



2017 Ontario Consulting Engineering Awards  
Category A | Buildings

## Mattamy National Cycling Centre

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ARUP





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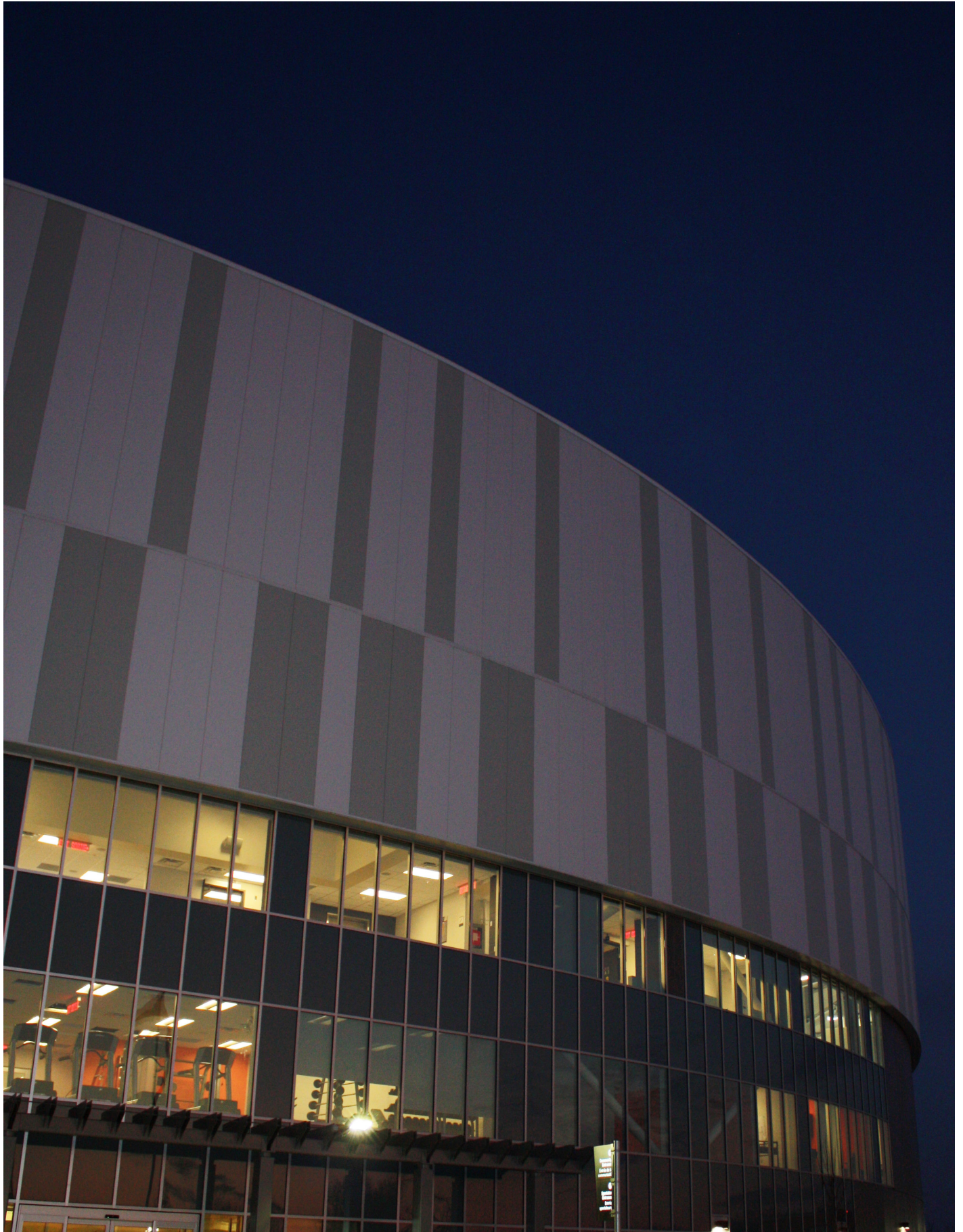
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The Mattamy National Cycling Centre - the fitness centre - by night



# Project Information

<b>Project Name</b>	Mattamy National Cycling Centre \ Cisco Milton Pan Am/Parapan Am Games Velodrome
<b>Project Location</b>	Milton, Ontario
<b>Project Size</b>	1500-seat velodrome, 2500 seats for games, 8,264m2 occupied area
<b>Year Completed</b>	2015
<b>Entering Firm</b>	Arup
<b>Project Partners</b>	Infrastructure Ontario (Owner), Cannon Design (Architect), Faulkner Brown Architects (Track Design), Morrison Hershfield Ltd. (Civil Engineering), Bouygues Building Canada/Kenaidan Joint Venture (Design-Build Contractor)
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Cisco Milton Pan Am/Parapan Am Games Velodrom at game time ©Arup





Cisco Milton Pan Am/Parapan Am Games Velodrome at game time ©Arup



# Project Summary



Cisco Milton Pan Am/Parapan Am Games Velodrome at game time ©Arup





The Mattamy National Cycling Centre © mattamynationalcyclingcentre.ca



# Innovation



As the first-ever International Cycling Union-regulated, Class 1 indoor velodrome in Canada, the design team had their work cut out for them in terms of creating effective, unique designs. Working closely with IO's specifications, Arup and our design partners were able to leverage international design experience to provide a number of design innovations for the MNCC.

The velodrome's heating, cooling and ventilation designs are unique. The velodrome's 250-metre indoor track is made of wood, and temperature and humidity levels can have a great effect on cyclist speed, so 'getting it right' was essential for a world-class competition venue.

Looking from the athletes' point of view and considering their needs, our engineers designed mechanical systems that minimize air movement and reduces drag effects to allow cyclists to maintain balance. At the same time, spectators and athletes are all housed together in one open space, so designs need to address spectator comfort. The design team successfully addressed this through automated controls and air diffusers in the ventilation system for both the infield and spectator areas, which helped to minimize excessive drafts in occupied zones for the greatest occupant comfort, while keeping optimal conditions for the track.

The lighting design took special consideration to eliminate glare and flicker for the comfort and safety of the athletes and spectators, while maintaining the high light levels required for televised broadcast. The lighting and power systems are also expandable to accommodate the more stringent requirements of international cycling events.

The cabling pathways for use by the TSR systems have been designed with flexibility in mind. With multiple access points throughout, locating TSR equipment can be done with ease while meeting event requirements.




Cisco Milton Pan Am/Parapan Am Games Velodrom at game time ©Arup







# Complexity



“The Mattamy National Cycling Centre is unique in both its design and the diverse nature of the activities that we offer...I’m more than pleased to say that the facility is already a highly successful attraction for many, whether they are international, national, provincial or our very own Milton residents.” Milton Mayor Gord Krantz

The building’s unusual oval shape posed a challenge for the design of electrical and IT cabling and mechanical ductwork, in that they needed to follow the form of the building without conflicting with structural and architectural elements. To address this, the team successfully used three-dimensional drawings (or Building Information Modeling, otherwise known as BIM) to coordinate the design of services within the overall structure. The use of BIM also allowed the team to design around a number of internal building constraints, like confined space below spectator seats, and areas with low ceiling spaces.

The sports lighting design was done by a third party designer, so coordination was required to ensure the appropriate BIM model was being used in order to mitigate the possibility of conflicts with the other building services. While Arup routinely designs in three dimensions, the BIM model in this case was much more complex than is typical due to its shape and constrained space, making it a challenge to coordinate with the lighting designer.

Event lighting needed to be designed with stringent uniformity along the track, with special focus on the finish line, to avoid shading and allow capturing high resolution images. Also, the event lighting auxiliary equipment (drivers, batteries) needed to be located close to the lighting itself, yet in a place that is easily accessible for maintenance.

In addition, designs needed to address critical backup power requirements to allow events to continue on without interruption in case of a power outage, and address local building code regulations, while allowing enough free space inside the velodrome’s ceiling for any temporary power services to be installed. Designers then aligned the main power service rooms to outside parking spaces to allow for easy and quick connection to temporary power generators on trucks, if needed, on event days.

Again, due to the shape of the facility and limited space outside of publicly accessible spaces, finding space to install conduits to meet the extensive data, voice, broadcast, TSR, and security cabling requirements was extremely challenging. Through extensive discussions with the architect, intelligent use of the 3D BIM model, and user groups we managed to find space for all required cabling pathways while keeping them out of sight of the patrons.



## Social and/or Economic Benefits

“This is the first opportunity we’ve had in over three decades to have our own place, to have a home for high-performance and national team growth.” Cycling Canada chief executive Greg Mathieu (Globe and Mail Aug. 25, 2015)

### Social

The post-Games (or “legacy”) uses of the facility provide many social benefits and enhanced quality of life and encouragement of involvement in healthy lifestyles.

The MNCC is the only practice track in Canada designed to an international competition standard that can be used by Canada’s elite athletes for training. In fact, before the Games, Team Canada athletes were required to travel to Los Angeles for training much of the year, without family and friends for support. According to reports, the ranks of elite cyclists on Team Canada has tripled since the games.

The venue is now home to the country’s national cycling team, is being used as a satellite training facility for the Canadian Sport Institute Ontario, and the Milton Cycling Academy, who is providing “ride the track” opportunities for the community.

The velodrome also provides valuable community space for the rapidly growing municipality of Milton. The facility is host to a fully-equipped fitness centre, spinning classes, a running track, basketball, badminton, floor hockey, volleyball and lacrosse programs; as well as “learn to cycle” and school programs, corporate sessions, and drop-in cycling programs

It contributes to the Ontario government’s initiative to promote cycling by providing a year-round facility to encourage the sport and an active lifestyle.

### Economic

The Pan Am Games themselves had a positive impact on the Ontario economy.

According to a report by Moneris Solutions Corp. from July 31st, 2015, “overall spending in downtown Toronto grew 7.71 per cent during the period of the Pan Am Games (July 10-26) compared with the same period last year.” In addition, the report outlines spending increases in areas surrounding the venues. Specifically, “Spending in Milton, the site of the newly built Pan Am Velodrome, increased 13.80 per cent during the three days of cycling track events (July 16-19), compared with the same period last year.”



## Environmental Benefits

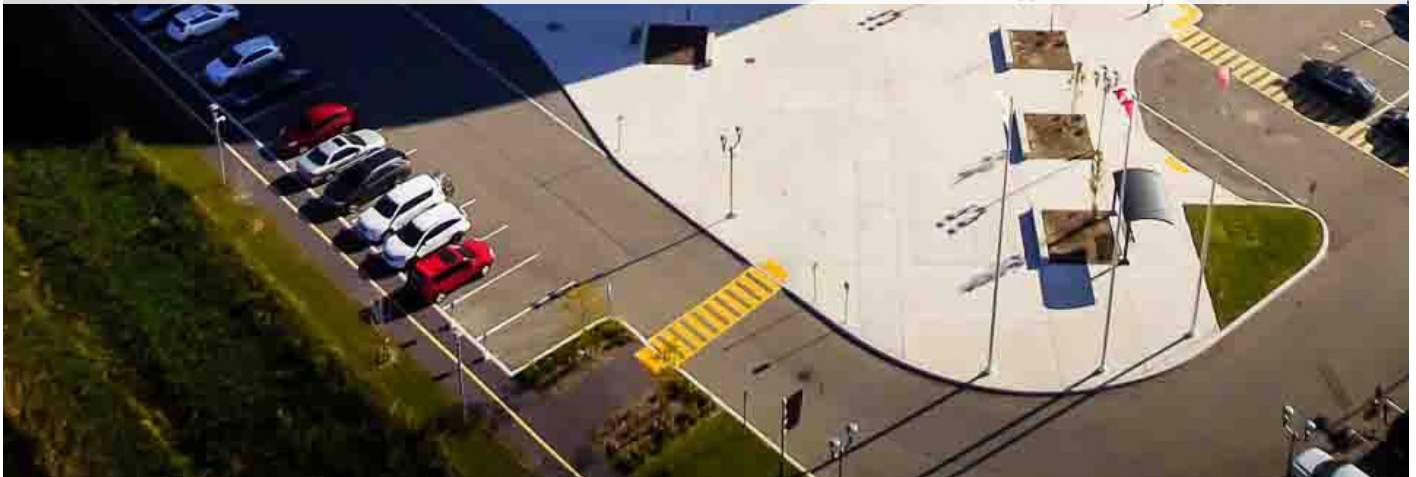


The facility is a certified LEED Silver building, demonstrating sustainability with erosion and sedimentation control; alternative transportation, such as carpooling and electric vehicle charging; high efficiency water fixtures; a shared storm water management pond and a highly reflective roof membrane. The landscaping strategy incorporates native and adaptive plantings, with no permanent irrigation system. Strategies to improve energy usage resulted in a 44% cost savings, according to the Modern National Energy Code for Buildings. (pedalmag.com).

The electrical design incorporates dynamic power factor correction to maximize the facility's energy efficiency. The distribution system is designed with low voltage step down transformers that meet the National Electrical Manufacturers Association (NEMA) Premium Efficiency Transformers program. Lighting control is provided throughout the building to provide flexibility for occupants and minimize energy usage when a space is unoccupied. In addition, the design incorporates demand metering, which provides opportunities of continuous improvement in the facility's energy use and efficiency.

The mechanical design took advantage of diffusers with modulating vanes used to match seasonal requirements for proper mixing of air, increasing overall ventilation effectiveness and comfort for the users. The result is better mixing in the space and less outside air volume required at the air handling unit (AHU), and consequently less energy for heating/cooling of outside air. High efficiency carbon filters used for the kitchen exhaust, result in less odour pollution to users outside. A combination of condensing and cast iron boilers used to achieve maximum system efficiency at any given load, decrease the annual energy usage. During the summer months, dedicated small boiler for domestic hot water (DHW), results in a more efficient system and less energy usage.

Arup is pleased to have been responsible for the centre of excellence for competitive cycling in Canada. Not only have our athletes been provided a modern and innovative facility for professional competition, the local community is benefitting significantly by this new addition to the Town of Milton.



Cisco Milton Pan Am/Parapan Am Games Velodrome © Arron D TV



## Meeting Client's Needs

The design delivered a flexible, easily maintainable facility – one that provides access to activities that promote a healthy lifestyle - for the Town of Milton. It can also be easily transformed back into world-class event space that meets international standards.

Achievements include:

- The design of the facility required a unique appreciation of the science and the sport of cycling
- The building services (electrical, heating ventilation and cooling) were designed to meet a Category 1 Velodrome
- Both environmental and physical factors were critical, and sometimes in conflict
- Humidity and temperature levels had to be considered as these affected track speed
- Mechanical systems were designed to minimize air movement and reduce drag effects to allow cyclists to maintain balance
- Track and seating lights were positioned to avoid glare.
- Windows for daylight helped to reduce operating costs and energy usage during training sessions while at the same time were carefully positioned to avoid track glare and uneven lighting during competition
- Electrical system design included event lighting to meet TV requirements, public address system, and high quality music systems used for specialist cycling events, and power and data for timing, scoring, and results (TSR) and to meet special requirements during sporting events



©Anthony Branco



Front Cover/ Velodrome ©Harold Clarke Photography  
Back Cover/ Velodrome ©Harold Clarke Photography



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