
Renovating an Aged University Building to Add a Cleanroom

Greg Owen, PE
GLO Consulting, LLC
503 819 5303
UGIM 2024
6/25/2024

The Problem

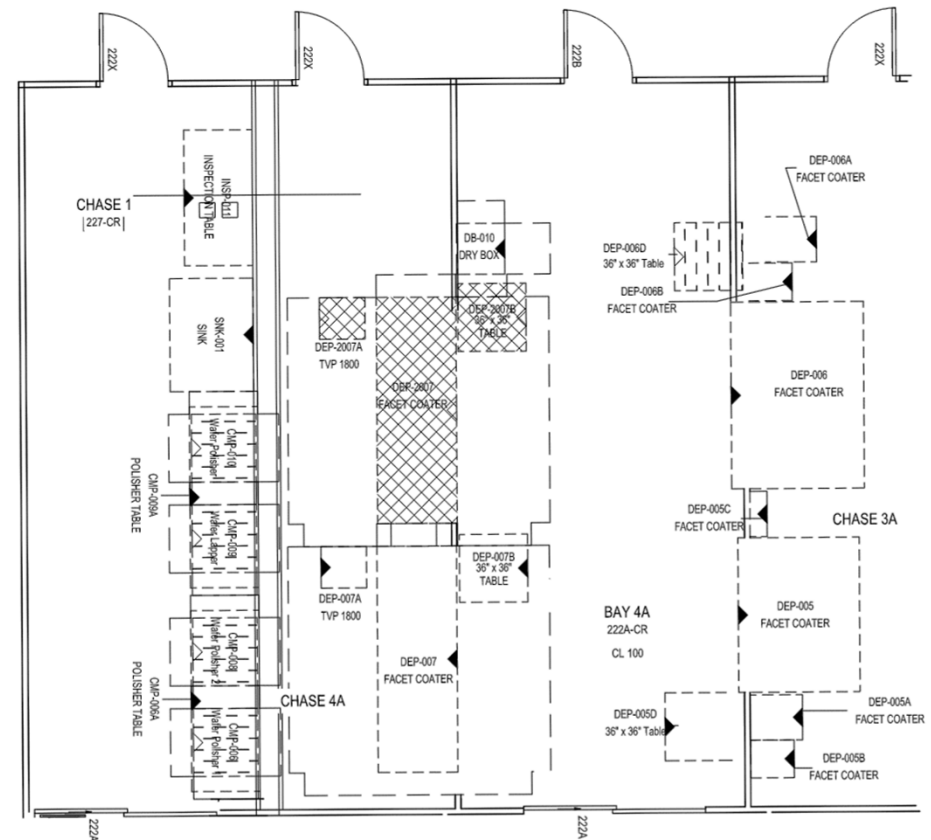
- Current Cleanroom is Full
- New PI or Grant Requires Additional Tools
- You are Offered Space in Another Campus Building



Can you make it work?????

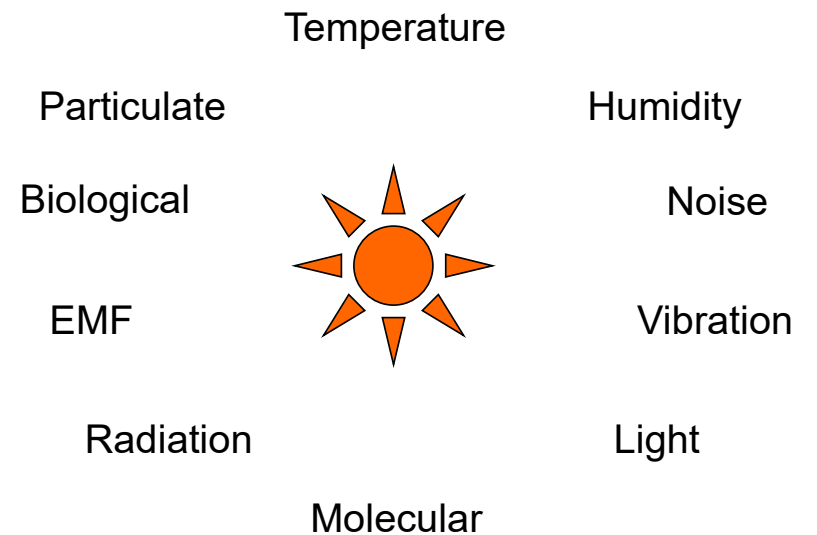
Key Questions

- What are the activities to be Performed in the New Cleanroom
- What are the tools to be installed
- What Chemistry will be used



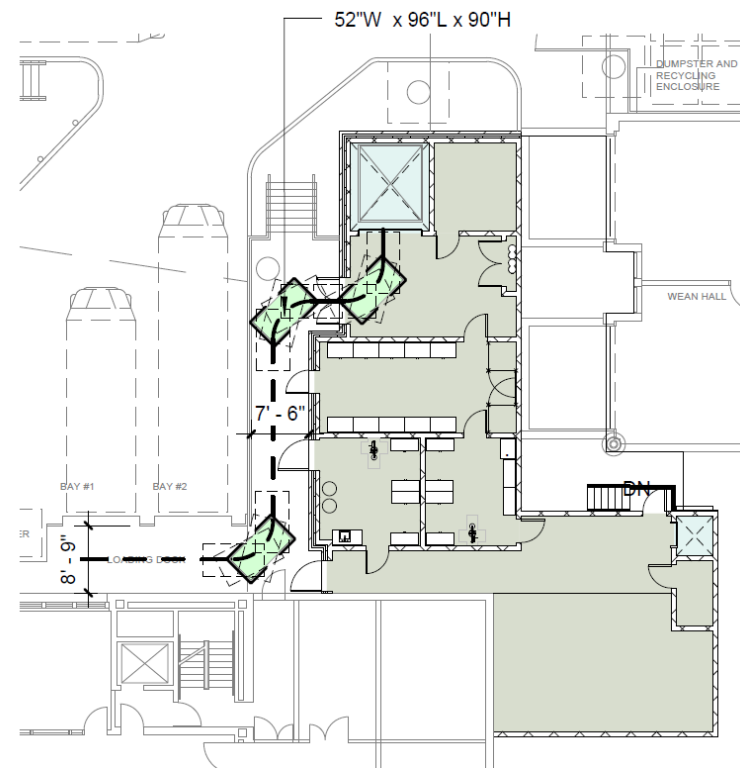
What is the Use

- Process Development or Research Focus
- Sensitivities
- Adjacency Requirements
- Visibility



Tool Set

- Identify the Best-Known Tool Set
- Identify tool size, mass and Utility / Chemical Requirements
- Tool Limitations and Special Requirements
- Tool Access



Tool Set

- Tool Access
 - Determine Max Tool Move-in Size and Weight
 - Evaluate:
 - Loading Dock
 - Access Doors
 - Elevators
 - Structural Capacity



Proposed Location

- Proposed Location in Building
- Building Construction / Occupancy
- Access to Space
- Clear Floor Height
- Adjacencies to Shared Resources
- Staff Offices



Key Element - Will the Space Work?

- Determine Building Code Occupancy Requirements for New Cleanroom
 - Building Construction May Limit Occupancy
 - Chemistry Normally Drives Occupancy
 - “B” of “H5” Occupancy
 - Chemical Storage Requirements
 - Clear Height of Proposed Cleanroom Space



Key Element - Will the Space Work?

- Special Tool Requirements
 - Vibration
 - EMI
 - Tool Size / Access
- Program Requirements
 - Visibility
 - Image
 - Adjacency



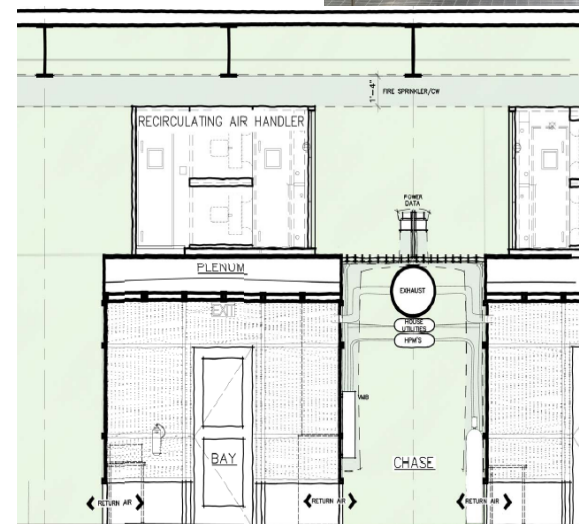
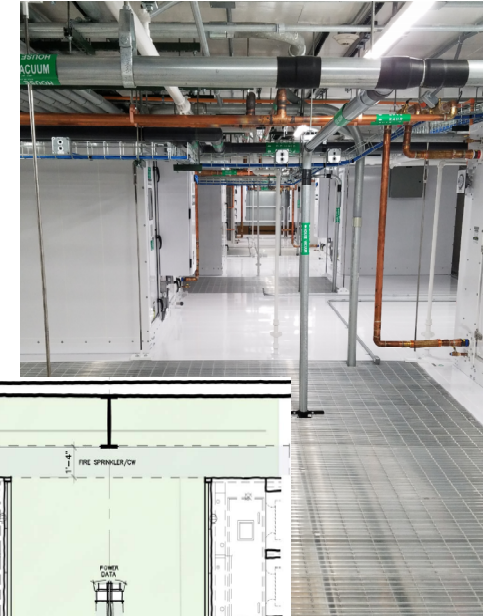
Any Element Can Disqualify the Potential Space

Building Code Occupancy

- Driven By Chemistries Used in Cleanroom
 - Quantity And Hazard Category Driven
 - H-5 Occupancy If Quantiles exceed Table 307.1(1) and 307.1(2) Maximum Allowable Quantities (MAQ's)
- Storage and Dispense Requirements
 - Chemicals Stored / Dispensed Outside Cleanroom
 - Gas Rooms
 - Liquid Chem Storerooms
 - Waste Chem Accumulation Room
 - Same Drivers as for Cleanroom

Clear Height

- Ideal Condition
 - 20Ft Minimum Clear
 - Clean Interstitial
 - No Included Shafts
 - Cleanroom Clear Height 10 F



Clear Height

- New Construction – Cleanroom was an after thought !
- ~15ft Clear Height with 16” Pan Depth
- Through Shafts



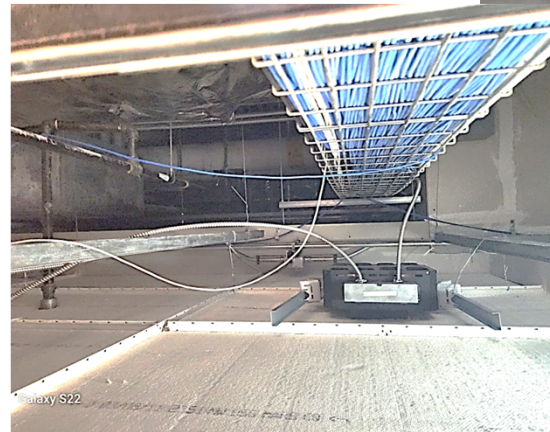
Clear Height

- New Construction – Cleanroom was an after thought !
- ~15ft Clear Height with 16” Pan Depth
- 6 inch clearance at beams
- 42” high RAH’s
- 18” deep Plenums
- 9’-6” Cleanroom Height



Clear Height

- Congested / Non-Cleanable Interstitial
- Drives Air Management System
- ~14ft Clear Height
- Shafts Penetrating



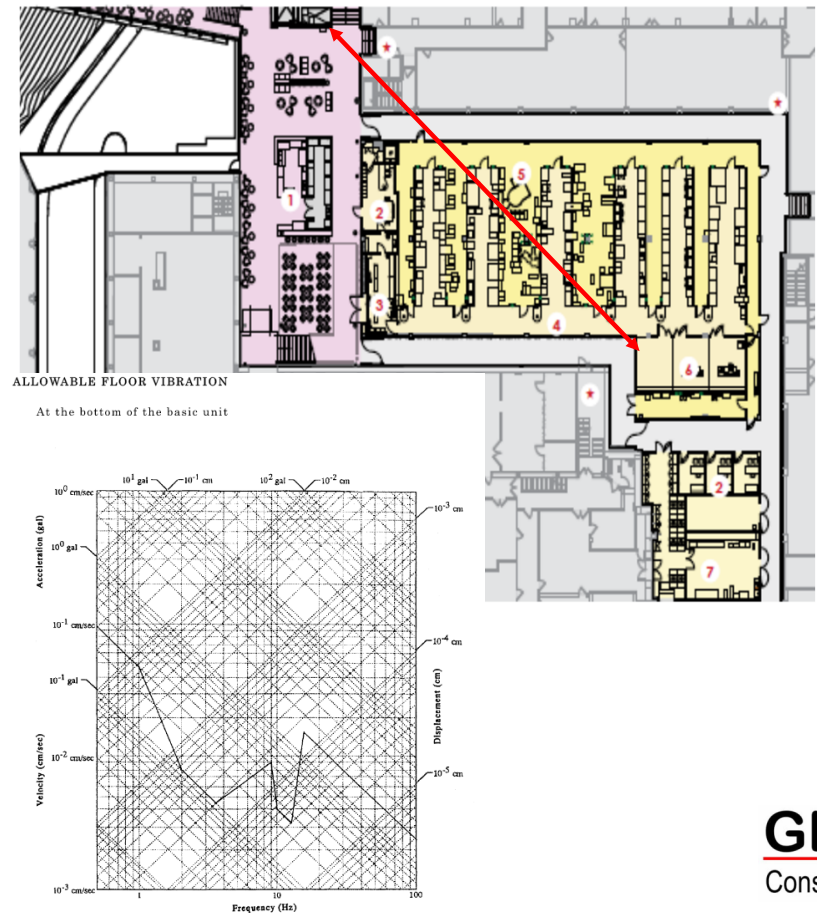
Low Clearance Air Management Systems

- Key Considerations
 - Clear Height
 - Contaminated, non-cleanable interstitial
 - Energy and Sustainability
- Minimum Clearance Cleanroom Ceiling Height Plus 3ft.
 - Lower the Interstitial Height Results in Higher Energy Use
 - Clean Room Sound Levels Increase with Lower Interstitial Heights



Special Tool Requirements

- Vibration
 - Determine Most Sensitive Tool
 - Vibration Analysis of Existing Structure
 - Mitigation Possible
 - Structural Modifications
 - Isolation Platforms
- Electromagnetic Interference
 - *Determine the most Sensitive Tool*
 - *EMI Study of Existing Structure*
 - Mitigation Possible
 - *Shielding*
 - *Active Cancellation*



Key Points

- Code Implication of a Cleanroom
 - Chemistry
 - Tool Requirements
- Space Requirements
 - Clear Height
 - Tool Access
 - Special Tool Requirements
- Air Management Concepts
 - Low Clear Height
 - Dirty Interstitial

Discussion

Greg Owen, PE
GLO Consulting, LLC
503 819 5303