

25TH ANNUAL



25TH LCI CONGRESS
OCTOBER 24-27, 2023

Integrated Project Delivery In the EV Market

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25 YEARS OF LEARNING: SUPERCHARGE YOUR LEAN JOURNEY IN THE MOTOR CITY

October 25, 2023

Welcome

Session Objectives:

- Understand the value IPD can bring to your projects
- Share challenges and lessons learned
- Set future and current IPD projects up for success

Agenda:

REVEAL

The true scheduling, cost, and efficiency benefits of IPD and equitable risk

CONSTRUCT

A contract that supports IPD to eliminate questions upfront and build a cohesive team

UNCOVER

The expectations and deliverables of every project stakeholder

BUILD + MAINTAIN

Trust and collaboration from day one

Welcome

Speaker Introductions



Alan Blanchette

Sr. Project Director
BARTON MALOW COMPANY



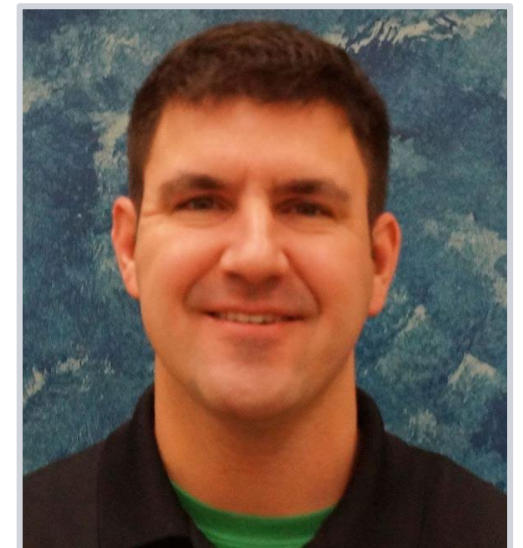
Alonso De Avila, Jr.

Sr. Project Manager
GENERAL MOTORS



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Alan Thompson

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REVEAL

THE TRUE SCHEDULING, COST, AND EFFICIENCY
BENEFITS OF IPD + BENEFITS OF EQUITABLE RISK



Ultium Cells Project Overview



Greenfield lithium-ion electric cell manufacturing facilities
and supporting infrastructure for EV products

What is IPD?

Integrated Project Delivery (IPD) is a delivery model using a single contract for design and construction with a shared risk/reward model, guaranteed costs, waivers of liability between team members, an operating system based on lean principles, and a collaborative culture.

TRUE IPD

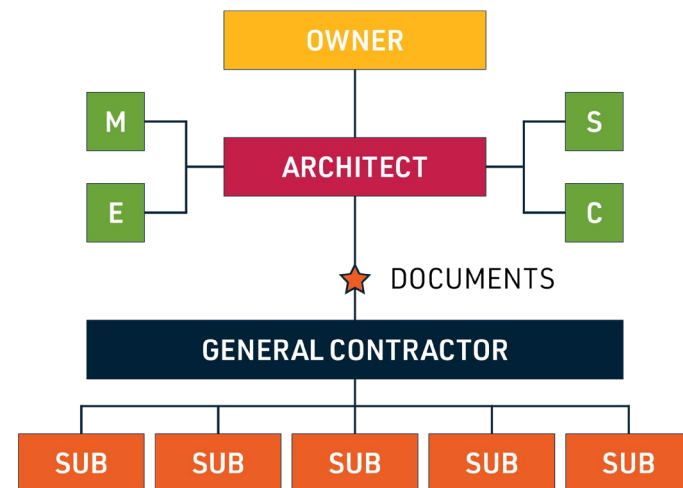
Uses an Integrated Form of Agreement (IFOA) signed by the Owner, Lead Designer, Lead Builder, and possibly other participants

IPD Lite

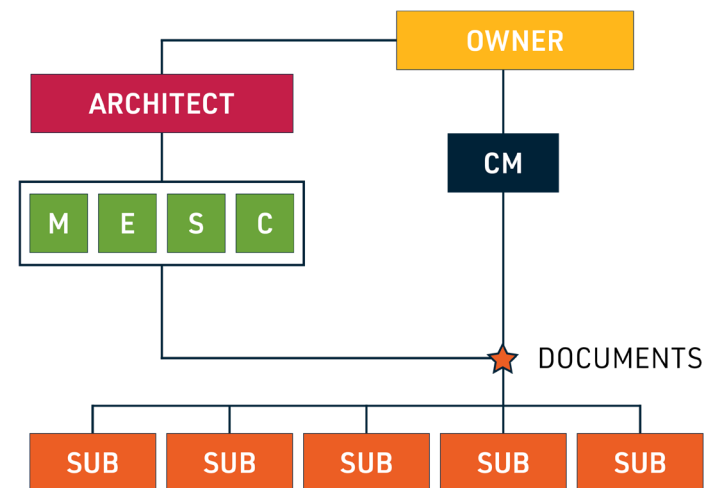
Uses select IPD techniques in another delivery model, often Design-Build or CM at Risk.
Also known as "IPD-ish"

What is IPD?

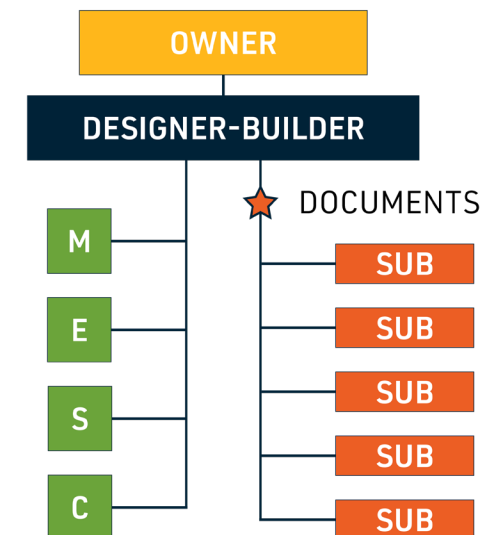
GENERAL CONTRACTING



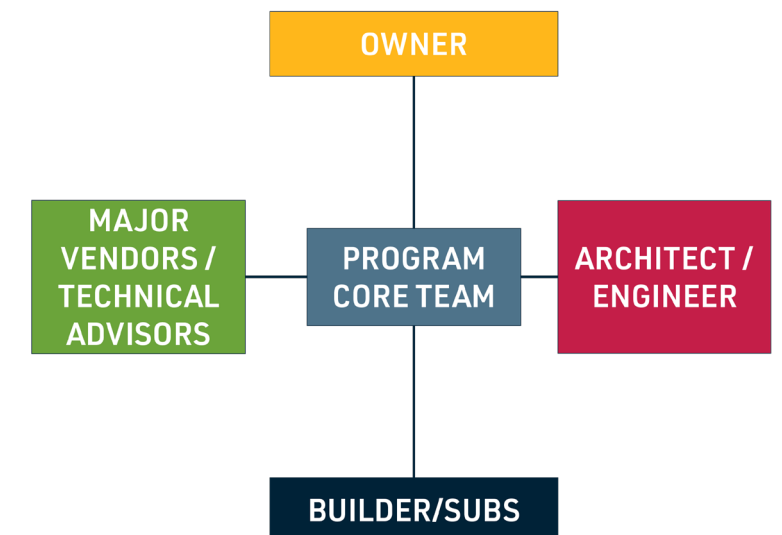
CONSTRUCTION MANAGEMENT



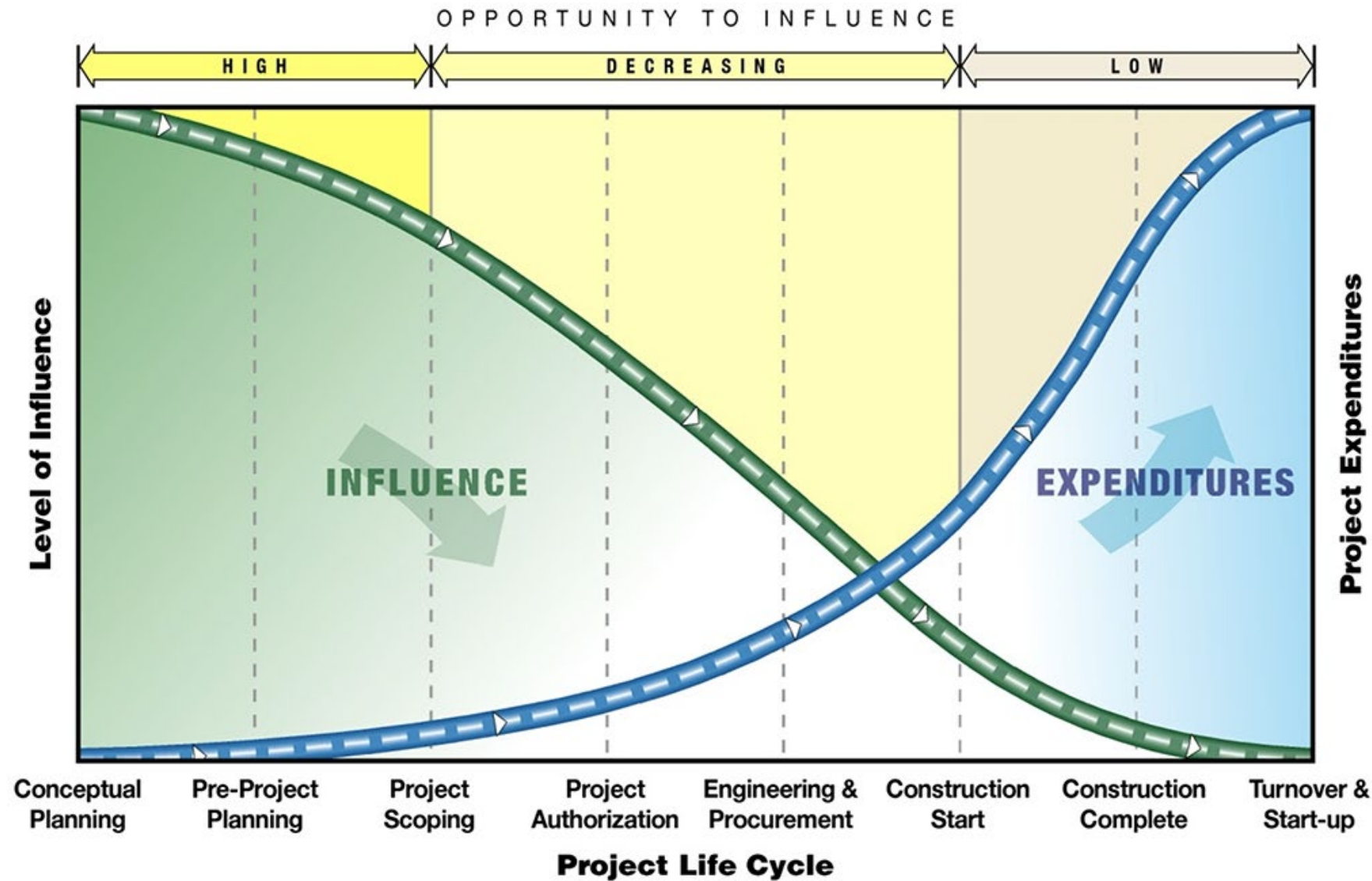
DESIGN-BUILD



INTEGRATED PROJECT DELIVERY



What is IPD?



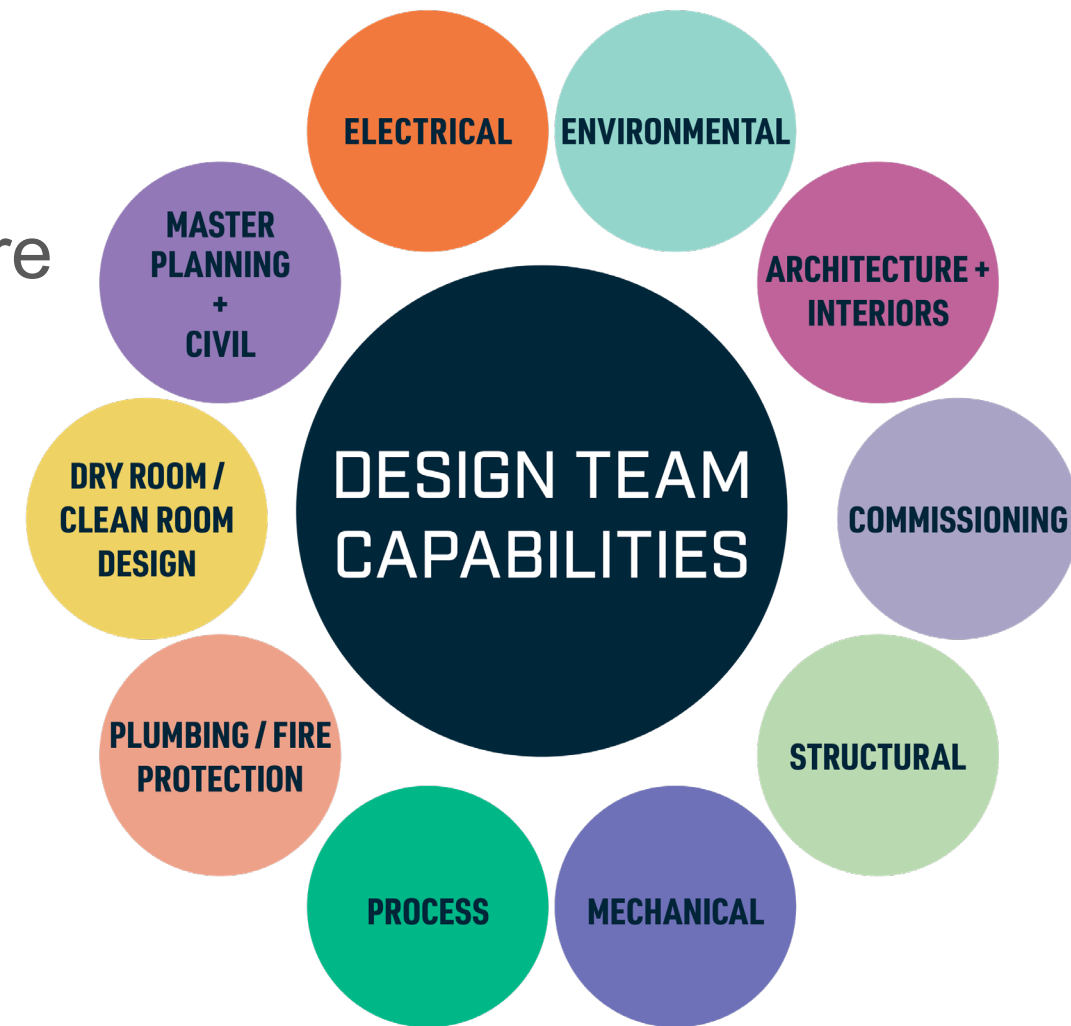
“By the time 1% of a project’s upfront costs are spent, 70% of its life cycle costs may already be committed.”

– Joe Romm,
Founding Editor of Climate Progress

The Design Team

Key Factors to Lean Construction Implementation Success:

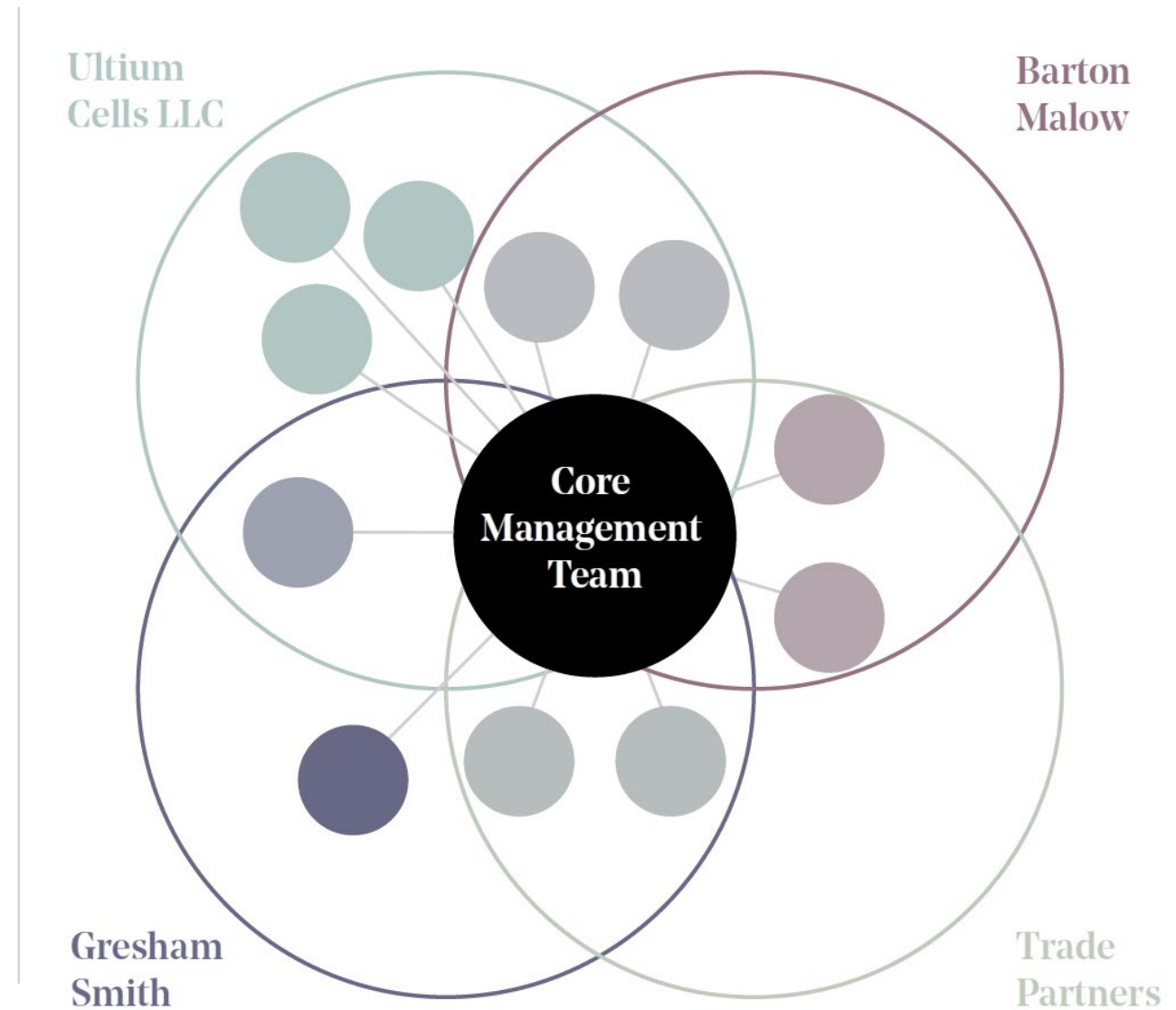
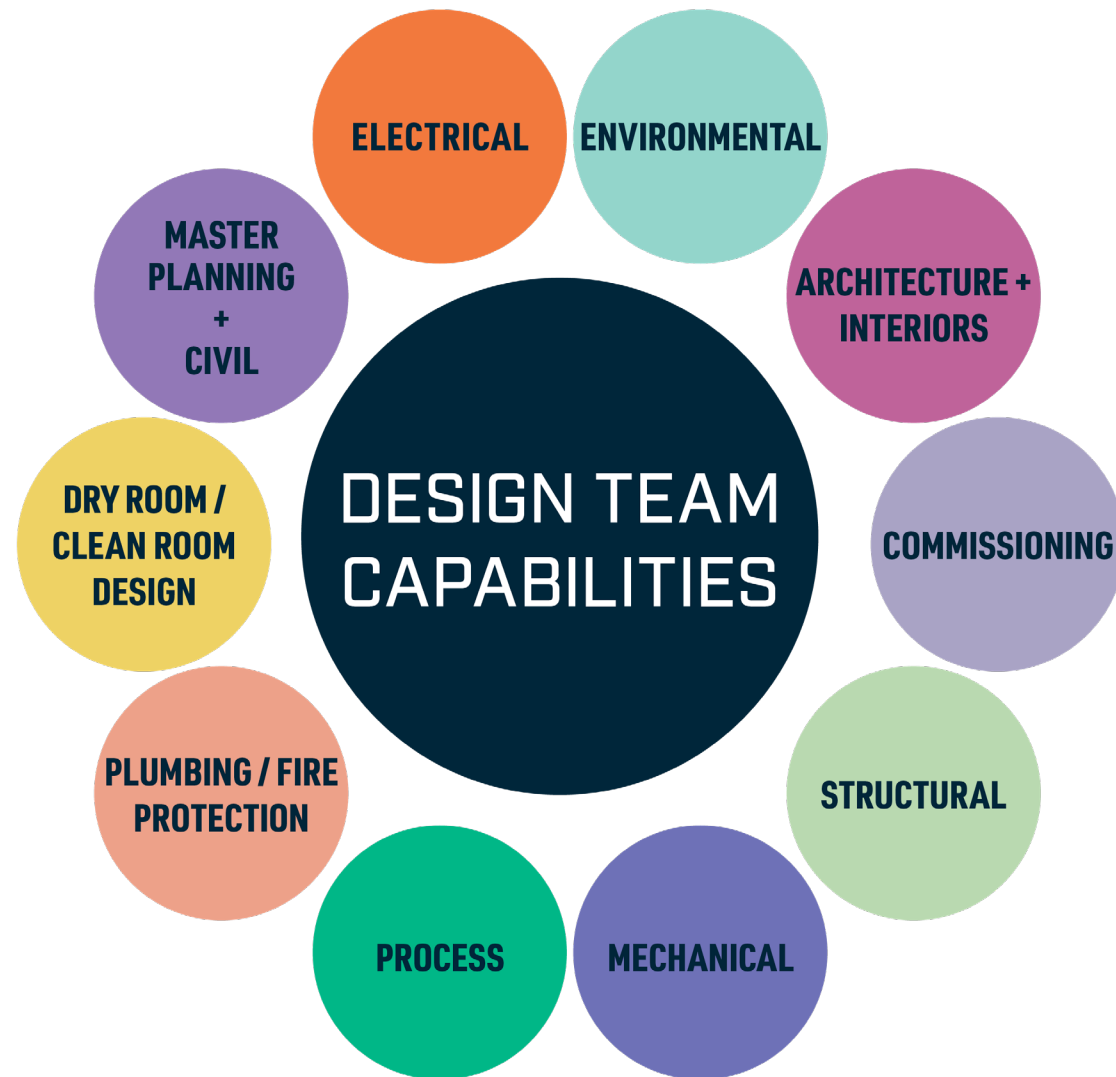
- Consolidate program requirements into a single structure
- Simplify and unify the building envelope
- Prefabrication
- Standardization
- Elimination of redundant drawings and documentation
- Bluebeam review and comment of design by installers
- Integrated Virtual Design and Construction



INTERNALIZED LEAN PRACTICES AND TOOLS

- *Project Chartering*
- *Alignment on Conditions of Satisfaction*
- *Schedule Pull Planning*
- *BIM Visualization in design and owner review*
- *Clash detection on weekly basis*
- *Pre-installation conferences with trades*
- *Integration of construction models into Navisworks*
- *Target Value Design*
- *Stage Gate decision-making*

Project Team Partners

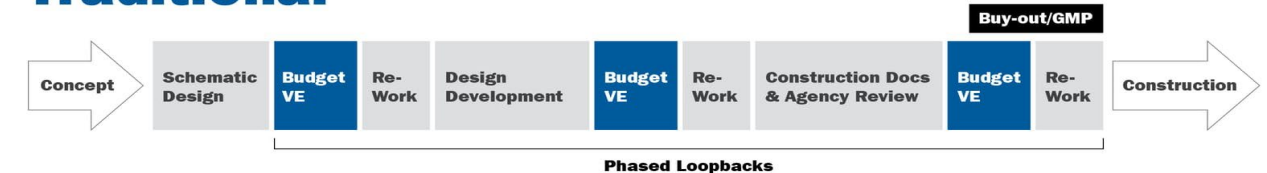


The Team

Target Value Design + Continuous Cost Tracking

- Identify the target value goal
- Identify variations as decisions are incorporated
- Estimate by system as the work progresses
- Validate system cost is within target model
- Use alternate and deferred cost elements to control

Traditional



Target Value Design



TOOLS + SOFTWARE APPLICATIONS

Specialized Design Software

CAICE, SWMM (XPSWMM, PCSWMM, EPA SWMM, SSA), WaterCAD, HASP, COGO, INROADS, Wildsoft, QUAL2Kw, HEC-RAS, HY8, HYDRAIN, Haestad Methods, MathCAD, ArcView, ETAP, ElumTools, AGE, Visual, EDR, Trace 700, COMcheck and other

Web-Based Project Server Space

Newforma/ProjectWise

BIM Software

BIM 360 Team, Collaboration for REVIT, Autodesk REVIT, Civil 3D, Plant 3D, Bentley MicroStation, Geopak, InRoads

Cost Estimating

US Cost Success

Design/Rendering/Presentation

Bluebeam, Adobe Acrobat, AutoCAD Viz, Bentley Architecture, Plotting, Powerpoint, Sketchup, Cloud Rendering, Enscape, Lumion

Office Automation

Office 365 Suite

Project Scheduling

MS Project, SmartSheet, P6, Phoenix

Document Management/Control

Revit Server, Exchange, Newforma, ProjectWise, SharePoint



The Design Team

Big Room and Co-location Collaborative Design Process



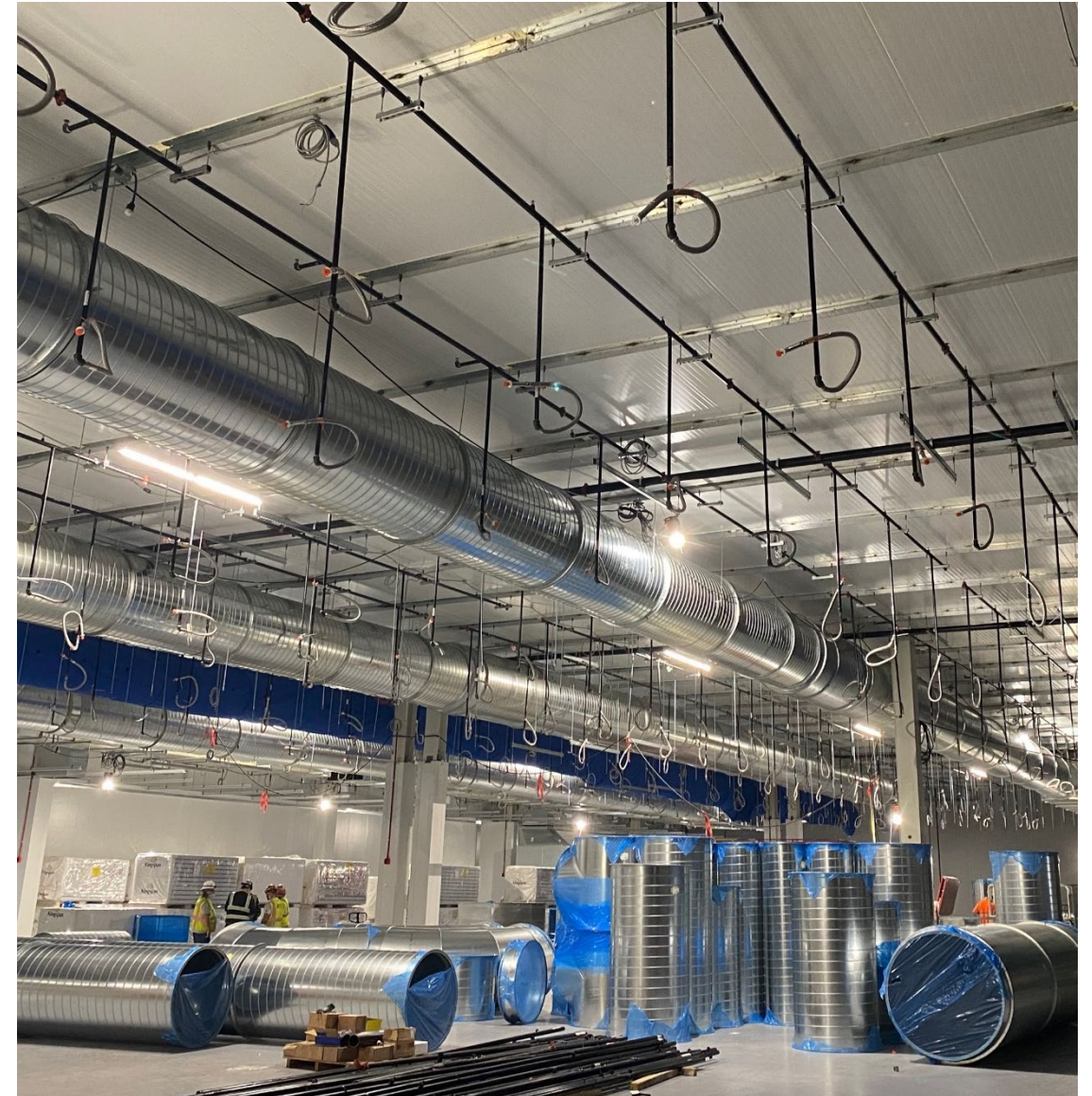
- Big rooms
- Co-location
- Established team relationships
- Bi-lingual capability

- Video conferencing technology
- Project information shared via cloud-based site
- Documented design decisions in meeting minutes and Bluebeam

Design Process Refinement

Innovations

- **Conventional duct-sealing as opposed to welding**
- Modularize pipe racks, utility plants, substations
- Dry boxes around equipment instead of dry rooms
- Recycling of dry/clean air into clean spaces
- Combine trades on pipe racks
- Relocation of higher hazard materials to outside of the conditioned environment



Design Process Refinement

Lessons Learned

ENVIRONMENT:

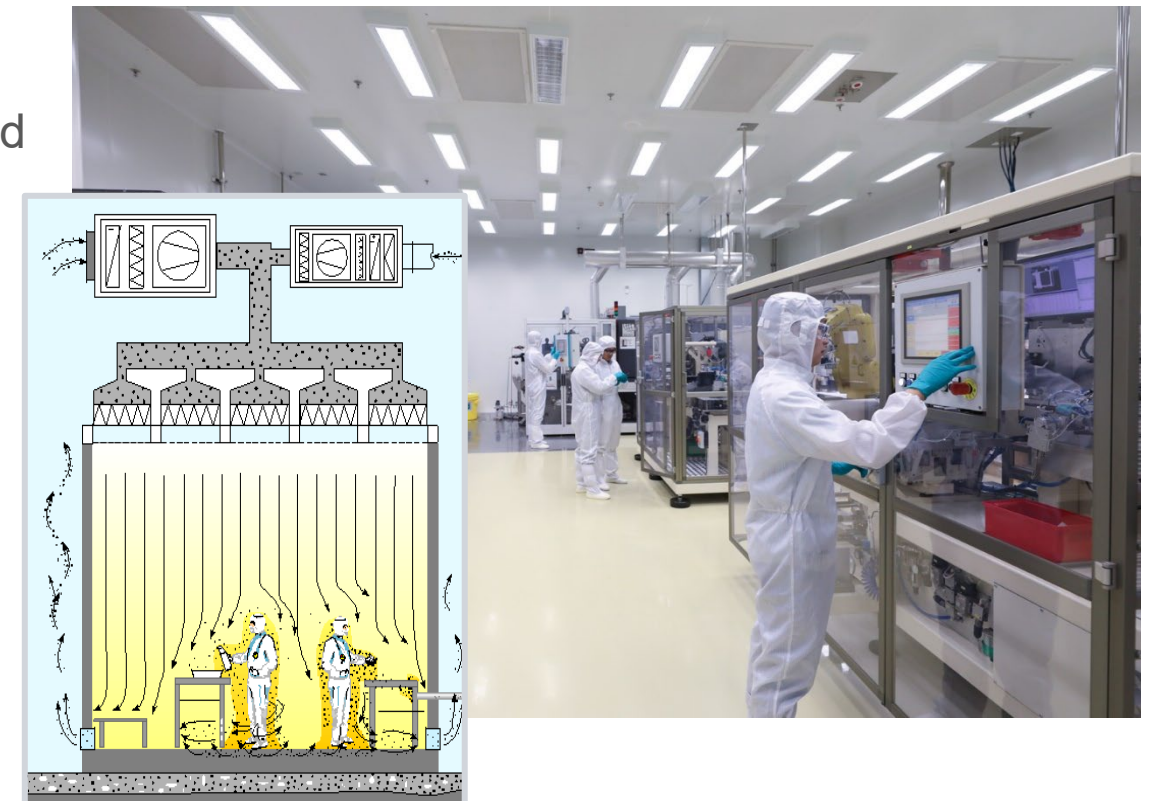
Created new protocols to establish “means and methods” for low humidity, low pressurization leak rates, and minimum envelope penetrations critical for clean/dry rooms in battery manufacturing

PREFABRICATION:

Used prefab modular wall and ceiling systems to maintain clean requirements and installation schedules. Also applicable to airlock/ showers/pass-through areas

CODES + HAZARDS:

Municipalities face steep learning curve relating to materials required for battery manufacturing. Meeting face-to-face with building officials, fire marshals, and ordinance officers to clear permit issues on time



Design Process Refinement

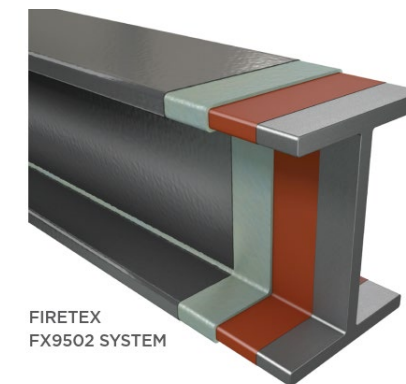
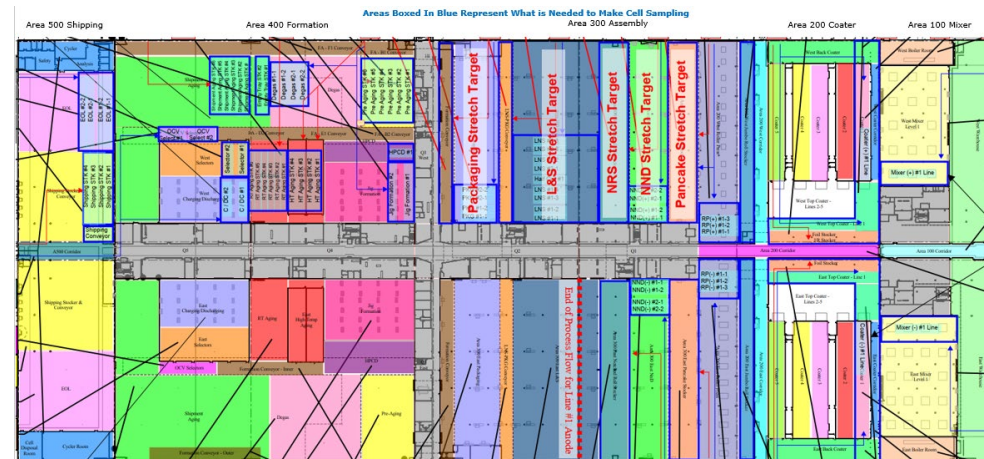
Lessons Learned

PROCESS TURNOVER:

Initiated early front-end coordination with process OEMs on start-up activities for sequencing construction activities, equipment deliveries, and system turnover to support facility commissioning and product validation. Resulted in a blueprint for IPD team to assure all process needs are ready and available

MIXING ROOMS:

Timing of code study was critical for a fast project schedule. “New” technologies, like EV batteries, required research through code study/analysis. Ex.: fireproofing using shop-applied intumescent paint saves time and money. Timing/coordination of process team to identify material storage and processes as it relates to code study



CONSTRUCT

A CONTRACT THAT SUPPORTS IPD TO ELIMINATE
QUESTIONS UP FRONT AND BUILD A COHESIVE TEAM



“Not finance. Not strategy. Not technology.
It is **TEAMWORK** that remains the
ultimate competitive advantage, both
because it is so powerful and so rare.”

- Patrick Lencioni



Getting Started

THE TEAM: WHO'S IN?

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graph TD; A[THE TEAM: WHO'S IN?] --> B[Project Stakeholders]; A --> C[Senior Management Team]; C --> D[Core Team]
```

Project Stakeholders

- Owner
- Contractor
- Designer
- Critical Trade Partners

Senior Management Team

- Primary decision-makers
- Solves challenges and gives direction

Core Team

- Represents each entity and signatory
- Day-to-day operations and questions

Getting Started

Defining Project Objectives

Safety

Quality

Scope

Schedule

Cost

Focus on objectives **early** and **often**.

Agreement Types

Risk/Reward Commercial Agreement

- Share in risk pool = costs are protected
- Built-in incentive for all to perform

Integrated Form of Agreement (IFOA)

- Density of contract
- Based on principles and how work is accomplished, who is making decisions, etc.
- Early onboarding of partners who all sign the same agreements

UNCOVER

THE EXPECTATIONS AND DELIVERABLES OF
EVERY PROJECT STAKEHOLDER



Prefabrication

Incorporating Safety

Prefabrication requires significant initial project planning around uniform and repetitious building elements, often during the design phase.

This creates the opportunity to:

- identify safety risks early
- properly plan for them
- and/or design any potential risks out of the project altogether



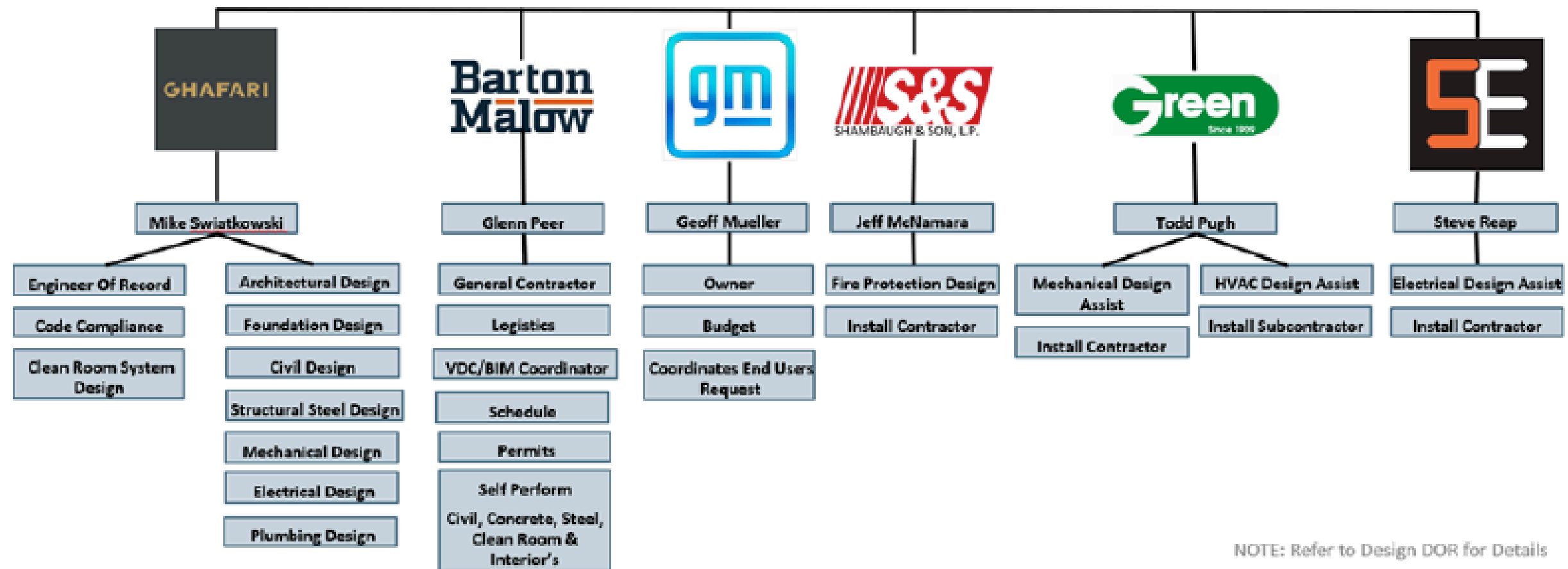
Value Matrix

Prefabrication Opportunity + Results

PREFABRICATION OPPORTUNITY	RESULTS					
	Cost Savings	Schedule Savings	Reduced Safety Concerns	Increased Quality	Order of Magnitude Cost Savings	Order of Magnitude Schedule Savings (Compared to similar field assembly)
ABOVE CEILING RACKS Corridor rack modularization for MEP above ceiling systems in a common structure, including adjacent top of wall assemblies	✓	✓	✓	✓	5-15% MEP CONTRACT VALUE	30-40%
MEP SYSTEM KITS Per room bundled assemblies that can be prepped offsite + delivered in room-specific bundles	✓	✓	✓	✓	2% SYSTEM CONTRACT VALUE	40-60%
EXTERIOR WALL MODULES Large, preassembled exterior wall modules of similar or complementary materials	✓	✓	✓	✓	1-2% CONTRACT VALUE	15-30%
IN-WALL MEP Individual wall units pre-piped with in-wall MEP systems, supports, and full-wall assemblies	✓	✓	✓	✓	5-15% CONTRACT VALUE	40-60%
BATHROOM PODS Factory-made bathroom units that come pre-installed with mechanical, electrical, plumbing, and HVAC. Once manufactured, it is shipped to an end construction site, ready to use		✓	✓	✓	20-30% COST PREMIUM	75%
VERTICAL RACKS Modularized piping, duct, and/or conduit that is pre-built and installed as a complete unit into the vertical chases of a structure		✓	✓	✓	NEUTRAL	75%

Roles and Responsibilities

IPD Core Team and Support Organizational Chart



Design Division of Responsibility (DDOR)

Real Example DDOR

ITEM DESCRIPTION	DESIGN RESPONSIBILITY		
	BASIS OF DESIGN CRITERIA	SCHEMATIC DESIGN	IFR & IFC DELIVERABLES
A/EOR			
Architect of Record	GHA	GHA	GHA
Civil Engineer of Record	GHA	GHA	GHA
Mass Grading / Stormwater / SWPPP	WT	WT	WT
Structural Engineer of Record	-	-	-
Foundations	GHA	GHA	GHA
Structural Steel (Building Superstructure)	RBY	RBY	RBY
Supplemental steel for clean/dry room walls over 30 ft tall	HCC	HCC	HCC
Ceiling hanger design for cleanroom and trades including trapeze	HCC	HCC	HCC
Structural Steel - Misc Steel (Trestles, Exterior Duct/Pipe Supports, Etc.)	RBY	RBY	RBY
Light gage framing	GHA	GHA*	GHA*
Mechanical & Plumbing Engineer of Record	GHA	GHA	GHA
Fire Protection Engineer of Record	GHA	GHA	GHA
Electrical Engineer of Record	SUP	SUP	SUP

Validation Deliverables

Validation Study Key Deliverables

- Establish Core Group's goals for the Project
- Assist Owner in further development of the Owner's program and Project requirements
- Provide evaluation of alternative systems and technologies for review by the core group
- Identify any deviations from the Owner's program
- Recommend alternative investigations/studies required for Project success and implement recommendations after core team approval
- Support developing a cost model defining costs and confirm budget is below allowable costs
- Support developing a Risk Pool Plan
- Support development of a proposed Project schedule including major milestones

Validation Deliverables

Validation Study Key Deliverables (CONTINUED)

- Develop an insurance strategy and resolve open insurance issues
- Co-locate in office resources provided by the Constructor at its headquarters during the Validation Phase
- Support development of an initial cash flow study for execution of the Project scope
- Support the development of a long lead material strategy to ensure program timing goals are met
- Support the Constructor in providing intermediate assessments of Project, the first due on March 11, 2022, and the second due on March 31, 2022. This will be an initial assessment of program feasibility detailing specific risks and key enablers to success of the Project
- Collaborate with the IPD Team in the design of structural, architectural, mechanical, electrical, civil, major equipment and systems utilizing set-based design principles and A3 documentation in establishing the optimum solution for the Project and advise the design team to develop the program to the optimum value-to-cost outcome. The Constructor and Trade Partners will bring construction expertise and solutions along with cost data to the design effort in a collaborative manner to help drive the design to a fully constructible and coordinated plan.
- Support collaborative efforts for means, methods, coordination, and conflict resolution

Validation Deliverables

Final Deliverables

- Support the collaborative efforts in developing Validation Phase “Pull Plans” which optimize the definition and decisions required to release work. Pull planning is a key element of the Last Planner System (LPS). LPS is a work planning and organization process that develops collaborative work plans created by the folks actually doing the work. It is based on commitments and accountability and has some metrics associated to help proffer continuous learning and improvement. Pull planning specifically is working backwards from a defined milestone to schedule work at the pull of the downstream customer.
- Support verifying schedules for the specific trade scopes of work
- Support the activation of Project control tools
- Support the development of implementation plans for Target Value cost estimates.
- Contribute to the development of the Project risk register and associated mitigation strategies.
- Provide input into conceptual estimates as necessary for all design sets.

BUILD AND MAINTAIN

TRUST AND COLLABORATION FROM DAY ONE



Team Health Assessments



OVERVIEW OF THE PARTNERING + TEAM HEALTH PROGRAM

Barton Malow’s Partnering + Team Health program is built on three major components:

**TEAM CHARTER**

**TEAM HEALTH ASSESSMENT**

**QUARTERLY MEETING RHYTHM**

An in-house coach walks the team through implementing and maintaining these disciplines, helping the team realize its shared goals through effective cooperation, coordination, and communication.⁶



TEAM CHARTER

Just as construction drawings define the end product and set direction for building a structure, a team charter defines the desired state and sets direction for building a team.⁷ It consists of four elements:

1 PROJECT STATEMENT	2 ROLES + RESPONSIBILITIES	3 TEAM NORMS	4 CONDITIONS OF SATISFACTION
<p>A motivational statement that excites the workforce and captures the ultimate purpose of the project.</p> <p>Examples:</p> <ul style="list-style-type: none">Fulfill our promise to the university for a cool building that inspires students and continues a tradition of campus reinvestmentCreate a modern hospital that will provide extraordinary healthcare services to our community for generations to comeLead the electric vehicle revolution (from an electric vehicle battery plant project)	<p>A clear description of who does what for each phase of construction (preconstruction, construction, closeout). This may also include an Issue Resolution Framework to specify how decisions will be made when disagreements arise among project partners.</p>	<p>A set of behaviors that the team wants to characterize its work together.</p> <p>Examples:</p> <ul style="list-style-type: none">Lead with the other’s perspectivePrioritize verbal over electronic communication for quick inquiriesCelebrate accomplishmentsAdmit mistakes	<p>A list of aspirational statements that will define success for the project team’s work together.</p> <p>Examples:</p> <ul style="list-style-type: none">Building is recognized for craftsmanship with an industry awardSafety statistics are significantly better than industry standardsTeam members want to work together again on a future project

Cluster Groups

Problem Solving by Cluster Groups

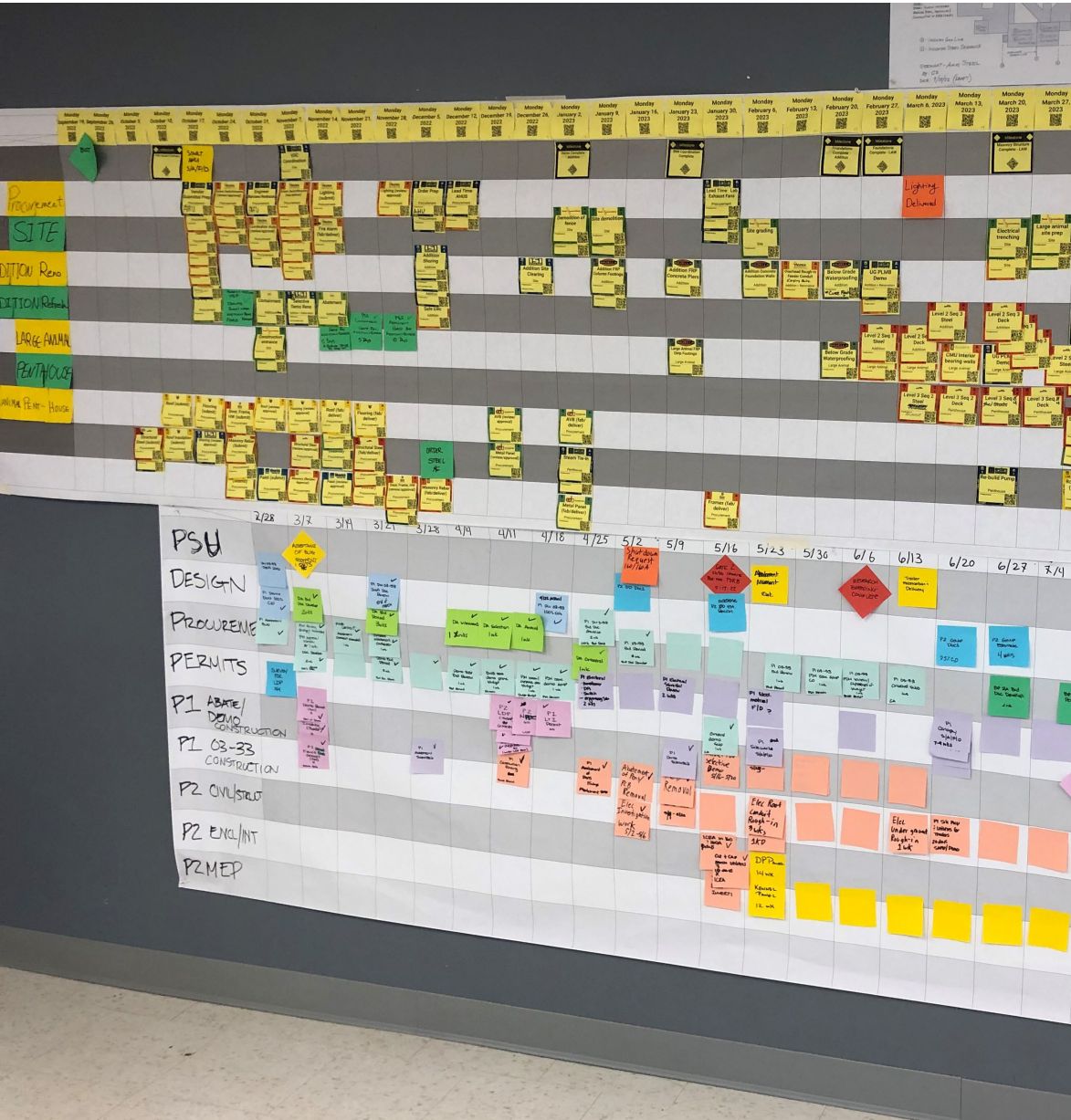
- **Clusters by Discipline:**
Civil, Structural, Architectural, Mechanical, Electrical, Commissioning, Safety, Quality
- Budget
- Schedule



Alignment Through the Big Room



Joint Estimate Review and Last Planner



How can you apply this tomorrow?

- **Assess** where the firm would fit into an IPD contract and where the firm is in terms of readiness for an IPD model project.
- **Determine** the appropriate team members to begin discussions around project types to develop a basic understanding of where IPD delivers the most value.
- **Trust** the value of teamwork, planning, and lean methodologies.
- **Understand** how complexity in design and process can drive cost, and that adapting to new technology requires an agile and collaborative team that actively engages major stakeholders.
- **Practice and Promote** the mindset of “focus on objectives early and often” through all phases of planning: design, validation, and construction to closeout and turnover.



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In the spirit of continuous improvement, we would like to remind you to complete this session's survey! We look forward to receiving your feedback.

Contact Us

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Thank you for attending this presentation. Enjoy the rest of the 25th Annual LCI Congress!