PART 1
PROJECT DESCRIPTION

Use for all categories. Projects are judged based on criteria of sustainable design, architectural merit and innovation.

2021
CANADIAN GREEN BUILDING AWARDS
THE NATIONAL PROGRAM OF SUSTAINABLE ARCHITECTURE & BUILDING MAGAZINE SABMag

Project categories

Identify which Award category you are entering

[ ] **1. Residential [small]**
Open to new or renovated buildings less than 600m² in area, of which a minimum of 75% is dedicated to single-family or multi-family residential uses.

[ ] **2. Residential [large]**
Open to new or renovated buildings [typically multi-unit buildings or groups of related buildings] greater than 600m² in area, of which at least 75% is dedicated to residential uses.

[ ] **3. Commercial/Industrial [small]**
Open to new or renovated buildings up to 2,000m² in area, of which more than 75% is dedicated to commercial or industrial uses.

[ ] **4. Commercial/industrial [large]**
Open to new or renovated buildings [or groups of related buildings] greater than 2,000m² in area, of which at least 75% of the floor area is dedicated to commercial or industrial uses.

[ ] **5. Institutional [small]**
Open to new or renovated buildings up to 2,000m² in area, of which more than 75% is dedicated to institutional uses.

[x] **6. Institutional [large]**
Open to new or renovated buildings [or groups of buildings] greater than 2,000m² in area, of which at least 75% of the floor area is dedicated to institutional uses.

[ ] **7. Mixed Use**
Open to new or renovated buildings [or groups of related buildings] of any size, in which no individual use exceeds 75% of the overall floor area.

[ ] **8. Existing Building Upgrade**
Open to buildings of any size or type in which the primary focus of the work has been to enhance the performance or extend the life of an existing structure. Entries in this category are required to respond only to the submission criteria appropriate to the project.

[ ] **9. Interior Design**
Open to interior design projects of any size or type. Entries in this category are required to respond only to the submission criteria appropriate to the project.

An award will be given in each category at the discretion of the jury.

PROJECT DETAILS

Project name: Humber College Barrett Centre for Technology Innovation

Address: 205 Humber College Blvd Toronto, Ontario M9W 5L7

Year completed: 2019

PROGRAM AND CONTEXT

Project type: [Identify all uses occupying 10% or more of gross floor area]
Open collaboration zones, Maker spaces, Over night suites, Office space, Tech zones

Project site: [Check all that apply]

- [ ] Previously undeveloped land
- [ ] Urban
- [ ] Rural
- [x] Previously developed land
- [x] Suburban

Other Building description: [Check only one]

- [x] New
- [ ] Renovation
- [ ] Both [If both, list __% new and __% renovation]

STATISTICS* Provide the following metrics as applicable to your project.

- Site Area: 5,958 m²
- Building gross floor area: 8700 m²
- Energy Intensity: 99.82 KWhr/m²/year [Include both base building and process energy]

[optional: report energy intensity separately as follows:

- Energy Intensity, base building: 99.82 KWhr/m²/year
- Energy Intensity, process energy: 17.97 KWhr/m²/year

- Reduction in energy intensity: 100 %.
- State the reference standard on which the % reduction is based: MNECB, NECB or ASHRAE 90.1 [include version]: MNECB 1997
- Recycled materials content: 24 % by value
- Water consumption from municipal source: 1,559 litres/occupant/year [Include both base building and process consumption]
- Reduction in water consumption: 40 %
- State the reference on which the % reduction is based: LEED [x] or other [ ]
- Construction materials diverted from landfill: 85.3 %
- Regional materials by value: 34 %

***NOTE FOR PART 9 RESIDENTIAL PROJECTS: PROVIDE THE STATISTICS ABOVE IF AVAILABLE.** Include in the Executive Summary [see next page] the EnerGuide or the Home Energy Rating System [HERS] ratings if available, and the WalkScore rating [see www.walkscore.com]. Also, a qualitative assessment of project performance should be included in the appropriate sections of the narrative.

PART 1
PROJECT DESCRIPTION

PROJECT SUMMARY
In 200 words or less, describe:
• The project program and function, building type, and context
• Any special features or constraints that influenced the design.
• The sustainable design strategies [up to five] that are important to the success of the project.
• If your project is designed to any LEED Canada or Passive House rating systems, or other rating systems.

For Part 9 residential projects, include the EnerGuide or the Home Energy Rating System [HERS] ratings if available, and the Walkscore rating which can be determined at **www.walkscore.com.**

MAIN PROJECT DESCRIPTION
Fill in each section below that applies to your project. A description is provided for each section as a guide. Each section of the project description may be accompanied by up to four graphics or tables illustrating the key sustainable principles or data. The total project description [sections 1 - 10] should not exceed 1,000 words in length.

1. Strategic Decisions
Sustainable design embraces the ecological, economic, and social circumstances of a project. Explain how these circumstances influenced decisions such as site selection, building placement and orientation and program organization. Describe the passive design strategies at work in the building, and how active systems are employed to enhance their performance.

2. Community
Describe as appropriate, how the project enhances the public realm,, encourages community interaction and supports community resiliency. Explain how the project reduces automobile travel, including choice of location; use of any alternative local or regional transportation strategies; as well as any successful efforts to reduce locally mandated parking requirements.

3. Site Ecology
Describe how site design strategies work to preserve, rehabilitate or enhance natural ecosystems including details of the approach taken to groundscape, water management, planting and habitat creation. Indicate whether these strategies are contained within the project site, or extend beyond the site boundary. If appropriate, include a brief description of how these strategies fit within the scale of a neighbourhood, community or regional plan.

4. Light and Air
Describe the day lighting and fresh air ventilation strategies, and how the building design and operation maximizes the effectiveness of both. Indicate the percentage of the occupied floor area that is within 7 metres of an operable window. Describe the devices/technologies used to reduce the energy consumption of the lighting system, and the projected annual energy consumption of the system in $KWhr/m^2$. Quantify the provision of fresh air in air changes per hour.

5. Wellness
Describe how the design of the project addresses our understanding of how buildings can support both the physical and psychological health of their occupants. This may include material choices, introduction of biophilic elements, provision of social spaces, support of physical activity through design etc.

6. Water Conservation
Describe how building and site strategies conserve and manage water supplies, including measures to capitalize on renewable sources such as rainwater, and reusable sources such as building grey water. Indicate the strategies and technologies used for water conservation, and the projected potable water consumption per m^2/occupant/annum for the building from municipal or other centralized off-site supply. What percentage improvement does this represent over the water consumption of the reference building?

7. Operating Energy Present and Future
Describe how the building's mechanical, electrical and related control systems are integrated into passive design strategies including orientation, thermal mass and building cross section. Explain how these systems contribute to energy conservation, reduced pollution, improved building performance and comfort. What is the projected annual energy consumption for the building in KWhr/m^2? Indicate what percentage of the energy consumed is from renewable sources [site installations, district heating systems, waste heat captured from adjacent buildings, or green power certificates], and how the building could respond to a future shortage of fossil fuels.

8. Materials and Resources
Describe how the selection of materials for the building addresses concerns for occupant health and comfort, durability, and building performance. Indicate how the materials chosen were assessed for their environmental impacts, (including embodied carbon) and provided transparency, such as through health or environmental product declarations. Indicate any life cycle analysis conducted, the percentage of recycled materials used in the building, and the percentage of waste materials recycled during construction.

9. Building Life Cycle Considerations
The environmental impact of buildings begins with material extraction, and continues through fabrication, transportation, construction and operation, before ending with disassembly and disposal. Life Cycle Assessment influences material selection as well as the choice of building systems. Describe how life cycle issues were incorporated into the design approach including: designing for the anticipated service life of the building, the measures that have been taken to ensure flexibility in use, adaptability to other functions and demountability and recyclability of building components.

10. Education and Information Sharing
The ultimate success of sustainable design will require both a top down and bottom up approach. It will depend on transforming the cultural attitudes among building owners, and disseminating information among professionals to push the envelope of best practice standards. At the same time, public education will raise the awareness and expectations of building occupants and users, and encourage market transformation. Describe how the project addresses these concerns.

Humber College Barrett Centre for Technology Innovation

Toronto, Ontario

Project Summary

The Barrett Centre for Technology Innovation (BCTI)—the first net-zero energy building for Humber College and registered to achieve LEED Platinum certification—is a flagship building for the suburban campus. The facility sets a new stage at post-secondary institutions for innovation in automated manufacturing and human-centered solutions for the 21st Century by omitting classrooms entirely. Instead, flexible project modules provide space for fabrication and technical zones for students, faculty, and industry to research, fabricate, and explore together.

Sustainable design strategies important to the success of the project:

1. Net-zero energy through energy conservation first approach — design EUI of 99.82 kWH/m2 offset by extensive 700 kW solar PV array located on adjacent parking structure
2. Passive design strategies — early parametric analysis for solar and radiation, daylighting, natural ventilation, envelope optimization
3. Embodying sustainability in alignment with the College's values — with green rooftop teaching spaces, urban agriculture pods, and high-performance building systems that are displayed through viewing portals reflecting aspirations for a culture of environmental stewardship as a vital aspect of entrepreneurial innovation
4. Materials — careful selection and integration into the project with low environmental impact and health, and well-being as a focus
5. Design which responds to durability and climate resilience

1. Strategic Decisions

The campus master plan was analyzed for site locations considering efficient use of space with shared resources including parking and services like the district energy central plant.

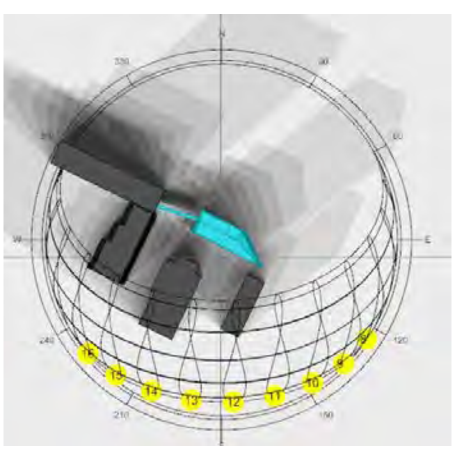
Parametric design analysis, including solar and radiation, wind, daylighting penetration, and envelope optimization, optimized both the massing and envelope resulting in a highly insulated façade and concrete floors acting as thermal mass in the lobby, and also assisted in developing the BCTI's unique form.

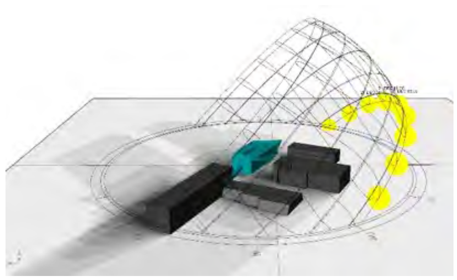
A protected bus terminal outside of the building, which will link to future light-rail transit (LRT), makes the BCTI a well-connected magnet for students, community, and industry partners to gather, collaborate, and showcase projects.

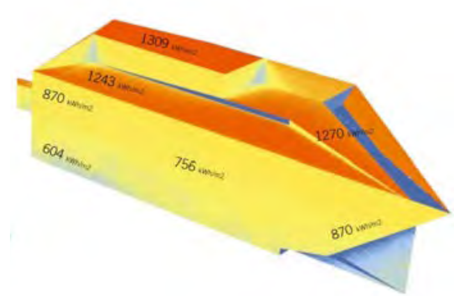
Below:
The building entry and protected bus terminal. The strategically positioned BCTI creates a new campus gateway—a new beacon and community hub for the rapidly growing campus—aligned with existing and new transit infrastructure.

Left:
The transparent central atrium adjacent to the bus terminal supports informal gathering, collaboration, and events.

Below:
Extensive 3D prototyping of the central atrium combined with solar mapping studies helped optimize day-lighting into the space while mitigating unwanted solar heat gain.







2. Community

The experience of the BCTI begins the moment one steps onto campus. The building presents itself as a dramatic portal through its dynamic prismatic glazed lobby and gravity defying cantilevered form establishing a new focal point for student life.

The BCTI is seamlessly interlinked with the surrounding network of campus open spaces and also focuses on street level appeal, fostering an accessible, interactive public realm and encouraging healthier alternative modes of transportation, like walking and biking. Bike parking and showers are available to all occupants.

Adjacent to the College's main bus loop and designed to address the additional influx of pedestrians associated with a future LRT along the northeast corner of the campus, the BCTI is highly accessible by public transport reducing car dependency and provides an important building block in Humber College's master plan vision towards a greener, more sustainable, and pedestrian friendly campus.

The building's success is bolstered by the high visibility of its spaces with areas for students and industry to showcase work as a catalyst for community interaction.

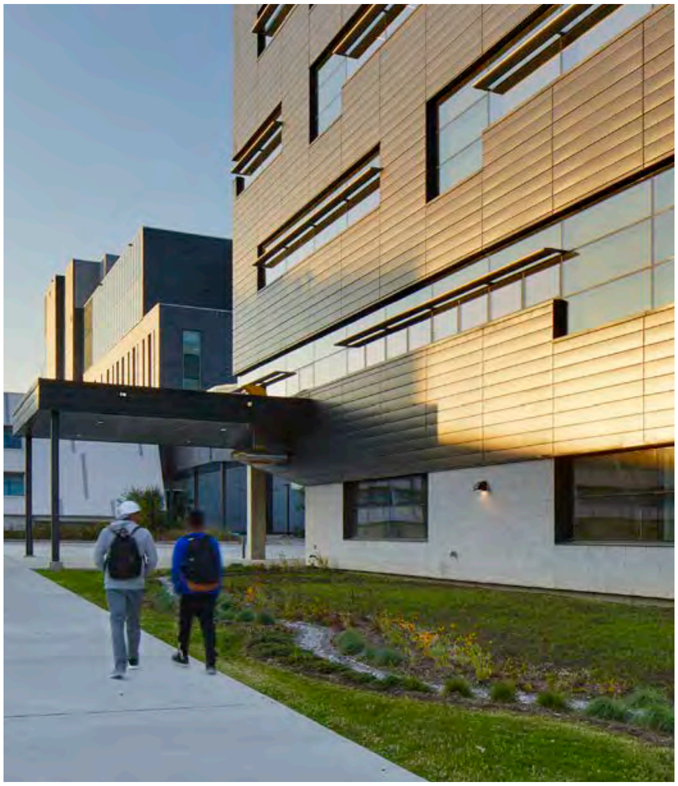
↑
The multipurpose central atrium supports informal gathering and open demonstration space which enables new technologies and ideas to be presented to the larger community.

→
Identified beneath a dramatic wood-toned angled panel, the central atrium presents a new community hub for the rapidly growing campus.

3. Site Ecology

The BCTI is situated in a suburban context with limited vegetation, dominated by major arterial roads and the adjacent Etobicoke General Hospital. Improving the existing built context is a key aspect of the facility's larger social and ecological function. The BCTI features the concept of an enclosed roof terrace and garden supporting sustainable strategies and engaging students in concepts of wellness and environmental stewardship. A community garden allows for food production and a habitat for butterflies and pollinators. All exterior lighting is fully shielded downwards to provide safe, well-lit pedestrian routes. This mitigates light pollution by reducing sky-glow, improve nighttime visibility through glare reduction, and reduce development impact on nocturnal environments. Lighting is limited to the project's boundaries, controlling light trespass from both the building and the site.

Generous plantings of new native and drought tolerant trees, and preservation of existing trees and berms, not only provides habitat and promotes biodiversity but also creates spaces for users to connect to nature and enjoy.



→

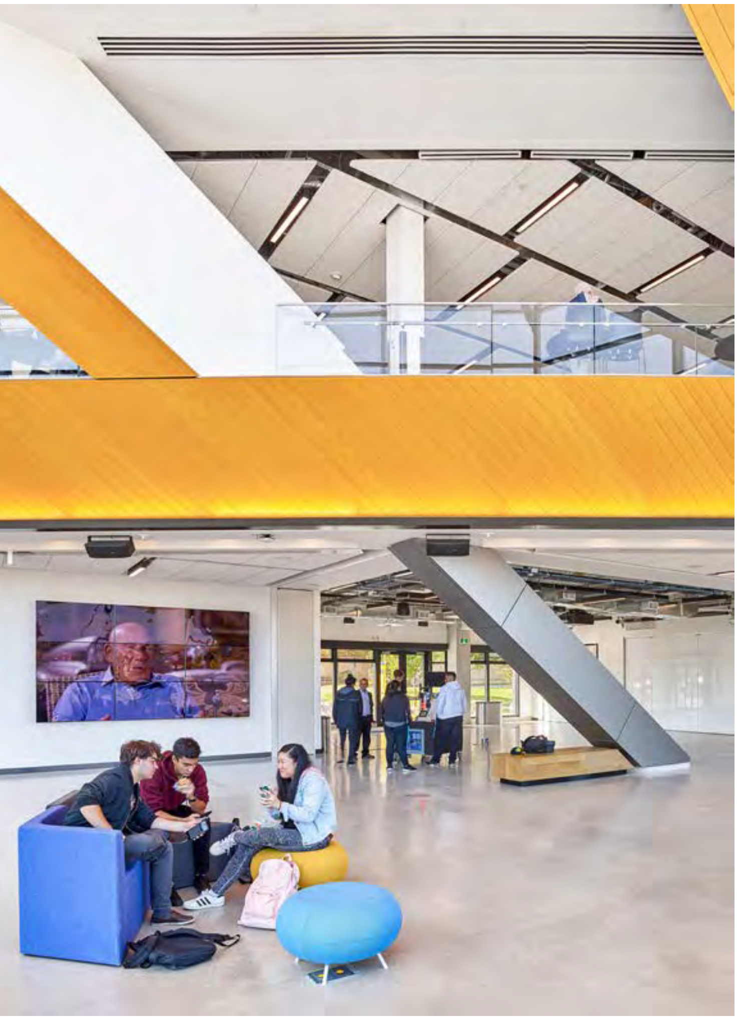
The south façade is defined by a carefully articulated zinc skin with brise soleil, motorized operable windows, and optimized 40% window/wall ratio. A rain garden along this edge provides one of many sustainable demonstration features of the project.

4. Light and Air

An energy conservation-first approach and early parametric analysis for solar radiation, daylighting, natural ventilation and envelope optimization guided the design. A glazing to wall ratio of 40% emphasizes glazing where daylight is beneficial to support occupant health, like in active learning spaces, collaboration zones and circulation paths. Brise Soleil shading devices on the south façade mitigate heat gain and glare.

Right: *A multi-storey thermal chimneys that demonstrates the daylighting and natural ventilation functions of the building.*

Below: *The central atrium allows light to penetrate deep into the building.*



Indicate the percentage of the occupied floor area that is within 7 metres of an operable window: 23%

Part load equipment operation/control: occupancy and daylight sensors; variable speed drives on motors for air handling system fan and heating and cooling system pump; CO_2 level controlled ventilation rates complimented with natural ventilation where BAS will automatically open windows on lower floors and top of light well to allow free cooling when outdoor conditions are suitable.

Total EUI: 99.82 kWh/m^2, with only 41.2 kWh/m^2 allocated to heating.

Efficiency measures: 96% efficient condensing style boilers serving DHW and service heating loop; dedicated outside air system for accurate/efficient fresh air; air handling system with energy recovery enthalpy wheels from relief/exhaust air to temper outside air and reduce energy; cooling system with distributed fan coil units to cut cooling transmission energy use with hydronic systems instead of central air systems.

Quantify the provision of fresh air in air changes per hour: 16,170 cf/m or 269.5 cf/h

5. Wellness

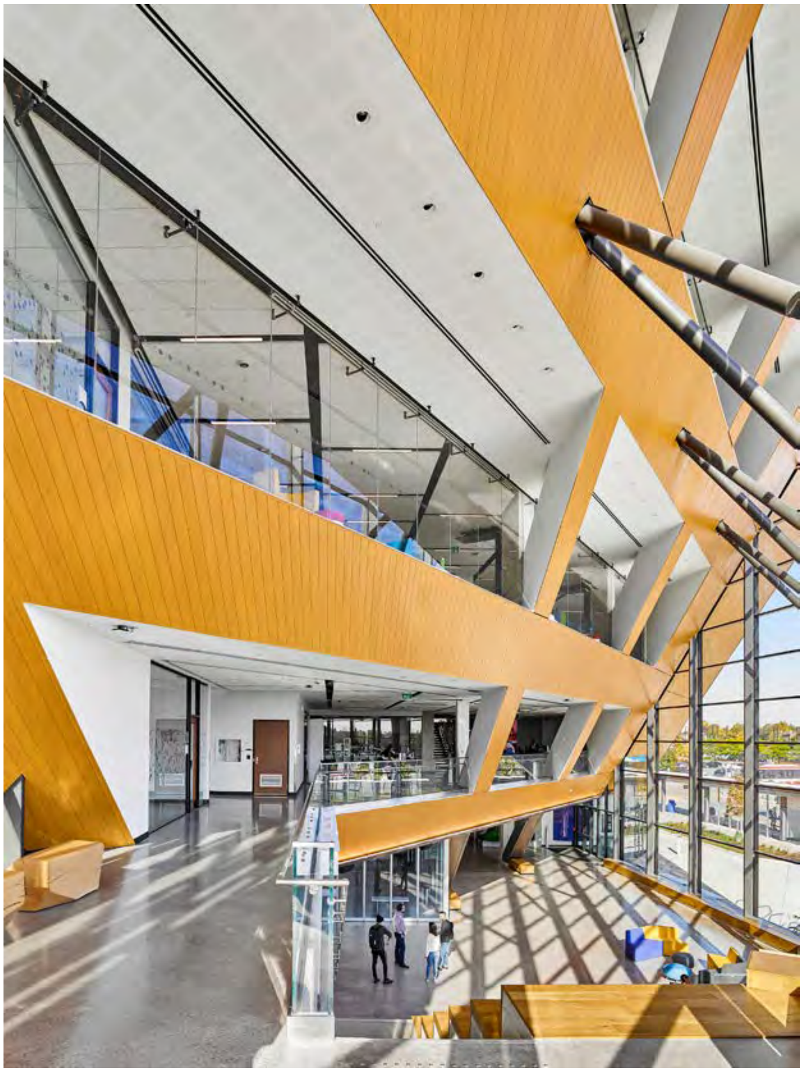
The BCTI features active and social spaces like interactive demonstration areas and flexible open-concept gathering areas. These spaces are designed to enable a free exchange of information and ideas to inspire an informal and active learning experience.

Biophilic design strategies are the essence of spaces like the central atrium offering an immediate connection to the outdoors through views to surrounding landscaped spaces and campus at large and ample access to natural light.

Other health and wellness features include:

- Natural ventilation and access to daylight through the atrium
- Extensive thermal and lighting controls
- CO_2 monitoring tied to natural ventilation rates to improve indoor air quality and limit energy consumption
- IAQ Management Plan following SMACNA guidelines was employed throughout construction with regular inspections combined with successful achievement of IAQ flushout prior and during the initial stages of occupancy
- Low emitting materials were selected, and exceeding LEED prescribed requirements, 20 materials were screened against a list of 56 precautionary chemicals known to have negative impact on both human health and the environment
- Achieving the requirements of LEED indoor chemical and pollutant source control, including the installation of MERV 13 filtration prior to occupancy to improve air quality

Below: *The BCTI celebrates a unique identity centered around wellness. The central atrium and glazed portions of the building provide ample daylight to adjacent learning and meeting spaces.*



6. Water Conservation

The BCTI maximizes green space at grade and incorporates a green roof, contributing to the stormwater retention on the site and replenishment of onsite vegetation, nutrients in soils, and local watershed. Planted areas use native and drought resistant species, eliminating need for irrigation and creating micro habitats that contribute to the greater local ecosystem. On site stormwater management practices along with the green roof and the featured naturalized rain garden, manage stormwater runoff as well as used as irrigation collected in the cistern. Stormwater is detained and treated through mechanical and natural means, utilizing oil-grit separator unit and stormwater retention pond. Designed using a xeriscape process, no permanent irrigation is utilized for outdoor landscaping, which features native and drought resistant species, including the green roof.

Above: *A green roof on the 5th floor roof contributes to water retention on site.*

Indicate the strategies and technologies used for water conservation: Low flow and flush fixtures, achieving a 39% savings, or 599 L/occupant/year.

Projected potable water consumption per m2/occupant/annum for the building from municipal or other centralized off-site supply: Annual potable water consumption in m3: 437 m3

What percentage improvement does this represent over the water consumption of the reference building?: Percent Potable Water Use Reduction: 40%

7. Operating Energy Present and Future

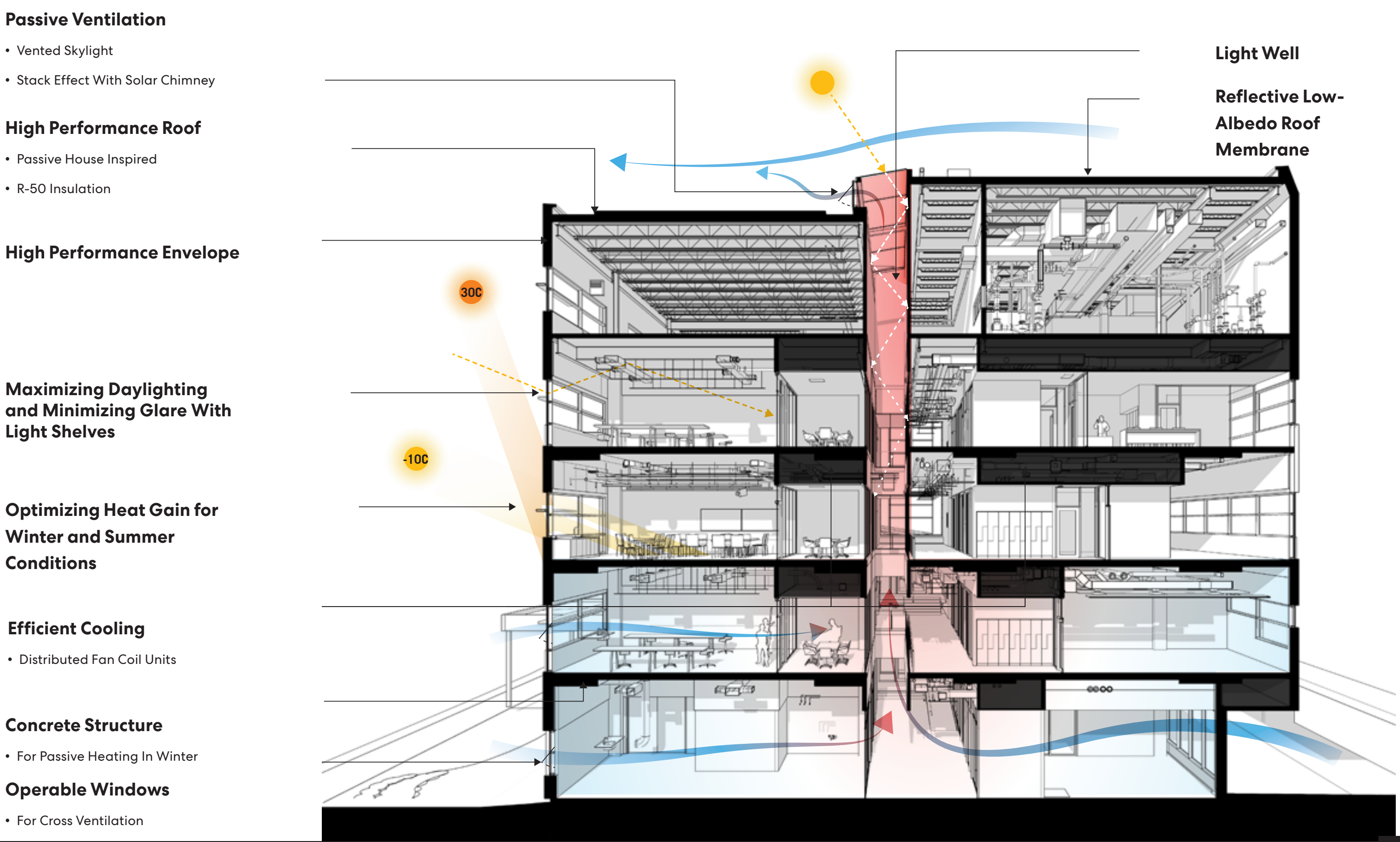
The BCTI is a net-zero energy building with its entire energy use offset by a 700 kW solar PV array located on an adjacent parking structure. A series of passive studies and strategies include a solar chimney which allows natural ventilation in the more temperate seasons, a passive house inspired building envelope with enhanced R-values and emphasis on reduced thermal bridging, and extensive natural daylighting in occupied areas. Passive strategies are complemented with high efficiency active lighting, heating, and cooling systems which result in the BCTI being one of the most energy efficient buildings of its type in Ontario with a **designed EUI of 99.82 kWh/sq.m**. This aligns with Humber College's long-term Integrated Energy and Water Master Plan which mandates that all buildings perform at or near best practices for energy efficiency at 100 kWh/m^2 or lower.

With environment, health and wellness as its core, the BCTI integrates innovative conservation-first approaches to reduce energy use through passive and active M&E systems.

The BCTI also focuses on street level appeal by fostering an accessible, interactive atmosphere, and encouraging healthier, alternative modes of transportation, such as biking and connection to public transportation.

Indicate what percentage of the energy consumed is from:

- Renewable sources site installations: 100%
- District heating systems:
  50% (offset by solar PV renewable energy production)



8. Materials and Resources

The concept was inspired by passive design principles with particular focus on increased R-values, and reduced infiltration and heat loss within the envelope. A 3rd party durability consultant was employed to refine envelope detailing towards mitigating thermal bridging and enhancing overall durability of materials and assemblies. The design team adjusted various parameters including R-value, infiltration rates, and solar heat gain co-efficients for glazing using dynamic multi-parametric modeling software to find the most efficient and cost-effective combination of elements.

A dark natural zinc plank system was chosen as cladding for its durability and modularity, allowing greater ease of long term maintenance. Durable, natural limestone along the base of the building provides a direct material linkage to the surrounding natural landscape.

Materials were screened for embodied carbon, and reductions were achieved through use of FSC lumber, low-carbon insulation, low-carbon exterior cladding material, reduction in glazing, low-carbon refrigerants, and use of aluminum in place of steel for window assemblies.

Materials were also selected to be low emitting, and contain **high regional (34%) and recycled content (23%), and 24% recycled material content**. 20 finishes were screened against a list of 56 precautionary chemicals known to have negative impact on both human health as well as the environment.

↑
Healthy, low emitting materials were selected throughout the building.

→
The south facade features a durable natural zinc plank system and natural limestone at the base.

9. Building Life Cycle Considerations

Resilience analysis was conducted for future weather data and impact on building cooling and heating degree days, as well as climate impact on exterior materials which were selected to be long lasting and durable. A durability plan was developed with a durability consultant to ensure decisions aligned with the building's service life.

Interior spaces are modular and demountable and operable wall systems allow spaces to be converted and expanded over time. Flexibility is considered at a systems level with fully exposed and accessible HVAC and electrical for ease of reconfiguration.

Recycled content achieved on this project is 24%, with regional content being 34%.

Above: *Operable wall systems increase flexibility of spaces.*

Left: *The BCTI presents an important first step in Humber College's master plan vision which looks to replace parking areas with built fabric and green space and create a new sequence of entry to the campus as the future LRT comes on-line.*

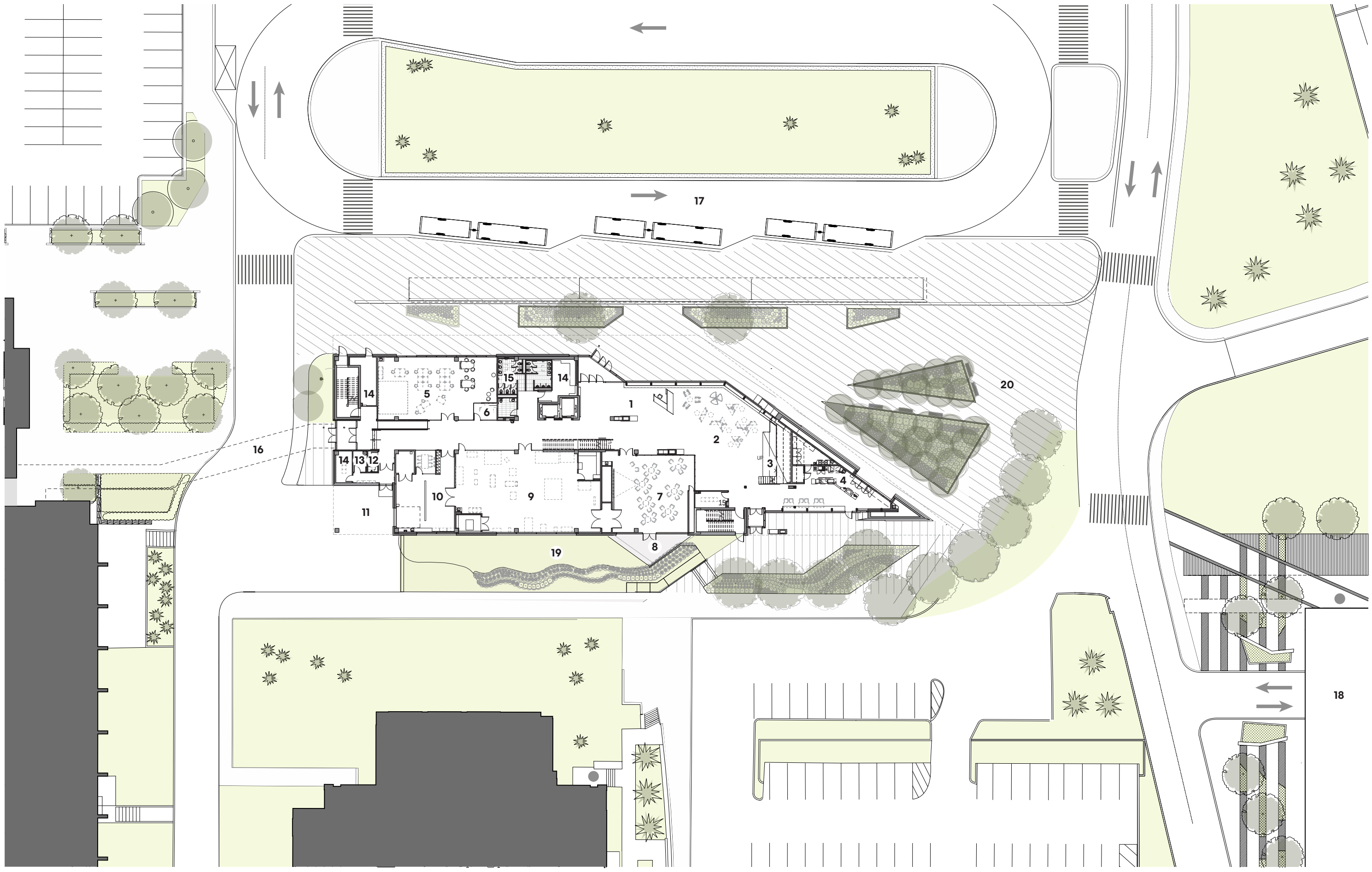
10. Education and Information Sharing

The BCTI aligns with Humber College's vision of embodying sustainability through the implementation of visible energy, water, and resource conservation features that support the teaching mission of the College. This speaks to the commitment within the design to expose systems throughout the building to not only promote the plug and play capability of many of its workshop and maker spaces, but also to demystify the operations of the building and ultimately enhance adaptability of the spaces for changing functional needs in the future. This extends to various features such as operable windows and bris soleils as well as multi-storey thermal chimneys showcasing day-lighting and natural ventilation functions of the building.

The BCTI's net-zero energy status has attracted many visitors to the building from other colleges and stimulated discussion amongst students and faculty around its many unique features and systems. Ultimately, the building offers a powerful living lab for monitoring energy and water performance through its integrated Building Automation System and various metered systems, in addition to being a unique teaching tool in promoting a stronger culture of environmental sustainability.

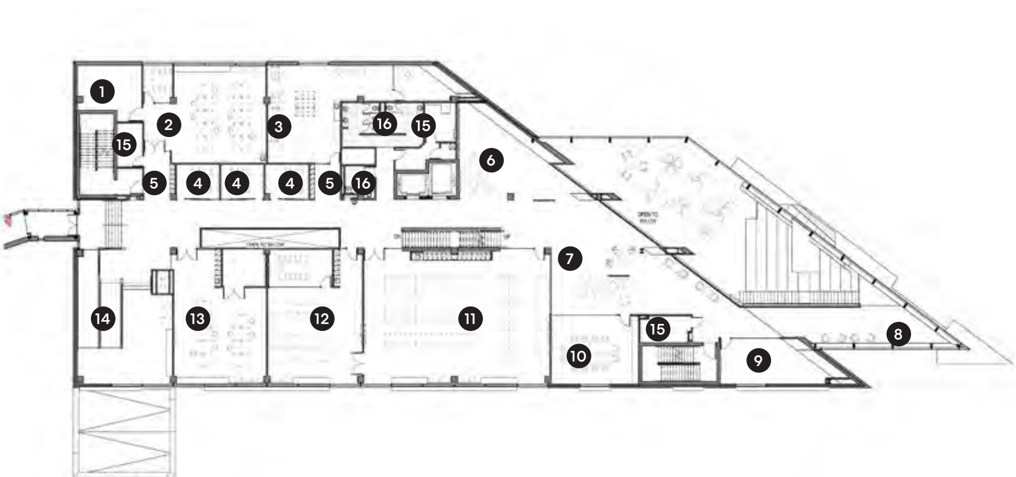
Right and below: *building systems are exposed throughout the building in programmed and common spaces.*

Site Plan and Level 1



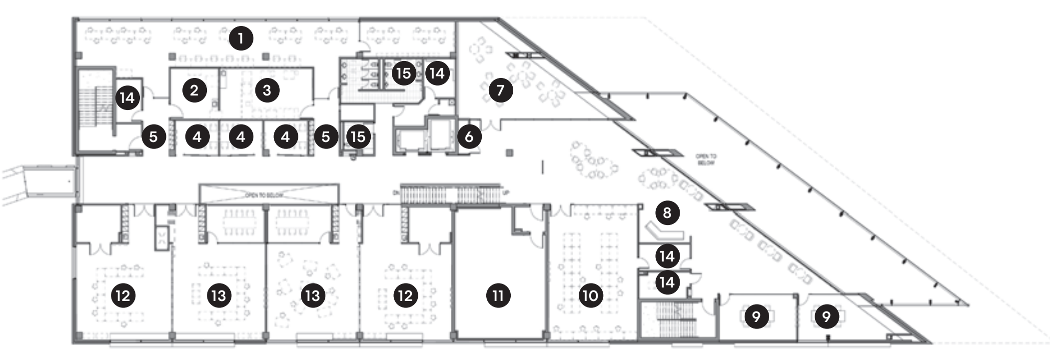
1. Welcome Zone
2. Social Space
3. Seating Stair
4. Cafe and Kiosk
5. Collaboration Sandbox
6. Resource Work Room
7. Demonstration Room
8. Outdoor Demonstration Space
9. Tech Zone—Wood and Metal
10. Wet Module
11. Mobile Tech Bay
12. Shower
13. Janitor
14. Mechanical and Electrical
15. Washroom
16. Pedestrian Bridge
17. Bus Loop
18. Parking Garage
19. Rain Garden
20. Plaza

Floor Plans



Level 2

1. Makerspace Equipment Storage
2. Module A
3. Tech Zone - Digital 3D Development
4. Project Room
5. Lockers
6. Gaming Area
7. Learning Commons
8. Aboriginal Display
9. Work Room
10. Seminar Room
11. Skills Training Hub Module A
12. Skills Training Hub Module B
13. Module B
14. Coffee Bar
15. Mechanical/Electrical
16. Washroom

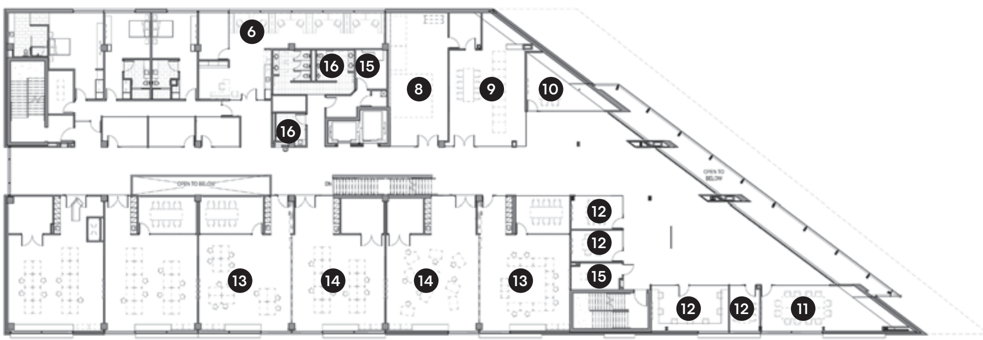


Level 3

1. Multi-Functional Space
2. Solvent Room
3. Tech Zone - Electronics
4. Project Room
5. Lockers
6. Food Storage
7. Visualization Studio
8. Learning Commons
9. Work Room
10. Interaction Design Studio
11. Sound Studio
12. Project Work Module
13. Discussion/Presentation Module
14. Mechanical/Electrical
15. Washroom

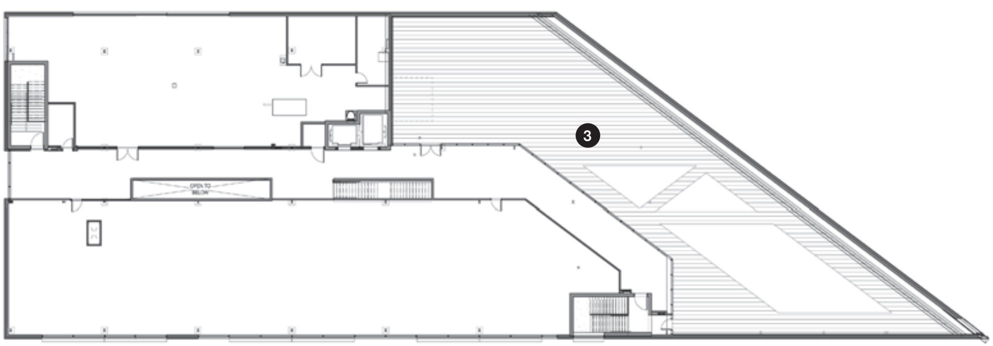
Floor Plans

Level 4



1. Accessible WC
2. Accessible Overnight Suite
3. Overnight Suite
4. Suite Wc
5. Director Office
6. Shared Hotelling Office
7. Hotelling Office
8. Attenuation Chamber
9. Server Room
10. Work Room
11. Meeting Room
12. Project Room
13. Discussion/Presentation Module
14. Project Work Module
15. Mechanical/Electrical

Level 5



1. Mechanical Penthouse
2. Shell Space
3. Teaching Terrace