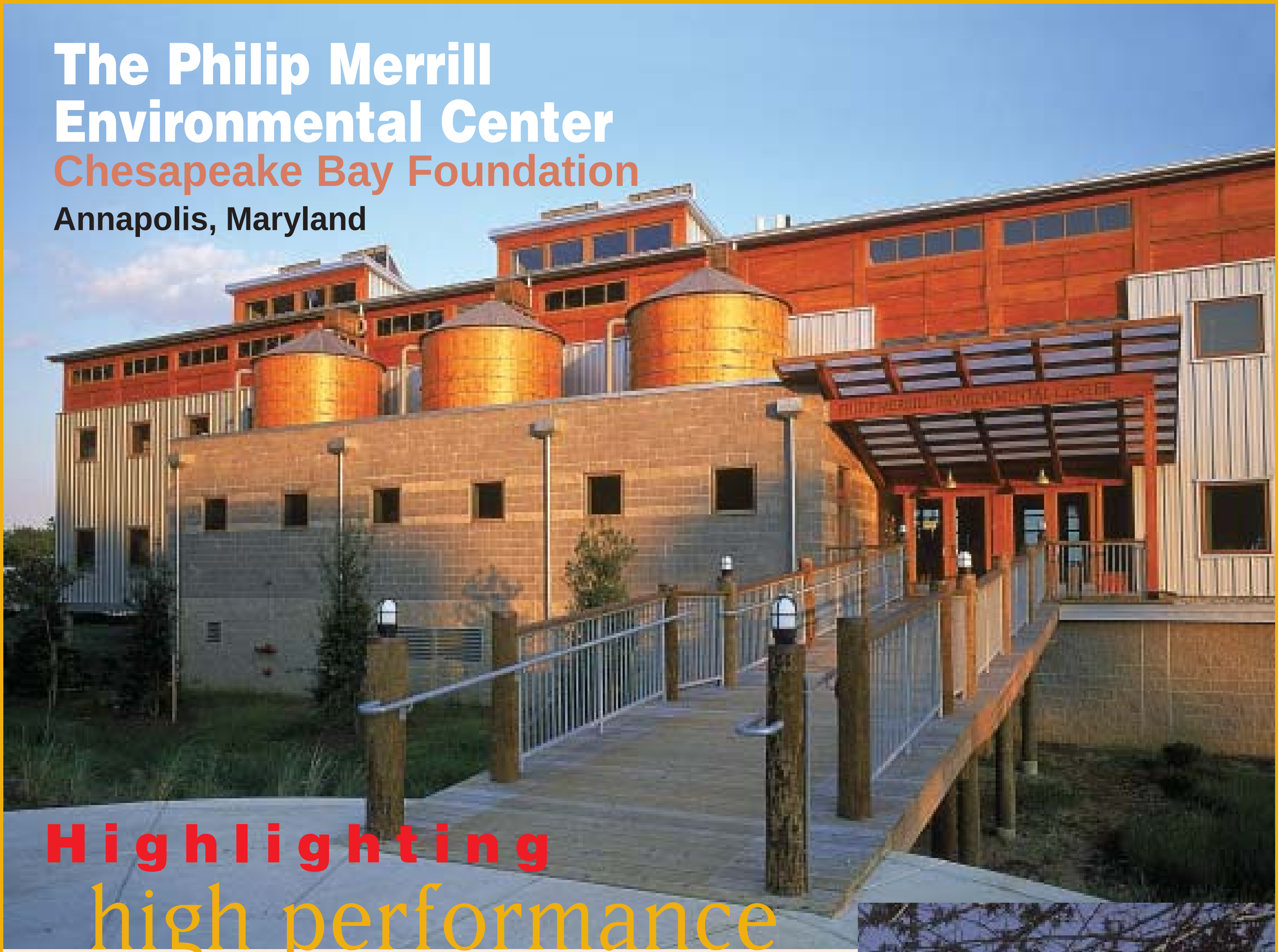
The Philip Merrill Environmental Center

Chesapeake Bay Foundation

Annapolis, Maryland

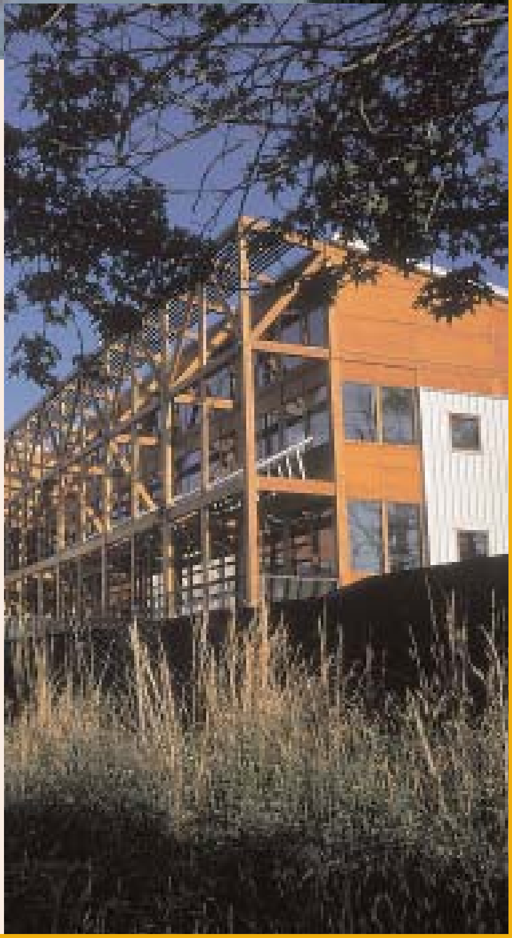


Highlighting high performance

The Chesapeake Bay defines the Philip Merrill Environmental Center in nearly every way. The view of the bay fills the 32,000-square-foot building's entire southern wall of windows, and the building was created to house the Chesapeake Bay Foundation (CBF), a 35-year-old organization dedicated to resource restoration and protection and environmental advocacy and education. CBF works to reduce pollution, restore habitat, and replenish fish stocks in what is North America's largest estuary. Chesapeake Bay is a seriously threatened ecosystem, having lost, according to the foundation, approximately 98% of its oysters, 90% of its underwater grasses, 60% of its wetlands, and 50% of its forests. Situated on 31 acres of shoreline, the entire site around the Philip Merrill Center is a restoration project. The building literally connects CBF to the bay and is designed with the specific intention of minimizing its effect on the bay.

The Merrill Center design shows an awareness, not only of the building's link to the bay, but to the land. The building sits on the footprint of a defunct beach club. Construction did not touch previously undisturbed portions of the site and maintained existing native landscaping, including mature hardwoods. Placing the building on piers allowed for under-building parking, which also helped keep the building footprint small.

CBF has worked to reduce the building's impact after construction as well by promoting environmentally sound transport options such as walking, biking, and carpooling for the 100 people who work there. CBF provides electric, natural gas, and hybrid vehicles for errands, and bike storage, showers, and lockers make it possible for employees to bike, walk, or kayak to work. Videoconferencing and a telecommuting policy also minimize transportation and its impact. CBF also arranges carpooling and has lunch delivered daily so employees don't have to drive to get lunch. In addition, the green features of the center—such as an open floor plan—help the staff work together collaboratively. CBF uses the center as a teaching tool, giving public tours of the building and opening it up to use by outside groups.



As visitors enter the Merrill Center from the north they can see high-performance features, such as solar water heaters, operable and clerestory windows, and rainwater cisterns. The building's south wall, mostly glass, faces the bay.

High-performance features help the Chesapeake Bay Foundation save the bay.

A Simple, Healthy Design

Simple, natural approaches to building often result in the healthiest and the most efficient processes and designs. The shed roof of the Philip Merrill Center is a traditional indigenous form of architecture, historically visible along the shoreline of the Chesapeake Bay. The shed roof is particularly efficient for this building because it allows for easy collection of rainwater and encourages an open interior design, both important components of this office space. Natural light, views, and fresh bay air are never far from any desk or meeting room. Building occupants use operable windows for natural ventilation. Sensors keep track of outdoor temperatures and humidity and automatically shut down air conditioning and open motor-operated windows. Sensors also switch on indicator signs throughout the building when conditions favor open windows. As the bay's breezes cool the building, it relies less on air conditioning.

Water

Slickly designed Swedish composting toilets reduce water use in the building, which is less than 90% of a typical office building this size. A rainwater catchment system captures water, also reducing the need to draw from wells. The shed roof, covered in galvanized metal, allows for a single rain gutter, which drains the water through filters and into cisterns. Since only residential taps were available for the area's water system, installing cisterns avoided a massive city infrastructure upgrade. A sand filter treats the rainwater and CBF employees use it for washing their gear and hands and for mop sinks, laundry, irrigation, and fire suppression.

Parking is underneath the building, and a relatively small area designed to meet occupancy and covered by a permeable surface is used for outside parking. Storm water passes through a bioretention storm water treatment system in the form of manmade wetlands to filter water and treat oils before the water enters the bay or the adjacent Black Walnut Creek. Drought-tolerant native plants minimize irrigation, and mowing meadow and grasslands only once a year reduces fuel use and pollution on site.

A "Less Is More" Interior

On the interior, unfinished pressed wood fiberboard and the lack of finishes and fixtures reduces resource use and indoor air pollutants. The building team's decision not to fill nail holes on interior finish wood, for example, saved $30,000. The designers capitalized on the aesthetic effect of a raw looking interior, intentionally emphasizing the beauty of the unfinished look. They also chose natural renewable materials such as cork flooring, bamboo flooring, and natural linoleum, eliminating the use of virgin materials and petroleum-based materials. The building's beams are parallel strand lumber constructed from waste lumber strips.

Recycled Materials

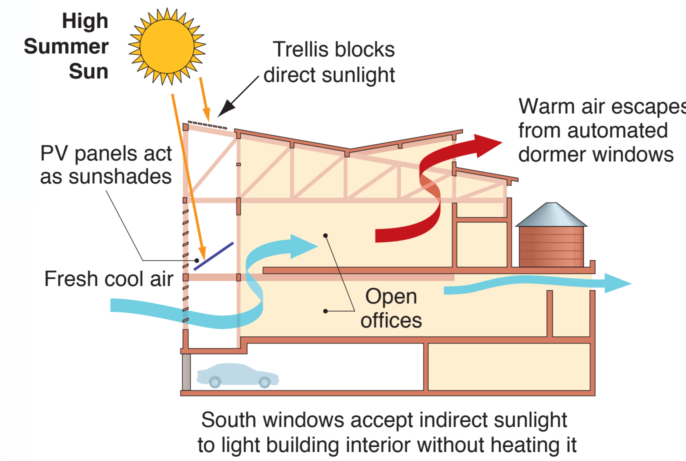
Recycled materials in the building include galvanized steel siding, galvanized roofing, and medium density fiberboard. Parallel strand lumber, made from scrap wood that is normally wasted, was used for posts, beams, and trusses. The sun louvers are made of salvaged pickle barrel staves. Reused broken concrete from the previous structure covers the road beds. A majority of materials used for construction were produced within 300 miles of the construction site.

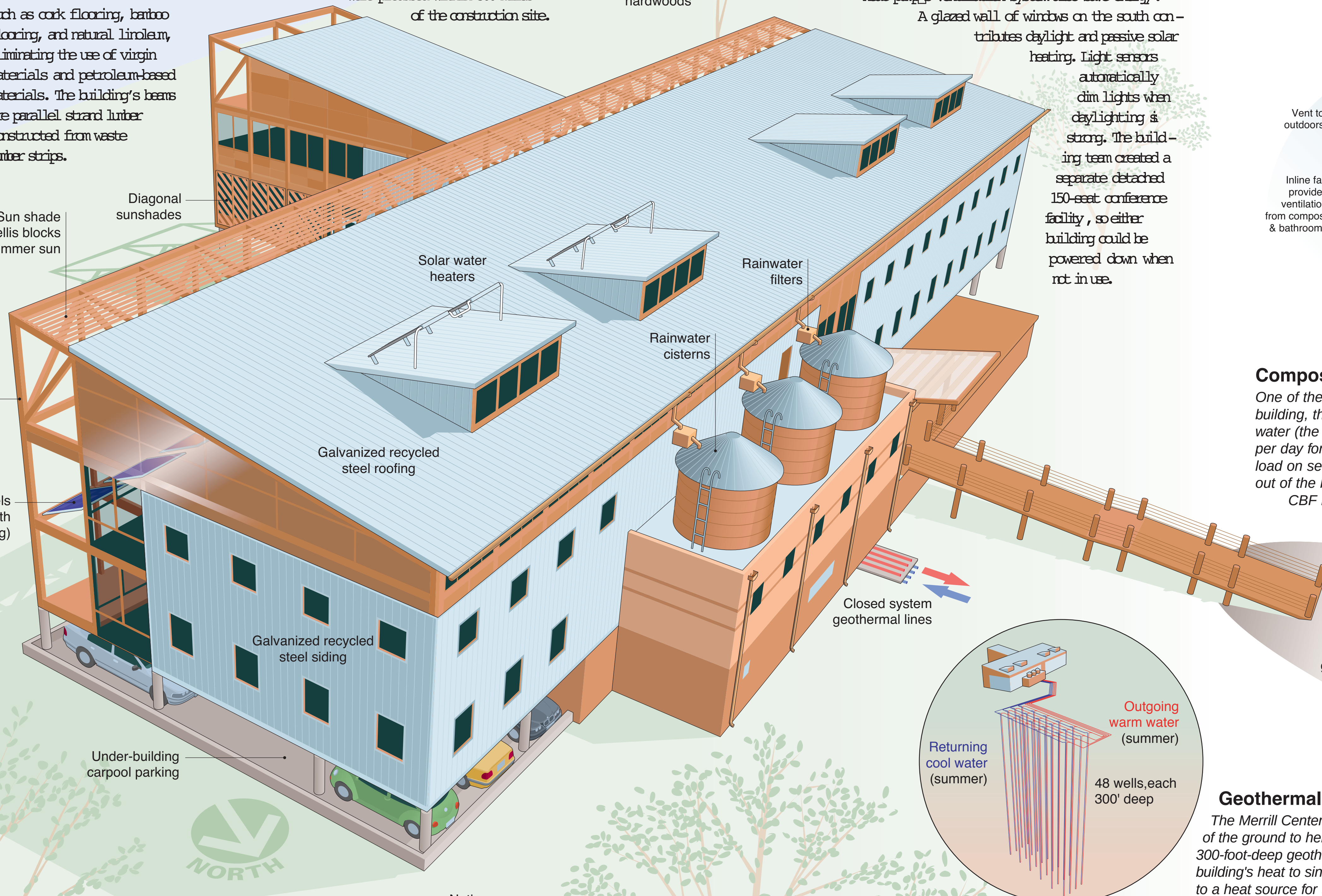
Energy

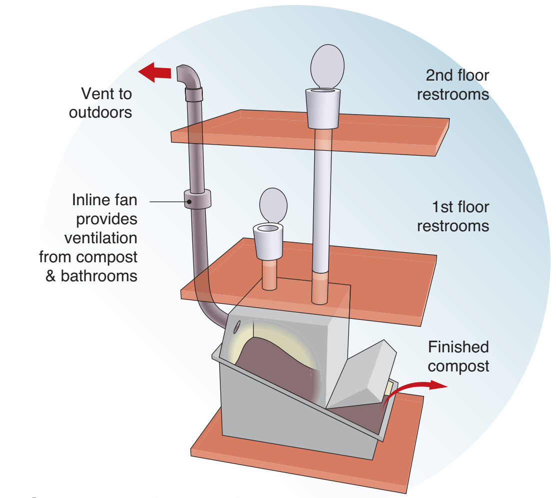
Structurally insulated panels (SIPs) form the building envelope, using less wood than conventional framing and resulting in a higher R-value. A SIP consists of foam core 4 to 8 inches thick with faces consisting of oriented strand board (OSB).

Renewable energy sources provide approximately 30% of the building's energy load. Solar hot water heating provides all the domestic hot water for the building, saving approximately 120 kilowatt-hours (kWh) of electricity per day. A 4 kWh photovoltaic system helps offset a portion of the building's electrical load.

The Merrill Center uses a ground source heat pump system for heating and cooling. Forty-eight wells, each 300 feet deep, use the earth's constant temperature as a heat sink in the summer and a heat source in the winter. A desiccant dehumidifier and a heat recovery wheel on the heat pump's ventilation system also save energy. A glazed wall of windows on the south contributes daylight and passive solar heating. Light sensors automatically dim lights when daylighting is strong. The building team created a separate detached 150-seat conference facility, so either building could be powered down when not in use.







Composting Toilets

One of the first uses of flushless toilets in an office building, these composting toilets use hardly any water (the composting mister uses 1 gallon of water per day for the entire system). They also reduce the load on sewage treatment plants and keep nutrients out of the bay because waste does not leave the site. CBF recycles the compost as fertilizer for the native landscaping on site.

Geothermal Heat Pumps

The Merrill Center uses the constant 54° temperature of the ground to help with heating and cooling. Forty-eight 300-foot-deep geothermal wells provide avenues for the building's heat to sink in the summer, and provide access to a heat source for the building in winter.

Buildings for the 21st Century

Buildings that are more energy efficient, comfortable, and affordable… that's the goal of the U.S. Department of Energy's Office of Building Technology, State and Community Programs (BTS). To accelerate the development and wide application of energy efficiency measures, BTS:

- Conducts R&D on technologies and concepts for energy efficiency, working closely with the building industry and with manufacturers of materials, equipment, and appliances
- Promotes energy/money saving opportunities to both builders and buyers of homes and commercial buildings
- Works with state and local regulatory groups to improve building codes, appliance standards, and guidelines for efficient energy use
- Provides support and grants to states and communities for deployment of energy-efficient technologies and practices.

OFFICE OF BUILDING TECHNOLOGY, STATE AND COMMUNITY PROGRAMS

OFFICE OF ENERGY EFFICIENCY AND RENEWABLE ENERGY

Looking Ahead

The center used the Leadership in Energy and Environmental Design (LEED) rating system of the U.S. Green Building Council as a guiding framework for design. The council awarded the building a platinum rating, their highest rating. The National Renewable Energy Laboratory is monitoring the energy flows and performance of the building's components to assess the effectiveness of the design and the design framework. The research will be helpful for planning future high-performing commercial building designs.

More Information

The following table shows some of the energy-efficient features of the building as designed, compared to a similar, conventional building. R-values and U-values measure how well the insulation or windows transfer heat—the higher the R-value or the lower the U-value, the more resistance. In this case the R-values pertain to structural insulated panels (SIPs). Window solar heat-gain coefficients (SHGC) measure the amount of solar heat that enters a building through the glass.

Key Energy-Efficiency Features

	Base Case	CBF
Wall insulation	R-value = 13	Wall SIPs R-value = 23.5
Roof insulation	R-value = 15	Ceiling SIPs R-value = 30
Floor insulation	R-value = 19	R-value = 20
Windows – solar heat gain coefficient	0.39	0.49
– U-values	0.57	0.32

Solar hot water heaters atop the shed roof provide heat for all of the building's hot water. The galvanized metal shed roof allows for easy collection of rainwater. On the inside, the lack of interior walls, finishes, and fixtures saves resources and adds to a carefully cultivated raw design aesthetic.

Contacts

Chesapeake Bay Foundation, Inc.
Philip Merrill Environmental Center
410-268-8816
www.savethebay.cbf.org

U.S. Department of Energy
Energy Efficiency and Renewable Energy Clearinghouse (EREC)
1-800-DOE-3732
www.eren.doe.gov

U.S. Department of Energy
Office of Building Technology, State and Community Programs
www.eren.doe.gov/buildings/highperformance

National Renewable Energy Laboratory
Center for Buildings and Thermal Systems
www.nrel.gov/buildings/highperformance

U.S. Green Building Council
Leadership in Energy and Environmental Design (LEED)
www.usgbc.org/programs/leed.htm

Produced for the U.S. Department of Energy by the National Renewable Energy Laboratory, a DOE national laboratory

DOE/GO-102002-1533
April 2002

Photo Credits
Robb Williamson, www.williamsonimages.com: Cover—PIX10884; Cover inset—PIX10888; Back—PIX10891; Back Inset—PIX10885

Printed with a renewable-source ink on paper containing at least 50% wastepaper, including 20% postconsumer waste