

22<sup>ND</sup> ANNUAL



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OCTOBER 19-23

# From Monumental to Modular: How a Modular Restroom Is Saving Money and Headaches

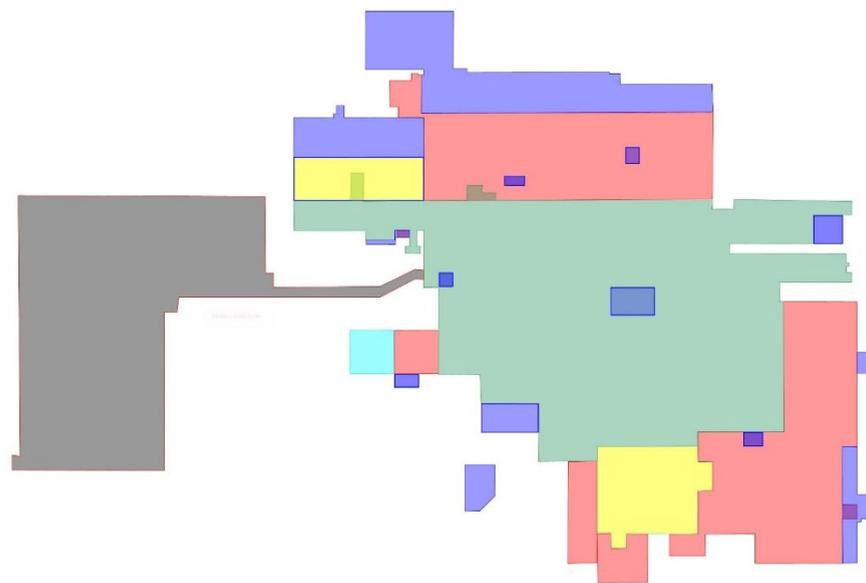
Michael Swiatkowski and Jonathon Jackson, Ghafari Associates

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

October 22, 2020

# Problem Statement

- Monumental restrooms can cost up to **\$1 million** to build.
- Industrial project **programs change**.
- This requires the **cost of demolition and rebuilding** them.
- Our client – a **global automaker** – sought to mitigate this cost.
- Example Automotive Project:



2006 - 992,487 sf
2008 - 65,911 sf
2013 - 751,445 sf
2014 - 366,935 sf
2016 - 671,437 sf
2019 - 22,500 sf



In Total:

- 330 Water Closets
- 168 Urinals
- 445 Lavatories

# Modular vs. Monumental



# Monumental vs. Modular

- Monumental structures **cannot be moved**
- They take up **valuable space**
- They require **longer shut downs** for installation and demolition

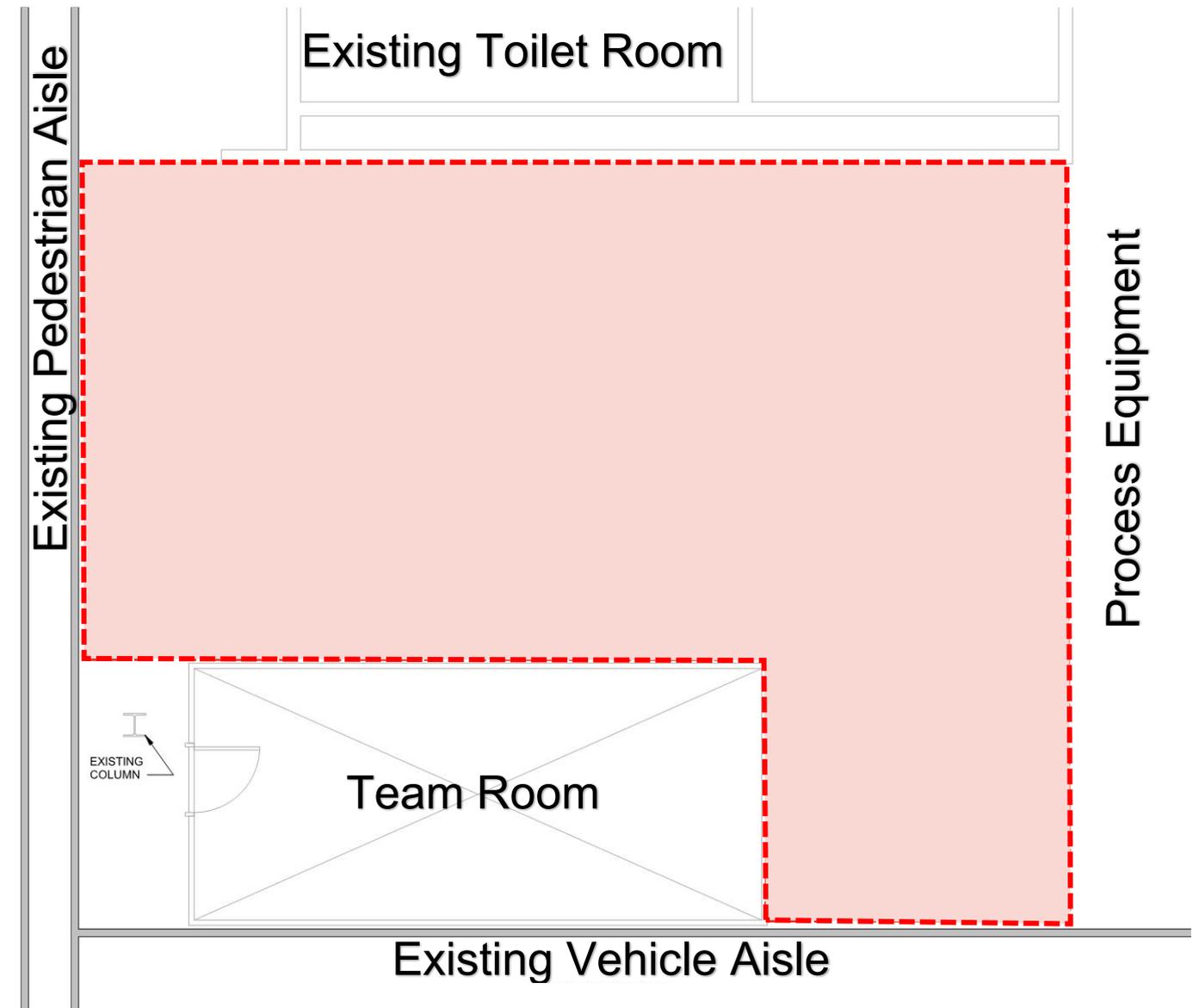


# Why modular made sense for our client



# Existing conditions

- Modular unit next to **existing toilet room**
- Designed in tandem next to **Team Room**
- Existing **doors and aisles** drove dimensions
- **Shipping restrictions**



# Client-Specific Requirements

- Minimum **fixture count**
- Must fit within **space constraints**
- Client **standards** must be followed
- Each toilet room to be **self-sufficient**
- Match **wind speed** of monumental rooms
- Design the connection to the **existing utilities**
- Must be **barrier free**
- Materials to be **durable** and **easy to maintain**
- Must meet **shipping** requirements

RESTROOM DESIGN SPECIFICATIONS REVIEW				(UPDATED 8.22.19)
SPECIFICATIONS	PROPOSED	GHAFARI DESIGN	ACCEPTED	NOTES:
Size	10' W x 35' L x 9'H/4-Sided			
1 Ceiling Height	10 feet			
2 Interior Width	11.5 feet			
3 Weight	Estimated at 175 lbs. to 200 lbs. Per sqft			
Sump Unit				
4 Width				
5 Height				
6 Weight				
Ramp and Misc.				
7 Width				
8 Height				
9 Weight				
Construction	Factory Assembled			
10 Structure	TMMAL Severe Weather Shelter requirements			
11 Walls	Designed to match 8" thick CMU Block filled and #6 Rebar			
12 Ceiling	Designed to match 4" thick Structural Slab and Rebar			
13 Tie- Down	Provide design to secure units to floor (Severe Weather Req.)			
14				
15				
Materials				
16 Structural Framing				
17 Roof / Siding	Forklift able Floor Structure - Fork Pocket Sets			
18	Fire Rated Plywood Subfloor			
19	Vinyl Composition Tile			
20	Moisture Resistant Drywall or Densglass or Equal			
21				
22				
Perimeter Walls				

# Design of the modular restroom

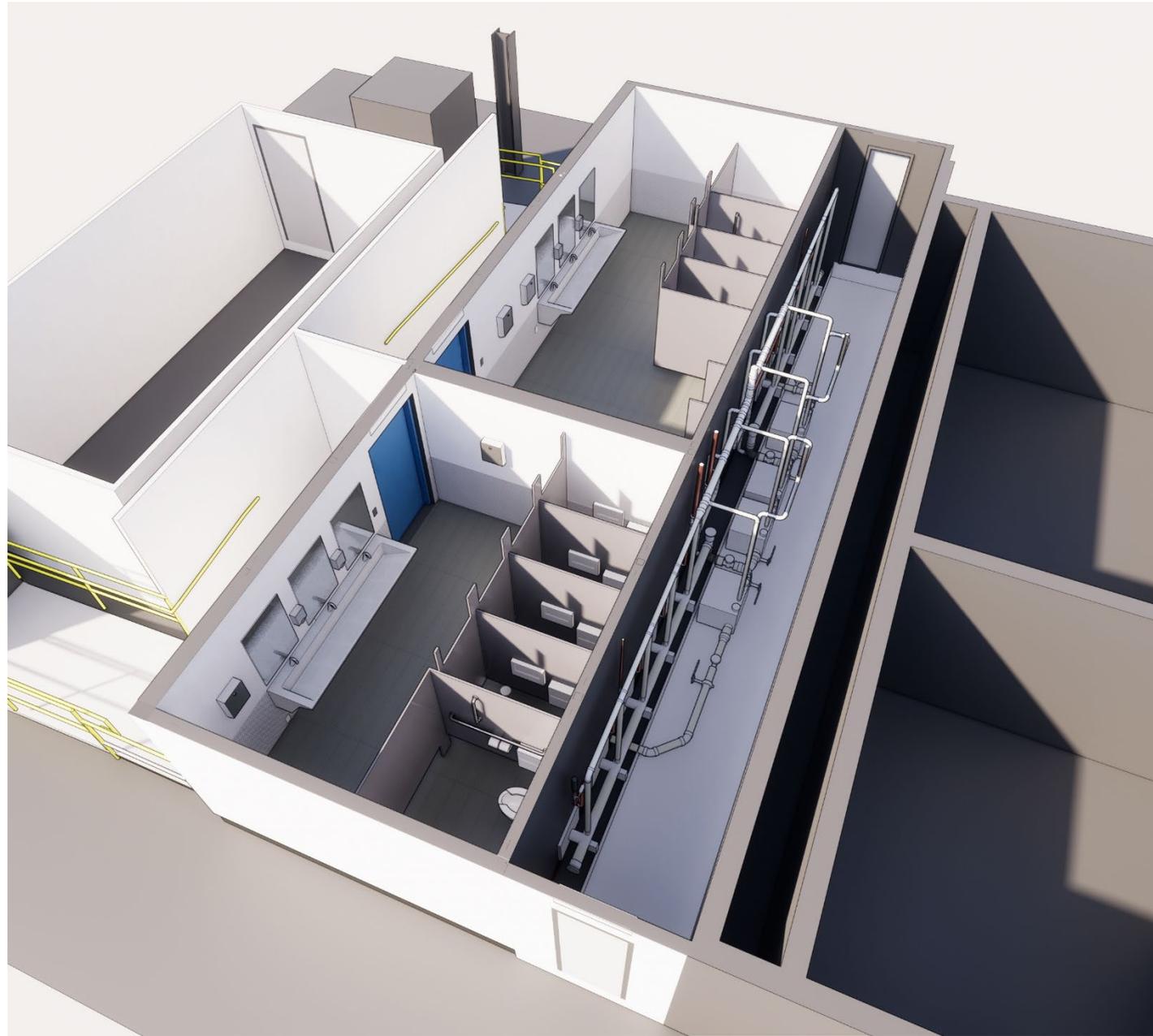


# BIM Utilization – How it was utilized

- **Digitally build** within space constraints
- Perform **clash detections**
- Solve **constructability** issues
- Perform model **reviews** with clients
- Develop **renderings** for review



# BIM Utilization – How it was utilized



# Review process

- Revu Bluebeam was utilized
- Captures changes sent from owner
- All comments captured in one location
- Ease of sharing documents

**TOILET ACCESSORY LEGEND**

SYMBOL	DESCRIPTION	QTY	CFM
(1)	TOILET		
(2)	24" x 48" MIRROR		
(3)	PAPER TOWEL DISPENSER - OWNER PROVIDED		
(4)	WALL HUNG URINAL - TO MATCH EXISTING KHLER URINAL AND AUTO FLUSH VALVE		
(5)	WOMEN'S PARTITION		
(6)	FLOOR DRAIN - SEE MECHANICAL		
(7)	CEILING HUNG TOILET PARTITION - POWDER COATED STEEL PARTITION (GALV OR BRASS) 6' TALL		
(8)	AMBULATORY URINAL (3) 48" HORIZONTAL, (3) 18" VERTICAL		
(9)	GRIP BAR (1) 18" AND (1) 42" HORIZONTAL, (1) 18" VERTICAL		
(10)	SOAP DISPENSER		
(11)	CANTRY NAPPA DISPENSER		
(12)	TOILET SEAT COVER DISPENSER		
(13)	TOILET PAPER DISPENSER		
(14)	SEMI-PRIVATE RECEPTION		

**ENLARGED CEILING PLAN**  
SCALE: 1/4" = 1'-0"

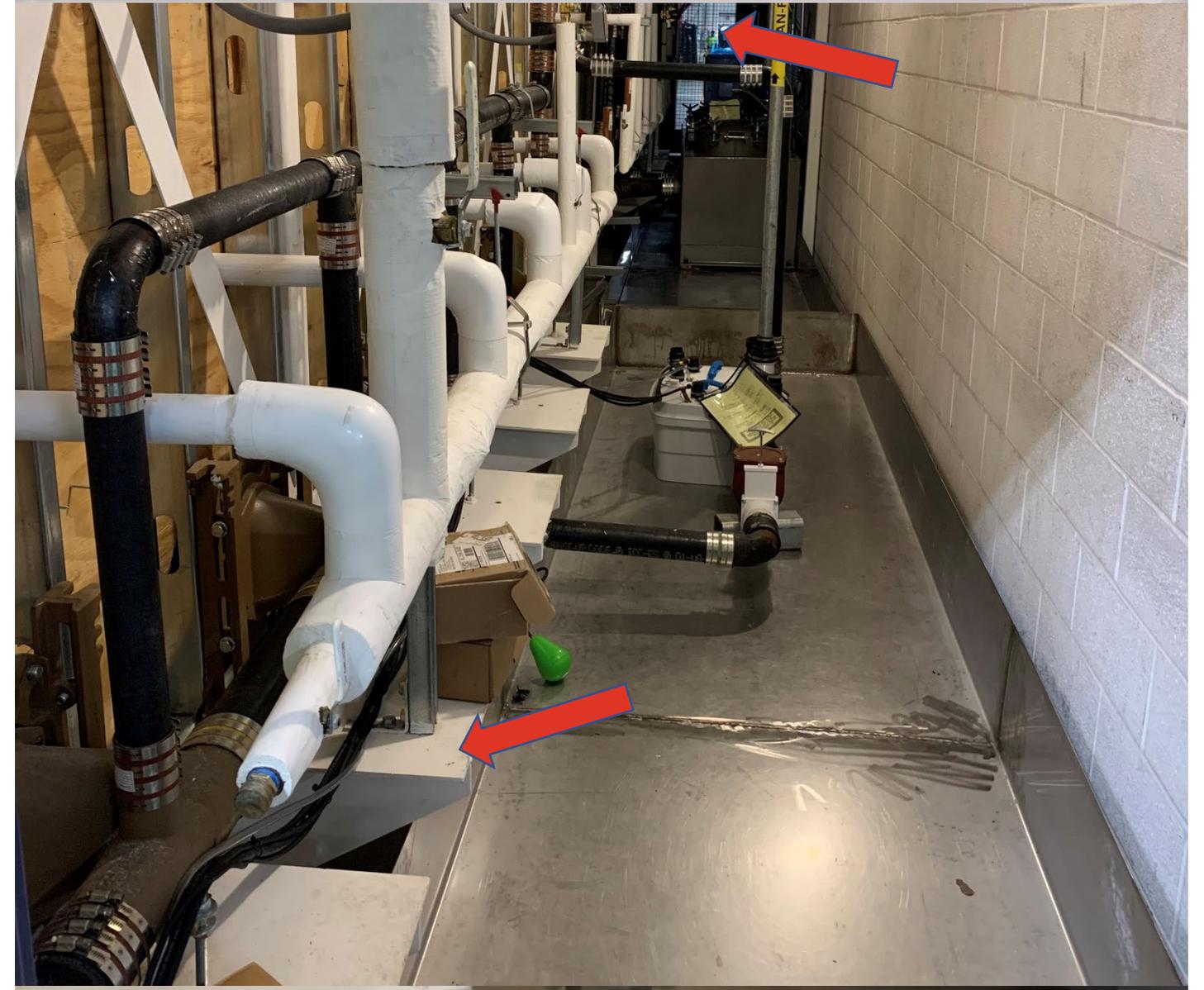
**ENLARGED FLOOR PLAN**  
SCALE: 1/4" = 1'-0"

**NOT FOR CONSTRUCTION**

**AE4-00-01**

# Architectural Design

- **Durable** materials that are easy to maintain.
- Exterior FRP serves as dry erase board
- Drop ceiling allows for utility maintenance
- No floor mounted fixtures.
- **Tile floor** to match existing toilet rooms.
- **Containment pans** as extra precaution
- **Visual access** to pipe chase



# Structural Design

- Structural steel base served multiple functions
- Base to be **suitable substrate** for tile floor
- Integral fork truck **jack points**
- Designed for **wind speed** requirements
- Connections designed for **ease of assembly**
- Support all wall mounted fixtures



# Mechanical Design

- All Mechanical elements had to be above slab
- Pump sanitary 30' up to truss space
- **Custom tank design** per owner request
- **Testing equipment** integral to design
- Instantaneous Water Heaters



# Electrical Design

- Each unit has its own **transformer**
- Each unit has its own **receptacle panel**
- Lights and Exhaust fan had **battery backup**
- Reduce cost by not running conduit
- Low profile LED lighting due to **limited plenum**



# Construction of a Modular Restroom



# Critical Path Method

- Covid affected availability and schedule of multiple items
- Being transparent with the Plan Reviewers expedited the review process
- Working with the vendors and fabricators was essential for meeting the schedule



# Fabrication

- Facility for a controlled environment
- Remove weather as a factor
- Able to work around the clock



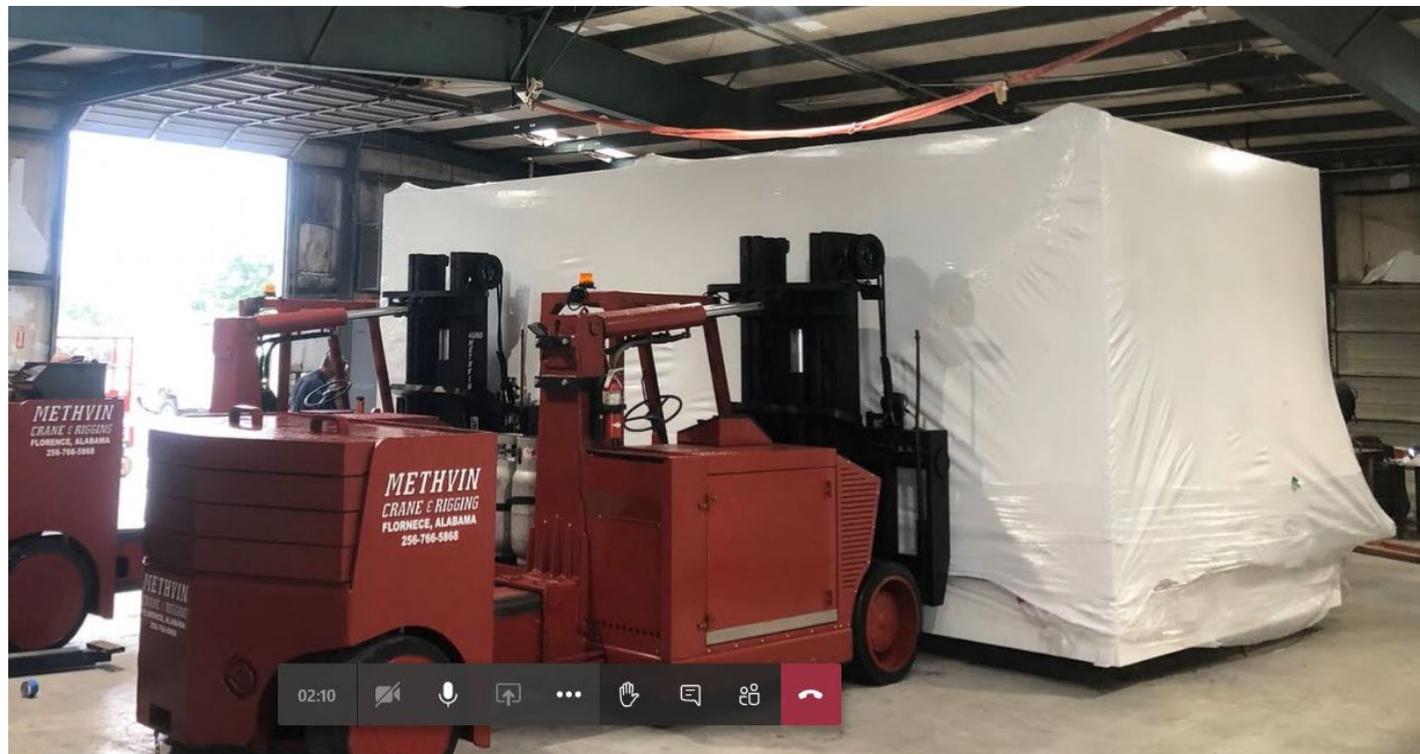


# Let's move



# Shipping the units

- Must meet local **shipping restrictions**
- Must fit through **OH door** and down the **aisles**
- Need **multiple rigging options**
- Must keep **existing slab design** in mind



# Final Product



# Final Product



# Lessons learned



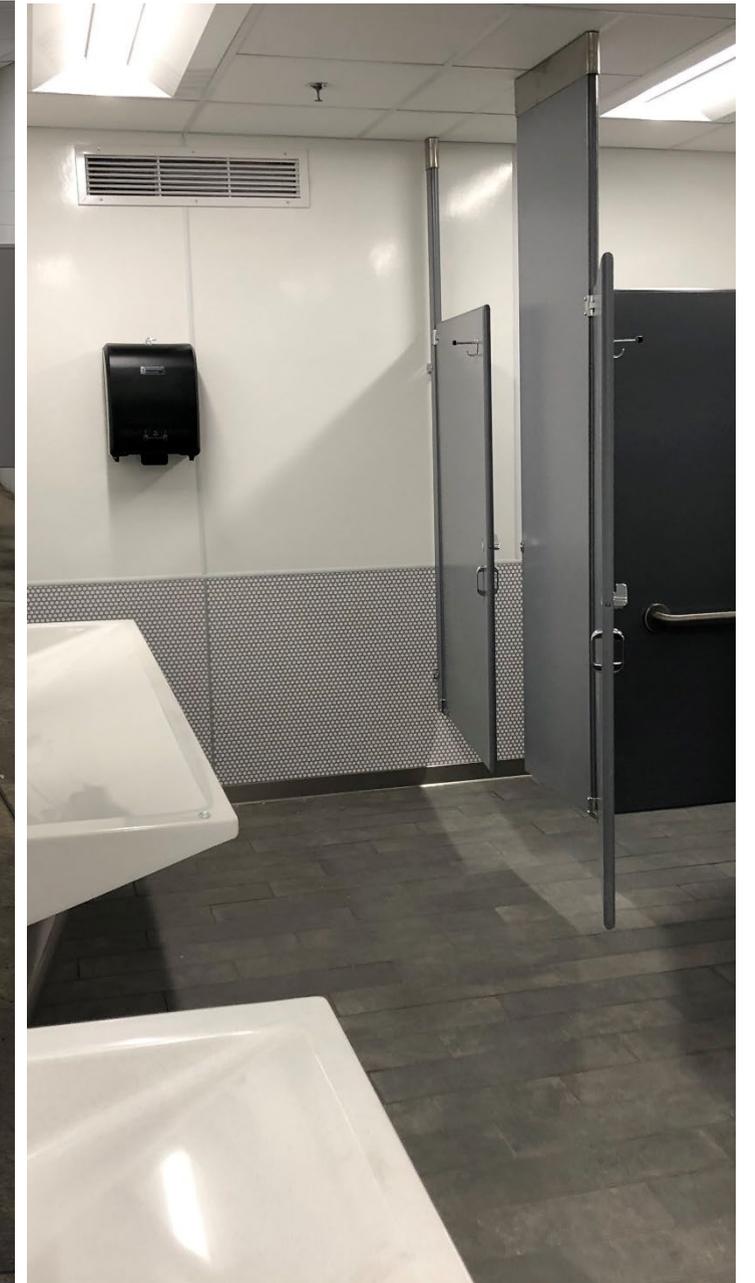
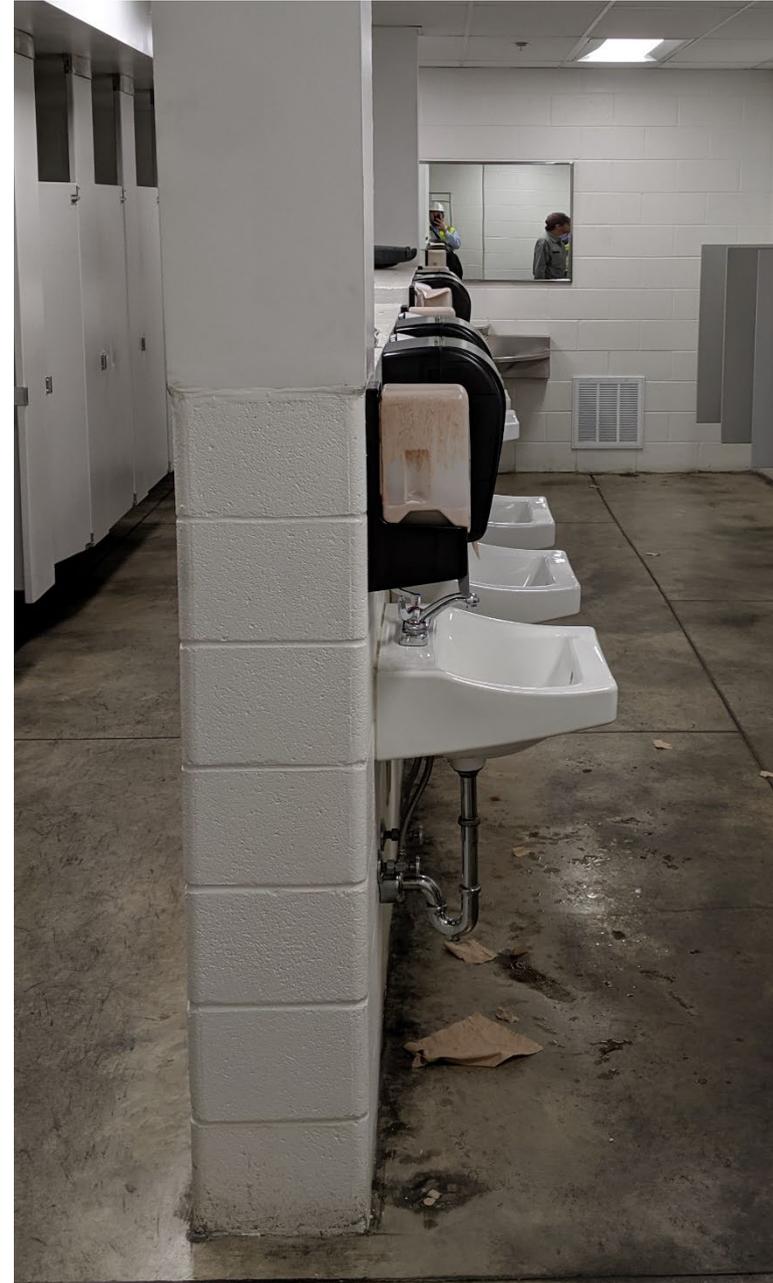
# Lessons Learned – Design and Constructability

- **Too many cooks** in the kitchen
- Get decisions **in writing**
- Consider Construction **Tolerances**
- Think about the **maintenance** person
- **Lead time** is critical



# Lessons Learned - Cost Savings

- Cost of toilet rooms just above \$1,000,000.
- About \$300,000 above the cost of masonry.
- ROI will be gained when you consider:
  - **Shut Down**
  - **Demolition of Existing**
  - **Cost of a new build**



# Other examples



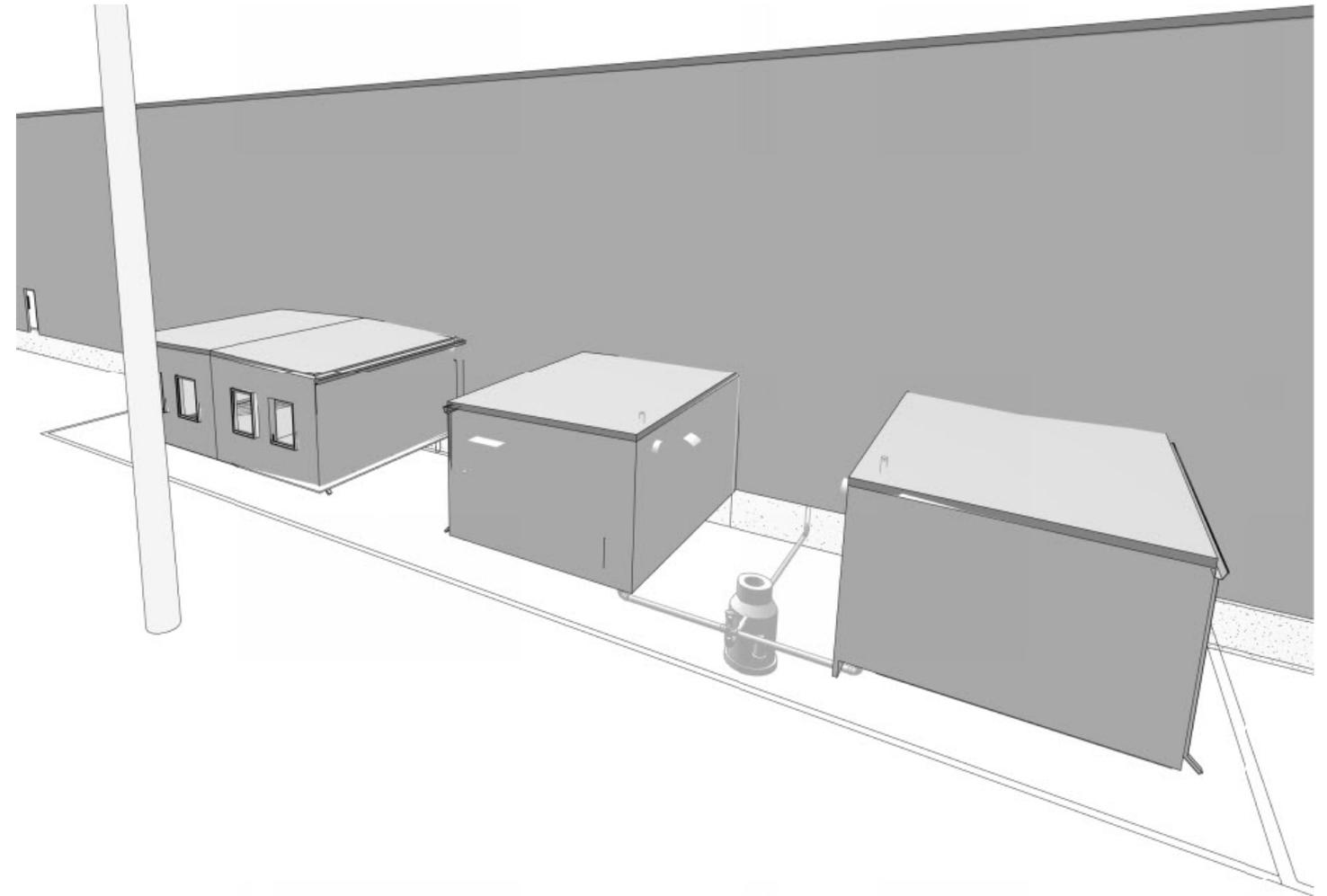
# Lighter Design

- Reduce wind speed requirements
- Lower the cost to \$833,308.
- Same amount of fixtures
- JC was added to the design
- Pipe chase part of the module



# Exterior Design

- Units will be built on trailer frame
- Two units will form larger Break Room
- Exterior units add new requirements
- Sanitary Pump is in ground sump



# Different Approach

- 9 different modules were developed
- Allowed for different arrangements
- Widely available equipment/material
- Touch free use
- Barrier free design option
- Unit and plant sanitary complimentary



# Thank you

**Katy Klapproth**

Robins & Morton

[KKlapproth@robinsmorton.com](mailto:KKlapproth@robinsmorton.com)



**Michael Swiatkowski**

Ghafari Associates

[mswiatkowski@Ghafari.com](mailto:mswiatkowski@Ghafari.com)



**Jonathon Jackson, AIA, CDT**

Ghafari Associates

[jjackson@Ghafari.com](mailto:jjackson@Ghafari.com)





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