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Mesterfjellet School, Larvik Municipality

Norway's first low-energy school with mixed mode ventilation

For the Mesterfjellet School in Larvik, Norway the municipality chose a mixed mode ventilation solution with automated windows to ensure a high-performance indoor climate with minimal CO_2 emissions

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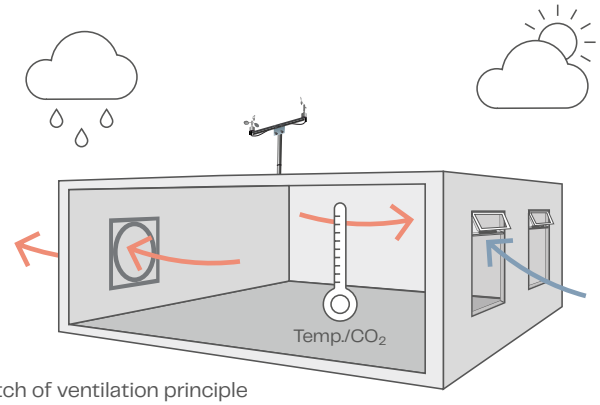
Mesterfjellet School

In the summer of 2014, Mesterfjellet School in Larvik was ready to welcome 530 pupils and 100 employees. The school is a combined elementary, middle, and high school which also includes after-school programs and a health care center.

Mixed mode ventilation
The building uses intelligently controlled, automated windows to deliver fresh from the outdoors to the dwelling zone. Natural ventilation is used most of the year to cool the building and reduce indoor CO_2 levels while the mechanical system manages the windows to avoid draft and control the heating system.



Sketch of ventilation principle

Builder
Larvik Municipality, Property

Turnkey Contractor
Buer Entreprenør

Architect
Cebra / SPINN Arkitekter / Various Architects

Project management
OPAK

Construction management and Coordinator SHA
Rambøll Norway

The solution ensures a healthy indoor climate that allows the building to provide a strong return on investment in terms of occupant wellbeing, productivity, and overall energy savings.

The mechanical ventilation system was delivered with a total air quantity of 28,250 CFM . A mechanical ventilation system without window ventilation is estimated to have a dimensioned amount of air at 57,650 CFM (Hansen, 2015b).

In this hybrid solution, the amount of air the mechanical ventilation system should provide is thus down-dimensioned by 50% – providing considerable cost and space savings.

All common rooms situated at the outer facade are equipped with intelligently automated windows controlled by a WindowMaster control system. Manual override via local keypads is also possible. The control system will open or close the windows and ventilation flaps depending on load and exterior weather conditions.

The effect of the mechanical ventilation system is controlled by the total requirement for air. In the Norwegian climate, this means that the effect is low during the summer, but increases during winter, providing an overall effect to help the building meet its energy targets.

General technique

KNX for the automation of ventilation, heat, light, sun protection, alarm, energy control, etc.

Ventilation

NV Advance® system to control the mixed mode ventilation.

Ventilation principle

Single-sided ventilation & mixed mode ventilation

Number of climate zones

120

Number of actuators

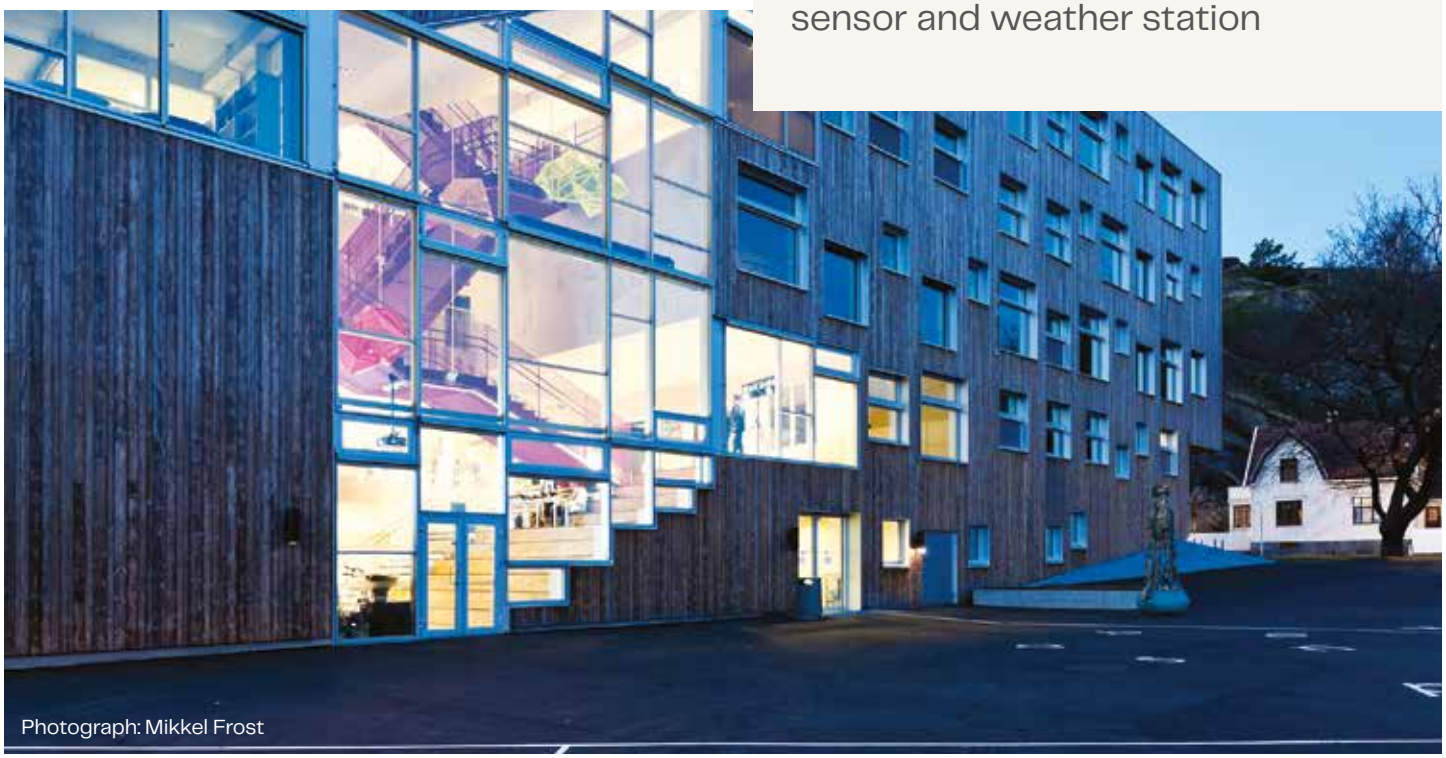
320

Type of windows

160 bottom-hung. Wooden windows opening inwards from Nordan – with integrated chain actuator in upper window frame

Sensors

Temperature / CO_2 / moisture sensor and weather station



Photograph: Mikkel Frost

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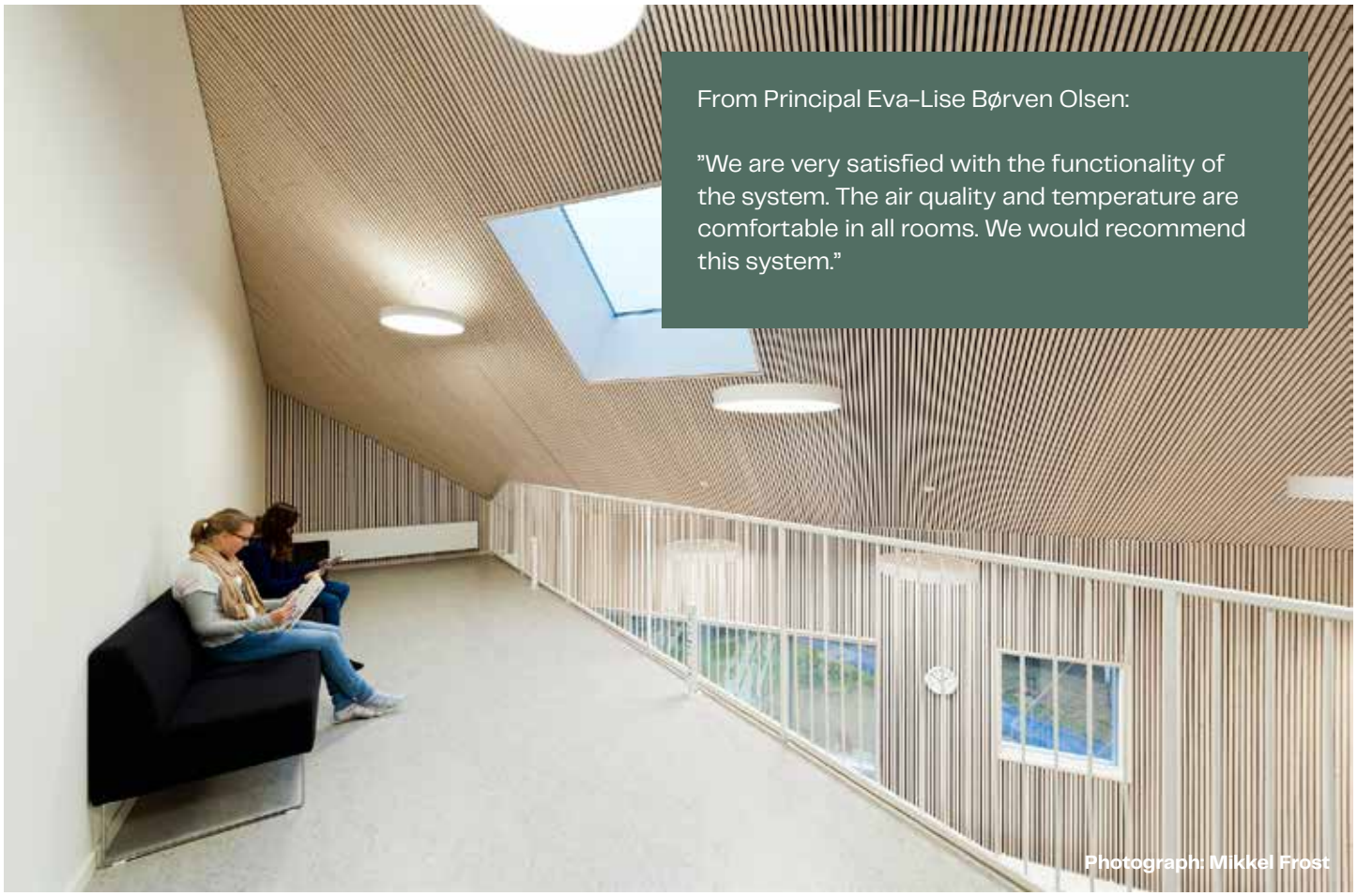


Indoor climate highlights

The school‘s high-performance indoor climate have quite a few highlights

Demand management at room level
The building is divided into zones at room level where each individual room is controlled according to air quality and temperature.

Supply of fresh and temperate air
Fresh and temperate outdoor air can be supplied nearly all the year round via intelligent control and without draft. Individual adjustment and local opening of windows give a high user satisfaction.

Less noise
In periods with natural ventilation, you will have considerably less background noise.

Efficient cooling with very low energy consumption
In many climates, the need for cooling dominates large parts of the year and intelligent window control can effectively address temperature management all year long. A high frequency of air renewal, combined with optimum night cooling offers comfortable indoor temperatures during the summer months.

Energy

After the first running year, the energy meter shows a low energy consumption with an impressive 19,340 BTU/ft² kWh/m², i.e. 18,700 BTU/ft², less than the applicable TEK 10 requirements (Norwegian building code).

Actual net supplied energy to Mesterfjellet (heated area = 62,570 ft²)

Savings according to applicable TEK 10:

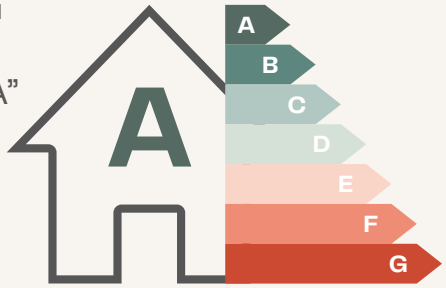
(38,000 BTU/ft² – 19,340 BTU/ft²) x 62,570 ft² = 1,100 MBTU/year

This allows the school to save resources, allowing them to invest in other key areas for the students and staff.

Energy item BTU/ft²/year months*	**Net supplied energy – measured past 12**
Space heating	: 6,660
Ventilation heat	: 2,850
Fans and pumps	: 2,540
Technical equipment, including lighting	: 7,290
Room cooling	: 0
Sum	**: 19,340 BTU/ft²**

Total energy consumption of Mesterfjellet School

19,340 BTU/ft² per year
"Low energy building class A" ranking according to TEK 10 Norwegian building code



WindowMaster aspires to protect people and the environment by creating a healthy and safe indoor climate, automatically ventilating spaces with fresh air through facade and roof windows in buildings. We offer the construction industry foresighted, flexible and intelligent window actuators and control systems for natural ventilation, mixed mode ventilation, and smoke ventilation – of the highest quality.

WindowMaster employs highly experienced cleantech specialists in Denmark, Norway, Germany, United Kingdom, Ireland, Switzerland, and the United States of America. In addition, we work with a vast network of certified partners. With our extensive expertise built up since 1990, WindowMaster is ready to help the construction industry meet its green obligations and achieve their architectural and technical ambitions.

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