

Endrup School

Improving the preschool learning environment with daylight and fresh air



Endrup School

Denmark

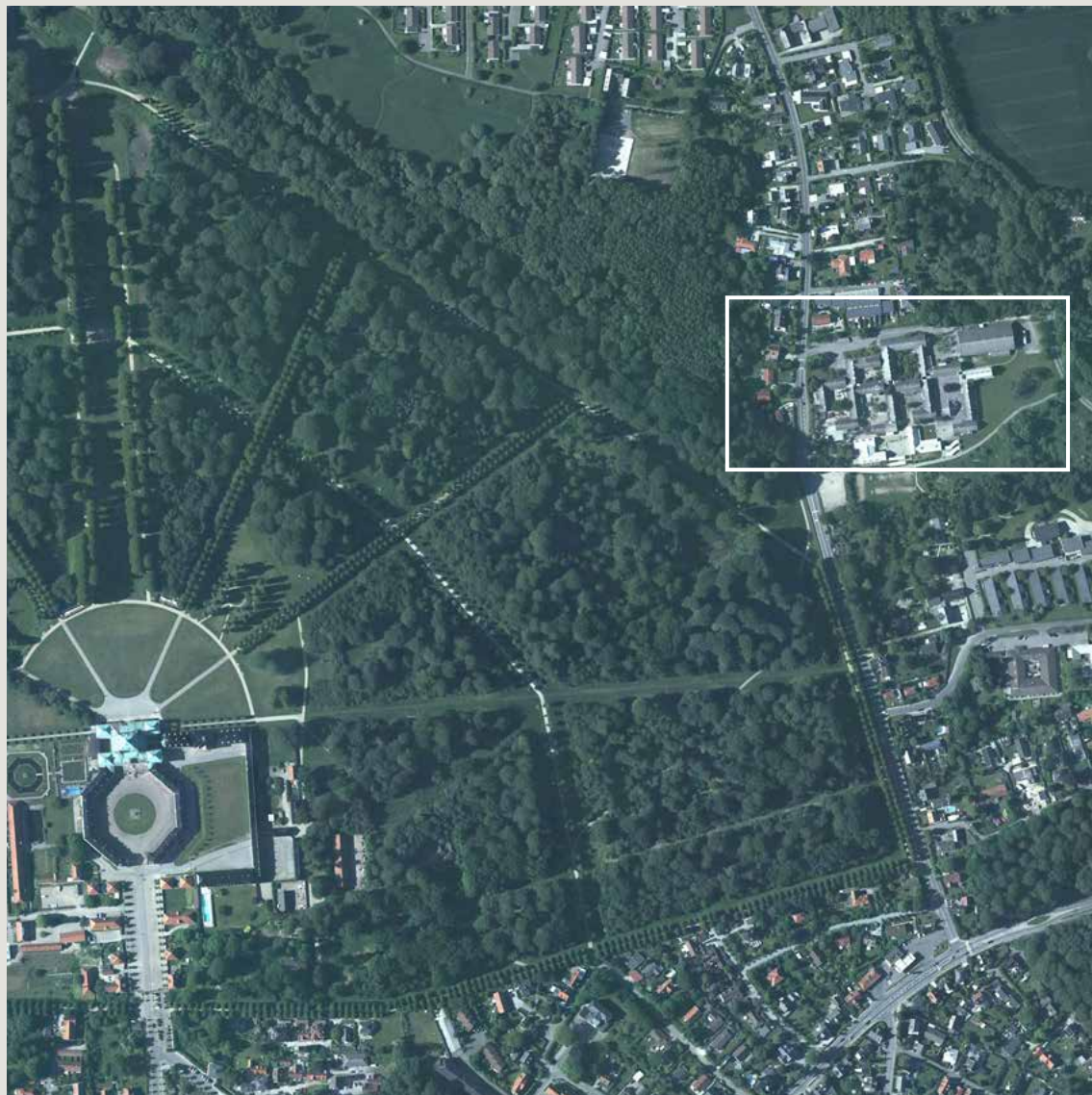


Endrup School is a state school built in the early 1970s and located near Fredensborg in eastern Denmark. The school consists of around 7,000 square metres of dense, low-rise buildings and has 450 pupils and 52 teachers. They enjoy the beautiful nature and tranquil surroundings of the park of nearby Fredensborg Palace.

Rebuilding a construction like Endrup School is an opportunity to implement principles of healthy indoor environment and energy efficiency. In so doing, an existing building can draw on the latest technology to optimise the indoor climate and, in the case of a school, the learning environment.

The objective of the transformation of Endrup School's preschool area was to:

- improve air quality
- reduce temperatures in classrooms, thereby creating a more pleasant indoor environment
- supply the area with abundant daylight.



The challenge

Unproductive classrooms

Active use of daylight and fresh air not only ensures a comfortable building, it also has a number of well-documented positive effects on our senses, concentration and health. A classroom is an environment that should support learning and creativity. To fulfil this goal, a pleasant and healthy indoor climate is crucial.

Until recently, Endrup School's two pre-school classrooms possessed none of these qualities. The rooms were dark, façade windows created unpleasant temperature changes and, most importantly, the teachers and pupils suffered from bad air quality that caused discomfort and tiredness. The school asked the municipality of Fredensborg for help.

Here, architect Knud Jensen had three requirements: "We wanted a solution that ventilated the rooms, lowered the temperature and created better light."

In collaboration with the VELUX Group, the municipality came up with a solution: by installing roof windows equipped with software that enables automatic control and pulse ventilation, the classrooms would be provided with fresh air without large swings in temperature. When the solution was approved, the three-month rebuilding began.



"We wanted a solution that ventilated the rooms, lowered the temperature and created better light."



Before renovation.



After renovation and installation of VELUX roof windows.

Solution

Light and air from above



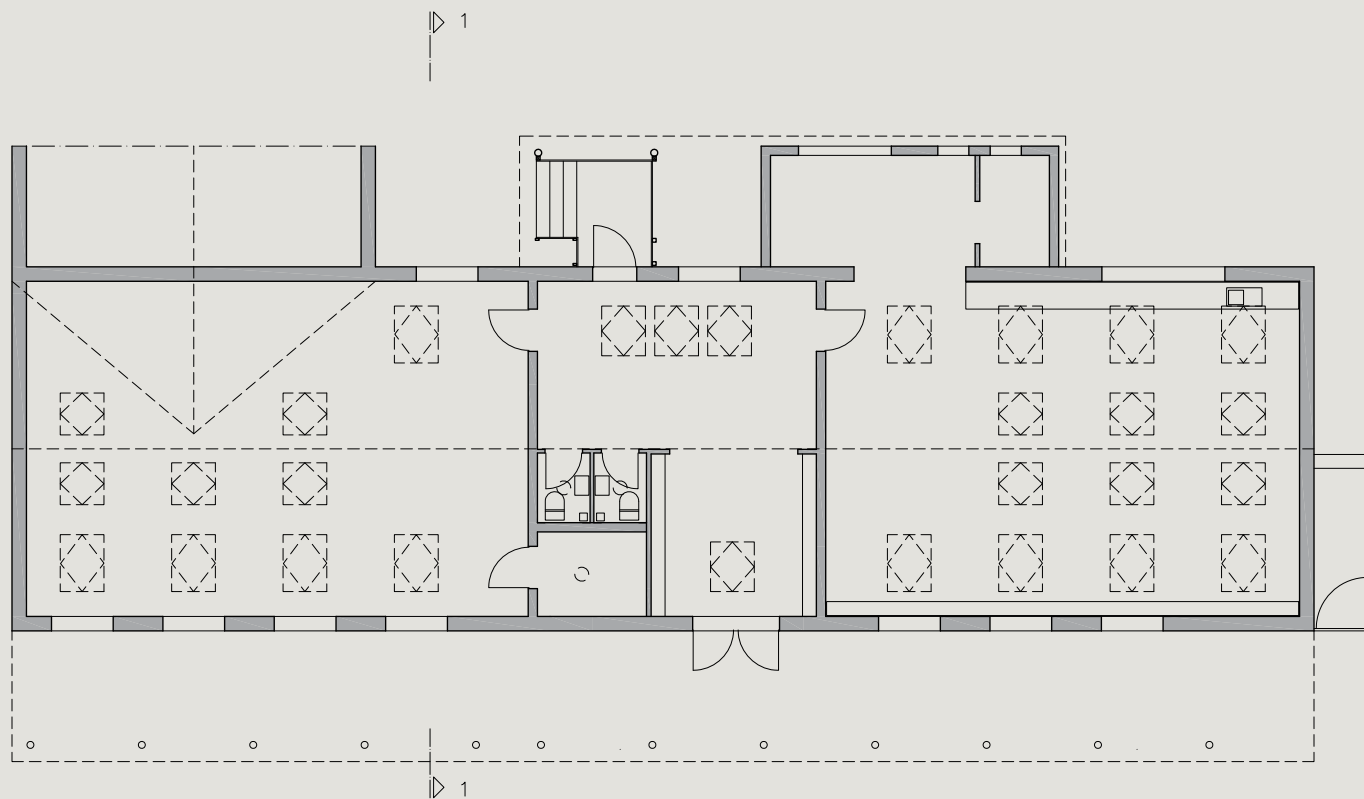
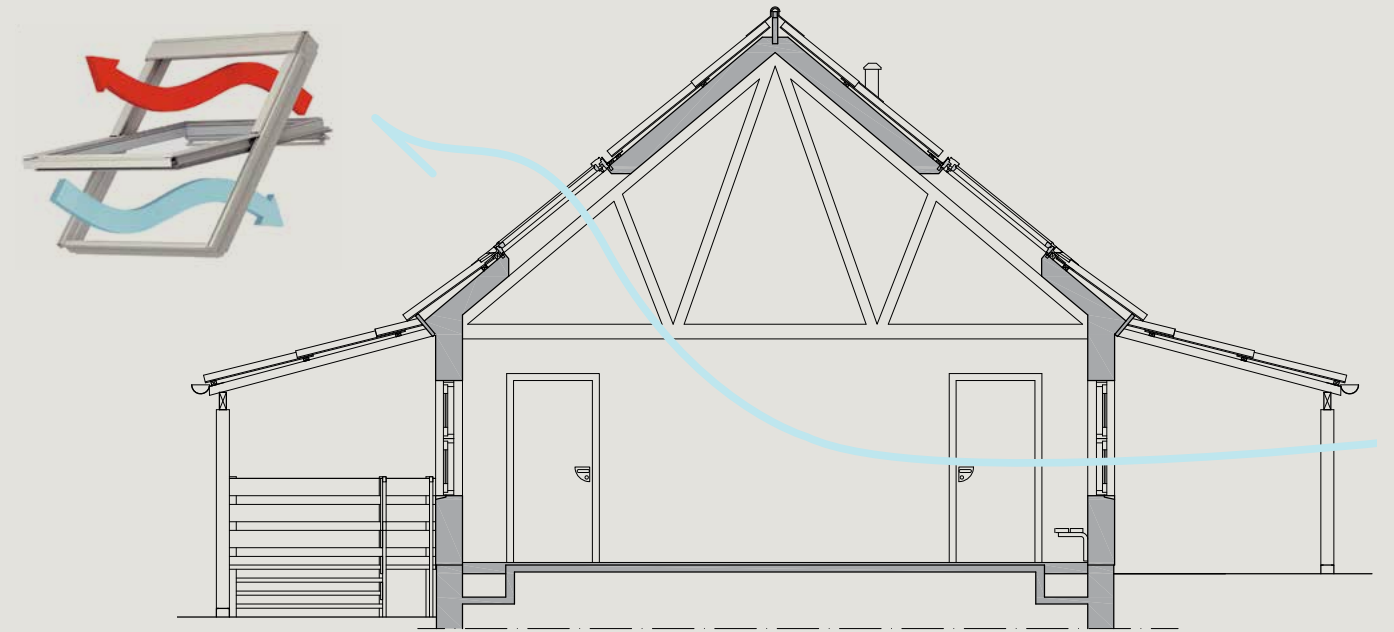
The roof windows in the preschool area have effectively solved the problem of poor air:

"I don't get tired as fast as I did before. I guess it's mainly thanks to the improved air quality," says preschool teacher Annette Lehmann.

But the rebuilding has done much more than that. It has transformed the workplace of teachers Kirsten Hansen and Annette Lehmann, and they are delighted with the change.

"The room feels bright and inviting now," explains Annette Lehman. Kirsten Hansen adds. "Previously, we almost always had to switch on the electrical light but we rarely need that now. In addition, the roof windows enhance the sense of a high ceiling".

Both teachers are pleased with the windows' automatic control and pulse ventilation. With 28 pupils to look after in each class, they rarely have time to perform a manual air change themselves. Before the rebuilding, they often simply forgot it. "Now the software ensures that the air is changed during the breaks and whenever it is needed. There is a CO₂ monitor in the classroom and if the air needs changing, the windows open automatically and close again when the air change is complete, or if it starts to rain," explains Annette Lehman. "The indoor climate feels much more pleasant now that the air is changed through the roof windows," adds Kirsten Hansen. "And the room doesn't get as cold as it used to when we changed the air through the façade windows."



Teaching in a new light

"The sunlight simply makes me happy, and that's a feeling I would like to pass on to the pupils"

The installation of roof windows in the pre-school area was mainly motivated by the need to improve air quality. But it turned out to have a number of other benefits. First of all, the windows have enabled teachers and pupils to enjoy daylight and their surroundings in a new way.

"We notice when the sun is shining and when there is a change in the weather. Before, the rooms were just dark," says Kirsten Hansen.

Inside the busy class room, you do not have to observe the pupils for long to notice that they too enjoy their new view to the outside world. Watching the local wildlife seems to be a welcome distraction when the 5- and 6-year-olds need a break from teaching:

"I like it best in the summer, when there are butterflies outside. But do you know, I have even seen a butterfly in the autumn," relates 5-year-old Lisa. Her classmates Besim and Lena prefer to watch birds and start listing what they have seen:

"A blackbird right outside the window," says Besim.

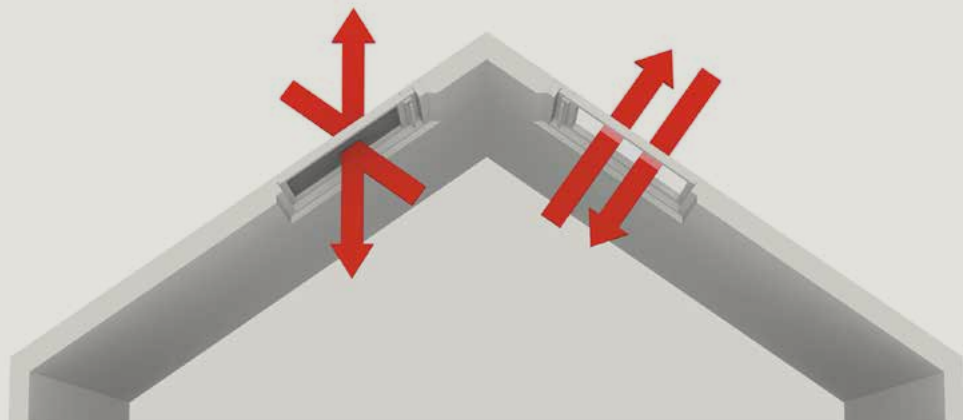
"And crows and magpies," adds Lena.

Though teachers and pupils alike appreciate how the windows have enabled them to enjoy sunlight and nature, the teachers also value the built-in sun screening. Teachers can activate the screening whenever they need it from a control panel in the classroom.

"Thanks to the sun screening, we can darken the classroom and use projectors and smart boards. And we can include computer games and the internet in our teaching," explains Kirsten Hansen.

The advantages of the new windows and their equipment are many but, according to the teachers, the most important benefit is a general feeling of well-being:

"The sunlight simply makes me happy, and that's a feeling I would like to pass on the pupils," says Kirsten Hansen.



Daylight

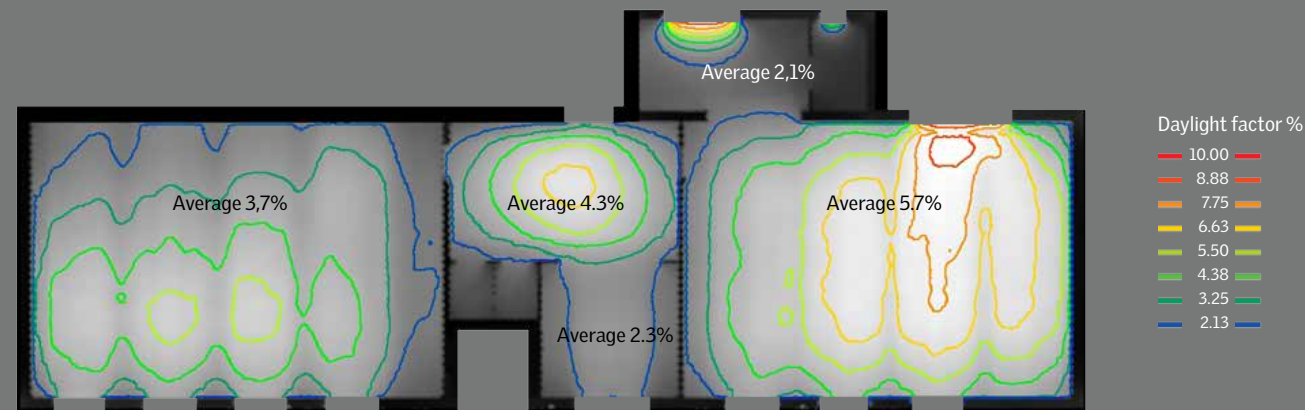
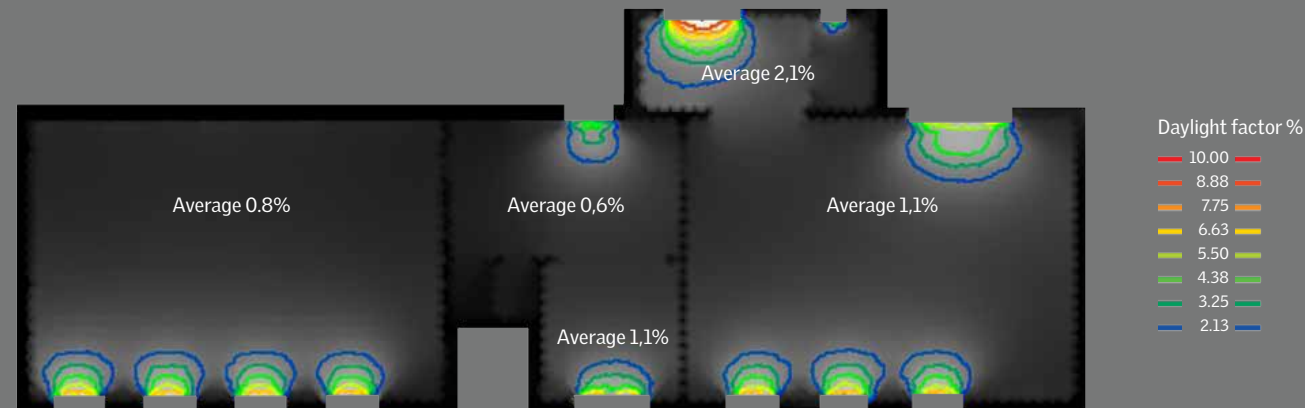
Facts

The daylighting performance of Endrup School has been specified using the daylight factor (DF) as indicator.

The daylight factor is a common and easy-to-use measure for the available amount of daylight in a room. It expresses the percentage of daylight available inside, on

a work plane, compared to the amount of daylight available outside the building under known overcast sky conditions. The higher the DF, the more daylight is available in the room. Rooms with an average DF of 2% or more are considered daylight. A room will appear strongly daylight when the average DF is above 5%.

The daylight factor analysis has been performed using computer simulations made by the VELUX Daylight Visualizer 2, a software tool dedicated to daylighting design and analysis. For more details and download, visit <http://viz.velux.com>. The figures below are showing the daylight factor levels on each floor and the impact of the installed roof windows.



Comparisons of the results show the positive effects on the daylight conditions by adding roof windows. The roof windows provide a more even distribution of light in the classrooms. Before the renovation the daylight levels were critically low and electrical lighting was needed throughout the whole day.

Daylight is vital for our biological rhythm and has a positive impact on our wellbeing and performance and thus provides the pupils and teachers with a better learning environment. In addition, an optimized and controlled use of daylight reduces the need for artificial lighting and provide useful

solar gains during the winter period. In this respect, intelligent use of daylight can significantly help to reduce a building's energy consumption.

VELUX products

Endrup School

The VELUX Group creates better living environments with daylight and fresh air through the roof. The VELUX product programme contains a wide range of roof windows and skylights, along with solutions for flat roofs. The Group also supplies many types of decoration and sun screening, roller shutters, installation products, products for remote control and thermal solar panels for installation in roofs. The VELUX Group, which has manufacturing companies in 11 countries and sales companies in just under 40 countries, represents one of the strongest brands in the global building materials sector and its products are sold in most parts of the world. The VELUX Group has about 10,000 employees and is owned by VKR Holding A/S, a limited company wholly owned by foundations and family. For more details, visit www.velux.com.



VELUX roof windows

Model GGU INTEGRA®. Pivot hung. Electrically operated roof window including remote control and rain sensor for automatic closing in case of rain.



Sunscreening products

Exterior – VELUX awning blinds. Model MML.

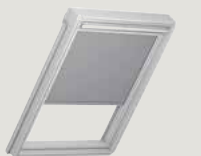


VELUX sun tunnel

VELUX sun tunnels are easy to install and can be combined with a VELUX light kit to keep the space illuminated even when the sun goes down. The sun tunnel connects your ceiling and roof and inside it has a highly reflective coating capable of funneling daylight into the building's darkest corners – even on a cloudy winter day.



Interior – VELUX blinds. Model DML. Elegantly designed VELUX blinds for easy control of heat and light in the building. Adding VELUX blinds to roof windows can increase comfort and reduce heat loss by as much as 21% with the energy blind – lowering heating bills while enhancing comfort.



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