraints from the Constraints Log.

Rules

- **If a task wasn't completed on time…**
  The task must remain where originally scheduled until:
  - The task is completed.
  - Thursday's Last Planner Meeting (for reschedule).
- **If a task is completed early…**
  The task receives a completion sticker and moves to the completed column.
- **If a task can be pulled back…**
  The task can be rescheduled to an earlier date as long as the Team agrees to the reschedule.

Daily Huddle

BOLDT
WIMR Center Tower
University of Wisconsin-Madison

DAILY HUDDLE

General Outline

Who attends?	A Superintendent or Forman from each Subcontractor
When?	6:45 am Monday, Tuesday, Wednesday, and Friday
Where?	Boldt jobsite plan area
How long?	No more than 15 minutes per meeting

Procedure

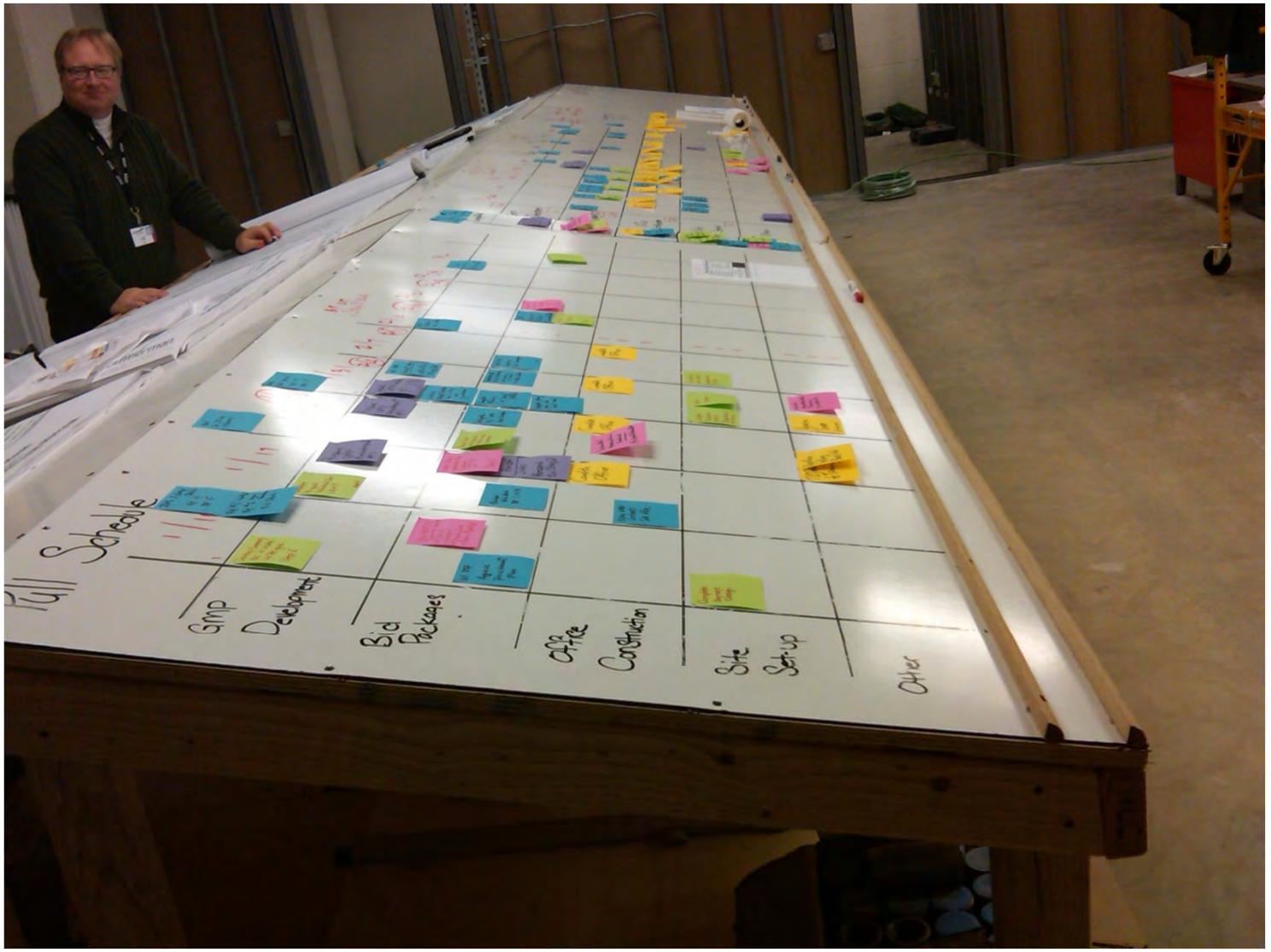
1. Complete the Attendance Log.
2. Review previous day's tasks for completion.
   - If a previous day's task was completed, the Subcontractor attaches a Completion Sticker to the tag and moves it to the Completed Column.
   - If the task was not completed, the Subcontractor provides a reason. If the reason is a constraint that requires resolve from outside the Daily Huddle, it must be entered on the Constraints Log.
3. Review current day's tasks and finalize any coordination required for successful completion.
4. Add/Remove constraints from the Constraints Log.

Daily Huddle

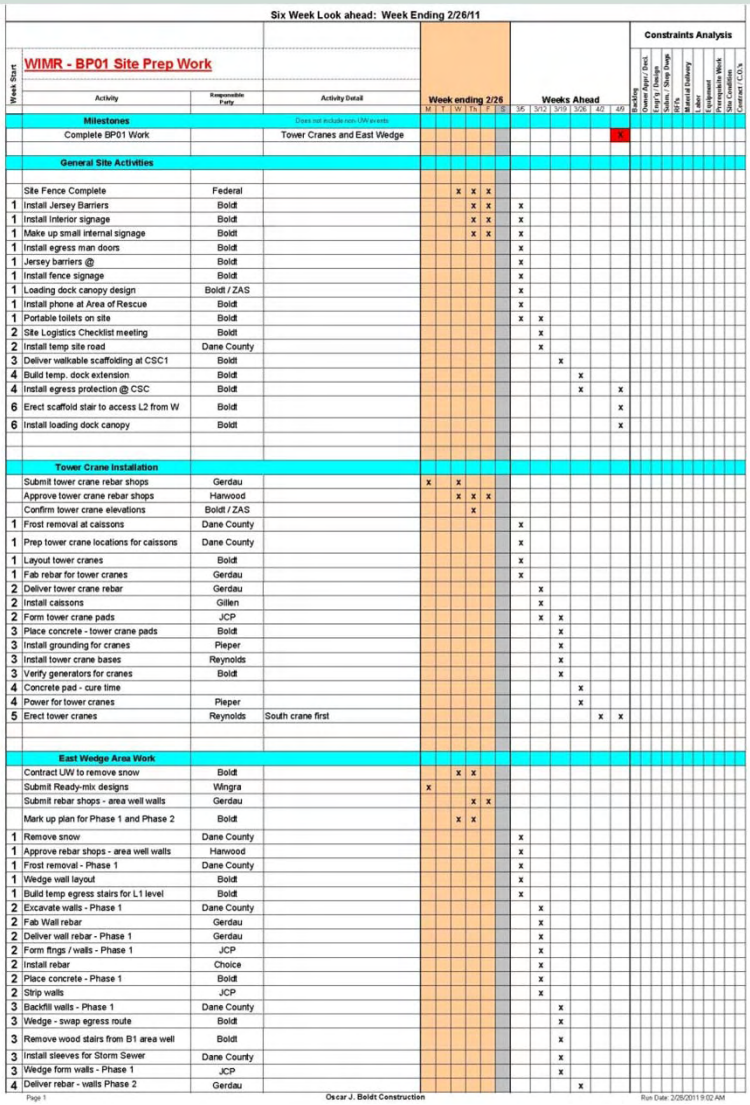
Rules

- **If a task wasn't completed on time…**
  The task must remain where originally scheduled until:
  - The task is completed.
  - Thursday's Last Planner Meeting (for reschedule).
- **If a task is completed early…**
  The task receives a completion sticker and moves to the completed column.
- **If a task can be pulled back…**
  The task can be rescheduled to an earlier date as long as the Team agrees to the reschedule.

WIMR Pull Schedule



Last Planner Example (WIMR) page 1



Six Week Look ahead: Week Ending 2/26/11

WIMR - BP01 Site Prep Work

Week Start	Activity	Responsible Party	Activity Detail	Week ending 2/26 M	T	W	Th	F	S	Weeks Ahead 2/5	2/12	2/19	2/26	4/2	4/9	Backlog	Constraints Analysis: Owner Appv./ Decl.	Eng'g / Design	Shop Dwgs. / Shop Prep.	RFI's	Material Delivery	Labor	Equipment	Prerequisite Work	Site Condition	Contract / COO's
	Milestones		Does not include non-UW events																							
	Complete BP01 Work		Tower Cranes and East Wedge													x										
	General Site Activities																									
	Site Fence Complete	Federal				x	x	x																		
1	Install Jersey Barriers	Boldt					x	x		x																
1	Install interior signage	Boldt					x	x		x																
1	Make up small internal signage	Boldt					x	x		x																
1	Install egress man doors	Boldt								x																
1	Jersey barriers @	Boldt								x																
1	Install fence signage	Boldt								x																
1	Loading dock canopy design	Boldt / ZAS								x																
1	Install phone at Area of Rescue	Boldt								x																
1	Portable toilets on site	Boldt								x	x															
2	Site Logistics Checklist meeting	Boldt									x															
2	Install temp site road	Dane County									x															
3	Deliver walkable scaffolding at CSC1	Boldt										x														
4	Build temp. dock extension	Boldt											x													
4	Install egress protection @ CSC	Boldt											x		x											
6	Erect scaffold stair to access L2 from W	Boldt													x											
6	Install loading dock canopy	Boldt													x											
	Tower Crane Installation																									
	Submit tower crane rebar shops	Gerdau		x		x																				
	Approve tower crane rebar shops	Harwood				x	x	x																		
	Confirm tower crane elevations	Boldt / ZAS				x																				
1	Frost removal at caissons	Dane County								x																
1	Prep tower crane locations for caissons	Dane County								x																
1	Layout tower cranes	Boldt								x																
1	Fab rebar for tower cranes	Gerdau								x																
2	Deliver tower crane rebar	Gerdau									x															
2	Install caissons	Gillen									x															
2	Form tower crane pads	JCP									x	x														
3	Place concrete - tower crane pads	Boldt										x														
3	Install grounding for cranes	Pieper										x														
3	Install tower crane bases	Reynolds										x														
3	Verify generators for cranes	Boldt										x														
4	Concrete pad - cure time												x													
4	Power for tower cranes	Pieper											x													
5	Erect tower cranes	Reynolds	South crane first											x	x											
	East Wedge Area Work																									
	Contract UW to remove snow	Boldt				x	x																			
	Submit Ready-mix designs	Wingra		x																						
	Submit rebar shops - area well walls	Gerdau					x	x																		
	Mark up plan for Phase 1 and Phase 2	Boldt				x	x																			
1	Remove snow	Dane County								x																
1	Approve rebar shops - area well walls	Harwood								x																
1	Frost removal - Phase 1	Dane County								x																
1	Wedge wall layout	Boldt								x																
1	Build temp egress stairs for L1 level	Boldt								x																
2	Excavate walls - Phase 1	Dane County									x															
2	Fab Wall rebar	Gerdau									x															
2	Deliver wall rebar - Phase 1	Gerdau									x															
2	Form ftngs / walls - Phase 1	JCP									x															
2	Install rebar	Choice									x															
2	Place concrete - Phase 1	Boldt									x															
2	Strip walls	JCP									x															
3	Backfill walls - Phase 1	Dane County										x														
3	Wedge - swap egress route	Boldt										x														
3	Remove wood stairs from B1 area well	Boldt										x														
3	Install sleeves for Storm Sewer	Dane County										x														
3	Wedge form walls - Phase 1	JCP										x														
4	Deliver rebar - walls Phase 2	Gerdau											x													

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Last Planner Example (WIMR) page 2

Six Week Look ahead: Week Ending 2/26/11

WIMR - BP01 Site Prep Work

Week Start	Activity	Responsible Party	Activity Detail	Week ending 2/26	Weeks Ahead				Constraints Analysis											
				M T W Th F S	3/5	3/12	3/19	3/26	4/2	4/9	Backlog	Owner Appr / Decl.	Engr'g / Design	Shop / Mock-Up	RFIs	Material Delivery	Labor	Equipment	Prerequisite Work	Site Conditions	Contract / C.O.'s
4	Remove frost - phase 2	Dane County						x													
4	excavate walls - Phase 2	Dane County						x													
4	Form wedge Walls - Phase 2	JCP						x													
4	Install rebar - walls - Phase 2	Choice						x													
5	Install sleeves for Storm Sewer	Dane County							x												
5	Install conduit for pump electrical	Pieper							x												
5	Place concrete - Phase 2	Boldt							x												
5	Strip walls	JCP							x												
5	Backfill walls - Phase 2	Dane County							x												
5	Install storm sewer	Dane County							x												
5	Install pump	Dane County							x												
6	Raise grade / Install storm a East Wedge	Dane County								x											
6	Power to pump	Pieper								x											
6	SOG at area well - B1 level	JCP / Boldt								x											
6	rub walls	Boldt								x											
6	Install new temp. stair @ B1 level area well	Boldt								x											
	Center Tower Roof Demo / Prep																				
	Roofing demo / waterproofing Mtng	Boldt	Finalize plan / schedule		x																
	Remove roof ballast	GBR	L2 and L3 levels						x												
	Remove lightning protection	Pieper							x												
	Temp. Steam relief out wall	GHAC							x												
	Relocate cage wash exhaust	GHAC							x												
	Remove existing roof	GARR	L2 and L3 levels						x	x											
	Extend existing lightning protection	Pieper								x											
	Install Waterproofing	Zander	L2 and L3 levels						x	x											

Last Planner Example (WIMR) Blow-up

Six Week Look ahead: Week Ending 2/26/11

Week Start	WIMR - BP01 Site Prep Work	Responsible Party	Activity Detail	Week ending 2/26 M	T	W	Th	F	S	Weeks Ahead 3/5	3/12	3/19	3/26	4/2	4/9	Constraints Analysis: Backing	Owner Appr./ Elect.	Eng'g / Design	Subm. / Shop Dwgs	RFI's	Material Delivery	Labor	Equipment	Prerequisite Work	Site Condition	Contract / C.O.'s
	Milestones		Does not include non-UW events																							
	Complete BP01 Work		Tower Cranes and East Wedge												X											
	General Site Activities																									
	Site Fence Complete	Federal				x	x	x																		
1	Install Jersey Barriers	Boldt					x	x		x																
1	Install Interior signage	Boldt					x	x		x																
1	Make up small internal signage	Boldt					x	x		x																
1	Install egress man doors	Boldt								x																
1	Jersey barriers @	Boldt								x																
1	Install fence signage	Boldt								x																
1	Loading dock canopy design	Boldt / ZAS								x																
1	Install phone at Area of Rescue	Boldt								x																
1	Portable toilets on site	Boldt								x	x															
2	Site Logistics Checklist meeting	Boldt									x															
2	Install temp site road	Dane County									x															
3	Deliver walkable scaffolding at CSC1	Boldt										x														
4	Build temp. dock extension	Boldt											x													
4	Install egress protection @ CSC	Boldt											x		x											
6	Erect scaffold stair to access L2 from W	Boldt													x											
6	Install loading dock canopy	Boldt													x											
	Tower Crane Installation																									
	Submit tower crane rebar shops	Gerdau		x		x																				
	Approve tower crane rebar shops	Harwood				x	x	x																		

Charter Street Heating Plant (CSHP)

Last Planner Example CSHP page 1

BOLDT amec Charter Street Heating Plant

Six Week Lookahead: Week of 2/21

Charter Street Heating Plant Rebuild

x = Repeated Items

Week Start	Activity	Responsible Party	Activity Detail	Week of 2/21 M	T	W	Th	F	Sa	Weeks Ahead 2/21	2/28	3/7	3/14	3/21	3/28	Constraints Analysis: Backlog	Owner Appr./ Decl.	Engr'g. Design	Mtrls. Shop Dwgs	Material Delivery	Labor	Prerequisite Work	Site Condition	Contract / C.O.'s
	Technical Leadership Team		**Review at Wednesday TLT Meeting**																					
1	See Major Equipment Procurement Report			x	x	x	x	x	x	x	x	x	x	x	x									
1	Sustainable guidelines	Andy	Schedule after reconfiguration of project							x							x							
1	Monthly Master Schedule update	Gus	Issue wrap up to state					x		x		x		x				x						
2	Submit February Invoice	Gus	Mar. 3								x													
2	Fire Protection Sub Approval	Gus	Gus to Jeff for TLT approval - waiting for reconfiguration of project								x						x							
2	Roofing Sub Approval	Jeremy	Jeremy to Jeff for TLT approval								x													
3	Pencil review pay application	Jeff N.	review February invoice Mar. 9									x					x							
	Events																							
1	DOA/DSF Furlough Day	N/A	Feb. 21	x						x														
	General Project																							
2	Fire protection bid package	Gus	Waiting for project reconfiguration								x						x							
2	City Coordination meeting	Gus	1-Mar								x													
2	Critical Components of the Work	Maynard	Waiting for project reconfiguration								x						x							
	Eastside of Mills St.		**115 N. Mills St**																					
	Dayton Building																							
	General																							
1	steam vault	A&O	Design	x	x	x	x	x		x														
1	Underslab Plumbing	Andy	Amec design with owner approval of steam turbine drives	x	x	x	x	x		x	x						x	x	x	x				x
2	Rebar Submittal	Andy	16 Line L06 to the West								x							x							
1	Equipment Layout	Dan R.	L06 to the W waiting on reconfiguration	x	x	x	x	x		x	x	x	x	x			x	x						
1	Waterproofing	G & C	Insulation on M line to elevation 91 - Prep work on 16 line M to L4	x	x	x	x	x		x			x	x									x	x
1	Precast	Jeremy	Precast submittals N. & E. Elevation	x	x	x	x	x		x	x													
1	Curtain wall	Jeremy	Issue contract and continue shop drawings	x	x	x	x	x		x	x	x												
1	Metal Panels	Jeremy	Issue contract and continue shop drawings	x	x	x	x	x		x	x	x												
1	Roofing	Jeremy	Review Proposals	x	x	x	x	x		x														
1	Install Drain tile and backfill foundations	Joe	11.85 to 16 line on M line - 16 line M to L4		x	x	x	x		x	x	x											x	
1	FRPS Southeast Stair Tower 1st thru 5th - Stair #1	Joe	Place wall to 129'		x	x	x	x		x	x	x	x					x		x				
1	FRPS Interior Footings	Joe	place footings 15 Line to 11.1 - L to L2, to elevation 77'2"		x	x	x	x		x	x							x		x	x	x	x	
1	FRP Transfer structural slab	Joe	Form and Pour 1st Floor elevated deck at gas vault		x	x				x													x	
1	Install Drain tile and backfill foundations	Joe	Back Fill - 10.8 to 16 line on M line		x	x	x	x		x	x	x												
1	Install Drain tile and backfill foundations	Terra	Back Fill - 10.8 to 16 line on M line		x	x	x	x		x	x	x											x	
1	Mass Excavation	Terra	excavate at L6 line		x	x	x	x		x	x	x						x						
1	Earth Rentention System	Terra	welding tie backs at F.1 and 11.1 line		x	x	x	x		x											x		x	
2	Temp heat	Ahern	Pipe through 16 line wall								x												x	
2	Fire Pump Submittal	Gus	Contractor recommendation								x						x	x	x					x
2	FRPS Building Foundation Walls	Joe	Pour walls - 1.4 to H Line								x	x	x							x	x	x		
2	New MGE Gas Regulating/Metering Station	MG&E	Install PRV - March 1								x													
3	Design Sprinkler Pipe Route	Andy	Waiting for project reconfiguration									x												
4	Erect Steel	Andy S.	Start layout Mar. 14 - Install steel Mar 21										x	x										
	Phase 3 - ON HOLD/OWNER DECISION		**Vault/building reconfiguration**																					
##	Install grounding	Joe	11-Feb																					
##	FRPS Building Footings	Joe	11-Feb																					
##	FRPS Building foundation walls	Joe	18-Feb																					
1	Waterproofing	Joe	25-Feb							x														
2	Install Drain tile and backfill foundations	Joe	4-Mar								x													
	Phase 4 - ON HOLD/OWNER DECISION		**Vault/building reconfiguration**																					
2	Install Grounding	Joe	28-Feb								x													
2	FRPS Building Footings	Joe	28-Feb								x													
3	Install Drain tile and backfill foundations	Joe	7-Mar									x												
	Superstructure																							
1	Review & approve 1st tier steel shop drawings	Andy		x	x	x	x	x		x	x							x						

Oscar J. Boldt Construction

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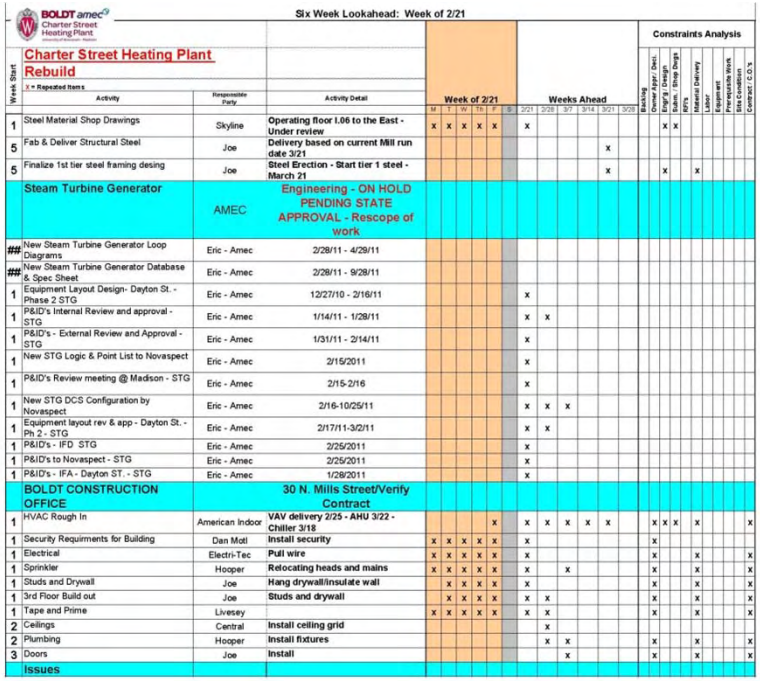
Last Planner Example CSHP page 2



BOLDT amec Charter Street Heating Plant

Six Week Lookahead: Week of 2/21

Charter Street Heating Plant Rebuild

X = Repeated Items

Week Start	Activity	Responsible Party	Activity Detail	Week of 2/21 M	T	W	Th	F	S	Weeks Ahead 2/21	2/28	3/7	3/14	3/21	3/28	Constraints Analysis: Backlog	Design / Engr / Dwgs / Permits	Submittals / Shop Dwgs	RFI's	Material Delivery	Labor	Equipment	Prerequisite Work	Site Conditions	Contract / C.O.'s
1	Steel Material Shop Drawings	Skyline	**Operating floor l.06 to the East - Under review**	x	x	x	x	x		x							x	x							
5	Fab & Deliver Structural Steel	Joe	**Delivery based on current Mill run date 3/21**											x											
5	Finalize 1st tier steel framing desing	Joe	**Steel Erection - Start tier 1 steel - March 21**											x			x		x						
	Steam Turbine Generator	AMEC	**Engineering - ON HOLD PENDING STATE APPROVAL - Rescope of work**																						
##	New Steam Turbine Generator Loop Diagrams	Eric - Amec	2/28/11 - 4/29/11																						
##	New Steam Turbine Generator Database & Spec Sheet	Eric - Amec	2/28/11 - 9/28/11																						
1	Equipment Layout Design- Dayton St. - Phase 2 STG	Eric - Amec	12/27/10 - 2/16/11							x															
1	P&ID's Internal Review and approval - STG	Eric - Amec	1/14/11 - 1/28/11							x	x														
1	P&ID's - External Review and Approval - STG	Eric - Amec	1/31/11 - 2/14/11							x															
1	New STG Logic & Point List to Novaspect	Eric - Amec	2/15/2011							x															
1	P&ID's Review meeting @ Madison - STG	Eric - Amec	2/15-2/16							x															
1	New STG DCS Configuration by Novaspect	Eric - Amec	2/16-10/25/11							x	x	x													
1	Equipment layout rev & app - Dayton St. - Ph 2 - STG	Eric - Amec	2/17/11-3/2/11							x	x														
1	P&ID's - IFD STG	Eric - Amec	2/25/2011							x															
1	P&ID's to Novaspect - STG	Eric - Amec	2/25/2011							x															
1	P&ID's - IFA - Dayton ST. - STG	Eric - Amec	1/28/2011							x															
	BOLDT CONSTRUCTION OFFICE		**30 N. Mills Street/Verify Contract**																						
1	HVAC Rough In	American Indoor	**VAV delivery 2/25 - AHU 3/22 - Chiller 3/18**					x		x	x	x	x	x			x	x	x						x
1	Security Requirments for Building	Dan Motl	**Install security**	x	x	x	x	x		x							x								
1	Electrical	Electri-Tec	**Pull wire**	x	x	x	x	x		x							x			x					x
1	Sprinkler	Hooper	**Relocating heads and mains**	x	x	x	x	x		x		x					x			x					x
1	Studs and Drywall	Joe	**Hang drywall/insulate wall**		x	x	x	x		x							x			x					x
1	3rd Floor Build out	Joe	**Studs and drywall**		x	x	x	x		x	x						x			x					x
1	Tape and Prime	Livesey		x	x	x	x	x		x	x						x			x					x
2	Ceilings	Central	**Install ceiling grid**								x														
2	Plumbing	Hooper	**Install fixtures**								x	x					x			x					x
3	Doors	Joe	**Install**									x					x			x					x
	Issues																								

Last Planner Example CSHP blow-up

BOLDT amec Charter Street Heating Plant

Six Week Lookahead: Week of 2/21

Charter Street Heating Plant Rebuild

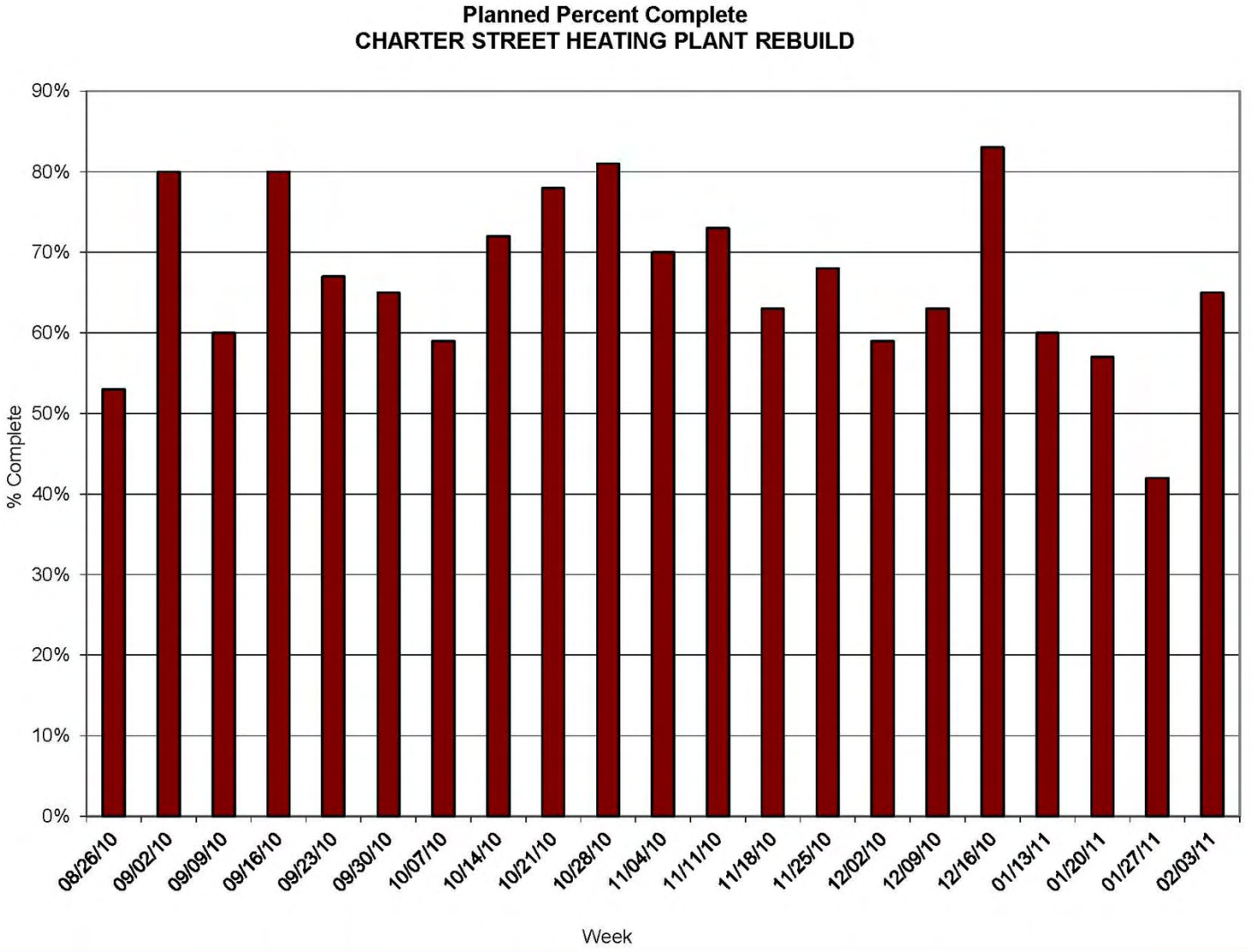
X = Repeated Items

Week Start	Activity	Responsible Party	Activity Detail	Week of 2/21 M	T	W	Th	F	S	Weeks Ahead 2/21	2/28	3/7	3/14	3/21	3/28	Constraints Analysis: Backlog	Owner Appr. / Decis.	Engr'g / Design	Subm. / Shop Dwgs	RFI's	Material Delivery	Labor	Equipment	Prerequisite Work	Site Condition	Contract / C.O.'s
	Technical Leadership Team		**Review at Wednesday TLT Meeting**																							
1	See Major Equipment Procurement Report			x	x	x	x	x	x	x	x	x	x	x	x											
1	Sustainable guidelines	Andy	Schedule after reconfiguration of project							x							x									
1	Monthly Master Schedule update	Gus	Issue wrap up to state					x		x		x		x					x							
2	Submit February Invoice	Gus	Mar. 3								x															
2	Fire Protection Sub Approval	Gus	Gus to Jeff for TLT approval - waiting for reconfiguration of project								x						x									
2	Roofing Sub Approval	Jeremy	Jeremy to Jeff for TLT approval								x															
3	Pencil review pay application	Jeff N.	review February invoice Mar. 9									x					x									
	Events																									
1	DOA/DSF Furlough Day	N/A	Feb. 21	x						x																
	General Project																									
2	Fire protection bid package	Gus	Waiting for project reconfiguration								x						x									
2	City Coordination meeting	Gus	1-Mar								x															
2	Critical Components of the Work	Maynard	Waiting for project reconfiguration								x						x									
	Eastside of Mills St.		**115 N. Mills St**																							
	Dayton Building																									
	General																									
1	steam vault	A&O	Design	x	x	x	x	x		x																
	Underslab Plumbing		Amec design with owner approval of																							

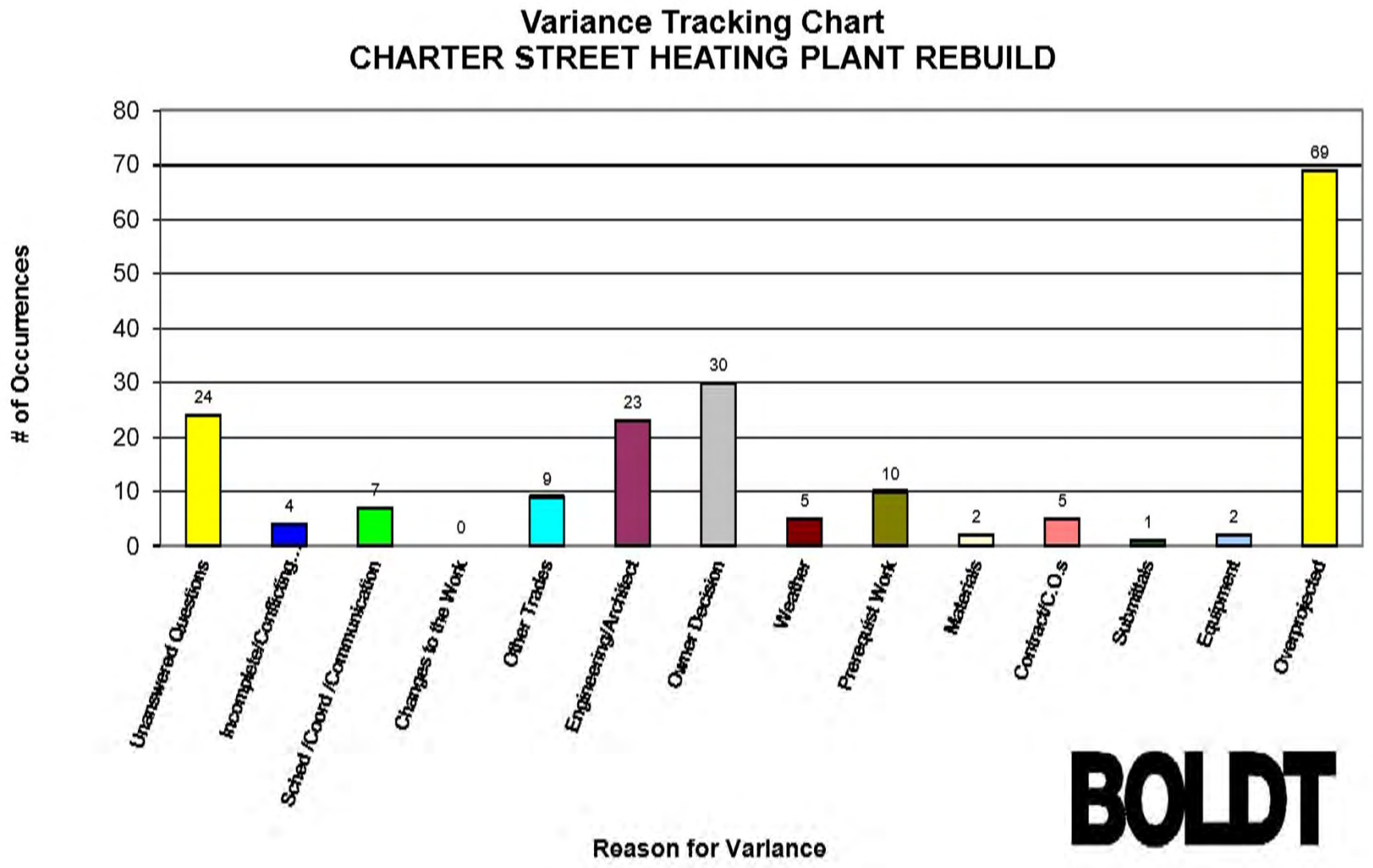
Last Planner Example CSHP PPC Calculation

BOLDT	Charter Street Heating Plant Rebuild					February 14, 2011
Planned Percent Complete						82%
Assignment Description				PPC Analysis		
REPEAT	Remember the Five Criteria for Release of Assignments **Specific, Sound, Sequenced, Sized, Safe**	Responsible Party	Activity Detail	Y	N	Reasons For Variance
	Technical Leadership Team					
	Monthly Master Schedule update	Gus	Issue wrap up to state	Y		
	Pencil review pay application	Jeff N.	review December invoice	Y		
	General Project					
	steam vault	A&O	Design		N	Engineering/Arch
	Equipment Layout	Dan R.	I.06 to the W waiting on reconfiguration	Y		
	Waterproofing	G & C	P line going west to L.1 - 10.8 going N to 15 line - moving north along M Line	Y		
	Precast	Jeremy	Precast submittals	Y		
	Curtain wall	Jeremy	Issue contract and start shop drawings		N	Contract/C.O.s
	Metal Panels	Jeremy	Issue contract and start shop drawings		N	Contract/C.O.s
	Roofing	Jeremy	Review Proposals		N	Over projected
	Install Drain tile and backfill foundations	Joe	Underslab drainage - start at P line going west to L.1 - 10.8 going N to 15 line	Y		
	FRPS Building Foundation Walls	Joe	Pour walls - 16 line M to I.6	Y		
	FRPS Southeast Stair Tower 1st thru 5th - Stair #1	Joe	Place wall to 115'10"	Y		
	FRPS Interior Footings	Joe	form footings 15 Line to 11.1 - L to I.2	Y		
	Install Drain tile and backfill foundations	Terra	Back Fill - Start at 12.7 and P	Y		
	Mass Excavation	Terra	form footings 15 Line to 11.1 - L to I.2	Y		
	Dayton Building					
	GENERAL					
	Superstructure					
	Review & approve 1st tier steel shop drawings	Andy		Y		
	Steel Material Shop Drawings	Skyline	Operating floor I.06 to the East	Y		
	Boldt Construction Office					
	HVAC Rough In	American Indoor	VAV delivery 2/25	Y		
	Security Requirments for Building	Dan Motl	Install security	Y		
	Electrical	Electri-Tec	Continue rough in	Y		
	Sprinkler	Hooper	Rough In	Y		
	Studs and Drywall	Joe	Hang drywall/insulate wall	Y		
	3rd Floor Build out	Joe	Start door frames and studs	Y		
	Tape and Prime	Livesey		Y		

Last Planner Example CSHP PPC Trend Chart



Last Planner Example CSHP Plan Failure Chart



Last Planner Coaching

Last Planner Score Card

Project Name _____ **Project #** _____

Legend: ○- Not used ◑ - Needs improvement ● - Used well

Score	Item	Comments
	PPC (5 min)	
○	PPC is measured	
○	Plan failures are probed	
○	Review PPC trend	
	Lookahead Plan (15 min)	
○	A lookahead plan is utilized	
○	The team is prepared	
○	Dialogue on conflict occurs	
○	Activity screening is utilized	
	Constraint Analysis (included above)	
○	Constraints analysis is conducted	
○	Constraints are clearly defined	
○	Responsibility for constraint removal is clear	
	Commitment Plan/WWP (35 to 40 min)	
○	A commitment plan is developed	
○	Commitments are specific and clear	
○	Responsibilities and due dates are understood and freely agreed to	
○	Workable backlog is identified	
	Meeting Efficiency	
○	Meeting was a reasonable length	
○	Ground rules were utilized	
○	Formal feedback was sought	

Recommendations

Distribution

Project Mgr	Facilitator	Superintendent	
Group Mgr	VP Gen Mgr	VP Production	Paul Reiser
Regional Resource Specialist			

Last Planner Meeting

Purpose

- Plan and control reliable production of work

Steps or Process

- Measure progress and learn how to plan better
- Shape work flow by understanding interdependencies
- Identify constraints
- Generate commitment for next week's work plan

Ground Rules

- Be on time for the meeting
- Be prepared
  - Will you finish last week's commitments.
  - What work is coming within the next six weeks.
  - What are your constraints?
- Plan to understand interdependencies and identify constraints. Do not plan to resolve constraints.
- Make commitments, do not use "I hope…"
- If you can't do it say so! (and tell us why)
- Turn off cellular phones
- Practice common courtesy
- Use "parking lot" or "issues board" for topics not requiring everyone's involvement.
- Evaluate the meetings once per month (+/Δ)

Outside the Last Planner Meeting

Score	Item	Comments
○	Master Schedule is updated regularly	
○	Master Schedule is divided into logical phases	
○	Phase schedules are developed and updated by the appropriate team (subs, designers, etc.)	
○	PPC trends are analyzed and appropriate action is taken	
○	Plan failures are summarized, root cause analysis is conducted and action is taken	

Recommendations

C:\Lean\UW - Madison Class\Week 4\Last Planner Score Card Updated Template.doc

Last Planner Coaching

Last Planner Meeting

Purpose

- Plan and control reliable production of work

Steps or Process

- Measure progress and learn how to plan better
- Shape work flow by understanding interdependencies
- Identify constraints
- Generate commitment for next week's work plan

Ground Rules

- Be on time for the meeting
- Be prepared
    - Will you finish last week's commitments.
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Last Planner Coaching

Score	Item	Comments
	PPC (5 min)	
○	PPC is measured	
○	Plan failures are probed	
○	Review PPC trend	
	Lookahead Plan (15 min)	
○	A lookahead plan is utilized	
○	The team is prepared	
○	Dialogue on conflict occurs	
○	Activity screening is utilized	
	Constraint Analysis (included above)	
○	Constraints analysis is conducted	
○	Constraints are clearly defined	
○	Responsibility for constraint removal is clear	
	Commitment Plan/WWP (35 to 40 min)	
○	A commitment plan is developed	
○	Commitments are specific and clear	
○	Responsibilities and due dates are understood and freely agreed to	
○	Workable backlog is identified	
	Meeting Efficiency	
○	Meeting was a reasonable length	
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Last Planner Coaching

Outside the Last Planner Meeting

Score	Item	Comments
○	Master Schedule is updated regularly	
○	Master Schedule is divided into logical phases	
○	Phase schedules are developed and updated by the appropriate team (subs, designers, etc.)	
○	PPC trends are analyzed and appropriate action is taken	
○	Plan failures are summarized, root cause analysis is conducted and action is taken	

Recommendations

The Last Planner process

Facilitating the right conversations
with the right people
at the right time

Questions?

Jeff Niesen

Jeff.Niesen@Boldt.com

608-250-8414

LAST PLANNER

Monroe Clinic Northwest Addition Experience

CGSCHMIDT

Introduction

- Jeff Kenley – Senior Project Manager, CGS Monroe Clinic Northwest Addition
- Kyle Mainwaring – Assistant Project Manager Self-Perform Group and HVAC Manager
- Tony Buss – Assistant Project Manager Subcontractor Management and LEAN Leader

The Experience

- The Project
- How We Started
- Last Planner Start-up
- Implementation into Concrete
- Interior Pull Schedule
- Coordinating the Utility Connections
- Last Planner Documents

The Project

- Issued in Five Bid Packages
- Four Story – 235,000 SF
- New Emergency Department, Imaging, Operating Rooms, Pre/Post Op Rooms, Patient Rooms, ICU and Women's Center
- Parking and Exterior Improvements

The Project

- Server and Dinning Space
- New Main Entrance and Four Story Connector

How We Started

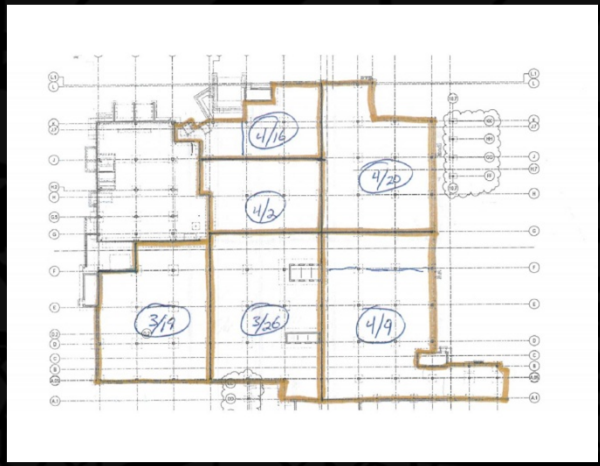
- Bid Packages #1 - #4
- Bid Schedule
- Subcontractor Input Schedule
- Subcontractors to Meet the Schedule
- “Push” Schedule

Last Planner Start-Up

- Bid and Awarded Bid Package #5
- Implemented LEAN and "Pull" Scheduling
- LEAN Project Consulting Presentation & Training
- 1st Pull Session – Structure & Exterior

Implementation into Concrete

- Building Challenges
- MEP Contract Awards
- Typical Push Schedule
- Pull Schedule for SOG
- Sequence Adjustment



Scheduling Elevated Decks

- 3-D Coordination
- Elevated Deck Pull Sessions
- Wood knockers

Interiors Pull Schedule

Four Levels

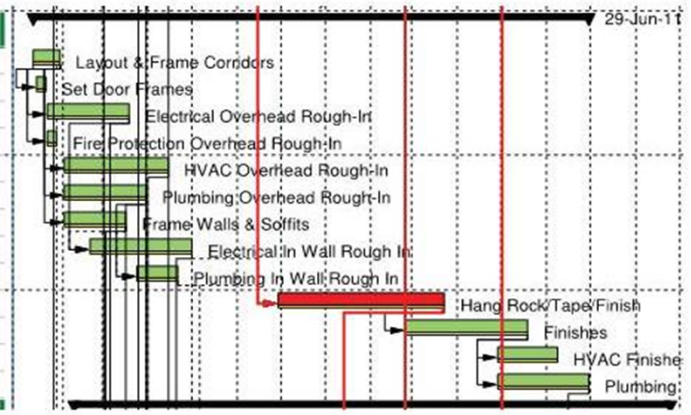
- Lower Level
  - Imaging, Pharmacy, ED, Cardio
- Lobby Level
  - Prep & Recovery, OR's, PT
- 1st Floor
  - Patient Rooms, ICU
- 2nd Floor
  - Patient Rooms, LDRP, Kitchen, Chapel

Traditional Schedule

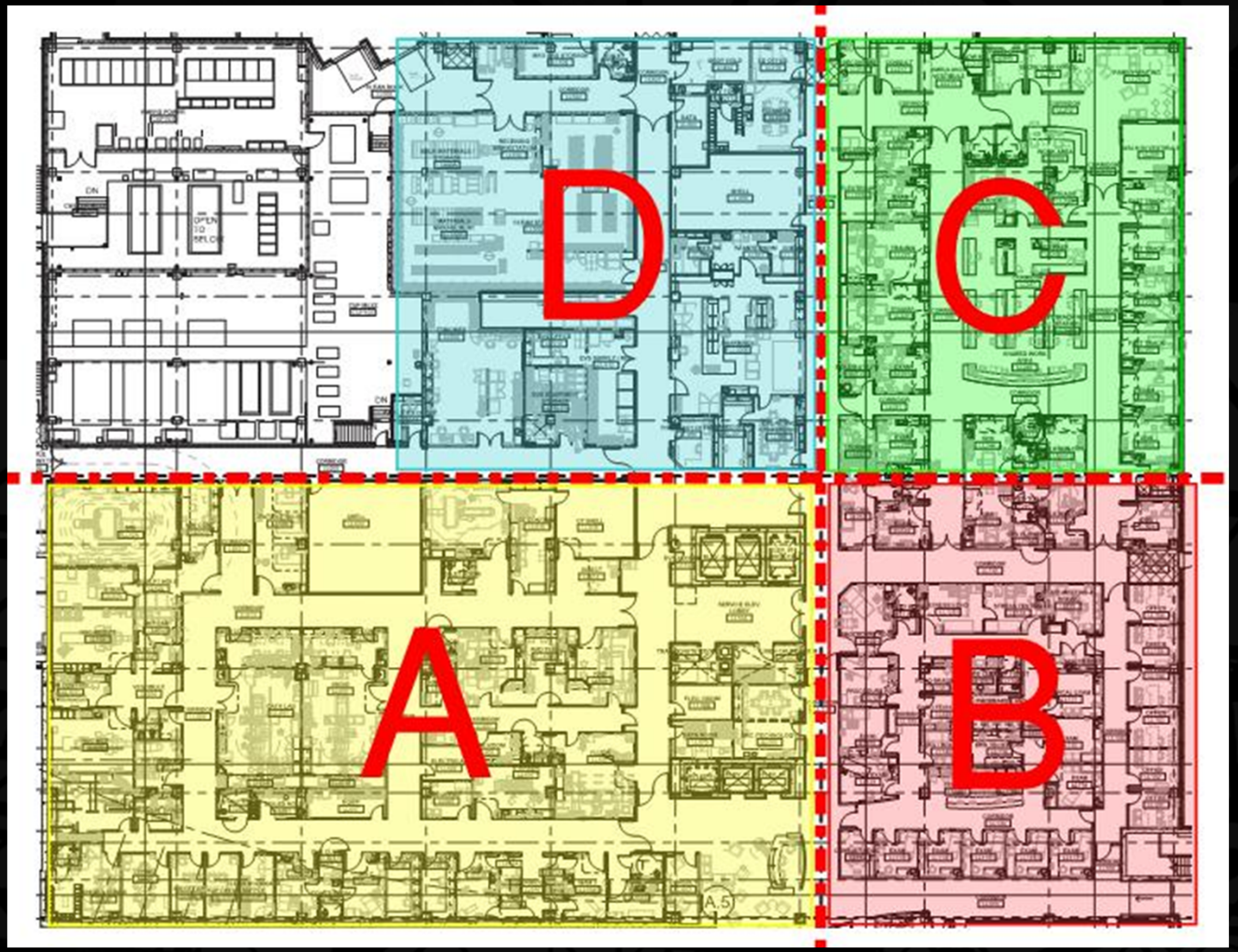
- Generalized
- Pre-Bid
- Estimated Sequence
- Estimated Durations

Pre-Construction Schedule - Lower Level

Lower Level		268d	14-Jun-10	29-Jun-11
A15490	Layout & Frame Corridors	15d	14-Jun-10*	02-Jul-10
A15500	Set Door Frames	5d	16-Jun-10	22-Jun-10
A15510	Electrical Overhead Rough-In	40d	24-Jun-10	19-Aug-10
A15520	Fire Protection Overhead Rough-In	5d	24-Jun-10	30-Jun-10
A15530	HVAC Overhead Rough-In	50d	06-Jul-10	14-Sep-10
A15540	Plumbing Overhead Rough-In	40d	06-Jul-10	30-Aug-10
A15550	Frame Walls & Soffits	30d	06-Jul-10	16-Aug-10
A15560	Electrical In Wall Rough In	50d	23-Jul-10	01-Oct-10
A15570	Plumbing In Wall Rough In	20d	24-Aug-10	21-Sep-10
A15580	Hang Rock/Tape/Finish	82d	29-Nov-10	23-Mar-11
A15590	Finishes	60d	24-Feb-11	18-May-11
A15600	HVAC Finishes	30d	28-Apr-11	08-Jun-11
A15610	Plumbing Finishes	45d	28-Apr-11	29-Jun-11



Division of Work Areas

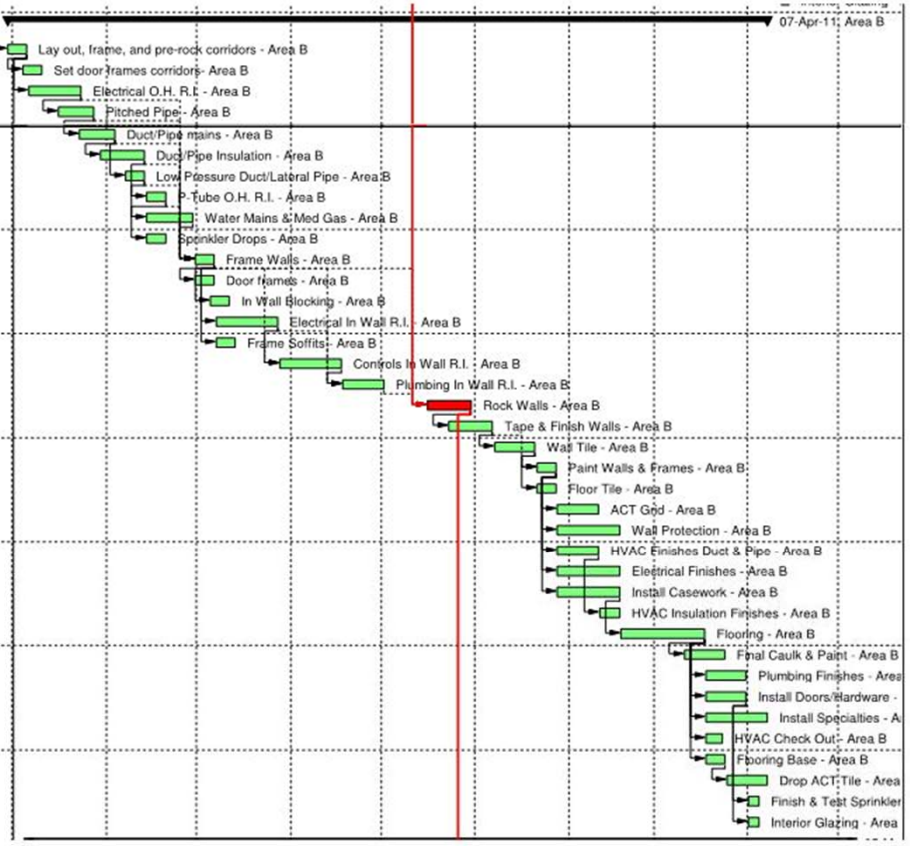


Pull Session

- Project Team Input
- Precise Durations
- Detailed Sequence
- Proactive Approach

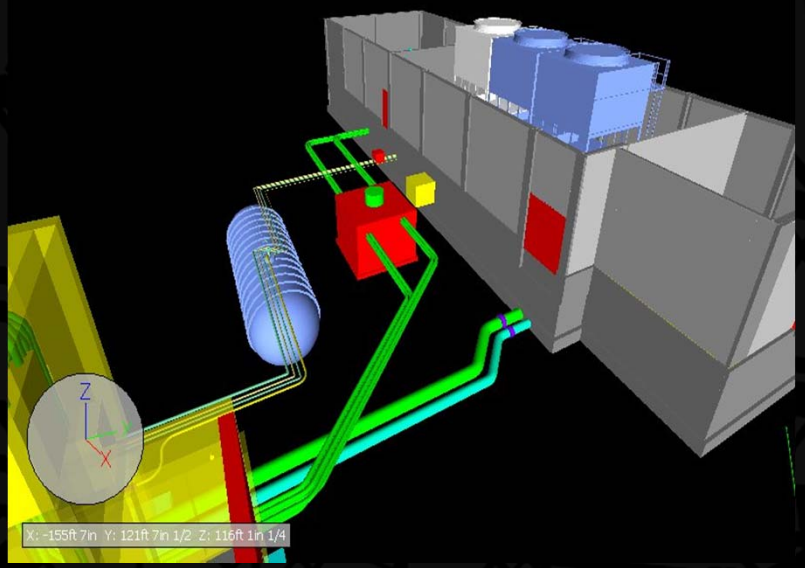
Lower Level Area B - Pull Session

Area B		176d	30-Jul-10	07-Apr-11	
A1390	Lay out, frame, and pre-rock corridors - Are...	5d	30-Jul-10	05-Aug-10	Hallmark
A1400	Set door frames corridors- Area B	5d	04-Aug-10	10-Aug-10	CGS
A1410	Electrical O.H. R.I. - Area B	12d	06-Aug-10	23-Aug-10	Faith
A1420	Pitched Pipe - Area B	10d	16-Aug-10	27-Aug-10	Hooper
A1430	Duct/Pipe mains - Area B	10d	23-Aug-10	03-Sep-10	NAMI
A1440	Duct/Pipe Insulation - Area B	10d	30-Aug-10	13-Sep-10	NAMI
A1450	Low Pressure Duct/Lateral Pipe - Area B	5d	07-Sep-10	13-Sep-10	NAMI
A1460	P-Tube O.H. R.I. - Area B	5d	14-Sep-10	20-Sep-10	Swisslog
A1470	Water Mains & Med Gas - Area B	12d	14-Sep-10	29-Sep-10	Hooper
A2330	Sprinkler Drops - Area B	5d	14-Sep-10	20-Sep-10	Ahern
A1480	Frame Walls - Area B	5d	30-Sep-10	06-Oct-10	Hallmark
A2560	Door frames - Area B	5d	30-Sep-10	06-Oct-10	
A1490	In Wall Blocking - Area B	5d	05-Oct-10	11-Oct-10	CGS
A1500	Electrical In Wall R.I. - Area B	15d	07-Oct-10	27-Oct-10	Faith
A1510	Frame Soffits - Area B	5d	07-Oct-10	13-Oct-10	Hallmark
A1530	Controls In Wall R.I. - Area B	15d	28-Oct-10	17-Nov-10	Masters
A1540	Plumbing In Wall R.I. - Area B	8d	18-Nov-10	01-Dec-10	Hooper
A1550	Rock Walls - Area B	10d	16-Dec-10*	30-Dec-10	Hallmark
A1560	Tape & Finish Walls - Area B	10d	23-Dec-10	06-Jan-11	Hallmark
A1580	Wall Tile - Area B	10d	07-Jan-11	20-Jan-11	????
A1590	Paint Walls & Frames - Area B	5d	21-Jan-11	27-Jan-11	HGS
A1600	Floor Tile - Area B	5d	21-Jan-11	27-Jan-11	????
A1610	ACT Grid - Area B	10d	28-Jan-11	10-Feb-11	Austad
A1620	Wall Protection - Area B	15d	28-Jan-11	17-Feb-11	CGS
A1630	HVAC Finishes Duct & Pipe - Area B	10d	28-Jan-11	10-Feb-11	NAMI
A1640	Electrical Finishes - Area B	15d	28-Jan-11	17-Feb-11	Faith
A1650	Install Casework - Area B	15d	28-Jan-11	17-Feb-11	CGS
A1660	HVAC Insulation Finishes - Area B	5d	11-Feb-11	17-Feb-11	NAMI
A1670	Flooring - Area B	20d	18-Feb-11	17-Mar-11	????
A1680	Final Caulk & Paint - Area B	10d	11-Mar-11	24-Mar-11	HGS
A1690	Plumbing Finishes - Area B	10d	18-Mar-11	31-Mar-11	Hooper
A1700	Install Doors/Hardware - Area B	10d	18-Mar-11	31-Mar-11	CGS
A1710	Install Specialties - Area B	15d	18-Mar-11	07-Apr-11	CGS
A1720	HVAC Check Out - Area B	4d	18-Mar-11	23-Mar-11	Masters
A1730	Flooring Base - Area B	5d	18-Mar-11	24-Mar-11	????
A1740	Drop ACT Tile - Area B	10d	25-Mar-11	07-Apr-11	Austad
A1750	Finish & Test Sprinklers - Area B	2d	01-Apr-11	04-Apr-11	Ahern
A1760	Interior Glazing - Area B	2d	01-Apr-11	04-Apr-11	K-D

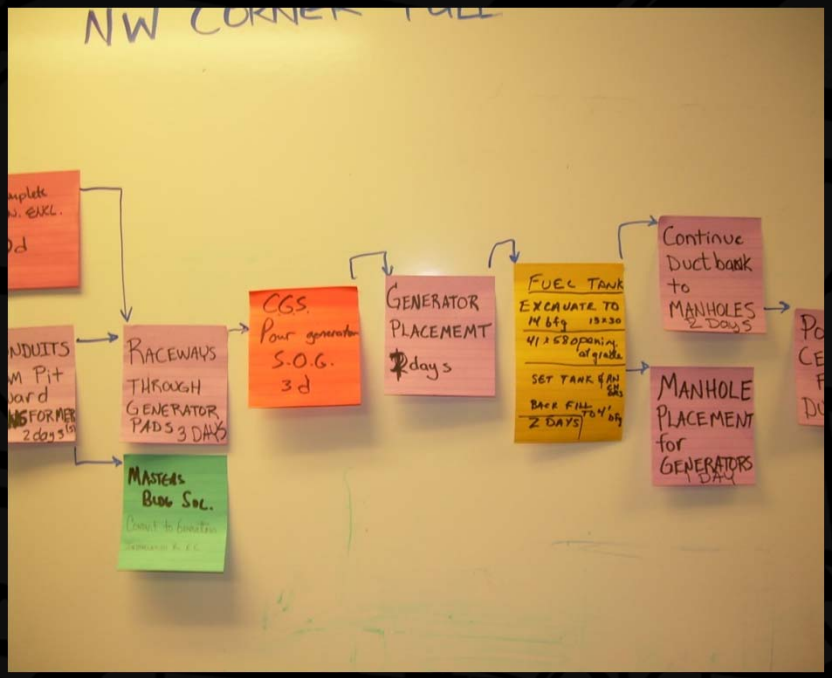


Coordinating the Utility Connections

- MEP Site Utility Yard
  - Multiple Trade Coordination
  - Start – Finish Schedule
  - Subcontractor Requested



Coordinating the Utility Connections

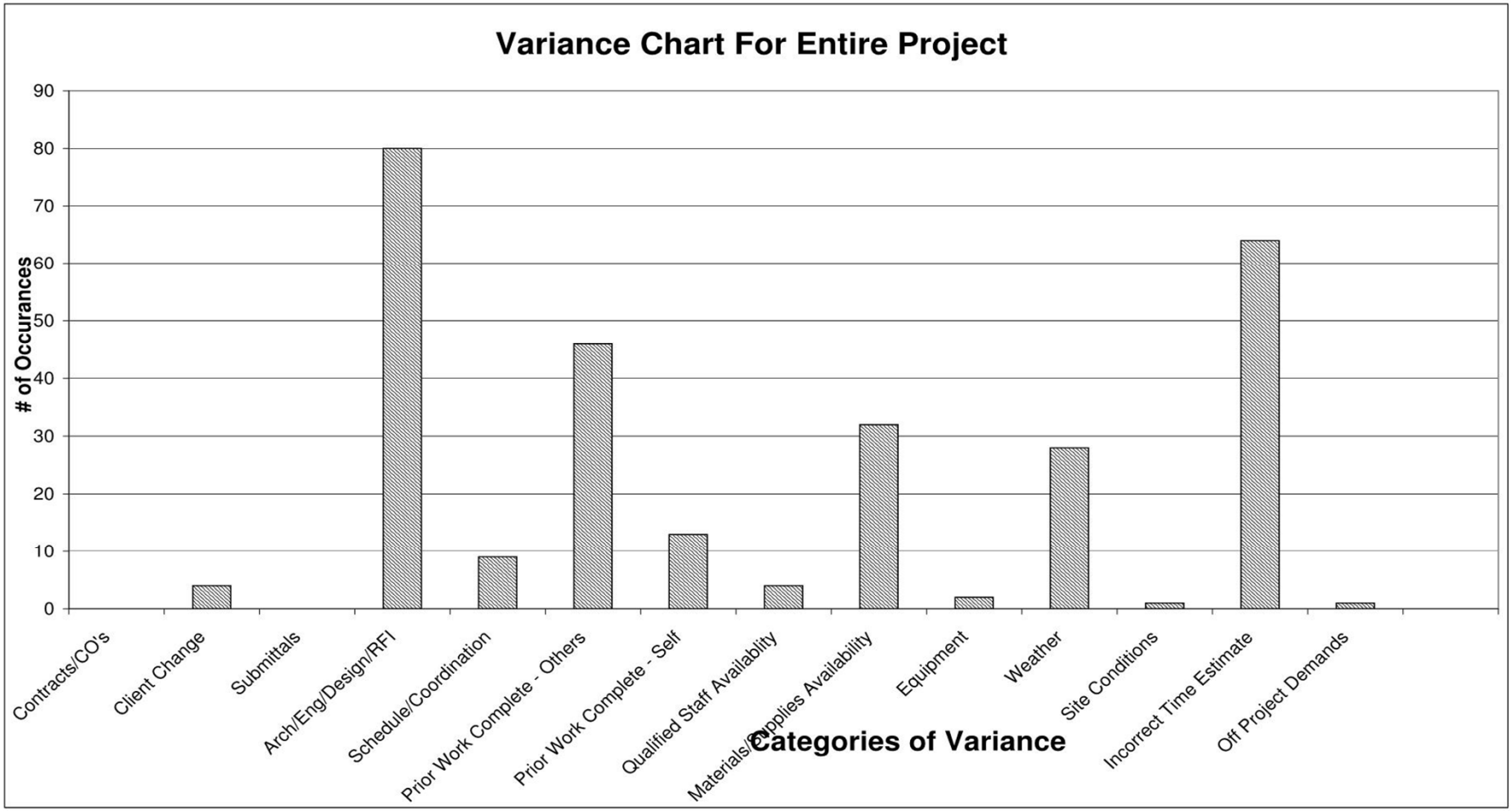


Weekly Work Plan

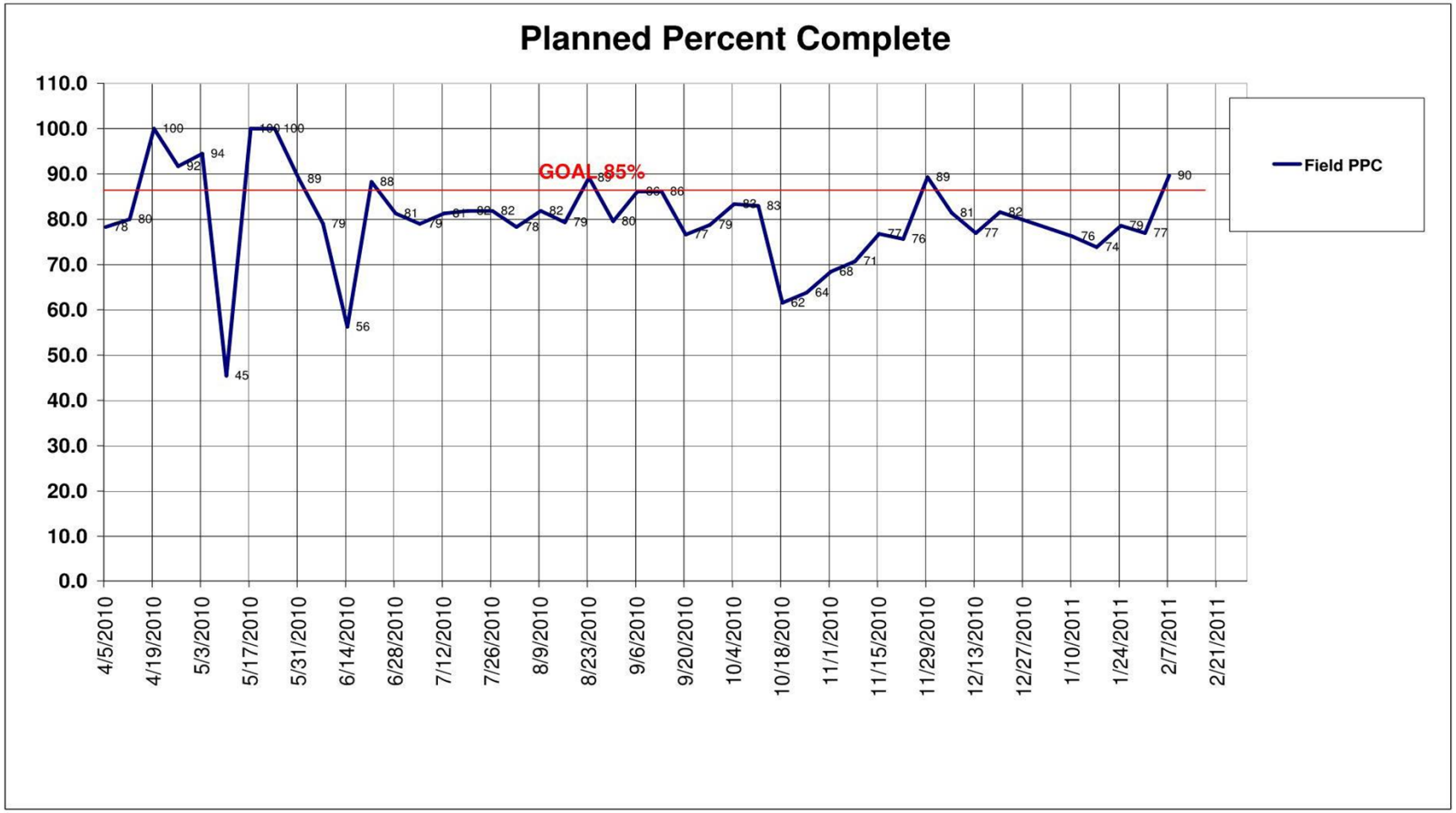
WEEKLY WORK PLAN

	GROUP	**C G SCHMIDT - KAHLER SLATER**		CATEGORIES OF VARIANCE								TOTAL ACTIVITIES	42		
	PROGRAM	**MONROE CLINIC**		1	Contracts/CO's			8	Qualified Staff Availabi			ACTIVITIES COMPLETED	32		
	PROJECT	**NORTHWEST ADDITION**		2	Client Change			9	Materials/supplies avai			PERCENT PLANNED COMPLETE	**76%**		
	PROJECT NUMBER	**080188**		3	Submittals			10	Equipment						
	RESPONSIBLE INDIVIDUAL	**ROD MARRON**		4	Arch/Eng/Design/RFI			11	Weather						
				5	Schedule/Coordination			12	Site Conditions						
				6	Prior Work Complete - Othe			13	Incorrect Time Estimat						
				7	Prior Work Complete - Self			14	Off Project Demands						
REPEAT	ASSIGNMENT DESCRIPTION	RESPONSIBLE PARTY	COMMENTS	STARTING ON		**10-Jan-11**				DONE?		**PPC ANALYSIS**			
				Mon	Tue	Wed	Thu	Fri	Sat	YES	NO	REASONS FOR VARIANCE	Cate-gory		
				10-Jan	11-Jan	12-Jan	13-Jan	14-Jan	15-Jan						
	LOBBY LEVEL SOFFIT SOUTH	**AUSTAD**		X							X	HALLMARK / NATIONS	6		
	2ND FLOOR CONNECTOR SOFFIT SOUTH	**AUSTAD**		X	X	X	X	X			X		6		
	FRAME CLINIC CONNECTOR	**CGS**		X	X	X	X	X		X					
	DOOR FRAMES LOWER LEVEL - AREA C	**CGS**		X	X	X				X					
	WALL BLOCKING - LOBBY LEVEL AND LOWER LEVEL	**CGS**		X	X	X	X			X					
	BREAK DOWN GENERATOR ENCLOSURE WALL FORMS	**CGS**		X	X					X					
	PANELS AND CONDUIT IN CUP	**FAITH**		X	X	X	X	X		X					
	IN WALL ROUGH IN LOWER LEVEL (ALL AREAS WHERE AVAILABLE)	**FAITH**		X	X	X	X	X			X	DESIGN CHANGE PENDING	4		
	OVERHEAD ROUGH IN ON 2ND FLOOR	**FAITH**		X	X	X	X	X		X					
	MISC CONDUIT ON LOBBY LEVEL	**FAITH**		X	X	X	X	X		X					
	LOWER LEVEL - SOFFITS AND BULKHEADS	**HMARK**		X	X	X	X	X		X					
	Z-FURRING & PLYWOOD - NORTH CONNECTOR	**HMARK**		X	X	X	X				X	JPC	6		
	INSTALLING WATER MAIN ON 1ST FLOOR AREA B	**HOOPER**		X	X	X	X	X		X					
	TESTING MED GAS ON LOBBY LEVEL	**HOOPER**		X	X	X				X					
	INSTALLING MED GAS IN WALL LOWER LEVEL IN AREA C	**HOOPER**		X	X	X	X	X		X					
	INSTALLING PITCH PIPE AND HANGERS IN CUP	**HOOPER**		X	X	X	X	X		X					
	START MED GAS IN WALL AREA A - LOBBY LEVEL	**HOOPER**		X	X	X	X	X			X	OWNER	4		
	HANGERS ON 1ST FLOOR AREA B BEHIND DUCT INSULATION	**HOOPER**		X	X	X	X	X		X					
	INSULATION ON LOWER LEVEL MAINS	**HOOPER**		X	X	X	X	X		X					
	IN WALL AREA B LOBBY LEVEL ON WATER AND WASTE	**HOOPER**		X	X	X	X	X		X					
	CONNECTOR GLASS	**KD**		X	X	X				X					
	INSTALL SUNSCREENS	**KD**		X	X	X	X	X		X					
	LB - INSTALL VAV BOX CONTROLLERS - WESTPHAL	**MASTER**		X	X	X	X	X		X					
	LB - MISC STAT ROUGH IN - WESTPHAL	**MASTER**		X	X	X	X	X		X					
	RA/SA DUCT MAINS 1ST - C AREA	**NAMI**		X	X	X				X					
	INSTALL F/S DAMPERS PENTHOUSE	**NAMI**		X	X					X					
	AHU-1 OVERHEAD DUCT ROUGH PENTHOUSE	**NAMI**		X	X	X	X			X					
	CORING HOLES FOR PIPING IN BLOCK WALLS CUP	**NAMI**		X	X						X		13		

Variance Chart



WWP - Percent Complete



Constraint Log

CGSCHMIDT

MASTER CONSTRAINT LOG

	GROUP	C G SCHMIDT - KAHLER SLATER
	PROGRAM	MONROE CLINIC
	PROJECT	NORTHWEST ADDITION
	PROJECT NUMBER	080188
	RESPONSIBLE INDIVIDUAL	ROD MARRON

CONST #	CONSTRAINT DESCRIPTION	DATE IDENTIFIED	IDENTIFIED BY	NEEDED BY	6-WEEK LOOK-AHEAD ID #	RFI#	RESPONSIBLE PARTY	ACTUAL COMPLETED DATE
99	NO SECURITY PLANS FOR CONSTRUCTION	7/28/10	FAITH	8/16/10	A18320		OWNER	
144	DNR PERMIT APPROVAL - BOILER STACK HEIGHT	10/21/10	NAMI	11/30/10		299	A/E	
151	EWC-1 SELECTION BY OWNER	12/2/10	HOOPER	12/17/10	A18350	463	OWNER	
160	DECISION ON HEADWALL	12/22/10	HOOPER	1/10/11	A20690		A/E & OWNER	
161	EQUIPMENT LAYOUT ROOMS: L409, L408, L406, L407, L602 (CB #19)	12/22/10	HOOPER	1/10/11	A19130	519	A/E & OWNER	
163	FIRE DAMPER NUMBER SEQUENCING	12/8/10	NAMI	3/14/11			OWNER	
166	CB-17 APPROVAL TO PROCEED WITH CHANGES	1/3/11	NAMI	1/19/11			OWNER	
167	NO UPS PLANS	1/13/11	FAITH	1/20/11			OWNER	
169	OR APPROVAL	1/13/11	FAITH	1/20/11	A23600		OWNER	
172	GRC ROOM LAYOUT (CB #19)	2/3/11	FAITH	2/10/11			A/E & OWNER	
173	ANGIO ROOM GLASS DOOR DECISION	1/26/11	CGS	2/10/11		534	OWNER	
174	ADDED CHEMICAL TREATMENT TO CHUTE	1/26/11	HOOPER	3/1/11	A22610	562	OWNER	
175	STEEL RADIATION AT OR EXTERIOR WALL	2/9/11	NAMI	3/14/11	A22580	552	A/E	
176	FPR AT EXTERIOR WALL IN REHAB GYM - L103A&B	2/9/11	NAMI	3/14/11	A23360	551	A/E	

LAST PLANNER

Questions & Answers

Plus	Delta
length of presentations was excellent	make sure schedule is correct
focused in on smaller pieces of lean	make powerpoints available ahead of time
discounted student faculty rate	provide a list of attendees - use LinkedIn
case studies of projects	
local people providing case studies	
sharing of information	
mix of participants (different professions)	
great attendance	
varied experiences, common process	