Steel

Institutional Projects

UOIT's one-of-a-kind wind tunnel takes flight

Crews had to navigate a logistical nightmare for dream project

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Transporting steel hundreds of kilometres, limited site access and carefully avoiding other construction work were just some of the numerous challenges in the erection of a first-of-its kind climatic wind tunnel at the University of Ontario Institute of Technology in Oshawa.

Designed by Toronto-based Aiolos Engineering, the three-storey-high continuous loop tunnel will be used to evaluate climatic and ultimately aerodynamic impacts on vehicles for the automotive industry at the university's just completed $100-million Automotive Centre of Excellence.

The tunnel is actually just one phase of this integrated test facility — which is also being described as a first of its kind.

Other key players in the tunnel project include Diamond & Schmitt Architects, who designed the centre, construction manager Vanbots, and Marcon Custom Metals Inc., the Kitchener-based firm that fabricated approximately 364,000 kilograms of steel for use in the construction of the shell and floor assemblies.

All the assemblies were fabricated with pre-determined construction joints in overall sizes suitable for ease of transportation and installation within the ACE building, says Marcon president Randy Gondosch.

Simultaneous shop drawing work and fabrication started in August 2008. But that wasn't an easy process, at least initially, says Gondosch.

"It was basically left up to us to decide where the splits should go. The objective was to have as many flat panels as possible for easy truck transportation, as well as making the on-site welding easier."

Over the course of the project, approximately 50 truckloads of steel were shipped to the site. Delivering the various components required careful scheduling as there was limited access to the site and only a small ground area to lay out the material, says Gondosch.

Following site placement, all the steel shell and floor sections were welded together by Cassidy Industrial Contractors, the erection subcontractor.

As this work could not interfere with construction of the centre's other sections, which was being carried out at the same time, close collaboration with Vanbots was critical to help manage the many design and construction issues, says Phillip Duggan, vice-president of business development for Aiolos.

DIAMOND & SCHMITT

Building this state-of-the-art wind tunnel required some fancy footwork by the steel fabricators and contractors. Sections had to be configured for easy shipping while space at the site was tight.

And installing the shell and floors wasn't the only massive undertaking.

A Czech company manufactured the 60,000-pound steel fan assembly, which includes a 3,000-horsepower motor, which also had to be fabricated in suitable sections for overseas shipping, road transportation and site installation. It was installed over several months by Barrie-based Western Mechanical Millwright & Machinery Division.

The fan might be considered the engine of the tunnel, which is capable of providing a full range of climate conditions from desert temperatures of 60°C with 95 per cent humidity to Arctic temperatures of -40°C, including snow, rain and solar simulation capabilities, says Duggan.

It generates wind speeds ranging from as low as two kilometres an hour to as high as 240 kilometres an hour. The wind flows along the duct and then is pushed by two turning vanes into a settling chamber, which includes a heat exchange to control air temperature, plus several anti-turbulent screens. From there it goes through a contraction area and then is forced through an adjustable nozzle into a large test chamber with a dynamometer assembly.

This large sophisticated piece of machinery includes a turntable that can rotate vehicles at different angles. What makes the dynamometer truly unique is that it has been designed for easy removal so it can be replaced with one for evaluating aerodynamic conditions, says Duggan.

Other features of the test chamber include two snows guns to replicate snow conditions and a solar simulation system, he says.

"This is a true integration of technology and architecture. The tunnel and the building had to be designed in unison," says Diamond & Schmitt principal and project architect Mike Szabo.

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