




**CLARK**  
CONSTRUCTION

# DESIGN-BUILD FOR MISSION CRITICAL FACILITIES



**Case Study:**  
**California ISO Iron Point Facility**  
**Folsom, CA**

# MISSION POSSIBLE

- ✓ Mission Critical Headquarters
- ✓ Design-Build Delivery

- ✓ Delivered Early
- ✓ Delivered Under Budget



COLLABORATION

**CLARK**  
CONSTRUCTION

CERTAINTY

# PRESENTERS



**Katie Twomey**  
Clark Construction  
Principal in Charge



**Gus Fischer**  
Dreyfuss and Blackford  
Project Architect



**Phil Ball**  
Frank M. Booth  
Engineer of Record



**Caroline Fenlon-Harding**  
WSP Flack + Kurtz  
Engineer of Record



**Blythe Shannon**  
Clark Construction  
Design Manager / Sr. PM



**Hector Alvarez**  
California ISO  
Director of Campus Operations

COLLABORATION



CERTAINTY

# PROJECT TEAM

**OWNER:** CALIFORNIA ISO



**CONSTRUCTION MANAGER:** VANIR



**DESIGN-BUILDER:** CLARK CONSTRUCTION



**DESIGNER:** DREYFUSS & BLACKFORD



**STRUCTURAL ENGINEER:** BUEHLER & BUEHLER



**MECHANICAL & PLUMBING ENGINEER:** FRANK M. BOOTH



**ELECTRICAL ENGINEER:** WSP FLACK + KURTZ



**ELECTRICAL SUBCONTRACTOR (DESIGN-ASSIST):** HELIX ELECTRIC



**COMMISSIONING AGENT:** GLUMAC



COLLABORATION



CERTAINTY

# PROJECT MISSION



COLLABORATION



CERTAINTY

# PROJECT MISSION



COLLABORATION

**CLARK**  
CONSTRUCTION

CERTAINTY

# PRESENTATION AGENDA

## Major Topics

- Sustainability
- MEP Design and Innovation
- Innovation to Achieve Early Completion
- How We Did It

COLLABORATION



CERTAINTY

# COLLABORATIVE APPROACH

## *Team Formation and Owner Groundwork*



COLLABORATION



CERTAINTY



# SUSTAINABILITY

## **LEED Project History**

- LEED NC v2.2 – (69 Possible Points)
- Project Conception - Owner initially had no criteria
- Pre-Design Build – Owner targeted LEED Silver minimum
- Design-Build RFP required a target of LEED Gold +10 points (49 points)
- Project enhancements targeted LEED Platinum (52 points minimum)
- Final LEED awarded 55 of 57 points attempted



**COLLABORATION**

**CLARK**  
CONSTRUCTION

**CERTAINTY**

# SUSTAINABILITY

- Sustainable Sites (10 of 14 Points)
- Water Efficiency (5 of 5 Points)



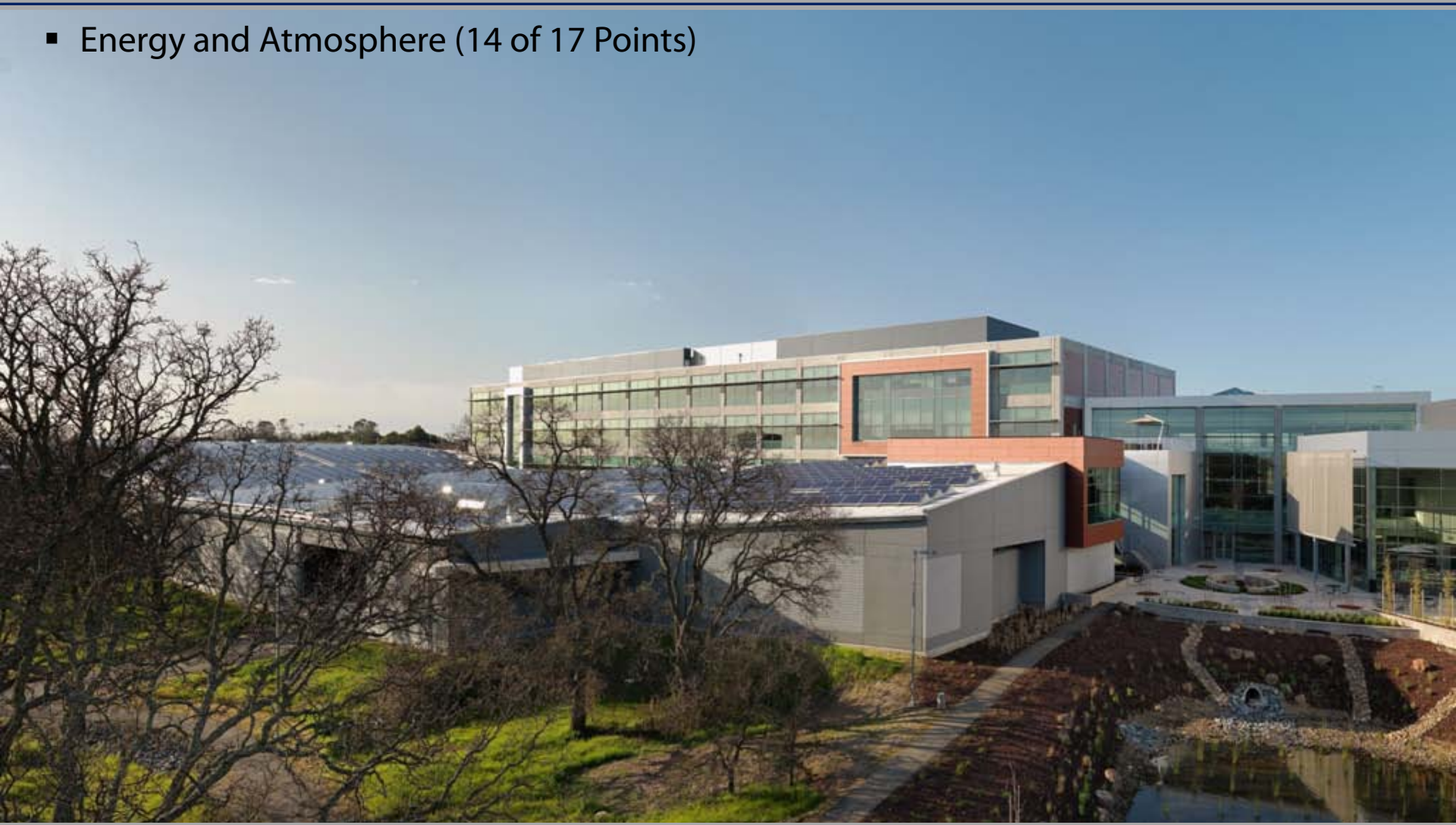
COLLABORATION



CERTAINTY

# SUSTAINABILITY

- Energy and Atmosphere (14 of 17 Points)



COLLABORATION



CERTAINTY

# SUSTAINABILITY

- Materials and Resources (7 of 13 Points)



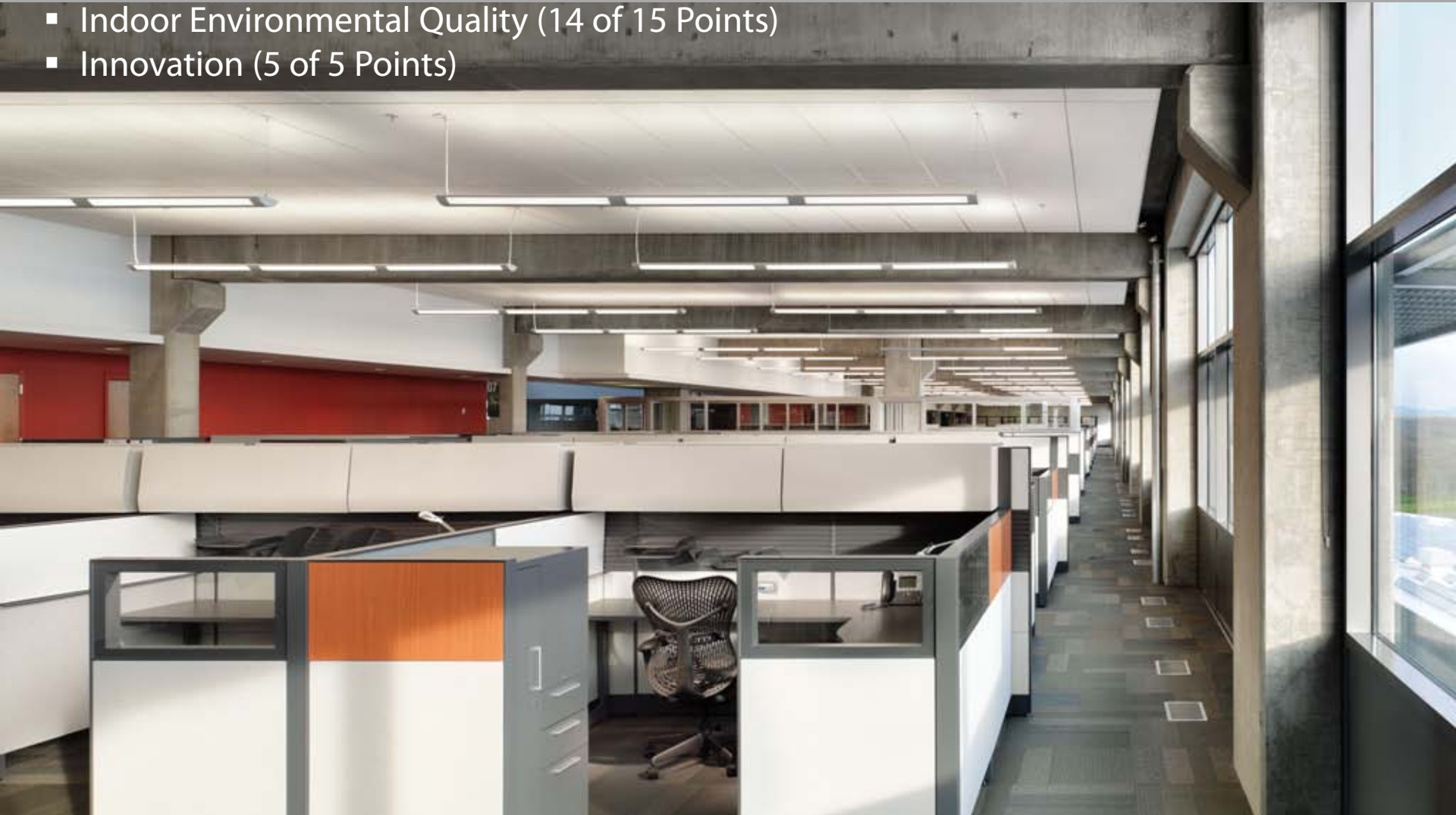
COLLABORATION



CERTAINTY

# SUSTAINABILITY

- Indoor Environmental Quality (14 of 15 Points)
- Innovation (5 of 5 Points)

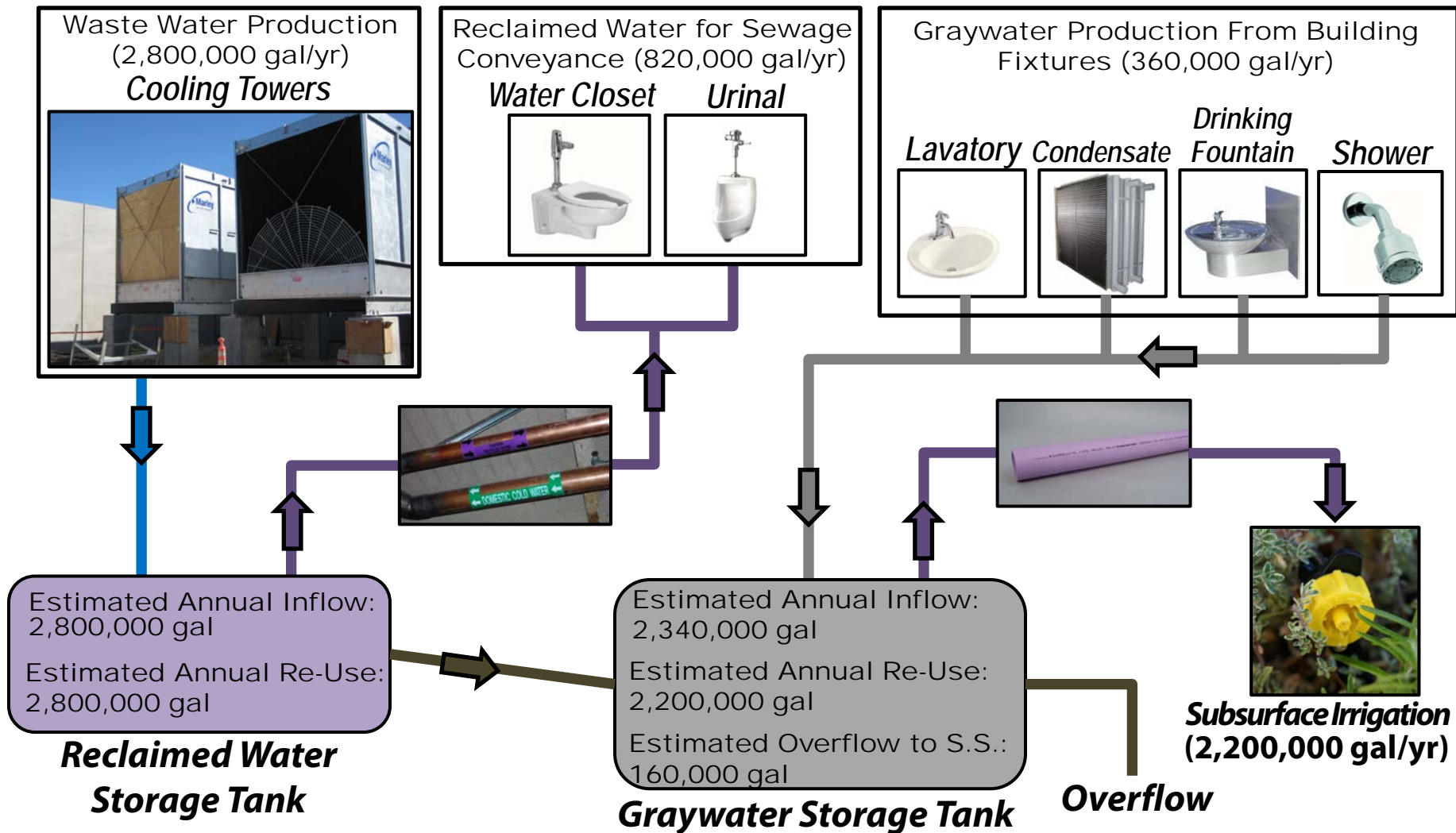


COLLABORATION



CERTAINTY

# WATER EFFICIENCY & SUSTAINABILITY

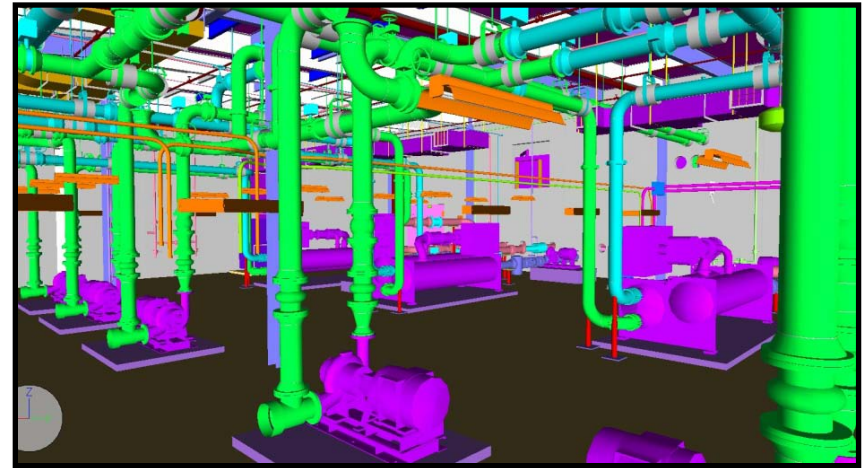


COLLABORATION



CERTAINTY

# HVAC COOLING PRODUCTION

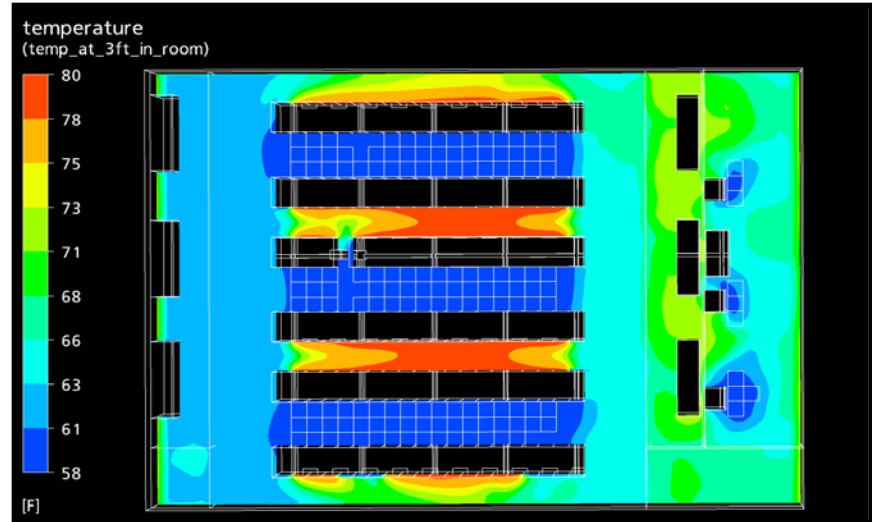
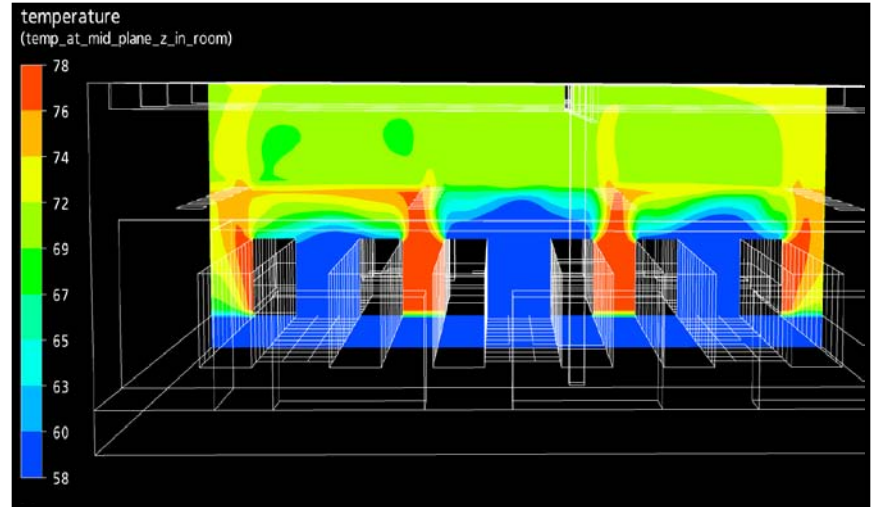


COLLABORATION



CERTAINTY

# MISSION CRITICAL HVAC



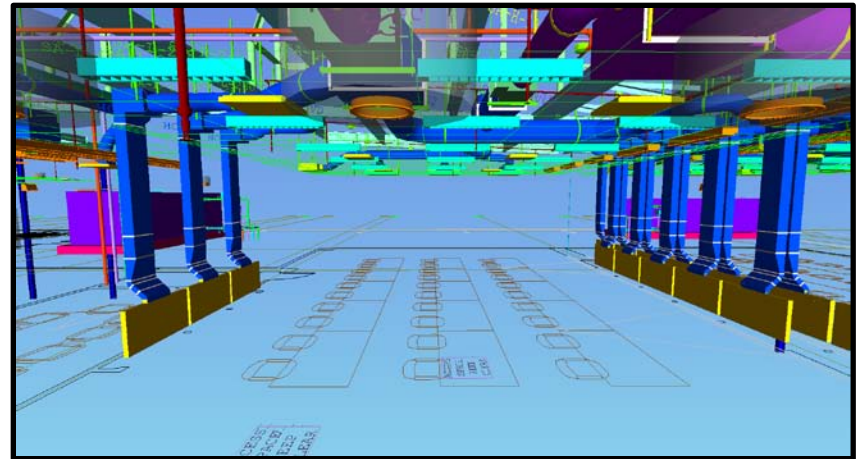
COLLABORATION

**CLARK**  
CONSTRUCTION

CERTAINTY



# HVAC AIR DISTRIBUTION



COLLABORATION



CERTAINTY

# MISSION CRITICAL - ELECTRICAL

## *Tier Levels*

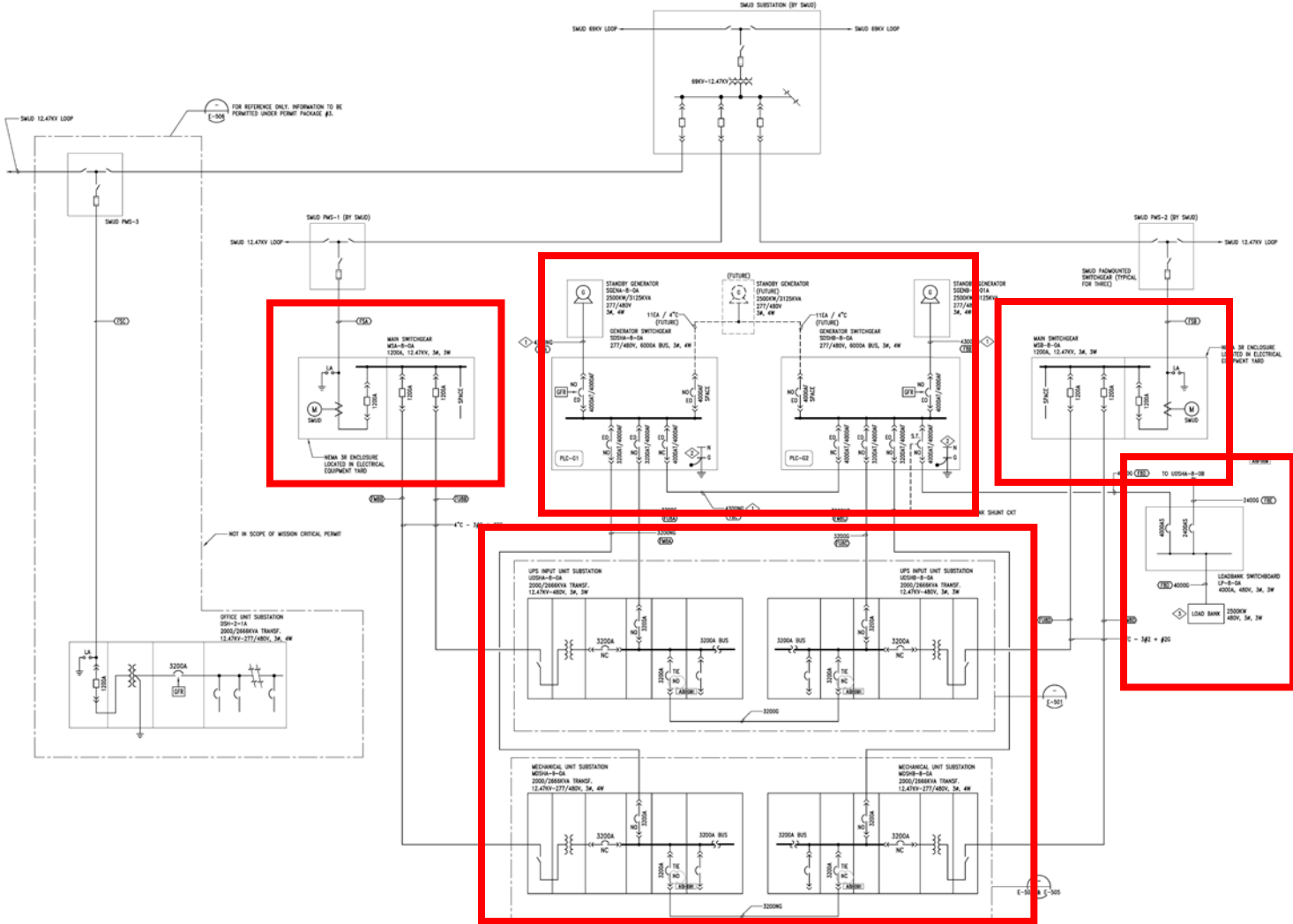
TIER LEVEL	REQUIREMENTS
1	<ul style="list-style-type: none"><li>▪ Single non-redundant distribution path serving the IT equipment</li><li>▪ Non-redundant capacity components</li><li>▪ Basic site infrastructure guaranteeing 99.671% availability</li></ul>
2	<ul style="list-style-type: none"><li>▪ Fulfills all Tier 1 requirements</li><li>▪ Redundant site infrastructure capacity components guaranteeing 99.741% availability</li></ul>
3	<ul style="list-style-type: none"><li>▪ Fulfills all Tier 1 &amp; Tier 2 requirements</li><li>▪ Multiple independent distribution paths serving the IT equipment</li><li>▪ All IT equip must be dual-powered and fully compatible with the topology of a site's architecture</li><li>▪ Concurrently maintainable site infrastructure guaranteeing 99.982% availability</li></ul>
4	<ul style="list-style-type: none"><li>▪ Fulfills all Tier 1, Tier 2 and Tier 3 requirements</li><li>▪ All cooling equipment is independently dual-powered, including chillers and HVAC</li><li>▪ Fault tolerant site infrastructure with electrical power storage and distribution facilities guaranteeing 99.995% availability</li></ul>

COLLABORATION



CERTAINTY

# DATA CENTER ELECTRICAL SYSTEM

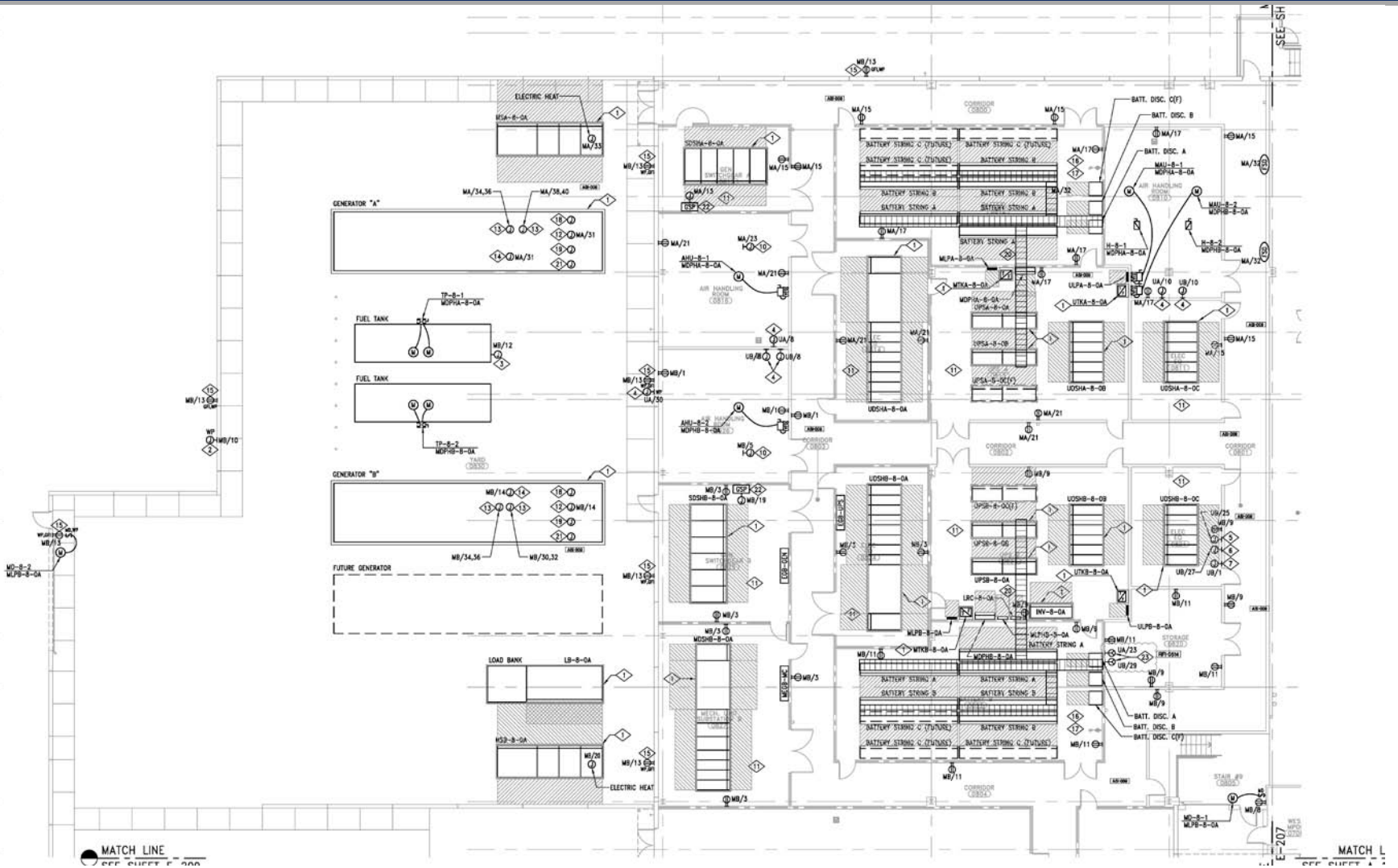


COLLABORATION



CERTAINTY

# MISSION CRITICAL - ELECTRICAL PLAN



COLLABORATION



CERTAINTY

# MISSION CRITICAL - PRIMARY SERVICE

- (2) Services, Switchgear
- 12,000V, 3ph, 3W
- Utility: SMUD
- Manufacturer: Square D



COLLABORATION



CERTAINTY

# MISSION CRITICAL - UNIT SUBSTATIONS

- (2) 2,000kVA for UPS system
- (2) 2,000kVA for HVAC system
- Main-Tie-Tie-Main (OPR)
- ATO
- Manufacturer: Square D



# GENERATORS

- (2) @ 2,500kW
- 277/480V, 3ph, 4W
- Hospital Grade Silencer
- 72 hours of fuel
- NEC 702



COLLABORATION



CERTAINTY

# PERMANENT LOADBANK

- 2,500kW
- Shunt trip
- Shared with Generator and UPS



COLLABORATION

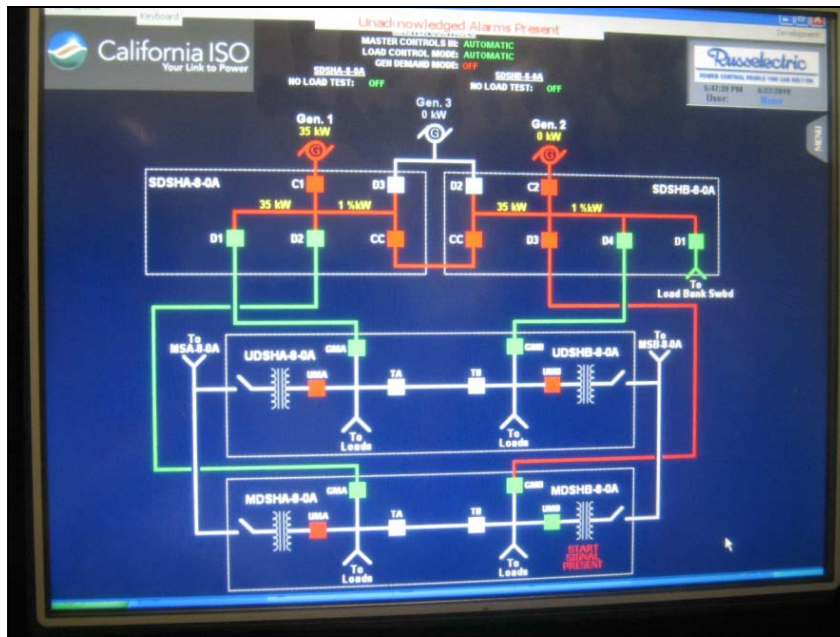
**CLARK**  
CONSTRUCTION

CERTAINTY



# MISSION CRITICAL - PARALLELING SWITCHGEAR

- Physically separate, connected by a tie
- 277/480V, 3ph, 4W

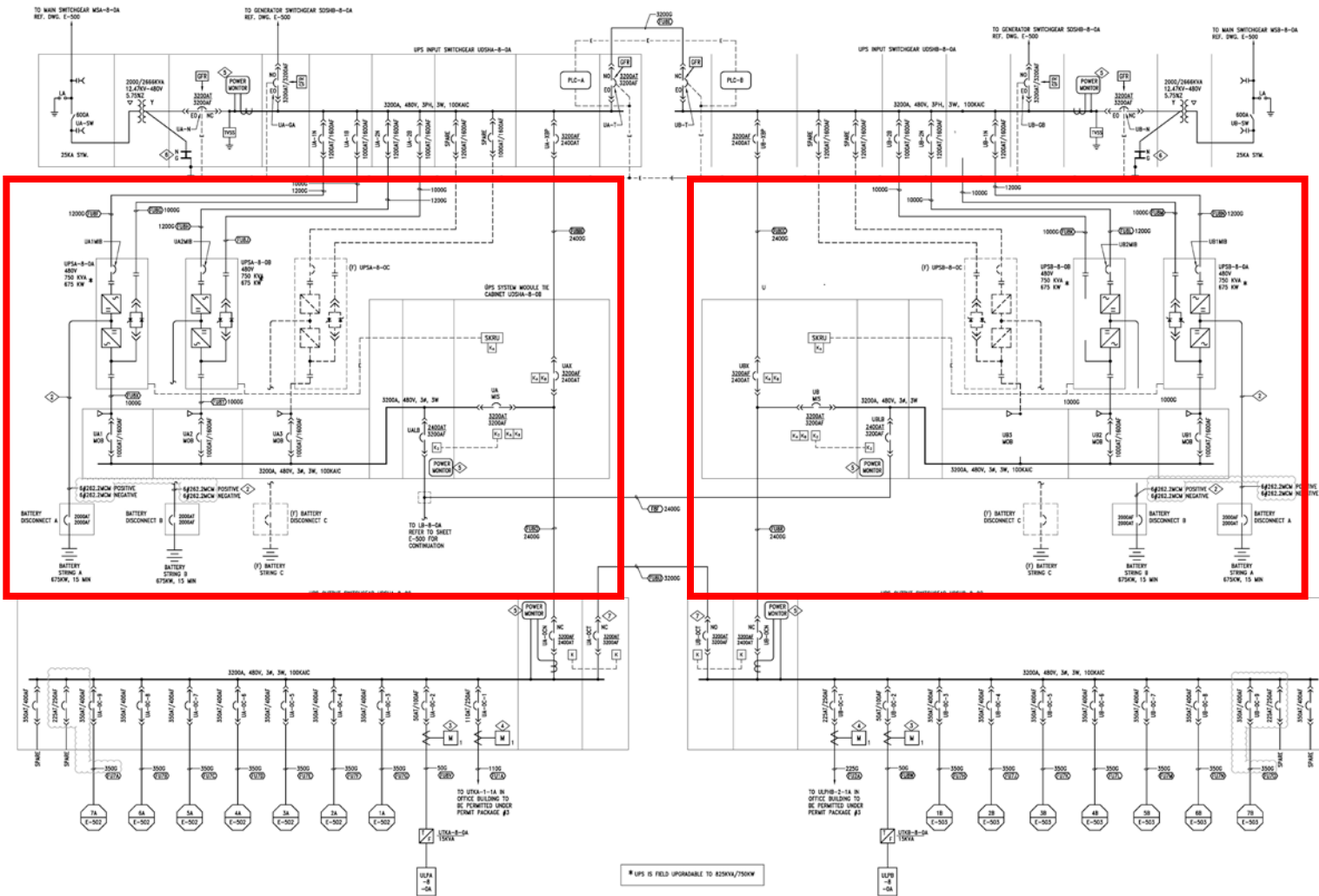


COLLABORATION

**CLARK**  
CONSTRUCTION

CERTAINTY

# UPS + TIE CABINET



COLLABORATION

CLARK  
CONSTRUCTION

CERTAINTY

# MISSION CRITICAL - UPS



- (2) 750kW UPS on both sides
- Hot-sync bypass
- Manufacturer: Powerware



COLLABORATION

**CLARK**  
CONSTRUCTION

CERTAINTY

# MISSION CRITICAL - UPS OUTPUT SWITCHGEAR

- Manual Tie with Key Sequence
- Enables bypass and transferring load to redundant UPS

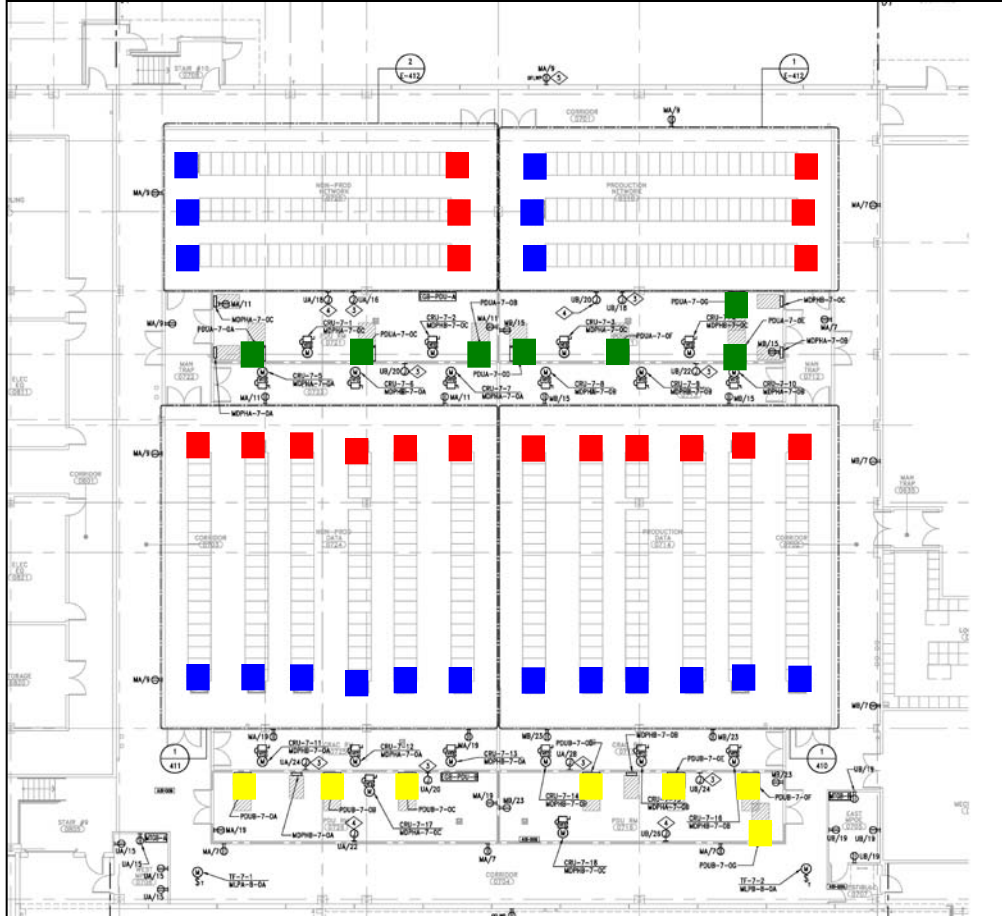


COLLABORATION



CERTAINTY

# COMPARTMENTED HVAC/ELECTRICAL SERVICES

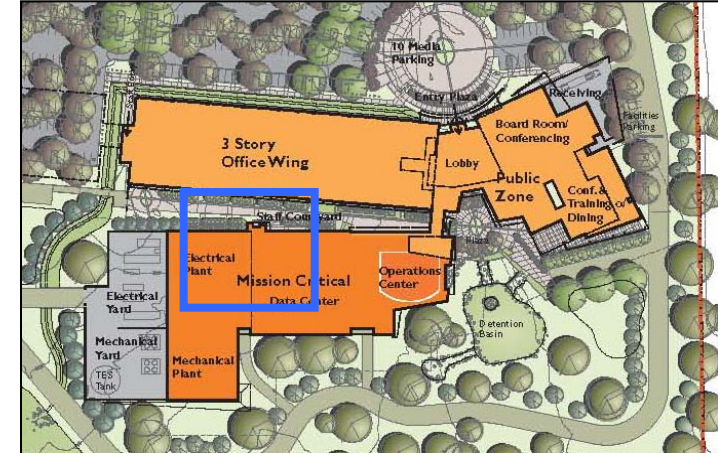


■ RPP "A"

■ RPP "B"

■ PDU "A"

■ PDU "B"



COLLABORATION

**CLARK**  
CONSTRUCTION

CERTAINTY

# MISSION CRITICAL - CONTROL ROOM



- Consoles
- Video wall
- Single-corded equipment



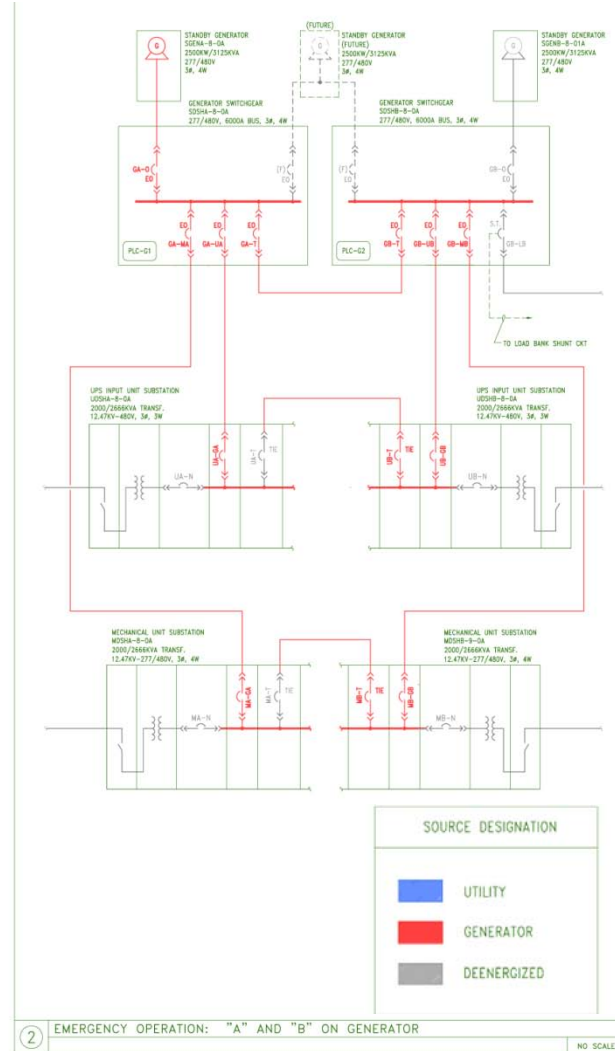
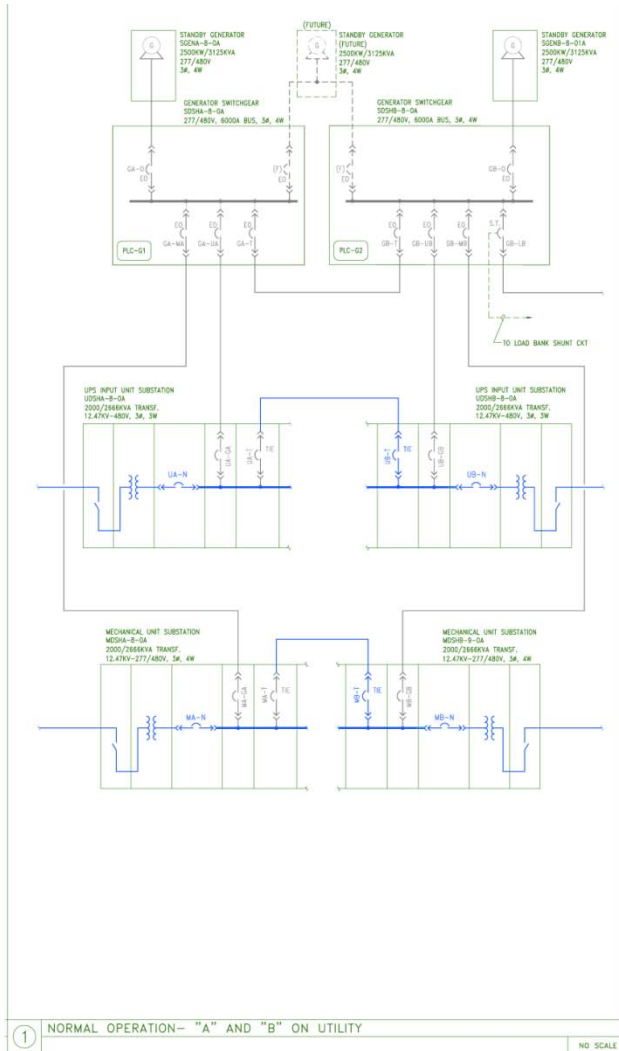
Dual cord power strip

COLLABORATION

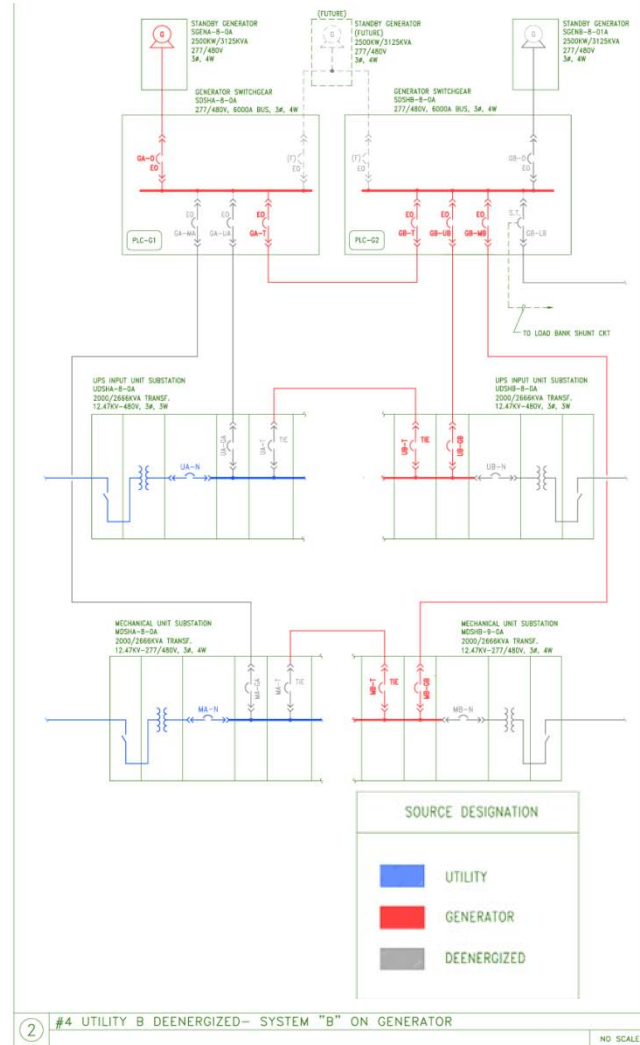
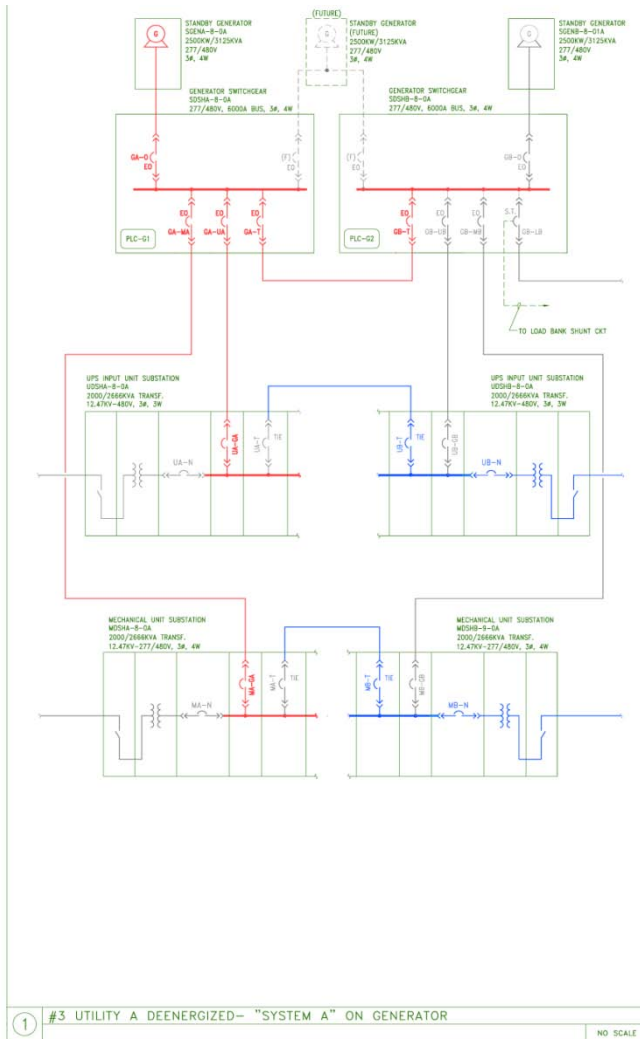


CERTAINTY

# LOAD SEQUENCING DIAGRAMS



# LOAD SEQUENCING DIAGRAMS



COLLABORATION

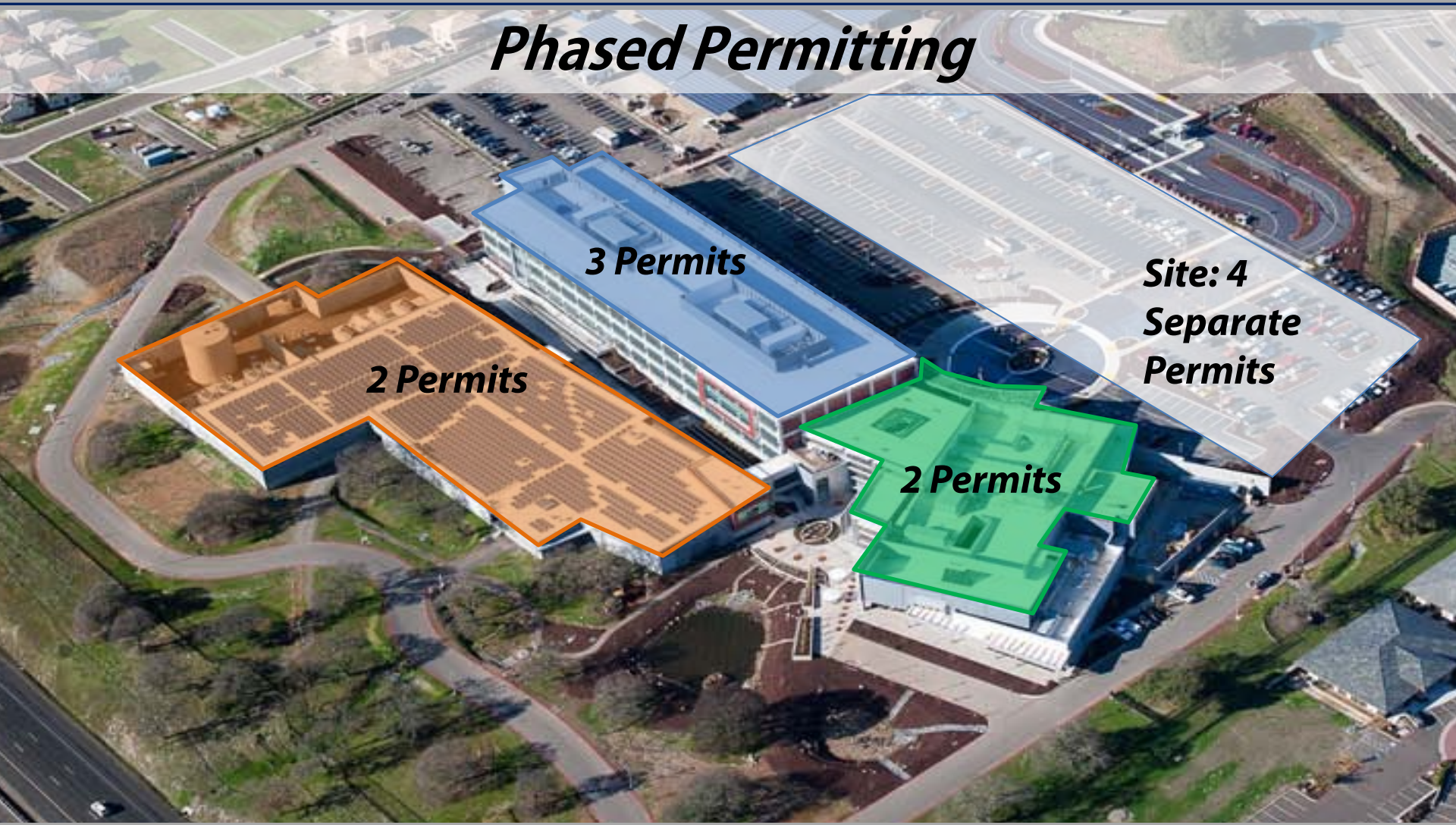


CERTAINTY



# INNOVATIONS FOR EARLY DELIVERY

## *Phased Permitting*



COLLABORATION

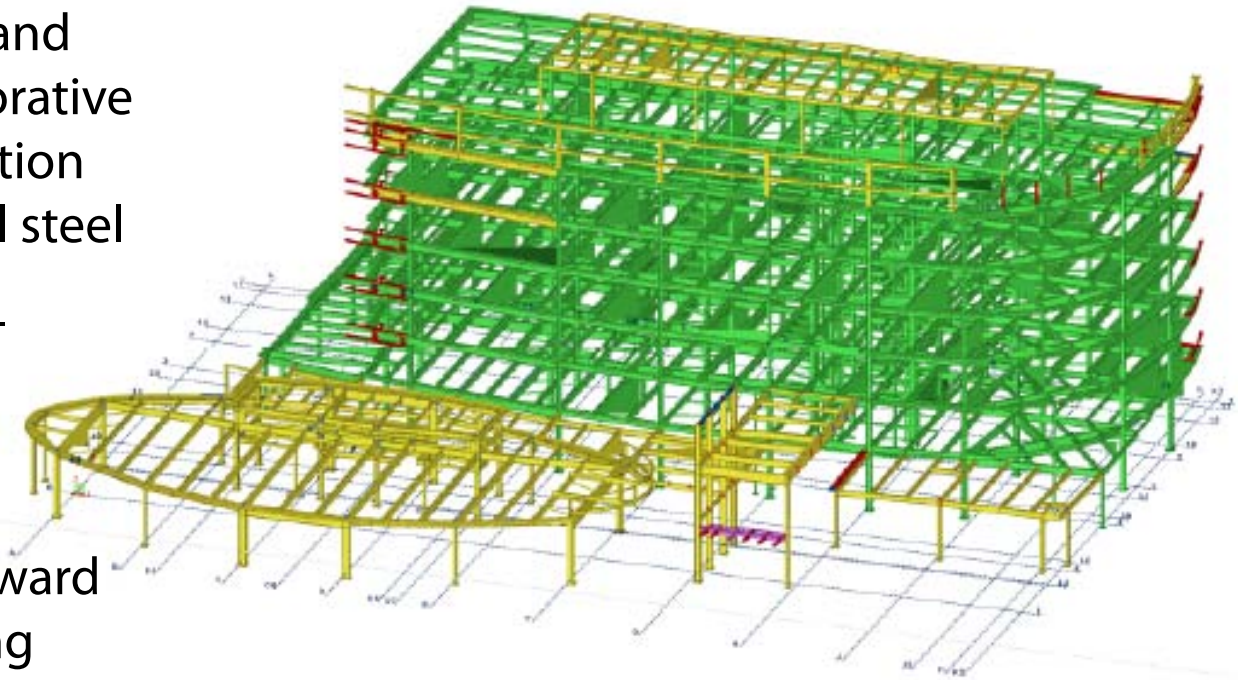


CERTAINTY

# INNOVATIONS FOR EARLY DELIVERY

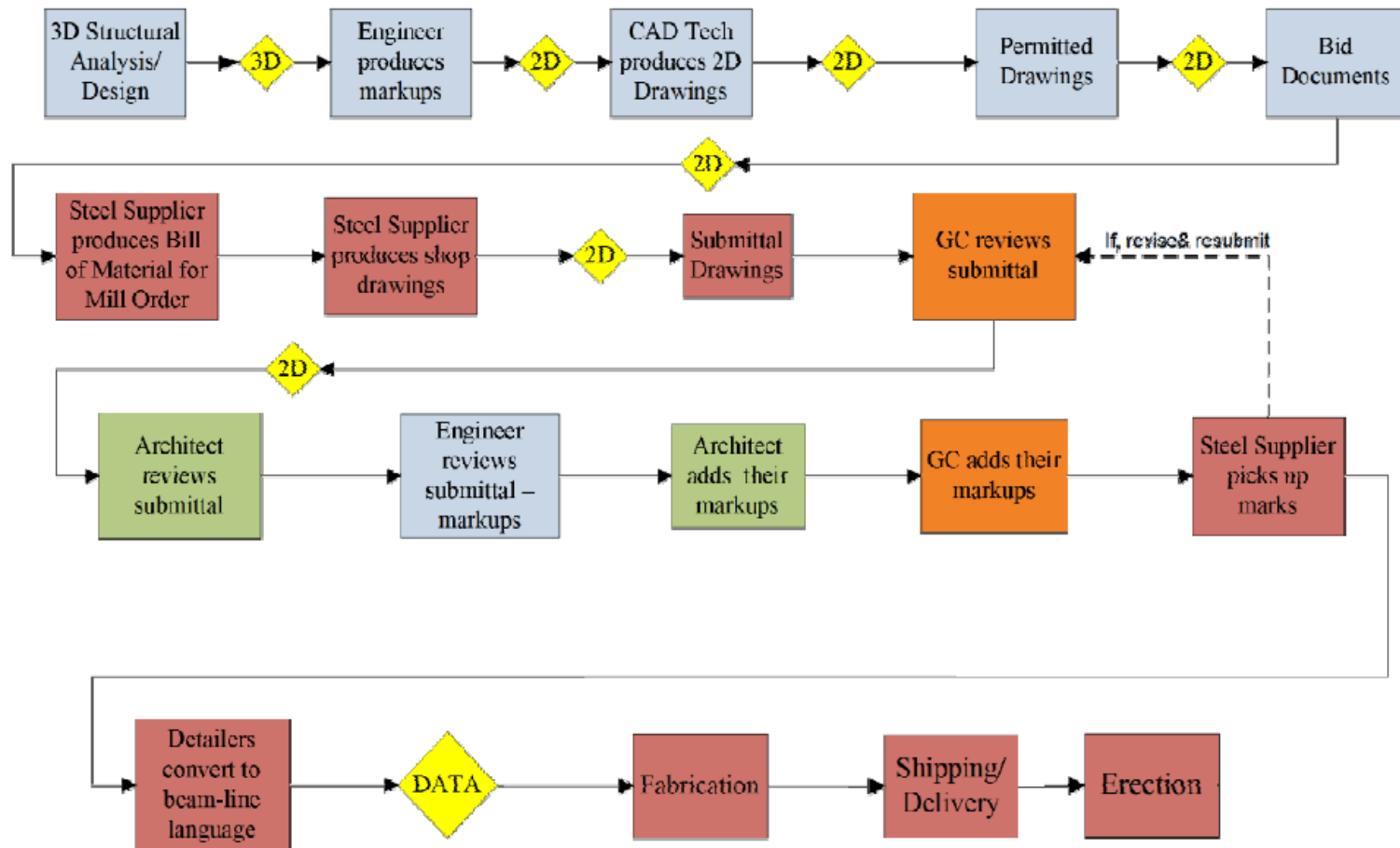
## *Integrated Steel Design & Delivery*

- Integrated Steel Design and Delivery (ISDD) is collaborative design, detailing, fabrication and delivery of structural steel
- Direct Engineer-Detailer-Fabricator integration
- Only 17 Steel RFI's
- 6 months from project award to steel erection including design and fabrication



# INNOVATIONS FOR EARLY DELIVERY

## *Traditional Workflow*



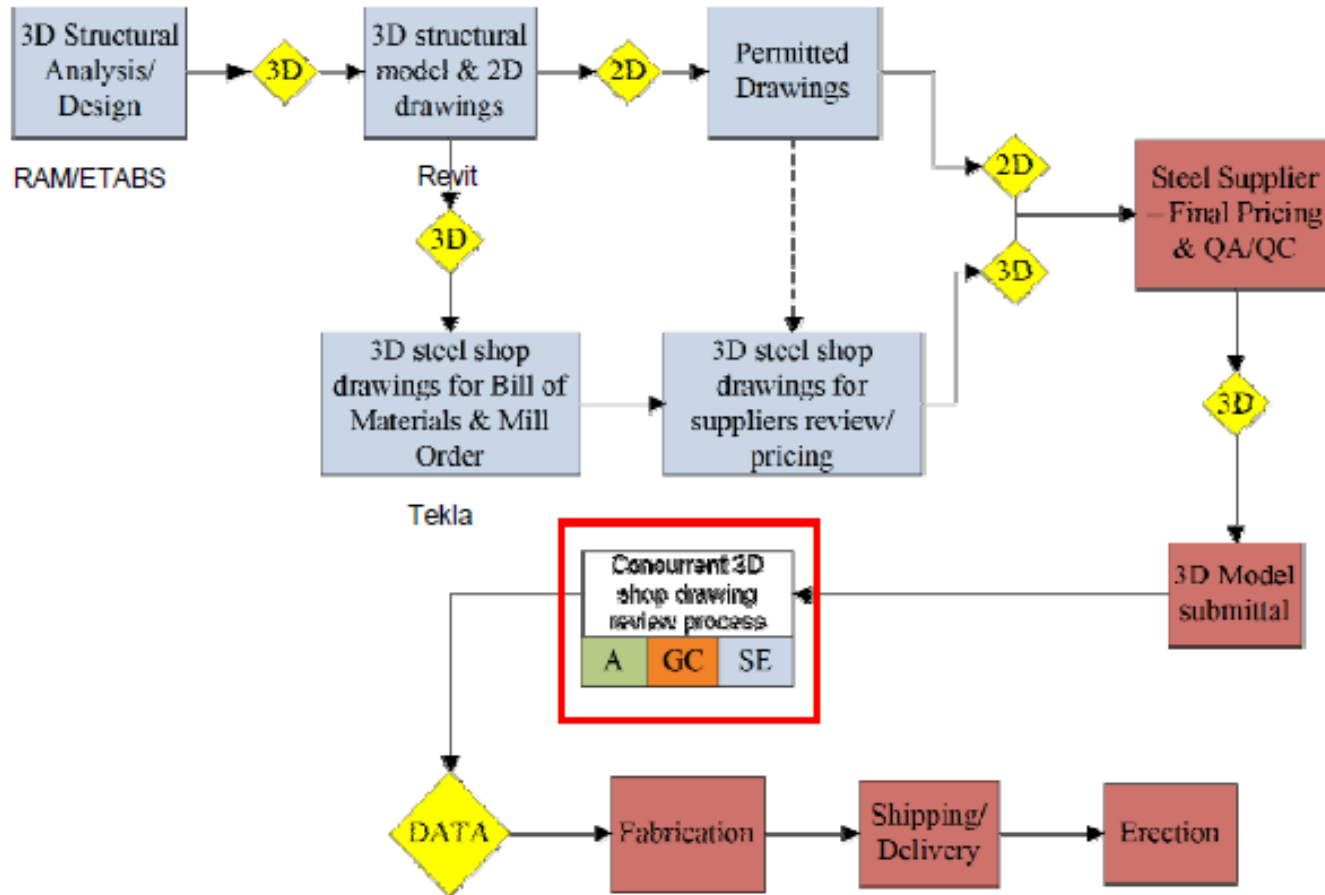
COLLABORATION



CERTAINTY

# INNOVATIONS FOR EARLY DELIVERY

## *Modified Workflow*



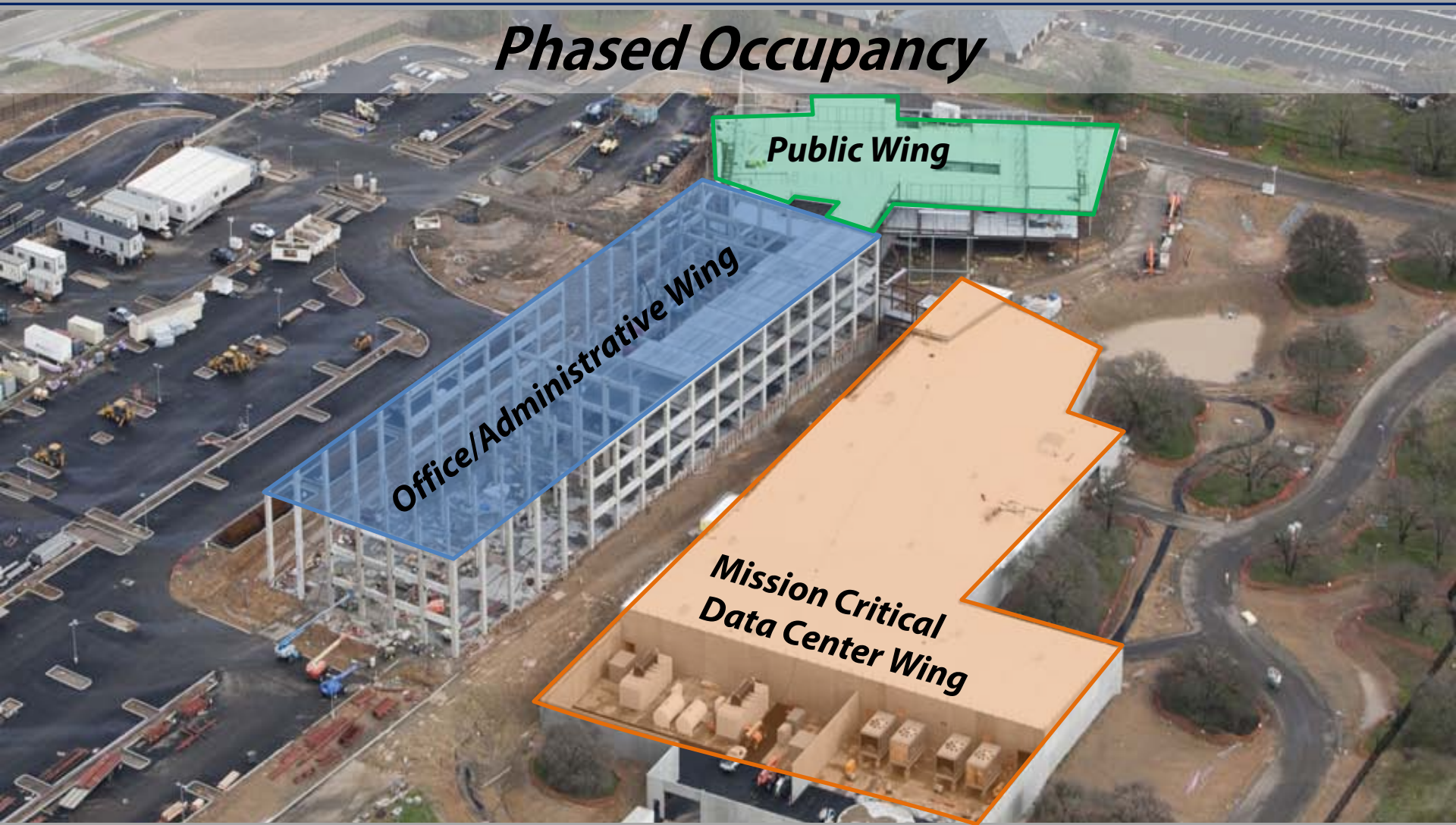
COLLABORATION



CERTAINTY

# MEETING OWNER NEEDS

## *Phased Occupancy*



**Public Wing**

**Office/Administrative Wing**

**Mission Critical  
Data Center Wing**

**COLLABORATION**



**CERTAINTY**

# HOW WE DID IT

## THE DESIGN-BUILD EXPERIENCE

*Collaboration*

*Respect*

*Trust*

COLLABORATION



CERTAINTY

# **“MISSION ACCOMPLISHED”**

*Cutting Edge Security*

*Highly Sustainable*

*“Feels like home”*



**COLLABORATION**



**CERTAINTY**