

TORONTO PAN AM SPORTS CENTRE

CANADIAN CONSULTING ENGINEERING AWARDS 2016



PROJECT OUTLINE

The Toronto Pan Am Sports Centre (TPASC) is the largest sport new-build for the 2015 Pan Am Games. Jointly owned by the City of Toronto and the University of Toronto, the centre is now home to a variety of programming for students, athletes, and the public. WSP provided structural engineering, green design management and enclosure engineering services for this major sports venue.

INNOVATION

At an overall project cost of \$205 million, this 360,000-square-foot facility includes two 10-lane, 52-metre international competition pools, a 5.5-metre deep diving tank, as well as a multi-use field recreational facility for training and competition.

To ensure that the TPASC remains world-class for years to come, the architects and engineers adopted an innovative three-phase design: pre-games, games, and post-games legacy. In the pool area, during the pre-games-phase, a line of removable columns was designed to help support and reduce the span of the 76-metre long span trusses in order to minimize deflection due to snow loads. During the games phase in the summer months, the columns were removed to accommodate extra seating capacity and create a large, unobstructed area to view the swimming events. During the third and final phase, the post-games phase, the columns were put back in place and made permanent.

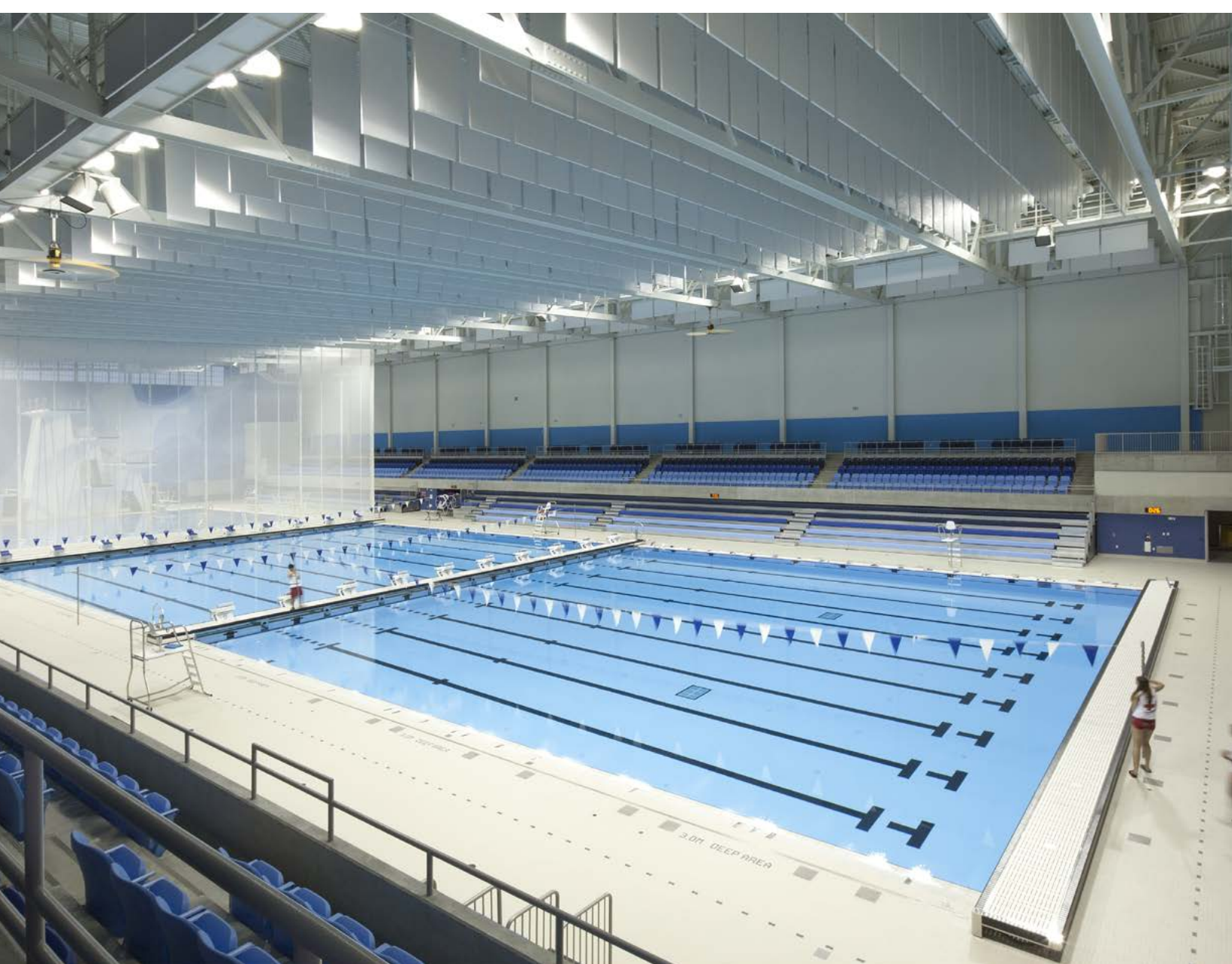
Another important feature that demanded innovation is the dive tower. Typically, dive towers are concrete structures that must have the required stiffness set out by the International Swimming Federation. As the dive tower would be located on top of service tunnels adjacent to the dive pool below, reducing the weight was a priority. To achieve this, the dive tower in the aquatics centre was designed and constructed using structural steel and then clad with precast concrete. A complex layout of substantial vertical cross bracing was utilized to meet the stiffness requirements and then hidden from sight with precast cladding. A detailed 3D model was created by the steel fabricator and a collaborative effort was required between the WSP design team, the constructor, precast supplier, and the steel fabricator to ensure that the tower could be fabricated and built on-site as the design intended.

COMPLEXITY

A project of this scope presents unique challenges. It was of utmost importance to create a grand, iconic space to present a positive image of Toronto and Canada to the rest of the world. To accommodate high volume spaces without overpowering the area with a large, above-grade structure, the facility is depressed approximately eight meters into the ground. The foundations are cast-in-place concrete with a structural steel superstructure. Long span roofs are framed with structural steel trusses and beams.

Designing for the aquatics centre was also challenging as the pool's ambient environment is highly conducive to condensation and corrosion. WSP carefully selected materials and designed building components within and around the pool to withstand the aggressive pool environment and maintain a long-term service life to meet the stringent durability requirements of the project.

The sequencing of construction added to the complexity of the project. To build the three pools in the space, the perimeter foundation walls and footings were constructed first. This level 1 grade was used as a staging area to erect the steel trusses. Once all of the steel was erected, the pool areas within the steel structure were excavated another storey down to build the pool bases and the level 1 cast-in-place pool deck.



SOCIAL AND/OR ECONOMIC BENEFITS

During the 2015 Pan Am and Parapan Am games, the aquatics centre and field house represented Toronto on an international stage as a world-class facility and contributed to our social quality of life. While grand in stature, the facility was accessible and hospitable through its openness and transparency. With a spectator capacity of 6,000 for the main competition pool and 2,000 for the field house, it provided a space for engaging the local community, connecting and inspiring the audience through sport. The centre was host to Pan Am competitions including diving, fencing, modern pentathlon, speed skating (roller sports), swimming, and synchronized swimming, as well as the sitting volleyball and swimming competitions of the Parapan Am games.

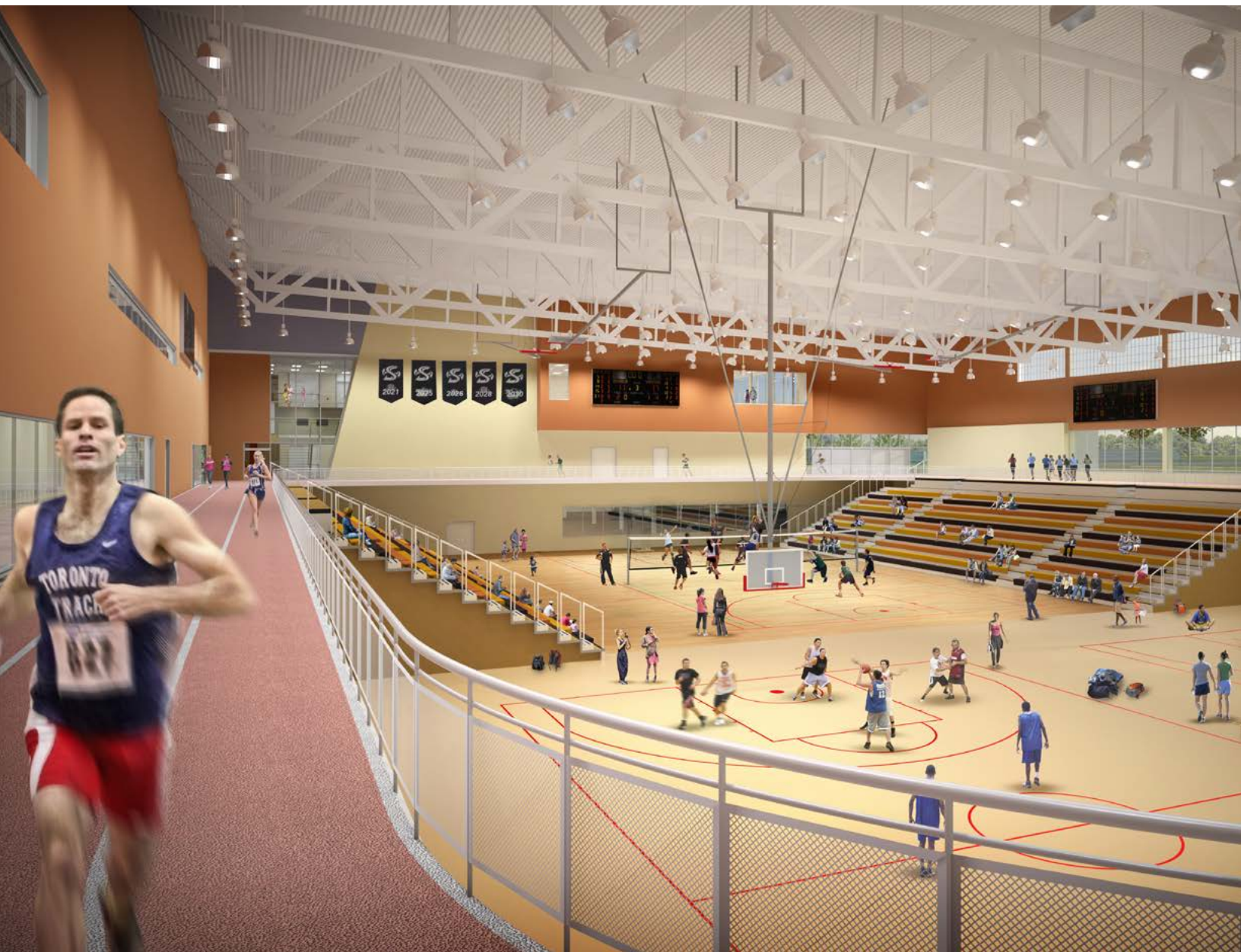
Since the games, TPASC has offered sports and physical activity programming for community residents; university students, faculty and staff; as well as training athletes. From September 8 to December 31, 2014, the centre received 188,928 visits and membership almost tripled, from 603 to 1,825. More than 25 types of distinct programs are offered, serving over 6,000 participants. TPASC also houses the head office of the Canadian Sport Institute of Ontario (CSIO). Here, the CSIO provides sport science and sport performance services, delivering programming to over 600 athletes and 100 coaches. With these kinds of figures, the centre is well on its way to achieving its mission of delivering “an inspirational and responsive experience in recreation and sport to communities through collaboration among the City, the University, and high-performance sports” (2016 – 2018 Strategic Plan, TPASC).



ENVIRONMENTAL BENEFITS

The TPASC demonstrates a serious commitment to energy efficiency, environmental stewardship and the well-being of its occupants. The building is estimated to achieve an energy cost reduction of 54 percent energy savings (40 percent energy cost savings) compared to the MNECB baseline, by using a variety of energy conservation measures: ventilation air heat recovery at 50-70 percent effectiveness, high efficiency boilers and chillers, high performance ground source heat pumps, variable speed drivers on all pumps, efficient pool dehumidification systems, and low LPD lighting with occupant controls. Renewable energy plays a big role in the building's design as well, with a 500-kilowatt solar photovoltaic array on the rooftop accounting for almost 8 percent of the building's energy costs. The roof is also covered with a 60,000-square-foot green roof to minimize the urban heat island effect. Other environmentally friendly design components include: carpool parking spaces and a carpool management plan, low-flow fixtures in all the washrooms, and a cistern to collect rain water for site irrigation. The low-flow fixtures reduce water usage by 37 percent compared to the baseline and, as a result of the underground rainwater cisterns, no potable water is required for landscape irrigation.

An impressive 95 percent of all construction and demolition was diverted from landfill through recycling, reuse, and composting. Additionally, 35 percent of the combined value of all project materials consisted of recycled material, and 42 percent came from regional materials, minimizing the consumption of energy associated with transportation.





MEETING CLIENT'S NEEDS

Among the most important achievements of the project was meeting the LEED Silver energy target. WSP provided comprehensive Green Design Management Services, including LEED and Toronto Green Standard consulting, energy modeling, and design feedback and support. Through these services, WSP exceeded the client's goal to achieve LEED Gold certification. The project also complies with The Toronto Green Standard with a green roof over 30 percent of its area.

Durability was a second important project objective. Not only was the venue created to play a fundamental role in the Pan Am and Parapan Am Games, it was also designed to remain a world-class facility for years to come. To ensure durability, WSP was retained to provide early cladding design advice. To improve metal wall/roof component durability, several cost-effective strategies were presented.

Considering the athlete and spectator experience of the Toronto Pan Am Sports Centre was imperative. The objective was to provide an environment that is conducive to competition and observation. To control glare and condensation, WSP used thermal and day lighting modeling to inform critical strategies within competition spaces.

