

Meeting Ventilation Requirements, Achieving IAQ and Operational Efficiency



Enhancing Healthcare Environments with Precision Airflow Management at Claremore Indian Hospital

The United States Public Health Service (USPHS) Claremore Indian Hospital (CIH), located in Oklahoma, is a 110,000 sq. ft. federally operated facility accredited by The Joint Commission. It provides emergency, acute, outpatient, and dental care to the Native-American population in the Indian Health Services Oklahoma City Area, which includes Kansas, Oklahoma, and Texas. Established in 1977, this 50-bed hospital serves at least 36,000 patients and conducts over 300,000 total visits per year. Claremore Indian Hospital has an overall Medicare Spending Per Beneficiary score of 0.73, which indicates that the cost of care at this specific hospital is lower than the national average. The facility has 83 providers who specialize in 13 different primary specialties.

In addition to providing world-class medical care, the hospital prioritizes energy efficiency in its facilities. It continuously looks for ways to ensure building performance, maintain Indoor Air Quality (IAQ), and achieve proper ventilation to reduce the spread of infectious diseases. The hospital's wide range of services requires a healthy and pleasant environment for patients' recovery and the efficient performance of the medical staff. Poor IAQ in healthcare facilities has been recognized as a primary contributor to healthcare-associated infections (HAIs). Among the significant effects of HAIs on public health are prolonged hospital stays, long-term disabilities, high treatment costs, and excess mortality rates. The proven strategies for reducing HAI are environmental infection control and engineering controls.

Engineering controls are measures that aim to either eliminate or minimize exposure to bacteria, viruses, and microbes. The HVAC system helps to achieve this in a healthcare environment through dilution, filtration, pressurization, temperature and humidity control. The ventilation rate in an indoor environment is measured based on its air change per hour (ACH) value. It is a quantity of the outdoor air volume added to a space divided by the volume of that space over a 1-hour period. The outdoor air provides dilution of contaminants that may be in the space. A proper air change rate can maintain the IAQ and reduce the risk of airborne cross-infection. The difference between the supply air rate to the space and the return air rate from the space determines the room pressurization. ASHRAE 170 Standard for Ventilation of Health Care Facilities prescribes various total and outside air change rates, pressurization relationship, temperature and humidity requirements for patient care, sterile storage, and surgical areas. Accurate measurement of total and outside airflow is critical to maintaining compliance with that standard.

In recent years, Claremore Indian Hospital has undergone HVAC renovations to increase building IAQ, energy efficiency, and validate airflows and air change rates. Some of the more recent retrofit projects at Claremore Indian Hospital were a complete air handler controls upgrade and an air handler replacement for the warehouse area where prepackaged sterile items are stored. Charles Lewis, Electromechanical Project Manager at Claremore Indian Hospital, had reached out to a local vendor, Airetech Corporation, which happened to be the local EBTRON Rep. Chad Smith, Vice-President/Principal of Airetech immediately introduced Charles to the EBTRON flow measurement product offering, providing information and education pertaining to the EBTRON product's features, capabilities, and proven track record. For both projects, EBTRON airflow measurement stations were chosen based on their outstanding reliability, ease of installation, and user-friendly interface provided by the local controller as well as EB-Link, the mobile phone app. Air handler building automation programs were written to include service area volume calculations and calculate the necessary airflow required to meet air change rates specified in ASHRAE 170.

"Those airflow stations are worth their weight in gold because we can use them to operate based on ASHRAE 170 required



Charles Lewis
Electromechanical Project Manager
Claremore Hospital

air changes by adding the space parameters and calculating the exact flow rates needed. I've gotten tons of positive feedback from the occupants, and the data trend shows that we are meeting all temperature, humidity, and room pressurization requirements- so we can call this a win!"

The EBTRON airflow stations with BACnet communication protocols addressed our need for data integration and operational transparency. The BAS system extracted data to help with decision-making, trend analysis, interoperability, and issue resolution. It allows us to have more actionable data and control, monitor, and trend historical events to optimize outside air, supply and return air, and exhaust systems. For quick on-site access, the EB-Link App allows TAB commissioners to access real-time temperature, humidity, enthalpy, dew point, and traverse data they can store on their phone or email as a text file. It provides quick validation anytime without going through the BAS. The hospital is 90% full nearly 100% of the time, which would make conducting traditional commissioning and maintenance a difficult task. Having technicians periodically check components and service systems from room to room is impractical. Since being commissioned, the EBTRON airflow measurement stations have performed as expected. "I love these airflow measurement sensors!" States Charles. The airflow measurement devices validate and maintain sufficient outside air (OA) and provide energy savings. The EBTRON



devices achieve accurate measurements and control of outside air change rates through MERV 16 filters. Claremore Indian Hospital's ability to measure and control OA precisely is critical. The hospital no longer has to rely on the damper position to guess the OA amount, and knowing the correct amount helps the team determine the air handling unit's (AHU) performance, especially during dehumidification. Also, during major infectious events such as the recent COVID-19 pandemic, complete fresh air flushes of buildings become extremely necessary to lower potential viral load. However, they can drastically increase HVAC energy usage depending on OA conditions. With accurate, real-time OA flow measurement, introduction of excess OA beyond that required for the flush can be eliminated, thus minimizing energy usage as much as possible.

Accurate measurement of outdoor air temperature is crucial, and the temperature measurement is utilized on all air handler outside air intakes. This redundancy is utilized in the Building Automation System to ensure outside air temperature measurements are always available. This data is used with humidity sensors to determine when conditions are favorable for utilizing air and water-side economizers, as well as providing input to air economizer logic utilizing quadratic functions to determine maximum allowable outside airflow based on current OA and return air temperature during cold weather conditions. With EBTRON OA airflow measurement sensors, Claremore Indian Hospital can measure the OA temperature accurately 24/7, regardless of the sun's position. Originally, the installed temperature/humidity sensor measurements varied wildly with the sun's position, even with additional shading. This caused inaccuracies in economizer staging and missed opportunities for energy savings. The EBTRON OA airflow sensors have dramatically optimized economizer staging, enabling the hospital to operate longer using free cooling. As Charles states: "The point I am trying to make here is, we love the EBTRON products and plan to use them anytime we need to measure airflow accurately."

The hospital meets ventilation requirements and achieves operational efficiency by integrating EBTRON airflow measurement stations. These stations enable real-time monitoring and storage of crucial parameters such as temperature, humidity, enthalpy, dew point, and traverse data. The data collection empowers Claremore Indian Hospital to make informed decisions, maximize system performance, ensure IAQ compliance, and proactively address potential issues. This approach provides a proper air change rate to maintain the IAQ and reduce the risk of airborne cross-infection. Claremore Indian Hospital's commitment to leveraging technology continues to create a healthier and more efficient environment.



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