

22<sup>ND</sup> ANNUAL



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# Pulling Takt Into Design Phase

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THE ABC'S OF LEAN: TRANSFORMATION THROUGH ACTIONS, BEST PRACTICES AND COACHING

OCTOBER 20, 2020

# Introductions



**Megan Arnold**  
Construction Project Manager  
CRB



**Shannon Chase**  
Design Project Manager  
CRB



**Daniela Gracey**  
Construction Project Manager  
CRB

# Presentation Overview and Goal



# Overview

Team collaboratively pulled a  
**field execution TAKT Plan into the design phase**  
on a process-driven building renovation  
to **accelerate Release for Fabrication**  
directly from the BIM model in small batches  
to support off-site fabrication and on-going installation



# Agenda

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- ① Project Background & Challenge
- ② Field Takt Planning with Minimal Design
- ③ Design Execution in Support of Field Takt Plan
- ④ Learning and Improvement

# Project Background & Challenge



# Project Background

- Vaccine manufacturing facility
- Full demolition and renovation
  - 29,400 sq. ft 1<sup>st</sup> floor and overhead interstitial
- Retrofit of existing
  - 17,000 sq. ft 2<sup>nd</sup> floor mechanical
- **\$200 million** Target Value Delivery

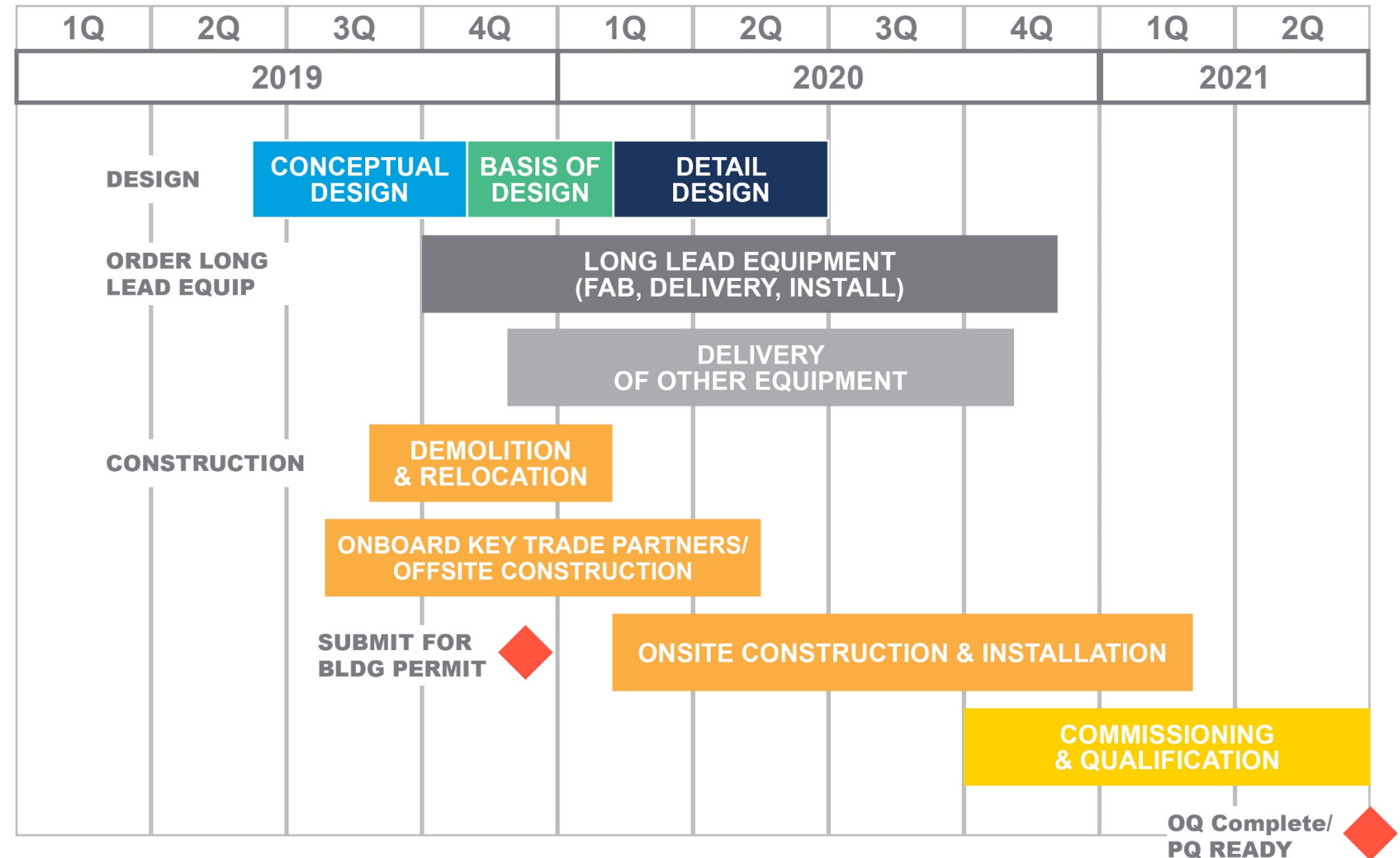


# Project Timeline & Challenge

**20 months**

Conceptual Design  
to Construction  
Complete

**Q:** How does the  
team deliver **fast-  
track, process-  
driven,  
non-repeatable**  
project in the given  
timeline?



# Takt Planning

**A:** Takt Planning establishes the **Flow** and **Pace of Production** to meet Overall Project Duration

$$\text{Takt Time} = \frac{\text{Work to be completed}}{\text{Available time}}$$



# Benefits of Takt Planning

Predictability

Reliability

Speed

Transparency

Teamwork

Lower Stress Levels



Removal of  
waste



Process  
& flow



Optimize the  
Whole



Collaboration



Respect for  
people & team

# Cultural Transformation

## Traditional Project Approach

- **Silo'ed** design & field teams
- Design decisions and deliverables **handed off** to the field team implementing the work
- Final **coordination by trades after IFC** documents issued



## Pulling TAKT into the Design Phase

- Foster **Cultural Connectivity** between the design and field teams
- Break down the work packages into small **executable portions**
- Deliver the work packages at the last **responsible moment**
- Workflow that supports **high performing team** mentality

# Benefits of Pulling Takt Planning into Design

- **Unified team CULTURE**
- **Focuses** the team
- **Align priorities** for overall project
- **Accelerates** ability to start procurement, shop fabrication and field install
- Release design to the shop or field in **executable portions**
  - Support duration of offsite fabrication
  - Support the cadence of installation
  - Trade partner input (constructability, full coordination) in design phase
  - Design 'need' dates pull-planned to align with construction

# Field Takt Planning with Minimal Design

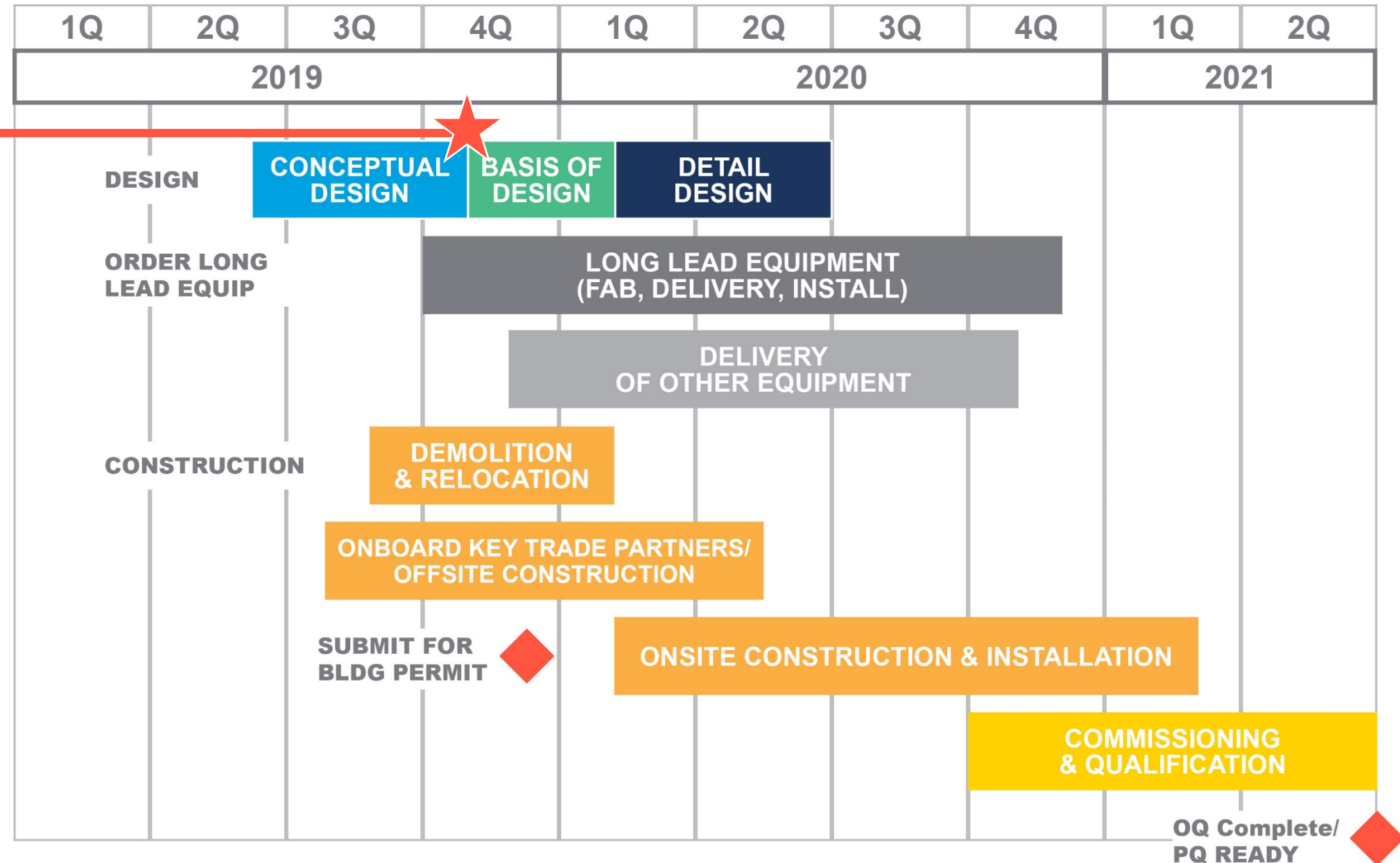


# Project Timeline

## Field takt planning

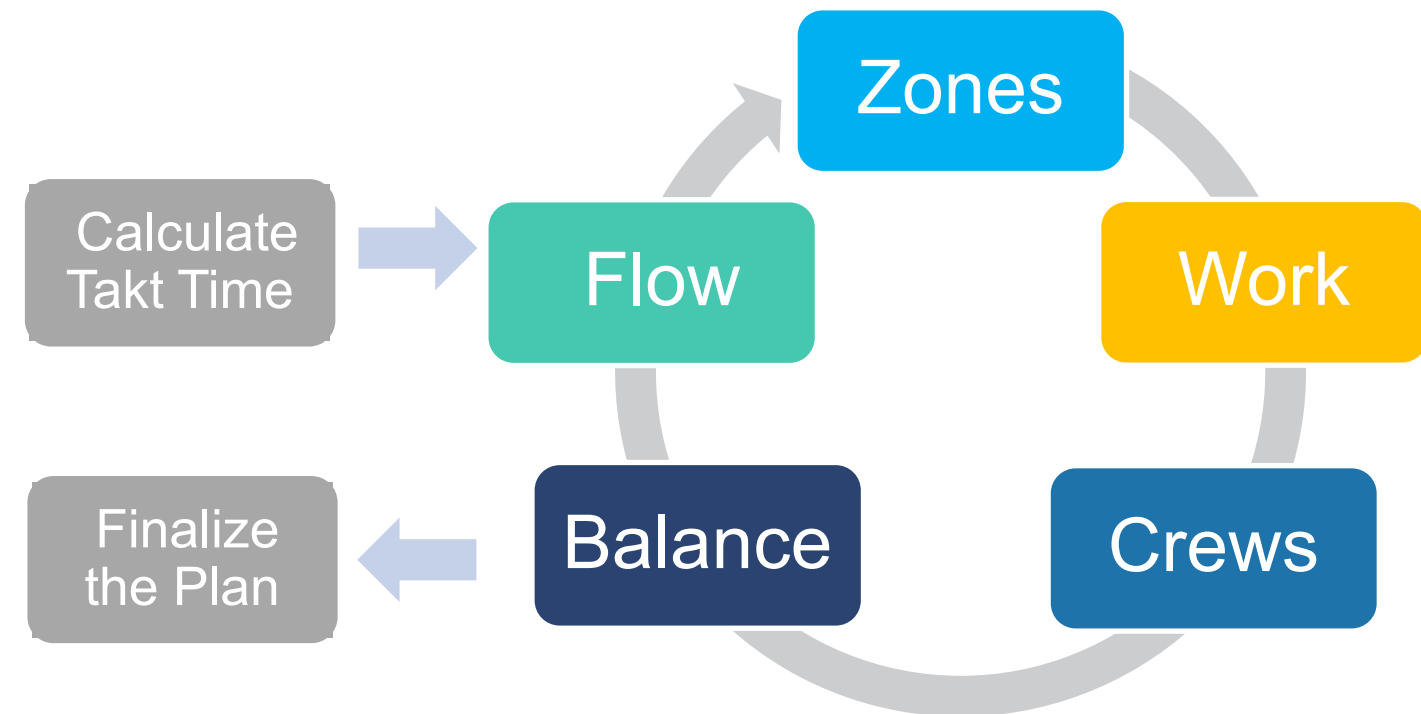
started at basis of design to validate:

- Overall schedule
- Estimate
- Sequence of construction



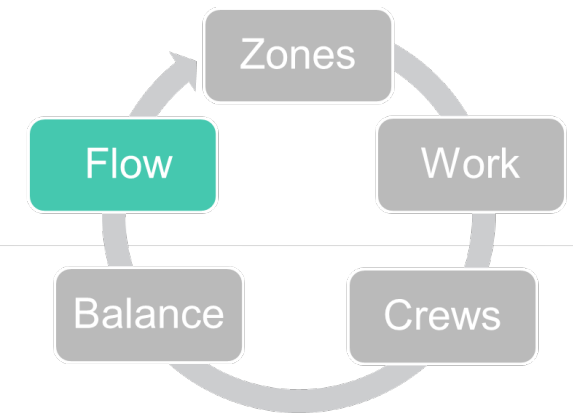
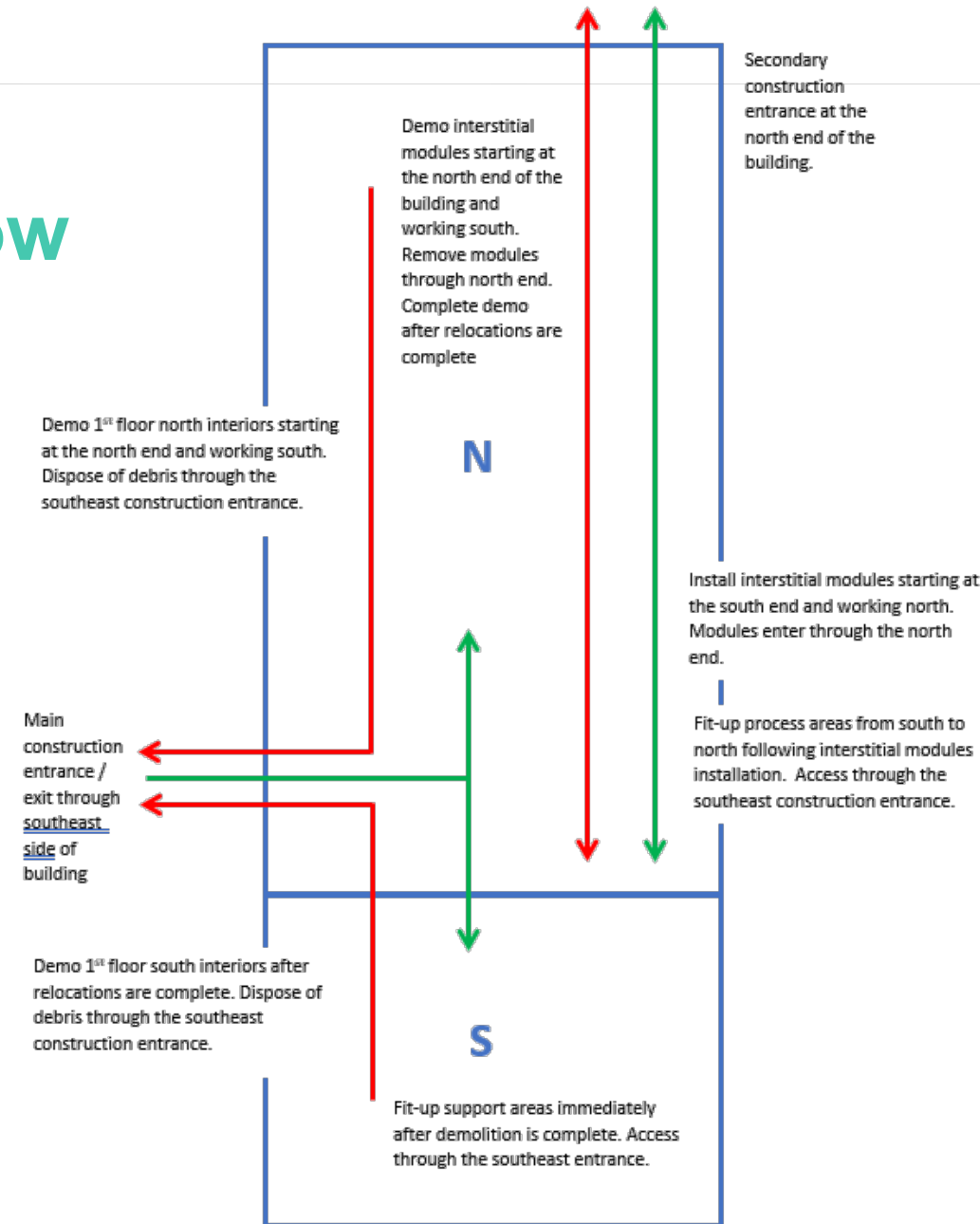
# Challenges to Takt Planning

- Starting Takt Planning *without* Detail Design
- Non-repeatable floor plan
- Mobilization would be required within weeks of design release



# Define the **FLOW**

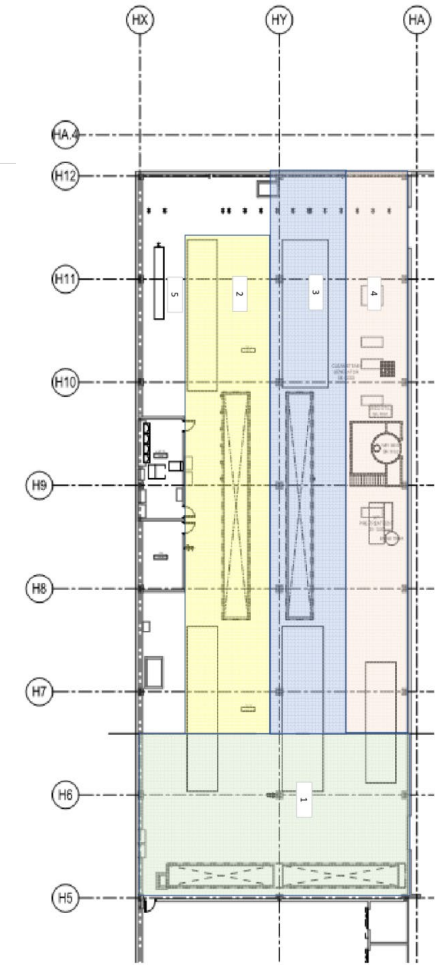
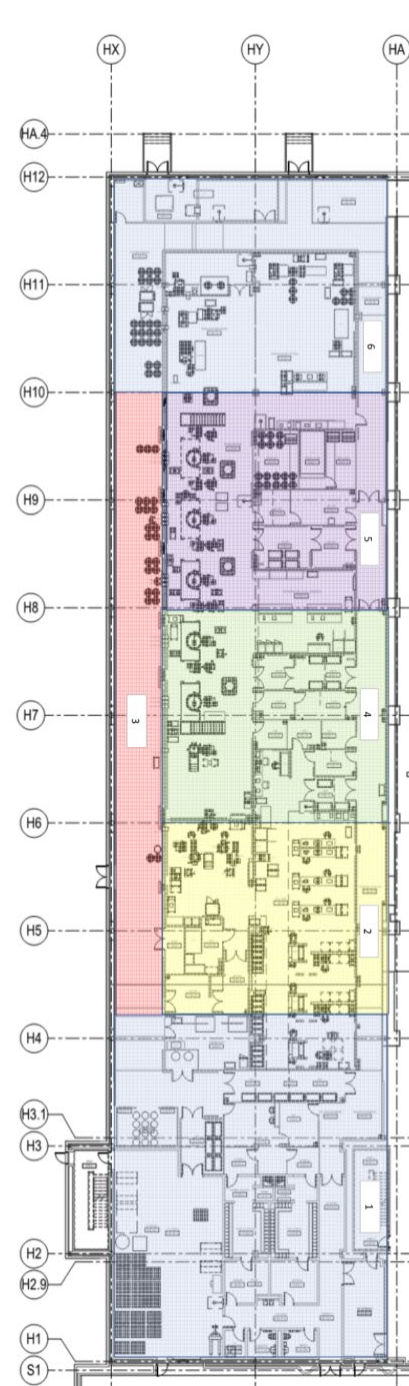
- Determine the **most efficient flow** of work in the field
- Considerations
  - Pre-requisite work
  - Equipment delivery dates
  - Off-site fabricated elements
  - Owner start-up sequence
  - Design status



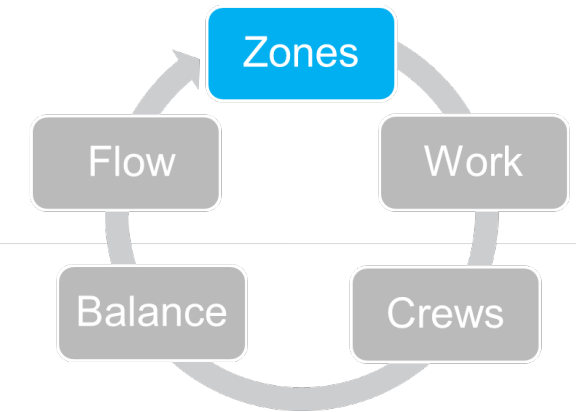
# Determine **ZONES**

- Identify Takt zones in plan and section (where necessary)
- Define zones as early as possible
- Considerations
  - Quantities
  - Sequence of installation
  - Crew size

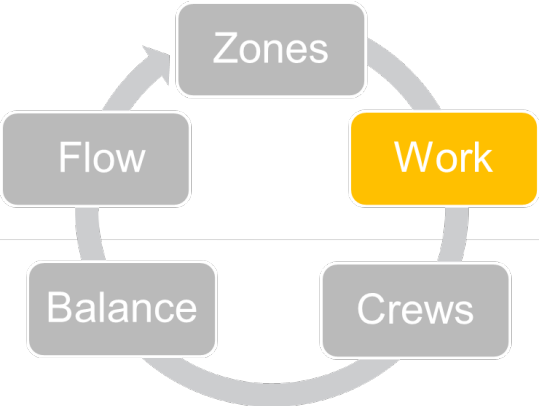
Interstitial/  
overhead  
MEP  
takt zones



Second floor  
mechanical  
takt zones



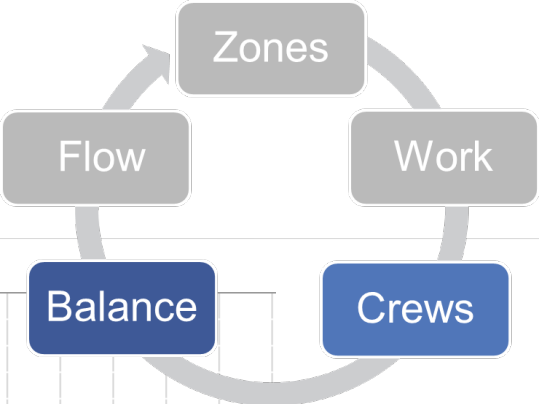
# Identify & Calculate the **WORK**



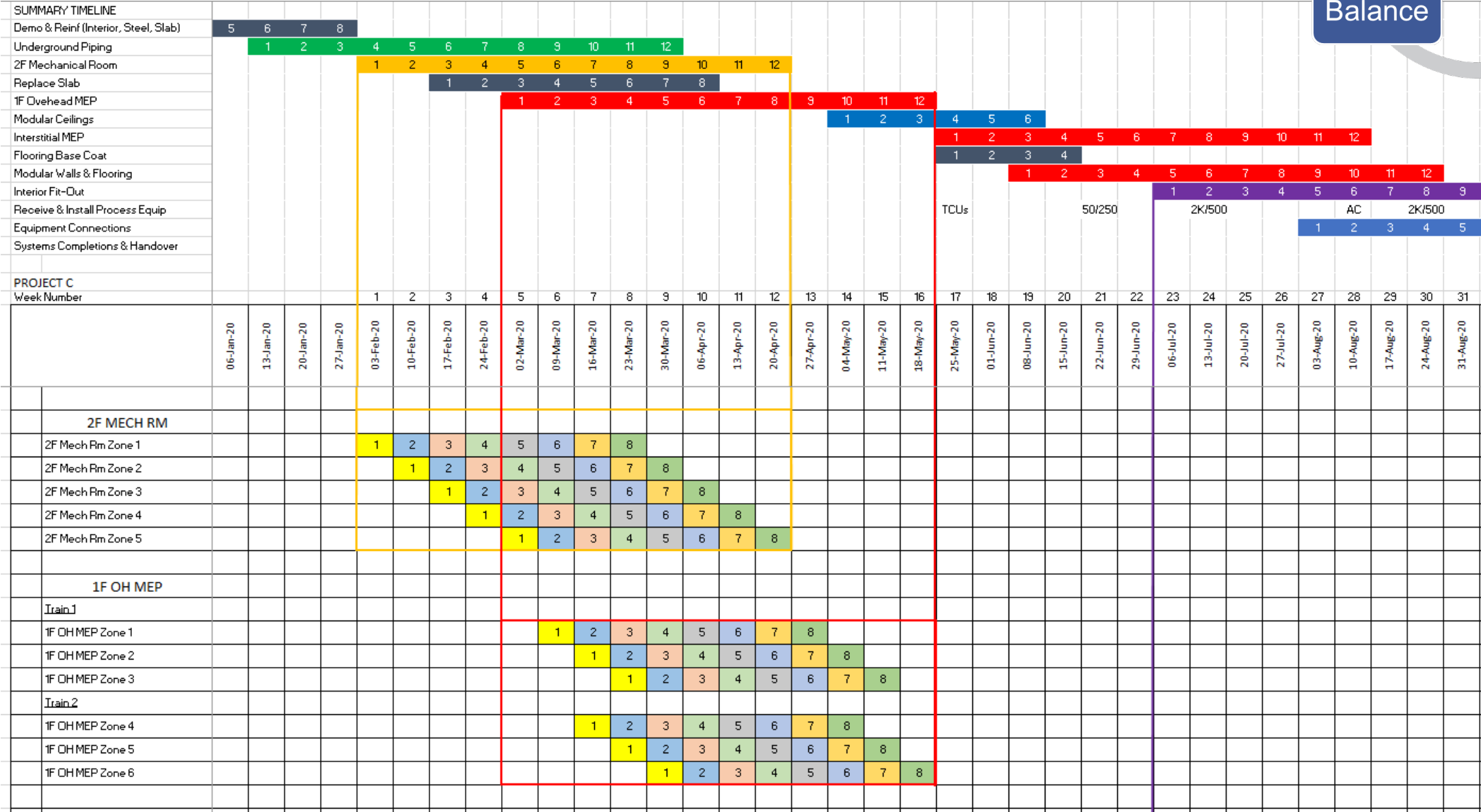
<div>PIPING</div> <div>3</div>		Stocking on Fridays
		install rods down
		install modular racks
		making connections for modular racks
		install seismic connections
		testing at completion of each task
		labeling and any additional valve tags
		Clean up and leave it like you found it
		Connections to riser mains
NOTES		Fire stopping from above the floor and insulation will be later
<div>HVAC</div> <div>4</div>		Load in on Mondays
		Modular exhaust mains
		Modular supply mains
		Remaining FSD that are inline with mains
		inspections
		duct leakage inspections
		Ensure bag ends are covered (LEED)
		Proress heating hot water and chilled water mains
		Clean up and leave it like you found it
		Install Seismic
NOTES		Fire stopping from above the floor and insulation will be later
<div>ELECTRICAL</div> <div>6</div>		Install prefabbed hangers, racks, seismics
		Install conduit, including branch
		All loading on 'Prime trade day' , Wednesday
		Clean up and leave it like you found it
		Tie in to electrical in priority walls
Notes		Panels and inwall electrical are getting prefabbed, wire pulling is workable backlog
<div>HVAC BRANCH</div> <div>8</div>		Load on Mondays
		Install Pheonix Stick assemblies
		Install low pressure duct work
		Pull Tees on HHW and CHW Mains
		Runout HHW and CHW to reheate coils and beams
		Duct leakage testing, pipe pressure testing
		Inspections
		Clean up and leave it like you found it
		Chilled beams in branch work for offices (Branch to be added)



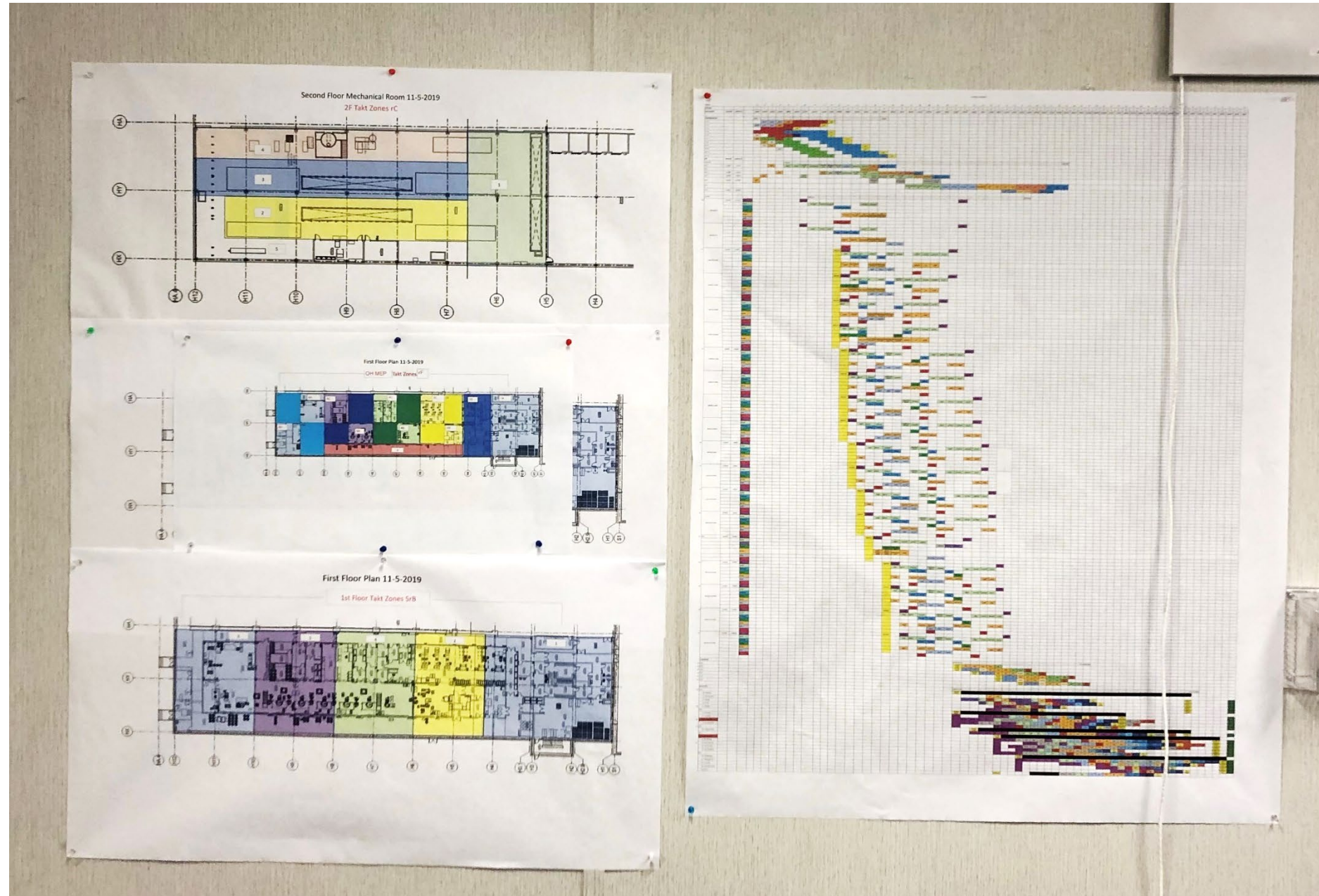
# Determine **CREW** Size & **BALANCE** the Plan



Early construction Takt Plan based on minimal design



# Field Takt Plan



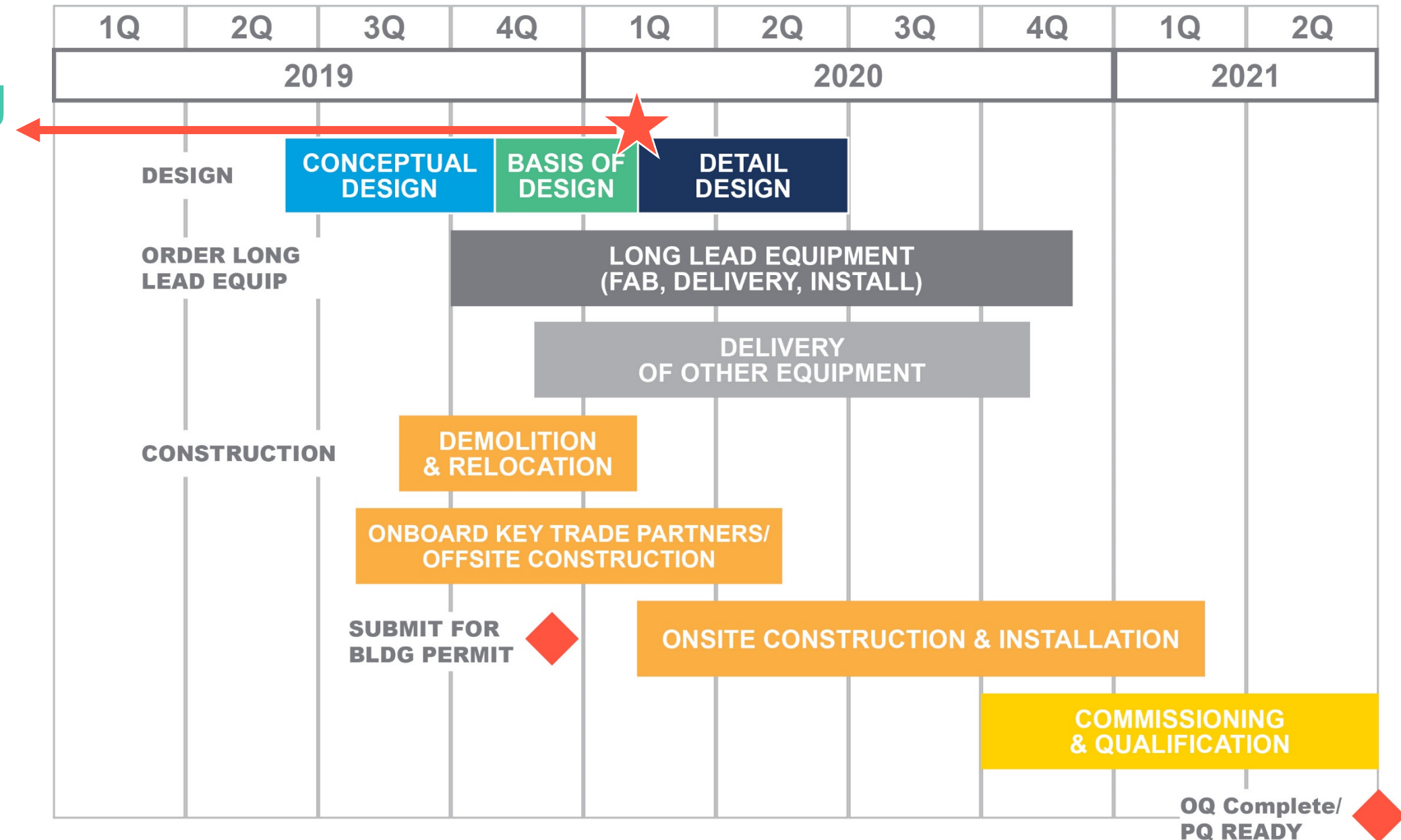


# Design Execution in Support of Field Takt Plan



# Project Timeline

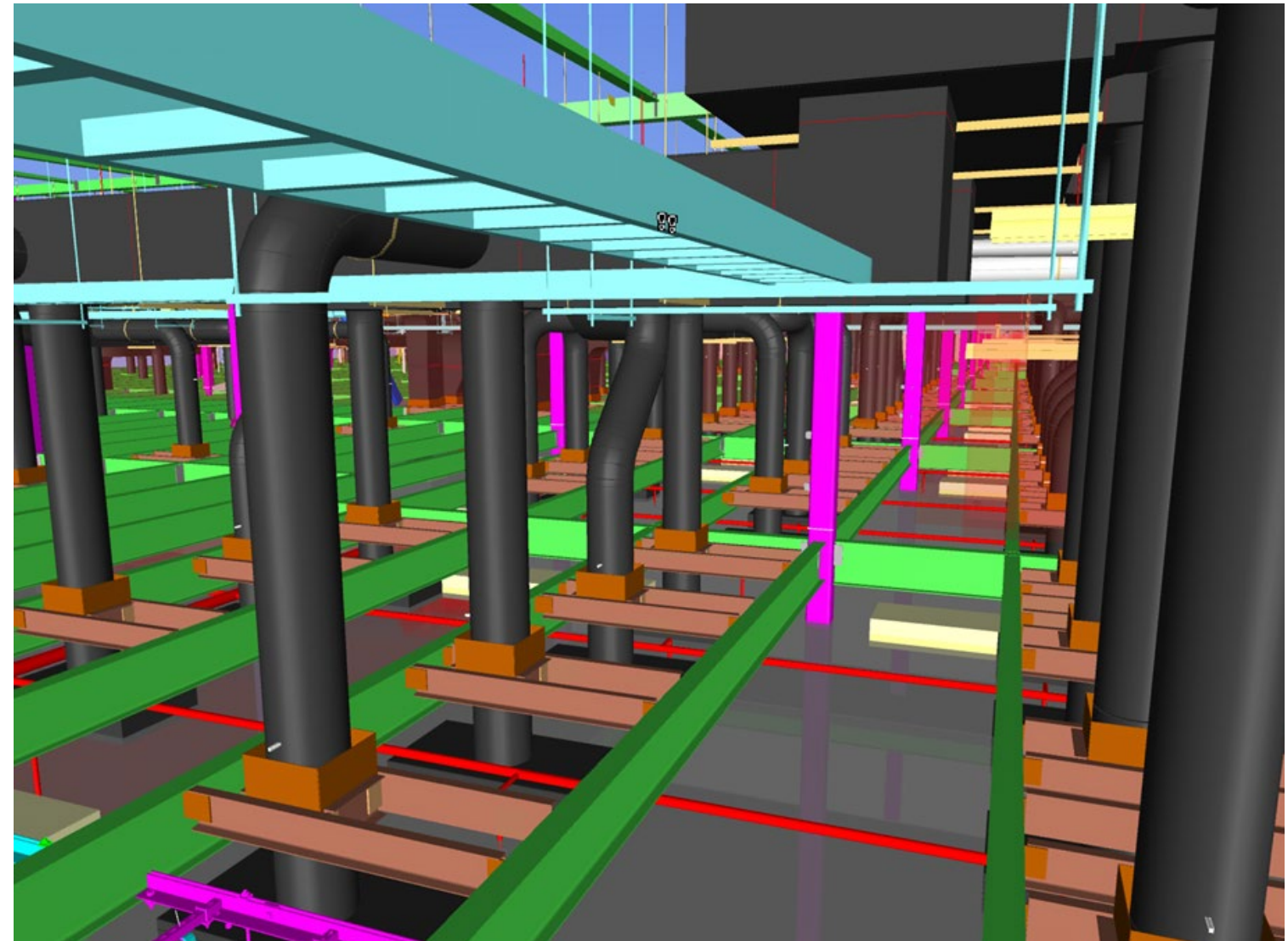
**Design Takt planning**  
started at Detail  
Design to Release for  
Fabrication via BIM  
model to shop or field



# Model Collaboration – Detail Design

- CRB and Trade Partners working together in Revit models to create **one Constructible Federated model**
- Majority Trade Partner-owned model content
- CRB managed the model and design
- **No separate** design intent and fabrication models

## *Model Level of Development (LOD) 350*



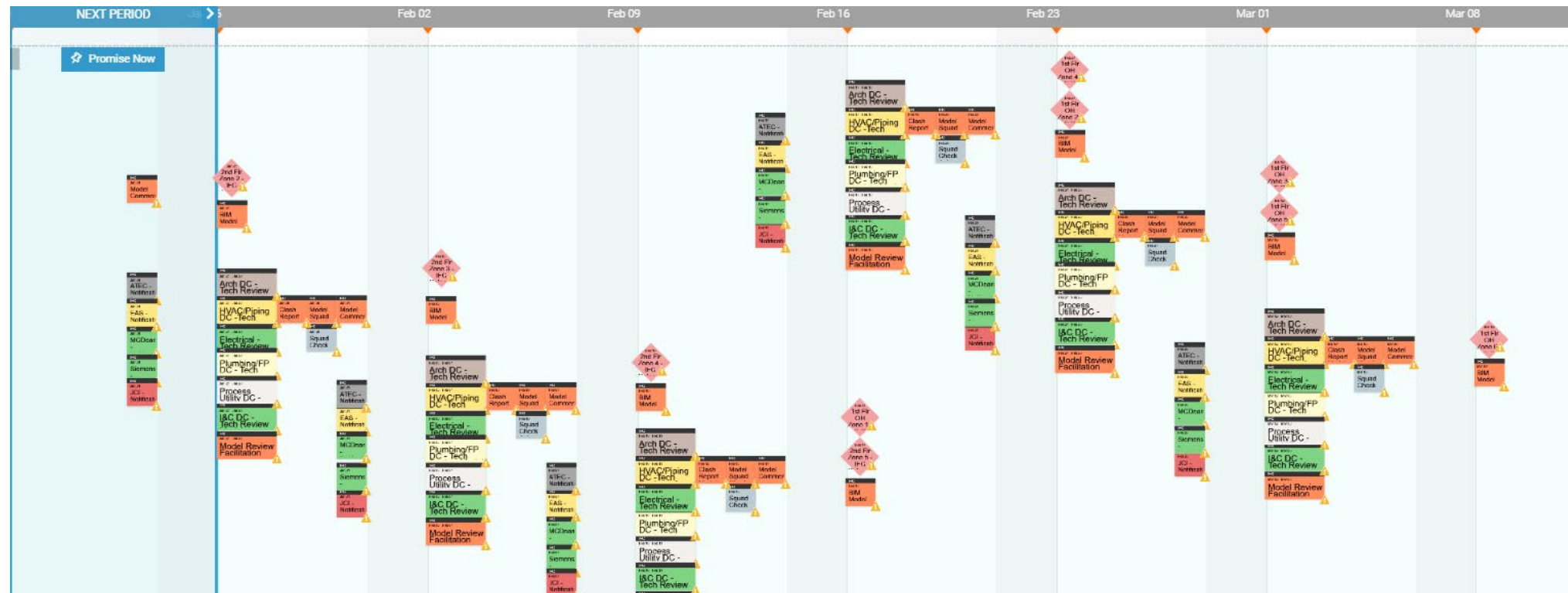
# Trade Partners Input to Design

- ✓ Early selection of trade partners
- ✓ Ownership of design and schedule
- ✓ Constructability perspective
- ✓ Identified work for off-site fabrication opportunities
- ✓ Trade partners owned BIM model content
- ✓ Facilitated transition to fabrication level details
- ✓ Conducted Takt zone-focused design coordination meetings to review BIM model progress and resolve clashes
- ✓ Released for Fabrication out of BIM model as opposed to IFC drawings



# Align Model Design Releases with Field Takt

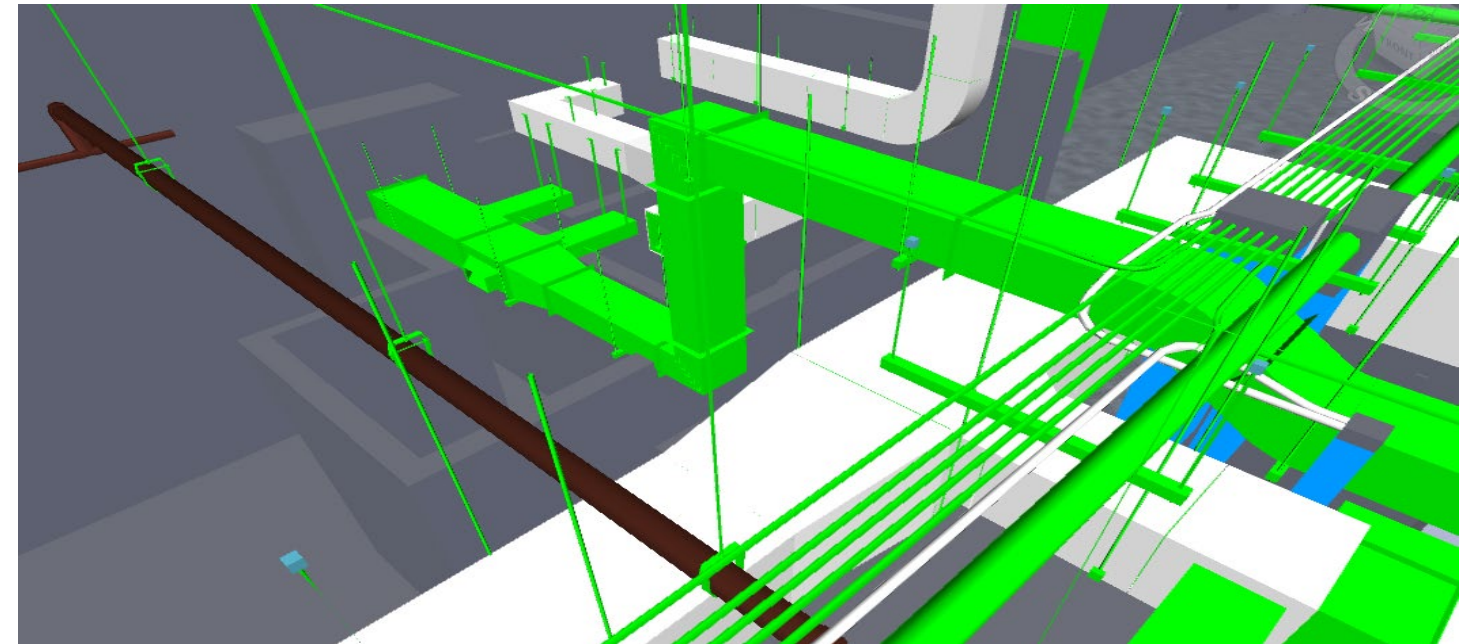
- Pull Planned from Takt zone construction start date
  - Release for Fabrication from BIM model
  - 6 weeks prior to construction start of the Zone



# Model Fabrication Release Strategy



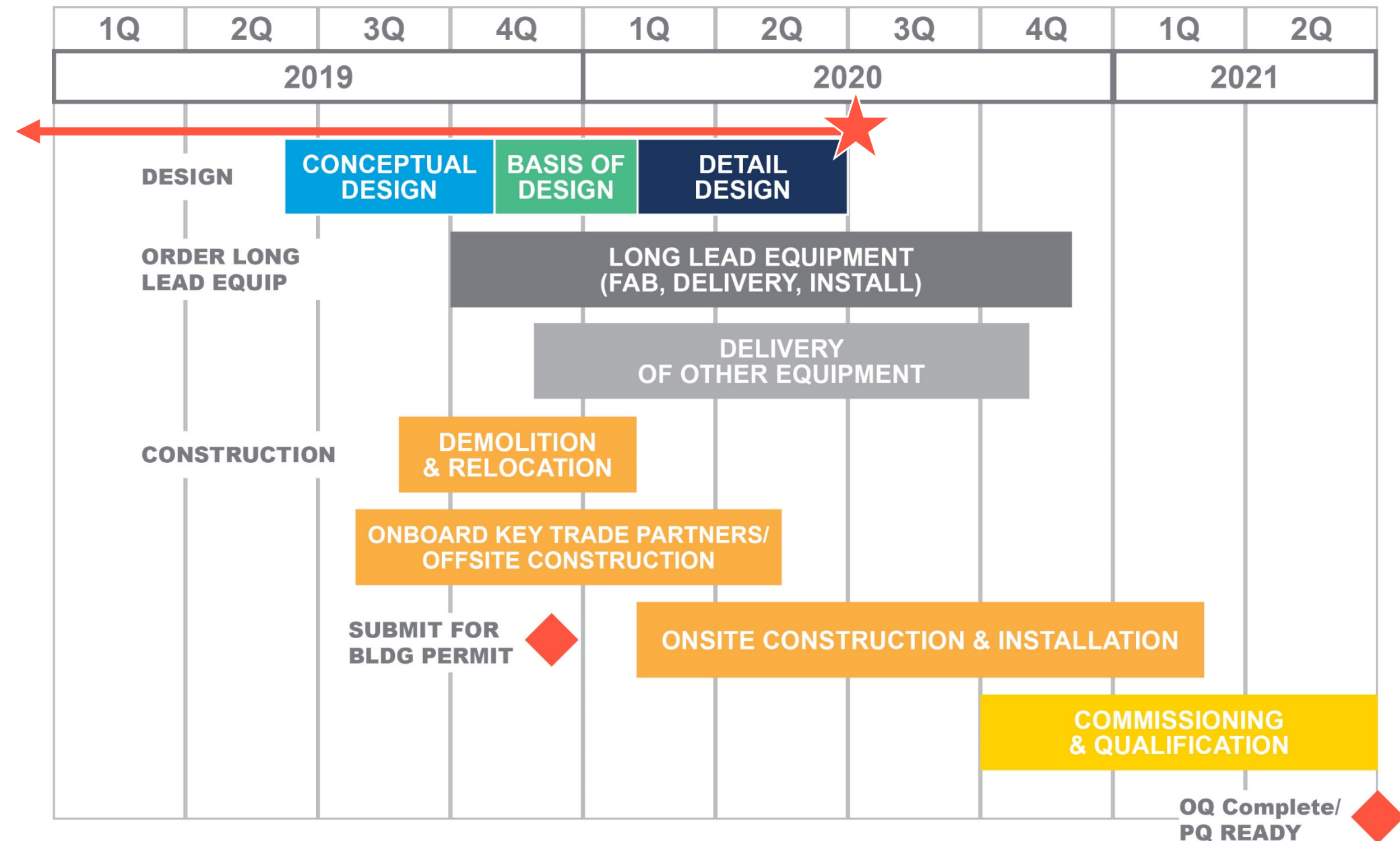
Final Approved	<input checked="" type="checkbox"/>
Data	
RELEASED FOR FABRICATION	<input checked="" type="checkbox"/>
RELEASE FOR FABRICATION C...	12NOV19



# Project Timeline

## Issued for Construction

~5 months of on-going construction prior to IFC



# Learning and Improvement



# Deltas

- Design must consider systems crossing multiple Takt zones
- Design input needed to field Takt zone development
- More rigorous spatial allocation by Takt zone by trade
- Improved communication between field and design on roadblocks and forecasted release dates
- Some minor trade partners not fully integrated into supporting Takt plan

## Feedback from Mechanical Trade Partner:

*“The expectation to only work one trade in an area along with the concept of completely finishing all tasks in an area may be unrealistic due to the nature and installation process for MEP systems.*

*TAKT plan development can be very time consuming as it is an ongoing process. This may be partially because it could be a fairly new concept for a project team. Additional training may be required at the onset of this process.”*

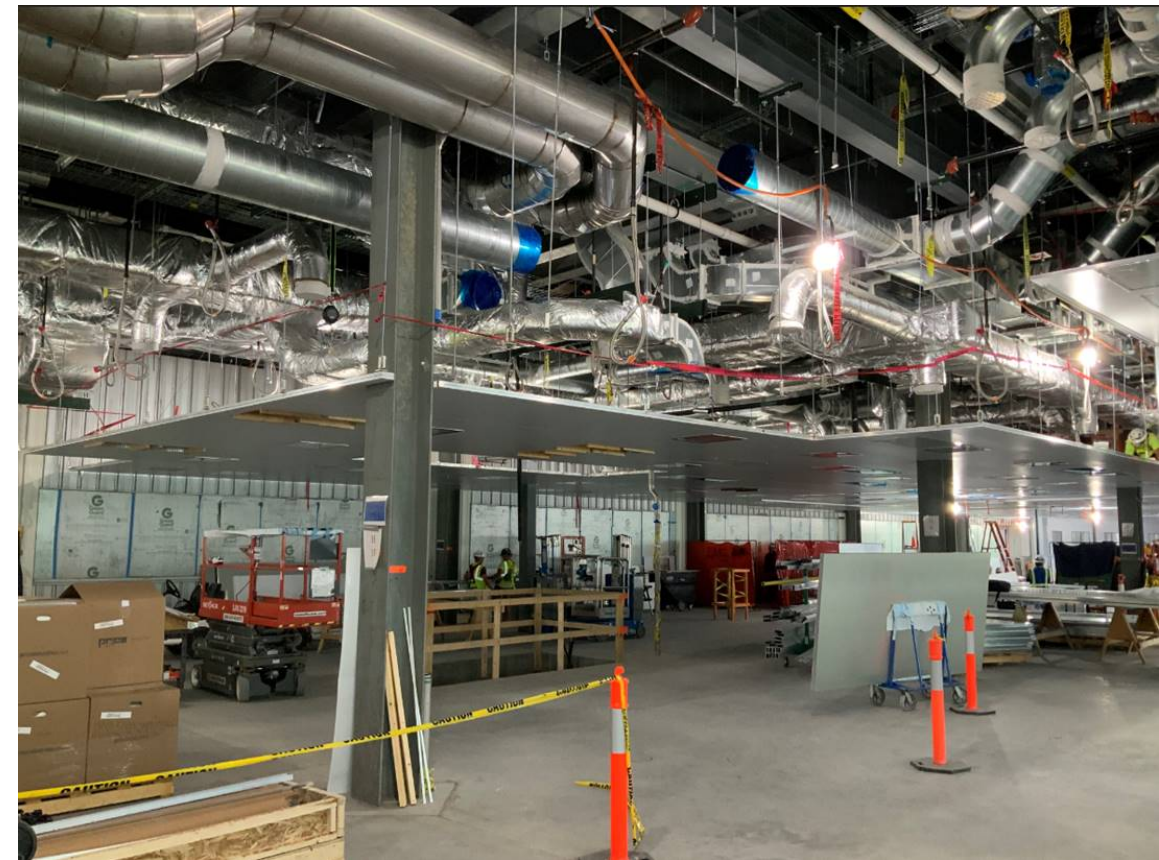
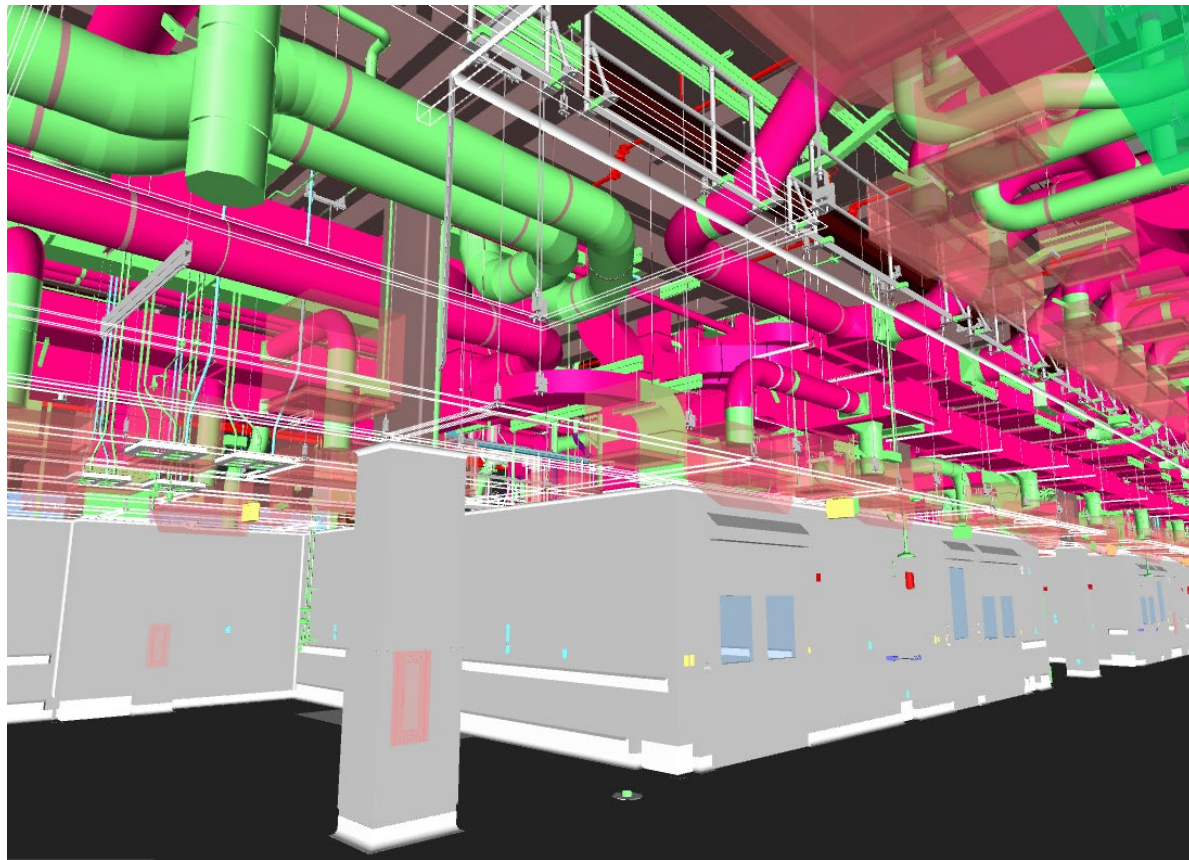
# Plus

- **Underground and Building Permits** received with an early set of IFC documents, without full design coordination complete
- **Very little field clashes** to resolve, overhead install very smooth
- **Field Takt plan visual**
  - Entire project in a summary, easy for team to read and measure progress against
- **Team Culture**
  - Collaboration from the beginning
  - Everyone had a chance to be part of the solution
  - Ownership in finished product
  - Promote and provide for interactive communication



# Continuous Improvements

- Set Takt zones as early as possible in the project
- Increased focus and rigor needed for spatial allocation
- More repetition and experience in Takt planning to refine process



## Quote

“TAKT planning on the project ended up being a **collaborative effort** that allowed for the realities of putting a job in while simultaneously progressing the design.

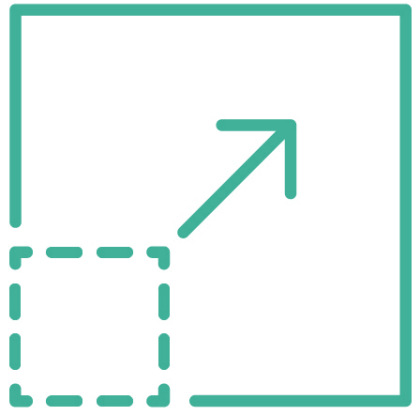
Many issues were addressed and **resolved in real time** with participation from all contractors involved which added additional understanding around field coordination.

It was a **refreshing approach** that in my opinion had many benefits not typically associated with the more standard scheduling exercises.”

- Hygienic Piping Trade Partner Project Manager



# How can you apply this in the future?



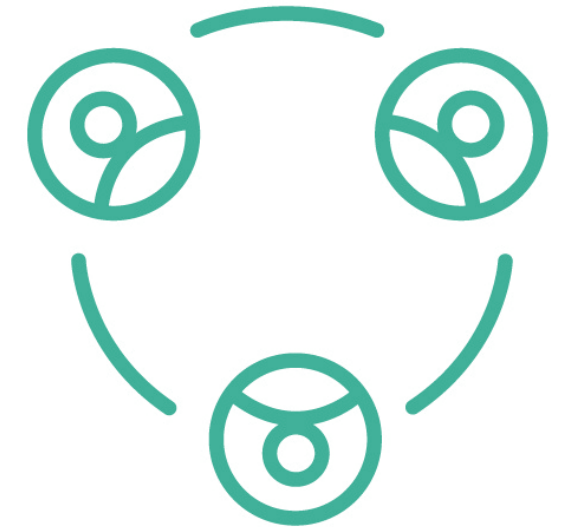
Traditional Takt planning approach can be modified to meet the needs of your project



Takt planning supports priorities of entire project



Takt planning does not require all design details



Be intentional in fostering a collaborative team

# Contact Us



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