



TRCA Staff Study Visit to Ireland

October 1-4, 2019

In July 2019, Toronto and Region Conservation Authority (TRCA) received an invitation from Enterprise Ireland, the trade and investment arm of the Republic of Ireland, to send members of the new head office project team to Ireland on an all-expenses-paid study tour. The purpose of the visit was to showcase the work of the lead architect, Bucholz McEvoy, as well as the technology of a variety of other Irish firms on TRCA's head office project. For Enterprise Ireland, this was an opportunity to share knowledge on Irish construction projects, technologies, and practices. For TRCA, it was an opportunity to see firsthand the operation of technologies included in the design of the new building.

Two TRCA staff participated in the study: Jed Braithwaite, Manager, Major Contracts, and Bernie McIntyre, Senior Manager, Corporate Sustainability and Community Transformation. Additionally, the study included two members of the external project team working on the new building: Mike Adams, Project Construction Manager, Eastern Construction, and Peter Duckworth-Pilkington, Principle with ZAS Architects + Interiors in a joint venture with Bucholz McEvoy Architects. Study members arrived in Ireland on October 2, 2019, and were given tours by Merritt Bucholz and Karen McEvoy. What follows is a synthesis of the learnings, an overview of the locations visited, and the Irish companies met.

SYNTHESIS OF LEARNINGS

The design strategies employed for TRCA's new head office were evident in all of the buildings visited during the study visit. Some of the common strategies observed included:

- Building orientation to support the use of natural resources such as solar thermal, and natural lighting, ventilation, and views to minimize the impact on the landscape
- Support for healthy interior environments with natural daylight and ventilation
- Decreased energy consumption through orientation and design of the facade to preheat the air and enhance airflow to reduce the need for mechanical ventilation
- Incorporation of green roofs and renewable energy
- Double skin and winter gardens on south walls to preheat and distribute ventilated air
- Interior and exterior blinds to manage incident radiation and glare
- Large wood beams as structural and aesthetic elements
- Extensive use of wood for floors walls and ceilings
- Pre-fabrication of building cladding to provide superior construction and on-site efficiency
- Use of employee-managed ventilation in combination with a building automation system of managed ventilation
- Employee training and standard operating procedures to prevent employee conflicts regarding ventilation, temperature, and comfort

The team was impressed with the pride building managers took in their buildings and the respect shown for the architects' work. Some issues were noted concerning the exterior blinds being fully exposed to the elements and needing ongoing maintenance. Exterior blinds, protected by the double facade and accessible through both the interior and exterior of the building for regular maintenance or replacement, will be installed in TRCA's new administrative building.

Several building managers indicated that they recommended informing staff on how the building would be operated and why. They also emphasized that it was essential to demonstrate that the building was within the design criteria to avoid conflict.

The team observed one key difference between the tour sites and the TRCA design - the HVAC systems of the tour sites use a building automation system (BAS), combined with staff-operated windows, to provide ventilation. The BAS system operates windows to manage temperature and CO2 levels within the buildings, and staff operate the windows based on comfort and perceived air quality. For TRCA's new administrative building, staff will be required to operate the windows for temperature control and CO2 management, principally in the shoulder seasons (spring and fall), and all year for individual comfort and perceived air quality.

Operable windows that permit the use of natural ventilation to minimize the use of mechanical ventilation and reduce energy use and GHG emissions are essential elements of the design. Should staff fail to open windows when required, the automated system intervenes to maintain the building within established temperature and CO2 levels. Although energy use and GHG emissions increase as a result, the building continues to operate within set parameters.

Achieving the modelled low energy consumption for the building will require that staff are trained to operate the windows. This shift will take some time and a concerted effort over the first year or two of building occupancy, followed by periodic, ongoing engagement of staff. Operations staff will also need to be trained to ensure that windows are not left open or closed at the wrong times.

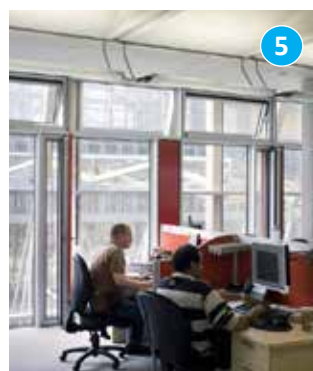
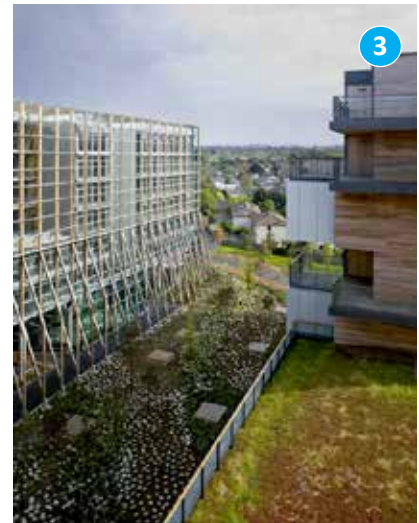
Further, the staff noted that the temperate climate of Ireland allowed the designers to maximize the "passive" techniques to minimize the use of HVAC systems. However, the Toronto climate of hot, humid summers and cold winters means that other methods need to be included in the design to bolster the "passive" techniques during the non-shoulder seasons. For example, TRCA's new administration building calls for large ceiling fans, which were not observed by staff in any of the buildings in Ireland, as a method to create a sense of cooling in the summer.

The following are short descriptions of the buildings and companies involved in the study visit:

Elm Park

Elm Park is a 100,000 m² mixed-use, private development which includes commercial offices, residential, a hotel, social housing (seniors), a hospital/medical clinic, a leisure centre, parkland, and extensive underground parking. The project was started in 2004 and was nearly complete by 2008 when it went into receivership. The project was purchased out of receivership in 2014 and is now substantially complete. The project was nominated for 12 national and international awards between 2006 and 2009. The six photos below show:

1. An aerial view of the development site
2. A closer look of the double-skin facade
3. A view of a green roof and the south-facing, double-skin facade
4. A close-up of one of the large office buildings
5. Natural lighting for the office spaces
6. Building and staff-operated ventilation as well as building-operated internal blinds to reduce glare



Ballyogan Operations and Maintenance Building

The operations centre at Ballyogan is comprised of a new, three-storey office building, a maintenance/salt storage utility building and storage yards and is the first step in creating a new civic domain on the site of the former landfill at Ballyogan. It is an integral part of a larger design strategy for the area which seeks to reconnect and link the adjacent suburban areas back to the foothills of the Dublin Mountains. It was also the ambition to provide excellent facilities for staff to create an effective platform for delivering better service to the public. The office building is composed of three narrow floor plates made entirely of timber. These floor plates are stacked on top of each other to create a passively designed, low-energy, naturally ventilated building that maximizes passive energy sources. This building received recognition in the best public building and sustainability category in the RIAI Irish Architecture Awards 2013. The six photos below illustrate:

1. The main office building and the double-skin facade
2. The open office space with natural lighting and exposed wood
3. Staff-operated ventilation with building-operated ventilation above
4. Sliding doors for ventilation and maintenance access to the facade
5. A close-up of the double-skin facade
6. A wetland feature for stormwater next to the office building



Samuel Beckett Civic Campus

Samuel Beckett Civic Campus is a vibrant, diverse community on an 18-acre site along Ballyogan Road, in South County Dublin. The sustainable design approach incorporates natural daylighting and ventilation strategies, along with the use of natural materials to create and promote healthy environments. The building orientation has been optimized to benefit from passive solar gain to reduce energy load and wind direction and enhance natural ventilation. Natural, cross-ventilation of internal spaces is optimized with ventilation openings on the external facades and roof. These are strategically placed for this purpose, including high floor to ceiling dimensions, to enhance air movement.

Natural daylighting of the internal spaces and the facade of the building has been maximized to minimize the dependence on artificial lighting while incorporating different degrees of screening and solar protection. The use of naturally occurring energy sources has been optimized with the installation of photovoltaic cells on the roof to harness solar energy. Passive wind energy is used to enhance natural ventilation, and windmill turbines, adjacent to the synthetic pitches along Ballyogan Road, take advantage of south-westerly winds.

The primary material of the Civic Campus buildings is wood, which provides a human scale and proportion, as well as robustness, that is appropriate to their use. Wood was used as the primary material for the facades and upper structure of the buildings, imbuing them with the psychological benefit of warmth, colour, and the aroma of wood.

The four photos below illustrate:

1. A distance view of the main building
2. A close-up of the exterior showing the prefabricated exterior wall elements
3. An atrium with extensive natural light and wood
4. A program space with hybrid timber and concrete structure and an inside view of prefabricated exterior wall elements

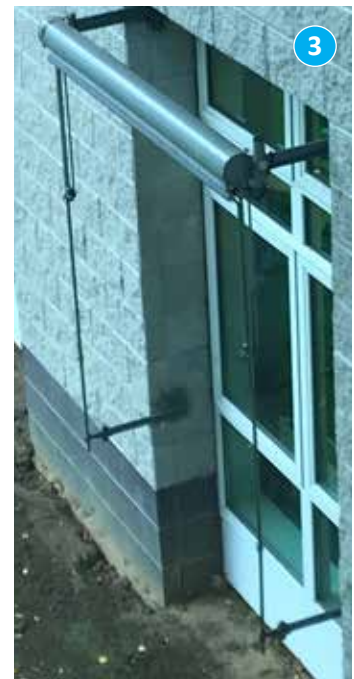


SAP Building, Citywest Dublin

The SAP office was an interesting variation from the other buildings we toured. While all other buildings were new-builds, the SAP building was a retrofit of an existing standard commercial office building. SAP hired Bucholz McEvoy to apply its principles of good building design to enhance the work environment for employees. Because the project was a retrofit and SAP was a tenant rather than the owner, the project focused on ventilation, natural lighting, office furniture, and layout. The project included the creation of cross-ventilation with BAS and staff-operated windows, retractable exterior blinds to control incident sunlight, and moveable interior screens to manage glare. Meandering wood desks, cloth screens, wood trim, and reflective lighting created an inviting work environment. SAP management was delighted with the performance of the building. The six photos provide:

The four photos below illustrate:

1. An aerial view of the facility and its overall nature as a basic commercial office building
2. The exterior of the building with exterior retractable blinds to control solar radiation
3. A close-up of a retracted blind
4. Building-operated ventilation above, and staff-operated ventilation below
5. Natural lighting in the office space and warm wood desks
6. Extensive wood in the cafeteria with natural and reflected light fixtures



GEM Joinery Workshop

GEM Joinery was founded in 1978 and has become a leading specialist architectural joinery company. The company has a full in-house design and scheduling facility, combined with a state-of-the-art 25,000 sq/ft manufacturing floor and a fully automated spray line. GEM Joinery sources only timber from sustainable sources, and it currently holds both FSC and PEFC chain of custody certification.

GEM is one of Ireland's first organizations to transition to the new ISO 45001 Occupational Health and Safety standard. It operates an Integrated Management System which is externally audited and certified by the NSAI to ISO 9001, 14001, and 45001 international standards.

GEM prefabricated the exterior wall components for the Samuel Beckett Civic Campus, building the units off-site in its shop, then transporting and craning them into place and finishing them on-site. The design team is investigating a similar prefabrication process for the TRCA administration building. GEM designs and manufactures its tools and connectors in its workshop, which allows it to create very complex joints and hangers.

Staff were impressed to see a solid hardwood fire door with a one-hour fire rating based on the joinery. The four photos below illustrate:

1. The tools cut on-site
2. The storeroom of all tools for all projects
3. Simple joinery
4. Complex joinery



Westmeath County Buildings

This project is a low-energy Civic Office Headquarters and Public Library for Westmeath County Council, in the centre of Mullingar town. Due to its location on a historic site, the project carefully incorporated and renovated several protected structures and buildings over archaeological remains. The design solution brings new energy and civic values to the site, carefully weaving the historical and urban context to creating an ensemble of new and old buildings. Internally, it is a sculpture of light, constructed primarily with glass, timber, and concrete; externally, an open and transparent expression of local government. The two photos illustrate:

1. The exterior of the office space and library with a double-skin facade and large exterior wood beams for structural support and aesthetics
2. The central entrance atrium for preheating and access to natural light



IRISH COMPANY PRESENTATIONS

Cylon

An industry leader in the development and manufacturing of smart energy management systems for more than three decades, the company has provided building automation and control solutions and is one of the largest independent, global manufacturers in the industry. With a network of system integrators, Cylon is committed to delivering sustainable solutions to provide comfort, energy, and operational efficiency to commercial buildings, schools and universities, healthcare facilities, and retail buildings. <http://www.cylon.com/>

Smartglass

Smartglass specializes in the development of three types of electronically switchable glass: privacy, solar, and blackout. Switchable privacy glass is used in partition screens, windows, roof-lights and doors, security and teller screens, and as an HD projection screen. Solar control glass controls solar glare and has been shown to reduce thermal transmittance through a glass facade to directly cut down on associated HVAC costs. Blackout glass provides complete privacy and light control at the flick of a switch. <http://www.smartglassinternational.com/>

EcoVolt

EcoVolt develops and integrates products that support near-zero energy buildings. Some of the products and systems it incorporates include solar panels, radiators, EV chargers, battery storage units, and paint-on radiant heating systems. <http://ecovolt.ie/>

GoContractor

GoContractor is a software as a service company that provides online contractor orientations. Utilization of a cloud-based data storage and retrieval system permits the online training of workers and verification of completed training. <https://gocontractor.com/>

Zutec

Zutec is an online, advanced construction data platform. The system allows for onsite access to building information models, site drawings, reports, asset information, and project data. The platform provides full building life cycle software solutions for projects, and it is easy to use, with clear and concise information. <https://www.zutec.com>

Saragossa Software

Saragosa Software is a university-based startup software company that is developing a simplified model to allow architects to evaluate the energy effectiveness of their building designs.