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LUCAS OIL STADIUM

CASE STUDY

Excitement won't be the only thing in the air when fans first gather inside the new Lucas Oil Stadium for the start of the Indianapolis Colts' football season. Innovation will surround them from the stadium's one of a kind retractable roof to the massive spiral ductwork suspended from overhead.

The ductwork – as large as 118 inches in diameter--is hung from a 3-piece support system for extra stability against winds when the roof is open. Shipped in 6 ft. long sections, the duct is plenty large enough for a Colt fullback to stand inside. The ductwork will serve as the transport system for 1,384,000 cfm of fresh air to over 60,000 screaming fans.

1,486 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 two 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 (AHUs). Supply air from each set of four AHU's discharges into a larger common discharge 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 service the fresh air intake requirement for the 16 AHUs as well as miscellaneous exhaust air plenums servicing the loading dock and garage area.) The large plenums made it possible to collect the supply air from the AHUs and move it horizontally to a location where the large exterior ductwork could 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.

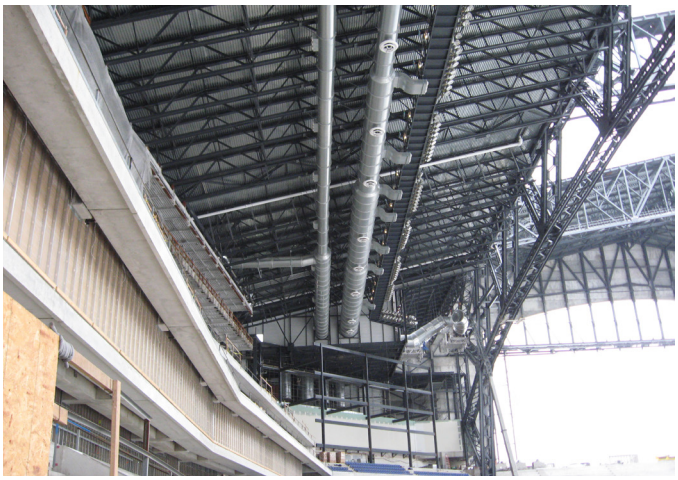
Moore Engineers in Carmel, IN provided the mechanical design for the stadium. The sheer size of the project added to the complexity of the design and installation, said Tim

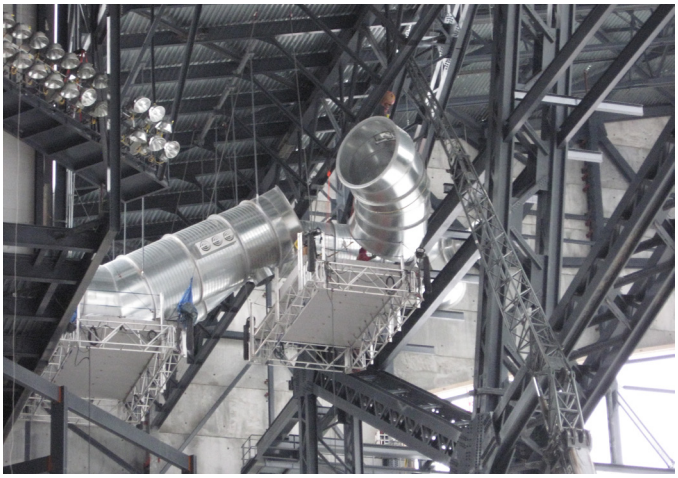
Moore, design engineer and Principal of Moore Engineers. "SEMCO was the only manufacturer I felt comfortable dealing with for a project of this scale," said Moore. "I've worked with them before as a sheet metal contractor and I know their engineering assistance was strong and available."

KEEPING UP APPEARANCES

The spiral duct is massive by anyone's standards--so large in fact, 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 Tim 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 to minimize this effect for aesthetics and also eliminate the cost associated with the flanged reducers and connectors. Therefore, he designed

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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 backpressure and the desired balancing affect.

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.

OTHER 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 or Bright Sheet Metal worked closely – sometimes daily – with Gerri Hill, Inside Sales of SEMCO, to schedule 132 box trailers and 36 dry van deliveries of the 6 ft duct sections so they arrived just in time for installation. 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 in and of itself. SEMCO had already helped Bright Sheet Metal determine the optimum duct length to minimize transport/handling damage as well as installation labor. The ductwork was shipped in 6 ft long sections, either in a box truck, or standing upright on an open trailer; duct was never stacked.

While the Colts make sports history on the field in this new stadium, others involved in the mechanical design can take a little pride in the fact the air delivery system was also a well-coordinated team effort.

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