CASE STUDY

"Hide the HVAC" Requirement Lets Engineers Reveal Benefits of McQuay Vision™ Air Handlers at Ottawa Airport's New Passenger Terminal

Passengers arriving at Ottawa International Airport's new 600,000 square-foot passenger terminal (opened in October 2003) are greeted by high, open spaces designed to be reminiscent of an airplane hangar. Exposed structural steel, a three-story atrium, and a full length 40-foot window give clear views of runways and easy access to check-in, gates, and baggage claim. The architects (YOW Consultants, an alliance between Brisbin Brook Beynon Architectural, Ottawa, and Architecture Planning Interiors Inc., Vancouver) wanted to create a seamless blend of architectural innovation and first-class comfort.

Achieving this goal meant hiding the building's crucial services. There's nary an air duct, ventilation unit or even thermostat to be found. Yet 32 Vision™ air handling units from McQuay circulate 500,000 cubic feet per minute (cfm) of air economically and comfortably throughout the building's three levels. After all, more than just hiding the services, the goal of any well-designed HVAC system is to make it invisible to those who benefit from it.

McQuay Vision™ Customized Indoor Air Handler

McQuay Vision custom-modular units help meet "on time, on budget" requirement

According to Nigel High, lead engineer with McKee Engineering, Ottawa, a primary goal of the project was to complete it "on time and on budget." The passenger terminal opened six months ahead of schedule, on budget, and without help from government subsidies (an airport improvement fee administered over the last four years covered the $310-million cost).

"The job was bid to a number of suppliers, but in the final analysis, McQuay had the features, as well as being cost-effective," said High.

McQuay custom-modular Vision units allow specifiers to select from a variety of factory-installed components and configurations to fit their exact requirements. For the Ottawa Airport, these included stainless steel interior lining options, polished aluminum diamond plate floors, marine lights, windows in access doors, and a painted finish.

A custom dimension specified between the fresh air and exhaust air connections provided more space for the insulation contractor to install insulation on the fresh air duct to the unit. "The custom-modular construction gave us features generally only available in a custom unit-but without the expense. That meant we could install the kind of equipment we wanted at a cost effective price," said High.

Customized spaces present challenges

Besides hiding the mechanical services, engineers designed the air handling units to accommodate a variety of spaces, including the open check-in level on the third floor, the three story-high baggage claim area, and individual offices throughout.

Every one of the 18 departure gates, with their floor-to-ceiling west-facing windows, is served by an individual Vision air handling unit.

"This was not a cookie cutter project," said High. "Every area had specific requirements in terms of ventilation, cooling, heating, and air distribution. Probably our biggest challenge was to economically distribute air throughout the space, while at the same time hiding these services in the architectural features." The solution proved to be both innovative and economical.

Energy-saving design brings in conditioned air at floor level

"It's not like a typical office building, which generally requires one air handling system because each floor has the same service requirements," said Sylvain Chenier, project engineer with McKee Engineering. "And it's different from many other airports and large spaces such as gymnasiums because those spaces often have exposed ductwork."

Standard HVAC systems supply air from above with air diffusers that push conditioned air down toward floor level, which can be 20 feet away. That requires conditioning a relatively large volume of air. The

solution at the airport was to stratify the air: bring it in at ground level at low velocity and return the air at about eight feet above the floor. That requires conditioning only the first eight feet of air.

"Stratification is not a common feature in most buildings, but we had great success with it at the Ottawa airport," said High. "Reducing the cooling requirements helps to boost energy efficiency in the facility."

Architectural features hide HVAC service

At the third floor check-in area, 10 free-standing service tables offer travelers a convenient surface for setting their bags or writing a note. The real purpose of the tables is to hide ventilation grilles, located in the cavities below the tables, and served by ductwork hidden underneath the floor. The grilles are hidden behind perforated stainless steel.

"The tables serve as an architectural feature to accommodate the air displacement units," said Chenier. "Low velocity air is supplied from underneath the tables at just a few degrees cooler than ambient temperature. This stratifies the air, providing conditioned air for the space up to eight feet or so above the floor. It's very economical because, when cooling is required, it conditions air at a fraction of the volume of the space, and pushes the warmer air up. We don't need the typical fan power to blow air down from above."

A similar system was installed behind the 25 ticketing desks, which also hide the displacement units. "The challenge here was to avoid blowing cold drafts on the ticketing agents. We provided conditioned air at extremely low velocity, and added dampers so that air flow can be easily adjusted," said Chenier.

To further boost energy efficiency, engineers incorporated variable speed drives throughout the project, on both variable and constant volume systems. The variable frequency drives help save energy by reducing air change rates during those hours when the airport is not busy. In addition, ventilation rates are adjusted based on a CO_2 demand ventilation strategy.

More than just a passenger terminal, the airport is "our national gateway to the world," said Paul Benoit, the airport authority's chief operating officer, during commissioning ceremonies. Modern conveniences include climate-controlled covered walkways and a giant video wall displaying national news. Local touches include a water fountain representing the confluence of the region's three rivers, and copper and limestone from nearby sources. These and other amenities – including those no one notices – make it a pleasure to visit this airport.