aquatic facilities Case Study

BUILDING THE UBC AQUATIC CENTRE

AN INNOVATIVE FACILITY EQUIPPED WITH MULTIPLE SUSTAINABLE FEATURES

The University of British Columbia (UBC) Aquatic Centre is a modern competitive and recreational aquatic facility that was designed and built by a team of consultants and contractors working with UBC and UBC Properties Trust.
Photo by Alex Chou/ AME Group

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The state-of-the-art University of British Columbia (UBC) Aquatic Centre, which opened earlier this year, is a modern competitive and recreational aquatic facility that was designed and built by a team of consultants and contractors working with UBC and UBC Properties Trust. The facility represents a unique hybrid aquatic complex that brings together the programmatic uses of competition, community, and campus life.

The swim programming at the university is one of the highest achieving programs in the country. In fact, UBC sent more athletes to the 2012 Olympics than any other location in Canada. It is also located within one of the fastest growing communities in the province's Lower Mainland for families and students thanks to the development and growth of the surrounding Endowment Lands.

Located in the heart of the re-envisioned 'Student Precinct' at UBC's Point Grey campus, the aquatic centre commands an open and engaging urban building design to draw in casual and recreation-based student use, whether for swimming, socializing, or spectating. The building fronts the newly designed Transit Arrival Plaza—the daily arrival and departure point for half of the university's 50,000 students who attend this campus. The aquatic hall is a gateway building, providing a warm welcome to students entering the campus. Combining these three programming goals of competition, community, and campus within a single aquatic centre was the driving force behind the design, making this building unique within North America.

INSIDE INFORMATION

A central light well and light diffusing screen conceptually and physically separate the competition and community sides of the natatorium while delivering controlled natural daylight to the centre of the plan. Exterior ramps and plazas on the north and south façades follow the slope of the land and slowly rise to the level of the

THE UNIVERSITY OF BRITISH COLUMBIA (UBC) AQUATIC CENTRE COMMANDS **AN OPEN AND ENGAGING URBAN BUILDING DESIGN** WHICH DRAWS IN CASUAL AND RECREATION-BASED STUDENT USE.

bleachers allowing for strong visual connectivity and light to the aquatic hall and access for spectator events, or for casual use of the bleachers without having to pass through the lobby. This creates flexible campus space where students and community members can gather while also limiting interference with the operation of community or competition programming.

The floating white roof has a ribbon of glazing that wraps the facility allowing for even light and unobstructed views of the pool environment. The interior of the tessellated roof form is a high-performance acoustic ceiling that provides a unique environment where teaching and coaching can take place alongside high volume leisure activities. The aquatic centre allows toddlers and athletes to thrive side-by-side, making this space an open and inviting asset to the quality of the student experience on campus.

The 8000-m^2 (79,000-sf) facility includes a 50-m pool, a 25-m pool, a leisure pool, hot tub, steam room, sauna, viewing decks and spectator areas, change rooms, meeting rooms and wet classrooms, and a food and beverage kiosk to meet the needs of students, faculty, and the community.

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Photo courtesy MJMA & Acton Ostry Architects

Feature focus

The 50-m pool is designed to Canadian and international competitive swimming standards. It has a movable bulkhead that permits swimming competitions in either a 50- or 25-m configuration in the same orientation, which allows for enhanced viewing from the 460-seat spectator area. Since the pool is 25-m wide, it provides 20 lanes of cross-course training. Further, the facility has a dual-timing system to accommodate two simultaneous 25-m events for large meets.

Beside the 50-m pool is the 8-lane, 25-m lap pool which is available for swimming instruction, as well as lap and recreational swimming. It can also be used as a warm-up pool for major aquatic events. It is designed to accommodate a future buoyant floor system, which will be capable of adjusting the pool's depth from zero to 3.5 m (zero to 11.5 ft). An additional feature included with the 25-m pool is a Tarzan swing for bather enjoyment.

The leisure pool includes water features such as geysers, two floatables for climbing, bubble benches, a basketball hoop complete with a 7/8 scale foul line and three-point markings, and a current channel commonly known as a lazy river.

The UBC Aquatic Centre is a fully accessible facility. Even the 30-person hot tub is the first in the province to be fitted with an aquatic elevator, enabling seniors and the mobility impaired to appreciate the relaxing and therapeutic benefits of this amenity.

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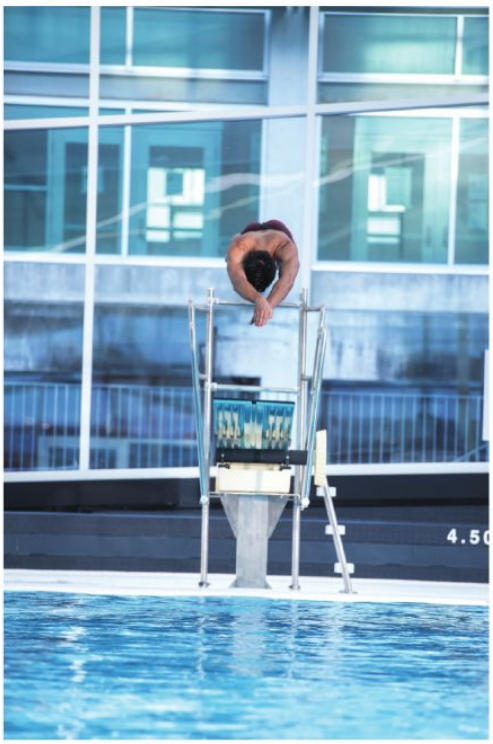
Photo by Paul H. Joseph

To enhance swimmers' overall experience and enjoyment, the UBC Aquatic Centre is equipped with the latest water



The 50-m pool is designed to Canadian and international competitive swimming standards.
Photo by Paul H. Joseph

A central light well and light diffusing screen conceptually and physically separate the competition and community sides of the natatorium while delivering controlled natural daylight.
Photo by Ema Peter

treatment and filtration systems. In fact, the advanced filtration system implemented at this facility exceeds local health authority requirements. While most pools traditionally use sand filters, this aquatic centre uses regenerative media filters which require less space and are capable of removing material from the water from as small as one to five microns. This debris is much smaller and invisible compared to the average 12 to 15 microns of material that a sand filter can remove. The more material removed from the pool, the better the water quality is and, consequently, fewer chemicals are needed to treat the water.

Further, the water consumption needed to maintain a sand filter is much greater than what is used for a regenerative media filter. When it comes to backwashing, one case study has shown regenerative media filters use only eight per cent of the amount of water a sand filter requires to perform the same task.[1] Therefore, regenerative media filters can reduce water consumption by 92 per cent.

WATER CONSERVATION A TOP PRIORITY

The university is recognized as a leader in sustainability and the UBC Aquatic Centre serves as a showcase project for water conservation and water recycling strategies. Sustainable methods implemented at this facility to reduce water consumption include low-flow plumbing fixtures that reduce annual potable water demand by 47 per cent and the installation of rainwater harvesting systems.

Considering Vancouver's wet climate, it made sense to implement a rainwater harvesting system that collects water from the roof of the UBC Aquatic Centre and stores it for use in a below-grade 900-m^3 (31,783-cf) cistern. Rainwater collected from the roof passes through multiple stages of filtration prior to its use in the facility. First, the water undergoes a pre-filter treatment before entering the cistern, followed by cartridge and ultraviolet (UV) treatment for use in irrigation, toilet flushing, and topping up the pool. The recycled rainwater is introduced into the pool via surge tanks where it is subsequently circulated through the filtration system where it receives further UV and chlorination treatments.

Typically, a large volume of potable water is required to make up what is lost through evaporation. Thanks to the harvesting system, the UBC Aquatic Centre can collect approximately 2.7 million litres (593,917 gallons) of rainwater annually for re-use with its current roof collection area. The system is also designed to allow for future neighbouring buildings to divert rooftop rainwater to the cistern for use at the aquatic facility.

Rising to the challenge

In terms of implementing the use of recycled rainwater, the main challenge the designer of the facility's plumbing, heating, ventilation, and air conditioning (HVAC), and pool's filtration and disinfection systems faced was addressing the concerns of Vancouver Coastal Health. After

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several months of review and ensuring the rainwater collection surface would not contaminate the water, along with the implementation of multiple water treatment stages, the health authority approved the use of the rainwater harvesting system for pool water make up.

The building's HVAC system is designed to maintain the space temperature, humidity ratio, and temperature in the natatorium, while at the same time provide better air quality for the comfort of the occupants. Air in the natatorium is changed more than six times per hour via two air handling units that have the capacity to provide 100 per cent outdoor air and dehumidification to maintain the relative humidity inside the facility at 60 per cent or lower. The designer worked with the architect closely to layout supply air diffusers that fit in with the architectural ceiling with low-level return at the four corners of the natatorium to ensure air circulation throughout the facility.

Two innovative features that provide enhanced air quality in the natatorium, and thereby a better experience for swimmers and staff, is the trichloramine exhaust system

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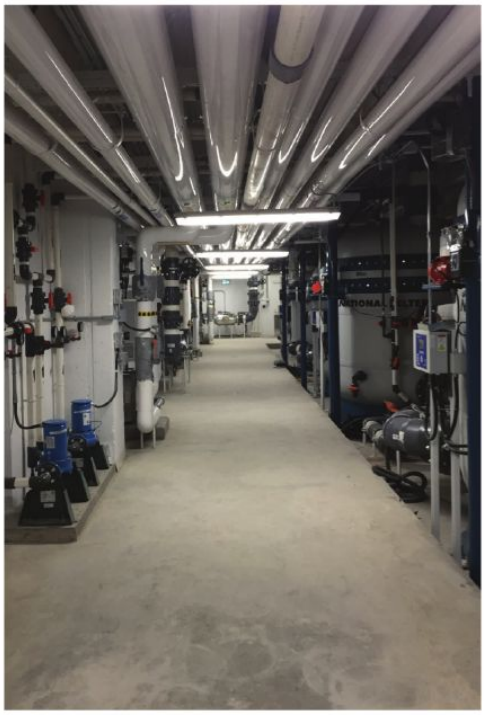
Photo by Ema Peter



The change rooms and basement pool mechanical room are also designed to maximize better air quality by using a heat recovery ventilator (HRV) that supplies 100 per cent outdoor air to these areas.
Photo by Alex Chou/ AME Group

Photo by Ema Peter

which uses a modern approach in pool design to exhaust this disinfection byproduct from the pool perimeter, while a separate system provides 100 per cent outdoor air to the natatorium via a displacement ventilation system.

The low-level displacement ventilation at the pool deck level with the pool gutter trichloramine exhaust allows ventilation an access to the pool surface to assist with the extraction of trichloramines. The university is performing an ongoing study to analyze the effectiveness of the trichloramine exhaust system implemented at new pool facilities.

AIR HANDLING IS SECOND TO NONE

The change rooms and basement pool mechanical room are also designed to maximize better air quality by using a heat recovery ventilator (HRV) that supplies 100 per cent outdoor air to these areas, which is pre-heated by reclaiming heat from the exhaust.

Although it is not the building's only source of heating, the aquatic centre also connects to UBC's award-winning District Energy System (DES), which provides building heat, as well as pool and domestic water heating. The facility has a chiller plant that supplies chilled water for dehumidification of the natatorium and cooling for the administration area. The hot water byproduct of the chiller plant—which would normally be rejected into the atmosphere—is reclaimed and injected into the heating loop that provides heat for the building, pool water, and domestic hot water. BC Hydro energy model results indicate the heat rejected from the chiller plant supplies more than 90 per cent of the total heating demand for the building.

Thanks to its impressive range of innovative sustainability, water-conservation, and energy-saving measures, the UBC Aquatic Centre is registered for—and on target to achieve—Canada Green Building Council's (CaGBC's) Leadership in Energy and Environmental Design (LEED) gold certification. Further, UBC is recognized among the world's top universities for adopting the most aggressive targets for reduction of greenhouse gases (GHGs) and this aquatic complex fulfils this mandate with its leading-edge technology to reduce its carbon footprint.

Authors' notes: The UBC Aquatic Centre's design team was led by the architectural joint venture of MacLennan Jaunkalns Miller Architects (MJMA) and Acton Ostry Architects. The AME Consulting Group Ltd. (AME Group) designed the facility's plumbing, heating, ventilation, and air conditioning (HVAC), as well as the pool filtration and disinfection systems. Water Technology Inc., designed the pool tanks, AES Engineering (AES) provided electrical design consulting, and Equilibrium Consulting Inc., was the structural engineer on the project. The construction manager was Heatherbrae Builders and Daryl Evans Mechanical Ltd., was the mechanical contractor.

This article was compiled with additional assistance from Ted Watson, architect AIBC, AAA, OAA, SAA, MRAIC, LEED AP, partner, MacLennan Jaunkalns Miller Architects (MJMA).

Exterior ramps and plazas on the aquatic facility's north and south façades follow the slope of the land.
Photo by Ema Peter

NOTES

[1] See Steinbach, Paul, "Regenerative Media Filters Considered the Wave of the Future" (April 2008), published by AthleticBusiness.com. For more information, visit http://www.athleticbusiness.com/aquatic/regenerative-media-filters-considered-the-wave-of-the-future.html. (Accessed July 19, 2017).

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