

Project Introduction

Project Summary

This project design pertains to a proposed four-storey office building at 101-111 Gerrard St. E., located in the heart of Toronto's downtown core. The area provides many challenges, mainly a harsh environment and low daylight exposure, when constructing an office space in a sustainable and efficient manner.

The property is owned by Ryerson University, and thus the building would be aimed to provide high-quality office space which would be used for administration and faculty offices. The goal of this building is to maximize productivity through workspaces that promote human wellbeing. Ryerson is in a dense area of the city and in urgent need of additional floor space. The surrounding area has seen 10.5% growth in population from 2011 through 2016, exceeding double the average rate of Toronto during that period (City of Toronto Planning, 2018). This expansion further points to the need for the creation of appropriate workspaces in the district while the city continues to grow and densify. By designing an innovative office building that can achieve low or net-zero operational energy use while remaining financially feasible in a high-demand market, our project could become a precedent for not only Toronto but for other high-density metropolitan areas in North America.

Design Strategy

Using both passive and active strategies, the first component of the design is to minimize the energy use intensity (EUI). To meet the remaining energy needs, onsite renewable energy generation is proposed. The focus is to create office space optimized for human productivity and wellbeing through the use of circadian lighting, low-VOC materials, effective ventilation, and indoor plants. The strategies also include the implementation of an airtight envelope with sufficient thermal resistance, optimized HVAC design for each respective space, photovoltaic systems on the rooftops of the proposed building and adjacent Ryerson buildings, maximized daylighting, and installation of low energy light fixtures. Furthermore, the design utilizes a mass timber structure to minimize the lifetime carbon required by the construction.

Project Data/ Highlights

- Location: Toronto, Ontario, Canada
- Climate zone: 5A (National Research Council Canada, 2015)
- Lot size: 1,255 m² (13,509 ft²)
- Building size: 5,899.2 m² (63,498.4 ft²); 4 stories
- Occupancy: 150 people; 31 m²/person (332 ft²/person) per Office floor
- Construction cost: \$2,775 CAD/m² (\$258 CAD/ft²)

Technical Specifications

- Wall: 8.45 m²·K/W (48 hr·ft²·°F/Btu)
- Roof: 9.68 m²·K/W (55 hr·ft²·°F/Btu)
- Foundation: 3.35 m²·K /W (19 hr·ft²·°F/Btu)
- Curtain Wall U-value: 0.52 W/m²·K (0.09 Btu/ft²·F)
- Window R-value: 0.693 W/m²·K (0.122 Btu/ft²·F)
- HVAC: Dedicated outdoor air system (DOAS) with ground source heat pump (GSHP) through underfloor air distribution (UFAD).
- Lighting: Artificial LED Circadian Lighting supplementing passive daylight strategies.
- Onsite PV: Annual production of 100.6 MWh (343261.4 kBtu).