

Construction of the CNI cleanroom on the 10th floor of the Schapiro CEPSR building

James Vichiconti

About me:

James Vichiconti, Former Director of the CNI cleanroom, held the position for 10 years.

- Prior
 - USS New York City, Machinist Mate
 - IBM T.J. Watson Research Center, 24 years
 - Everything under sun.
- Columbia
- Current
 - IBM T.J.Watson Research Center
 - Lab builds
 - Tool installs
 - Quantum system installs

Industry vs Academia

Doctor. Doctor. Doctor

Everyone is a doctor

And they were all teachers

Students

A lot of hard work

Give them the tools they need to succeed.

Industry vs Academia

Process and engineering controls

Tool Qualification

Custody of samples

So you want to build a cleanroom

- Dialog
 - Maybe we can help each other learn something new
- I don't know everything
- Feel free to interject and question as often as you'd like

Acknowledgements

- Professor Bergman and the CNI executive committee
- Dr. Nava Ariel Sternberg
- Columbia Engineering staff, permitting
- Stantec engineering
- Protecs Construction Management

So, you want to build a Cleanroom Design phase

Control over

Fixed constraints

Things you can Control

- Location
 - Where in the building
 - What is on the floor above
 - What is on the floor below
 - Asbestos abatement
- *Architect and engineering firm*
- **Project manager**

Location, Location, Location

- Greenfield vs Brownfield
- Ceiling height
 - Tallest piece of equipment
 - Raised floor
 - HEPA filters
 - Ducted
 - Fan powered HEPA
- Layout
 - Space around equipment
 - Vacuum pumps and chillers

Fixed constraints

Floor Loading

Freight Elevator

MAQ (Maximum Allowable Quantity)

Variance?

Floor loading

80, 100, or 200 pounds per square foot

Static load

Occupancy

Check nearby and adjacent loads

Plating

Teeter Totter

Always check with your structural engineer

Freight Elevator

- What are our X, Y, and Z?
 - Consider equipment height.
 - What can come off the top?
 - Furnace gas box removal
- Load capacity?
 - Litho equipment
 - CMP equipment
- Tubing comes in 20' lengths
 - Can this be carried up the stairwell?

MAQ

Location in the building will help determine MAQ

Sprinklered?

Variance

Homeland Security

DCS

Bulk gases?

Hydrogen storage

Things to consider when building

Monitoring

- TGMS
- Tool integration
- Exhaust monitoring
- Fire suppression
- Leak detection

Building fire alarms and gas delivery

- When do we shutdown gases?

TGMS and tool integration

Tool integration grants permission to flow gas

- N2 dilution
- Exhaust monitoring (pressure)
- Heat trace

TGMS stops gas flow in the event of a problem

- Ambient
- Any place with a fitting
- Gas cabinet
- Thermal monitoring when flammables are present
 - Thermal snap switch
 - Fire wire

Facilities present

- Electrical service
- NCCW
- Exhaust
 - Solvent
 - Corrosive
- Chilled water/ Glycol
- UPS

Lead times

- Get on top of long lead time items
- Expect delays at borders
- Expect tariffs as these can greatly affect budget

Running a furnace in your fab

- Atmospheric and CVD tube furnaces.

I am not an expert in these processes.

- Process can run from 800C to 1300C

Rough on the o-ring seals. Even with cooling water

Unless the furnace is run regularly, keep at an idle temperature and qualify as needed.