**A great trade: world-renowned financial exchange swaps large, aging air handlers for modular FANWALL TECHNOLOGY® from Huntair®**

***Contractor can carry out complicated installation plan thanks to compact FANWALL cells. The innovative air-handling technology also boosts system reliability and slashes maintenance requirements.***

CHICAGO—Located in this city’s famous Loop commercial center, the 600-foot-tall Chicago Board of Trade Building houses the world’s oldest futures and options exchange. Until recently, the building also housed a pair of aging air-handling units that were beginning to worry management. Due to their location, replacing these AHUs was no easy task. But a difficult retrofit job was greatly simplified by easy-to-handle FANWALL TECHNOLOGY® from Huntair Inc., a CES Group company. Other key features of FANWALL airflow systems will benefit CBOT employees, tenants and visitors for years to come.

Designated a National Historic Landmark, the 45-story CBOT Building is an Art Deco structure consisting of two towers. For many years, airflow for floors 10 to 23 in each tower was supplied by an air-handling system consisting of two large supply fans and two return fans. Installed in 1970, these old AHUs were becoming a cause for concern at CBOT, prompting the decision to replace them with new systems.

This decision may have been easy, but things would be much more difficult for Chicago-based Competitive Piping Systems Inc., the mechanical contractor tasked with the job of replacing the old AHUs. CPSI faced a big challenge in moving equipment to and from the two mechanical rooms that house the AHUs, which are located on the 24th floor. The only access to those rooms is through a door that leads into tenant office space where electronic trading and other important activities take place. During the weeks or months it would take to remove the old air-handling equipment and install the new systems, dealing with a steady stream of construction workers and equipment moving between the mechanical room and the 24th floor elevator “would have been a big hassle for the tenants,” notes Jim O’Connor, chief engineer for the CBOT Building.

O’Connor and his colleagues decided that another way had to be found to get men and equipment into and out of the mechanical rooms during the project. So a plan was devised that involved a different route, leading through holes to the outside cut in the mechanical room walls and then down to a sub-roof on the 23rd floor.

The difficulties involved in moving equipment via this route played a big role in the choice of new air-handling equipment. Originally, consideration had been given to replacing the old units with something similar, but that idea no longer seemed feasible. “The original blowers were extremely large,” says Tom Muraski, vice president of CPSI. “In order to get something that size into the building, we would have had to take out walls. It would have been a massive undertaking.”

**Engineers turn to FANWALL**

So instead of large conventional air handlers like the old ones, modular FANWALL TECHNOLOGY “seemed to be the best choice,” says O’Connor. A FANWALL system consists of a number of individual cube-shaped cells, each of which houses a fan, motor and electrical connections. The number and configuration of these relatively compact cells depend on the requirements of the particular air-handling application.

The modularity of the technology meant that no significant structural changes would have to be made to the CBOT Building in order to install the new air-handling systems. With FANWALL, “ we could bring the system up in small pieces and build everything onsite,” Muraski explains.

Custom FANWALL systems are configured by selecting the number of fans, as well as operating speed (rpm) and wheel width and diameter. This allows each design to be optimized for maximum efficiency. For this job, CBOT purchased FANWALL capacity totaling 470,000 cubic feet per minute (cfm) from Midwest Applied Solutions of Hillside, IL, a CES/Huntair distributor that provides specialized engineered product solutions for the HVAC and refrigeration marketplace. Midwest supplied two identical fan systems for the CBOT Building’s two towers. Each system consists of a 130,000 cfm supply array made up of 21 FANWALL cells and a 105,000 cfm return array made up of 15 cells. The cells measure approximately 3 feet by 4 feet and weigh about 400 pounds.

One by one, CPSI personnel brought the 72 FANWALL cells up to the 23rd floor using a dolly. Then the cells were moved outside onto the sub-roof, on which scaffolding had been erected. A hoisting rig attached to the top part of the scaffolding structure lifted each cell up to a catwalk next to the mechanical room on the 24th floor. Finally, a construction worker wheeled the cells into the mechanical room through the temporary hole in the wall.

**Job done in phases**

Further complicating the job was the requirement that airflow to floors 10 to 23 in both towers never be turned down during normal business hours. To meet this requirement, CPSI came up with a plan that broke the project into phases. First, while the existing supply fans were running, the old exhaust fans were demolished and replaced with the new FANWALL supply systems. Piping runs through the space designated for the FANWALL cells, but this presented no problem, thanks to the flexibility of FANWALL TECHNOLOGY. The cell array was simply split into two parts, one part five cells wide by three high and the other two cells wide by three high, with the piping running in between.

Once these systems were in place, CPSI switched over power and ductwork to the FANWALLS, which then began functioning as the new supply systems. Finally, the contractor demolished the old supply fans and replaced them with the exhaust FANWALLs.

The entire job, which included the installation of new coils and dampers, took about three months. All system shutdowns and startups occurred during nights, weekends and holidays so that the project wouldn’t disrupt the work being done in the building during normal business hours.

**FANWALL excels on the job**

Now operational in the two towers of the CBOT Building, FANWALL TECHNOLOGY produces a uniform piston of air that creates a uniform velocity profile at the unit coils and filters, as well as throughout the unit’s airway path. This uniform airflow profile reduces static pressure drop due to turbulence and system effects.

The FANWALL motor-control panels include three active variable-frequency drives (VFDs), each of which controls a third of the 21 motors in the supply array. The supply systems also include one redundant VFD wired for automatic switchover in the event of a VFD failure.

In addition, the new airflow systems are equipped with a full complement of variable air volume (VAV) boxes that allow airflow control on each floor served by the systems. The old air-handling system did not include VAV boxes for all floors. With no VAV box for a particular floor, “I didn’t have any control over how the static pressure built up,” O’Connor recalls. “On certain floors, you started building up static pressure at certain times of the year, and there was no way to relieve it. So I was excited to get the VAV boxes for those floors.”

**‘Redundancy is real nice’**

Perhaps no FANWALL advantage is more important than its superior reliability. The identically sized fans and motors that make up a FANWALL array operate in parallel to create the same airflow rate (cfm) as a single, larger fan sized for the same duty. Due to the system redundancy inherent in FANWALL TECHNOLOGY, a fan/motor failure is only a high-priority maintenance issue rather than a mission-critical failure that disables the entire air-handling system.

If one of the FANWALL motors fails during operation, the VFD and control system increases the speed of the other motors so that overall system performance can be maintained at the same level during the time it takes to replace the failed motor. “Before, if we lost one fan, we lost half our capacity,” O’Connor says. “Now, we’ve got multiple fans, so one motor going down really doesn’t affect our operation that much. Redundancy is real nice.”

The FANWALL design also simplifies maintenance. For example, the motors powering the fans in a FANWALL array are much smaller than those required by systems with large plenum fans. “If a motor goes out, it’s not a huge motor to change, which makes FANWALL a lot easier to work on,” O’Connor says.

To reduce maintenance, FANWALL’s direct-drive design requires no belts or sheaves. Nor does it require fan bearings, the HVAC component most likely to fail or deteriorate over time. The fan assembly also eliminates lubrication requirements with permanently sealed motor bearings.

In the mechanical rooms of the CBOT Building, small fans operating at relatively high speeds produce less of the particularly troublesome low-frequency noise than lower-speed larger fans sized for the same airflow and static pressure. The FANWALL design also benefits from careful attention to balance within each of the fan wheels, which significantly reduces vibration. Another key to noise reduction is FANWALL TECHNOLOGY’s patented Coplanar Silencer®, which surrounds the fan and motor of each FANWALL cube with acoustically absorbent material to greatly reduce airborne noise at the source.

“I remember being in the mechanical rooms with the old fans running and having to yell at everyone at the top of my lungs. Now we can have a piano recital up there if we want to,” says Joe Kurcz, a sales engineer for Midwest Applied Solutions.

In addition, the footprint of the FANWALL systems is only about half as big as the one occupied by the old air handlers, which has opened up about 600 square feet of additional space in each of the mechanical rooms. “We literally gave them their mechanical rooms back,” Kurcz reports.