DESIGN AWARDS

Project Title: Consortium for Building Energy Innovation

Client: The Dept. of Energy / The Pennsylvania State University

Built [X] **Unbuilt** [ ]

Completion Date: 2015

Cost/Budget: Withheld **Sq.Ft:** Retrofit: 35,000SF
New Classroom: 25,000SF

Location: Navy Yard, Philadelphia, PA

Type: 1 Retrofit; 1 New Classroom Building

AIA Philadelphia

CONSORTIUM FOR BUILDING ENERGY INNOVATION

Two buildings make up a mini-campus for an initiative devised by the Department of Energy to develop the means to reduce energy use in commercial buildings 20% by 2020.

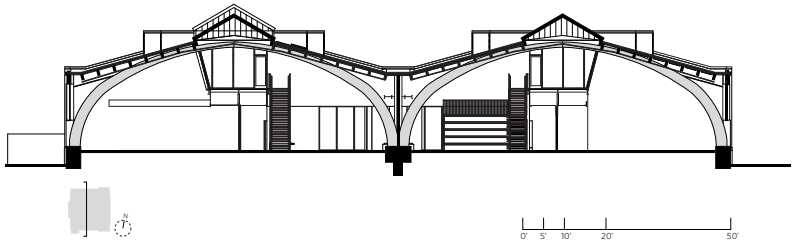
BUILDING GREEN ROOF

In 2011, the Consortium for Building Energy Innovation (CBEI) was formed by the Department of Energy. CBEI incorporates more than twenty member organizations, led by Penn State University, working towards whole building-system solutions for energy usage reduction.

The architects undertook the retrofit of a former recreation center (left) at the Philadelphia Navy Yard to serve as CBEI headquarters. They also designed and built a new classroom building and green roof on an adjacent site (right).

Built within a former 1940s navy recreational building that was unoccupied since the late 1990s, CBEI Headquarters is a living laboratory for advanced energy retrofit technology. It is designed to showcase energy-saving mechanical systems and lighting approaches for different space types.

With an objective to respect the original structure, two expressive glued laminated wood arches were refurbished to enhance one large flexible main space after a wall dividing the original pool and gymnasium was removed. Bleacher-style stairs in the atrium provide seating for lectures, public events, and impromptu gatherings.



A new steel mezzanine was built within the original arches above the main space, providing additional flexible gathering space. The large sky-lit atrium features interior glass walls that provide public views of building controls, lighting systems, and building information modeling labs, supporting the consortium's educational mission to give exposure to emerging tools and energy-saving systems deployed within the building.

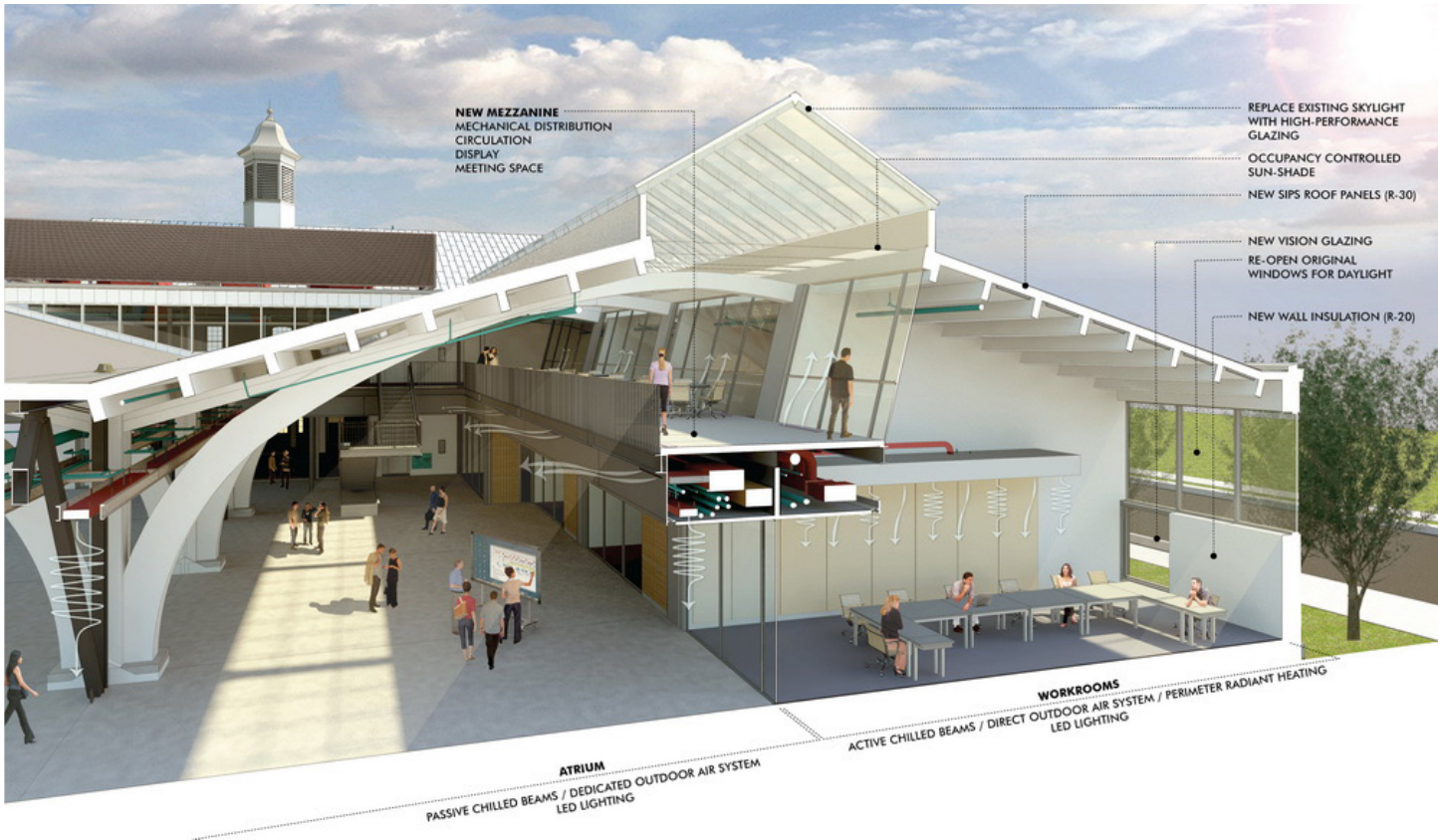
BEFORE

BEFORE

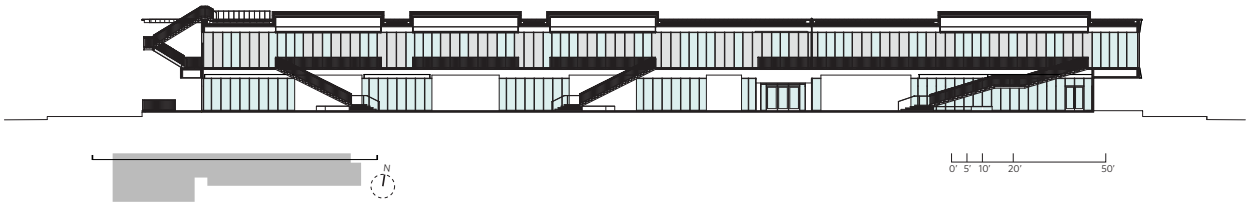
The design enables long-term flexibility; labs and collaborative work rooms are arranged to facilitate expansion or reconfiguration either by removing or repositioning walls. Benches are made from wood salvaged from the buidling.

Per the CBEI mission, all building systems are completely visible, including the main mechanical room, passive and active chilled beams, a low velocity underfloor system, and a split system in offices.

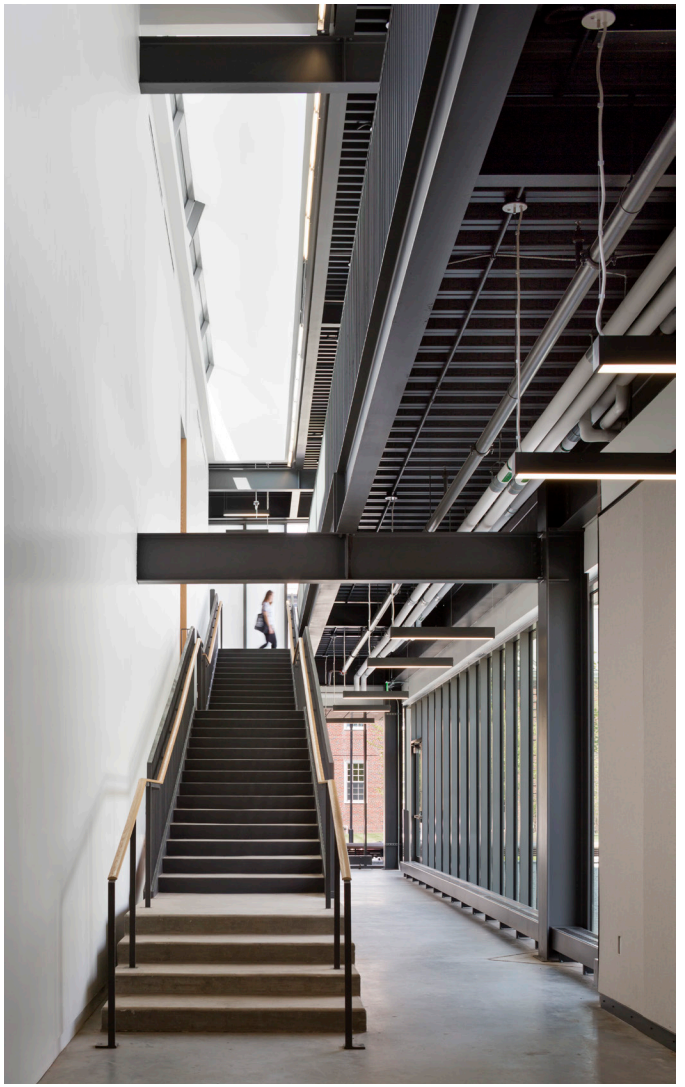
During the renovation process, the exterior envelope of the building was completely refurbished in order to support sufficient operations. Large expanses of new glazing were introduced in concert with a pair of new and retrofitted skylights to suffuse the workroom interior with natural daylight, reducing lighting usage and energy loads.

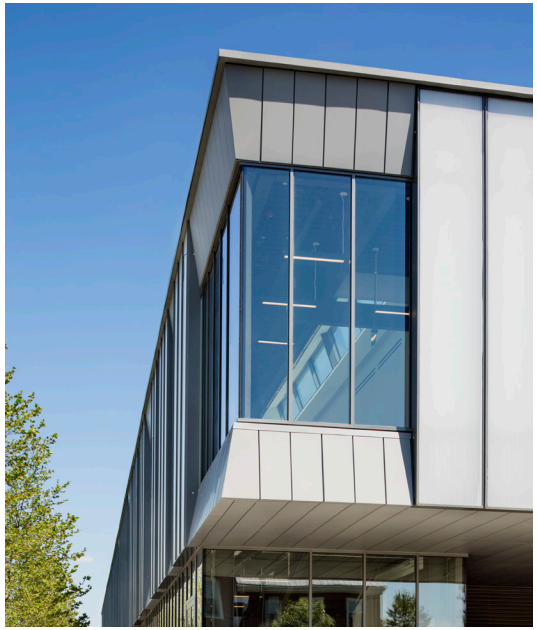


The newly constructed classroom building across the street, operated by Penn State's School of Engineering, will serve students, building operators, building energy auditors, and other practitioners. The facility includes capability for hands-on training on building mechanical equipment as well as on-site and distance-learning classrooms, a 180-seat auditorium, and extensive equipment gallery spaces for training and exhibitions.

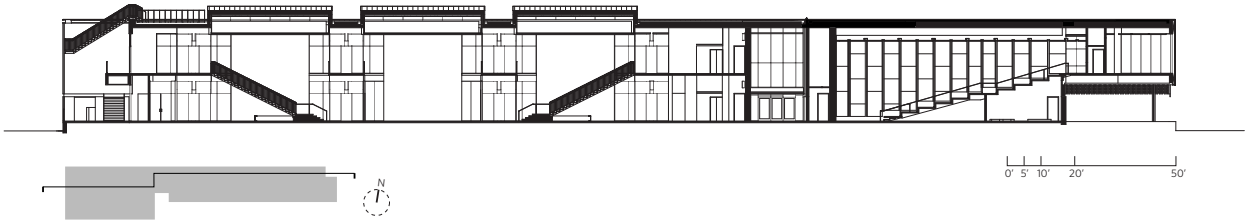


EAST-WEST SECTION





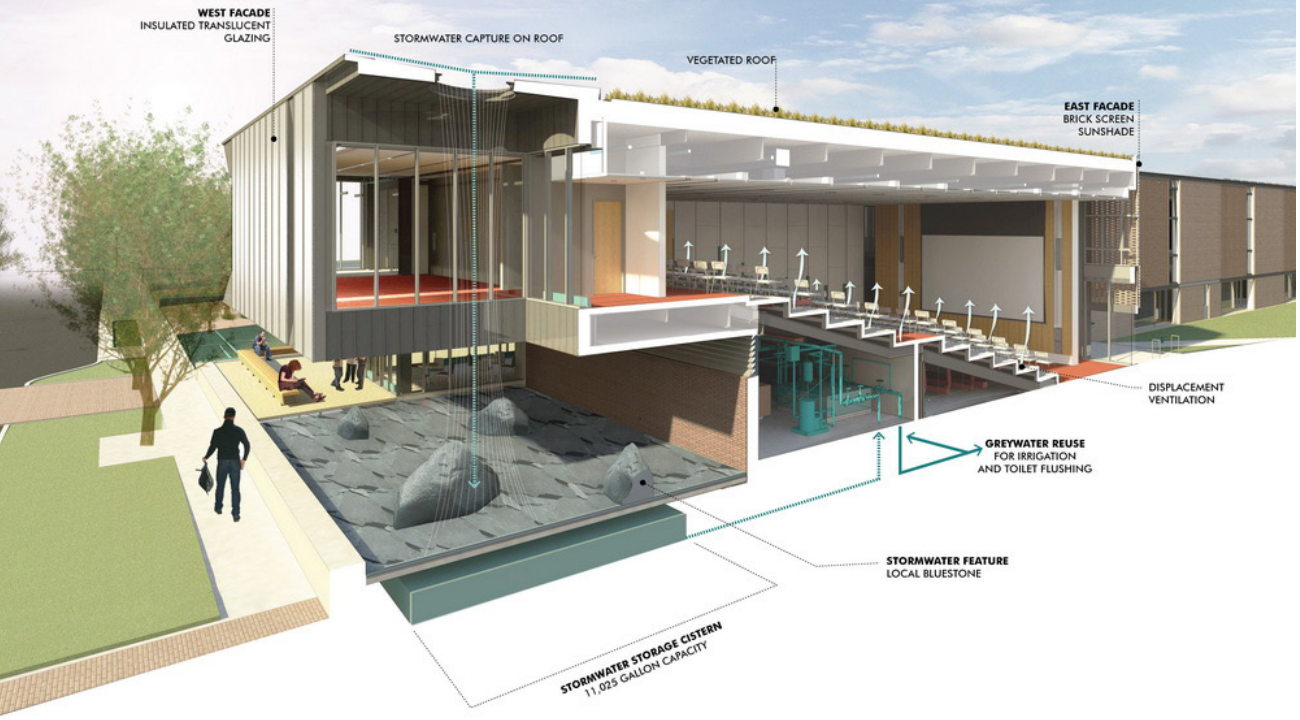
This building demonstrates best practices for a prototypical new commercial building. As with the CBEI headquarters retrofit, interior natural daylight is abundant, lessening reliance on artificial lighting and its related mechanical loads. Here, daylighting is facilitated by a south-facing roof monitor along with an almost completely glazed north wall. Additionally, the building's thin aspect ratio allows light to permeate its width.



EAST-WEST SECTION

The south-facing brick screens provide passive solar shading for classrooms and offices.

The north façade is comprised of 19-foot translucent panels that enhance the thermal performance of the exterior envelope.



Other environmental features include a gray water reuse system and a green roof. Wireless sensors embedded in the green roof monitor thermal performance—one of the first monitoring programs of its kind in the country.

A rooftop photovoltaic array supplies a portion of the classroom lighting and powers a car-charging station. A training room on the first floor is dedicated to the display of photovoltaic battery storage and will be used for education.

The decentralized mechanical strategy, using groundwater-sourced heat pumps with energy recovery wheels, is located between classrooms to maximize efficiency and provide opportunities for in-class observation and instruction.

48 geothermal wells were drilled into the park grounds just north of the building prior to its construction. These 250-foot wells serve as the primary method for heating and cooling the building. In cold weather, the system will pull warmth from the earth to heat the building, while in warm weather, it will remove heat from the building and transfer it to the ground. This system is not only environmentally sustainable, it also offers long-term operations savings when compared to a conventional system.