Manufacturing Architecture
A Case Study in Integrating Prefab Components in Healthcare Design & Construction

NCHEA – Spring Seminar
February 27, 2025

KPM MANAGEMENT + hord | coplan | macht + RODGERS Our Passion is Building®

agenda

- Speaker Intro
- Why should the AEC industry consider Prefab?
- What is Prefab?
- When, where and who should consider Prefab?
- How do we go about implementing Prefab in healthcare design?
- Project case study: Roper St. Francis Berkeley
- Q&A

KPM MANAGEMENT + hord | coplan | macht + RODGERS Our Passion is Building®



Michael Killian
Managing Director



Migena Dilolli
Associate Principal,
Design Leader



Gep Pond
Principal



Jesse Kinsey
Enclosure
Superintendent



Andy Cyr
Senior Vice President

www.kpmmanage.com

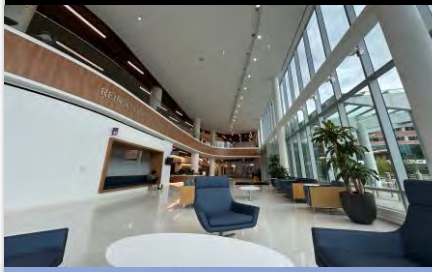
KPM

KPM is a Project Management firm focused on exceeding client expectations in the healthcare design and construction market.

- Project Management
- Owner Representation
- Design and Construction Management



Michael Killian





www.hcm2.com

Hord Coplan Macht

- Hord Coplan Macht is a multi-disciplinary firm offering planning, architecture, landscape architecture, interior design and environmental graphic design services founded in 1983 by Ed Hord, Lee Coplan & Carol Macht
- Offices in: Charlotte, Baltimore, Charleston, Denver, Hilton Head Island and the DC Metro area.



Migena Dilolli



Gep Pond



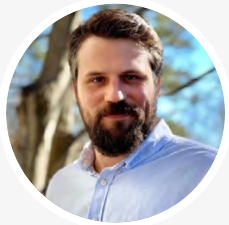




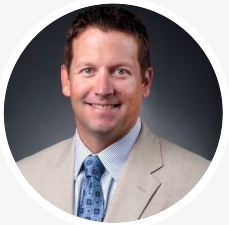
rodgersbuilders.com

Rodgers Builders

- 62 years in business — founded in 1963 by B. D. Rodgers
- 2024 volume: $756 million
- ENR - Southeast “Contractor of the Year” recipient
- Offices in: Charlotte, NC | Raleigh, NC | Wilmington, NC | Greenville, SC | Charleston, SC



Jesse Kinsey



Andy Cyr











Why should the AEC industry consider pre-fabrication?

- Client Perspective
- Design Perspective
- Construction Value

client perspective



Cost Predictability

Greater opportunities compared to traditional construction



Schedule

Efficiency & Speed to Market



Less Disruptive

During Construction



Improved Quality Control

Controlled vs. Uncontrolled Environment

design perspective



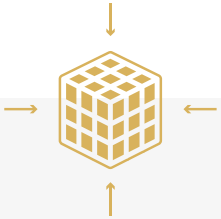
Improved Patient Experience

opportunity to zoom in the smaller details earlier due to repetition



Better Design Process

better informed & collaborative



Better Quality Building

prototyping of ideas earlier in the project



Environmentally Conscious

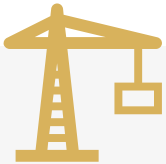
reduce waste, energy use & carbon footprint

construction value



Application To Different Climate Zones

climate dependent construction activities



Efficient Staging/Logistics

while buildings are operating (healthcare, higher ed, office buildings)



Waste Reduction

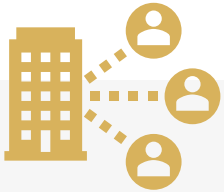
more sustainable & reduced wasted factors = reduced cost

construction value



Labor Skill & Safety

reduce field/site labor units



Quality Improvement

precision of tying in different elements



Higher Level Of Predictability

relative to quality, schedule & cost

What is Prefab?

- The Quest for Pre-fab
- Current Trends
- Future Possibilities

what it was

Pre-Cast Masonry Units

One of the oldest forms of Pre-Fab .





what it was

Single Family Homes

From Prefab Materials To Prefab Assembled Structures .







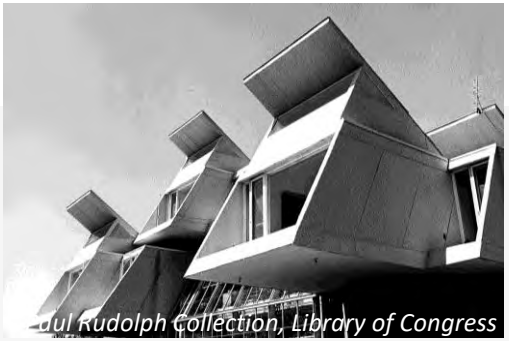
what it could be

Single Family Homes

The Green Residence is constructed by assembling a series of prefabricated segments which Paul Rudolph refers to as “**the twentieth century brick**”



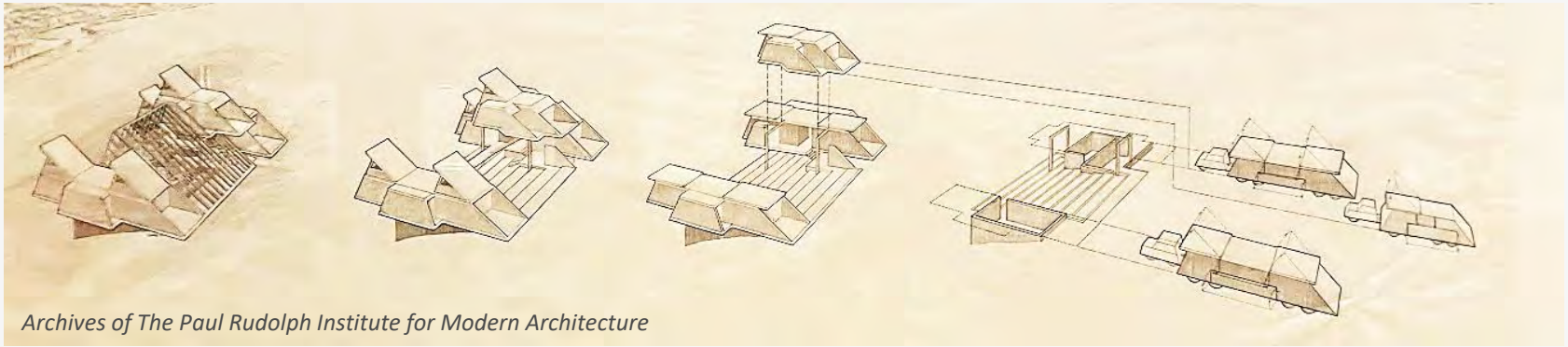
Paul Rudolph Collection, Library of Congress



ul Rudolph Collection, Library of Congress



Paul Rudolph Collection, Library of Congress



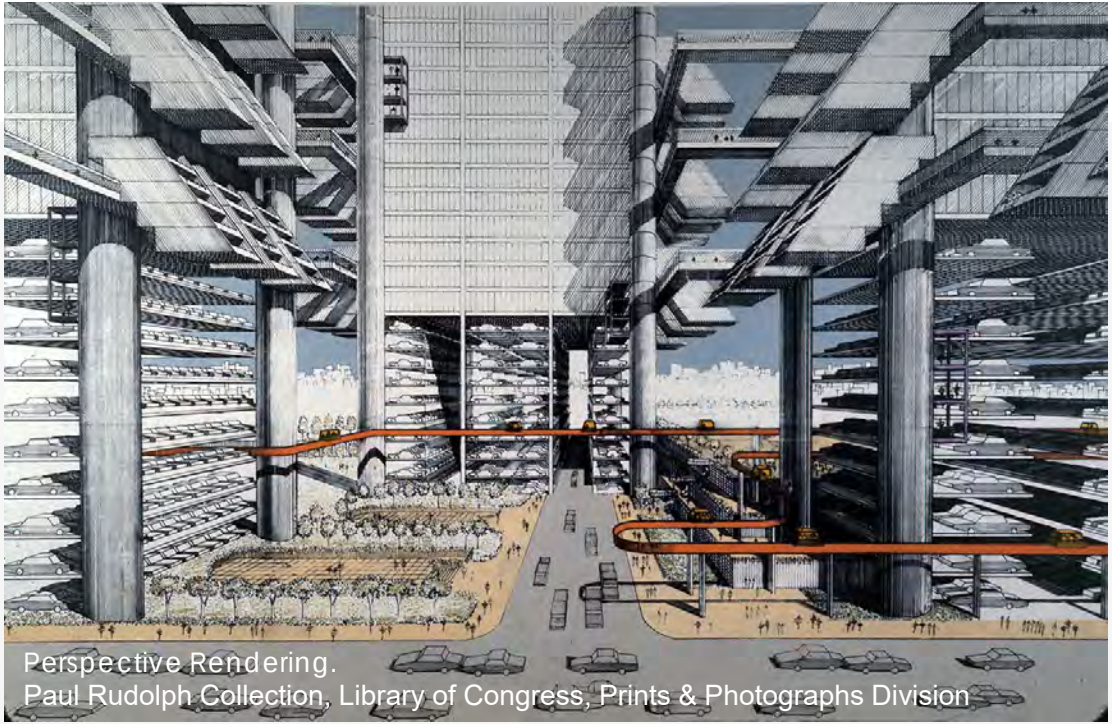
Archives of The Paul Rudolph Institute for Modern Architecture

what (if)

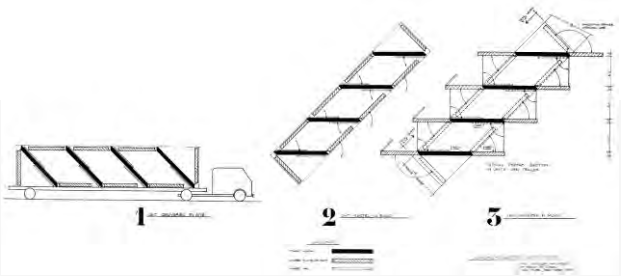
Prefabricated Megastructures

Lower Manhattan Expressway

Paul Rudolph



Perspective Rendering.
Paul Rudolph Collection, Library of Congress, Prints & Photographs Division





what we can do today

Prefabricated Building Components



→ Solid Walls

Use DIRTT wall assemblies with varying thicknesses in back-to-back configurations. DIRTT's UL listed assemblies include aluminum frames, blocking, insulation, and MDF wall panels that can be removed for easy future maintenance.

Acoustical Performance

Flexible Medical Gas

Infection Prevention

Medical-Grade Finishes

Accessory Integration

Electrical

Low-Voltage Devices





what we can do today

Prefabricated Building Units

BLOX BUILT

Design, manufacture, and construct standard modules & healthcare buildings in the United States.







Atrium Health, NC


Atrium Health, NC

Prefabricated Building Skins

what we can do today





Prefabricated Building Skins

what we can do today



Atrium, Pineville, NC

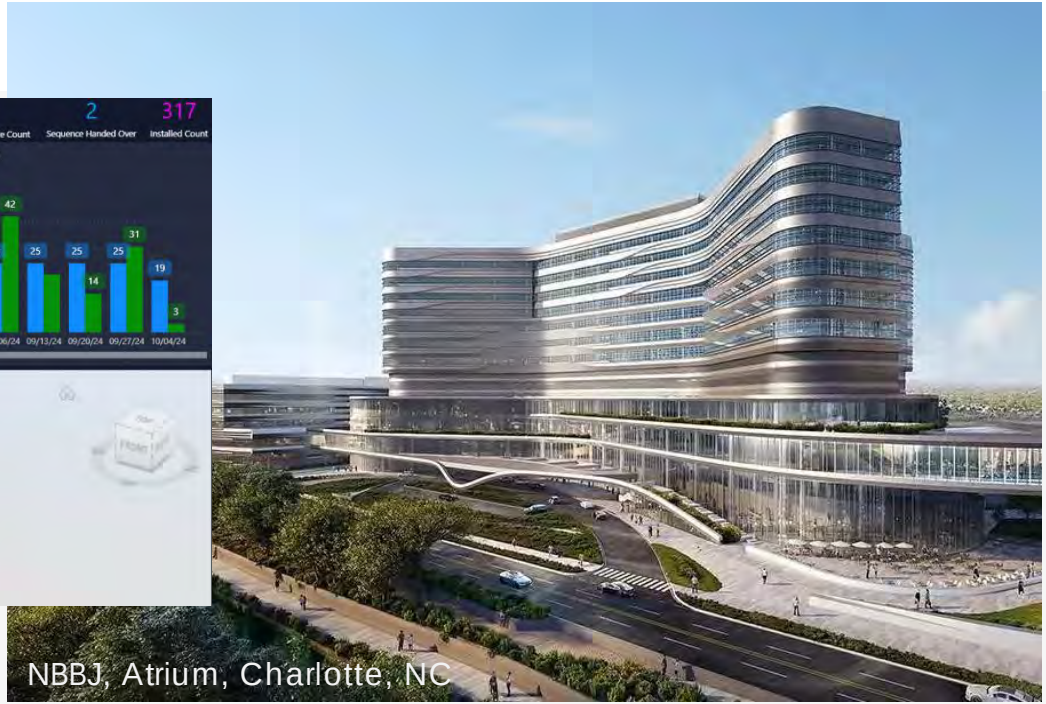


Atrium, Pineville, NC

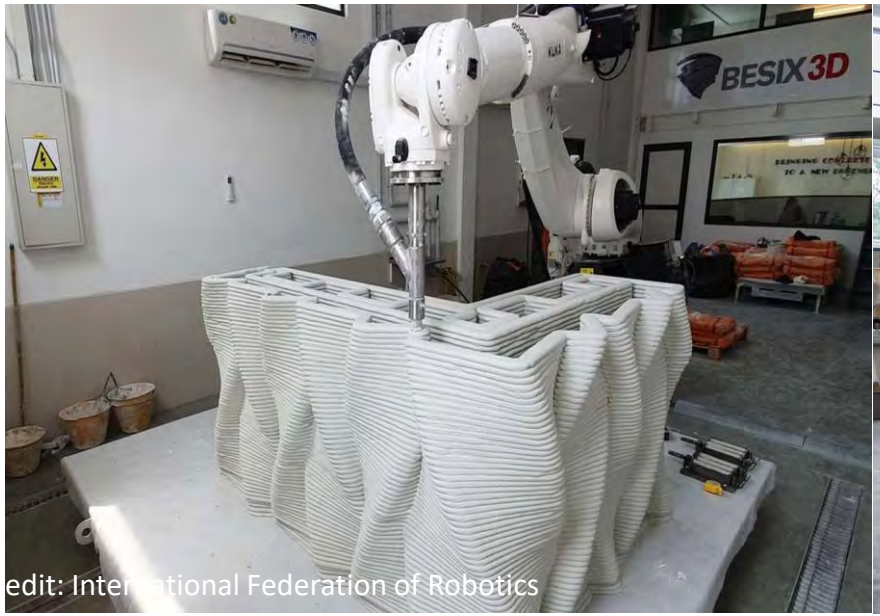
what the future holds

Thinking Big - Health Care Exterior




NBBJ, Atrium, Charlotte, NC

what the future holds



edit: International Federation of Robotics

3D Printing



Credit: Gramazio Kohler Research ETH Zurich

Automation

Case Study – Roper St. Francis Hospital Berkeley

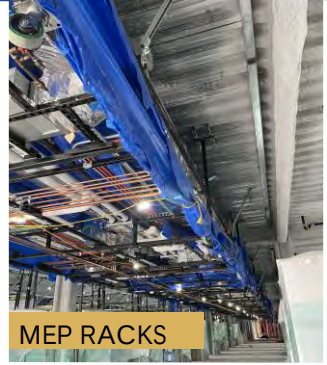
When, Where And Who Should Consider Prefab?

Who?

Healthcare prefabrication makes sense . .

Complex Repeated Components

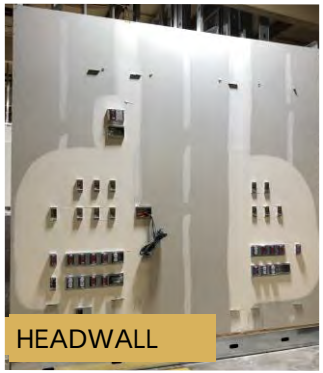

EXTERIOR WALLS


MEP RACKS


ELECTRICAL ROOM


SINK ENGINE


TILT WALL


HEADWALL


BATHROOM PODS


MODULAR HEADWALL


OR MODULAR SYSTEMS

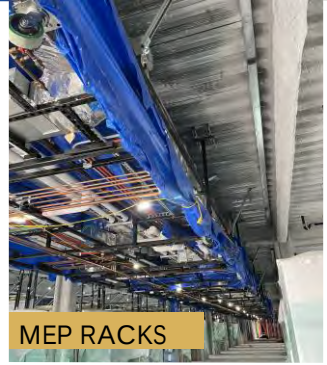

MODULAR WALLS


CURTAIN WALL

Case Study

Roper St. Francis Berkeley Prefabricated Components

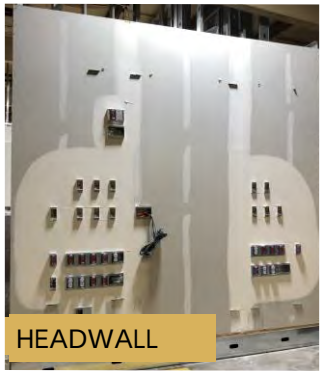

EXTERIOR WALLS


MEP RACKS


ELECTRICAL ROOM





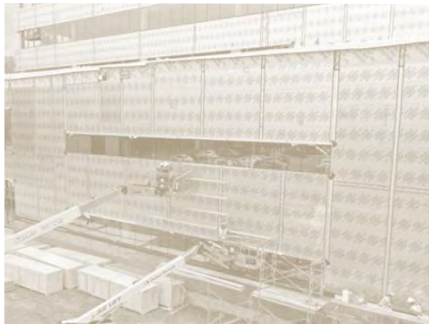

HEADWALL


BATHROOM PODS




OR MODULAR SYSTEMS





Why Prefab at Roper St. Francis



Less Disruptive

During Construction



Better Design Process

better informed & collaborative



Efficient Staging/Logistics

while buildings are operating (healthcare, higher ed, office buildings)



Labor Skill and Safety

reduce field/site labor units

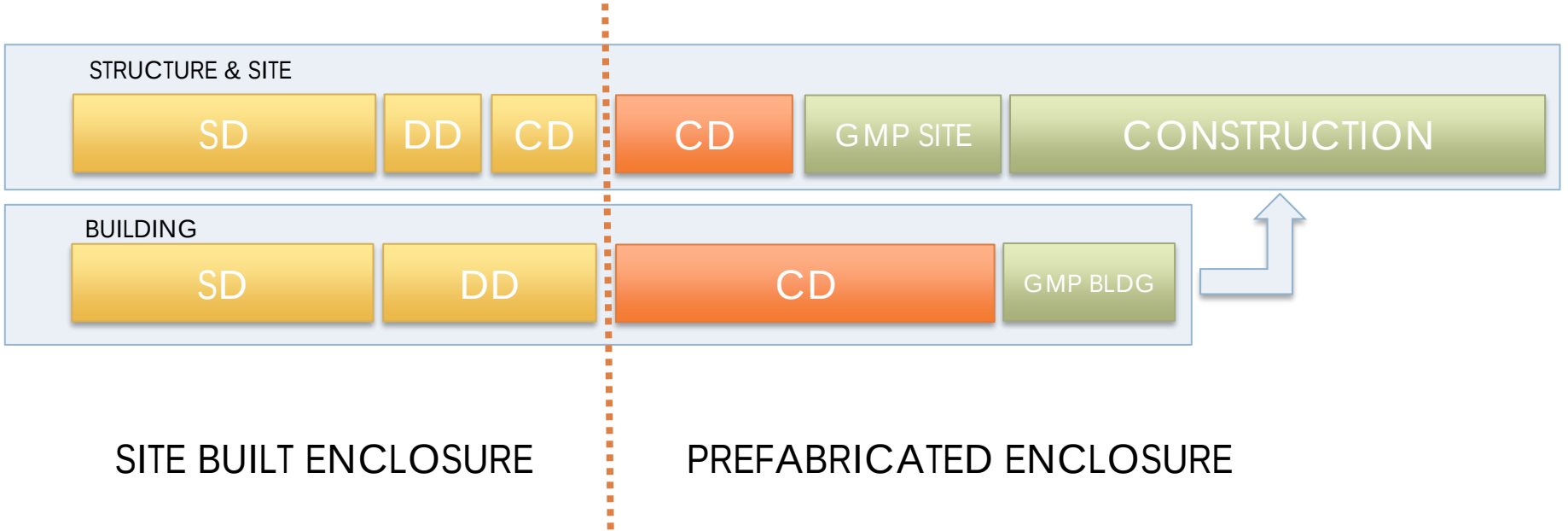
RSF Berkeley Campus Expansion




Rehab Hospital
MAIN ENTRANCE


ROPER
ST. FRANCIS
HEALTHCARE
Berkeley Hospital

Case Study - Prefabricated Enclosure

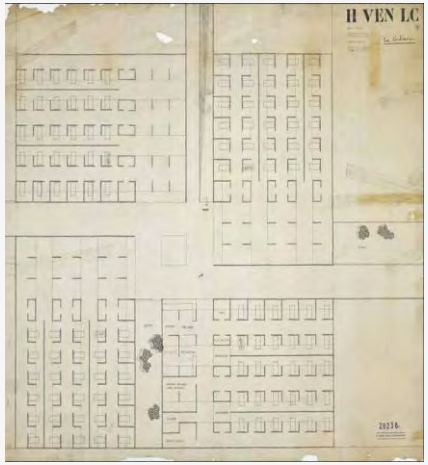


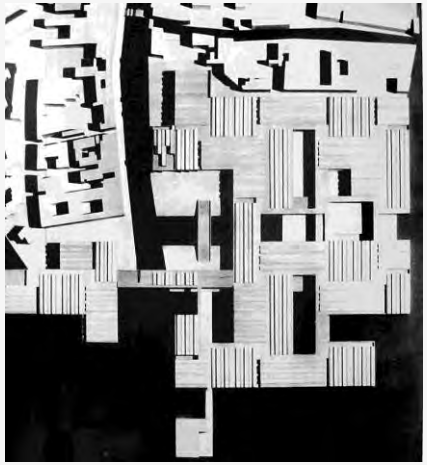
modularity

Modular Thinking I 1960s – Venice Hospital
Le Corbusier

The beginnings of Mat Building

A mat building is a building that has access, layout, daylighting and ventilation solved for a **plan unit that's repeated as often as needed**.



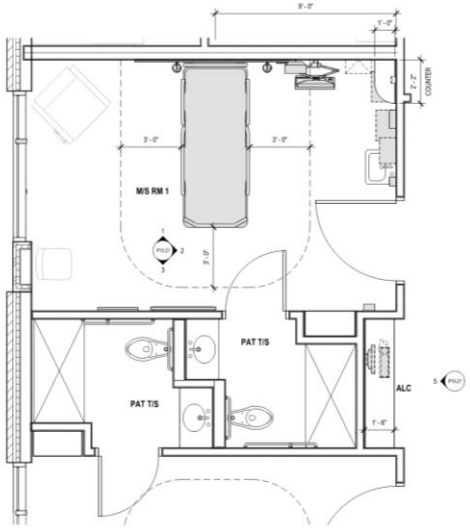




design story

Modular Thinking I Roper St. Francis Berkeley

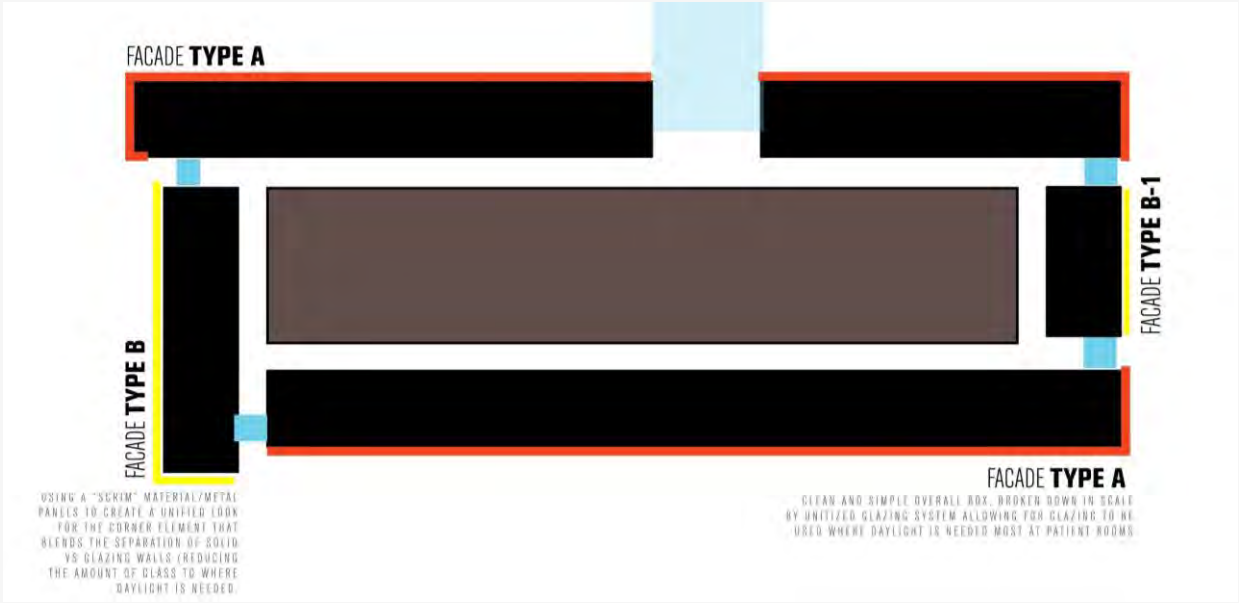




ENLARGED FLOOR PLAN - TYP MED/SURG PATIENT RM

modularity

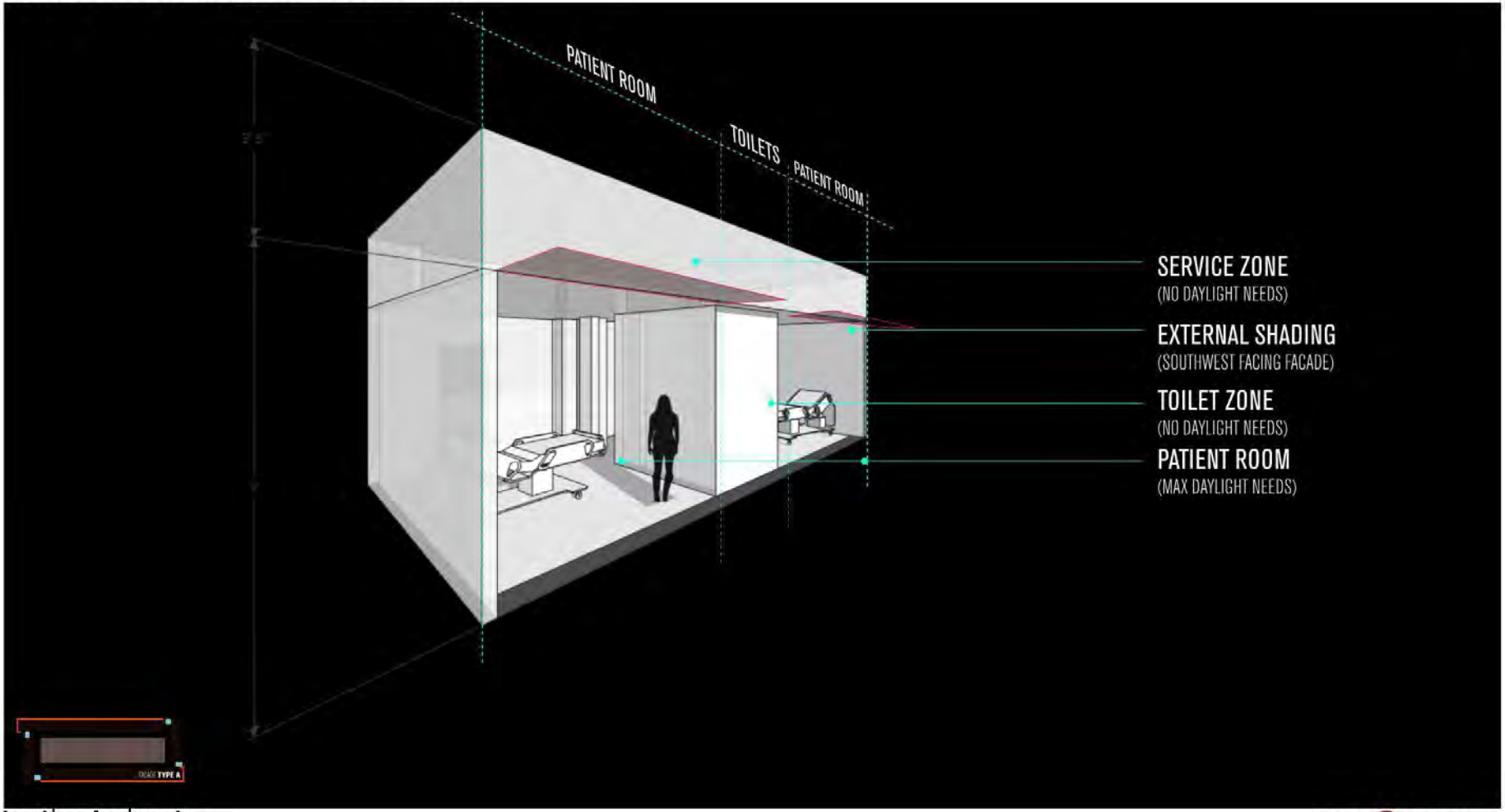
Roper St. Francis – Berkeley

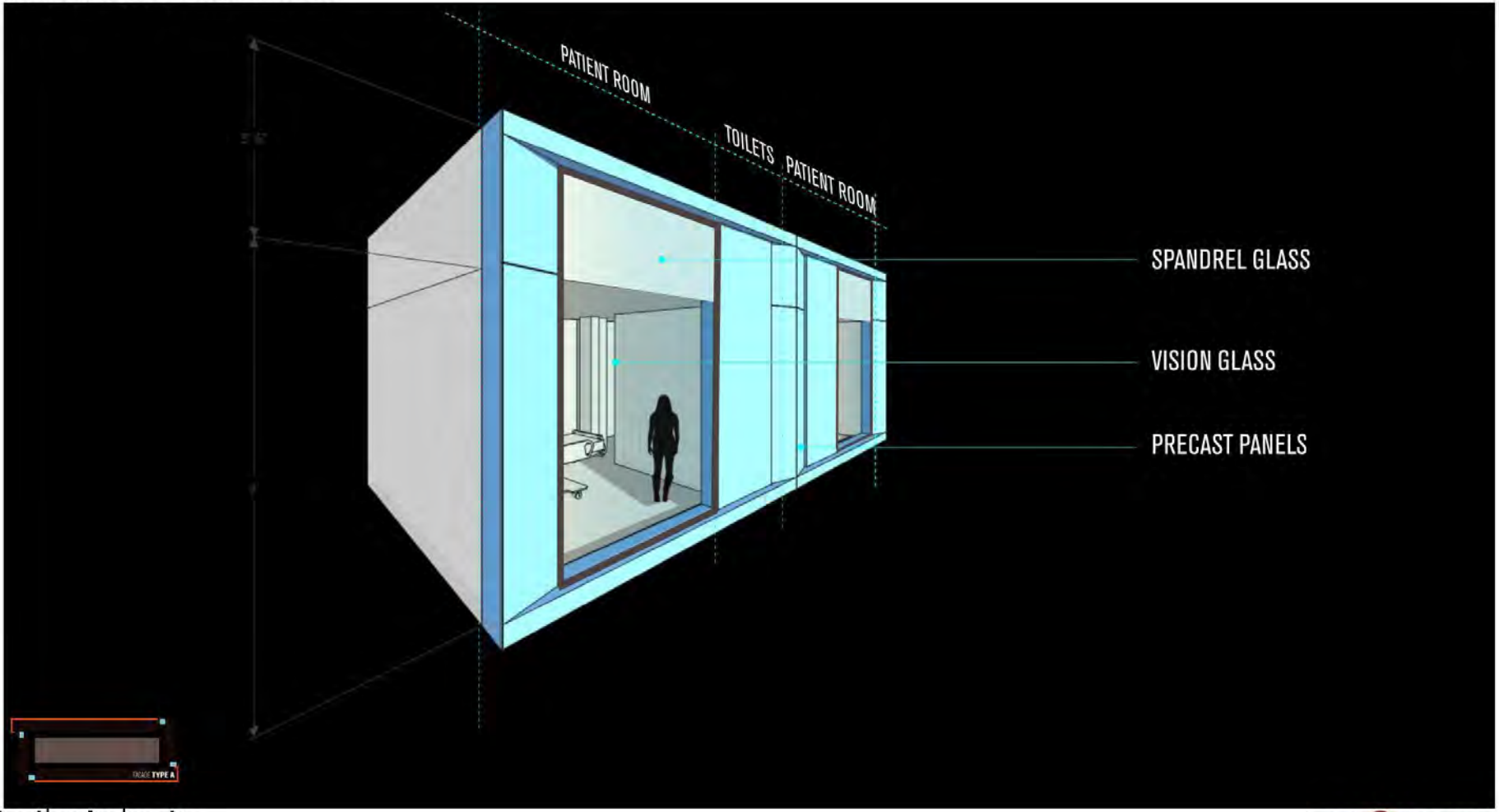


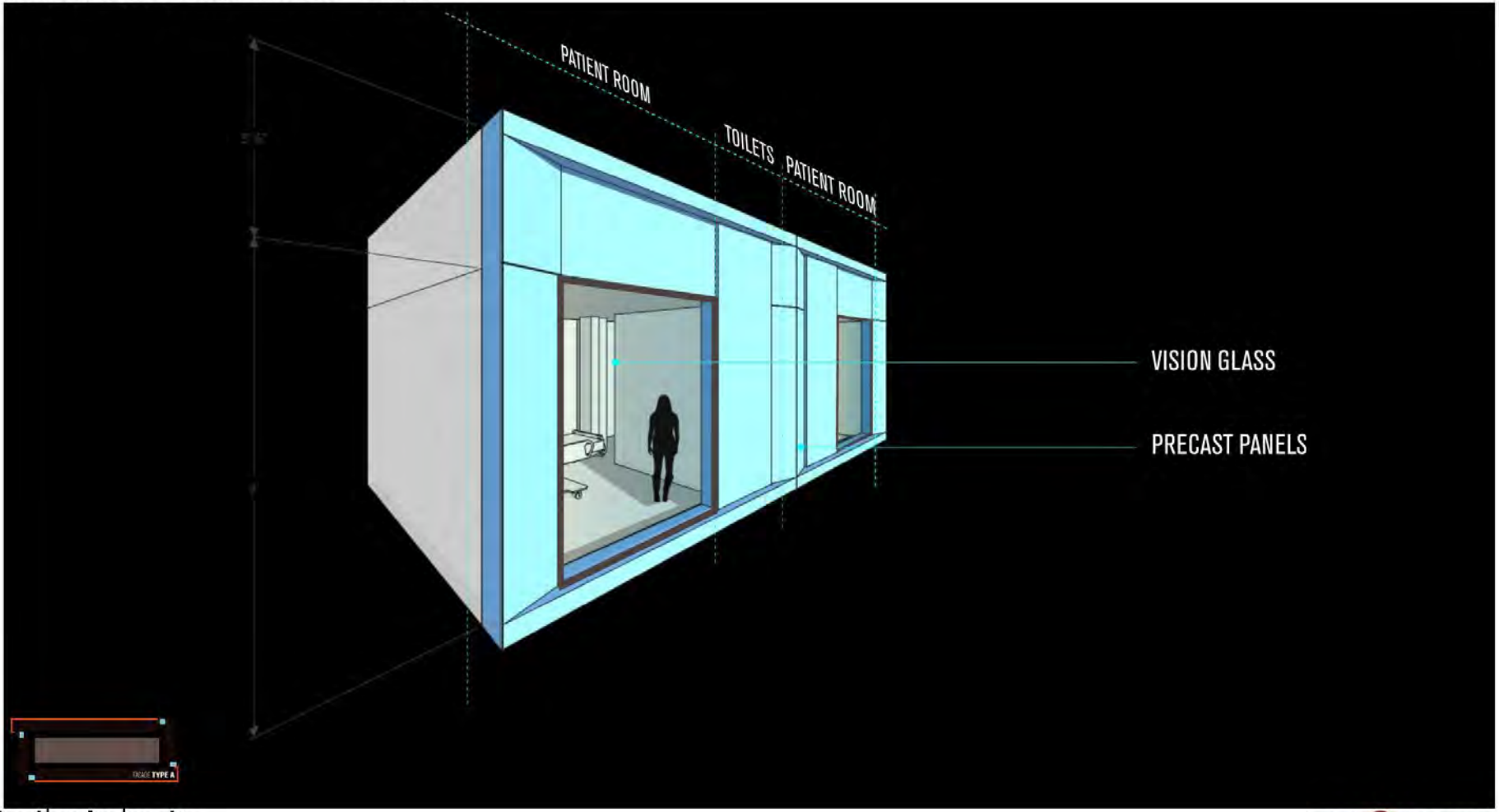







PATIENT ROOM
TOILETS
PATIENT ROOM
SERVICE ZONE
(NO DAYLIGHT NEEDS)
EXTERNAL SHADING
(SOUTHWEST FACING FACADE)
TOILET ZONE
(NO DAYLIGHT NEEDS)
PATIENT ROOM
(MAX DAYLIGHT NEEDS)
FACADE TYPE A


PATIENT ROOM
TOILETS
PATIENT ROOM
SPANDREL GLASS
VISION GLASS
PRECAST PANELS
FACADE TYPE A

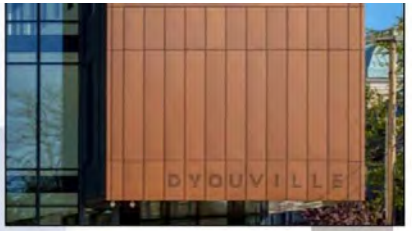

PATIENT ROOM
TOILETS
PATIENT ROOM
VISION GLASS
PRECAST PANELS
FACADE TYPE A

Roper St. Francis – Berkeley



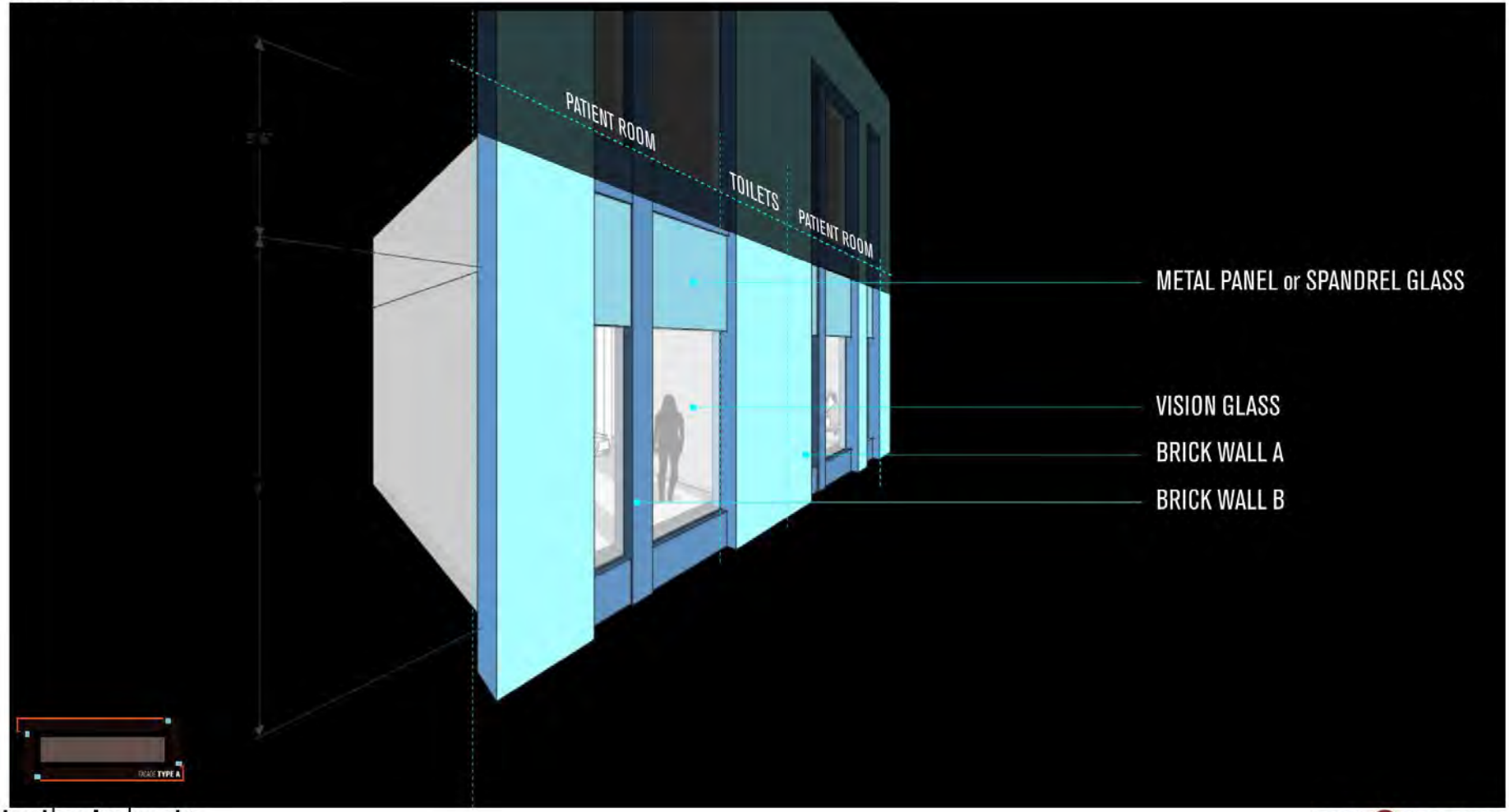
Roper St. Francis – Berkeley










PATIENT ROOM
TOILETS
PATIENT ROOM
METAL PANEL or SPANDREL GLASS
VISION GLASS
BRICK WALL A
BRICK WALL B
FACADE TYPE A

Roper St. Francis – Berkeley



Roper St. Francis – Berkeley







Roper St. Francis – Berkeley







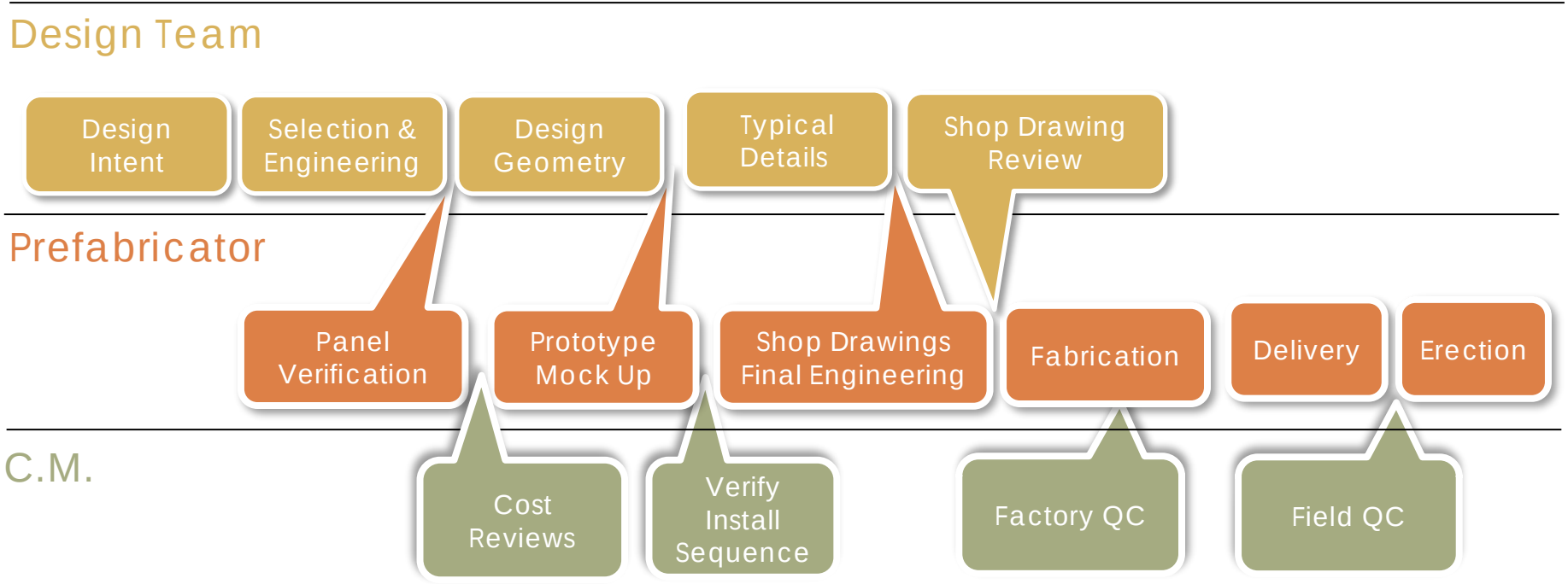


Prefabricated Enclosure Drivers

- Hot Humid Climate
- Seismic Category D
- Hurricane Impact Glazing
- NFPA 285 Fire Spread
- Healthcare HVAC



Prefabricated Enclosure Process





Milestones : Early Design

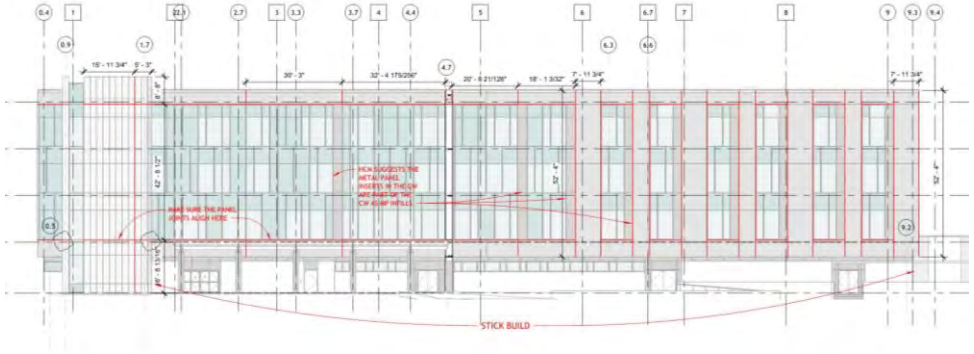
DESIGN: Design Geometry

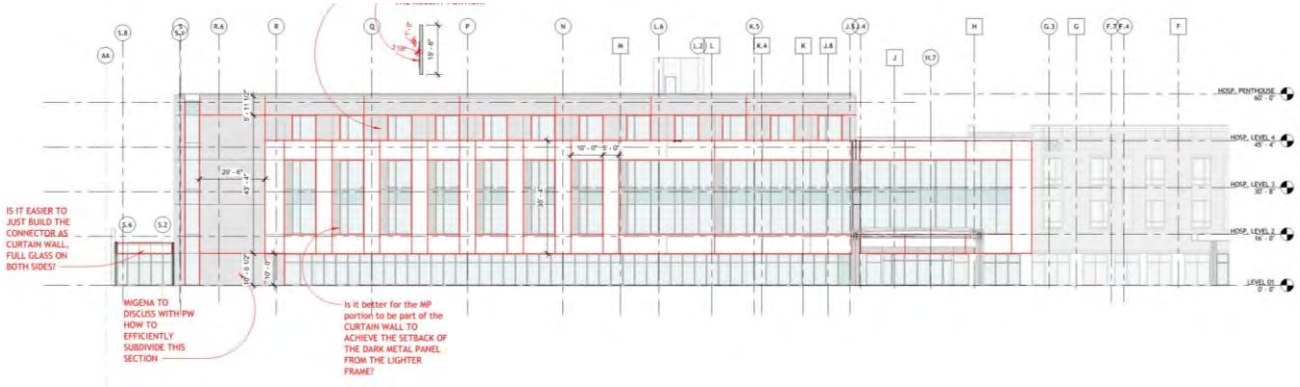
FAB: Identify Panel Constraints

CM: Cost review

TEAM: Define Documentation

Panel Layout Coordination

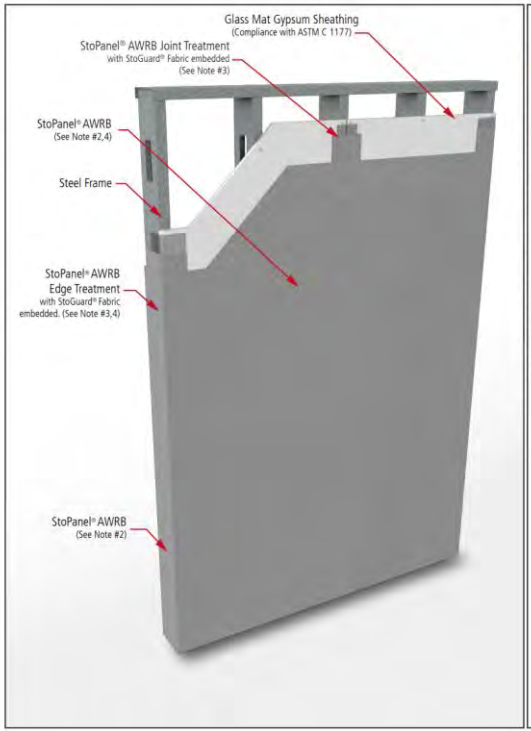




Panel Limits:

- Crane Capacity
- Roadway Regulations
- Erection Loads`

Documentation



Detail No.: **51.70**
Date: **October 2023**
Page: **1 of 1**

Notes:

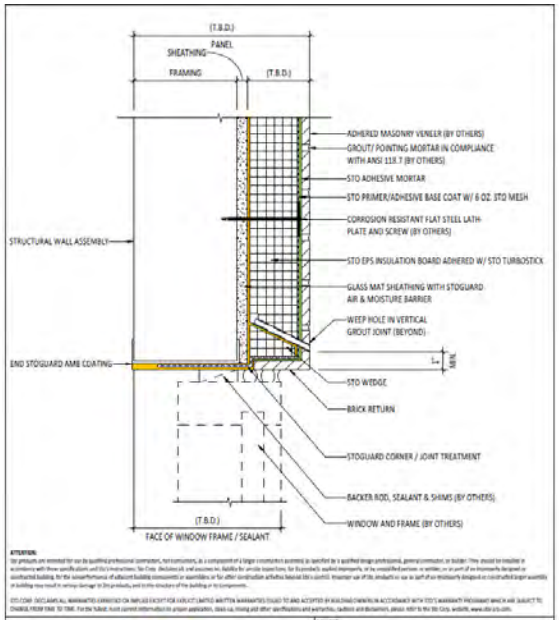
1. StoPanel® Backup is a lightweight, pre-fabricated exterior wall panel with continuous air and water-resistive barrier (AWRB).

2. Alternative air and water resistive barriers (AWRB): Sto Gold Coat®, Sto AirSeal®, and StoGuard® VaporSeal.

3. Alternative Edge and Joint Treatment: Sto RapidGuard®.

4. Protect StoPanel® AWRB with code compliant wall covering within 90 days or coat with StoColor® Acryl or StoColor® Acryl Plus for extended exposure (up to one year).

5. Components not identified as Sto are furnished by other manufacturers.



Detailing Strategy:

- Prefabrication "Sandbox"
- Design documents vs Fabrication drawings.



Milestones: Design Development

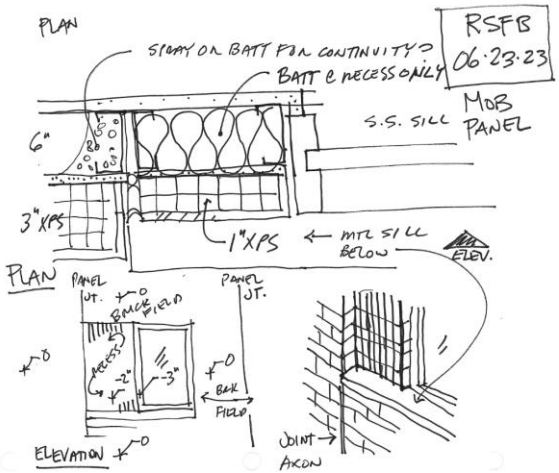
DESIGN: Define Typical Details

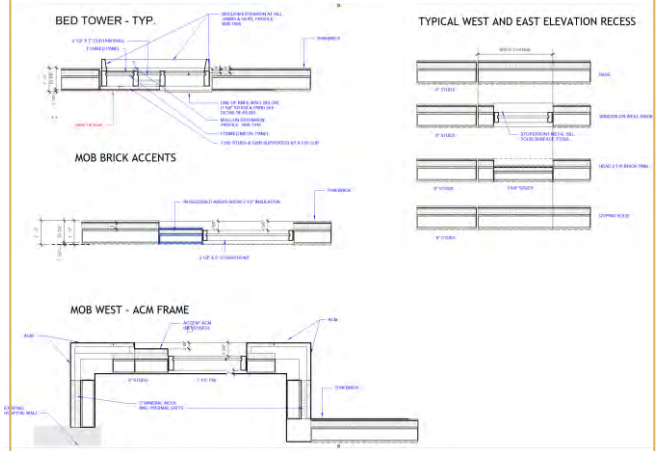
FAB: Production Constraints

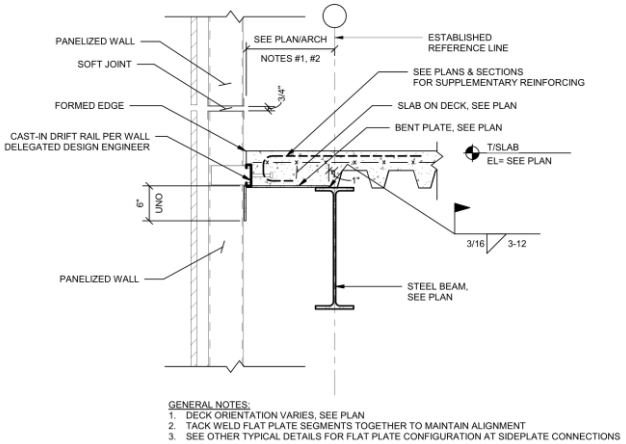
CM: Schedule and Cost

TEAM: Refine Panel Layout

Prototype Detailing







Mock-Up Prototype









Milestones: Construction

TEAM: Review of Bid Documents

FAB: Shop Drawing Preparation

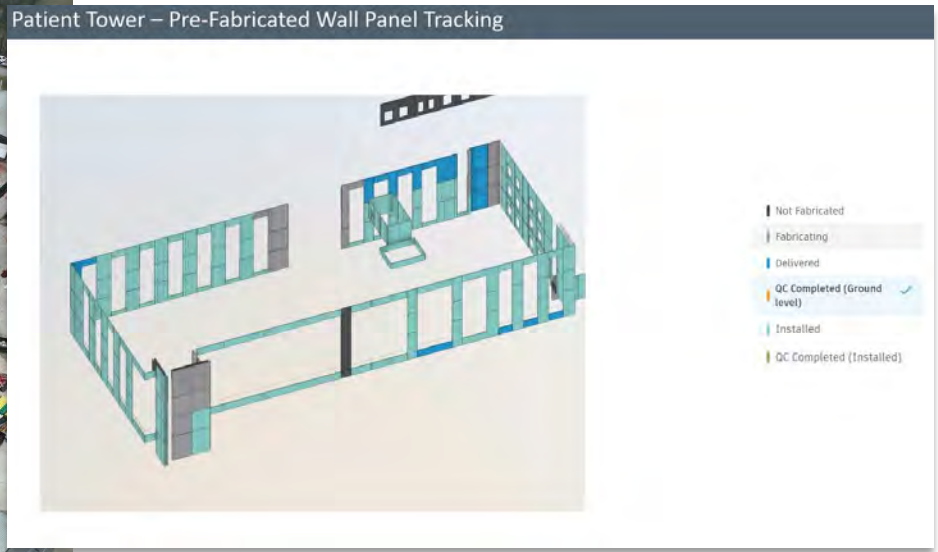
DESIGN: Shop Drawing Review

CM: Release for Fabrication

TEAM: Quality Control

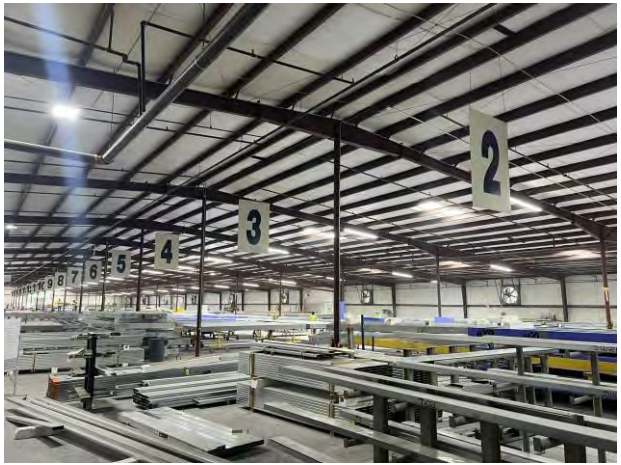
Installation Sequence

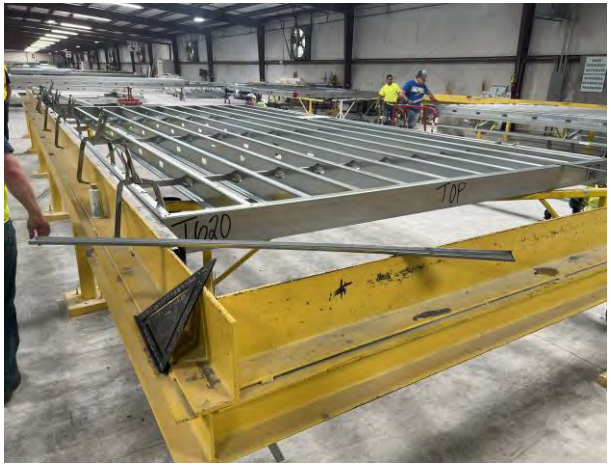




Fabrication

Framing, Sheathing & AVB Detailing

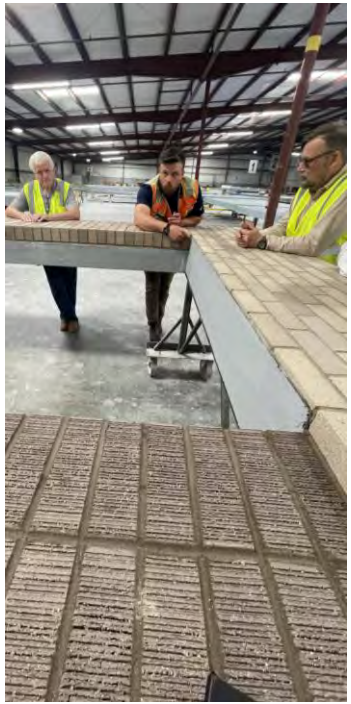




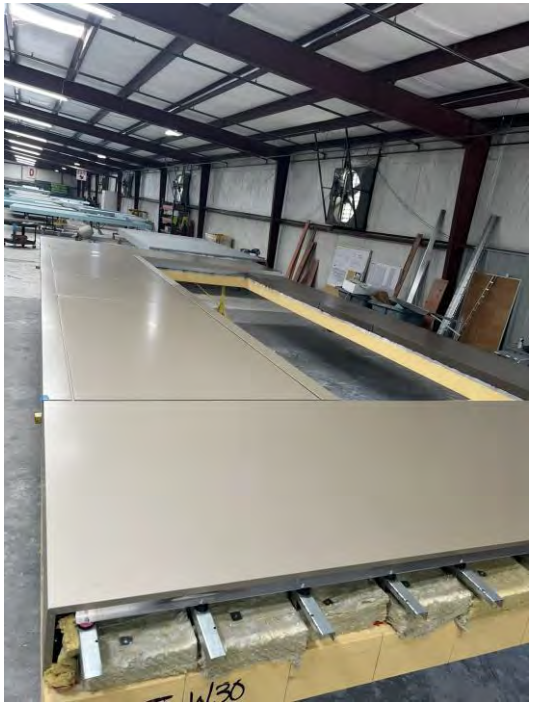


Fabrication

Cladding in ACM & Thin Brick









Factory Quality Control

Visual Inspection







Factory Quality Control

Bubble Gun Testing





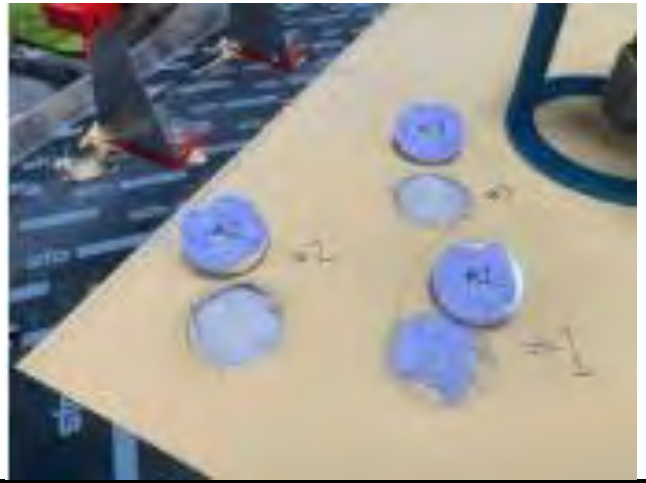


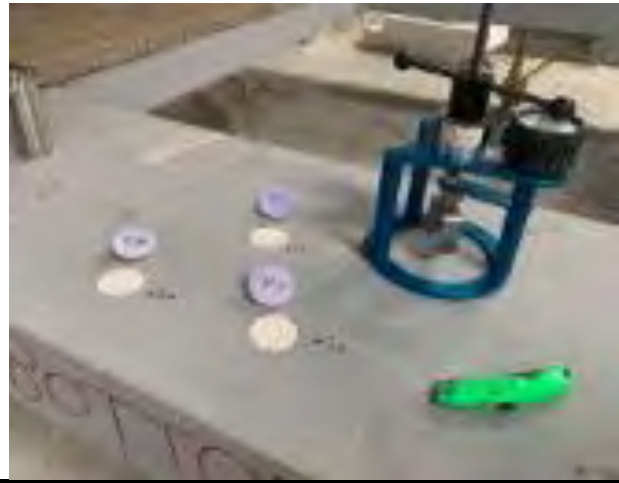
Test of anchor & self-adhering membrane to fluid applied membrane transition

Factory Quality Control

Pull Adhesion Testing







Overview of 3 separate pull tests

Transport and Erection



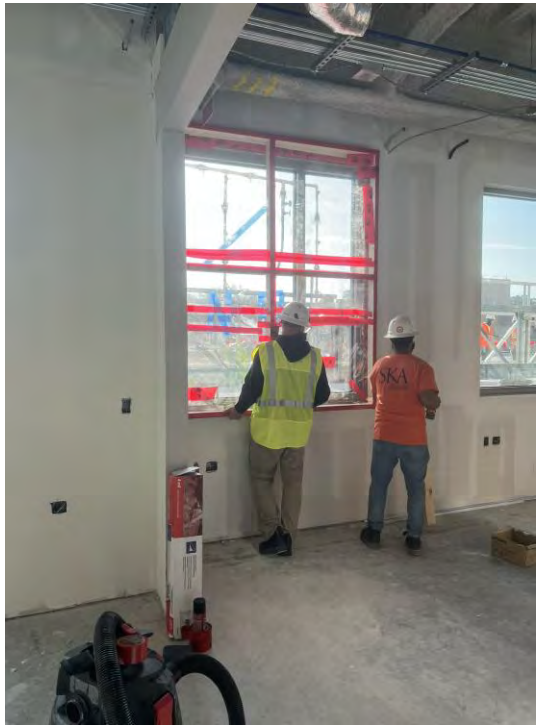




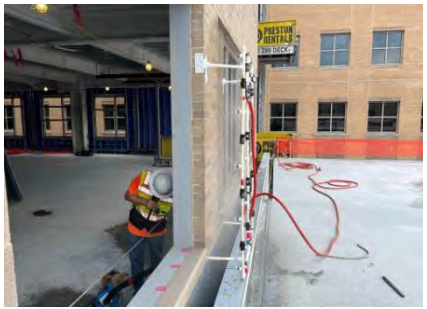
Site Quality Control



WATER TESTING WINDOWS AND PANEL







Photograph 12: SKA monitoring interior face of primary weather seal and joint for water intrusion during second test. No water intrusion observed.















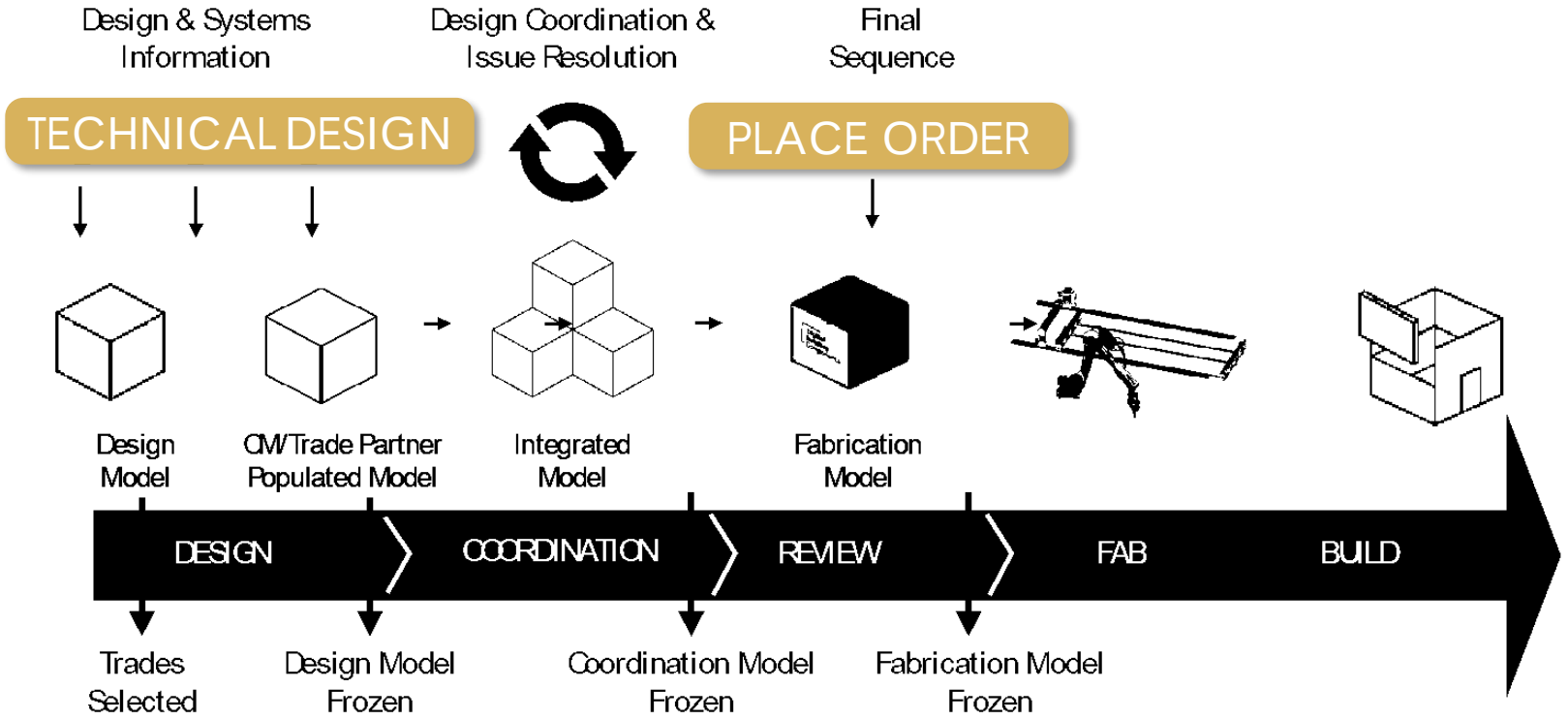

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No Pasar
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2024

Best Practices in pre-fabrication?

Best Practices: Ideal Timeline



Best Practices: Design Documents



- Design to panel joint limitations
- Level of detail for fabrication
- Design for erection and use
- Design for adjustment and installation tolerances

Best Practices: Design Coordination



- Design to panel constraints in early design.
- Understand sequence impacts on design and detailing.
- Some exterior materials some are more suitable for prefabrication.

Best Practices: Construction



- Design and fabrication geometry
- **“One-stop shop(s)”** system
- Focus on **“gray area”** scope

Questions?

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