

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

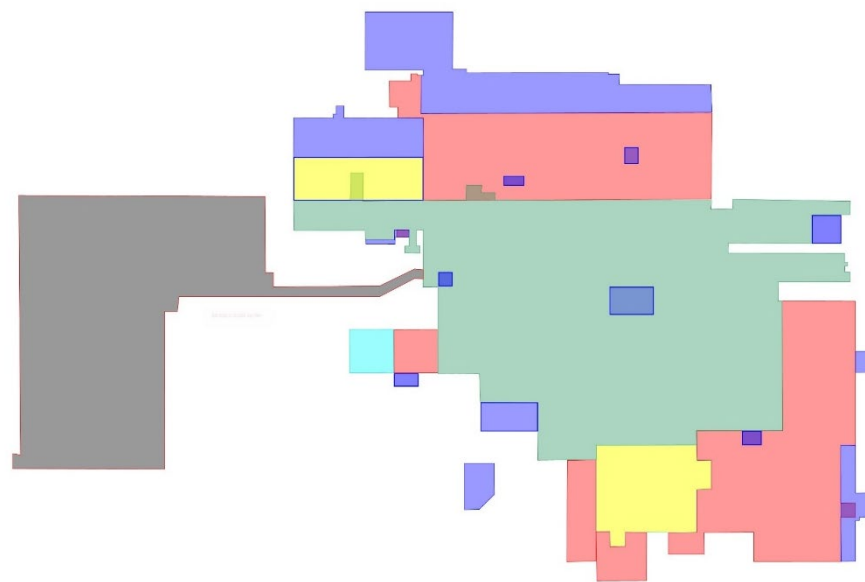
Michael Swiatkowski and Jonathon Jackson, Ghafari Associates

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



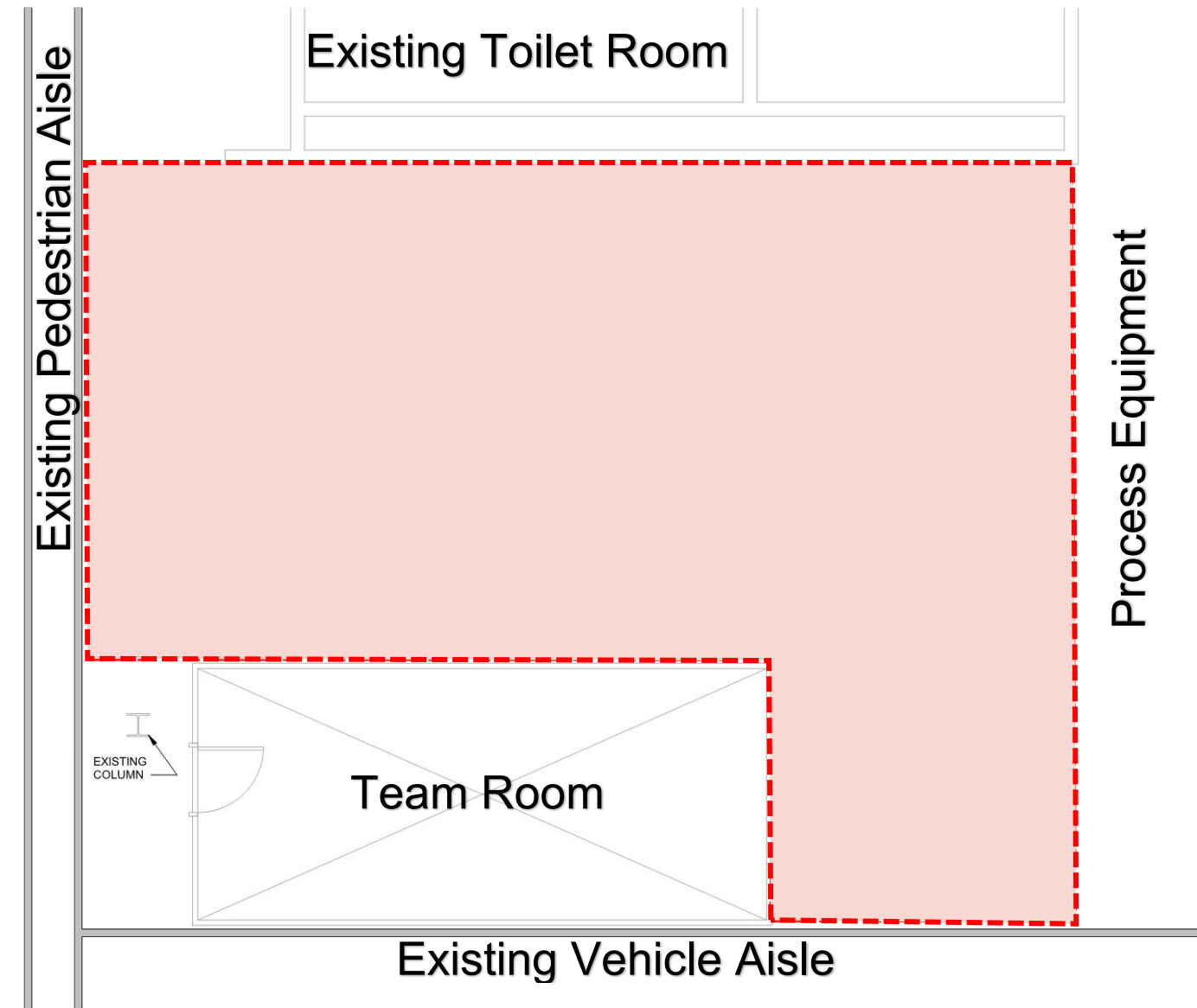


# Why modular made sense for our client



# 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





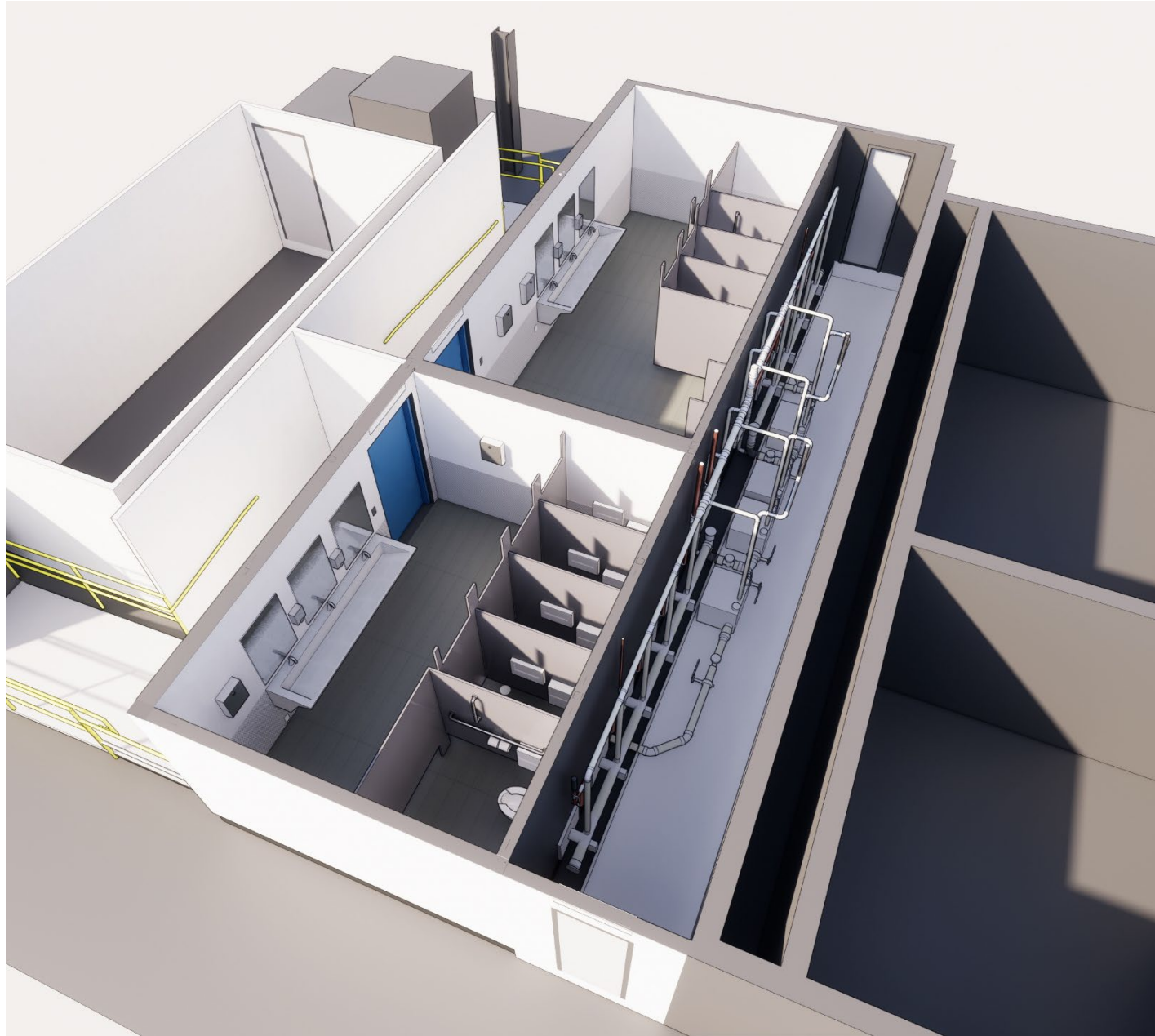
# BIM Utilization – How it was utilized

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





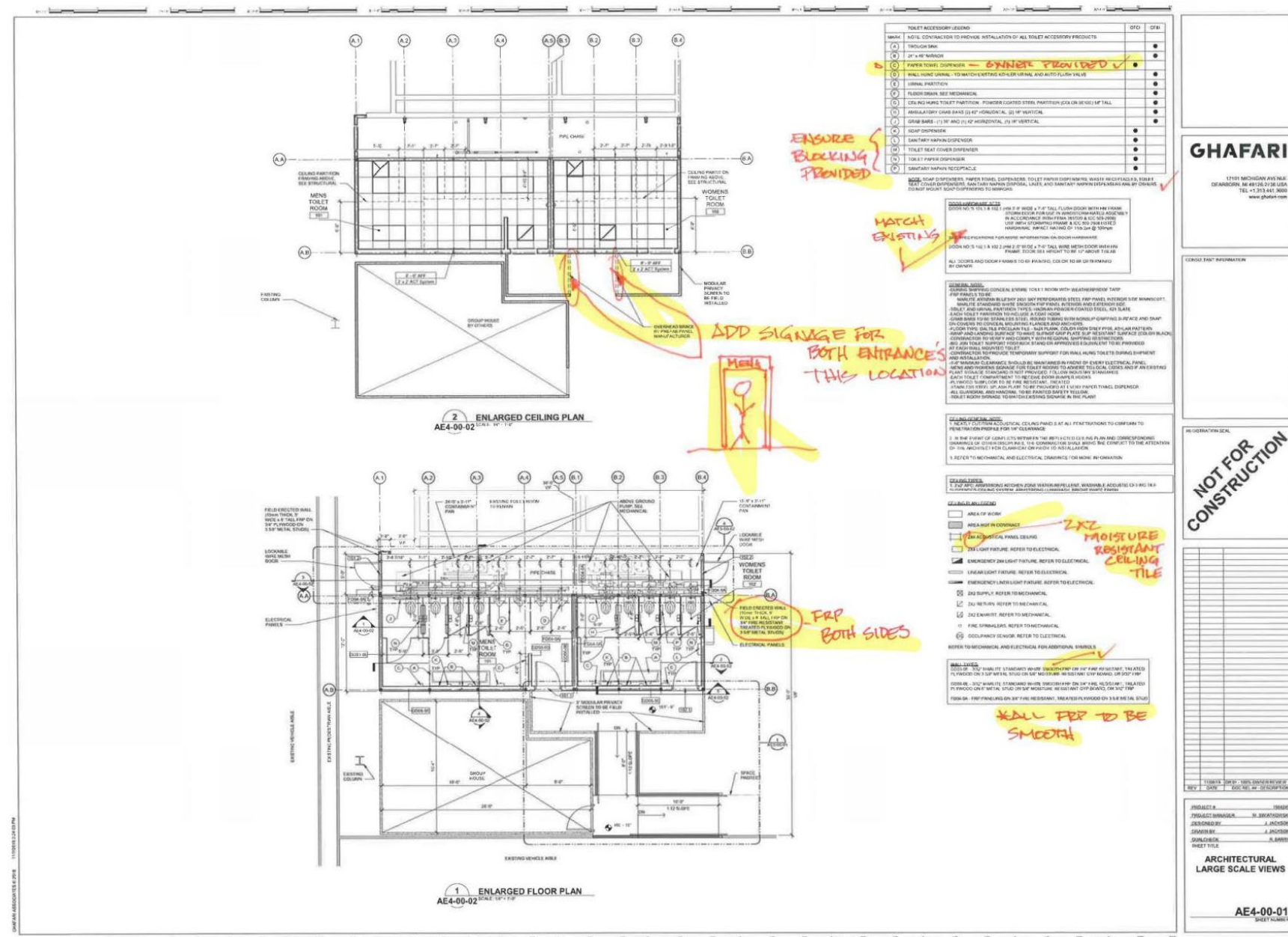
# BIM Utilization – How it was utilized





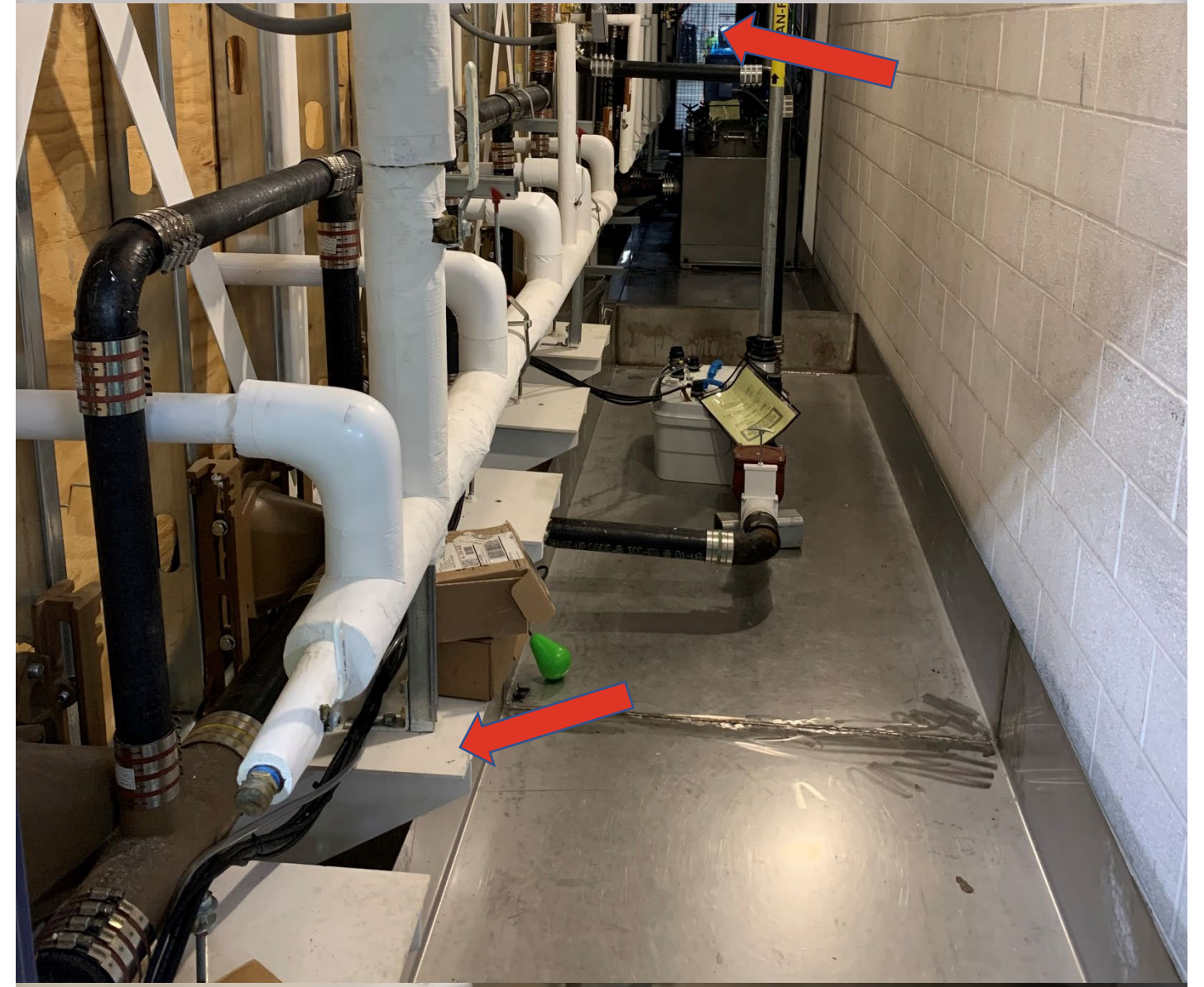
# Review process

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



# 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







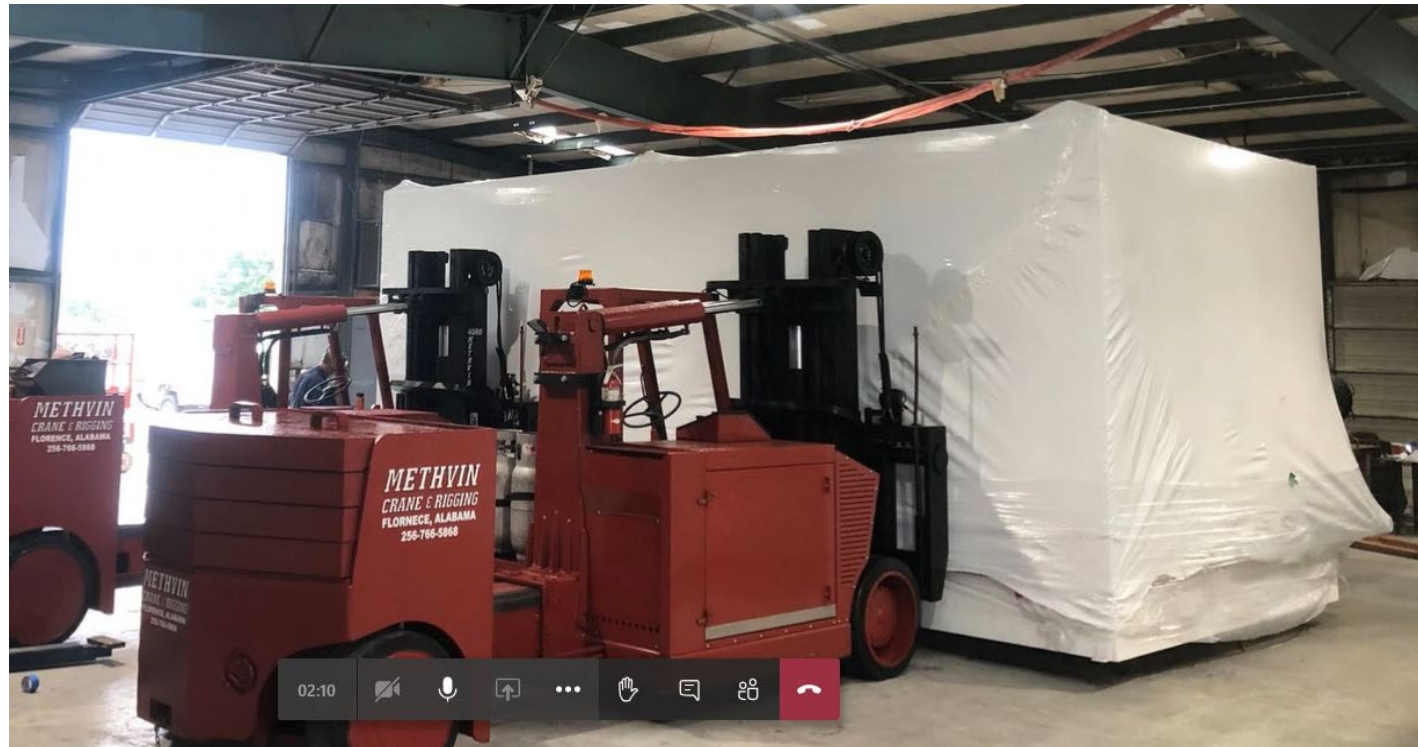
# Let's move





# 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



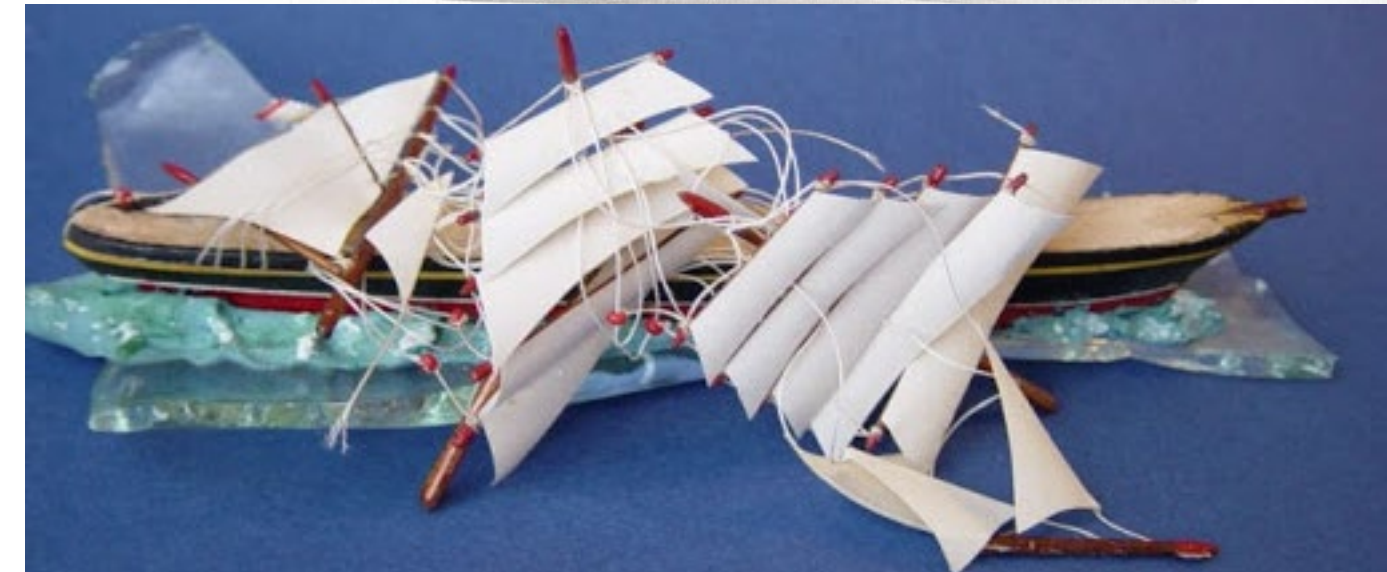


# Lessons learned



# Lessons Learned – Design and Constructability

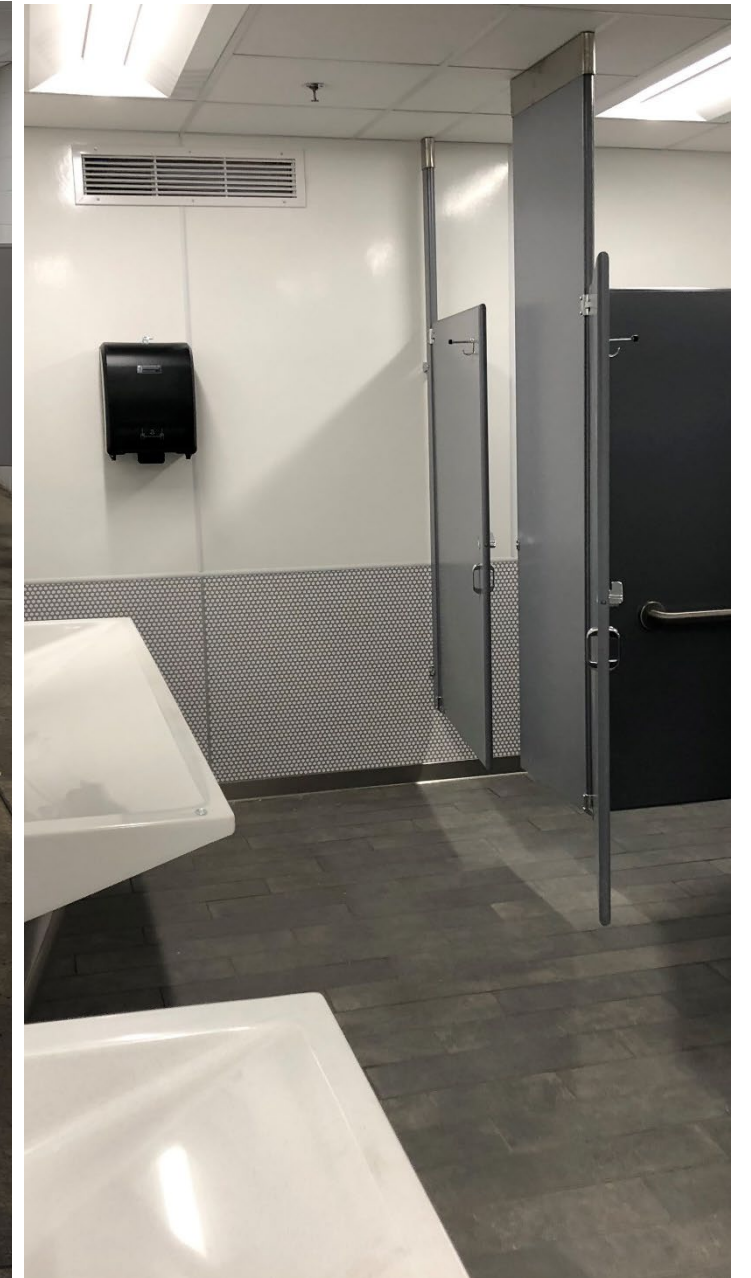
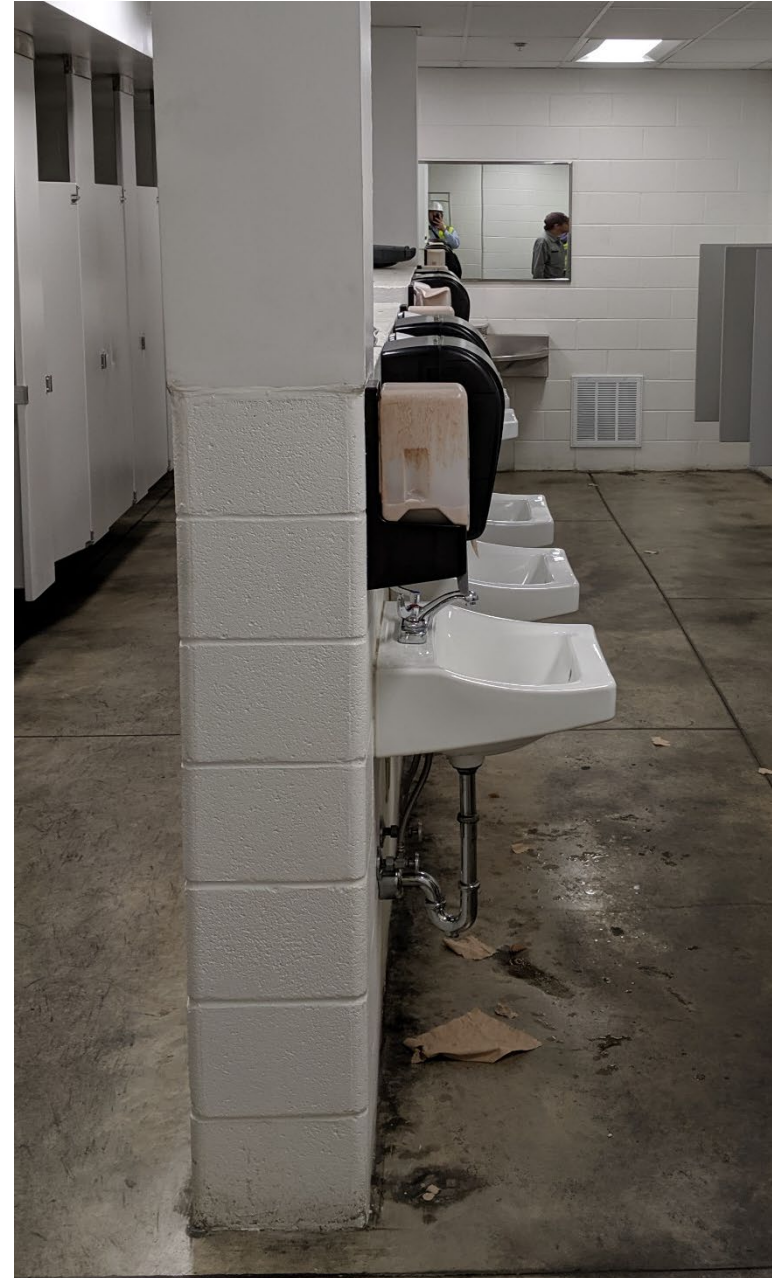
- **Too many cooks** in the kitchen
- Get decisions **in writing**
- Consider Construction **Tolerances**
- Think about the **maintenance** person
- **Lead time** is critical





# 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**



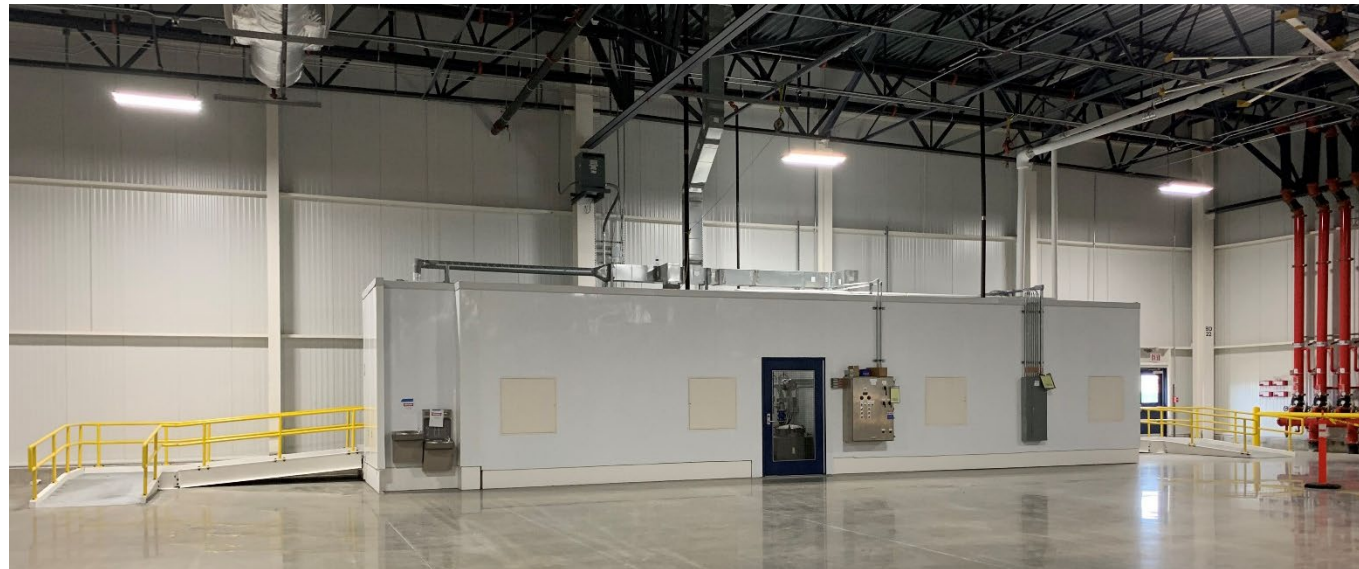
# Other examples





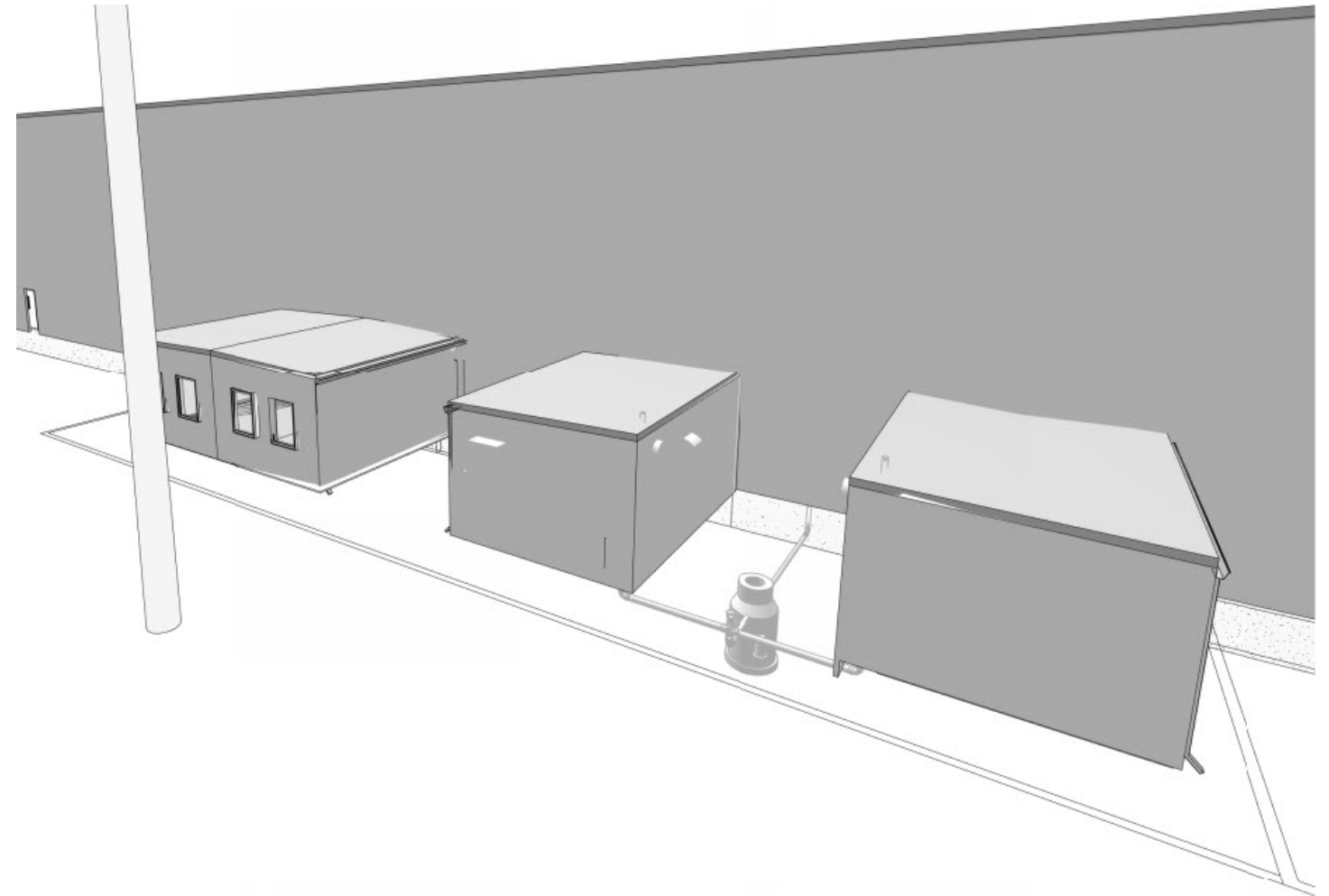
# Lighter Design

- 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

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