

Lessons Learned in the Operation of BSL-3/BSL-4 Laboratory Facilities

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Topics of Conversation

- Requirements for a successful laboratory project.
- Architectural: laboratory layouts and its effects on operations;
- Mechanical systems: air handlers, exhaust fans, HEPA filtration and its configuration and operation;
- Building automation systems(BAS): configuration and programming, benefits and consequences;

Topics of Conversation

- Barrier equipment: autoclaves and effluent decontamination systems;
- Plumbing: double containment piping and vent filters.
- Laboratory decontamination: building construction and decontamination issues;
- Electrical and security systems and regulatory compliance;
- Building complexity and ease of operation.

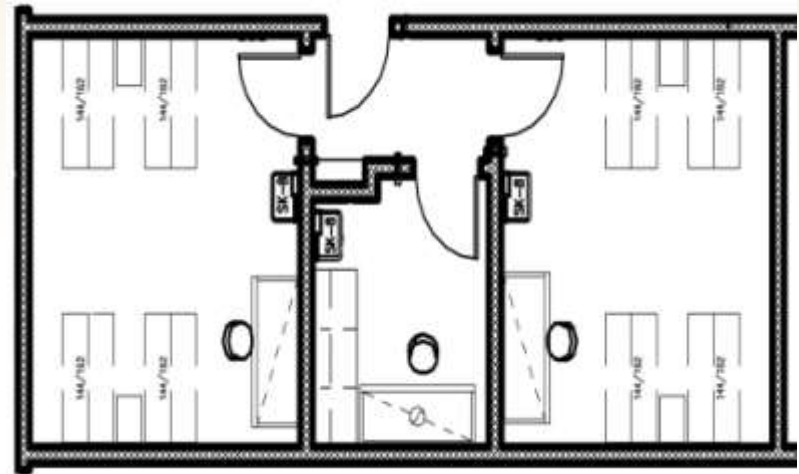
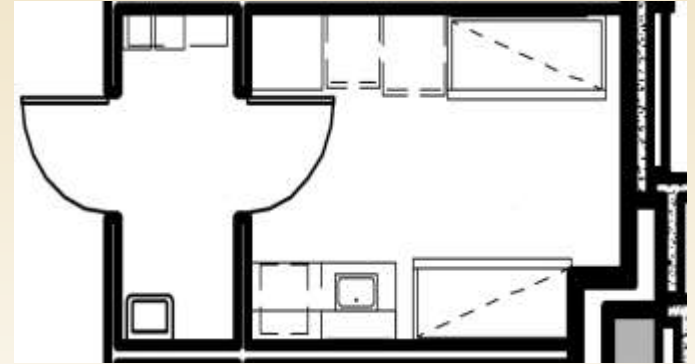
Requirement for Successful Laboratory Projects

- Knowledgeable design team;
- Engaged end users;
- Participation of users, design team and commissioning group from early stages of the project;
- Realistic performance requirements;
- Selecting a construction company that will be committed to the success of the project;
- Work as a team.



Architectural

- Vestibules for In-Vitro laboratories and animal holding rooms;
- Location of pathogen repositories;
- Autoclave vestibules and waste processing areas.



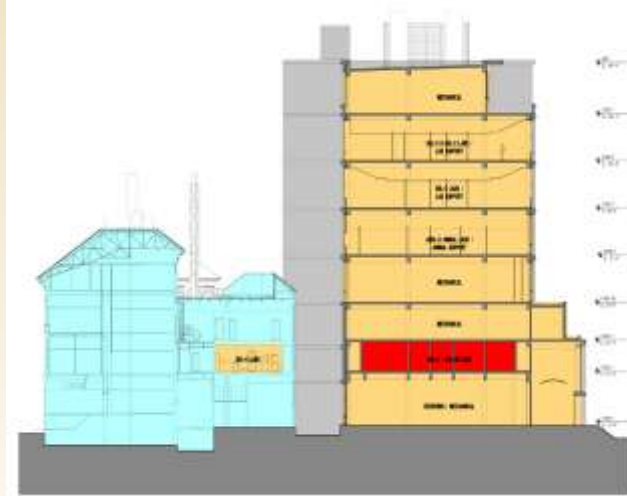
Mechanical Systems

- Equipment redundancy;
- Sharing of ventilation Equipment;
- HEPA filtration requirements and need for Redundancy;
- Types of exhaust fans and energy savings.



Building Automation System (BAS)

- Equipment selection;
- Ease of Programming;
- Communication infrastructure;
- Control equipment – single points of failure.



Barrier Equipment - Autoclaves

- Gravity Autoclaves
- Pre-vacuum autoclaves
 - Vacuum Pump
 - Venturi Water Ejector
- Containment barrier



Barrier Equipment – Pre-vac Autoclaves

Filtration of air from autoclave chamber:

- Air Incinerator
 - Advantages
 - Disadvantages
- Effluent Filter
 - Advantages
 - Disadvantages



Barrier Equipment - Effluent Decontamination

- Types for the right effluent;
- Availability of utilities or resources;
- Maintenance.



Plumbing Systems – Vent Filters

Vent Filtration:

- HEPA Filters
- PTFE Media Filters



Plumbing Systems – Double Wall Piping

Double Wall Piping:

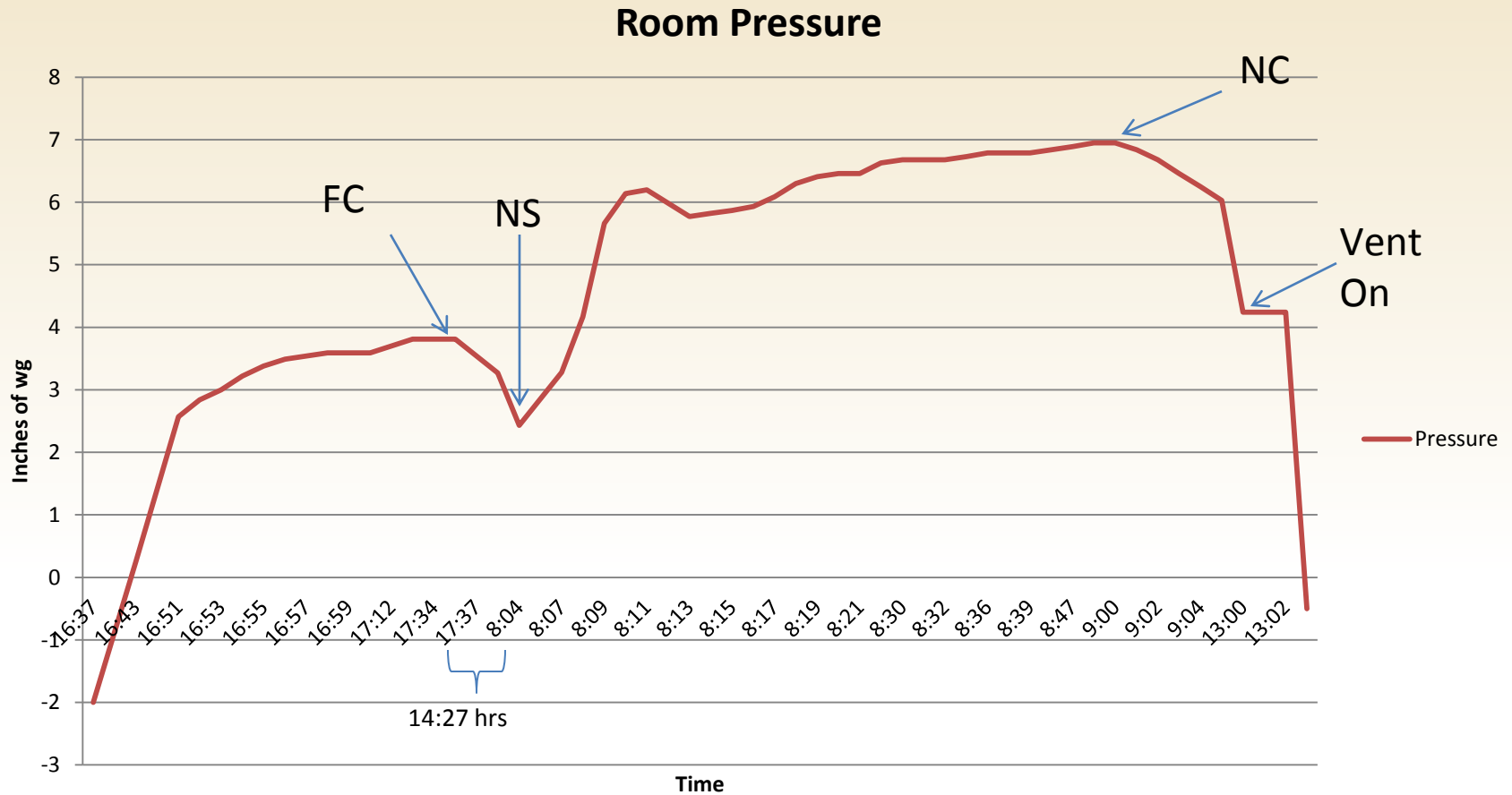
- Decontamination Capabilities
- False Alarm Issues



Laboratory Decontamination

- Decontamination Agents
 - Gas vs Vapor
- Type of Decontamination Agent and Effects over Equipment/Facility
- Gas Migration
- Pressurization During Fumigation

Fumigation Process – Air Tight Room



Electrical and Security Systems

- Emergency power requirements:
 - Separation and Distribution
- Emergency Power Systems and Regulatory Compliance:
 - NFPA
- Effects of Required Emergency Power Testing on Scientific Equipment
- Security Systems
 - Hardware: Fail safe, Fail Secure or Both?

Summary

- Select the right team for your project (Owner Representatives, Designer, Builder, Commissioning Agent).
- Design your building for ease of operation.
- Reduce building complexity as much as possible.
- Involve the future lab users and maintenance team early in the design to incorporate their comments and experiences.

Thank you...

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