Town + Gown

Lean Off-Site Manufacturing Case Study

December 2022

Moderator - Preston Lambert
Introductions

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Lean Off-Site Manufacturing Case Study:

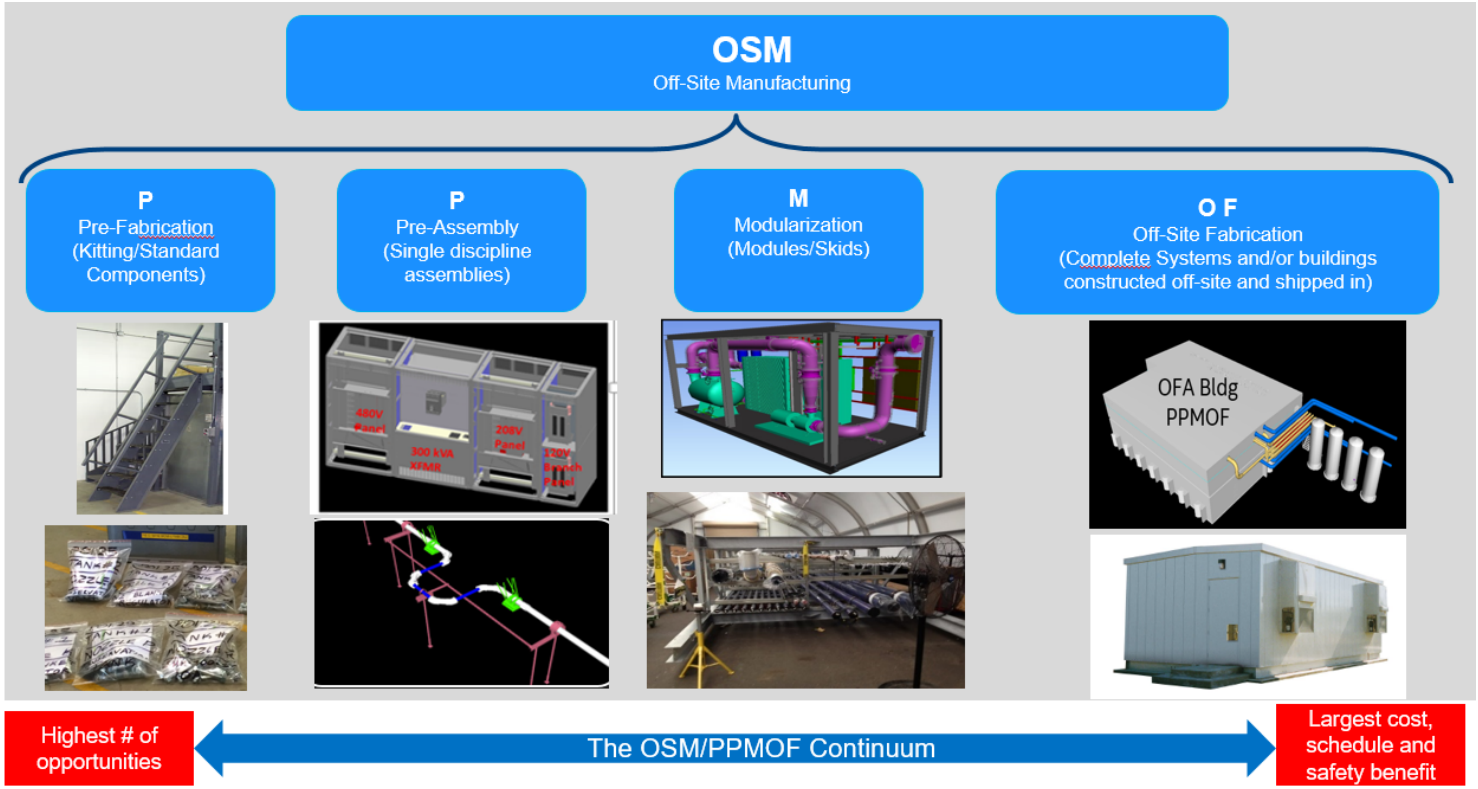
- Discussion Panel

Preston Lambert - Exyte
Director of VDC Operations
Preston has 20 years of experience with VDC technologies supporting both design and construction.

John Dunn - Exyte
Director of Off Site Manufacturing
John has 30 years of experience with M+W/Exyte in the design and construction of semi conductor facilities with focus on Offsite Manufacturing within the Advanced Technology and Bio/Life Science Market Sectors.

What Is OSM?

- OSM, Off Site Manufacturing
- AKA PPMOF, Prefabrication, Preassembly Modularization and Offsite Fabrication



Why We Need OSM?

OSM Benefits – De-Risk Project

- **Improve Span Of Control**
- **Reduce Schedule**
- **Improve Site Logistics**
- **Improve Quality**
- **Improve Safety**
- **Reduce CAPEX costs**

- Exyte Has A Mature OSM Program Capability
- Approx. $1.25B USD OSM Scope Completed Globally in 2021/22
- US & Singapore Self Perform Fabrication/Integration Capacity
- Significant In House Self Perform Capacity
  - TFS, NEHP, DFS, Fabtech, Exyte Technology
- Supply Chain Relationships & Qualifications Established
- Project Lessons Learned & Continuous Improvement Program

Pre-Construction\VDC Technology
Preston Lambert

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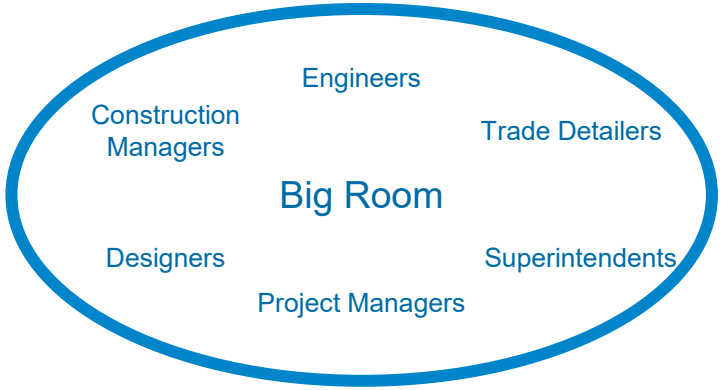
Lean Off-Site Manufacturing Case Study:

Pre-Construction

- Scheduling
  - Fast track nature
  - Market driven date milestones
  - Fabrication Drawings for OSM scope during design
- Co-located Trades with Design
  - Utilized a “Big Room”
  - Helped identify OSM possibilities
  - Constructability integrated with design



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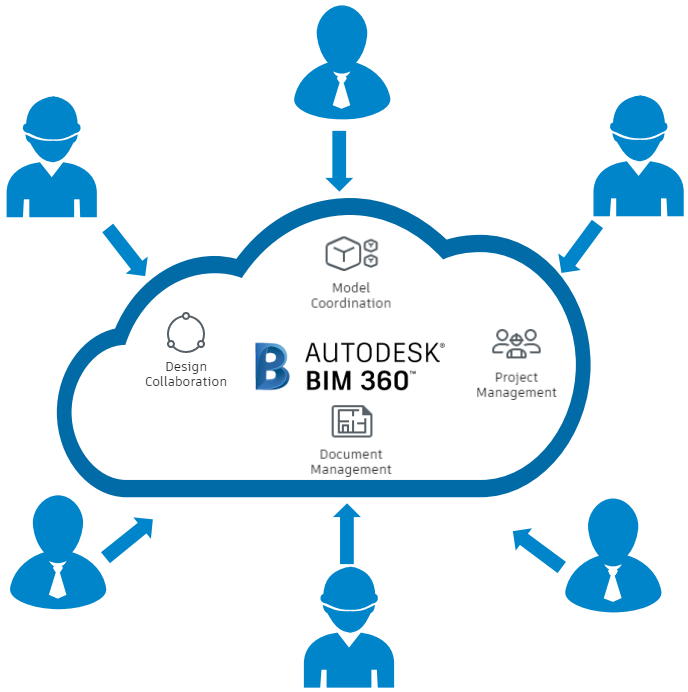
Lean Off-Site Manufacturing Case Study:

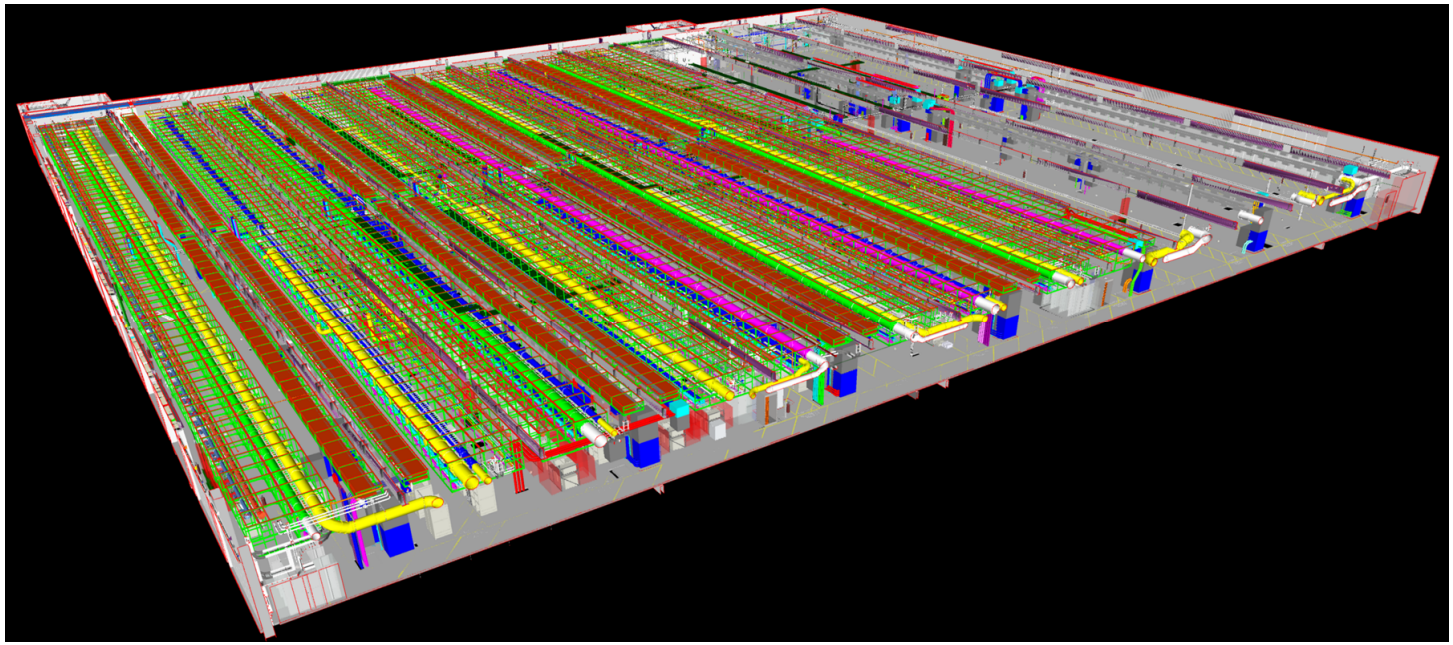
- VDC Technology
  - BIM 360 as a collaboration platform
    - Models
    - Drawings
    - RFI's and Submittals
  - Model Coordination and Navisworks for coordination reviews of the federated model
    - Clash Detection
    - Constructability reviews
  - Model Progression will continue with the facility
    - Future fit out and renovation work



Offsite Manufacturing (OSM)
Subfab Lateral Racks

OSM – Subfab Lateral Racks
Project Benefits

- Reduced Risk
- Improved Overall Schedule
- Improved Work Environment
- Reduced Manhours On Site
- Improved Site Safety
- Reduced Project Cost



OSM – Subfab Lateral Racks
Scope & Rack Configuration

- 108 Rack Modules
- 45’ L x 7’ W x 6’ H
- Module Will Fit Into Standard Semi

OSM – Subfab Lateral Racks Integration Vendor & Local Facility

- FPI Mechanical , Experienced, Qualified Vendor

- Albany, NY, Integration Facility
  - 30k SF Space
  - High Bay Assembly Area
  - Cleanroom Facility
  - Material Storage Space
  - External Finished Storage
  - Safe/Controlled Working Environment
  - Excellent Labor Welfare Facilities
  - Trade Parking & Freeway Access

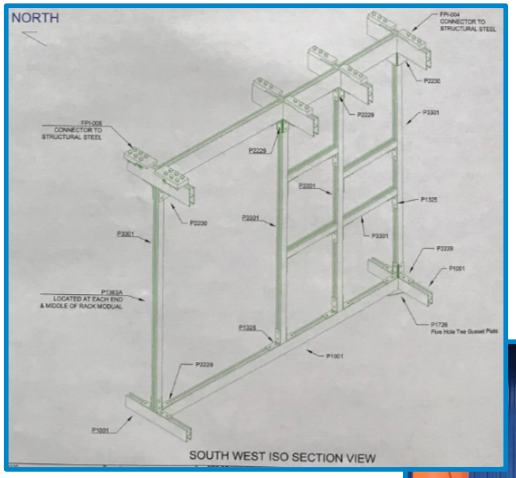
OSM – Subfab Lateral Racks
Integration Vendor & Local Facility

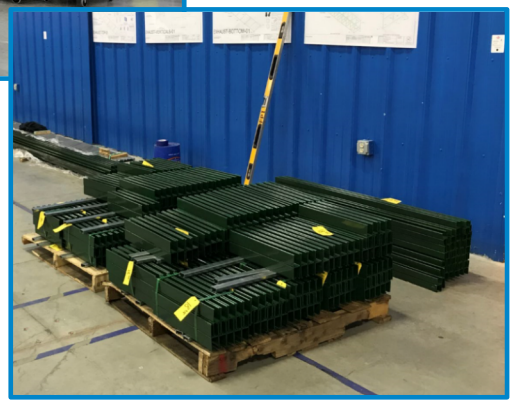
- Production Line Assembly
  - Unistrut Structure
  - Plastic Piping
  - Stainless Piping
  - Cable Tray
  - Exhaust Ducting
  - Tags & Labeling
- QA/QC

OSM – Subfab Lateral Racks Rack Configuration

- Unistrut Assembly

Unistrut Assembly Area





Precut Members

JIG For Repeat Assembly

OSM – Subfab Lateral Racks
Rack Configuration

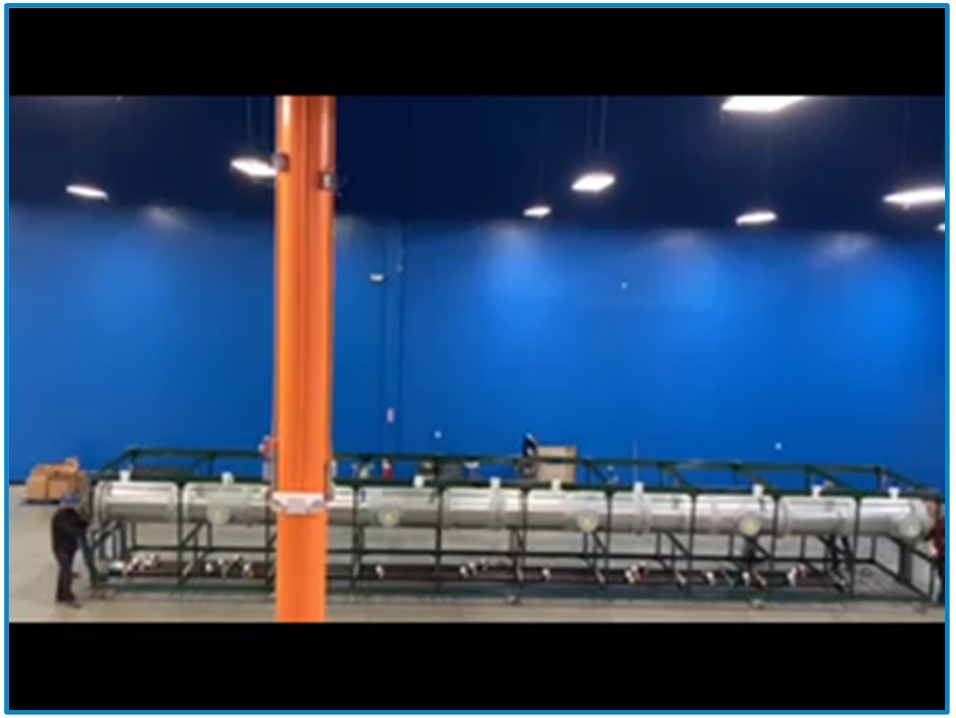
- Lateral Segments

Prefabricated Segments

OSM – Subfab Lateral Racks
Rack Configuration

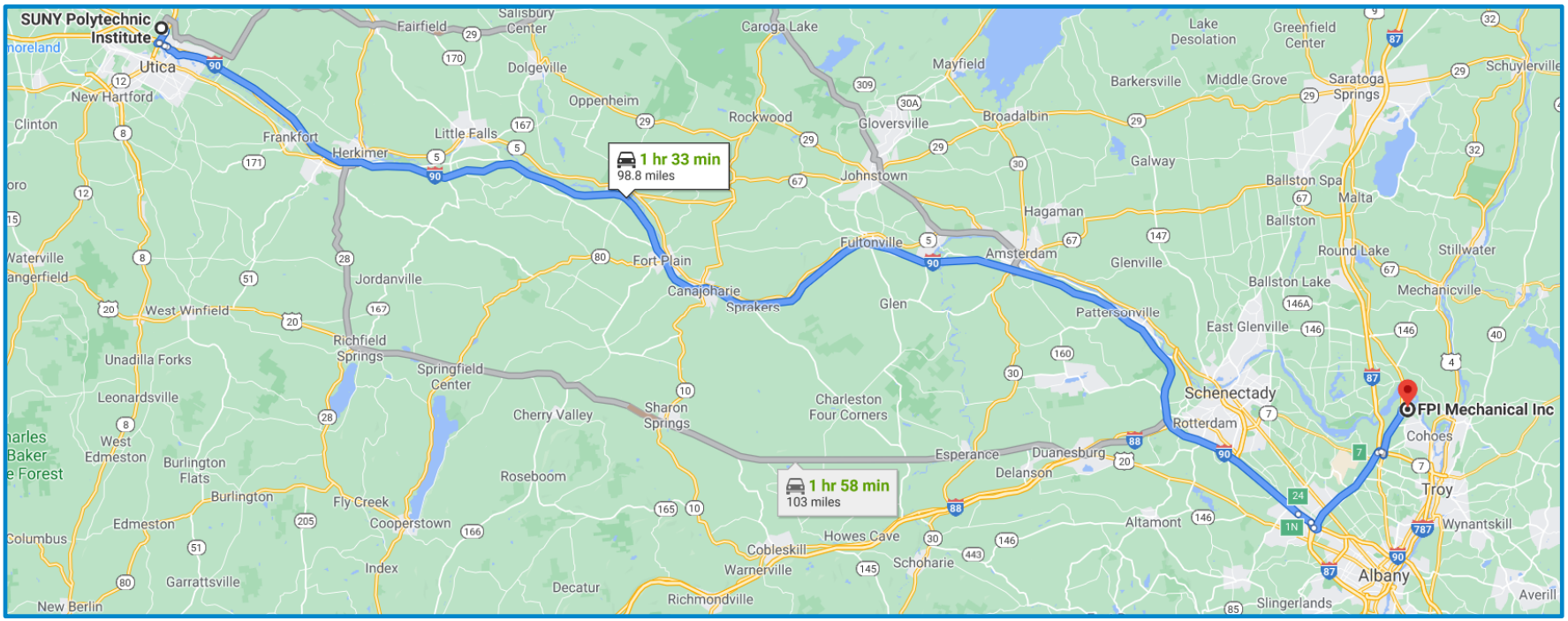
- Completed Modules Loading

Completed Modules Loading into Semi Trailer



OSM – Subfab Lateral Racks
Integration Vendor & Local Facility

- Short Journey From Integration Facility To Site

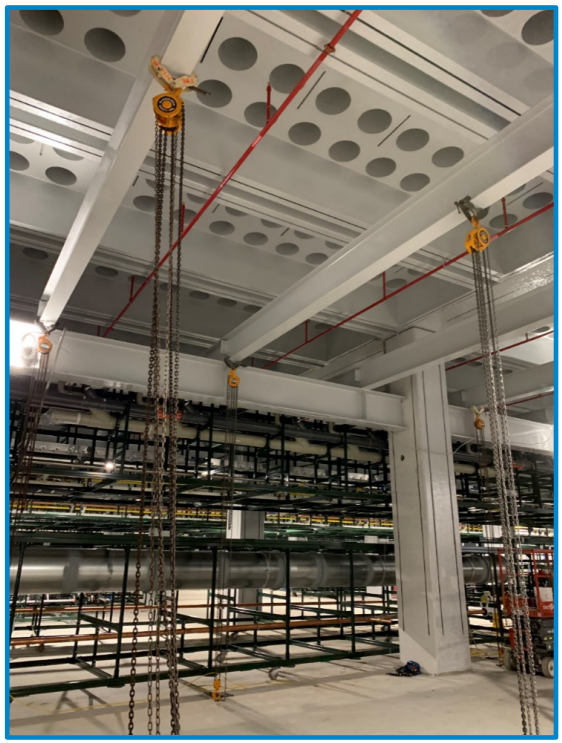


OSM – Subfab Lateral Racks
Lateral Rack Move In

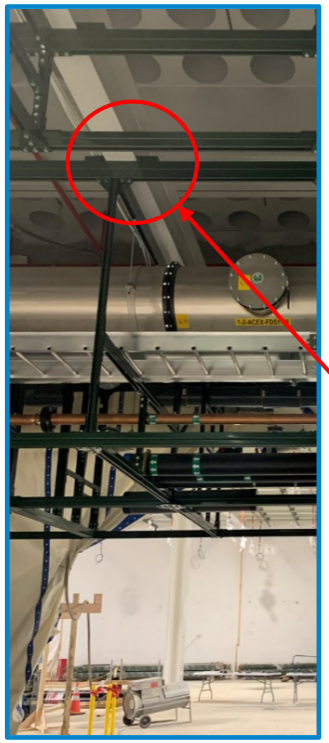
Lifting Frame To Temporary Platform For Subfab Access

Skating Module Into Position

OSM – Subfab Lateral Racks
Lateral Rack Move In & Installation

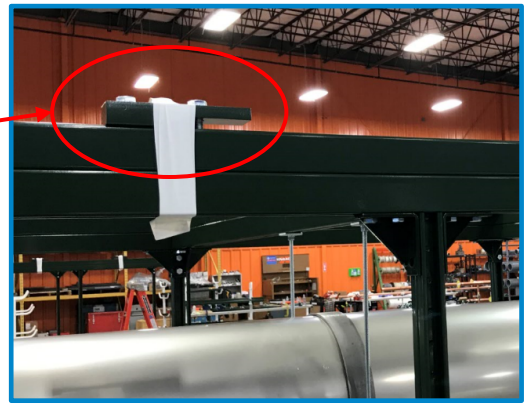


Bay Prepped For Installation



Module Structurally Attached

Slip/Clamp Fixing To White Steel

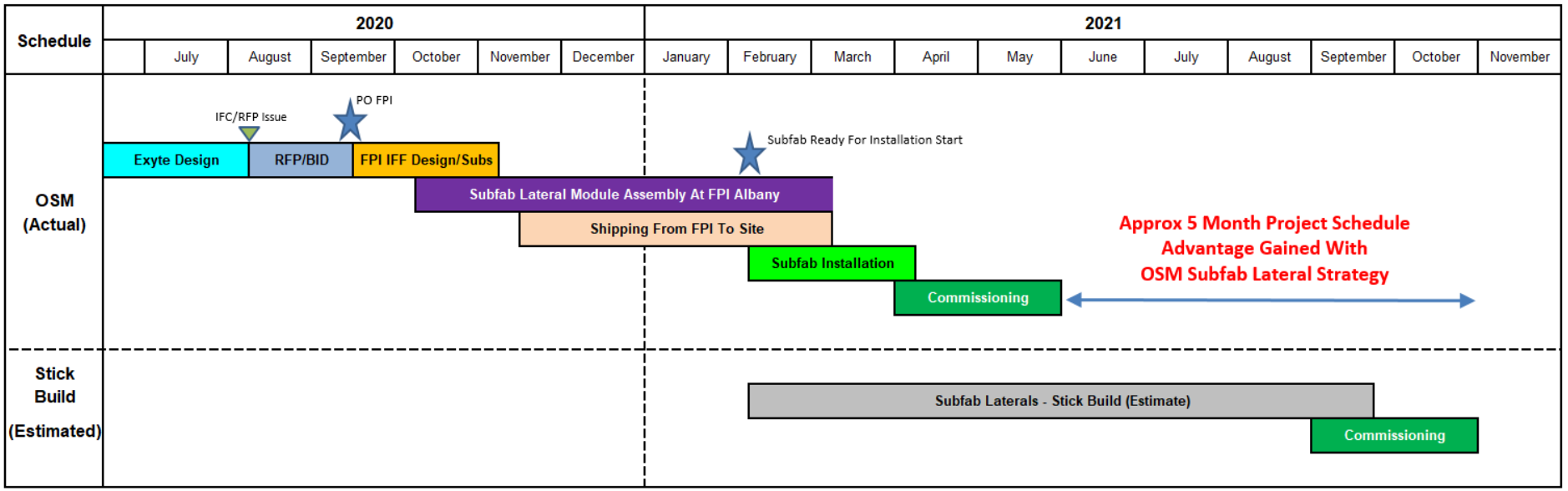


OSM – Subfab Lateral Racks
Lateral Rack Move In & Installation

OSM – Subfab Lateral Racks
Lateral Rack Move In & Installation

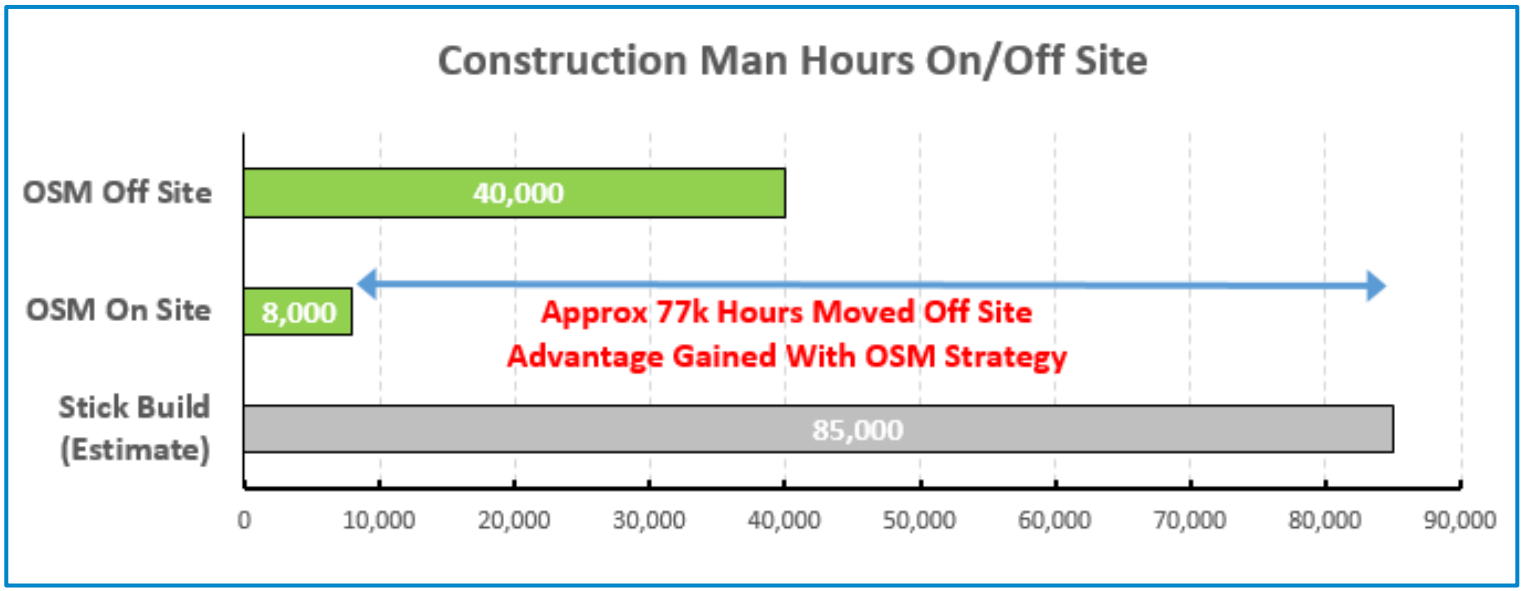
OSM – Subfab Lateral Racks Schedule

- Significant Schedule Improvement With OSM Strategy



OSM – Subfab Lateral Racks
Manhours On/Off Site

- Major Reduction Of On Site Hours
- Huge Safety Positive - Elimination Of Working At Height/Scaffolding
- Quality Improvements With All Work In Controlled Shop Environment
- Greatly Improved Labor Efficiency And Strain On Site Logistics/Welfare



OSM – Subfab Lateral Racks
Commercial

- Typical Project OSM Execution Provides 20 to 30% CoW Saving Over Stickbuild

Offsite Manufacturing (OSM)
External Utility Trestles

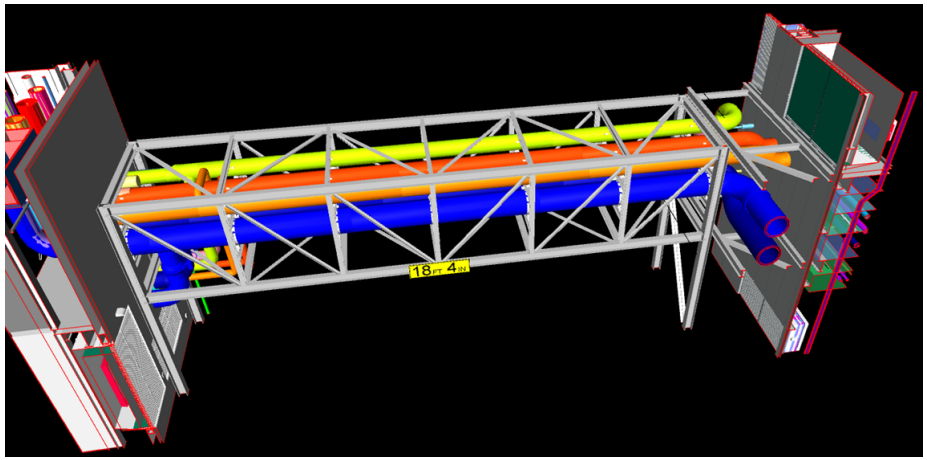
OSM – External Utility Trestles
Project Benefits

- Reduced Risk
- Improved Overall Schedule
- Improved Work Environment
- Reduced Site Construction Congestion
- Reduced Manhours On Site
- Improved Site Safety
- Reduced Project Cost

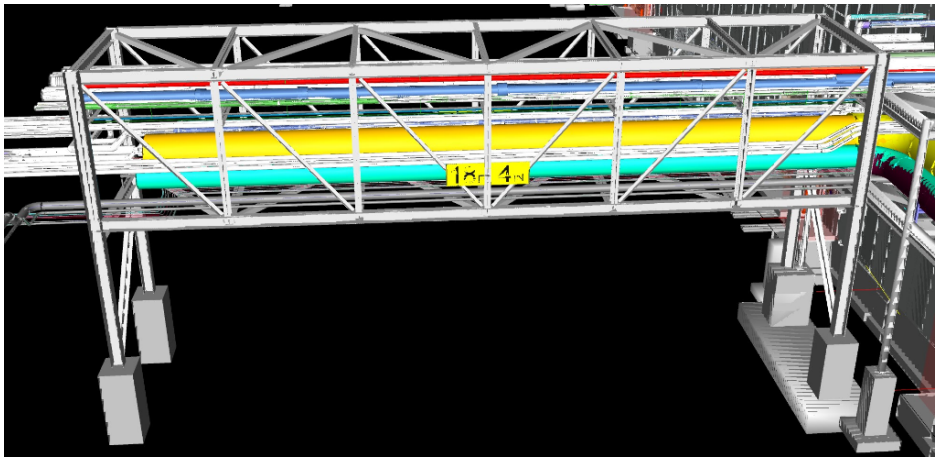
HVAC Piping Trestle

OSM – External Utility Trestles
Project Scope

- 2 Multi Tier Trestles Between The FAB & CUB Buildings



HVAC Piping Trestle

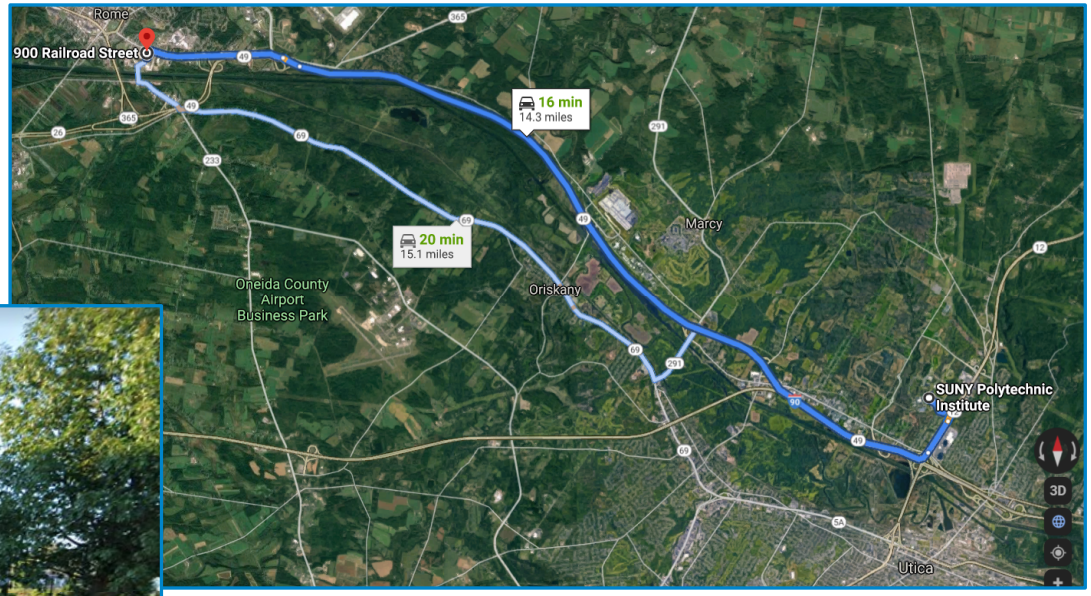


Process Piping Trestle

OSM – External Utility Trestles
Integration Vendor & Local Facility

- TFS, Experienced, Qualified Vendor

- Rome, NY, Integration Facility
  - 21,000 SF High Bay
  - 14 Mile Route To Site



OSM – External Utility Trestles Integration Vendor & Local Facility

- All Assembly With QA/QC
  - Structure
  - Carbon Steel Piping
  - Plastic Piping
  - UHP SS Piping
  - Electrical Conduit
  - Exhaust Ducting
  - Heat Trace & Thermal Insulation
  - Painting
  - Labeling

KIM

H.T. LYONS
contractors | engineers

RIDLEY | ELECTRIC

ADIRONDACK SHEET METAL, INC.

HOHL INDUSTRIAL SERVICES, INC.

since 1884 danforth

OSM – External Utility Trestles
Integration Vendor & Local Facility

- 2 Shipments, Max Load Weight, 50 Tons
- 16x16x80’ Load Required Road Escort Haulage & Permitting

HVAC Piping Trestle

OSM – External Utility Trestles Erection

- Reminder!!

Why We Avoid The Stick Build Challenge With Site Congestion And Typical Constraints!

CUB/FAB Access Road During Construction

OSM – External Utility Trestles Erection

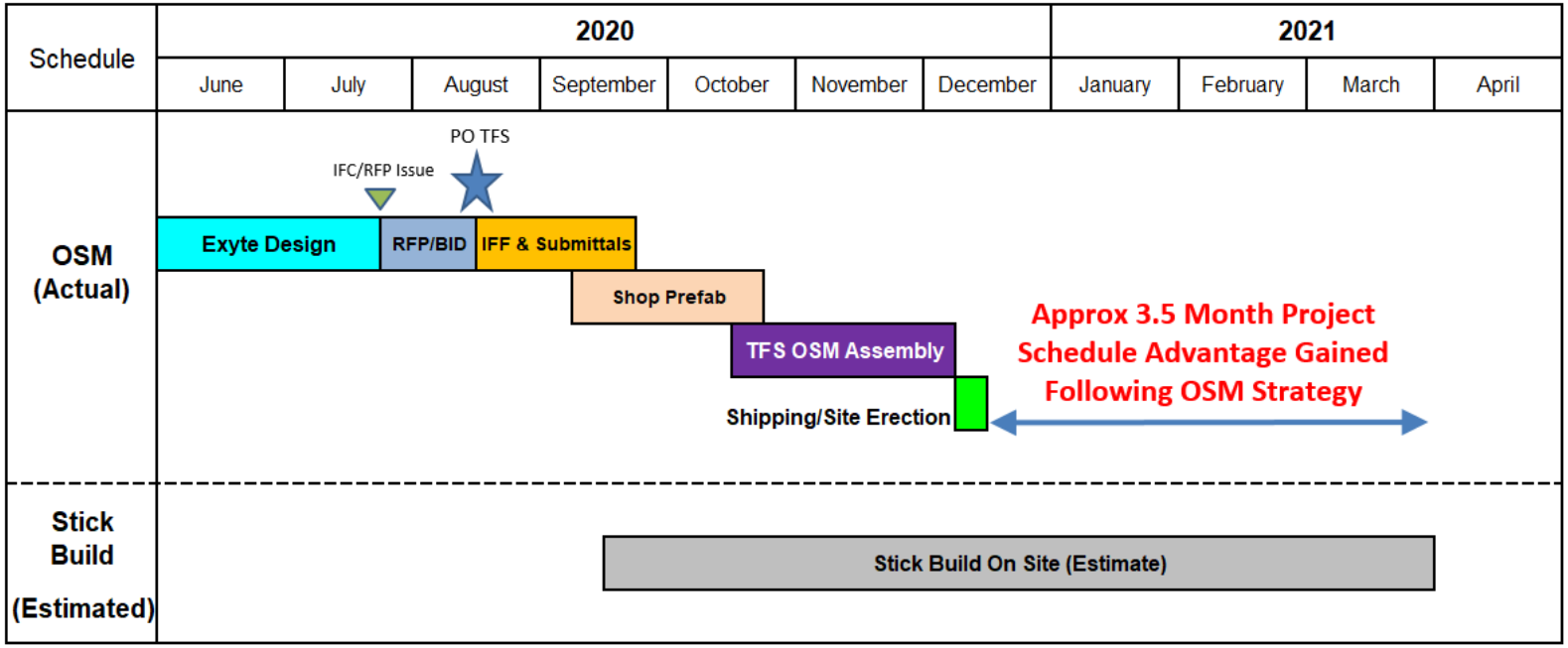
- One Day Delivery & Erection Per Trestle

HVAC Piping Trestle

HVAC Piping Trestle

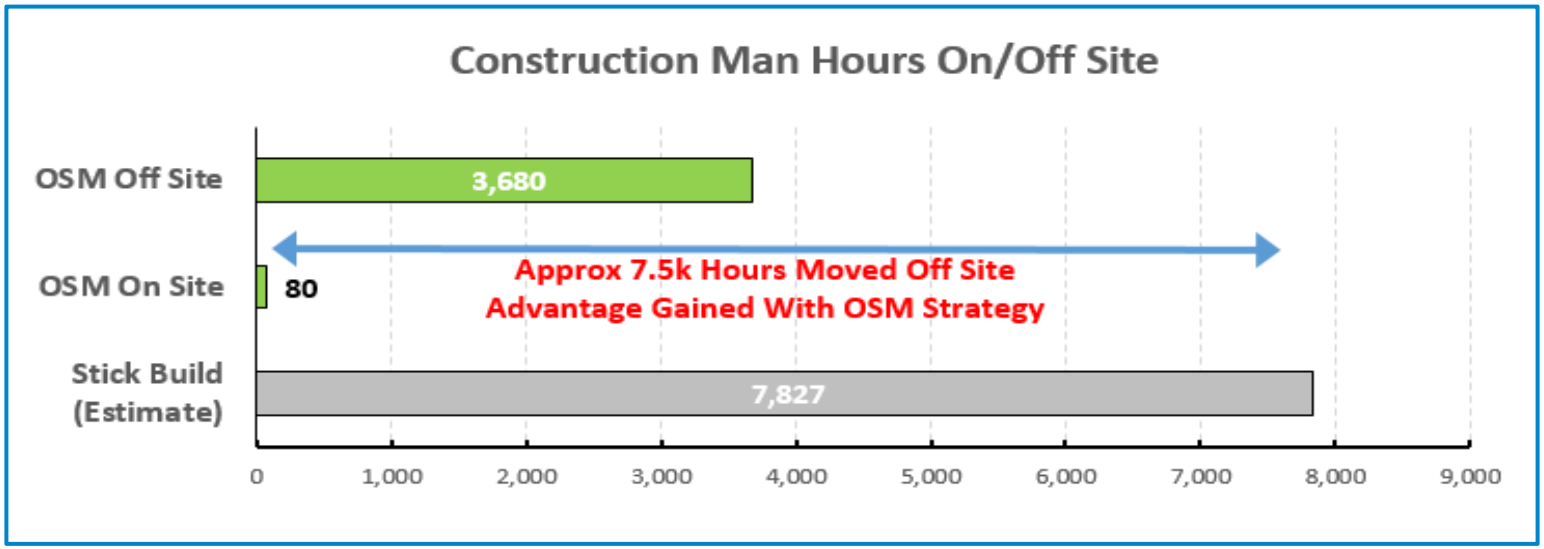
OSM – External Utility Trestles
Schedule

- Rapid Site Erection Possible, Avoiding Site Logistic Congestion Issues
- Significant Schedule Saving Over Stick Build



OSM – External Utility Trestles
Manhours On/Off Site

- Major Reduction Of On Site Hours
- Huge Safety Positive - Elimination Of Working At Height/Scaffolding
- Site Congestion Reduction At Main Construction Access Pinch Point Between Buildings
- Quality Improvements With All Work In Controlled Shop Environment



OSM – External Utility Trestles
Commercial

- OSM Strategy Provided Approx 40% Saving On CoW Compared To Stick Build Estimate

Process Piping Trestle

OSM – Key Take Aways

OSM Benefits – De-Risk Project

- Improve Span Of Control
- Reduce Schedule
- Improve Site Logistics
- Improve Quality
- Improve Safety
- Reduce CAPEX costs

- Experienced US Supply Chain
- Extensive Integration Of BIM Techniques In Process

- Questions/Comments?

Question and Answer

Contacts

Exyte U.S., Inc
Preston Lambert
201 Fuller Road, 4th Floor,
Albany NY 12203
M 518.858.5627
preston.lambert@exyte.net

Exyte U.S., Inc
John Dunn, P.E.
570 N. 54th Street, Suite 100,
Chandler, AZ 85226
M 602.315.8826
John.dunn@exyte.net