CONCEPT

Healthcare and Cleanroom HVAC Design Training: Operating Theatres and Isolation Rooms



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Introduction:

Healthcare and cleanroom HVAC design training for operating theatres and isolation rooms is a 1-week course for design, facilities, laboratory and commissioning engineers that ends with a Critical Space Ventilation Design and Verification Plan. Hospitals and laboratories lose theatre sessions, isolation capacity and certified cleanroom status when pressure regimes reverse, air change rates fall short, terminal filters leak and humid outdoor air overwhelms cooling coils. Nominees already design, run or test air systems at work and learn through inspection walkthroughs of drawings, rooms and test reports. CoreConcept Training Center delivers this healthcare and cleanroom HVAC design course.

Course Objectives:

- Map airborne contamination routes and assign a ventilation class, pressure regime and airflow pattern to each critical room
- Apply ASHRAE Standard 170 and HTM 03-01 room criteria and ISO 14644 cleanliness classes to room data sheets
- Size ultra-clean theatre canopies, isolation anterooms, protective environment supply and terminal HEPA layouts
- Specify dehumidification and control sequences that hold dew point, room pressure and airflow during hot, humid weather and fan failures
- Plan ISO 14644-3 verification tests and interpret airflow, filter leak, recovery and particle count results
- Produce a Critical Space Ventilation Design and Verification Plan for a case hospital wing and cleanroom suite

Target Audience:

- Engineers responsible for designing air-side systems for hospitals, laboratories and controlled manufacturing areas
- Facilities engineers responsible for running theatre, isolation and cleanroom air handling plant day to day
- Laboratory and cleanroom engineers responsible for holding certified cleanliness classes in their suites
- Commissioning and validation engineers responsible for testing and certifying critical rooms before handover
- Infection prevention engineering liaisons responsible for agreeing room pressure and air change criteria with clinical teams

Course Outline:

Day 1: Critical Space Ventilation Fundamentals and Room Risk Mapping

- Airborne Contamination Routes in Theatres, Isolation Rooms and Cleanrooms
- Room Function Schedule Linking Clinical Risk to Ventilation Class
- Pressure Regime Logic for Positive, Negative and Neutral Rooms
- Dilution, Displacement and Unidirectional Airflow Principles Compared
- Existing Critical Space Ventilation Survey Against Design Intent

Day 2: Healthcare Ventilation Standards and Cleanroom Classification

- ASHRAE Standard 170 Space Ventilation Requirement Tables Interpreted
- HTM 03-01 Specialised Ventilation Criteria and Plant Arrangements
- ISO 14644-1 Class Selection for Laboratory and Pharmacy Suites
- ISO 14644-4 Design and Construction Requirements for Controlled Zones
- HEPA and ULPA Filter Classes Under ISO 29463

Day 3: Operating Theatre, Isolation Room and Cleanroom Air-Side Design

- Ultra-Clean Ventilation Canopy Sizing Over the Operating Zone
- Airborne Infection Isolation Room Anteroom and Exhaust Arrangement
- Protective Environment Room Supply Positioning and Leakage Control
- Terminal HEPA Housing, Diffuser Layout and Return Grille Placement
- Air Change Rate and Room Pressure Differential Calculations

Day 4: Hot-Climate Humidity Control, Resilience and Verification Testing

- Dedicated Outdoor Air Unit Dehumidification With Controlled Reheat
- Desiccant Wheel and Deep Coil Dew Point Control
- Room Pressure Monitor Alarms, Door Interlocks and Fan Standby Logic
- ISO 14644-3 Airflow, Filter Leak Scan and Recovery Tests
- Particle Count Certification Sampling Plan and Failure Diagnosis

Day 5: Inspection Walkthrough of a Case Surgical, Isolation and Cleanroom Wing

- Case Theatre Suite Drawing Walkthrough Against Standard 170 Tables
- Case Isolation Ward Pressure Cascade and Smoke Visualisation Review
- Case Laboratory Cleanroom Recovery and Leak Test Report Review
- ISO 14644-2 Monitoring Frequency and Requalification Interval Schedule
- Critical Space Ventilation Design and Verification Plan Completion

Skills You Will Gain:

- Critical Room Risk Classification
- Pressure Cascade Design
- Unidirectional Airflow Sizing
- Terminal Filter Layout
- Dew Point Control Design
- Cleanroom Test Interpretation
- Room Data Sheet Preparation
- Airflow Fault Diagnosis

Why Attend This Course:

- Deliver a Critical Space Ventilation Design and Verification Plan to the estates director, the infection prevention committee and the laboratory manager
- Decide whether a theatre, isolation room or cleanroom can return to use after a failed pressure, leak or particle test
- Avoid cancelled surgical lists, closed isolation beds and lost cleanroom certification caused by reversed pressure, short air changes or high humidity
- Share room data sheets, test checklists and pressure monitor settings with designers, contractors and maintenance teams

Conclusion:

Back at work, the participant hands the Critical Space Ventilation Design and Verification Plan to the estates director, the infection prevention committee and the laboratory or pharmacy manager. They use it to approve room data sheets for new or refurbished theatres, isolation rooms and cleanrooms, to set acceptance criteria for contractors and to fund dehumidification or monitoring upgrades. After the first verification round under the plan, the team should review failed tests, pressure alarms and humidity excursions, then adjust design margins and test intervals.

Frequently Asked Questions FAQ:

What should participants know before healthcare and cleanroom HVAC design training?

Participants should already understand basic air handling plant, psychrometrics and duct systems. Bringing room data sheets, a theatre or isolation room drawing, or a recent cleanroom test report helps them apply the walkthrough exercises to their own buildings.

How does healthcare and cleanroom HVAC design differ from a general HVAC operation and maintenance course?

It concentrates on the air side of critical rooms: pressure regimes, air change rates, unidirectional airflow, terminal filtration, humidity and room verification tests. General courses cover chillers, cooling towers, building controls and plant maintenance across ordinary occupied buildings.

Why do operating theatres and isolation rooms need different pressure regimes in healthcare and cleanroom HVAC design?

Operating theatres and protective environment rooms are kept positive so filtered air pushes contaminants outward, while airborne infection isolation rooms are kept negative so infectious aerosols stay inside and are exhausted. Anterooms and monitors hold these directions when doors open.

What do participants take back from healthcare and cleanroom HVAC design training?

Participants take back a Critical Space Ventilation Design and Verification Plan for a case surgical wing, isolation ward and cleanroom suite, with room data sheet templates, pressure cascade drawings, dehumidification options and a verification test schedule.