FORM&FUNCTION

Sounds of silence in Nashville

In May 2010, 356 mm (14 in.) of rain caused flooding in Nashville, Tennessee. The recently completed Schermerhorn Symphony Center lost not only its instruments, but also its mechanical systems in the basement. With a time constraint of seven months, knock-down air-handlers were chosen to meet the challenges for access, space-saving, and acoustics.

Home of the Nashville Symphony, the 18,302-m² (197,000-sf), 1844-seat building suffered about $40 million in damages—from cleanup and reconstruction to lost business. Most was in the basement and sub-basement as the water's force cracked the floor when it filled with 6.7 m (22 ft) of water overnight. The water completely submerged 10 of the 11 air-handling units (AHUs), which were custom-designed to provide efficient airflow at the lowest possible sound levels.

Single, large-plenum fans and motors in custom cabinets were used for the original air-handling system. The six serving the performance hall were stacked top-and-bottom units because of the extra space required by the fans. Each one had to be cut out and removed in pieces as they were 6 to 9 m (20 to 30 ft) below building grade.

The new AHUs had to be small enough to meet the space needs of a new flood-remediation scheme and quiet enough to measure up to the center's stringent noise criteria. Using a modular knock-down air-handler, the units were manufactured and assembled at the factory to ensure fit; they were then disassembled, labeled, and shipped to the site for reassembly.

Each cube-shaped cell houses a fan, motor, and electrical connections. The number and configuration of these compact cells depend on the airflow and static pressure requirements of the particular air-handling application. Custom systems were configured by selecting the number of fans, operating speed (revolutions per minute [rpm]), and wheel width and diameter. This allowed each design to be optimized for maximum efficiency.

The pieces were brought into the building through the grated air opening 6 m below grade and lowered using a crane. The modular cubes were moved individually into position without requiring any building damage and then stacked onsite into the appropriate configurations.

Using preferred noise criteria (PNC)—an indoor noise measurement system—the facility's designers required a low PNC-30 in the areas surrounding the performance hall and an extremely low PNC-10 in the hall itself. To reach these levels, the original AHUs had 102-mm (4-in.) thick panels with fiberglass insulation between two sheet-metal layers.

Above: Since most of the flood damage occurred in the basement and ruined the mechanical systems, the Schermerhorn Symphony Center had to replace the air-handlers using modular units.

Photo © Steve Hall. Photo courtesy Hedrich Blessing

Right: The knock-down air-handler is compact enough to meet the space needs of a new flood-remediation scheme and quiet enough to measure up to the symphony hall's strict noise criteria.

Photo © Sarah Jones. Photo courtesy Schermerhorn Symphony Center

Similar noise-attenuating panels are installed in the ductwork connected to the air-handlers.

With a 15-decibel (dB) improvement over the old air-handlers, more than 25 percent of the sound-attenuation structure installed in the ductwork of the AHUs was eliminated. Additionally, the six systems serving the performance hall required much less sound-attenuating paneling than their larger 'stacked' predecessors.

The vertical space gained by the new configuration will help the center deal with future flooding. The air-handling units with the new fans sit on structural steel platforms raised 1.8 m (6 ft) off the floor of the mechanical rooms. Turbine pumps installed in the spaces beneath the units will allow those areas to be used as sump pits in the event of a future flood. **CS**