

# ISSUES IDENTIFIED BY COMMISSIONING, AGAIN AND AGAIN



# LIFE SCIENCES

ABSA

58th Annual Biological Safety Conference Rhode Island Convention Center • Providence, Rhode Island October 9-14, 2015 www.absaconference.org Joby Evans,

Merrick & Company

- Objective.
- Commissioning defined.

ABSA

- Commissioning process
- Predesign/Planning.
- Inspection and testing.
- Conclusion
- Questions.





# Objective

 Identify typical issues found during laboratory commissioning, to identify solutions and resolutions, and to suggest ways to potentially eliminate the issues prior to commissioning.





# **Commissioning Defined**

ASHRAE Guideline 0, The Commissioning Process, defines commissioning as "a quality-oriented process for achieving, verifying, and documenting that the performance of facilities, systems, and assemblies meets defined objectives and criteria".

- Commissioning ensures building quality using peer review and in-field or on-site verification.
- Drivers for Commissioning; energy, performance, mission critical, environmental controls and occupational safety, <u>projects with special</u> <u>performance requirements</u>







& COMPANY









& COMPANY

# **Cx Inspection/Test Program**

- Central Services
  Steam / Hot Water Boilers
  Chillers
  Heat Exchangers
- Hydronic Distribution Systems
   Water Supply / Quality
   Power Source / Redundancy
- Communications

### **BAS Building Automation**

- Integrated Systems Control Normal vs. Failure Mode
- Startup / Shutdown Sequences
- Diversity Control Turndown
- Energy Management Control
- Alarming / Response

### **Data Telecommunications**

- Telephone / Data Wiring Sealing Devices
- Telemetry Issues
- Suit Communications

### EVAC Systems / Control

- Air Handling Units
- Exhaust Fans
- Ductwork Tightness
- Bubble-Tight Dampers
- Pressure vs. Flow Control
- Measuring / Monitoring / Control-
- ling
- Differential Pressure Control
- Humidification
- Sound Attenuators
- Redundancy
- Room / Zone Isolation

#### **Primary Containments** Systems

- BSC / FH
- Class III Cabinets
- Centrifuges / Incubators

#### **Building / Site Security**

- Access Control Devices (Card, Memory, Biometrics)
   Receiver / Recorder CCTV
- Detection (Passive / Active Testing) TRA

#### Scientific Equipment

- Fixed vs. Non-fixed
- UPS / Power Conditioning
- Harmonic Control
- Service Access / Methods
- Heat Load
- Sizing and Installations
- Imaging Systems Monitoring / Alarming
- Software Re-Sets
- Central vs. Local Vacuum Pumps
- Cold Rooms
- Environmental Chambers

### COMMISSIONING Anatomy of a Laboratory

Animal Use Systems

Penning / Caging Rack Design Integration / HVAC Automated Watering Trench Drain Issues

Carcass Treatment / Sterilization Feed / Bedding Systems

Animal Watering Systems

### **BAS Building Automation** Pre-Filter Design Pre-Filter Design Static Loading Monitoring HEPA Efficiency Testing HEPA Housing Testing Gas Absorption Filters

Plumbing Vent Filters

### **Electrical Services**

Emergency UPS Transformers, ATS, Panels Lighting Systems Conduit / Box Design for Sealing / Testing

#### Fire / Life Safety

System Overrides HVAC / Door Interlocks Water, CO, Gas) Alarm Inpact / Protocol Safety Showers Eyewash Stations

#### Client

Access / Egress Equipment Maintenance Coupering Maintenance System
 Preventative Maintenance System
 OsM Manuals
 System Training Programs
 Warranty Management Programs

#### Sterilization Systems

- Liquid (Cockers, Traps, Piping) Solids (Autoclaves, Incinerators, Chemical) Sterilization vs. Disinfection

- Environmental Parameters (Temp / Time / Pressure)
- Gas Boxes
- Biological Validations





Laboratory Bench Services

Impermeability Compatibility of Components Decontamination Pressure Decay Testing

- E Lab Orientation Barrier Penetration Devices
- Casework Finishes
- Doors, Windows, Pass Boxes

Structural / Architectural

Components

- Define the Biosafety Level for the work you anticipate.
- Identify the features necessary
  - Autoclaves
  - Decontamination processes/leakage allowances
  - Number and types of biosafety cabinets
  - Animal holding/type
- Redundancy requirements
- Minimal in-lab storage
- PPE requirements and storage/recharging stations





Biosafety level?A BSL-4 lab.







- Biosafety level?
- A BSL-3Ag lab.





## Identify features.

















### Identify features.













### Identify features













### Lot of in lab storage, is it necessary in the containment space?







## • Review personal protective equipment (PPE)





 Biosafety professionals can be an integral part of the commissioning team.







## • Waste water piping.



Room leakage - Each BSL-3 enhanced containment space shall have its interior surfaces (walls, floors, and ceilings) and penetrations sealed to create a functional area capable of being decontaminated using a gaseous or vapor phase method. (BMBL)



Smoke pencil testing under Steady State conditions (-0.05"to -0.1" wc) or under deeper sustained negative pressure (-0.2" to > -1.0' wc)





& COMPANY



### **TYPICAL AREAS OF LEAKAGE / VISUAL RESULTS**



Pass-thru frame



Plumbing penetrations



Access panel frame



Thermostats



Diffuser frames/ duct connections

Floor Seams



Raceways/electrical penetrations



Lighting Frames



Door frames/ thresholds



Recessed plumbing connections









## Directional Airflow.





## Pressure trending and control.





 Pressure trending reversal of directional airflow.





HVAC configuration: Venturi valves on supply and exhaust. Active pressure control of supply valve.

- 1 Lead exhaust fan failed
- 2 Supply damper closed to limit positive press. (8sec)
- 3 Lag exhaust fan started
- 4 Supply damper opened to control



## Conclusion

- Concerted efforts by the owner's representatives to get early involvement of the commissioning agent can assist in reducing issues.
- Biosafety professionals can be their own best advocates for successful laboratory startup by understanding typical issues preventing project completion.





## Questions



### Joby Evans, PE, CxA, CAC

Joby.evans@merrick.com

o: 404-789-2715 c: 404-805-7558

Merrick & Company 160 Clairemont Ave Suite 600 Decatur, GA 30030

