PROJECT OVERVIEW

The Association of State Energy Research and Technology Transfer Institutions, Inc. (ASERTTI) and the National Association of State Energy Officials (NASEO) with the Department of Energy (DOE) and the EnergySmart Schools Program conducted a joint project that encompassed applied research, field testing and technology integration.

The following organizations worked collectively to conduct this research:

- Energy Center of Wisconsin
- Iowa Energy Center
- Lighting Research Center
- Lawrence Berkeley National Laboratory
- Dalhoff & Associates
- Fort Collins Utilities

As part of the overall project there were eight distinct tasks outlined, each with its own set of goals, activities and deliverables. This document was created as part of Task 4: Advanced Daylighting Research.
Energy Smart Schools – Daylighting Design Guidelines and Education Materials

CHALLENGE

To provide design guidelines and educational materials appropriate for incorporating daylighting strategies into schools in various climates and regions (from hot/humid to cold to hot/dry).

Design teams are given specific performance goals for building energy use but frequently don’t have background or training in integrated design approaches or practical design strategies for achieving those goals. Daylighting is a fundamental strategy for improving both building energy efficiency and student performance.

SOLUTION

Develop technical training materials that focus on a pattern approach for key design elements. These elements include building form, orientation and footprint, fenestration (glazing performance, window to wall ratios), electric lighting system, HVAC system sizing to accommodate reduced cooling and/or heating loads, lighting system controls, and building occupant education. Additionally, focus on a “first step” strategy that has the least potential for increasing first costs but will successfully incorporate daylighting and its inherent benefits in the building design.

The Energy Center of Wisconsin used its Daylighting Collaborative training materials as the foundation for creating materials that can be customized for specific climates and/or regions. The design guidelines emphasize the use of sidelighting as the primary strategy for incorporating daylighting into the building design without increasing first costs.

These materials are designed to be updated with region and climate specific examples and include the following sections:

- Introduction and Program Overview
- Introduction to Key Terms and Concepts (daylighting and energy efficiency/performance concepts)
- Daylighting Design Strategies
- Enhancing Human Performance (issues and research regarding student performance)
- Economic Performance (efficiency/daylighting and impact on first cost and operations/maintenance)
- Enhancing Environmental Performance (daylighting and “green”/sustainable building)
- Building Envelope – window to wall ratios, glazing performance, window apertures
- Electric Lighting and Controls Integration
- HVAC Systems for Schools
- Daylighting Design Overview: Review and Minimum Performance Standards

The curriculum and materials were developed using proven adult learning methodologies and strategies.

RESULTS

“How to Daylight Every School” is a technical training curriculum that includes a PowerPoint presentation and student manual. Additional resources are available via the internet at www.daylighting.org.
“How to Daylight Every School” serves as a starting point for educating design professionals on integrated design strategies and key energy efficiency opportunities that reduce building energy use.

FUTURE

Daylighting is a fundamental design strategy for school facilities because it influences building performance and student performance. Because daylighting affects multiple building systems (lighting, heating, cooling), it is a basic strategy for integrated building designs that reduce energy use. And, a growing body of research suggests improved student performance at daylit schools.

To ensure that new school construction takes advantage of the benefits of daylighting design strategies, we need to continue to provide trainings and educational materials that will assist both decision-makers and designers in implementing daylighting in new school construction.

Recommend:

- Continue to provide technical training.
- Continue to develop specific recommendations for daylighting design acknowledging there may be multiple daylighting solutions or strategies depending on building type, size, budget, climate and region.
- Continue to monitor daylit buildings in various climates and regions to replace modeled estimates with hard data in the training materials.
- Provide access to technical expertise and information on daylighting to assist project architects as questions arise during design process.