

WindowMaster projects in North America

WindowMaster has worked on many projects, supplying consultancy services and products for automated indoor climate solutions using natural and hybrid ventilation. View some of WindowMaster's projects in this brochure



Photo: LWA Architects



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HouseZero, Harvard Center for Green Buildings and Cities, Cambridge



Built in 1924, this residential building is situated on Harvard University's campus. It has been renovated to inspire others by how older, existing structures can be altered to become ultra-efficient facilities with ambitious performance targets. The building houses research dealing with global climate change and sustainable building design strategies.

The WindowMaster solution

HouseZero consists of the original structure and an extension of the existing building in the basement called "The Vault". The conventional heating and cooling systems that were previously in the house included a gas-powered boiler, hot water heater, steam-driven radiators, forced-air ventilation, and window-mounted air conditioning units.

These were fully replaced with a new indoor climate paradigm which relies on the addition of thermal mass and radiant surfaces.

The natural ventilation control system, NV Advance®, addresses the heating and cooling needs of both the original structure as well as The Vault. Rather than approaching the project as a hermetically controlled box, the envelope and materials of HouseZero are designed to interact with the seasons and the exterior environment in a more natural way. Much like a layered approach to clothing, the house is meant to adjust seasonally.

All glazing systems in the house will be replaced with triple-glazed, low-E windows and skylights, which will be fully operable through the WindowMaster control system, NV Advance®. This control system will allow the building

to fully monitor the temperature, humidity, and air quality through internal and external sensors. Manual overrides of the automated system are also incorporated.

The natural ventilation is attuned to seasonal and climatic variables through adaptive installations; some passive and some with algorithm-based control technologies, reducing energy consumption to practically nothing. Ventilation is controlled via WindowMaster actuated windows on all floors, while a passive solar chimney contributes to critical ventilation of The Vault and the event space in the basement.



Operable skylights are added to the roof plane to allow for a robust ventilation of level 2 and 3 as well as the stairwell. Furthermore, windows will let air in at select times to manage the indoor air quality during the winter. In the summer, the higher-level windows will be utilized to keep the temperature in the building at the required level throughout the day.

All openings are programmed for daily night purging to help stabilize indoor air quality throughout the seasons. NV Advance® also controls the sun screening in the building.



Photography by Michael Grimm©

San Diego Continuing Education Mesa College Campus, San Diego



The facility has been awarded LEED Silver certification by the U.S. Green Building Council, making it the district's fourteenth LEED certified facility. Natural ventilation and daylighting played a big part, while sustainable construction materials and high-efficiency plumbing and mechanical systems also contributed to the green qualifications.

This \$22.5-million school project consolidates programs such as English as a Second Language and disability support into a bright and airy two-story learning center of 37,700 sq. ft. (3500 m²). Project engineers have incorporated sustainable features such as natural ventilation and natural lighting to reduce the building's energy use by **43% compared** with state requirements.

The WindowMaster solution

The natural ventilation occurs via high-level automated façade windows in the classroom. In the back of each classroom, there are high-level automated vents, which can lead air into the common areas (hallway) where the air is ventilated out through the high-level automated windows in the clerestory.

Each teacher controls the classroom temperature through a single switch on the wall that offers the choice between natural and mechanical cooling. When the temperature falls within the comfort zone (as it does the majority of the year), the natural ventilation system disengages the mechanical air conditioning and automatically opens the windows.

In the design discovery process, teachers reported that they love to open the windows and doors. This building encourages that behavior, so it is likely that the teachers will choose natural ventilation most of the time.

WindowMaster was selected to supply the more than 100 motors for the natural ventilation solution for its MotorLink® technology. MotorLink® is a digital data communication technology designed to provide improved control and functionality where automated windows and natural ventilation are part of a building management system.



43% reduction of the building's energy use, compared with state requirements



Dartmouth College, Arthur L. Irving Institute for Energy and Society, Hanover



Arthur L. Irving Institute is a new highly energy efficient multi-purpose facility designed by Architects Goody Clancy with the intent to achieve LEED platinum. The Institute is part of Dartmouth College and is located on the East Coast of the United States in Hanover, NH. This building is set to provide an innovative and sustainable example of how to minimize energy consumption while ensuring the students have a healthy and productive indoor climate. Some of the sustainable design approaches used in the building is automated natural ventilation and passive cooling wherever possible to support the mechanical ventilation system, thus making the ventilation concept an energy efficient mixed-mode solution. The Institute opened in March 2022.

The WindowMaster solution

The 55,000-square-foot facility spread over 4 levels is built by Turner Construction. All zones with a facade facing the exterior include a natural ventilation solution using automatically controlled facade windows. WindowMaster worked with R&R Window Contractors and H Window Company to supply the automated awning and parallel pop-out windows. Altogether, the natural ventilation system is installed in 38 climate zones such as meeting rooms, workspaces, conference rooms, office areas, research labs, café, vestibule lobby area. This, to reduce the yearly energy consumption and to provide a comfortable indoor climate. The natural ventilation

principle is a mixture of single sided and cross ventilation.

WindowMaster has delivered approximately 135 low voltage window actuators with MotorLink® technology for this project. The actuators control a mixture of 79 top hung awning windows and 13 parallel pop-out windows. Most of the parallel windows are large in size and therefore demand four actuators per window profile. These four actuators synchronize their operation with the help of the MotorLink® technology, to ensure that the window's will not be damaged during operation.



WindowMaster's products are fully integrated into the Johnson Controls Building Management System, through BACnet-IP communication. The Johnson Controls BMS supplies the outdoor weather data and indoor zone data (indoor temperature and CO₂ levels) to WindowMaster's NV Embedded® system. This data is used for continuously intelligent control of the automated windows and natural ventilation strategy.



Photography by The Arthur L. Irving Institute for Energy & Society

The Bullitt Center, Seattle



Living Building certified by the Living Building Challenge 2.0 (LBC), the Bullitt Center is a high-performance, net-zero energy and net-zero water urban office building in Seattle.

In order to attain the certification, the building had to provide fresh air and daylight via operable windows to every occupant. The building also had to meet indoor air quality standards measured post-occupancy, in addition to the other LBC requirements.

The WindowMaster solution

To finetune the ventilation approach, the design team integrated the energy model to the comfort and airflow model that provided the anticipated window opening and closure data. Parameters and controls for the window automation are managed by the building management system. The WindowMaster actuators delivered to the

project feature a unique communication technology, MotorLink® which establishes a 2-way communication link between the actuators and the BMS.

Building sensors, which monitor indoor and outdoor conditions, then help the system to coordinate the opening and closing of the windows to maintain the building's low energy goal for cooling and ventilation.

Night purge or night flush ventilation are also employed for passive cooling of the building. However, when mechanical assistance is needed, the window automation technology coordinates with the BMS to open or close the windows to allow the radiant floor systems to further heat or cool the building.



Photography by Tom Kessler

The Tower at PNC Plaza, Pittsburgh



The Tower at PNC Plaza is an 800,000 square foot headquarters for the PNC bank in Pittsburgh, Pennsylvania.

Planned as a landmark building, both with regards to design and in terms of environmentally friendly solutions, the 33-story tower has a construction budget of approximately \$240 million. Incorporating state-of-the-art green technology, including a double-skin façade and solar chimney, the building was designed to exceed LEED Platinum certification and to be the greenest office tower in the world.

The WindowMaster Solution

WindowMaster has delivered more than **6,300 actuators** to control 700 parallel windows in the outer double-skin façade and 1,450 automated air vents in the inner façade.

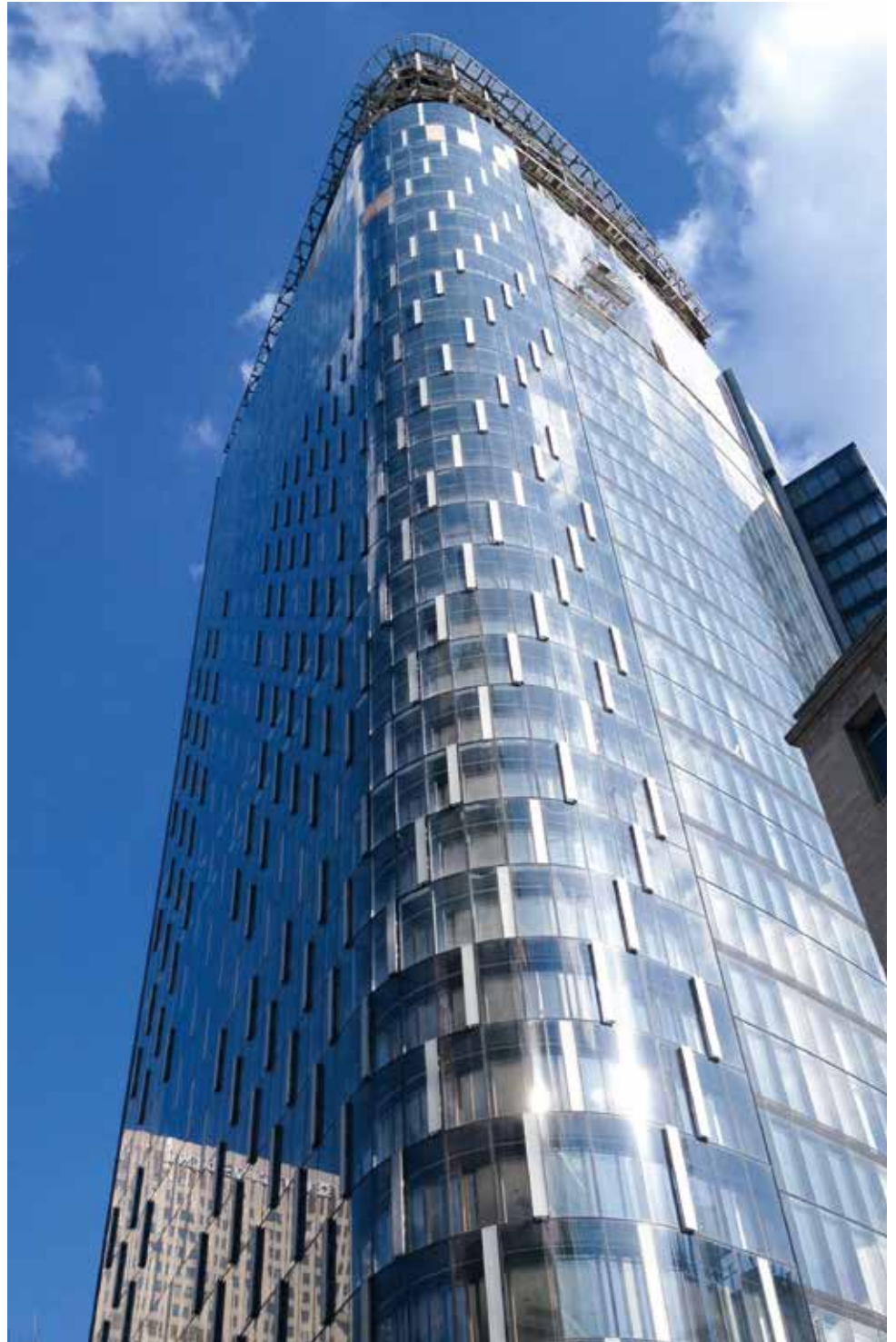
From its one-of-a-kind, breathable double-skin to its innovative workplace strategy, The Tower drives performance to new levels. The building “breathes” with a double-skin façade: a natural ventilation system that has a glass outer weather and air barrier and an inner layer with automated air vents, a wood curtain wall, and manually operated sliding doors. A series of automatic sensors on both layers open up the building for air when the weather permits.

The main reason for choosing WindowMaster as a supplier for this project is the MotorLink® technology that enables genuine synchronization of four actuators on one parallel window and exact position control and feedback via the BACnet BMS.

“The research told us that 45% of the time we would be able to open our windows for fresh air and essentially turn off the mechanical ventilation in the building.

We had to create a double skin that operated through a building control system that would open during the optimal weather days...”

Doug Gensler
Managing Director | Gensler Boston



The University of Baltimore School of Law, Baltimore



The new home of the John and Frances Angelos Law Center at 192,000 sq. ft., unites classrooms, faculty offices, administrative space, and the law library under a single roof for the first time in the history of the school. The building, located at the prominent intersection of Mount Royal Avenue and Charles Street, functionally and symbolically defines the Law School as an academic and social nexus, offering state-of-the-art teaching and learning facilities.*

The WindowMaster solution

WindowMaster has provided more than 1,000 MotorLink® actuators integrating the intelligent façade with the LONworks Buildings Management System. This enables

full control of each motorized window. The windows will then be automatically closed when the airconditioning is on, but are made available for the users to freely open and close by the manual override switches when the airconditioning is off.

Operable windows are provided in regularly occupied spaces, allowing users to have direct control of their environment. Occupants have local control of operable windows in all offices, teaching, and library spaces, and are notified of favorable outdoor conditions by means of a green indicator light that communicates appropriate times to open a window. Atrium operable windows are fully-controlled by the building automation system based on the quality of outdoor conditions. Atrium smoke

* J. Michael Barber is a senior associate with Ayers/Saint/Gross

exhaust fans are activated at low speed in natural ventilation mode to guarantee good cross ventilation through all spaces, and acoustically protected and fire-protected transfer openings are provided from perimeter spaces to the atrium.

Outdoor temperatures in Baltimore are appropriate for natural ventilation about 40% (approximately 5 months) of the year. Therefore, a mixed mode approach to the interior climate is taken, with mechanical ventilation, heating, and cooling during the extreme seasons and natural ventilation during spring and fall. **The law center does have a conventional HVAC system, but it is less than half the size of one that would be required for a normal building of its size.**



UBC Arts Students Centre, Vancouver



At the end of 2021 this multi-purpose facility opened for the art students at UBC, Vancouver. The Centre is a student-driven initiative designed by Leckie Studio Architecture + Design and it was built with sustainability in mind. One of the initiatives in this content is intelligent controlled windows in all areas used for daily natural ventilation and night cooling. The areas also contain mechanical ventilation making the ventilation concept an energy efficient mixed-mode solution. The buildings ventilation design was spearheaded by Integral Group Vancouver, who applied the innovative approach to the buildings automated natural ventilation system.

The WindowMaster solution

The Centre is spread over three levels with a total net area of approximately 1025 m² / 11.033 ft² and includes

functions such as café, gallery, meeting rooms and common areas for socializing. The building was designed with the intent to archive a LEED gold certification.

For this sustainable building, WindowMaster has supplied and commissioned an NV Embedded® natural ventilation system which will be used for indoor climate control when the BMS has deemed natural ventilation suitable. The building is divided into approximately 20 climate zones and the natural ventilation principles are a mixture of single-sided ventilation, cross ventilation and stack ventilation depending on the building geometry. The building maximizes the use of natural ventilation as far as possible to reduce energy consumption.

Approximately 100 window actuators are used in this project to secure comfort day ventilation. VELUX has

supplied 8 units of motorized skylights and the rest of the building incorporates automated awning and casement façade windows. WindowMaster has delivered all the actuators for the façade windows which include MotorLink® technology, and WindowMaster controls the eight units of motorized VELUX skylights. WindowMaster's products are fully integrated into the Delta controls building management system provided by ESC Automation, which also supplies the outdoor weather and room data (indoor temperature and CO₂ levels) to WindowMaster NV Embedded® system. This data is used by the NV Embedded® system for continuously intelligent control of the skylights and façade windows.

The solution also includes keypads for manual override which provides the occupants with a more personalized control. After 30 minutes, the control system reverts back to automatic control.

Through the integration of the WCC Plus panel with the Master fire life safety system, a signal can be provided confirming if the automated windows are opened or closed.



Carroll Hall – a Garden Wedding & Art Venue, New York



The first of its kind in New York City, Carroll Hall at 30 Morgan in Brooklyn, NY features indoor and outdoor spaces that are designed to connect people with nature, even while in the city.

The design approach, inspired by the merging of landscape and architecture, features an indoor space with natural ventilation and a botanical garden outdoors. A confluence exists between the two spaces so that fresh air can pass through the garden before flowing indoors. While fresh air ventilation in high-density areas has traditionally not been used in the U.S., this building proves that it can be successfully executed.

Earlier, in 2022, the project won an AIANY Design Awards in the category: Citation for Reclaiming Urban Space.

The WindowMaster solution

The primary method to cool the space is through the automated windows and skylights using buoyancy ventilation as the predominant ventilation principle. The fresh air flows in primarily via the facade openings, is distributed throughout the open spaces, and then rises into the air, so that the air leaves the building via the roof openings. The WindowMaster solution uses sensors to measure indoor temperature and CO₂ levels while weather stations monitor outdoor conditions. This provides the system with data to determine when the windows should open or close.

Elevated levels of CO₂ in the built environment are associated with reduced productivity and grogginess

for occupants, but opening the windows naturally flushes the spaces with fresh air and connects people to the outdoors.

The building's indoor space is used for private events and can fit around 200 people. With this size of people loads, mechanical ventilation is used to cool the space and optimize comfort when in the warmer months and/or internal heat loads are too high. The natural ventilation solution in the space coordinates with the mechanical cooling system so that the two systems are not working against one another. This is done through a simple on/off command given when internal and external conditions reach certain set points.

And even when the mechanical system is at work, the windows can still open to let fresh, outdoor air in, and CO₂ out.



Photography by Amy Barkow

WindowMaster aspires to protect people and the environment by creating a healthy and safe indoor climate, automatically ventilating spaces with fresh air through facade and roof windows in buildings. We offer the construction industry foresighted, flexible and intelligent window actuators and control systems for natural ventilation and mixed mode ventilation – of the highest quality.

WindowMaster employs highly experienced cleantech specialists in Denmark, Norway, Germany, United Kingdom, Ireland, Switzerland, and the United States of America. In addition, we work with a vast network of certified partners. With our extensive expertise built up since 1990, WindowMaster is ready to help the construction industry meet its green obligations and achieve their architectural and technical ambitions.

windowmaster.com