

Technical Assistance

Case Study



New National Conservation Training Center a Model of Energy-Efficient Design

From the project's inception, the U.S. Fish and Wildlife Service built in energy efficiency, cost-effectiveness, sustainability, and aesthetics.

The former Hendrix Farmstead on the banks of the Potomac River in West Virginia is the pastoral setting for the new U.S. Fish and Wildlife Service (USFWS) National Conservation Training Center (NCTC). It includes 16 buildings on 500 acres that accommodate education and training facilities. Opened in September 1997, the campus now serves USFWS's habitat management, biodiversity, and environmental training needs with classrooms, teaching labs, a museum, student housing, support and utilities spaces, and other structures. The center was designed to use passive solar and low-energy technologies that are readily available, easily maintained, and cost effective. All these technologies and applications fit into a comprehensive sustainability approach.

As a new Federal facility, the center was required to comply with Energy Conservation Mandatory Performance Standards for New Federal Residential Buildings (10 CFR 435). A computer analysis showed that the design substantially exceeded these requirements. Because the site demonstrates energy efficiency to a large number of non-Federal visitors, has replicable project features, includes educational displays, and is historically significant, the USFWS has designated the facility as a Federal Energy Saver Showcase.

Variety of energy-efficient features

The following features were incorporated into the center's design to save energy.

- **Passive solar design.** Buildings have an east-west orientation, which provides good solar exposure. In winter, large southern windows capture solar gain and brick floors behind windows store heat. Windows are made of high-performance glass, which enhances direct-gain heating. In summer, extended roof lines (overhangs) and landscaping provide optimum shading. Some windows are fitted with sunscreens, which also help reduce summer cooling loads.
- **Efficient heating, ventilating, and air conditioning (HVAC).** The lowest life-cycle cost-effective HVAC system available at the time of construction was installed. The system uses high-efficiency chillers and boilers, primary and secondary pump loops, and air and water energy recovery systems. Variable-speed motors are used.
- **Energy-efficient lighting.** The builders installed electronic ballasts, T8 lamps, ambient and task lighting, and occupancy sensors throughout.



The NCTC Instructional Complex features clerestories at roof-top level with diffusers and integrated control systems to provide natural light. The building has 12 classrooms with advanced audiovisual systems, in addition to breakout rooms and conference rooms.



U.S. Fish and Wildlife Service, NCTC/PIX06079

Most of the NCTC campus buildings have an east-west orientation, which is just one of the passive solar features employed in its design.

Control systems integrate the electric lighting with daylighting, which is provided by clerestories fitted with diffusers.

- **Superinsulation.** The center features argon-filled doublepane windows. Insulation in ceilings, walls, floors, foundations, and masonry voids significantly exceed code requirements.

Energy savings

On average, it is calculated that the entire NCTC campus will use 40.5 British thermal units (Btu) of energy per square foot for heating and cooling, compared with 54 Btu for an equivalent campus with traditionally constructed buildings. That is an energy savings of 25%.

During the engineering design phase, USFWS was able to reduce equipment size and energy needs approximately four different times by specifying energy-efficient technologies. However, it must be stressed that energy-loading calculations are based on design estimates, not actual performance data. NCTC has not been operating long enough to assess the validity of these estimates.

The USFWS energy coordinator for the site, David Guthrie, is an active member of the Renewable Energy Working Group. The group was established in 1994 by the Federal Energy Management Program (FEMP) and the Interagency Energy Management Task Force to develop a plan to significantly increase Federal use of solar and other renewable energy in a cost-effective

manner. Guthrie attended FEMP's Low Energy Building Design Course during the design phase of this project. The course reinforced the importance of his efforts. Guthrie and KCF/SHG Architects of Washington, DC, employed computer programs (ENVSTD 2.4 and LTGSTD 2.4) to demonstrate the design's compliance with the mandatory building envelope and lighting requirements of 10 CFR 435. Another computer program (TRACE), developed by the Trane Corporation, confirmed that the building's Federal energy use goal for fiscal year 2000 would be achieved. This goal is, roughly, to reduce total energy used in buildings by 20% as measured in Btu per gross square foot of energy-using space.

Other benefits

The facility is noteworthy for other reasons, as well.

- **Recycled materials.** The cement was augmented with fly ash, and reclaimed metals were used in the siding instead of redwood and red cedar. (Red cedar habitat is used by the spotted owl, a threatened species.) Resilient flooring for high-impact and physical training areas was made from recycled tires.
- **Materials conducive to indoor air quality.** Interior finishes and related systems were specified to reduce volatile organic compounds, which typically cause indoor air quality problems.
- **Aesthetics.** The buildings were designed to fit the scale and character

of surrounding rural structures, such as those on the Hendrix Farmstead, built in the 1700s. View corridors, areas immediate to the historic farm, and a historic race track next to the farm were protected. The design aesthetics were the subject of a favorable feature article in the July 1998 issue of *Architecture Magazine*.

- **Protection of cultural resources.** Before construction began, archeological surveys and studies were conducted to protect and record local cultural resources. Prehistoric artifacts, Native American encampments, homestead sites, and two cemeteries were found.

Visitors to this new Federal Energy Saver Showcase thus have a unique opportunity to learn more about our natural world and how energy-efficient buildings can help preserve it.



For More Information

FEMP Help Desk:
(800) DOE-EREC (363-3732)
Internet: <http://www.eren.doe.gov/femp>

Anne Sprunt Crawley
Technical Assistance Team Leader
DOE FEMP
(202) 586-1505

For more information about the project, contact:

Karen Thomas
National Renewable Energy Laboratory
(202) 651-7536

For more information on the facility only, contact:

Tom Davis
National Conservation Training Center
(304) 876-7416



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

DOE/GO-10098-530
October 1998



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