



## NATURAL INTERIOR DAYLIGHT

A REPORT TO ADVOCATE FOR SOCIALLY RESPONSIBLE SUSTAINABLE DEVELOPMENT

# TEACHERS PREFERRED NATURAL DAYLIGHT INSIDE PA ELEMENTARY SCHOOL

## ENEREF INSTITUTE EXAMINES THE BENEFITS OF LIGHTING CONTROLS WITH NATURAL INTERIOR DAYLIGHT IN CLASSROOMS

Wilson Elementary is a public school in the West Allegheny School District near Pittsburgh, PA. When engineering firm Thomas & Williamson distributed a survey to school staff, they came back with notable findings.

Seventy-one percent of the teachers expressed keen interest in having natural interior daylight in their classrooms.

Partly as a result of the survey, large domed skylights were installed on the roof of the school

# EVERYONE IS VERY HAPPY WITH THE SKYLIGHTS AND THE AMOUNT OF LIGHT PROVIDED

KEN FIBBI | *Director of Buildings and Grounds*

to illuminate classrooms and communal spaces.

“When the renovation was complete, it was unbelievable,” said Ken Fibbi, Director of Buildings and Grounds for the West Allegheny School District. “Students were astonished by the results.”

LED lighting was installed throughout the building in addition to the skylights. The LEDs are controlled by automatic dimming photocontrol sensors connected to the skylights, reducing electrical load.

“We don’t have to have the lights on at all some days, and the light in my room is enough for me to teach,” exclaimed Terisa Sharlow, the Wilson music teacher.

## THE BENEFITS OF DAYLIGHTING

The use of natural interior daylight, or “daylighting,” increases student performance, a key finding in the 1999 Hescong Mahone report “Daylighting in Schools: An Investigation into the Relationship Between Daylighting and Human Performance.”

Chris Shattuck, Principal of Wilson, reported an improvement in the overall energy and attitude of both students and teachers.

Tawnya Weidinger, a teacher of fifteen years in the West Allegheny district, agreed, stating “the students seemed happier. It feels much more open. The skylights lift your mood.”

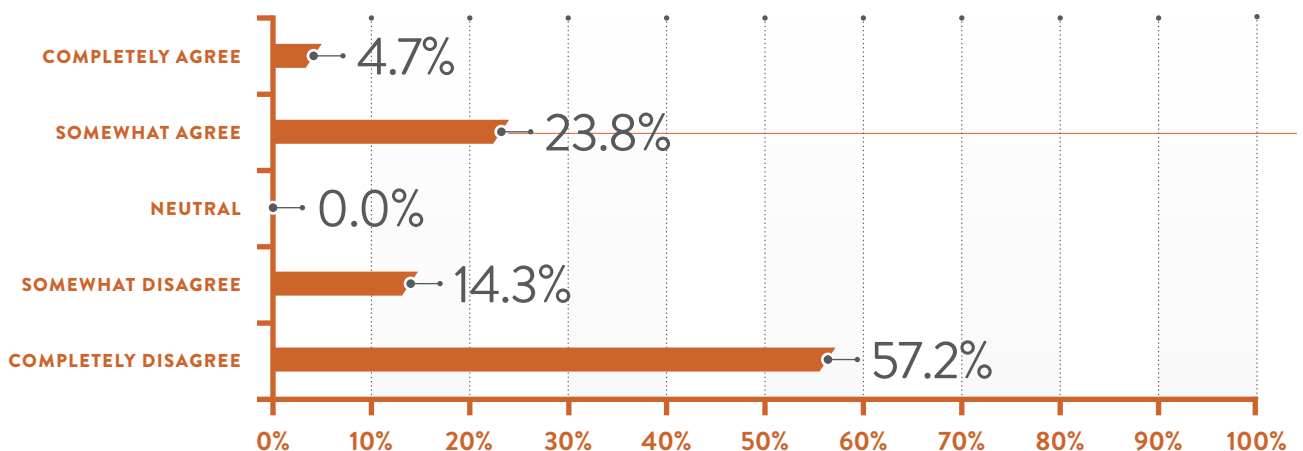
“It’s nice to sit in the sunshine and read a book,” said one young student, a stand-out comment among the host of overwhelming positive responses to the renovation.

Beyond the health and human performance benefits skylights provide, Wilson Elementary was able to halve their annual electricity consumption by

## OPINION PRIOR TO RENOVATION

AMOUNT OF DAYLIGHT IN MY ROOM WAS ADEQUATE

NATURAL INTERIOR DAYLIGHT SURVEY



## SCHOOL LIBRARY

*Sunoptics® prismatic skylights light the music and art classrooms, the collaboratory classroom, the cafeteria, and the library.*



effectively incorporating daylighting and upgrading outdated heating and cooling systems. The school also received a rebate of \$12,525 from their power utility company. An energy reduction initiative signed into Pennsylvania law in 2008, Act 129, facilitated this rebate.

### COUPLING PRISMATIC SKYLIGHTS WITH LED

LED lighting is an energy-efficient alternative to fluorescent, the more common classroom lighting source. Engineer Geoff Ford of CJL Engineering specified direct-indirect LED luminaires in the classrooms and recessed downlight LEDs in the corridors and offices to supplement the skylights. LED troffers were specified in kitchens and storage rooms.

The downlights specified were Gotham® EVO LED Open. Lithonia

Lighting® T Series Recessed LED Troffers were specified to deliver efficient ambient lighting. Both can be readily dimmed via Wilson's lighting controls.

Wilson incorporated the Acuity Controls nLight® network lighting controls with the Lithonia Lighting® luminaires. nLight is a networked digital lighting controls system that provides both energy savings and increased user configurability by integrating time-based, daylight-based, sensor-based and manual lighting controls. The lighting controls will turn the lights on and off or dim them if the space is occupied or when sufficient daylight is present.

In the corridors, cafeteria, library and all other communal areas, the nLight system can be programmed to control the lights with time-based controls,

which automatically shut off the lights at a certain time of day. In classrooms that receive natural daylight, Ford specified automatic dimming sensors.

"Sometimes teachers manually override and turn off the lights because they feel there's enough light with the skylights," said Buildings Director Ken Fibbi.

"I've gone into classrooms in the middle of the day and the lights are at 50 percent," Principal Shattuck concurs. "Some classes have their lights off entirely, and there's still plenty of light in the classroom."

### SPECIFYING SKYLIGHT TYPE AND LOCATION

The Hayes Design Group — Architects worked with Sunoptics® to procure different skylight types for use at Wilson. Clear skylights are over the corridors at

# THE STUDENTS SEEMED HAPPIER, IT FEELS MUCH MORE OPEN, THE SKYLIGHTS LIFT YOUR MOOD

TAWNIA WEIDINGER | *Teacher*

the school, while Multi-Lite and Double-Hip prismatic skylights light the music and art classrooms, the collaboratory classroom, the cafeteria, and the library.

The clear skylights allow direct entry of sunlight into interior spaces, while prismatic skylights use refraction to diffuse the light, increasing visible light spread but blocking the heat and discomfort often associated with direct light sources. Because prismatic skylights gather sufficient daylight even when the sun is low in the sky, the natural light is able to illuminate more efficiently over wider areas for longer hours.

A unique design feature of the school is the “Collaboratory,” an open, communal workspace for students. Hayes Architects illuminated the Collaboratory directly and indirectly, with Sunoptics prismatic skylights directly overhead, as well as borrowed light from skylights in the surrounding corridors.

“We wanted to maintain openness in the Collaboratory. The daylight really brought it to life,” said Jon

Thomas, President of Thomas & Williamson.

## INSTALLATION DECISIONS

Hayes Architects also incorporated natural daylight in the classrooms. A band of two-foot-high windows near the ceiling of the classrooms transfer natural light from the surrounding hallways into almost every classroom of the building.

The survey distributed to school staff prior to installation became a “wish list” for teachers, said Fibbi. The need for better use of daylight was a recurrent theme.

When Fibbi presented the potential energy savings skylights offered, school officials supported the project. Fibbi amortized the cost of the new skylights into the cost of a full renovation for the school’s 35-year-old roof.

“The challenge was not about the vision but rather about the implementation,” said Mark Duane, Project Principal at Hayes Architects. Tim Reidy, Project Architect from Hayes, notes, “The school district was already on board.”

While Wilson Superintendent John DiSanti originally wanted students to look up and see the sky, Hayes Architects recommended Sunoptics prismatic skylights to avoid the direct heat and uncomfortable brightness that clear skylights can invite.

To ensure the most suitable atmosphere for student success, Wilson and Hayes agreed to place prismatic skylights in study-centric areas including classrooms, the Collaboratory and the library. Clear skylights were reserved for the corridors, a commonly used but less sensitive space.

## LIGHTING CONTROLS

Engineer Geoff Ford selected the nLight lighting control system for ease of use and future flexibility.

“We wanted to give Wilson flexibility for room configuration changes in the future,” he said. “The nLight system offered those features.”

“You can also eliminate a lot of cabling, so we’re not taking cables all the way back to a central control panel,” Ford continued. If the 100,000-square-foot school had chosen a single central lighting control panel, they would have had to install numerous heads and relay panels.

CJL Engineering, Ford’s firm, has been recommending LEDs to all schools they’ve worked with in the last five years, since they save

## CORRIDOR SKYLIGHTS

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energy and have a long life. Hayes has deployed similar daylighting solutions into other projects with positive results.

Fibbi's cost concerns about LED were remedied in comparisons of lifetime-cost-of-ownership between T5 fluorescent and LED lighting. Another motivating factor was the easy dimming aspects of LED.

The school district began planning the renovation in 2011. Construction began in early spring of 2014 and took place during the school year and throughout the summer.

Wilson funded the entire project through a bond issue. However, PlanCon, an anticipated Pennsylvania state reimbursement program, has been held up by the state.

The school removed outdated rooftop mechanical equipment, creating pre-made openings for skylight installation. Architects Duane and Reidy added EPCO brand windows to the exterior of the building. Along with the roof's retrofit, the old electrical system was updated.

## INSTALLATION RESULTS

The installation of Sunoptics skylights and LED lighting controls at Wilson Elementary, along with the electrical system upgrade, brought huge energy savings for the school. Buildings Director Ken Fibbi notes that the school's electrical consumption fell from about 1.5 million kWh in 2013 to around 740,000 kWh in

2015—meaning that this project more than halved the school's annual energy use.

Regardless of calculated energy savings, everyone interviewed for this report was pleased with the outcomes of the renovation.

"Everyone is very happy with the skylights and the amount of light provided," said Fibbi.

Principal Chris Shattuck adds, "It was worth the investment."

Jon Thomas agrees: "It really brought the daylight and the outside into the middle of the facility. It brought the school to life."

**AS PART OF OUR NATURAL INTERIOR DAYLIGHT INITIATIVE,** *Eneref Institute interviewed participants in the planning and implementation. Interviewees included Chris Shattuck, Principal of Wilson; Mark Duane and Tim Reidy from The Hayes Design Group – Architect; Geoff Ford of CJL Engineering; Ken Fibbi, Director of Buildings and Grounds for the West Allegheny School District; and Valerie McKee, Daylighting Specialist at LaFace & McGovern Associates.*



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**ENEREF INSTITUTE** launched the Natural Interior Daylight Initiative to champion solutions in line with our mission that deliver sound ideas to significant market influencers. The initiative is designed to encourage responsible behavior within public and private organizations, municipalities and corporations by offering common-sense solutions that achieve effective results.

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