

THE ART OF THE BUILDER TAKT PLANNING & LAST PLANNER®

Jason Schroeder, Elevate Construction IST

Surfing the Wave of Lean Design and Construction

INSERT PRESENTATION DATE

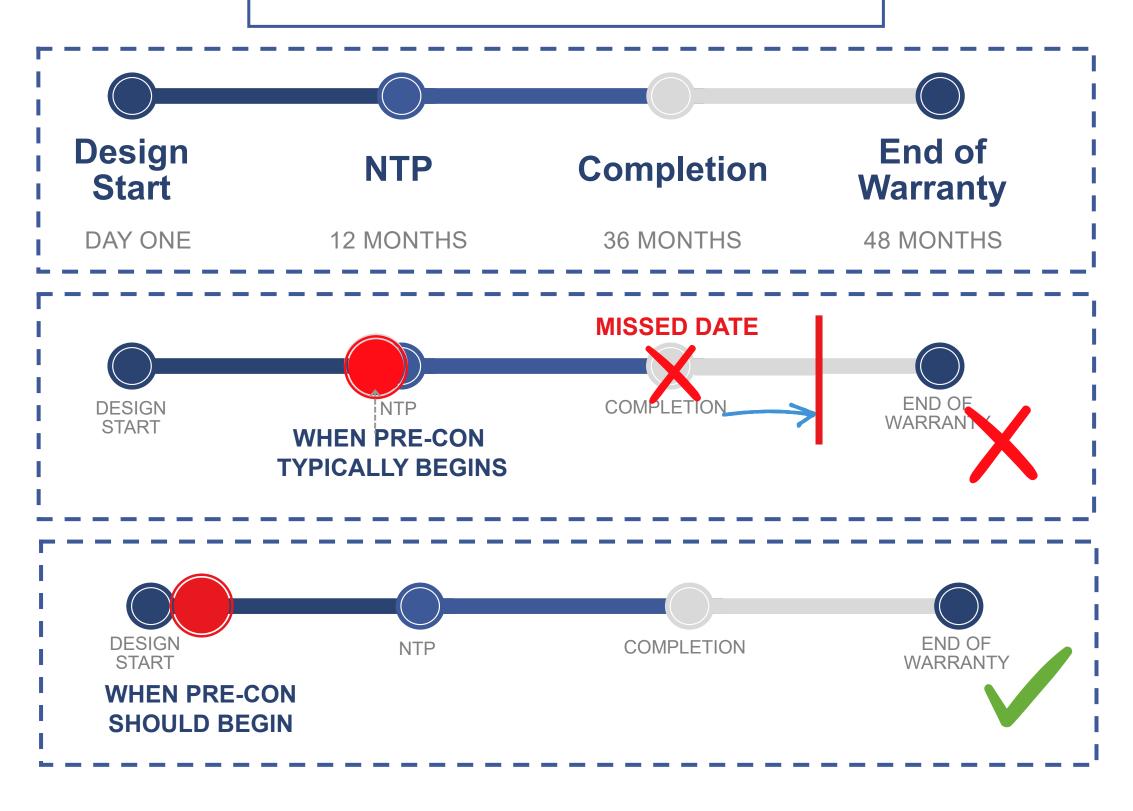


3 REASONS VALUE OF THE STATE OF



WHY PROJECTS GO WRONG

PLANNING PROJECTS



KEYS TO SUCCESS IN RUNNING REMARKABLE PROJECTS



- Anchor to past experience
- Assess and prevent risks
- Pixar Planning
- Include the builders



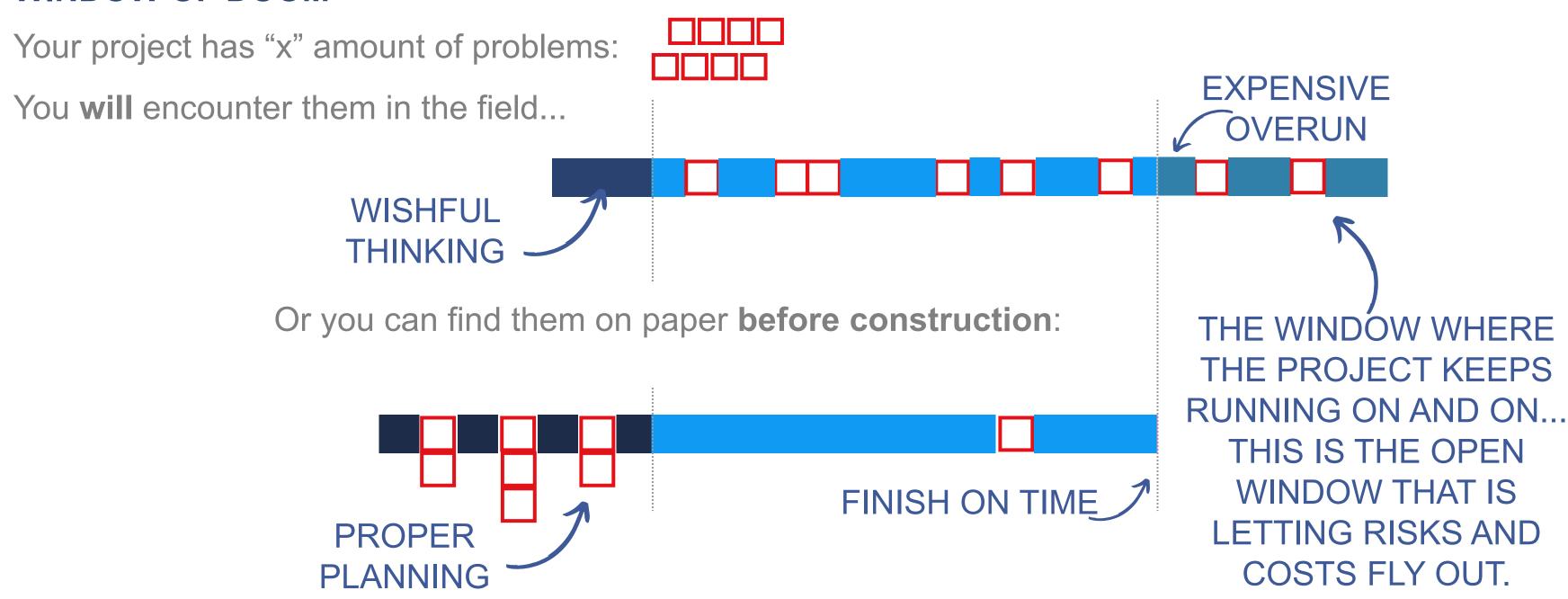
- Collaborate with trades
- Solve problems
- Adjust to unforeseen conditions

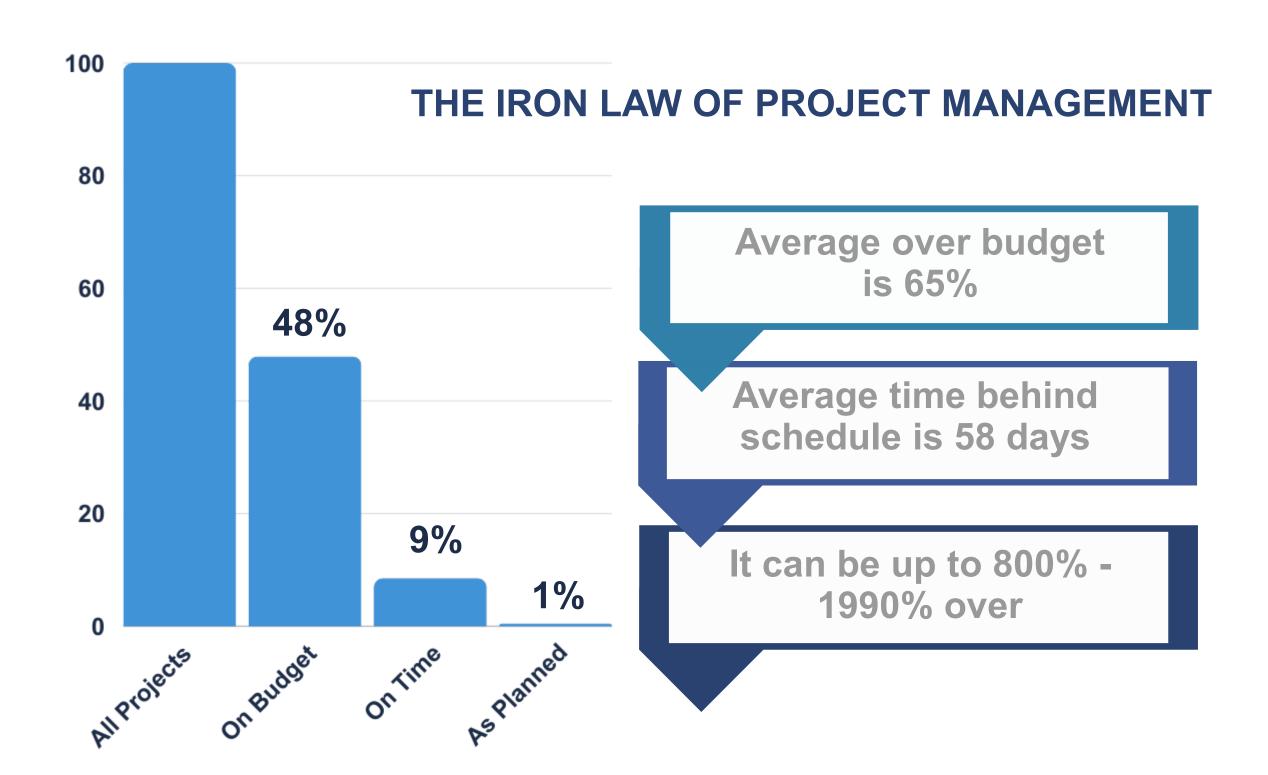


- Finish the work
- Commission systems
- Deliver the project as promised

WHY PROJECTS GO WRONG

WINDOW OF DOOM

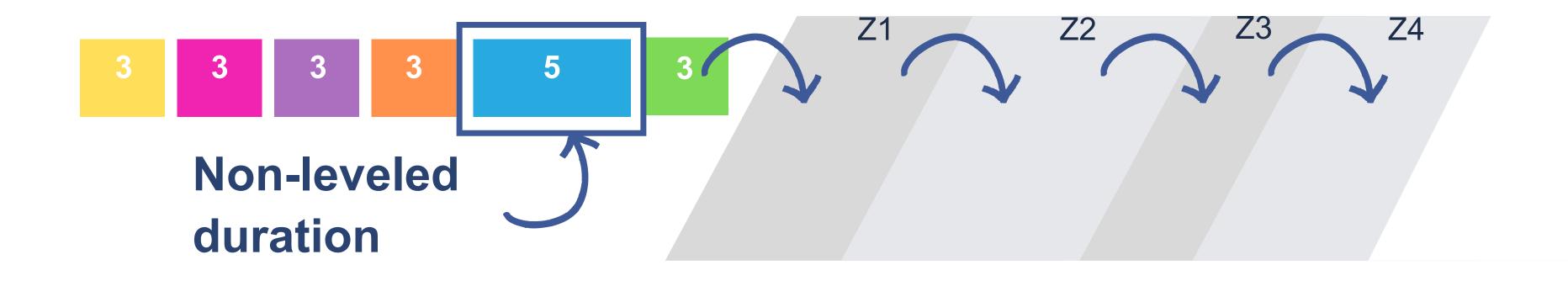




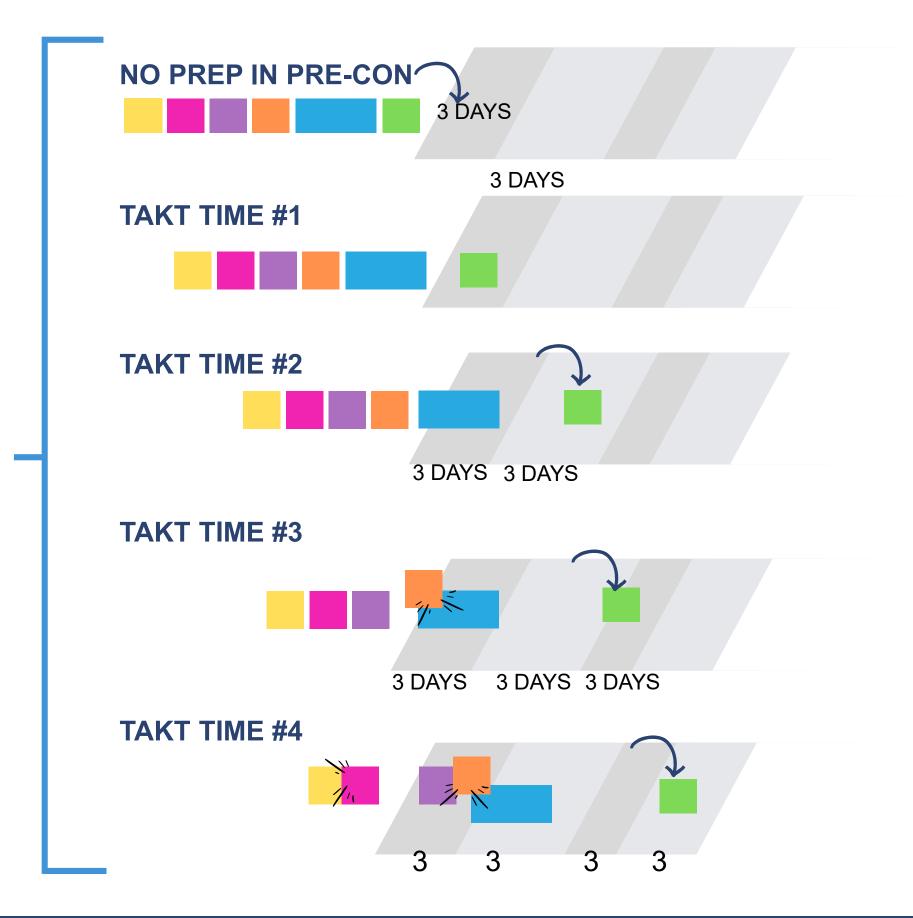
WHY PROJECTS GOWRONG

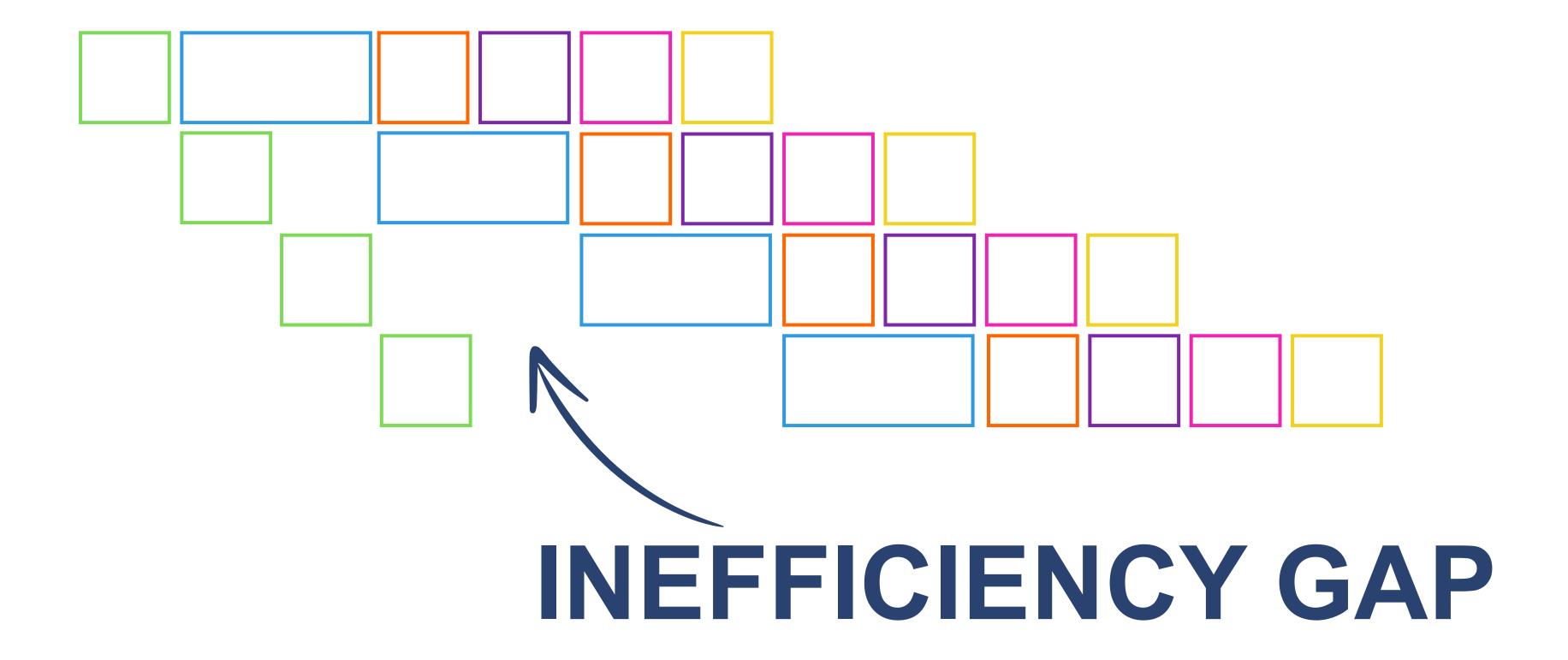
WHEN TRADES ARE NOT PACKAGED PROPERLY

WHEN TRADES ARE NOT PACKAGED PROPERLY



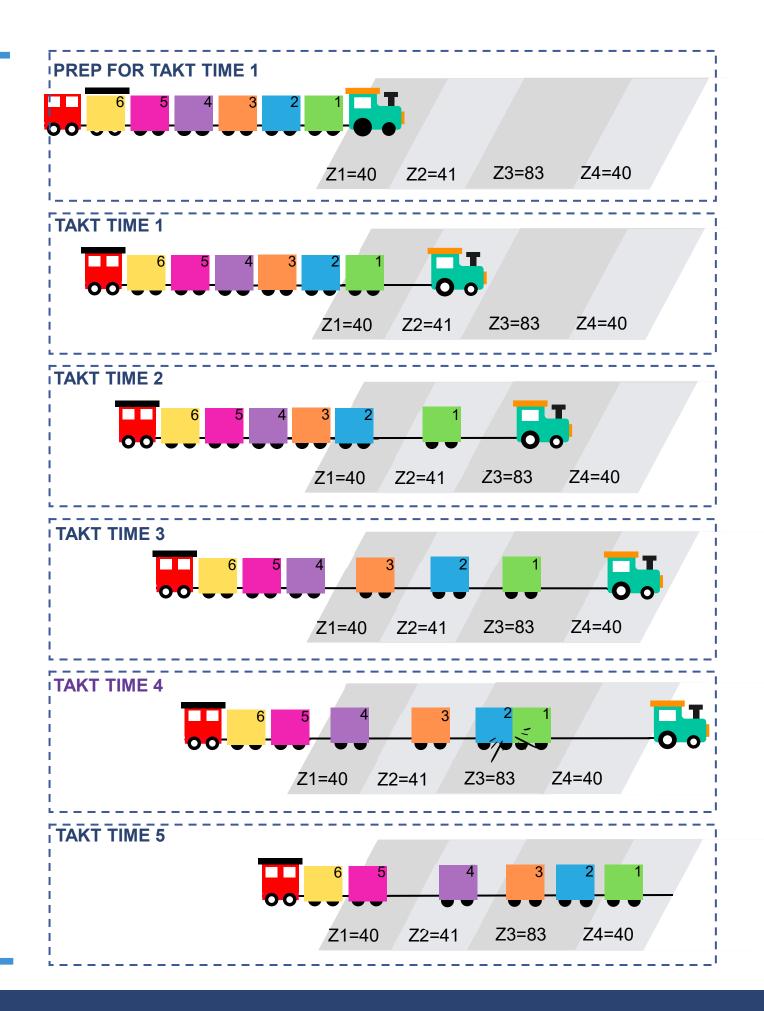
WITHOUT PROPER WORK PACKAGING FOR SPEED UP WITH THE FOLLOWING

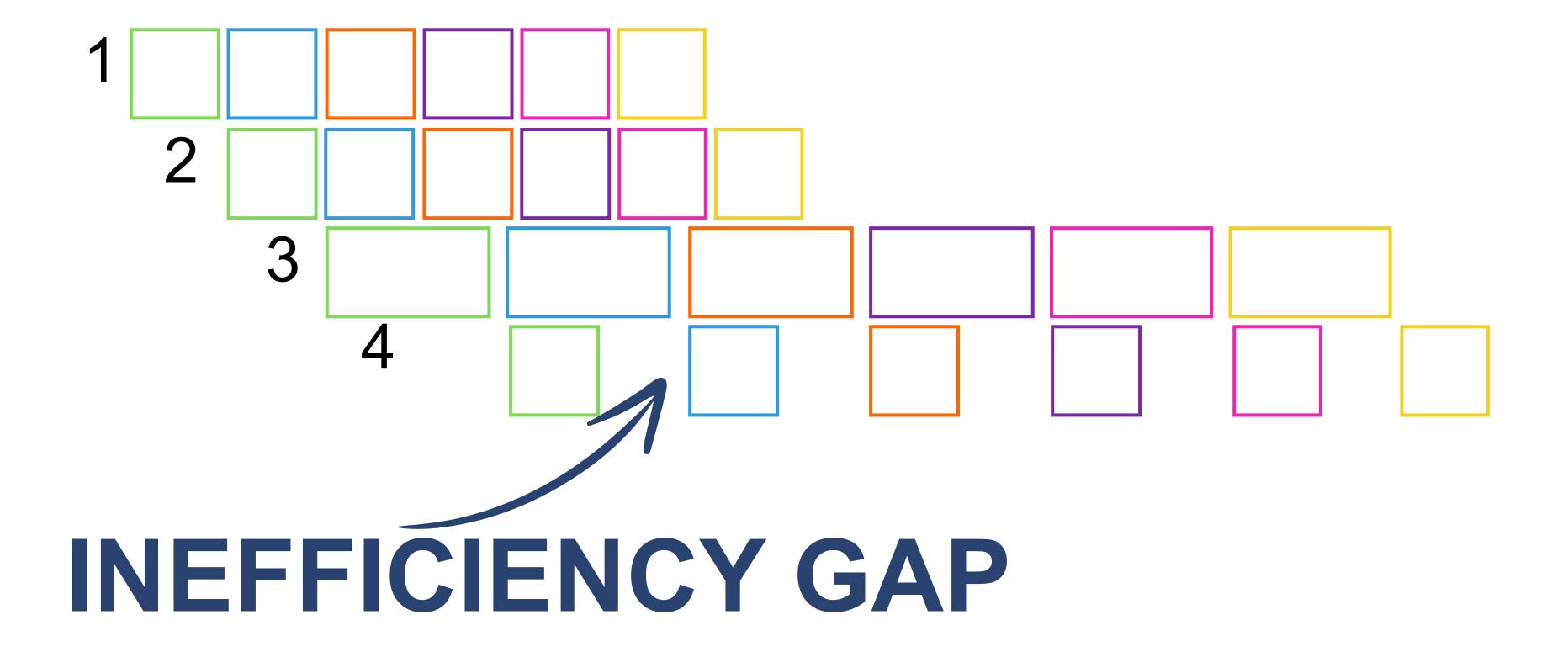




WHEN ZONES ARE NOT LEVELED

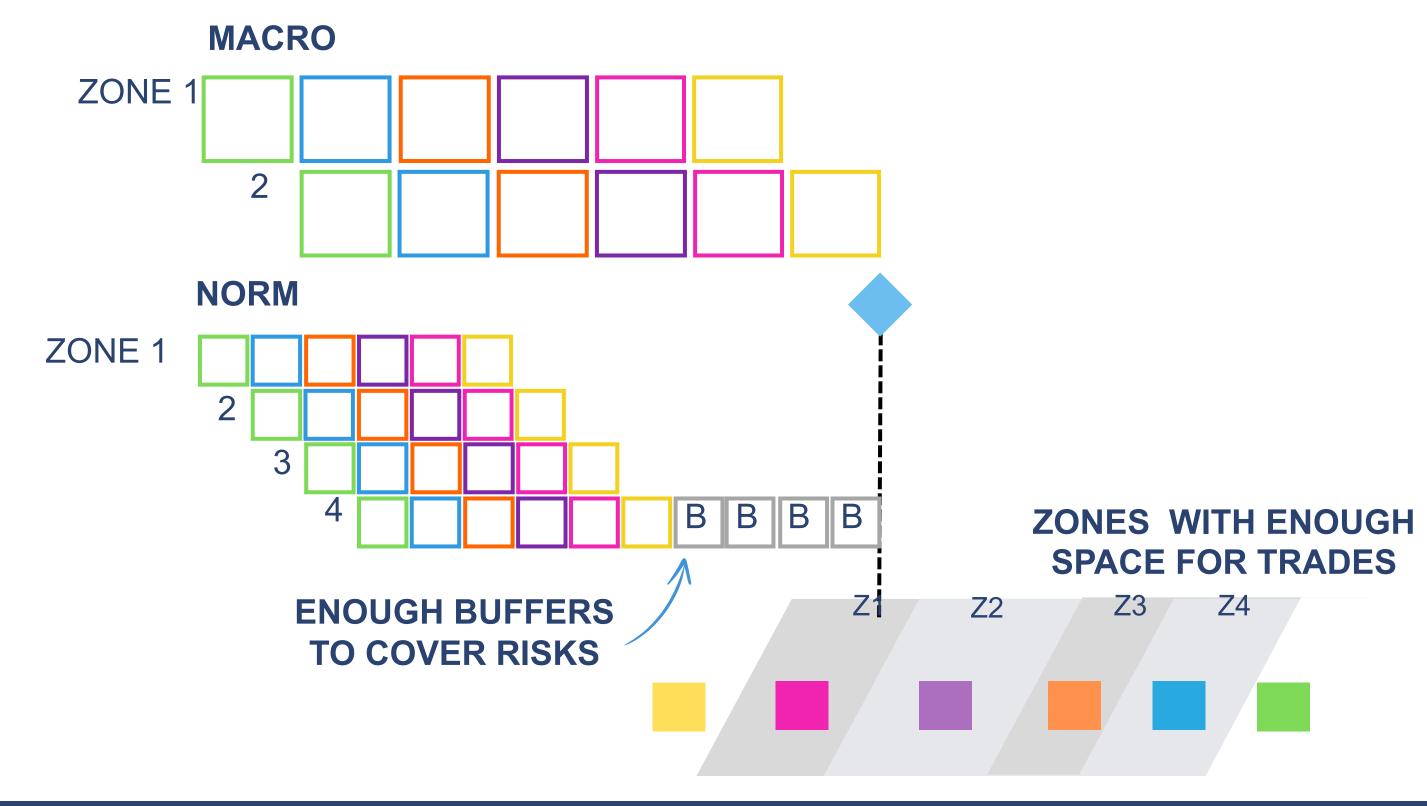
WHEN ZONES ARE NOT LEVELED



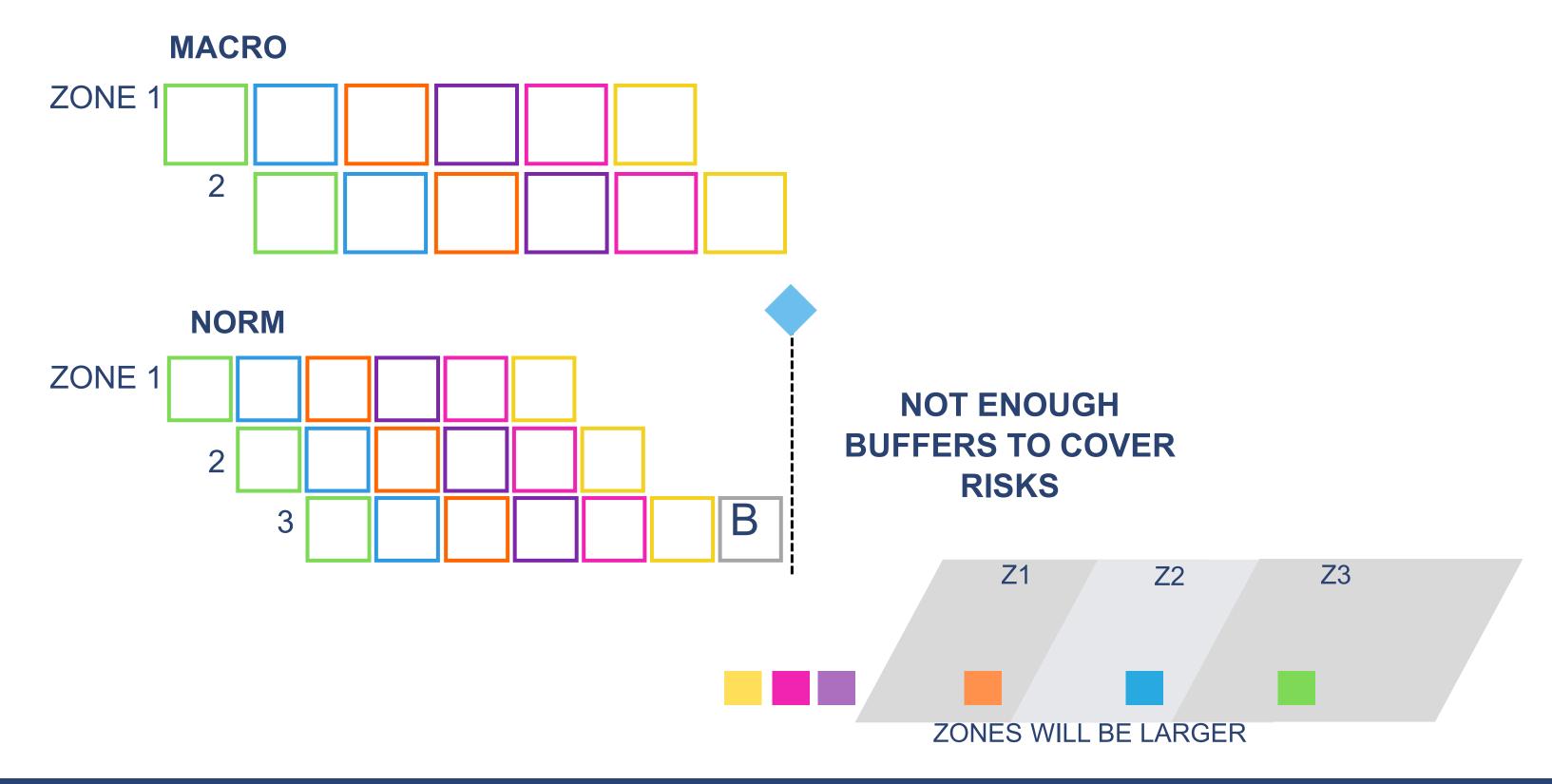


WHEN YOU DON'T HAVE THE RIGHT NUMBER OF ZONES

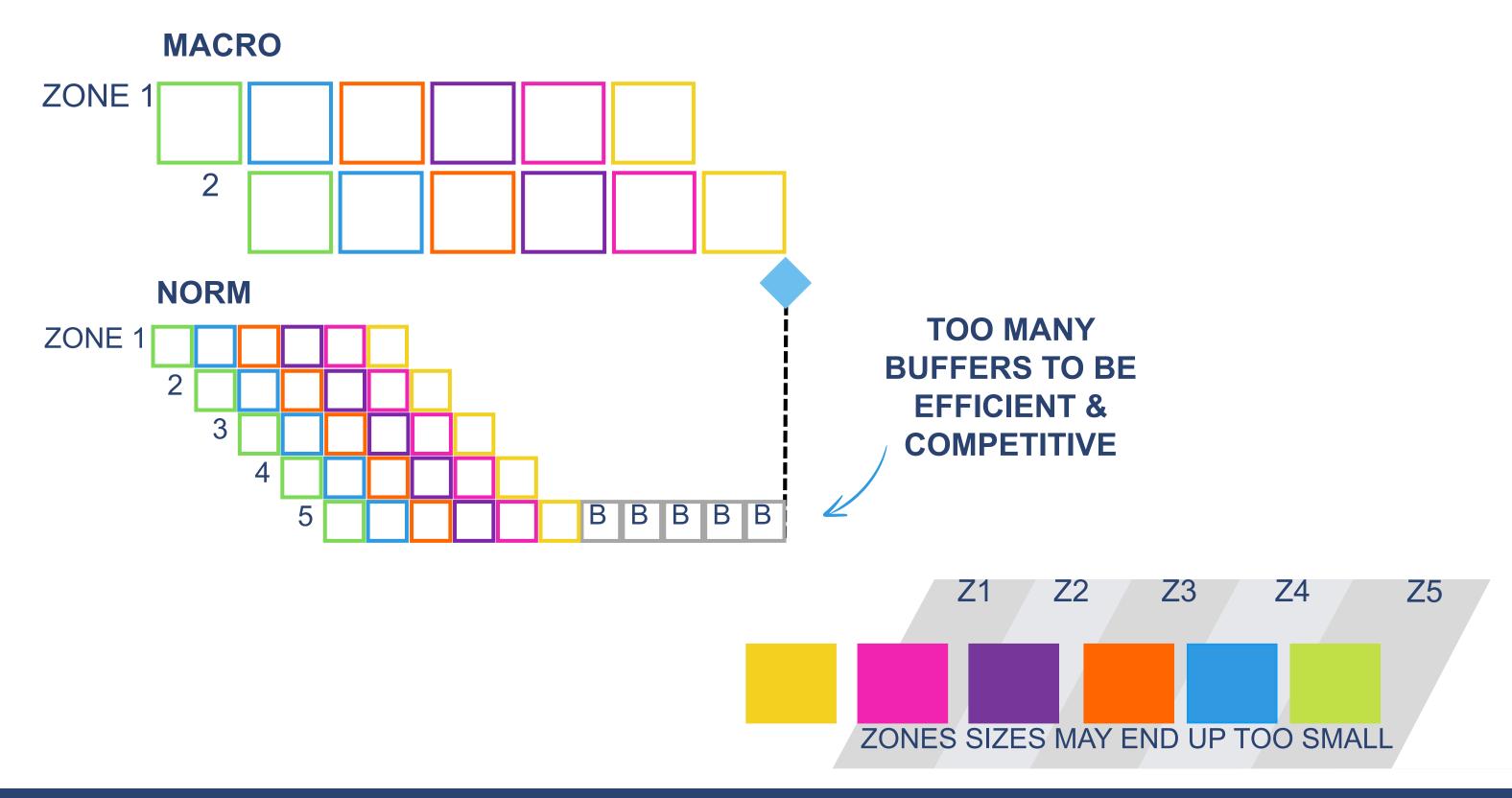
WHEN YOU DO HAVE THE RIGHT NUMBER OF ZONES



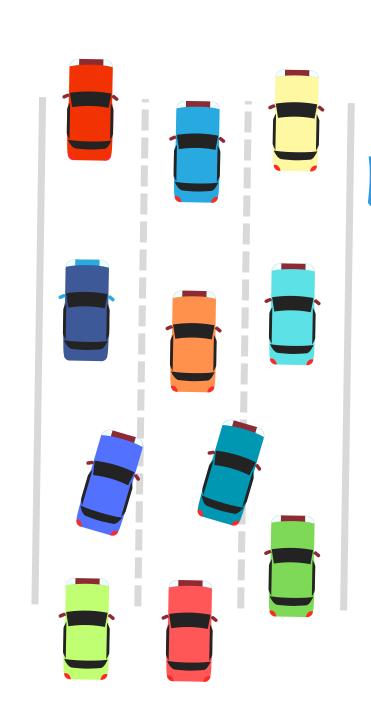
IF YOU HAVE TOO FEW ZONES:



AND IF YOU HAVE TOO MANY ZONES:



YOU MUST ALIGN WIP



YOU MUST ALIGN THE UTILIZATION OF A RESOURCE...

WITH THE CAPACITY OF THE RESOURCE

WHAT WHEN WE LIMIT WIP?

LOW RESOURCE UTILIZATION

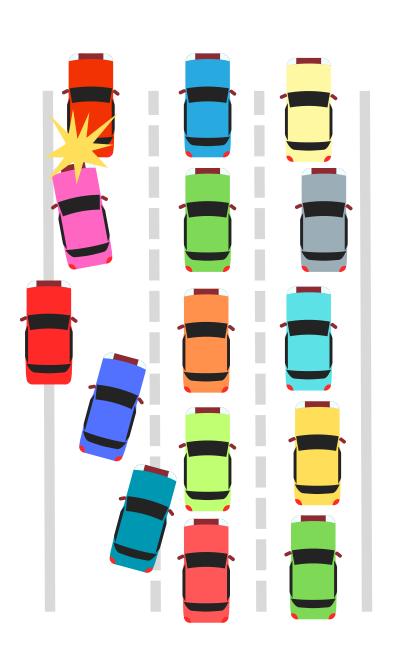
NO RESOURCE UTILIZATION

THIS IS BAD BECAUSE IT WASTES TIME AND CAPACITY

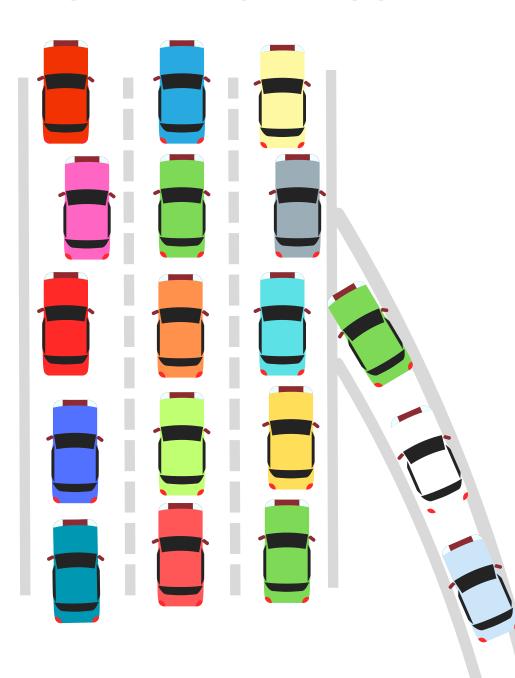
WHAT HAPPENS WHEN WE INCREASE WIP OVER CAPACITY?



HIGH RESOURCE UTILIZATION



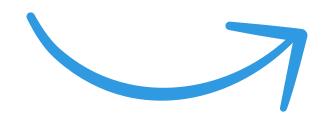
HIGH RESOURCE UTILIZATION PLUS

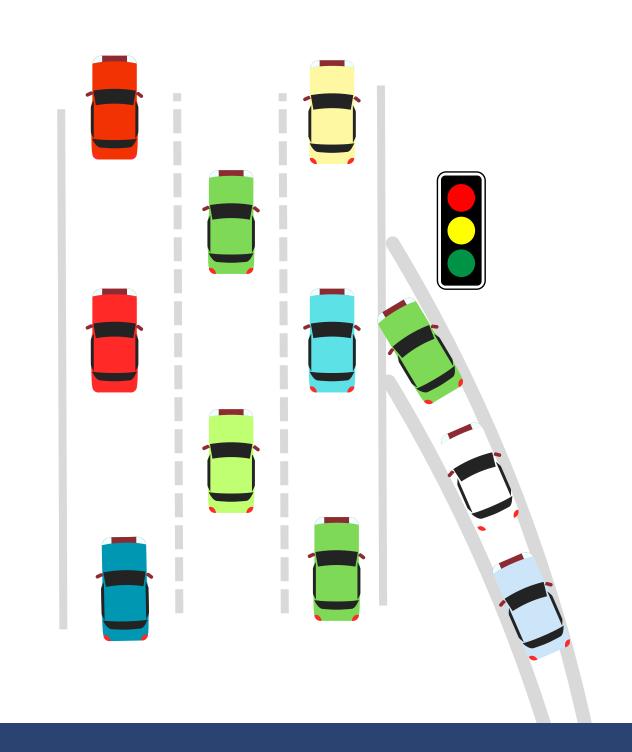


THIS IS BAD BECAUSE EVERYTHING SLOWS DOWN

WHAT WHEN WE ALIGN WIP?

THIS IS GOOD BECAUSE YOU HAVE BUFFERS FOR VARIATION, SHORTEN TRAVEL TIMES, AND MAINTAIN FLOW.







SO...

- IF WE WOULD NOT LIMIT FREEWAY TRAFFIC TO ZERO,
- WHY WOULD WE IN CONSTRUCTION?
- IF PACKING A FREEWAY ONLY MAKES EVERYONE'S TRAVEL TIME TAKE LONGER,
- WHY WOULD WE PACK A CONSTRUCTION SITE FULL?
- IF ADDING MORE CARS TO AN ALREADY PACKED FREEWAY OR BEHIND AN ACCIDENT ONLY MAKES IT WORSE,
- WHY WOULD WE ADD CREWS AND LABOR WHEN WE ARE IN TROUBLE WITH OUR SCHEDULE?



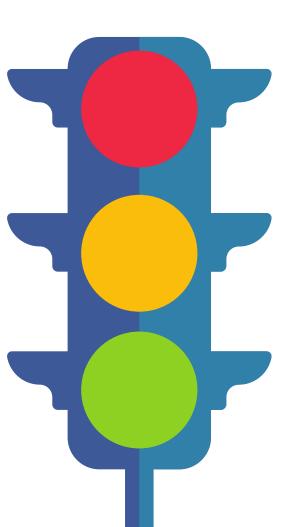




SO...

- DON'T LIMIT WIP
- DON'T INCREASE IT
- DON'T PUSH IT
- AND DON'T MEASURE CONSTRUCTION SUCCESS BY HOW MUCH WIP YOU CAN HAVE
- ALIGN YOUR WIP TO THE CAPACITY OF THE RESOURCE





LET'S START BY ANCHORING YOU TO THE LAST PLANNER® SYSTEM



THE LAST PLANNER® SYSTEM IS DESIGNED TO



Respect People ((()))



Collaborate





YOU WILL KNOW YOU HAVE IMPLEMENTED LAST PLANNER® IF YOU HAVE

WEEKLY MEETING PLAN



- A weekly meeting to maintain the master schedule.
- A meeting for pull, look-ahead, & weekly work plans.
- A daily huddle to coordinate work with the Foremen.

	MONDAY	TUESDAY	WEDNESDAY	THURSDAY	FRIDAY
м			NO MEETINGS		NO MEETINGS
М	WORKER DAILY HUDDLE	WORKER DAILY HUDDLE	WORKER DAILY HUDDLE	WORKER DAILY HUDDLE	WORKER DAILY HUDDLE
	CREW PREPARATION	CREW PREPARATION	CREW PREPARATION	CREW PREPARATION	CREW PREPARATION
М	SAFETY ORIENTATIONS			SAFETY ORIENTATIONS	
\M	TEAM WEEKLY	DAILY HUDDLE	DAILY HUDDLE	DAILY HUDDLE	DAILY HUDDLE
M	TACTICAL				
М				BIM COORDINATION	
AM		OAC MEETING			
M					
PM .	FOREMEN DAILY HUDDLE	FOREMEN DAILY HUDDLE	FOREMEN HUDDLE	FOREMEN DAILY HUDDLE	FOREMEN DAILY HUDDLE
M	STRATEGIC	TRADE PARTNER		COORDINATION	
PM . PM	PLANNING &	WEEKLY	3	MEETING	
PM	PROCUREMENT	2		PLACEHOLDER	
PM	1				

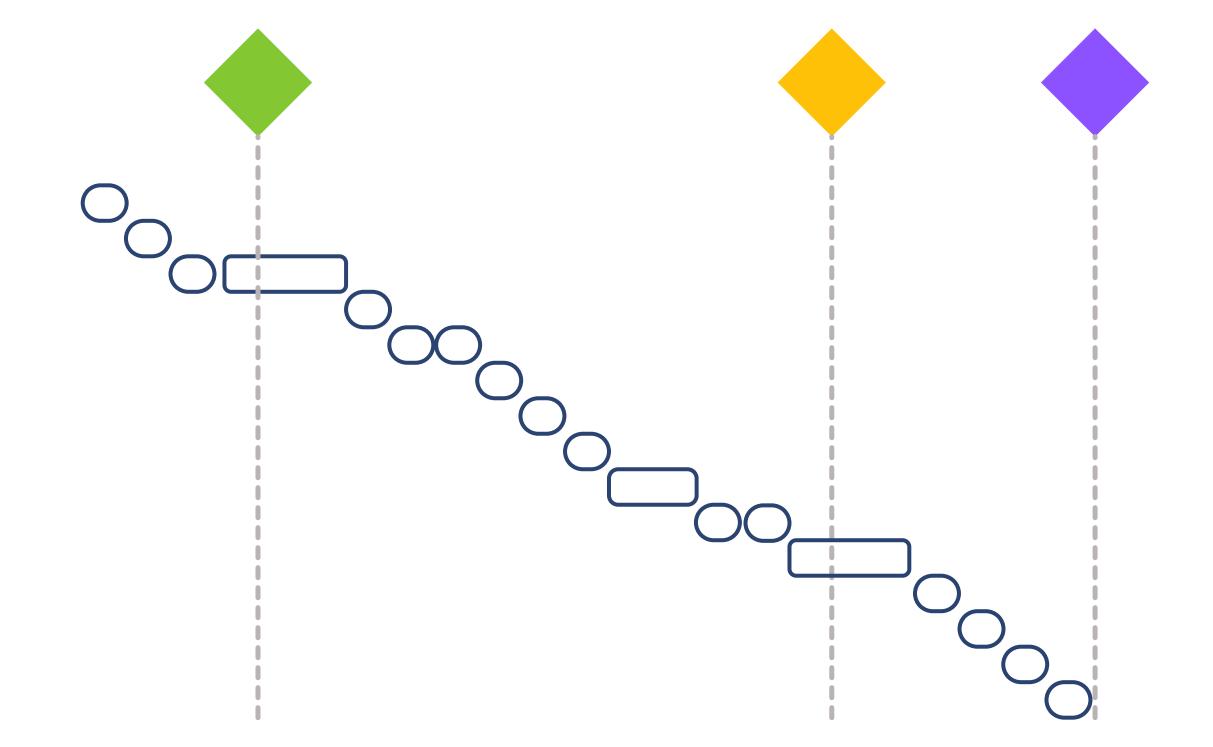


Trade Partners are respected, they are collaborating in meetings and with pull plans, and the focus is to see as a group, plan as a group, and act as a group.



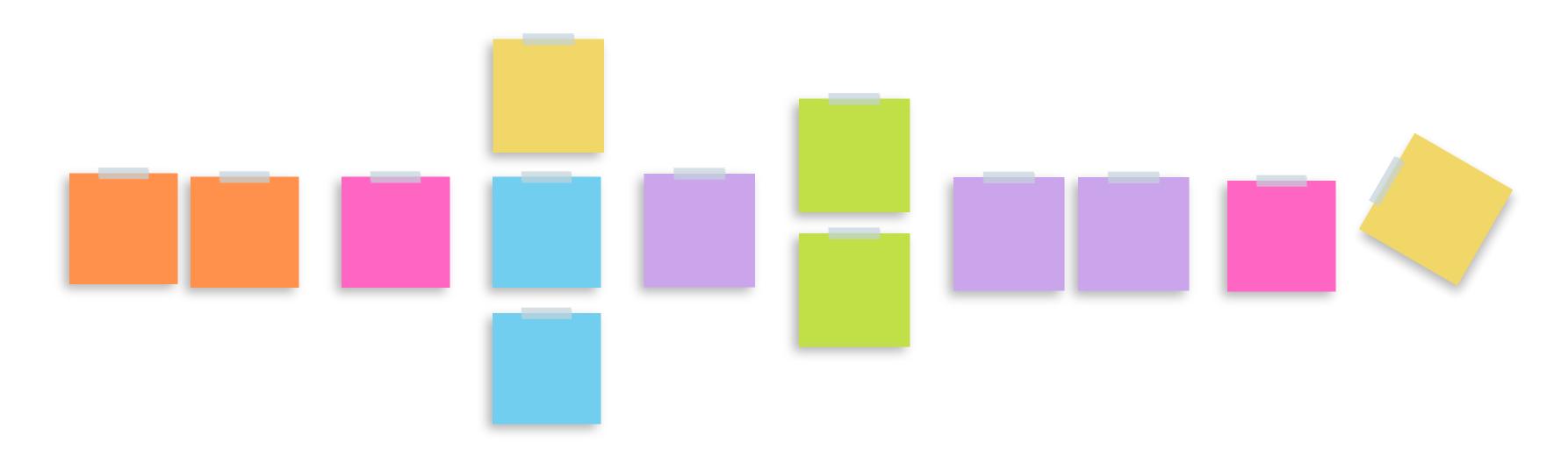


MASTER SCHEDULE

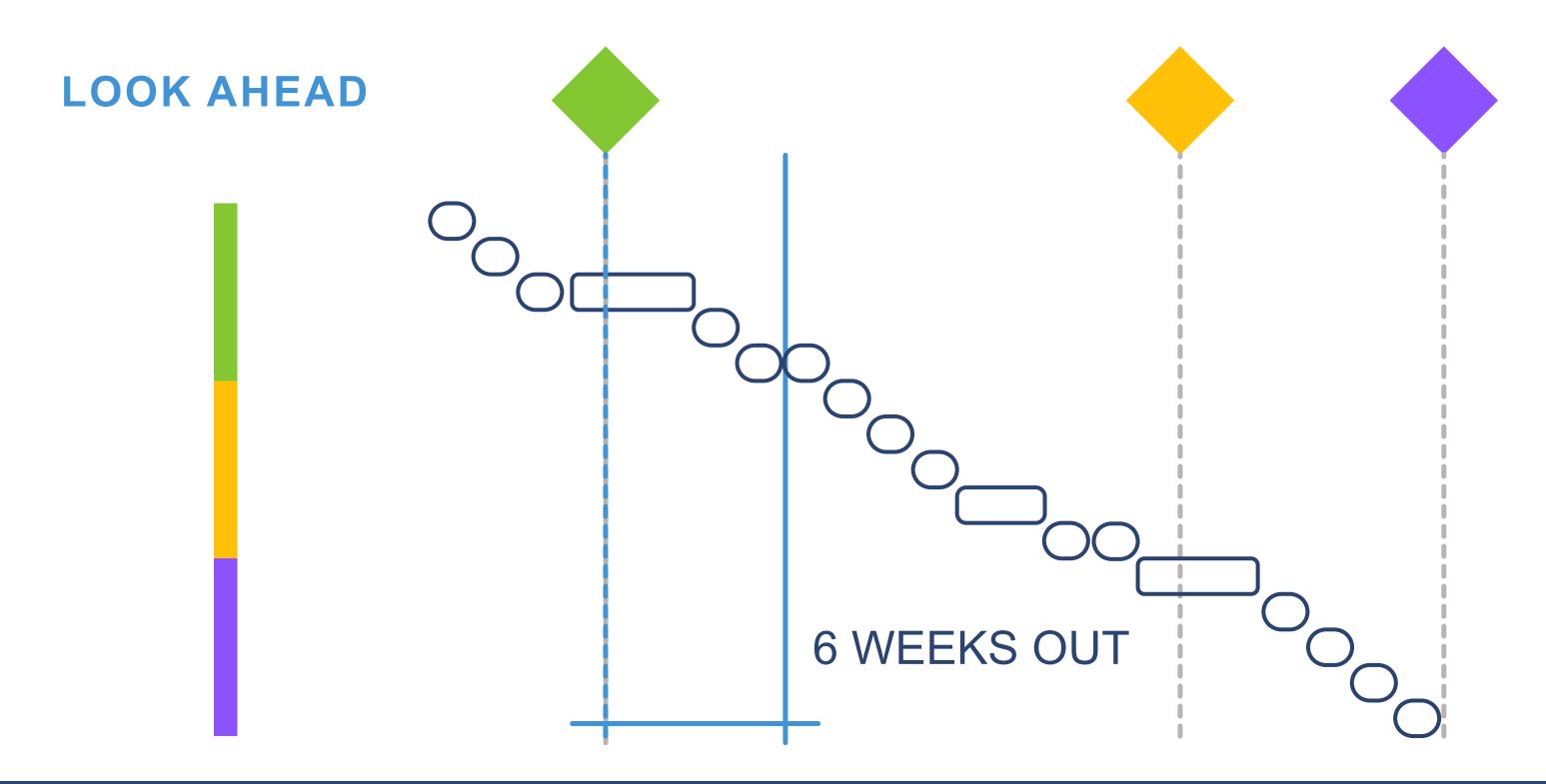




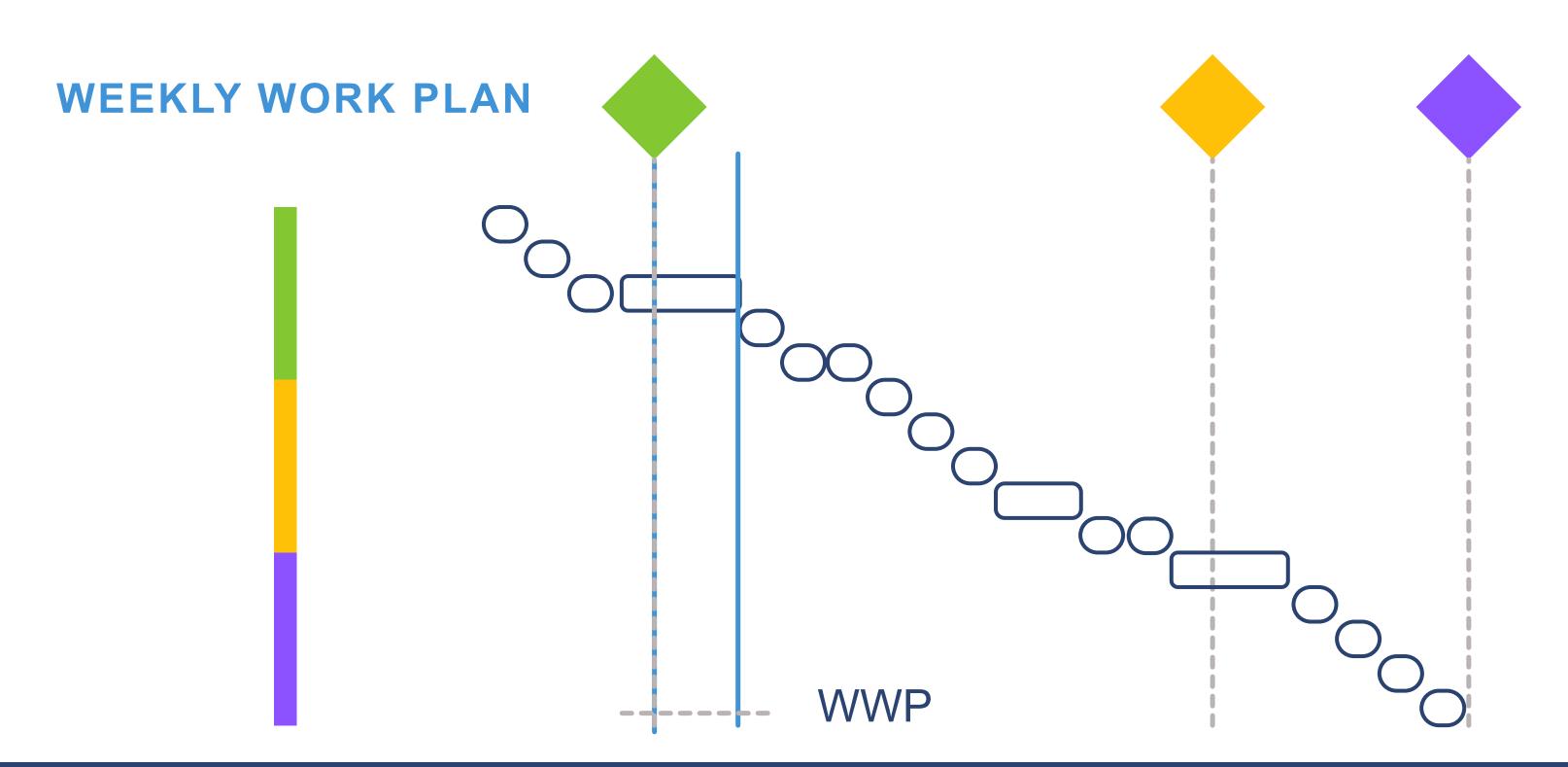
PULL PLAN







KEY DELIVERABLES

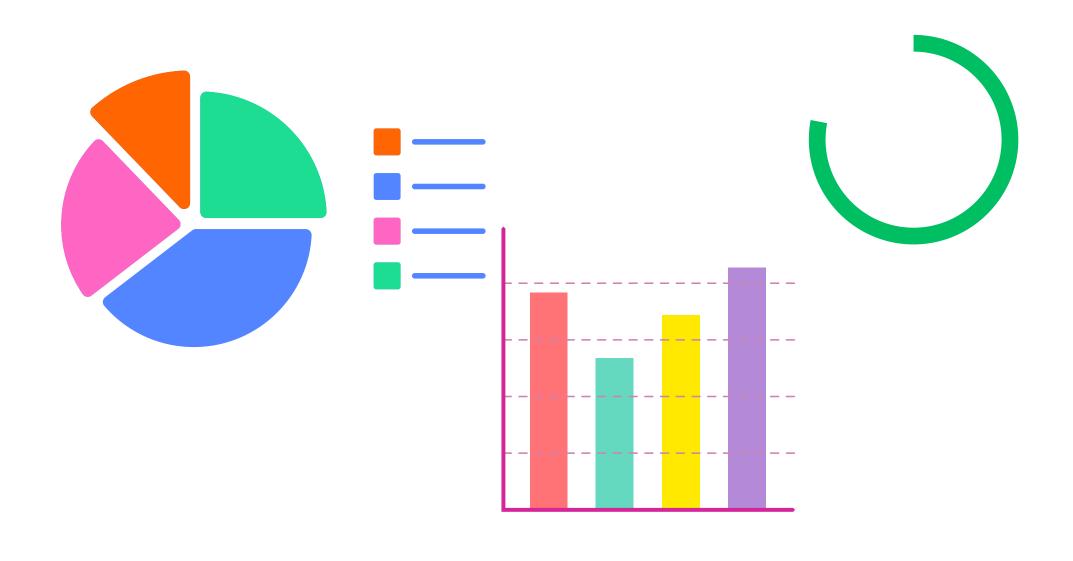




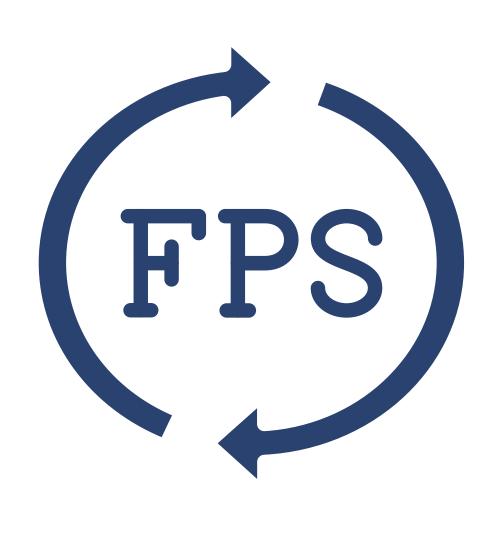
DAY PLAN



PERCENT PLAN COMPLETE

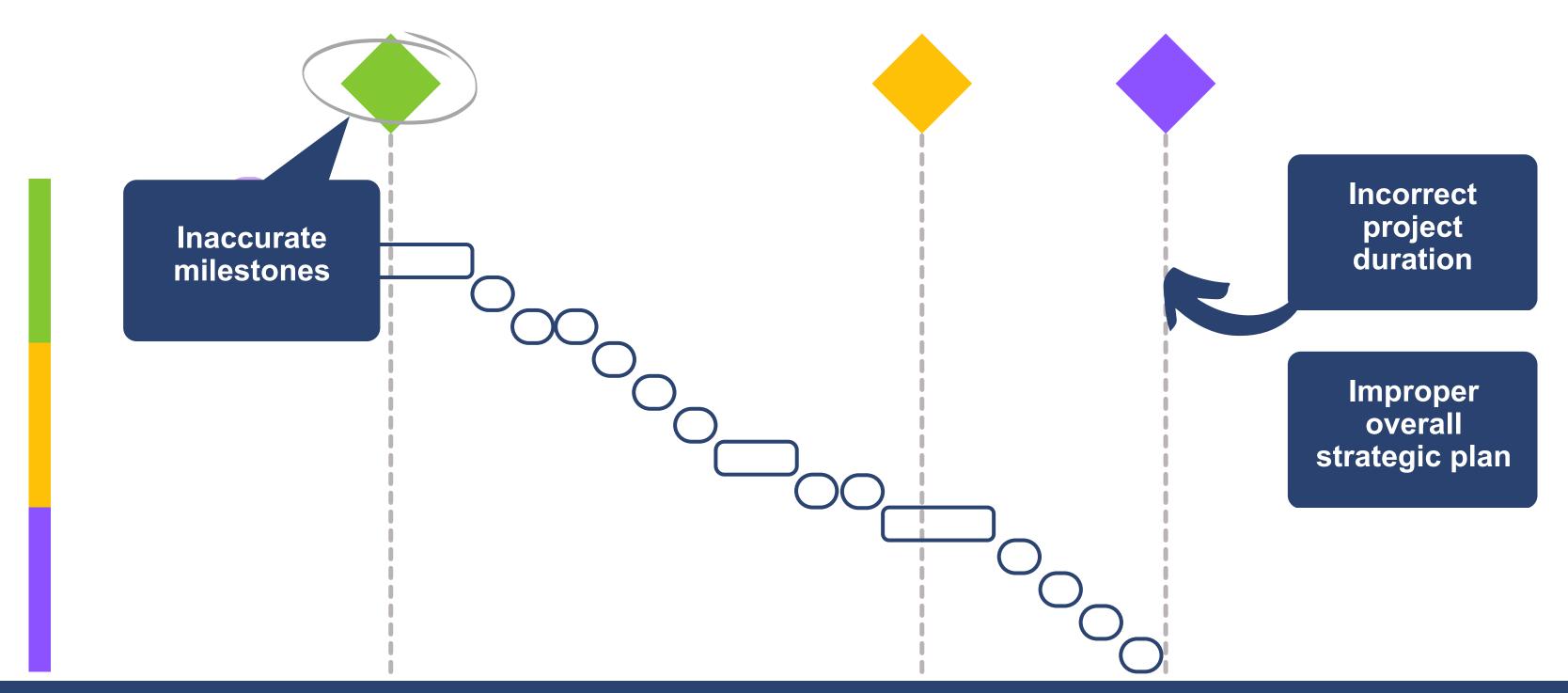


THE LAST PLANNER® SYSTEM IS NOT ENOUGH TO SUCCESSFULLY MANAGE YOUR PROJECT. YOU MUST HAVE A WORKING FIRST PLANNER SYSTEMTM AS WELL.



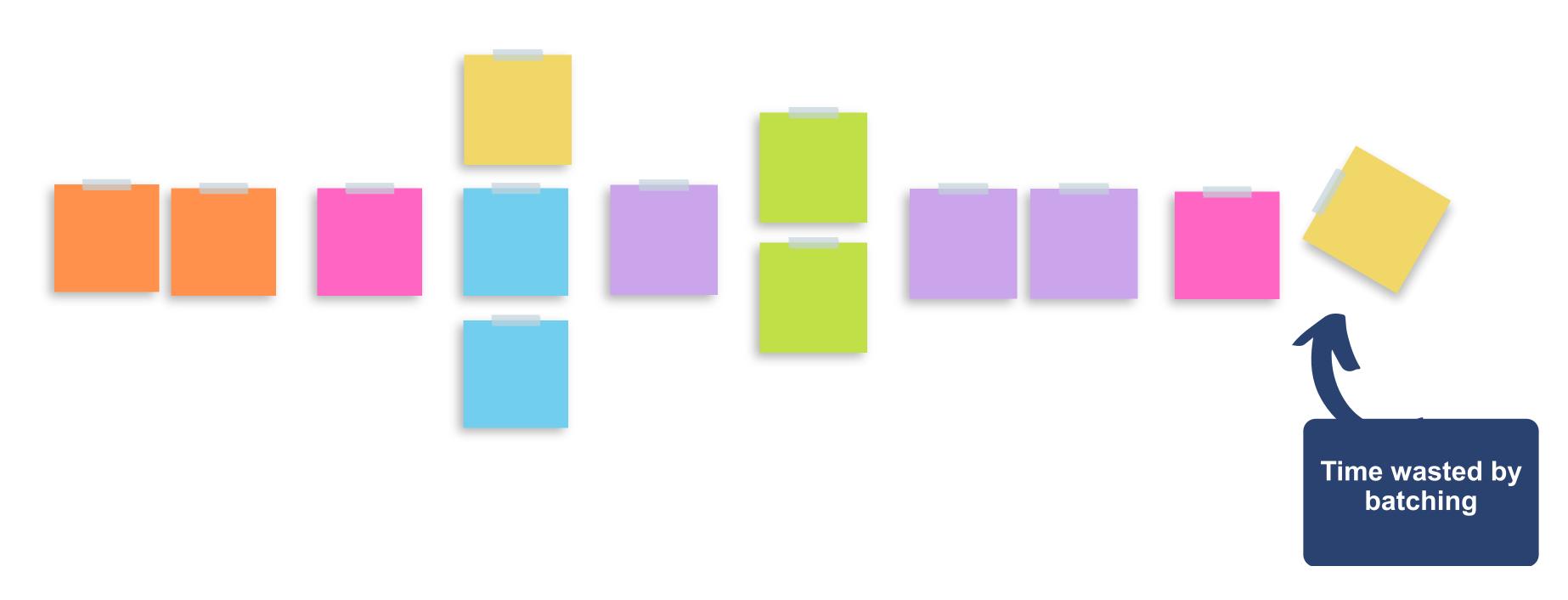
MASTER SCHEDULE

WITH CPM

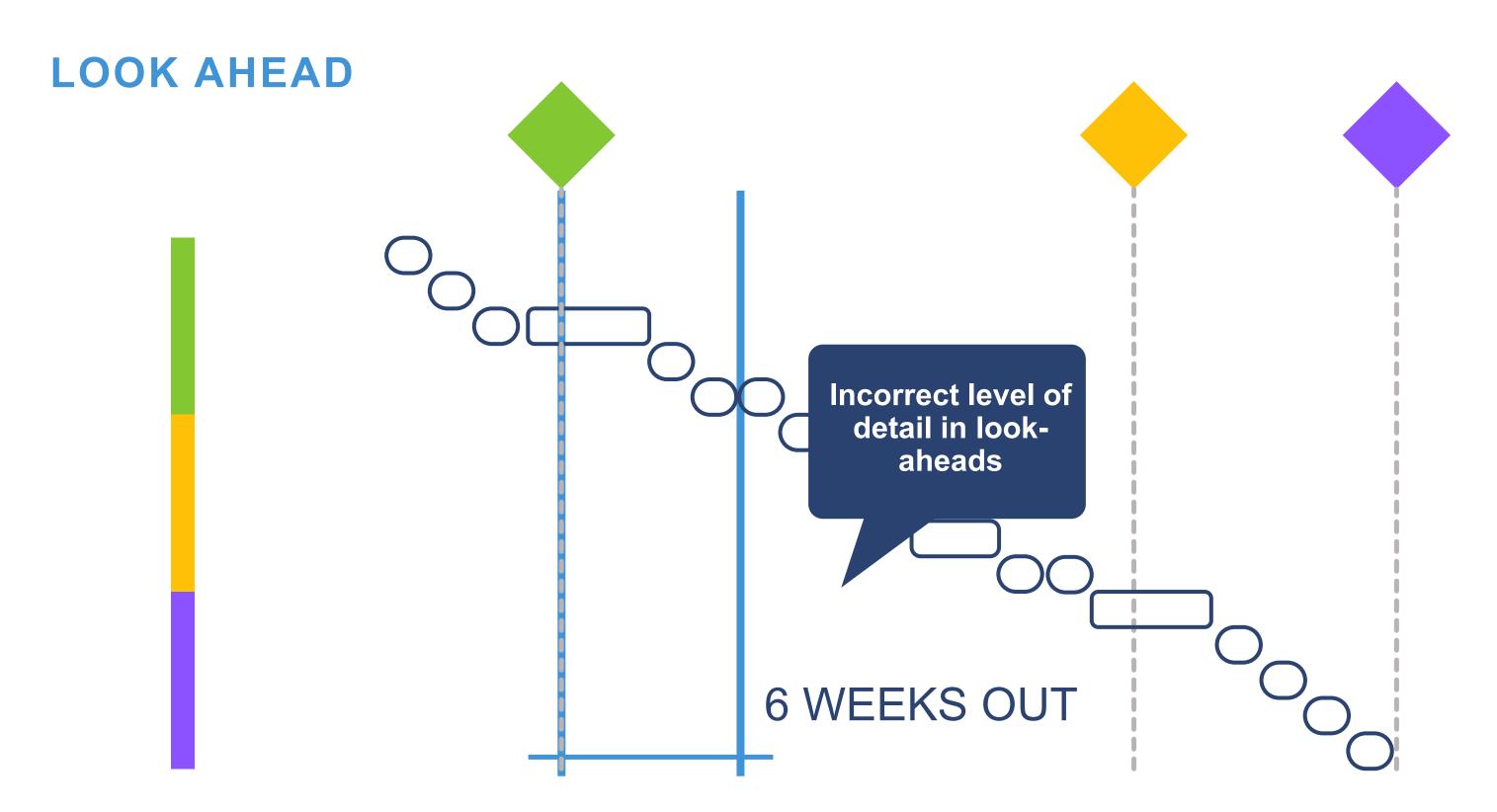


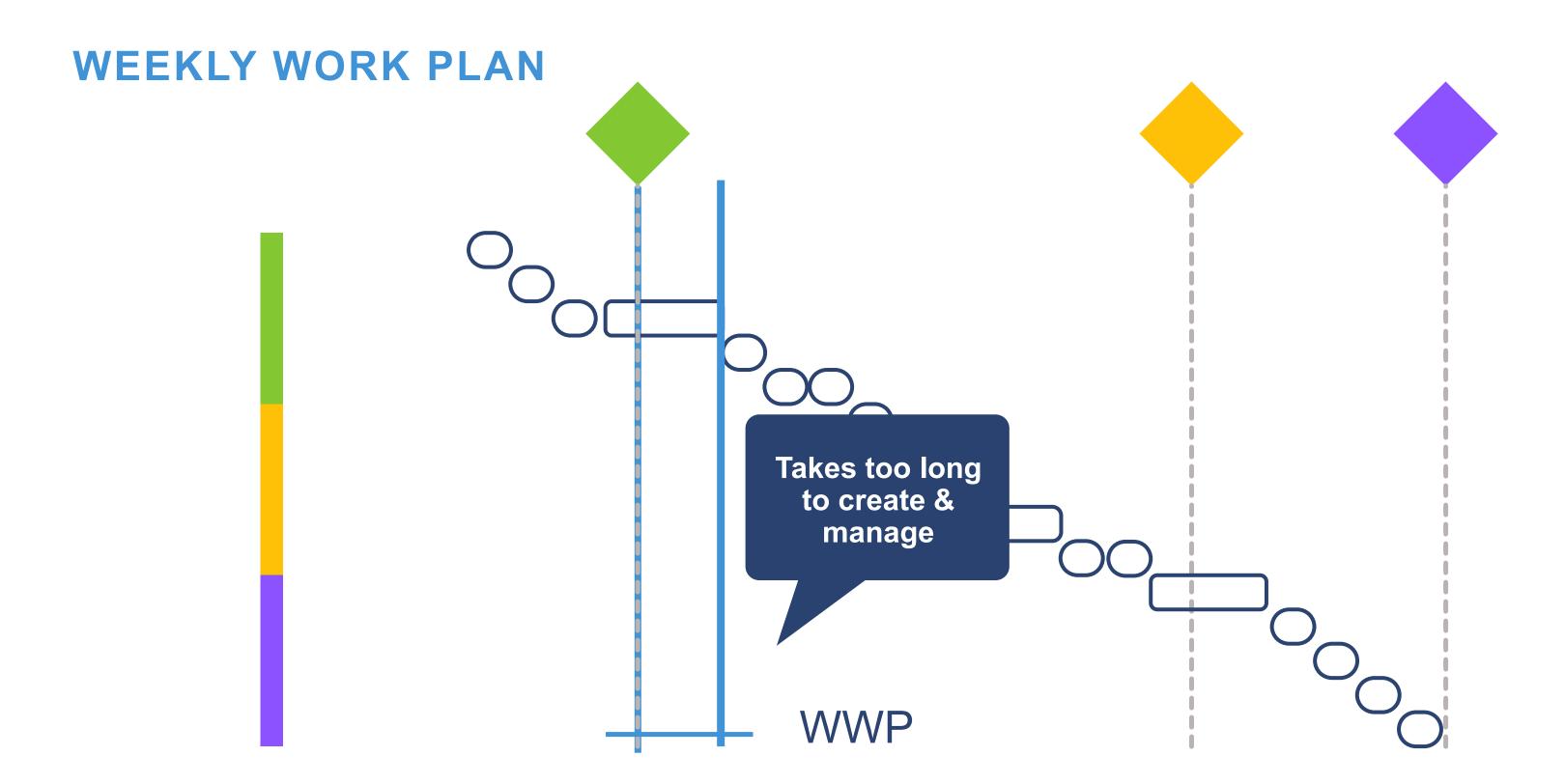
WITH CPM

PULL PLAN



WITH CPM

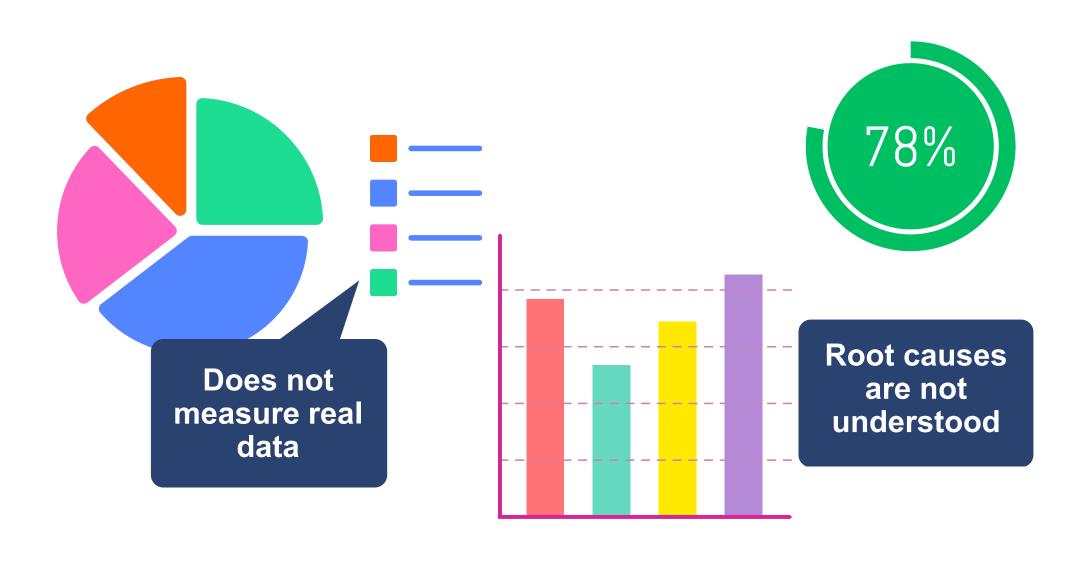




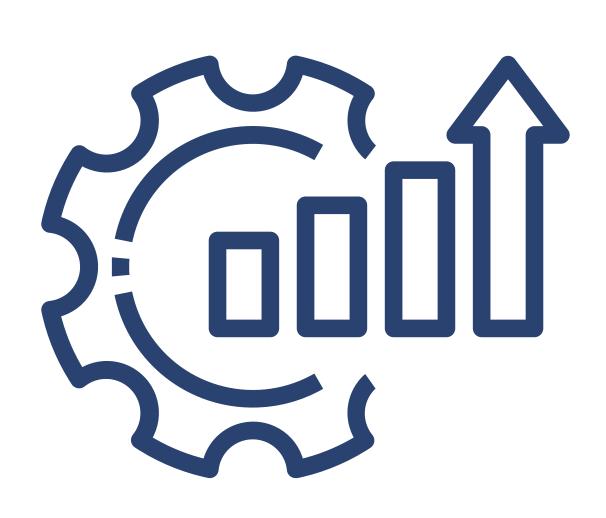
DAY PLAN

Not practical for use in the field

PERCENT PLAN COMPLETE

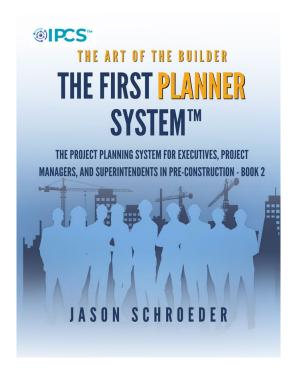


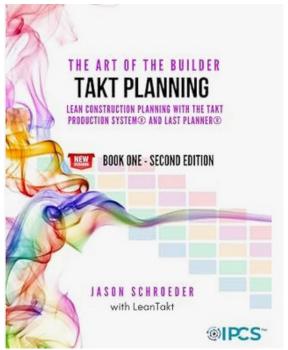
THE PROBLEM WITH THE LAST PLANNER® SYSTEM IS THE CRITICAL PATH METHOD.

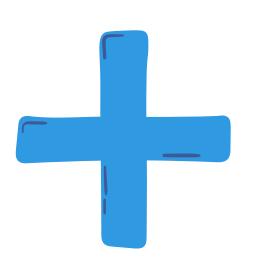


THE BOTTOM LINE IS THAT CPM...

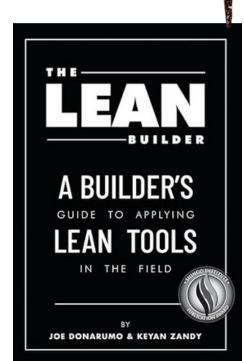
will drain the system like a parasite on a human host.





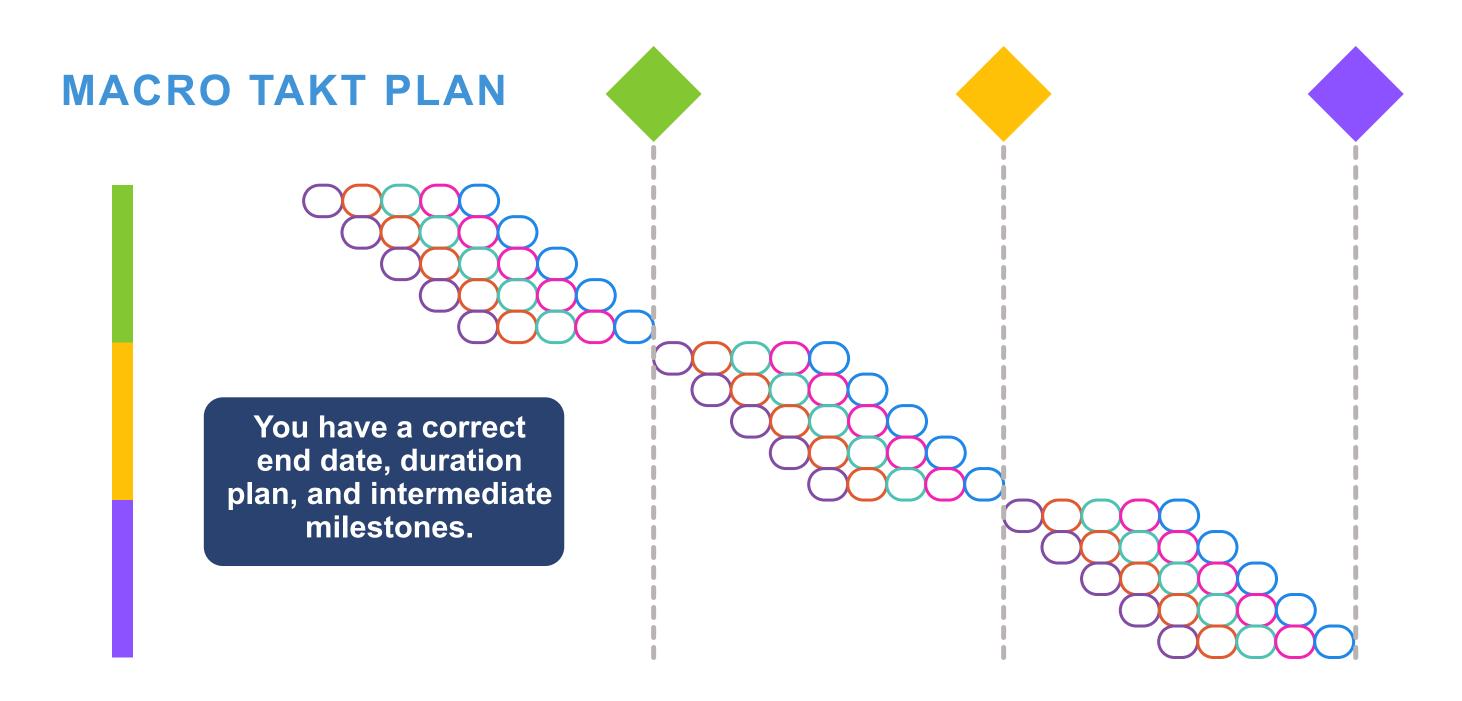




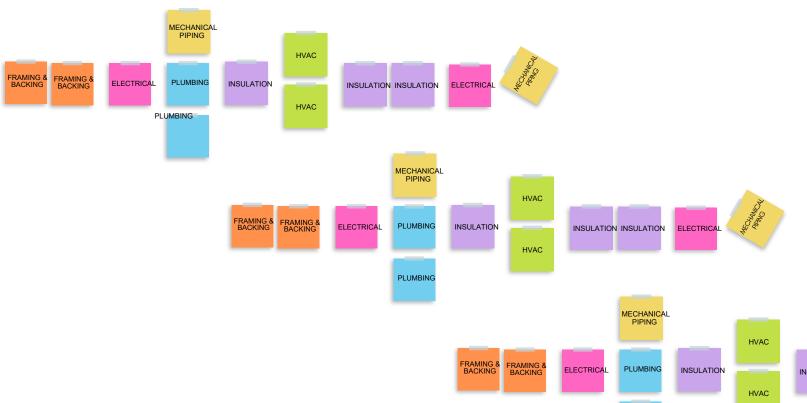


THIS IS LEAN!

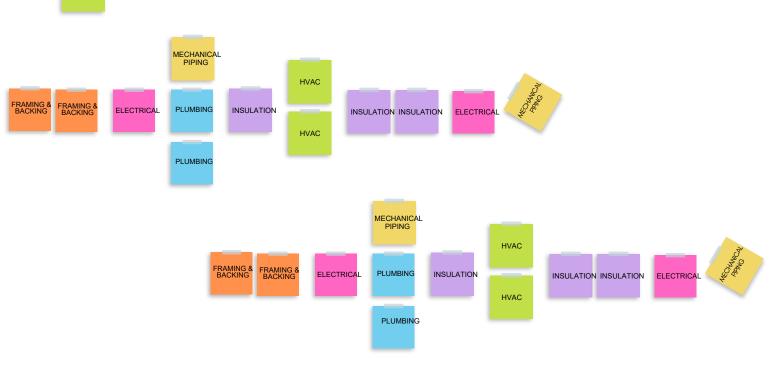
THIS IS WHAT HAPPENS WHEN YOU USE LAST PLANNER® WITH THE TAKT PRODUCTION SYSTEM®



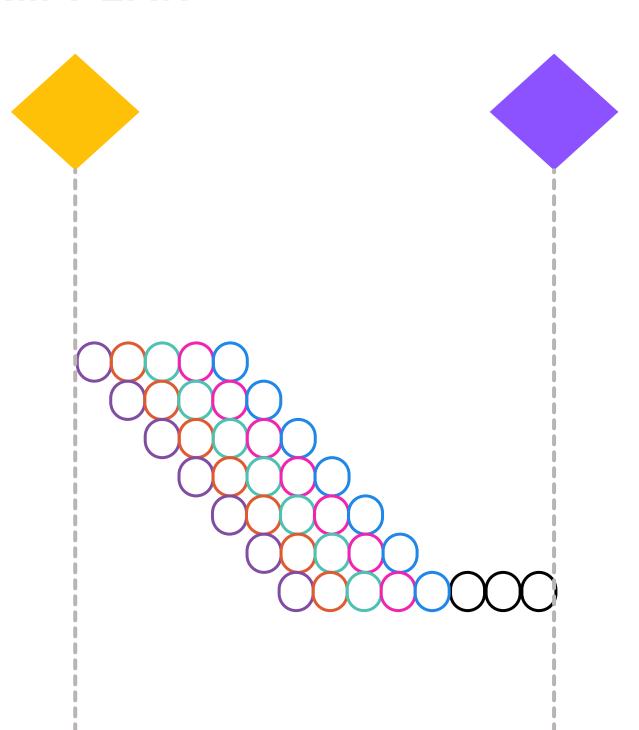
PULL PLAN



YOUR PULL PLANS ARE ALIGNED PROPERLY, BATCHED WELL, AND CONFIRMED FOR FLOW.

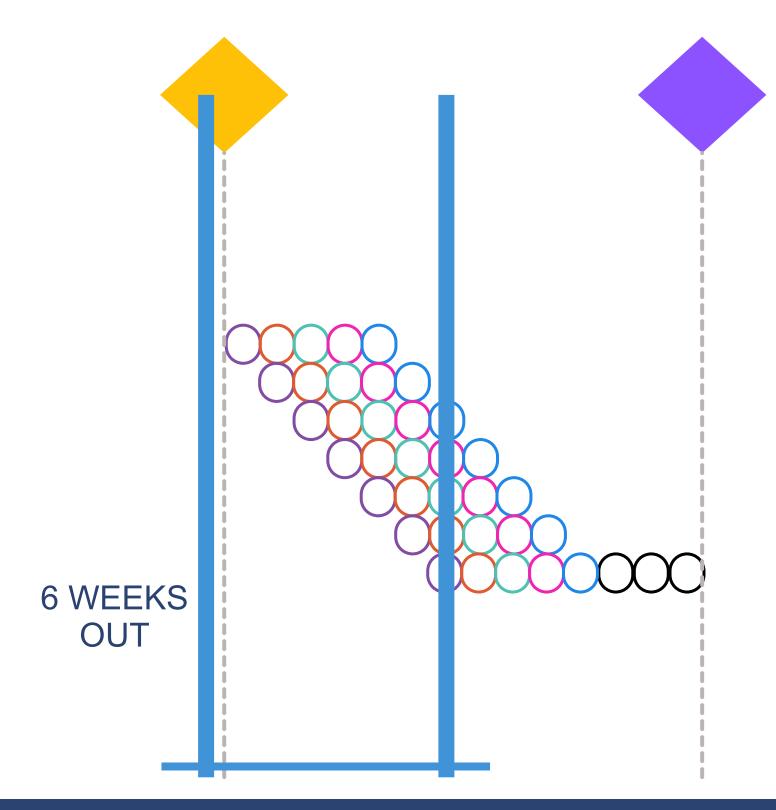


NORM PLAN



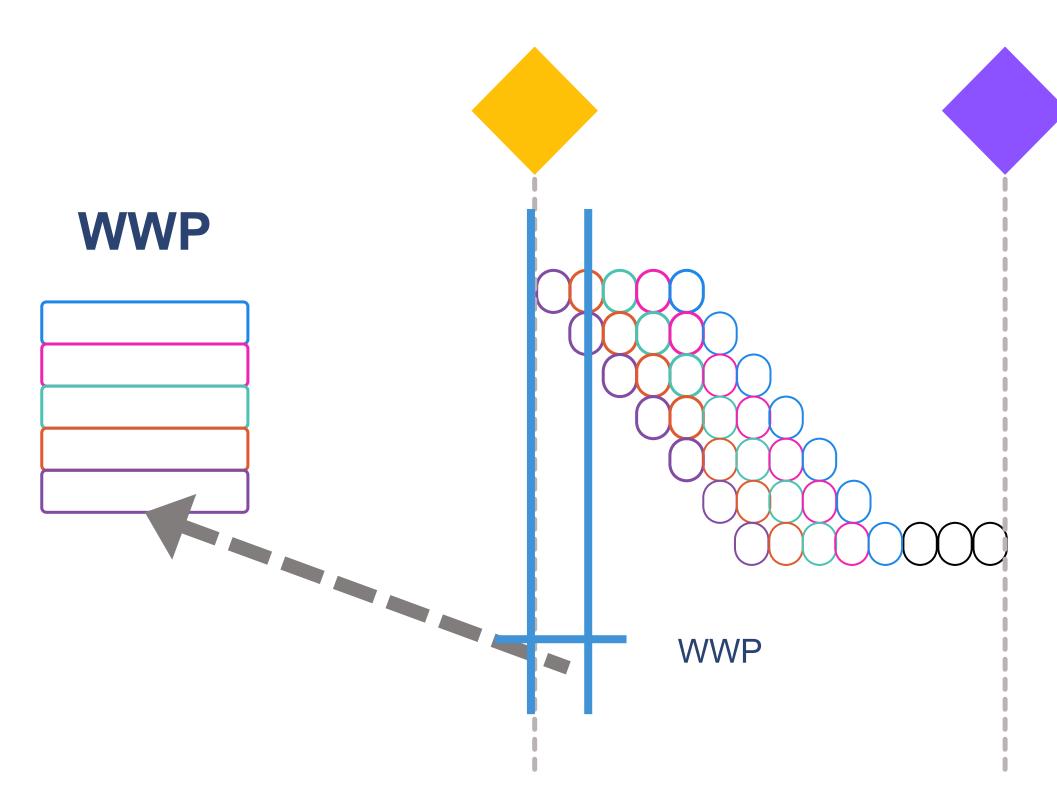
USING THE TAKT CALCULATOR YOU CAN **IDENTIFY THE RIGHT** NUMBER OF ZONES, GAIN BUFFERS, AND TARGET A GOOD PRODUCTION PLAN.

LOOK AHEAD PLAN



THAT MEANS ALL LOOK-AHEADS ARE ACCURATELY DETAILED, AND PERFECTLY ALIGNED WITH THE FLOW WHICH SYNCHRONIZES THE SUPPLY CHAIN.

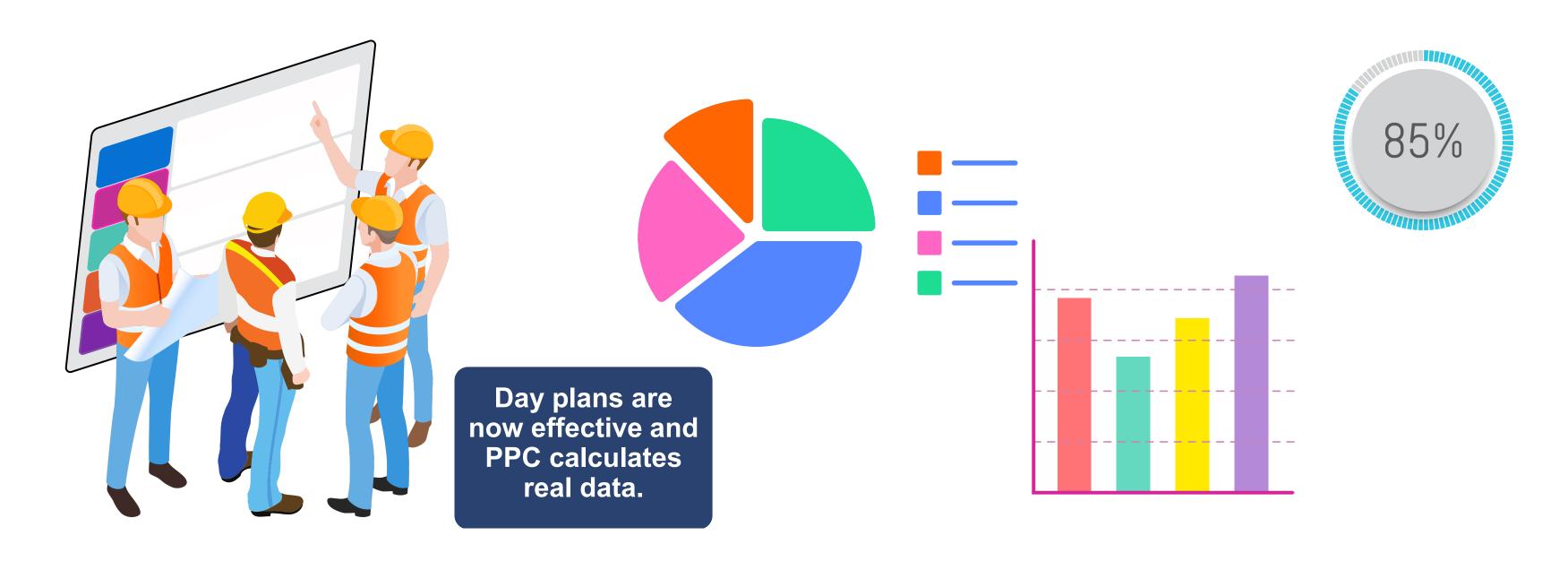
WEEKLY WORK PLAN



WEEKLY WORK PLANS ARE FAST AND EASY TO MAKE AND HANDOFFS ARE WELL COORDINATED.

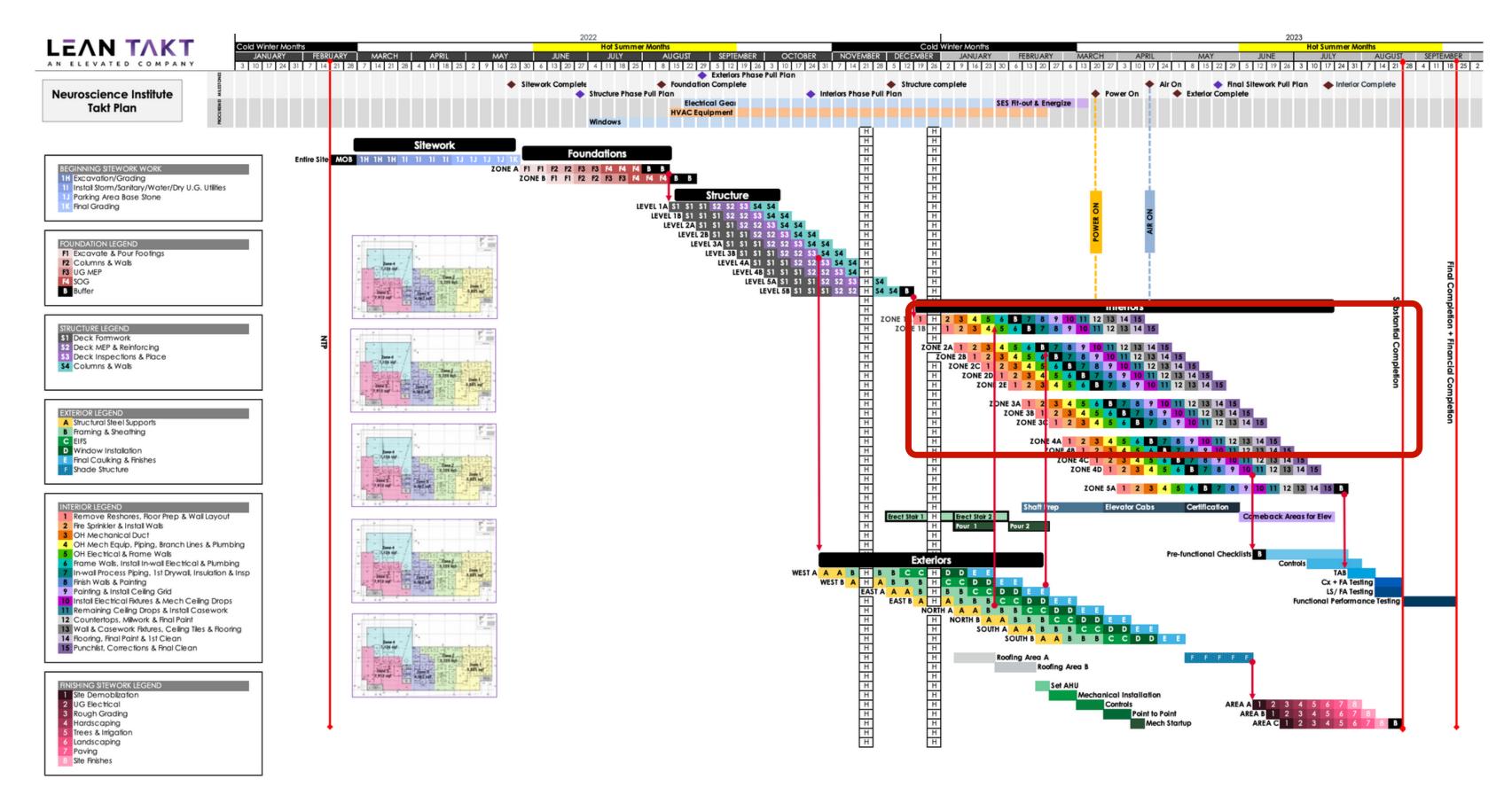
DAY PLAN

PERCENT PLAN COMPLETE

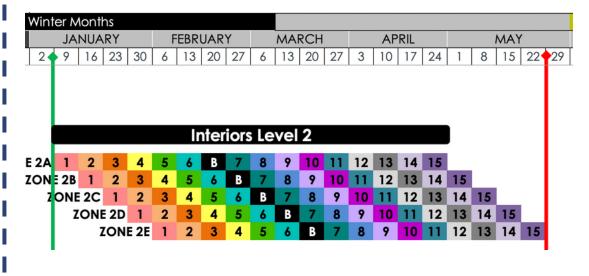


ALL YOU NEEDED WAS TO IMPLEMENT ALL THREE OF THESE LEAN SYSTEMS TOGETHER IN SUPPORT OF EACH OTHER.

SURFING THE WAVE OF LEAN DESIGN AND CONSTRUCTION



-MACRO-LEVEL-TAKT-PLAN



Slowest + Risk + Reference Analysis Class Speed

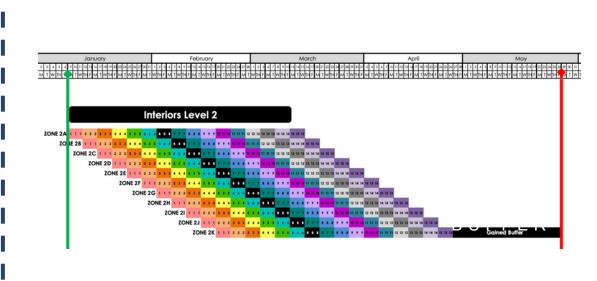
= Contractual Promise

SHORTEN YOUR PHASE **DURATION BY ADJUSTING**

YOUR ZONES.

YOU CAN

NORM LEVEL TAKT-PLAN



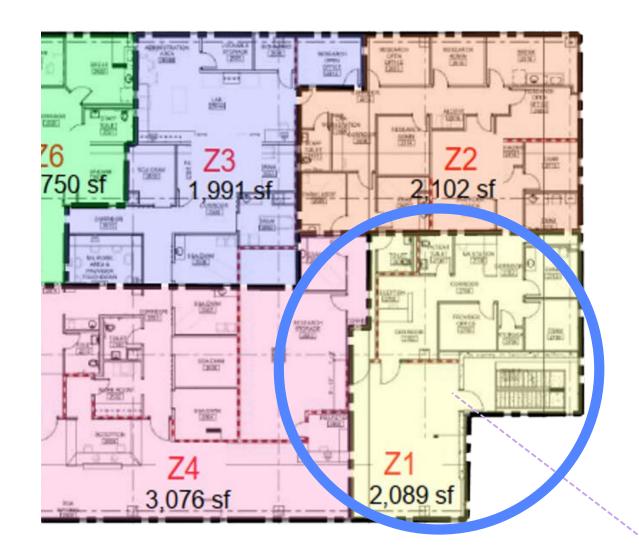
Optimized + Risk Mitigation + Strategies Speed

Reference Class Buffers Mitigation Strategies

= Production Torget

ONCE YOU KNOW HOW MANY ZONES YOU NEED BY CALCULATING THEM...

Optimize the Takt Phase				Takt Wagons	Takt Zones	Takt Time	Duration	Trade Time Gained	Area per Zone	Takt Level	Realized Flow Potential	Efficiency Parametric	Value Parametric
				15	2	13	208	1	24,713	Bad	19%	7.50	15.00
				15	3	9	153	2	16,475	Bad	25%	5.00	7.50
			_ (15	4	7	126	3	12,356	Macro	31%	3.75	5.00
Takt Inputs			Ш	15	5	5	95	0	9,885	Macro	41%	3.00	3.75
			4	15	6	5	100	5	8.238	Macro	39%	2.50	3.00
Takt Wagons		15		15	7	4	84	3	7,061	Macro	46%	2.14	2.50
		15		15	8	4	88	7	6,178	Macro	44%	1.88	2.14
Takt Zones 5		5		15	9	3	69	2	5,492	Norm	57%	1.67	1.88
				15	10	3	72	5	4,943	Norm	54%	1.50	1.67
Takt Time 5		5		15	11	3	75	8	4,493	Norm	52%	1.36	1.50
			П	15	12	3	78	11	4,119	Norm	50%	1.25	1.36
Duration		95	ч	15	13	2	54	1	3,802	Norm	72%	1.15	1.25
				15	14	2	56	3	3,530	Norm	70%	1.07	1.15
Area Inputs (m², sqft)		ш	15	15	2	58	5	3,295	Norm	67%	1.00	1.07	
		, 3411)	ч	15	16	2	60	7	3,089	Norm	65%	0.94	1.00
Area / Zone 9,885		9.885	ш	15	17	2	62	9	2,907	Norm	63%	0.88	0.94
		.,	н	15	18	2	64	10	2,746	Norm	61%	0.83	0.88
Min Zone Size 1,00		1,000	ш	15	19	2	66	13	2,601 2,471	Norm	59% 57%	0.79 0.75	0.83 0.79
			ш	15	20 21	2 2	68 70	15	2,354	Norm	56%	0.73	0.79
Max Zone Size	Max Zone Size 10,000		ш	15 15	22	2	70	19	2,334	Norm Norm	54%	0.68	0.73
Total SQFT of P	otal SQFT of Phase 49,425		11	15	23	2	74	21	2,149	Norm	53%	0.65	0.68
47,423		41	15	24	2	76	23	2,059	Norm	51%	0.63	0.65	
01 1		•	1 \	15	25	-	37	0	1,777	Nonn	100%	0.60	0.63
Snori	est Durat	ions		15	26	i	40	1	1,901	Norm	98%	0.58	0.60
Best # Zones	Takt Time	Duration	1	15	27	1	41	2	1,831	Norm	95%	0.56	0.58
25	1	39		15	28	1	42	3	1,765	Norm	93%	0.54	0.56
13	2	54	1	15	29	1	43	4	1,704	Norm	91%	0.52	0.54
9	3	69	1	15	30	1	44	5	1,648	Norm	89%	0.50	0.52
7	4	84		15	31	1	45	6	1,594	Norm	87%	0.48	0.50
5	5	95		15	32	1	46	7	1,545	Norm	85%	0.47	0.48
5	6	114		15	33	1	47	8	1,498	Norm	83%	0.45	0.47
4	7	126		15	34	1	48	9	1,454	Norm	81%	0.44	0.45
4	8	144		15	35	1	49	10	1,412	Norm	80%	0.43	0.44
3	9	153		15	36	1	50	11	1,373	Norm	78%	0.42	0.43
3	10	170		15	37	1	51	12	1,336	Norm	76%	0.41	0.42



-YOU CAN PULL PLAN ONE REPRESENTATIVE ZONE AND CREATE AN ACCURATE SEQUENCE THAT EASILY HITS THE MILESTONE TARGET.



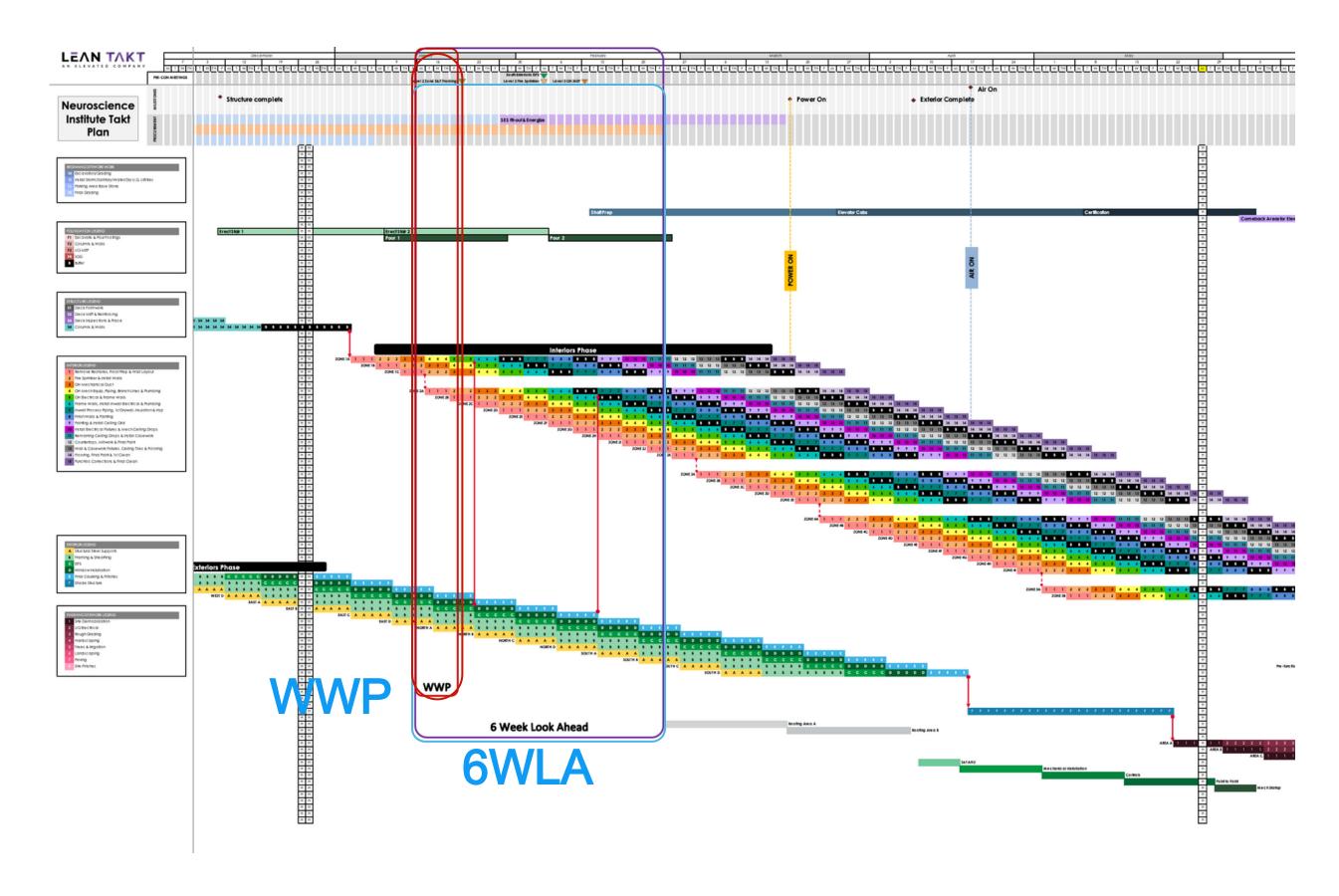
THE PULL PLAN ENABLES YOU TO CREATE YOUR NORM LEVEL TAKT PLAN...



-WHICH BECOMES YOUR PRODUCTION PLAN USED DAILY WITH THE LAST PLANNERS®.



NORM LEVEL TAKT PLAN



WEEKLY WORK PLAN

WEEKLY WORK PLAN

ASK QUESTIONS & HAVE A DISCUSSION

- 1. Ask where your bottleneck zone is
- 2. Ask what's your slowest trades
- 3. Discuss any owner changes with the trades
- 4. Remind the team of any key project planning items
- 5. Discuss key handoffs for the next two days
- 6. Discuss any new activities starting
- 7. Discuss any quality meetings needed for new work
- 8. Discuss deliveries and ask where they ao

TRADE PARTNER WEEKLY TACTICAL

- 1. Make the weekly work plan: 1 Week
- 2. Review last week
- 3. Review current week
- **4.** Review current progress
- 5. Fill out any one-off activities

			WEE	KLY	WORK PLAN (JAN 16-20)	HANDOFFS					
PHASE	AREA	ZONE	TRADE	#	ACTIVITY	M T		w	T F		
Interiors	All Building	All Building									
	AREA 1	Zone 1	Framing	1	Remove re-shores, Floor Prep, Final Patch Ceiling & Layout Walls				RR		
	AREA 2	zone i	FS	2	Install Fire Sprinkler Main and Branch Lines & Install Priority Walls					E	
	AREA 1	Zone 2	Framing	1	Remove re-shores, Floor Prep, Final Patch Ceiling & Layout Walls					RR	
	AREA 3	Zone 3									
	AREA 1	Zone 4									
	AREA 2	Zone 5									
	AREA 1	Zone 6									
	AREA 2	Zone 7									
	AREA 3	Zone 8									
	AREA 1	Zone 9									
	AREA 2	Zone 10									
	AREA 3	Zone 11		L							
10	AREA 3	Zone 1									
Ë	AREA 1	Zone 2									
CTIVITIES	AREA 2	Zone 3									
⋖	AREA 3	Zone 4									
ONE-OFF	AREA 3	Zone 5									
	AREA 1	Zone 6									
	AREA 2	Zone 7									
	AREA 3	Zone 8									

Interior Legend 1 Remove re-shores, Floor Prep, Final Patch Ceiling & Layout Walls 2 Install Fire Sprinkler Main and Branch Lines & Install Priority Walls 3 OH Mechanical 4 OH Mechanical. OH Plumbing 5 OH Electrical & Frame Walls 6 In-wall Electrical & Plumbing 7 In-wall Piping, One-side Dry Wall & In-wall Inspection 8 Second Side Dry Wall, Insulation & Finish Walls 9 Prime 1st & 2nd Coat Paint 10 Ceiling Grid, Lights, Electrical Fixtures & Mechanical Ceiling Drops 11 Casework & Final Pain (Possible) 12 Millwork, Plumbing, Wall and Casework, Ceiling Tiles 13 Flooring 14 Final Paint, Final Clean 1st Pass & Incomplete Worklist

15 Arch Punchlist, Corrections & Final Clean

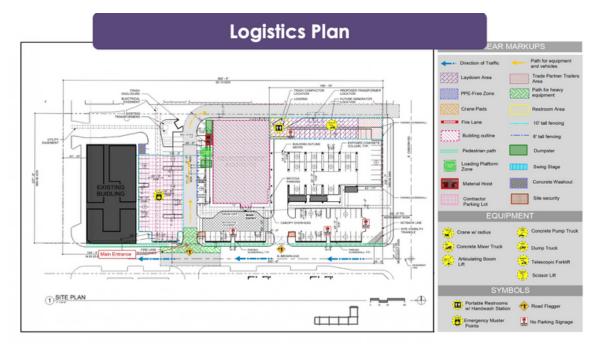


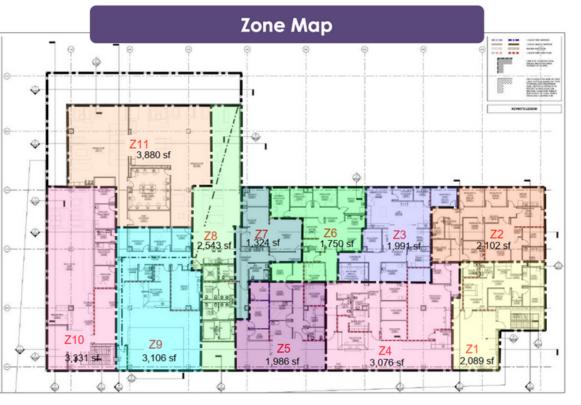
DAY PLAN

AFTERNOON FOREMAN HUDDLE

- 1. Make the day plan: 1 Day
- 2. Review today
- 3. Discuss tomorrow
- 4. Fill out the day plan according to the agenda
- **5.** Fill out any one-off activities

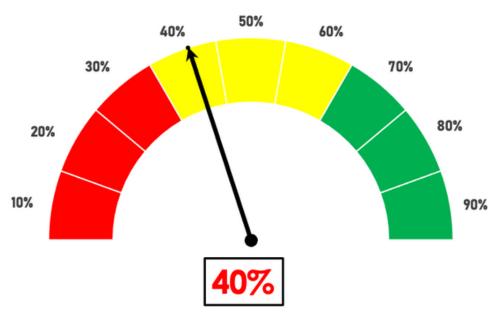
DAY PLAN								
SHOUT OUTS	The Concrete crew is out to a great start. They are cleaning as they go when stripping. Fire Sprinkler Trade is killing it with material staging.							
FEEDBACK	Ask crews for feedback on bathrooms and lunch area							
SAFETY FOCUS	Biggest safety focus is being careful around stripping operations and removing all nails from wood stripped.							
PERMITS	Electrical contractor has a dig permit at South exterior starting at 8am. Sign-off required before beginning. Also, Structural Steel Contractor has a hot work permit at South Stair. No access and fire watch to stay 30 minutes later.							
WEATHER	Clear and Sunny							
DELIVERIES	Delivery of Duct on First Floor. Place in room designed on Logistics map.							
DAY PLAN	Fire Sprinkler is starting in Zone 1. We have a first in place mockup inspection scheduled for Monday. Concrete continues in Zone 2.							



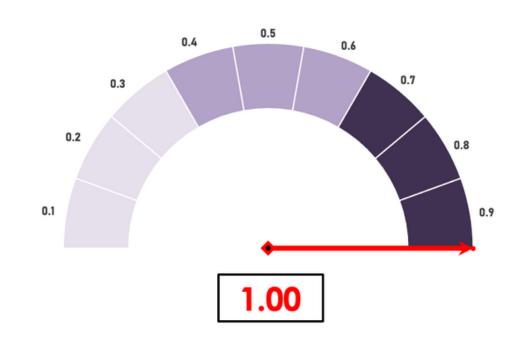


KPI DASHBOARD

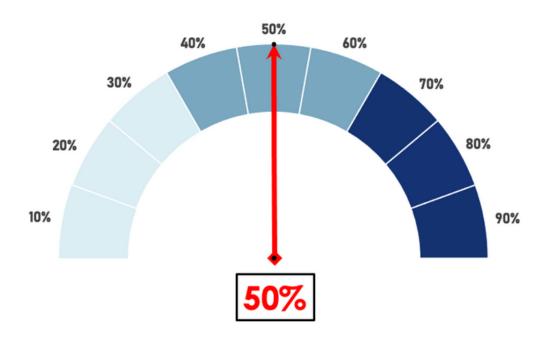
Percent Planned Complete (PPC)



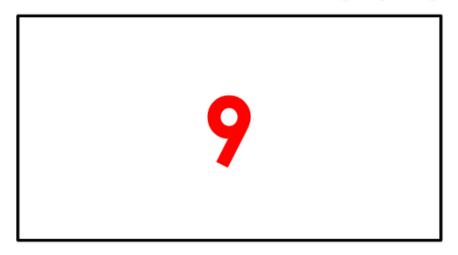
Remaining Buffer Ratio (RBR)



Perfect Handoff Percentage (PHP)

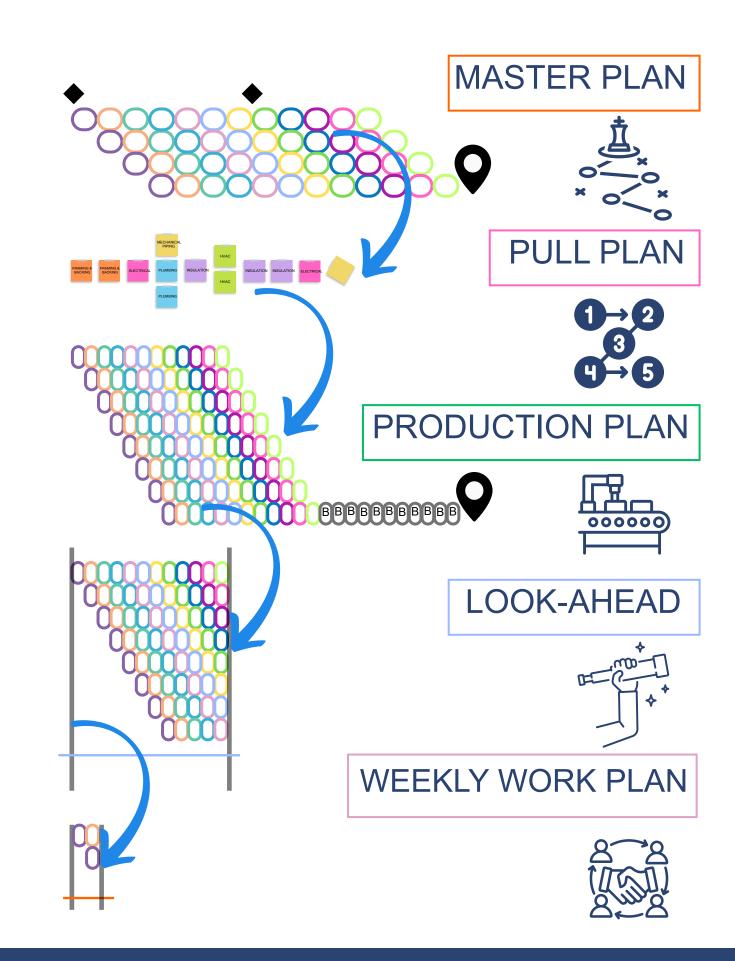


Roadblock Removal Average (RRA)

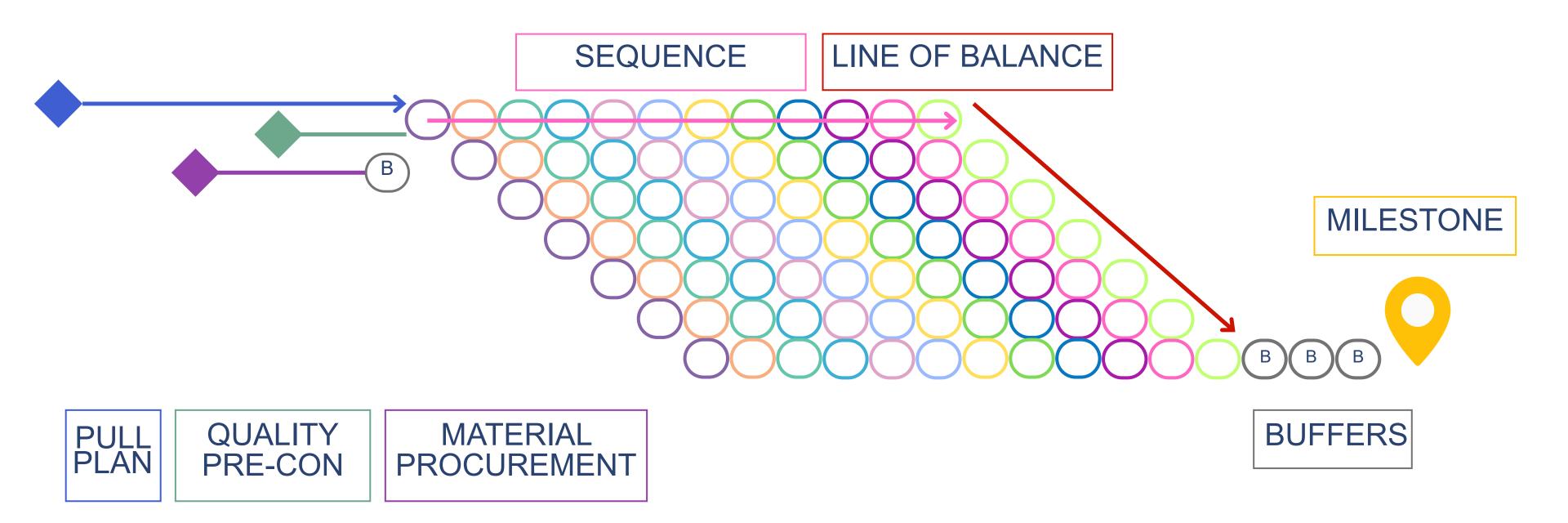


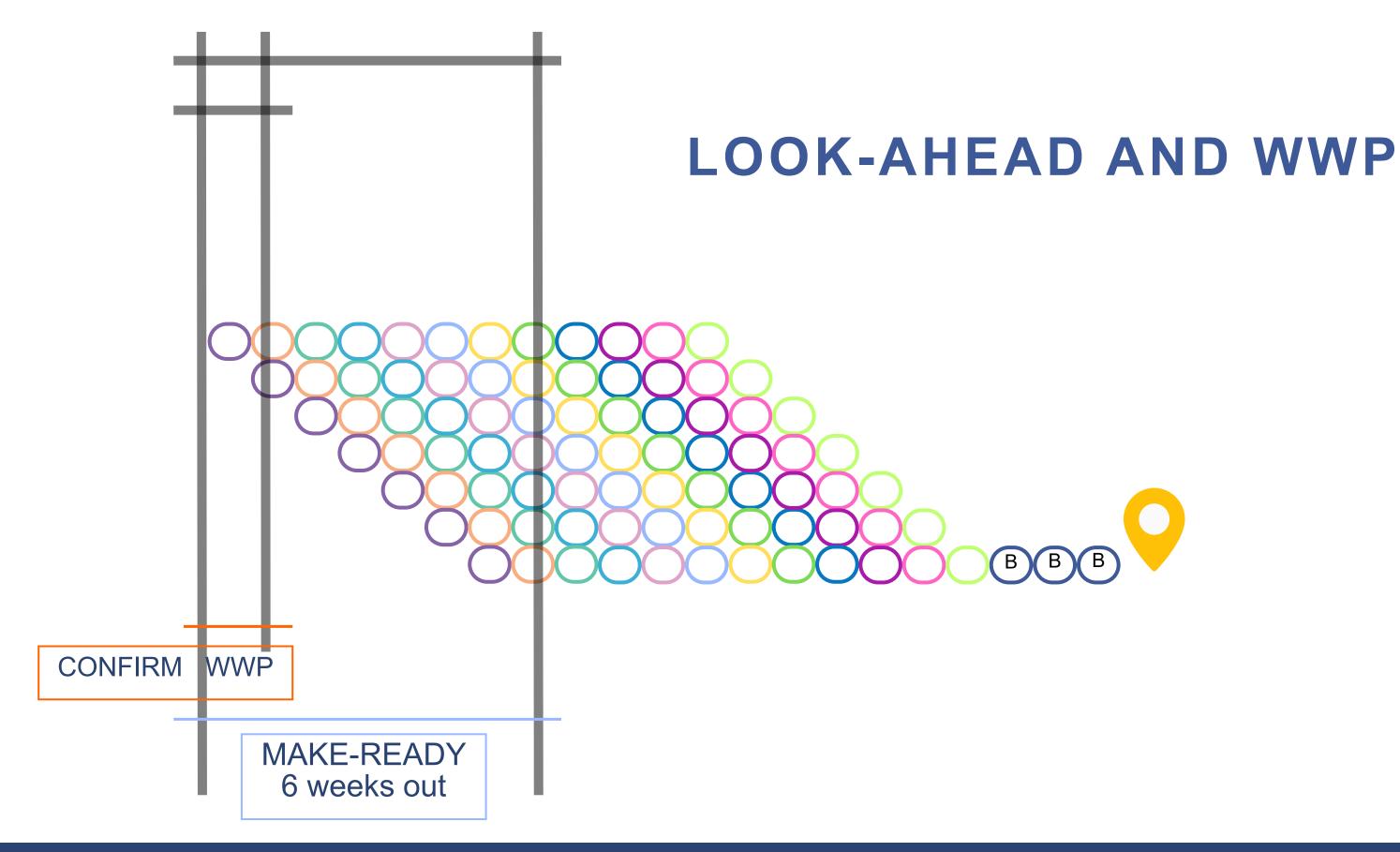
© LEAN CONSTRUCTION INSTITUTE 59

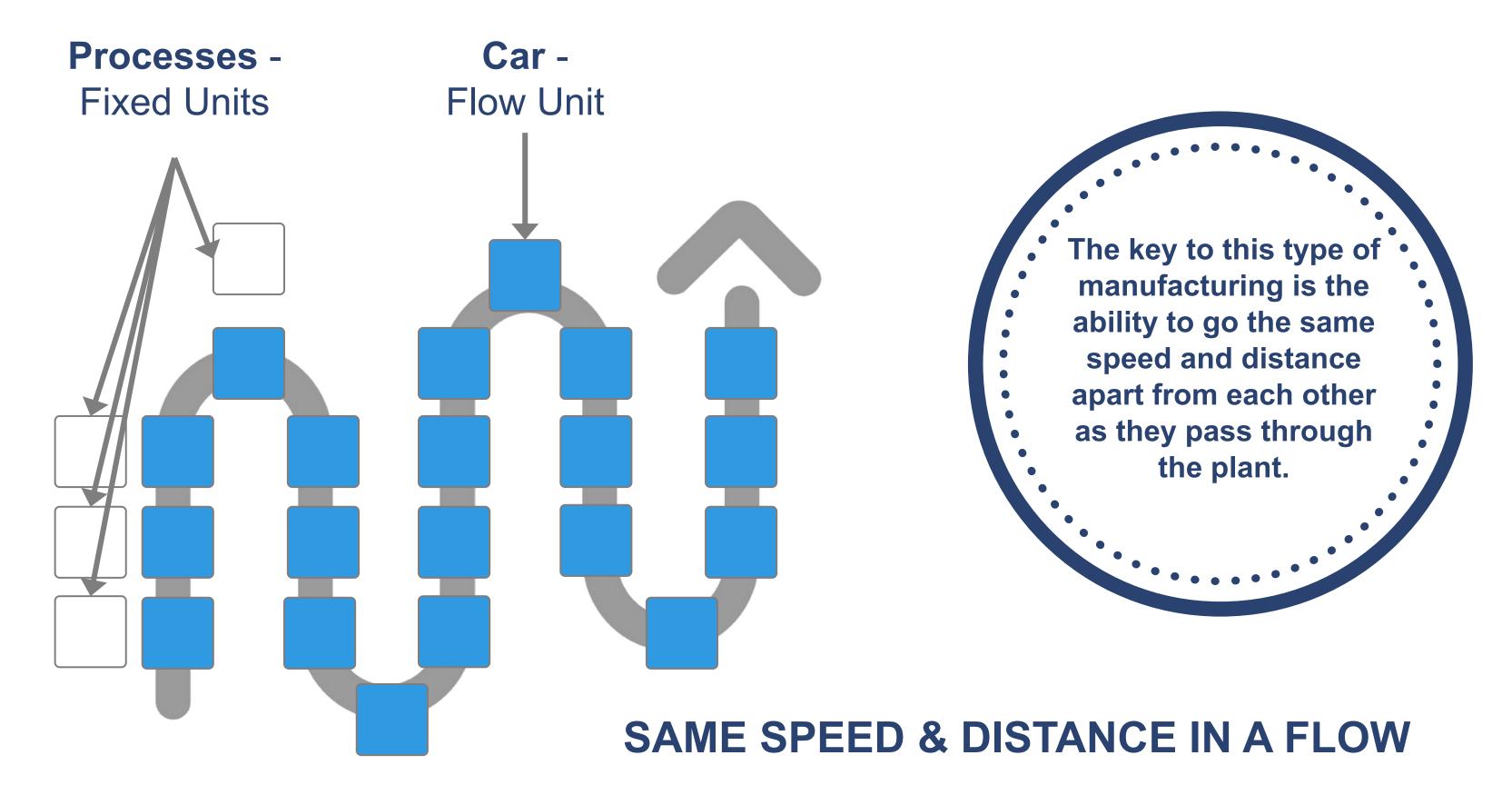
THIS PAGE SHOWS THE FLOW ON ONE PAGE SO YOU CAN VISUALIZE IT.

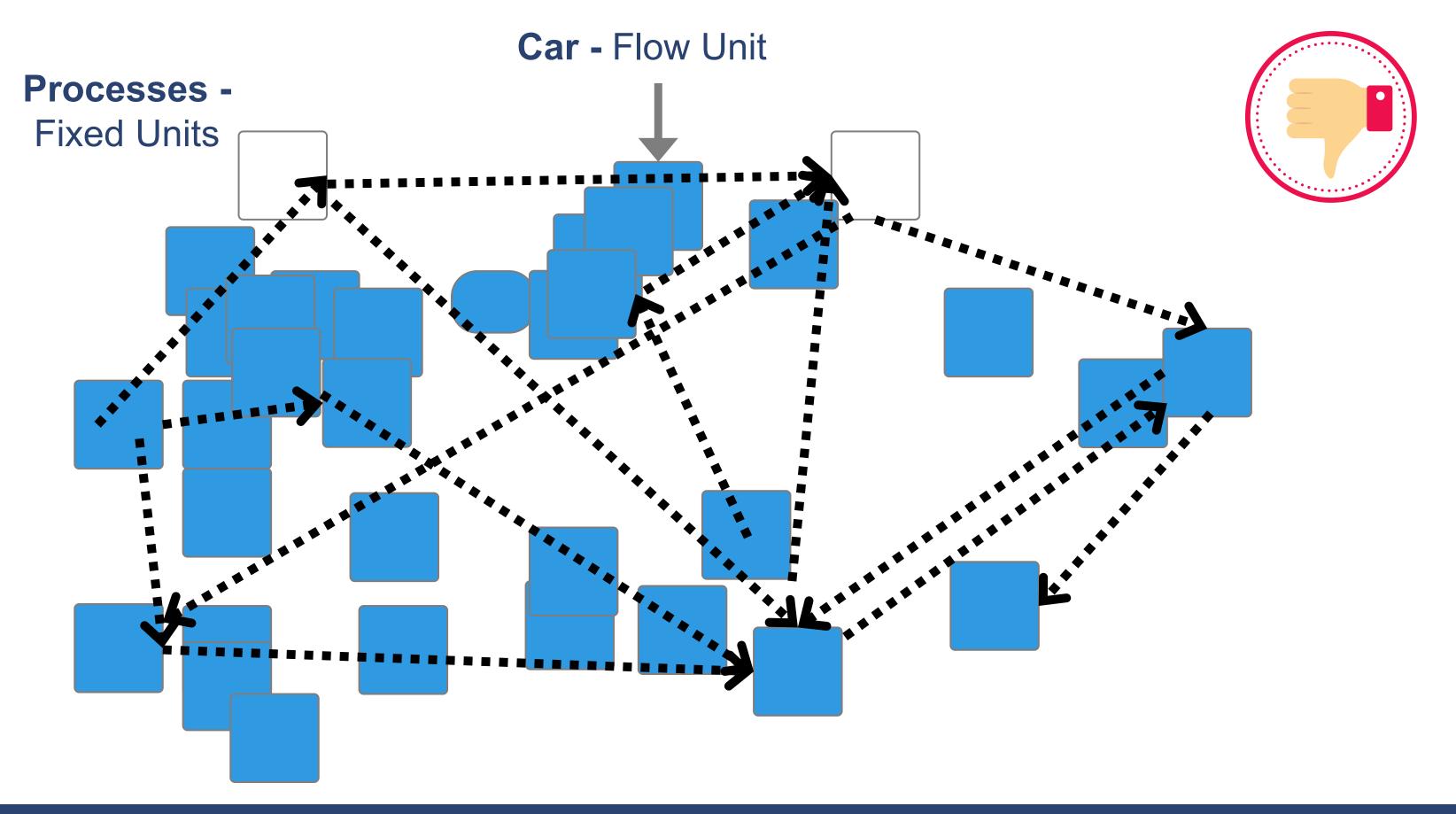


PRODUCTION SYSTEM





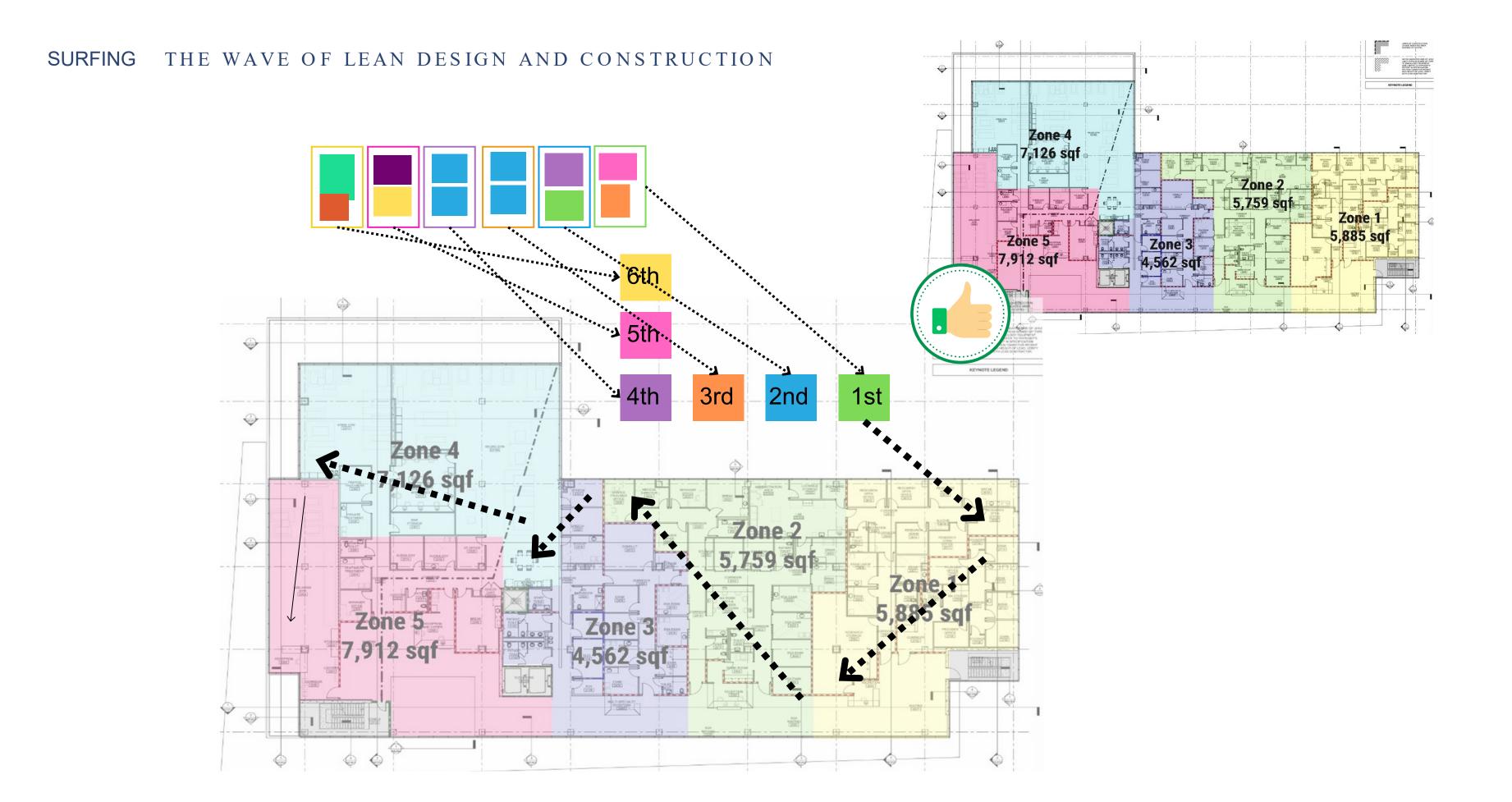




LEVEL 2







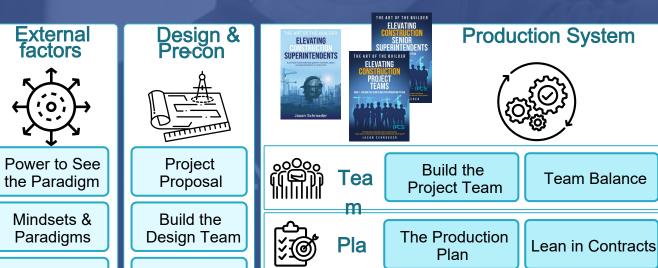
FLOW OF THE TRAIN

The intersection of time & space is what creates the takt plan shape



FPSTM TPS® LPS®

First Planner System™



Goals of the System

Structure of the System

Rules of the System

Trade Partner

Preparation

Builder Planning

Buyout

Start Strong

Enable Design

Win over The

Supply Chain

Safety

Quality

Procure

Resources

Workforce

Pre-Con First in Place Meetings

Follow-Up Inspection

Prefab

Clean, Safe, &

Organized Project

Final Inspection

Individual Balance

Manage Risks

Logistics

Onboarding &

Orientation

takt production system®

Takt Planning

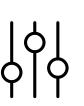


Takt Plan Creation

Plan Use & Management

First Planner & Last Planner® Collaboration





Constraint Management

Roadblock Removal

Zone Control

Delay Management accountability

Zero Tolerance

Daily Correction System

Quality at the Source

Contractor Grading

Team Health Score

Takt steering and control



kaizen

Quality

Continuous Improvement

Customer Needs & Wants

Last Planner® system





Meeting & Huddle System

Collaboration

Planning Deliverables





kpis

Conditions of

Satisfaction

Leading

Indicators

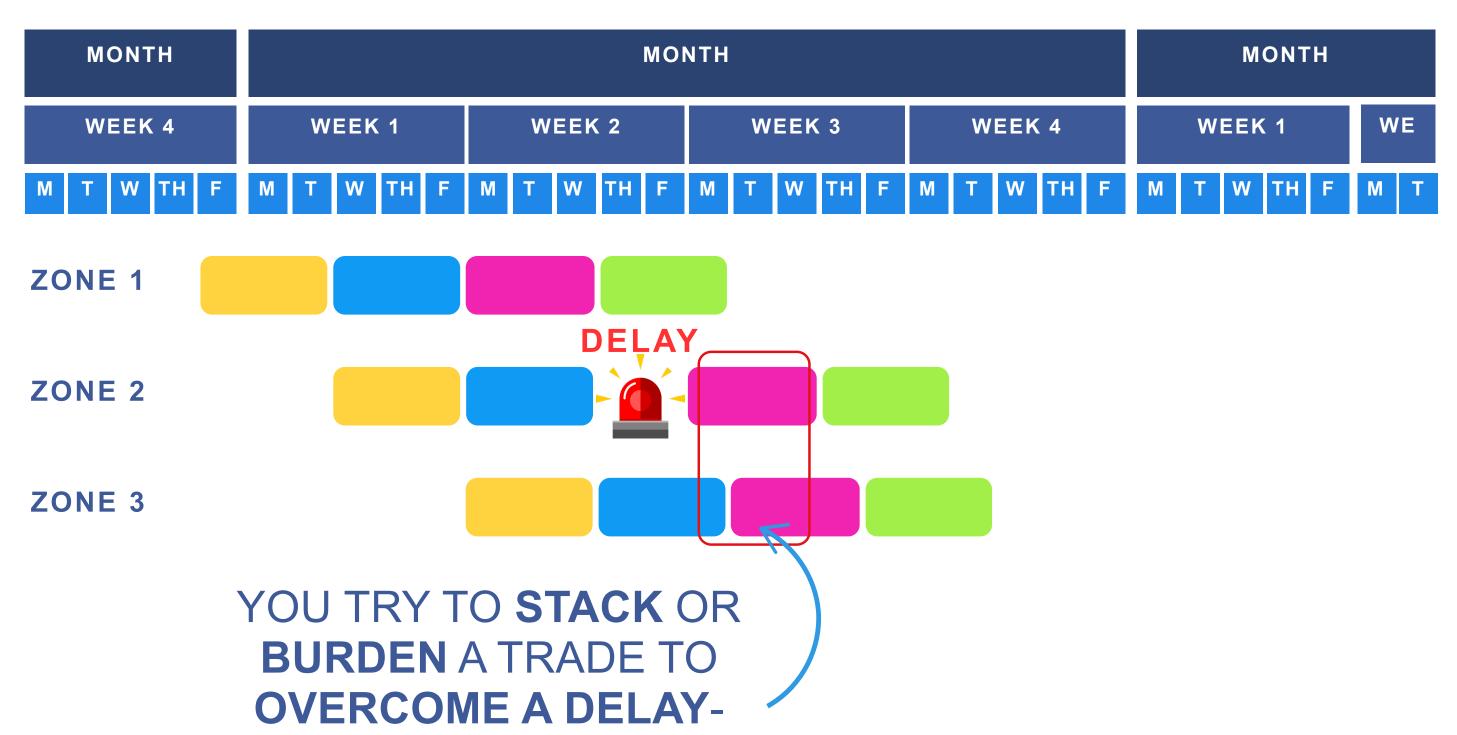
Lagging

Indicators

LUCY'S LAW TAKT STEERING & CONTROL



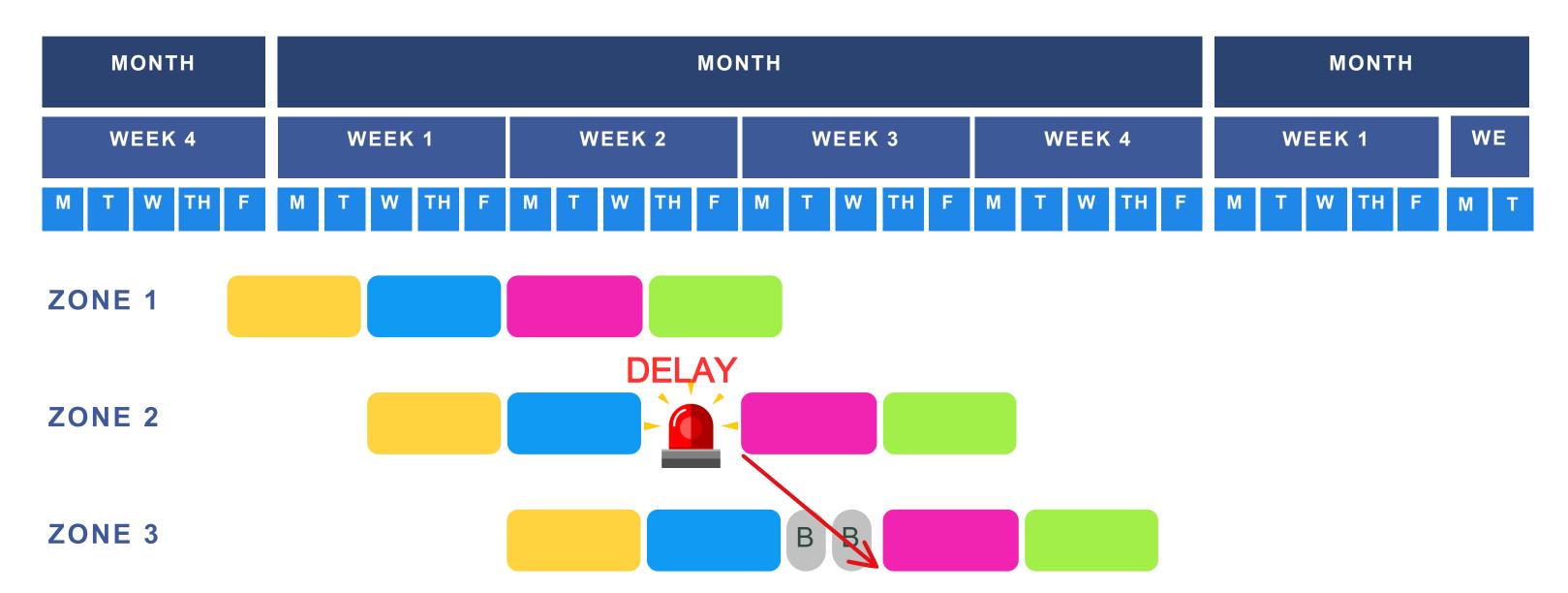
What We Attempt After a Delay



IF YOU TRY TO KEEP THE ORIGINAL **SCHEDULE** BY ADJUSTING THE WHAT WILL HAPPEN TRADE, YOU WILL EXTEND WORK **BEYOND THE ORIGINAL PLANNED** TIME. WORK CAN TAKE UP TO 3 TIMES AS LONG AS EXPECTED. **ZONE 1 DELAY** ZONE 2 1 TO 3 TIMES PUSHED ZONE 3 THE LUCY EFFECT

UNDERSTANDING TAKT & LUCY'S LAW

What We Should Do Instead



THE BEST OPTION IS TO MAINTAIN TRADE FLOW AND KEEP CREWS WORKING IN A RHYTHM.

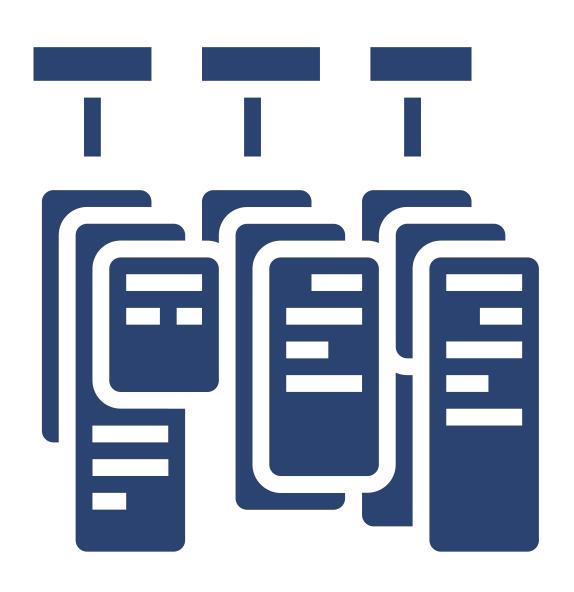
Why It Is Possible with Takt?



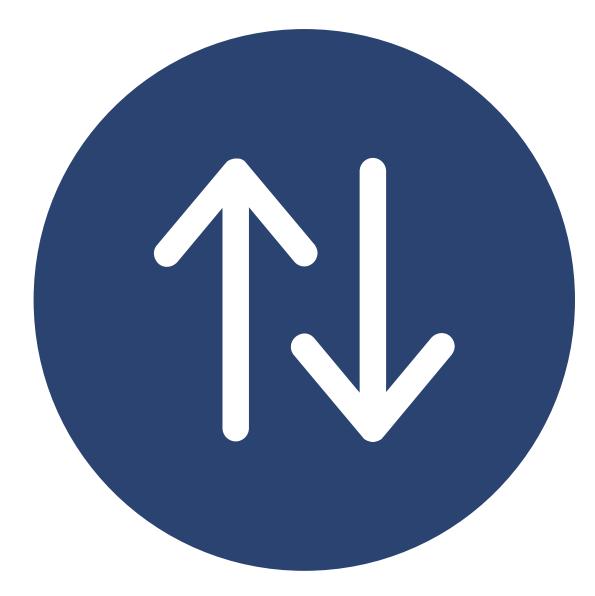
WHY DOES THE LUCY EFFECT HAPPEN?



You bring more resources.



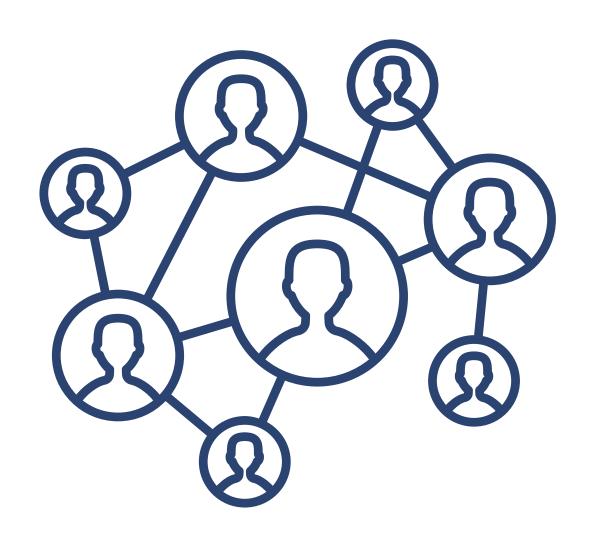
You begin batching work.



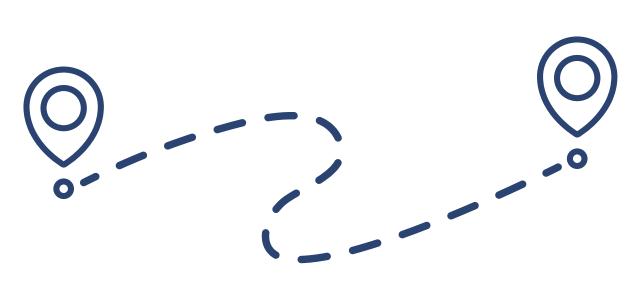
This leads to context switching.



With more people on-site, or in the crew, the team size increases, and communication gets more complex.



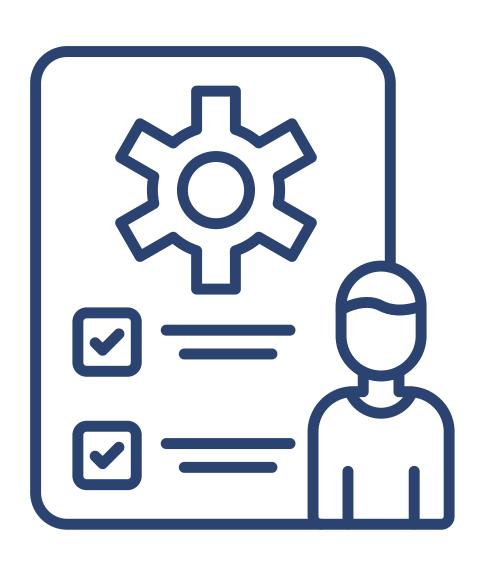
With more communication channels to be managed.



With more people in crews the composition of the crews changes and foremen assignments change. Workers are then separated from their normal environment.



Without a consistent leader, culture, language, and working habits, the crew loses productivity.

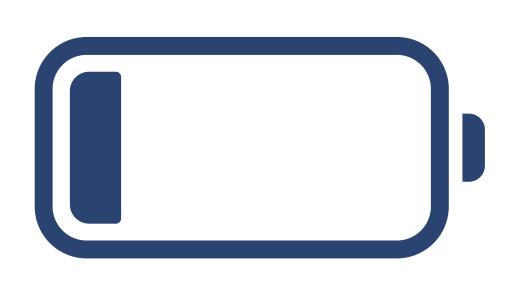


With new people coming to crews, they need to be onboarded.

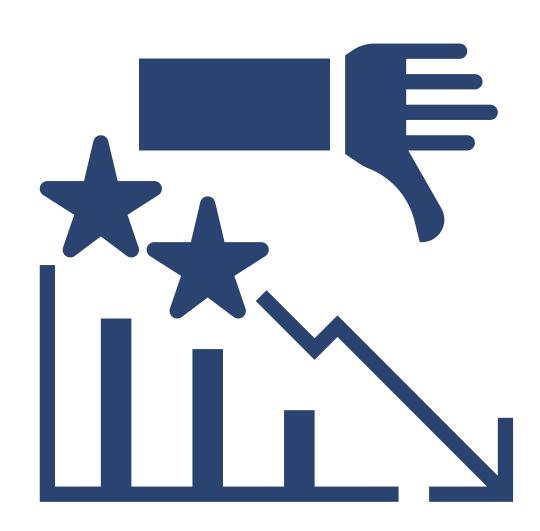
Onboarding to 100% productivity takes at least 7 days at best. Meaning the newer people are not fully up to speed and productive out of the gate and during crucial times.







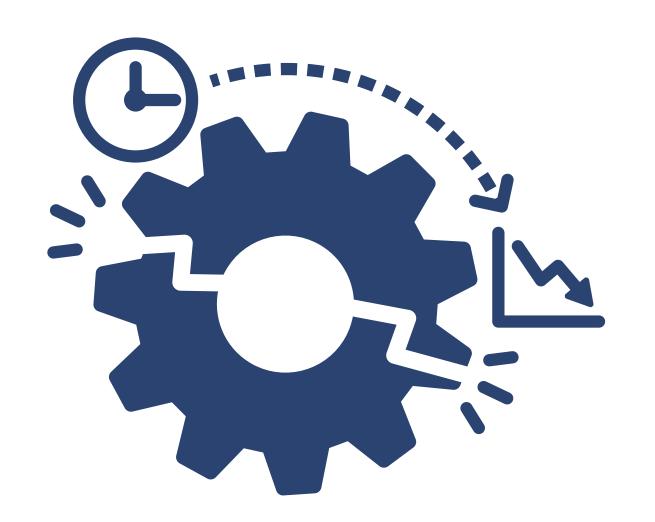
Until new resources reach additional productivity, crews typically begin working overtime which fatigues and overburdens the crew. This only helps production for a few weeks until it plummets.



Once overtime begins and new people enter the scene, the team takes their focus off quality.



The crew is now distracted.



Once distracted they begin installing work wrong and are riddled with rework which costs 2 to 12 times the original cost and time duration.



With all the rework happening the project team loses focus from planning, preventing, and removing roadblocks out ahead and they begin to experience stops and restarts.

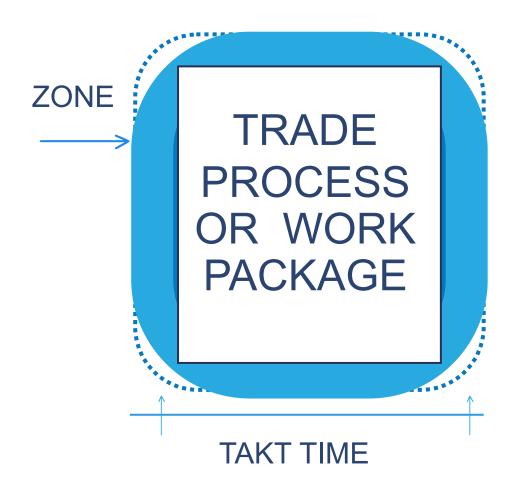


At this point the project descends into chaos, much like a dumpster fire inside a burning building, inside a nuclear bomb, during a solar flare.

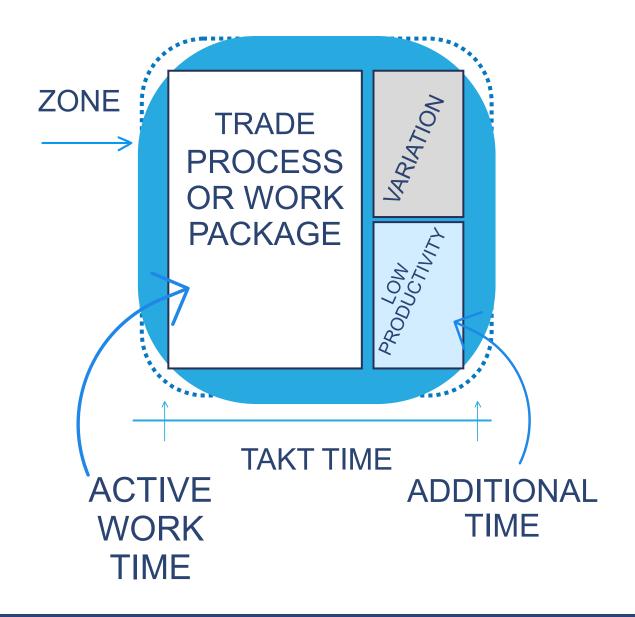
KINGMAN'S FORMULA

KINGMAN'S FORMULA

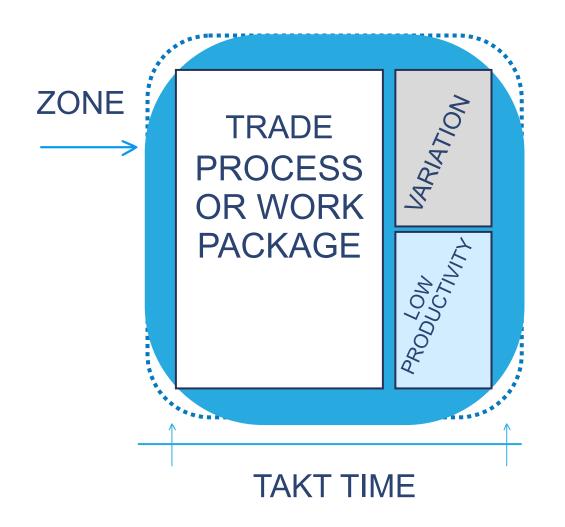
WHAT WE THINK WILL HAPPEN:



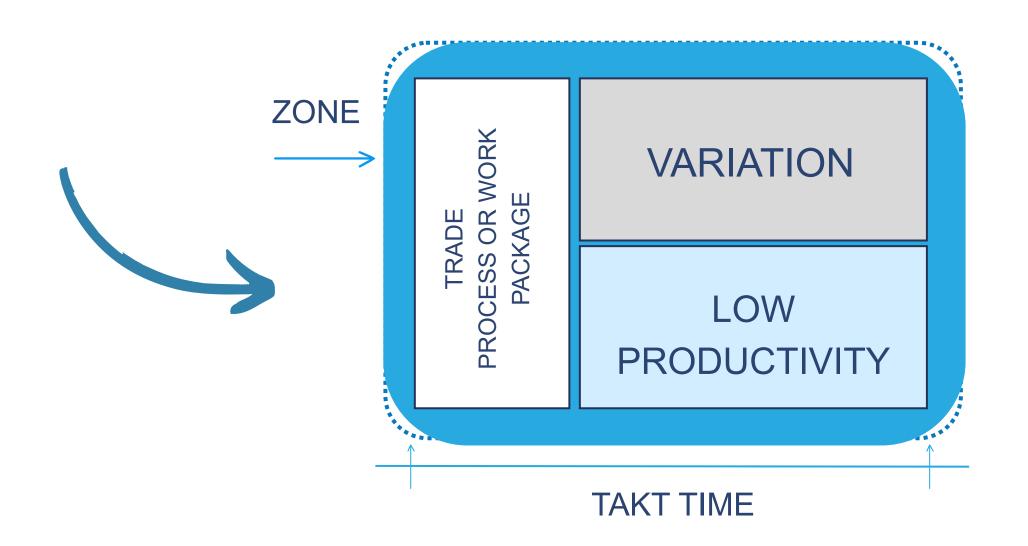
WHAT WILL HAPPEN:

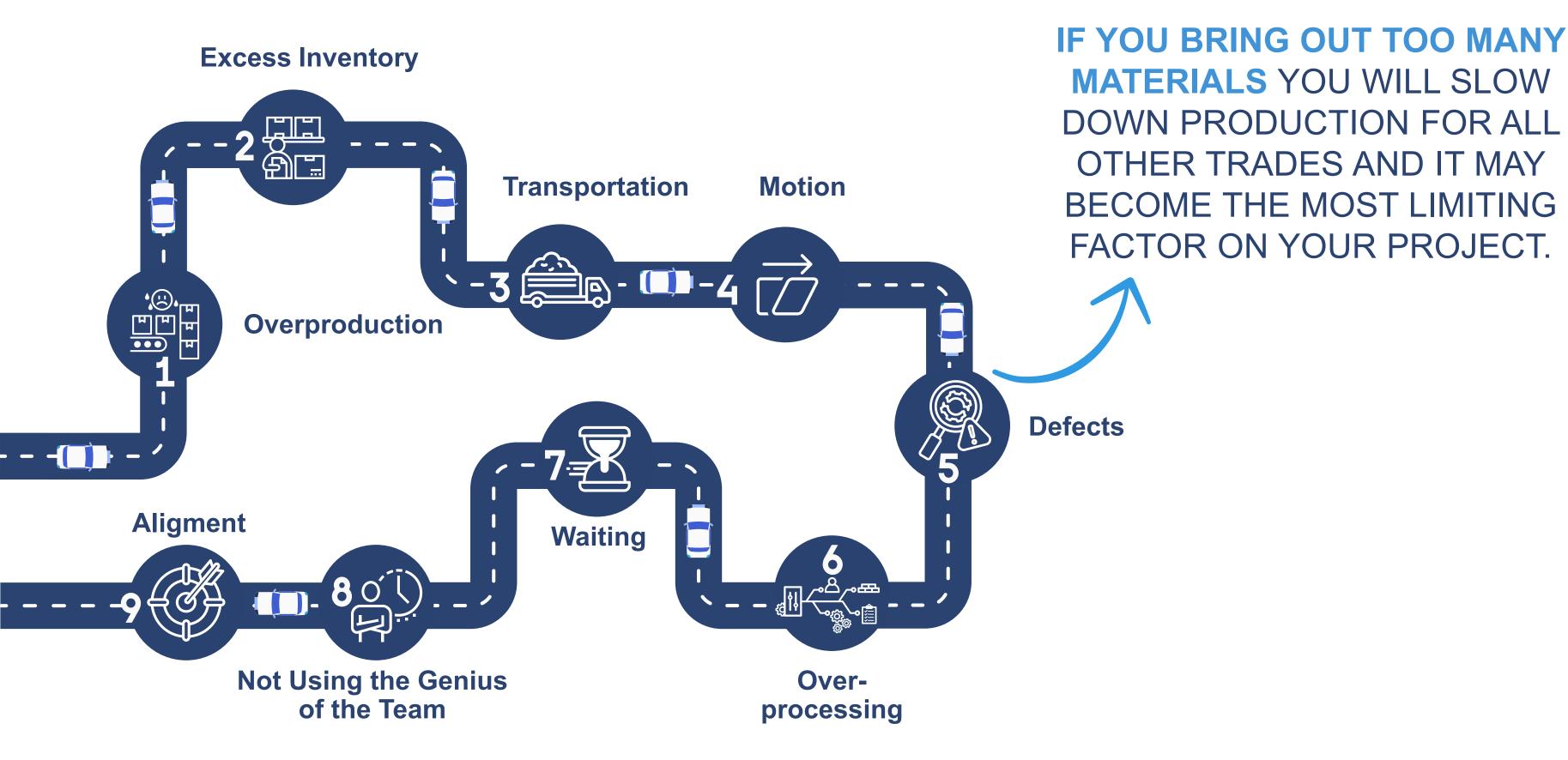


CURRENT CREW WORK:



WHEN ADDING MORE LABOR, YOUR ACTIVITY TIME SHORTENS, BUT YOUR OVERALL CYCLE TIME INCREASES.





PUSHING, RUSHING, & PANICKING LEADS TO...



Inability to focus on tasks.



Increased stress amongst the team.



Poor decision making due to clouded judgment.



An erosion of trust between the leaders, team, and especially the trades.



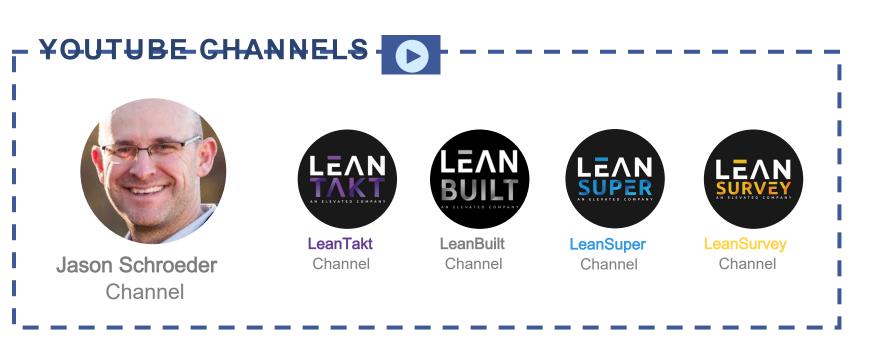
Communication channels breaking down.

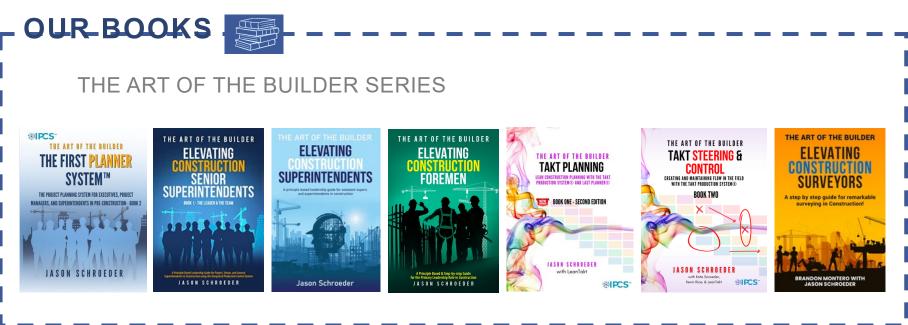


Developing a culture of fear and anxiety.

FREE CONTENT AND MORE!











THE ART OF THE BUILDER TAKT PLANNING & LAST PLANNER®

Jason Schroeder, Elevate Construction IST

Surfing the Wave of Lean Design and Construction

