FITZEMEYER & TOCCI ASSOCIATES, INC.

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Brigham and Women´s Faulkner Hospital

A Case Study on the New Inpatient Tower

At A Glance

Challenges

- Equipment and ductwork sizing for different system pressure drops in the two operating modes.
- Sizing of heating and cooling equipment for negative pressure operation, due to increased outdoor air needs.
- Ability to quickly respond and transition to airborne precaution mode.

Benefits

Adaptive Response to Public Health Emergencies

- Enables rapid conversion of standard rooms into isolation spaces during public health emergencies
- Expands surge capacity without requiring renovation or disruption

Enhanced Patient and Hospital Staff Safety

- Improves containment of airborne pathogens through negative pressure and full exhaust
- Reduces cross-contamination risk for patients and staff

Operational and Planning Efficiency

- Dual-use rooms maximize space utilization during normal operations
- Reduces reliance on permanently dedicated isolation rooms

Enhanced Infection Control Flexibility

- Enables patient rooms to convert to isolation spaces as needed
- Supports a scalable approach to infection control during surge events
- Reduces reliance on a limited number of dedicated A.I.I. rooms
- Expands capacity to safely manage infectious patients
- Provides flexibility to respond to changing clinical demands

Energy Efficiency and System Optimization

- Limits high-energy exhaust operation to only when clinically required
- Avoids continuous conditioning of large volumes of outdoor air

Patient Experience and Confidence

- Maintains a standard care environment under normal conditions
- Minimizes disruption while ensuring readiness for enhanced infection control

Objective

During the COVID-19 pandemic, hospitals and healthcare facilities were overrun with cases that required patients to be treated in negatively pressurized patient rooms for their safety and the safety of the staff. Typically, healthcare facilities have a limited number of these rooms available and are not prepared for a large influx of cases that require this level of airborne precautionary measures.

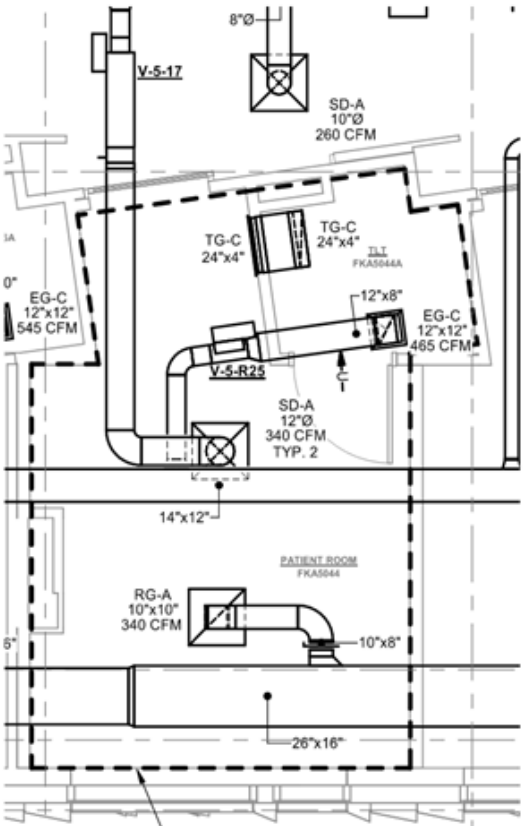
As a result of the overabundance of infectious patients in hospitals during the pandemic, new ways of thinking during the design phase of healthcare buildings were developed. Engineers and owners were looking for new ways to better prepare for the unknown. Fitzemeyer & Tocci was a strategic partner on he design team for the new Brigham and Women's Faulkner Hospital Inpatient Tower Addition and Renovation project during this time, where this forward-thinking approach was implemented. F&T played a key role in the design and implementation of providing the hospital with the ability to convert an entire inpatient floor from standard patient rooms to airborne precaution rooms. Through the building management system and movable partitions, the 5th floor of the new addition could convert standard patient rooms to allow the supply air into the room to be exhausted directly out of the building, while maintaining a negative, one-way airflow in the room. This design approach minimizes potential recirculation of airborne pathogen by removing 100% of air from the suite, protecting the hospital staff from getting sick and patients from spreading illnesses.

Solutions

- Exhaust fans and ductwork systems were designed to withstand higher static pressures to allow for higher airflows in smaller ductwork to maintain and streamline above-ceiling MEP-FP coordination, architectural design ceiling heights, and avoid the material and labor cost impact of larger ductwork.

- New air handling equipment was sized and provided with larger heating and cooling coils to ensure proper supply air temperatures were maintained during peak heating and cooling seasons AND while taking in 100% outdoor air, so the negative pressure control could be implemented regardless of the time of year.

- Once construction was complete, F&T worked with the general contractor, HVAC controls contractor, and testing and balancing contractor to validate that the change-over control sequence of operation for the system achieved the intended airflow when in airborne precaution mode and that the patient rooms remained negatively pressurized.



RESULTS

- The ability for the hospital to adapt to patient and public safety needs quickly.
- Maintains a level of staff safety when interacting with patients that have communicable airborne illnesses.
- Increase the level of patient care to the community by being able to maximize use of all patient rooms, especially during a health emergency.
- Rapid Surge Capacity – Capital Cost Avoidance
  - Overall construction costs were considered to be less by designing dual-use patient rooms instead of constructing additional permanent A.I.I. rooms by limiting additional ductwork systems all while maintaining the ability to safely manage sudden patient surges during public health emergencies.
- Operational and Space Efficiency – Cost of Unused Space Avoided
  - Dual-use rooms maximize inpatient capacity under normal conditions and prevent the underutilization of permanently dedicated isolation rooms. This approach increases the hospitals revenue capability and patient service ability by having inpatient space adaptable to patient needs.
- Energy Savings
  - High exhaust and increased AHU ventilation conditioning are only activated when clinically required, reducing continuous energy consumption. This is a cost effective approach by only implementing 100% exhaust of conditioned air when necessary rather than at all times, reducing the need to condition a high volume of outdoor air at all times to make up for the constant exhaust.