



Largest U.S. Indoor Waterpark Gets World-Class IAQ From Design/Build Contractor

Even air distribution from strategically-placed fabric ducts and orifices eliminates potential of chilling drafts and air stratification.

WISCONSIN DELLS, WI—The billing as “America’s Largest Indoor Waterpark” draws aquatic patrons to the new Wilderness Hotel & Golf Resort, but indoor air quality (IAQ) is one reason they keep returning.

When it comes to IAQ, there are a lot of mechanical engineering challenges in a huge indoor waterpark setting such as the Wilderness’ 68,000-square-foot Wild Waterdome. Just the presence of hundreds of thousands of gallons of water splashed around with

wave machines, water cannons, water slides, and patrons can create rainforest-like evaporative rates. Combine that with airborne byproducts of such a facility’s necessary sanitizing pool water chemicals and IAQ becomes vital for patron comfort.

But despite these IAQ challenges, the Wild Waterdome is a breath of fresh air in Wisconsin Dells, which is the world capital of waterparks with over 20 facilities. Designed by mechanical contractor Kilgust Mechanical, fabric ductwork plays one of the important roles in the successful IAQ of the Wild Waterdome.

Working with the engineering department of fabric duct manufacturer, DuctSox, Dubuque, IA, Jason Beren, P.E., vice president of operations, designed the airflow



around six 120-foot long runs of 60-inch-diameter TuffTex commercial grade fabric duct have a variety of orifice diameters ranging from 3/4-inches to 1-1/2-inches and duct circumference placements. The two 19-foot-high perimeter runs have two linear arrays of orifices directed toward the windows and another array towards the deck.

Typically indoor waterparks use coated spiral metal duct with registers every 10 feet. This design is good in industrial situations, but in occupied spaces, especially where wet body surfaces can easily be chilled by drafts, a more gentle and even airflow is preferred. With a designed airflow of 75 to 100 feet/min. at the pool deck level, the thousands of orifices engineered into the fabric duct are designed to deliver a gentle airflow to occupants. The evenness of the airflow also helps eliminate air stratification in the far corners of the space, which is a common problem in large spaces.

The computer aided design (CAD) orifice placements also bathe the Wild Waterdome's unique Texlon Transparent Roof System in dry warm air.

These intricate ventilation rates were fine tuned and confirmed during Kilgust's design process with the aid of a computational fluid dynamics (CFD) analysis. Matthew Herman, building physicist, Buro Happold Consulting Engineers, performed the CFD work.

On the economic side, fabric duct saved the project an estimated \$230,000 in HVAC costs versus the metal duct's higher material and labor costs, according to Jason Beren, Kilgust's vice president of operations. Just

the fact that fabric duct's comparably lighter weight eliminated expensive forklift and mechanical boom lift rental fees saved the project over \$10,000.

"Fabric duct resulted in a huge HVAC savings, but equally important was the fact the fast-track project's ductwork installation time was cut nearly in half," said Beren.

From an architectural standpoint, the streamlined fabric surface that's void of typical ribbing and protruding registers offers an aesthetic alternative to spiral metal ductwork. "With no prior fabric duct experience, we were a bit skeptical in the beginning," said Raymond E. Bolton, AIA, principal, Architectural Design Consultants Inc. "But we're really pleased how it performs and looks, especially the custom earth tone color that coordinates with the rest of the space. It's designed to resist corrosion so it's really a good choice for this type of space."

Additionally, the Wilderness took advantage of DuctSox's silk-screening. With dozens of competing restaurants in the Wisconsin Dells area, the Wilderness subliminally directs patrons to its own restaurant facilities with silk-screened logos of each venue appearing on the ductwork surface that's in full view of all waterpark patrons.

The mechanical side of Kilgust's design is based on a total 220,000-cfm capacity. There's a reliance more on outside air supply and exhaust with four to six air changes per hour depending upon the season. Summer operation features large natural ventilation openings, such as oversized doors, windows and louvers were incorporated to reduce energy consumption in the summer ventilation mode. This method combined with good air distribution helps reduce chloramines accumulation. Wintertime operation, seasonably dry outside air supply is pre-heated and mixed with the warm, humid pool room return air to provide a comfortable relative humidity to the pool area.

As waterpark design evolves into the 21st Century, design/build companies such as Kilgust have become leaders in mechanical design innovations such as fabric duct and airflow improvements.

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