

AHCA 24th Annual Meeting - Orlando, Florida
27-28 October 2008

Impact of Commissioning on Infection Control in Hospitals



Scott T. Fote, PE, LEED AP



RLF Architects/Engineers

Jerry Bauers, PE



Sebesta Blomberg & Associates

Modes of Transmission – *Air & Water*

Decreased Performance of HVAC Systems Can Contribute to the Spread of Health-Care-Associated Airborne Infections

- Filter Inefficiencies
- Improper Installation
- Poor Control System Response
- Poor Maintenance



Performance-Based Construction

Engineered Control

VS.

Administrative Control

Automatic Responses

Staff Responses

Design/Construction Balance



Engineered Control Requirements

- ◆ Ventilation Rates
 - Isolation Room (Dilution/Mixing)
 - Surgical Suites (Directed Air Flow)
- ◆ Temperature Levels
- ◆ Humidity Levels
- ◆ Minimum Air Changes Per Hour (ACH)
- ◆ Pressure Relationships



The critical challenge in operating isolation room ventilation system is to maintain a negative pressure differential relative to adjacent areas.

Engineered Control Requirements

Although the proper balance may be achieved when the system is new, Air Flow rates may change over time.

Operation and Maintenance factors:

- ◆ Dirty Filters
- ◆ Dirty Exhaust Grille
- ◆ Mechanical Wear (i.e. Fan Belts & Bearings)
- ◆ Leakage (Damage to seals around window, doors & other penetrations)
- ◆ Change in System Components



Infection Control Risks – Airborne Contamination

- ◆ Construction Contamination
- ◆ Maintenance Activities
- ◆ Inappropriate Temperature / Humidity Conditions
- ◆ Loss of Pressure Control – Normal or Failure Conditions



Infection Control Risk Assessment (ICRA)

Conducted before initiating repairs, demolition, construction, or renovation activities can identify potential exposures of susceptible patients to dust and moisture and determine the need for moisture containment measures.



Why is Commissioning Important for Infection Control?

- ◆ Provides a bridge between:
 - Design – Construction - Operation



Performance-Based Specification

- ◆ **Owner's Performance Requirements (OPR)**
- ◆ **Commissioning Plan**
- ◆ **Commissioning Specification**
- ◆ **Functional Performance Testing**
 - Acceptance Criteria
 - Testing Methodology



Sample Acceptance Criteria

- Process Variable Stability (e.g., Temperature $\pm 2^{\circ}\text{F}$)
- Output Stability (e.g., Output $\pm 20\%$ in steady state conditions)
- Loop Response
(1/4 decay response, PV Stability in no more that 5 mins)



Sample Acceptance Criteria - Failure Conditions

- Specified Failure Response

(On Supply Fan Failure, EF's shall shut down; On Exhaust Fan Failure, Redundant Fan shall ramp up to maintain pressure, etc.)

- (e.g., Output +/-20% in steady state conditions)

- Loop Response

(1/4 decay response, PV Stability in no more that 5 mins)

Critical Factors in Infection Control

◆ Functionality

- Steady State Operation
- Transition Condition Operation
- Failure Response



◆ Maintainability

- Accessibility
- Simplicity
- Visibility

◆ Commissionability



◆ Design Process

- Define Performance Criteria
- Operator Point of View
- Technical Support for Operations

◆ Construction

- Incremental Quality Control
- Planning Start Up/Turnover Activities
- Communicate Performance Req'ts



Acceptance Phase

- ◆ Performance Demonstration
 - Steady State Conditions
 - Transition Conditions
 - Failure Conditions/Return to Normal

- ◆ Staff Training
 - Participation in Testing
 - Organized Training Activities



Certify HEPA Filters for Surgery Suites

- ◆ \$25,000 for Particle Counter
- ◆ Maintenance cost averages \$50-\$100 per filter

Results

- ◆ Reduced Infection Rates
- ◆ Reduced Liability Rates
- ◆ Maintains Engineering Control Systems



Questions?

Comments?



AHCA 24th Annual Meeting - Orlando, Florida
27-28 October 2008

Impact of Commissioning on Infection Control in Hospitals



Scott T. Fote, PE, LEED AP



RLF Architects/Engineers

Jerry Bauers, PE



Sebesta Blomberg & Associates