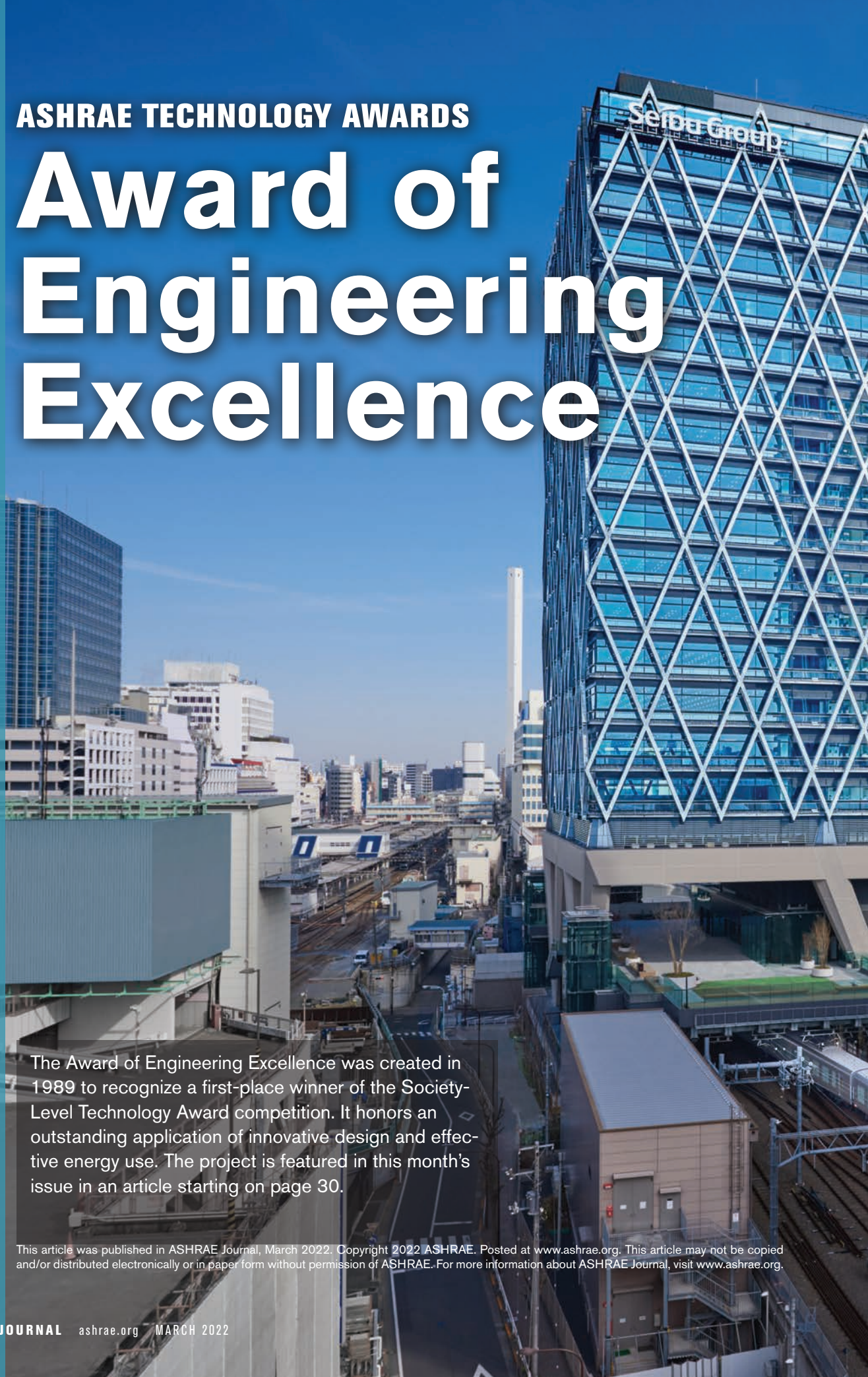
2022

## ASHRAE TECHNOLOGY AWARDS

# Award of Engineering Excellence




The Award of Engineering Excellence was created in 1989 to recognize a first-place winner of the Society-Level Technology Award competition. It honors an outstanding application of innovative design and effective energy use. The project is featured in this month's issue in an article starting on page 30.

# DaiyaGate Ikebukuro

## Tokyo

**Shiro Tsukami, P.E.jp, Member ASHRAE; Kitaro Mizuide, Ph.D., P.E.jp, Member ASHRAE; Hirotaka Kubo, P.E.jp, Associate Member ASHRAE**

The DaiyaGate Ikebukuro high-rise office building in Tokyo features a new hybrid air-conditioning system of a central AHU for the interior zone and perimeter through-wall units (TWUs), which reinforced resiliency for both daily energy use and emergencies. A new TWU was developed by adding an exhaust operation function that uses heat recovery of indoor exhaust air to the heat exchanger of the compressor in place of the conventional type, which is unable to bring outside air into the room or exhaust indoor air.

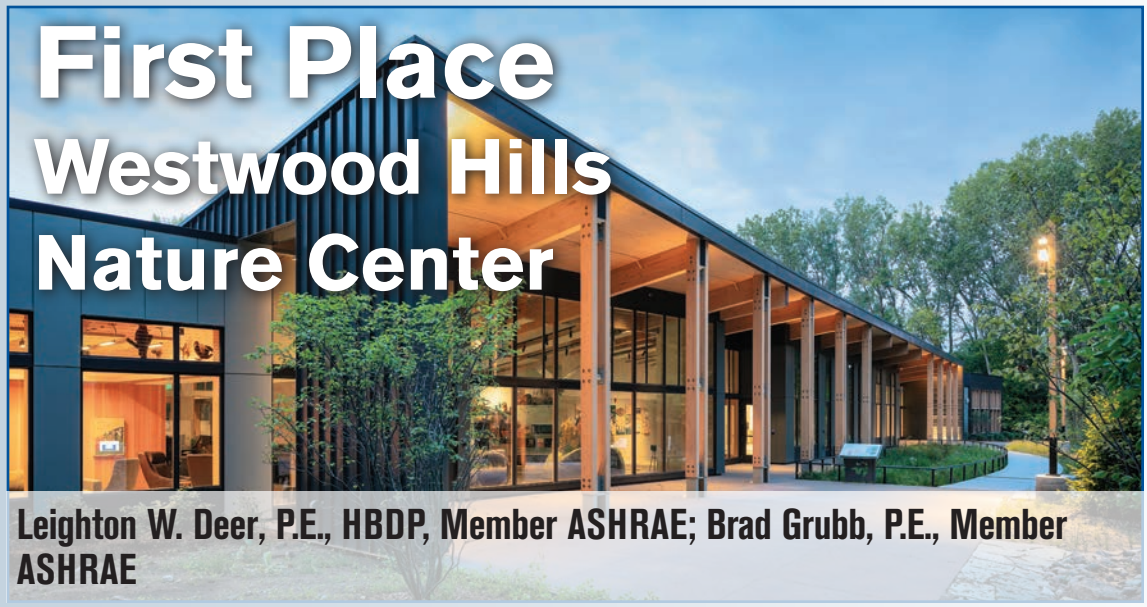
Conditioned air is supplied to the office by the AHU, and indoor air is exhausted by the TWUs, exhausting indoor air across the entire façade. The TWUs recover heat from the indoor exhaust air by a compressor for enhancing air-conditioner efficiency. Exhausting indoor air improved the efficiency by approximately 30% compared to a standard unit.

During the fresh air cooling mode by the AHU and TWU, the fresh air introduced is exhausted from the outdoor fan of the TWUs, which is in exhaust mode. The ventilation system performance produced by these TWUs achieved unidirectional airflow to the windows and does not stir or mix the indoor air.

This enables natural ventilation without using electrical power for the AHUs and TWUs when the power supply is interrupted, which is important in Tokyo, where experts say there is more than a 70% chance of an earthquake with a magnitude of 7 or greater in the next 30 years.

The new TWU is easy to install as it only needs to be installed inside a perimeter enclosure. It is versatile for other projects, as air-conditioning and ventilation operations are available by connecting a single-phase power source. This can be generally applied to most high-rise buildings.

ASHRAE Technology Awards recognize outstanding achievements by members who have successfully applied innovative building designs. Their designs incorporate ASHRAE standards for effective energy management and indoor air quality and serve to communicate innovative systems design. Articles featuring these projects will be published in upcoming issues of *ASHRAE Journal*.



## First Place
## Westwood Hills Nature Center

**Leighton W. Deer, P.E., HBDP, Member ASHRAE; Brad Grubb, P.E., Member ASHRAE**

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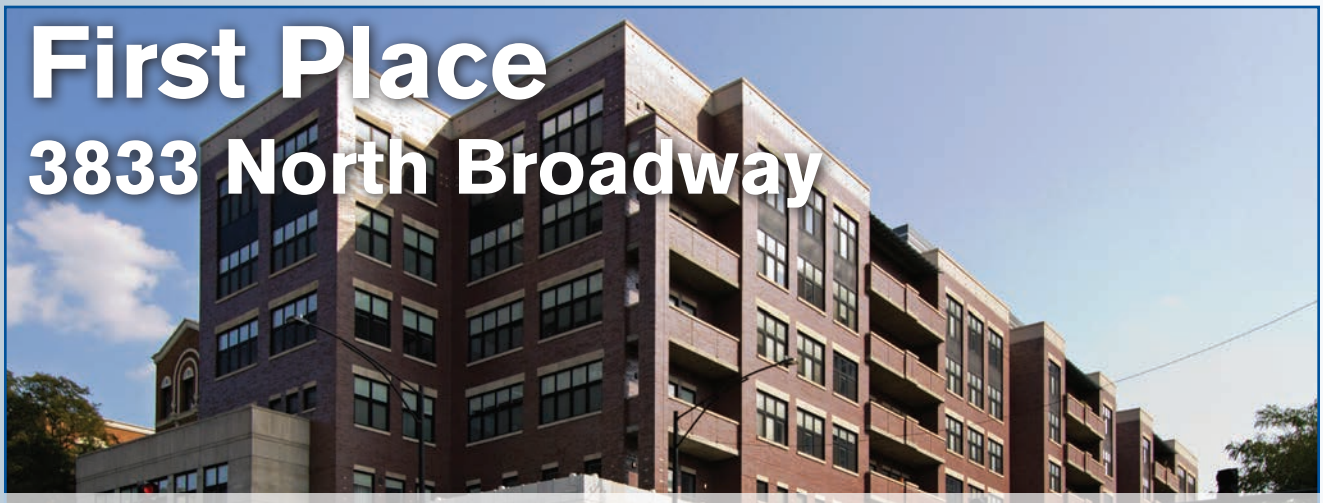
Through the integrated development of the building form and passive energy reduction strategies, the high-performance envelope, advanced lighting and effective use of proven heat pump technologies, the new Westwood Hills Nature Center in Minnesota was able to achieve a net zero energy design while being cost-effective and eliminating the use of fossil fuels in its operation.

## First Place
## Adlai E. Stevenson High School East Building Addition

**Donald R. Hartdegen Jr., P.E., Member ASHRAE; Asfandyar Khan, P.E., HBDP, Associate Member ASHRAE; Sudesh Saraf, P.E., Member ASHRAE**

This Illinois high school's new classroom and lab addition integrates sustainable design practices and proves the ability of technological innovation in creative design solutions that are simple yet effective, energy-efficient yet cost-effective. The facility includes classrooms, physics labs, a multipurpose room, living walls, a roof garden and a greenhouse. The design prioritized energy efficiency and indoor environmental quality.



# First Place
## 3833 North Broadway

**Dustin Langille, BEMP, HBDP, Associate Member ASHRAE; Donald McLauchlan, P.E., Member ASHRAE**

This Chicago mixed-use residential and retail building building incorporated best practices for decarbonization, indoor air quality, efficiency and maintainability while being built at market rate pricing. Located in Chicago's dense urban environment, the building has achieved an actual EUI of 22 kBtu/ft² (250 MJ/m$^2$) with full occupancy and was designed to meet LEED Gold, all for an HVAC cost of $14.56/ft² ($156.72/m$^2$) including geothermal.

# First Place
## Stellantis—Sterling Heights Assembly Plant

**Dennis C. McKale, P.E., Member ASHRAE; Bradley Herbeck, Member ASHRAE; Ryan Cowan, Associate Member ASHRAE**

The new Energy Center at Stellantis's Sterling Heights Assembly Plant in Michigan serves the building's HVAC and process cooling loads. It houses new chillers, hot water generators, pumps, purified water equipment, non-potable water supplies and associated equipment. The chilled water system operates at an average system efficiency of 0.42 kW/ton (0.12 kW/kW). It achieves a 45% reduction in annual power consumption and operating costs over baseline conditions.




A 100-year building at Iowa State University now has modern systems and a chilled beam system in the building—and was fitted with operable windows in a humid climate. The renovation project centered on fitting modern systems in the older building where there was not enough floor-to-floor height for significant horizontal distribution of ductwork.


Using a new strategy to reduce the Louisville, Ky., building's heating energy use intensity (EUI), the chilled beam zones incorporated filtered recirculation fans. Instead of providing all primary air for beam induction from the dedicated outdoor air system (DOAS), the recirculation fans handled the induction, and the DOAS variable air volume terminal unit managed the code ventilation and latent loads while still providing MERV 8/MERV 13 final filtered air.

# First Place
## Exact Sciences Lab

**Shana Scheiber, P.E., Associate Member ASHRAE; Rick Flock, P.E., Member ASHRAE**

MIKE REBHOZ

The Exact Sciences' Discovery Campus clinical laboratory building in Wisconsin supports high-throughput molecular diagnostics and health care-related sample processing testing. With such large volumes of odorous materials traveling throughout the facility, optimized operational capacity and indoor air quality were fundamental design requirements. Through extensive energy modeling and an emphasis on high-performance design, this 24-hour clinical processing and manufacturing facility incorporates an advanced HVAC ventilation and exhaust system.

# First Place
## Hotel Mandarin Oriental

**Hermes Silva Flores, Member ASHRAE**

This Santiago, Chile, luxury hotel's thermal power plant for domestic hot water (DHW) and heating is located in the building's underground. The thermal power plant was optimized with a dynamic heating system with the elimination (bypass) of the domestic hot water (DHW) accumulators, replacing them with real-time DHW heating systems. The real-time DHW system allows for the generation of DHW instantly, without accumulation, for large consumers of DHW, reducing the space of a thermal power plant by more than 60%, and simplifying its operation.

# First Place

## Kentucky Community and Technical College System

**Jason Volz, P.E., Member ASHRAE; Matt Branham, P.E., Associate Member ASHRAE; Brian Duvall, P.E., Associate Member ASHRAE; Braydi McPherson-Hathaway, Associate Member ASHRAE**

CMTA, INC.

In Kentucky, an extensive energy reduction project followed by continuous commissioning produced energy use intensity reductions of more than 45% across multiple college campuses. Energy use will continue to decrease as more building optimization opportunities are discovered using metadata obtained from the building automation system.

SECOND PLACE | **MEC Vancouver Store** | Roland Charneux, P.Eng., HFDP, Member ASHRAE; Daniel Picard, Ing., BEMP, Member ASHRAE; Jonathan Lacombe, Member ASHRAE Due to its location, the MEC Vancouver (Canada) building was required to connect to the Neighborhood Energy Utility (NEU), a district heating initiative that provides heat and hot water by recycling waste thermal energy from sewage with centralized heat pumps. Since the store is surrounded by condo complexes, using noisy and visually unappealing heat rejection equipment on the roof was unsuitable for the project. It was therefore proposed to reject heat to the NEU loop during the cooling season using a high-temperature heat pump rather than installing heat rejection equipment on the roof.

**Interdisciplinary Life Sciences Building** | Michael Radio, P.E., BEMP, Associate Member ASHRAE; Jonathan Friedan, P.E., Member ASHRAE; Tim Hagenbach, P.E., Associate Member ASHRAE

Officially opened in fall 2019, the Interdisciplinary Life Sciences Building (ILSB) at the University of Maryland is a model for energy efficiency, indoor air quality, and ease of maintenance. The building's overall annual energy use is over 40% less than the ASHRAE Standard 90.1-2007 baseline. The facility includes wet bench life science research space, shared scientific research core spaces, new multidisciplinary science teaching labs, and active learning classrooms. The lab also includes office space and a rodent vivarium.

HONORABLE MENTION | **Queensway Government Offices** | Kim Tang Cheuk, Member ASHRAE; Jeremy Ho, Associate Member ASHRAE This Hong Kong project showcased the joint efforts among stakeholders to achieve zero carbon targets. By adopting a new generation ultralow global warming potential HFO refrigerant and emerging technologies—such as chiller plant modeling analytics, digital solutions for ongoing real-time monitoring, commissioning and optimization, etc.—the aged chiller plant has achieved significant energy savings.

**Integrated Outcome-Based Project** | Antoine Courchesne-Tardif, Associate Member ASHRAE The Marguerite-Bourgeoys School Board project in Quebec was born out of a desire to improve the energy performance of 44 buildings. To achieve its financial goals, the school board turned to a project delivery approach that guaranteed costs, eligible financial incentives and annual savings. By focusing on sustainable development measures—such as geothermal,

air-source heat, heat recovery, LED lighting—the school board was able to take advantage of generous incentives and maximized savings, which significantly reduced the project's payback period.

**Tin Shui Wai Hospital** | Suet Fai Leung, C.Eng., Member ASHRAE Tin Shui Wai Hospital was built to meet the population growth and medical needs in the New Territories West Cluster of the Hong Kong Special Administrative Region. As the main medical institution in Tin Shui Wai, this hospital was designed not only to meet the public and medical professionals' needs in respect of energy-efficient technology and renewable energy technology features aiming to reduce operating cost and carbon emission but also designed with consideration of indoor air quality, innovation, operation and maintenance, cost-effectiveness and environmental impact.

**University of Illinois Holonyak Micro and Nanotechnology Lab: Renovation** | Chad Luning, P.E. Member ASHRAE; Tim Jendrycki, P.E., Member ASHRAE; Michael McDermott, Member ASHRAE; Kitty Knauz, Member ASHRAE; Mario Zotta, Member ASHRAE The scale of the cleanroom HVAC systems at Holonyak Micro and Nanotechnology Laboratory at the University of Illinois at Urbana-Champaign is an imposing 500,000 cfm (235 974 L/s) design for ISO 5 and ISO 6 microelectronics fabrication. The come-and-go occupancy of the university research setting allowed the lab's design to integrate active particulate monitoring with demand-controlled airflow to greatly reduce airflow and energy consumption during nonoccupied hours.

**Mitchell House Residence** | Massinissa Ourtirane, Associate Member ASHRAE As the first of a series of projects at Bishop's College School in Sherbrooke, Quebec, Canada, the Mitchell House Residence demonstrated the feasibility and the benefits of a sustainable design at a cost-effective rate. The energy consumption is significantly lower than the baseline case due to the use of geothermal systems, building management systems, high performance building envelope, active chilled beams and heat recovery from exhaust air.

**1801 J Street** | Raymond D. Schouweiler, P.E., Member ASHRAE Key to helping 1801 J Street in Sacramento, Calif., meet its net zero energy, fossil free and indoor environment goals was repurposing an existing basement into a thermal labyrinth, which is used to precondition the ventilation air. The thermal labyrinth is coupled with a VRF system and dedicated outdoor air unit with heat recovery to heat and cool the commercial building.