

applications *in the field*

Indianapolis stadium gets supersized ductwork

The new Lucas Oil Stadium is not only the home of the Indianapolis Colts' football team, it is also home to a retractable roof with massive spiral ductwork suspended overhead.

The ductwork — as large as 118 inches in diameter — is hung from a three-piece support system for extra stability against winds when the roof is open. Shipped in 6-foot-long sections, the duct is large enough for a Colt fullback to stand inside. The ductwork serves as the transport system for 1.3 million cfm of fresh air to over 60,000 fans.

More than 1,000 linear feet of Semco 2-inch dual-wall spiral duct snakes around the perimeter of the stadium, supplying all the conditioned air to the bowl. The interior duct is made of perforated steel and the exterior duct is galvanized sheet metal, with 2 inches of fiberglass insulation sandwiched in between.

The stadium bowl ductwork will deliver conditioned air from supply air discharge plenums in all four corners of the stadium, with each quadrant being served by four dedicated air-handling units. Supply air from each set of four air-handling units discharge into a larger common plenum, which has multiple taps from it that supply the spiral duct in the arena bowl.

The double wall plenums consist of approximately 20,410 gross square feet of sheet metal. An additional 12,541 gross square feet of plenums will serve the fresh air intake requirement for the 16 handling units as well as miscellaneous exhaust-air plenums servicing the loading dock and garage area.

The large plenums make it possible to collect the supply air from the air handlers and move it horizontally to a location where the large exterior ductwork can tap into the plenum top, run across the roof in public view, and enter the arena. Since the installation is completely exposed, and highly visible, details such as this were extremely important to the overall aesthetics of the stadium.

Moore Engineers in Carmel, Ind., provided the mechanical design for the stadium. The sheer size of the project added to the complexity of the design and installation, said Tim Moore, design engineer and principal with Moore Engineers.

"Semco was the only manufacturer I felt comfortable dealing with for a project of this scale," Moore said. "I've worked with them before as a sheet metal contractor and I know their engineering assistance was strong and available."

Appearances

The spiral duct at the stadium is massive by anyone's standards. It's so large that Semco had to design special heads for their spiral machines to fabricate it. The sheet metal is bent and crimped to achieve true spiral seaming. It is not rolled and welded, which Moore said would have been unacceptable in appearance.

"We don't believe spiral ductwork this large has ever been manufactured before," said Jim Walker, national sales director for Semco.

Walker worked very closely with Moore to correctly design and size the ductwork and plenums for the project.

Although it is customary in larger installations to use ductwork that progressively decreases in diameter to maintain velocities, Moore wanted



This spiral ductwork was installed at the Lucas Oil Stadium, the home field for the Indianapolis Colts. Some of the ductwork was as large as 118 inches in diameter.

to minimize this effect to eliminate the cost associated with the flanged reducers and connectors. He designed the duct so it only drops down a couple of sizes throughout its entire length. Moore Engineers used orifice plates between flanged connections to create back pressure and the desired balancing effect.

The use of these orifice plates also helped Moore avoid the problems and expense of balancing dampers inside the duct. Experienced in stadium design, Moore knew balancing dampers have a tendency to vibrate and shake loose after a couple of years, lose their balancing capability and begin to rattle and create noise. The orifice plates were not only a less expensive alternative, but more reliable as well.

Challenges

Design wasn't the only challenge posed by the large-sized duct. The logistics of delivery were also an issue. Again, Semco's close involvement in the project helped keep things running smoothly.

Ken Kendrick of Indianapolis-based Bright Sheet Metal worked closely with Gerri Hill, inside sales at Semco, to schedule 132 box trailers and 36 dry-van deliveries of the 6-foot duct sections so they arrived just in time. This meant accommodating various construction timetables associated with the stadium. It was also important the duct be installed quickly since it could easily become damaged if it were stored at the jobsite for any length of time.

"We worked together very closely from the start of the duct project in June 2007 through February 2008," said Kendrick. "Semco also assisted us through the CAD drawing process."

Shipping such large duct safely was a challenge. Semco had already helped Bright Sheet Metal determine the optimum duct length to minimize transport and handling damage as well as installation labor. The ductwork was shipped in 6-foot long sections, either in a box truck, or standing upright on an open trailer. It was never stacked.

While Colts fans can take pride in their team this football season, the mechanical design team for Lucas Oil Stadium will be taking pride in the fact that they were able to take on a large ductwork project of this scale. 