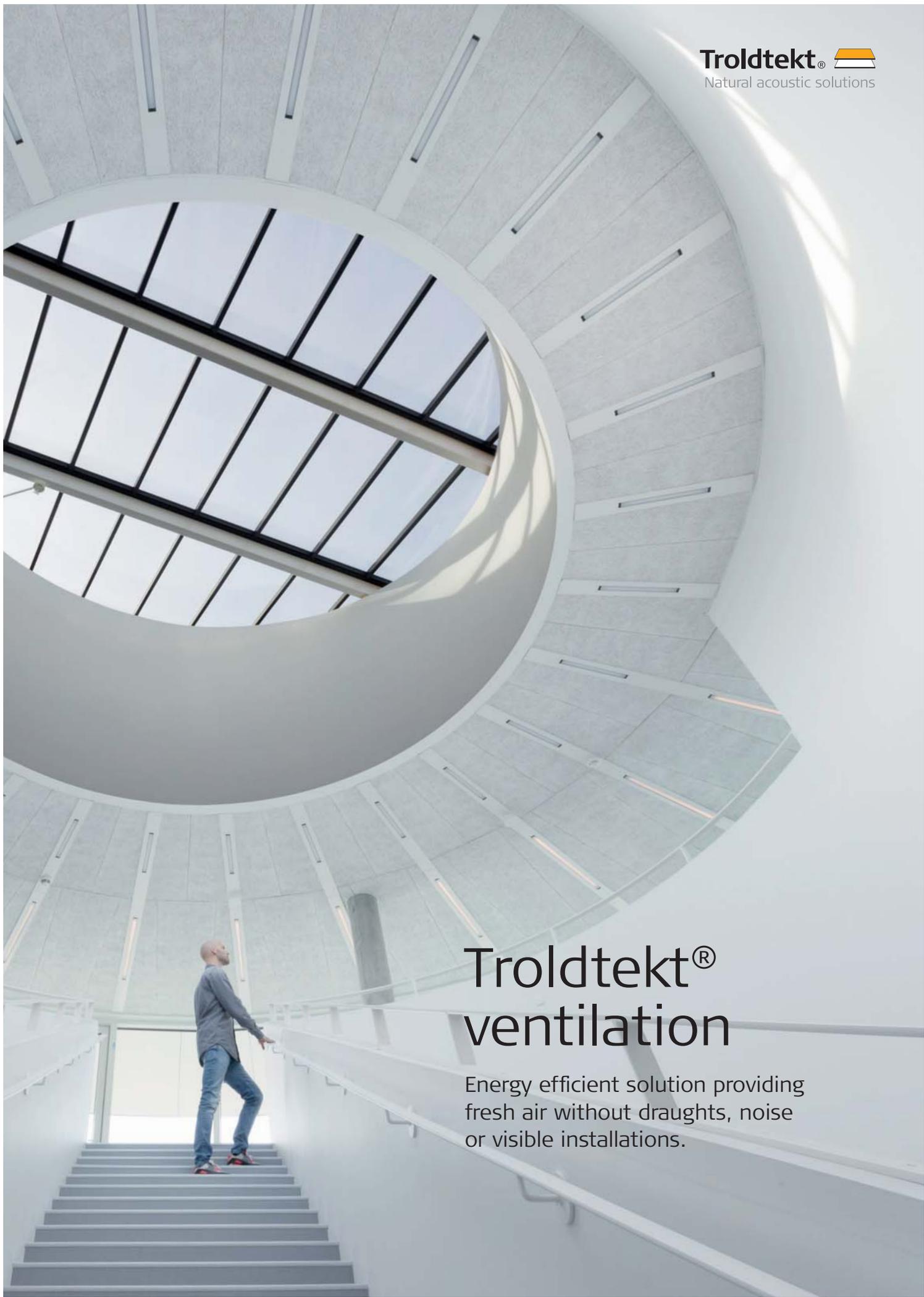


Troldtekt® ventilation

Energy efficient solution providing
fresh air without draughts, noise
or visible installations.



Ventilation hidden in acoustic ceiling panels

Troldtekt ventilation provides fresh air without draughts, noise or visible installations. At the same time, the solution can reduce energy consumption by more than 70 per cent compared to traditional ventilation systems.

In a room with Troldtekt ventilation, fresh air is able to flow in at low pressure. In practice, the solution is an acoustic ceiling, which also functions as a ventilation surface. This means that you are spared the sight of visible ventilation ducts and fittings. The minimum pressure loss through the ceiling ensures that fresh air is distributed evenly throughout the room. Troldtekt ventilation has been specially developed for comfort ventilation in offices, schools and institutions.

A system with active and passive panels

The ventilation ceiling comprises a combination of active and passive Troldtekt acoustic panels. Fresh air is supplied into the room via the active panels. The passive panels have sealed mineral wool glued to the rear side, which prevents any air flow. The size of the room determines the distribution of the two panel types, but usually 10-20 per cent of the ceiling is made up of active panels.

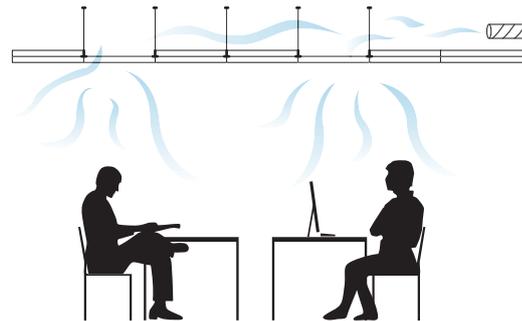
The injection surface is thus considerably larger than that in most traditional ventilation systems, where air flows in through ventilation ducts. This means that you avoid discomfort from draughts, while the low pressure ensures significantly reduced energy consumption.

Good opportunities for cooling

Troldtekt ventilation provides ideal room ventilation and is an economically viable solution for effectively controlling the indoor climate. The ventilation ceiling allows the air to be changed up to eight times an hour, and the supply air temperature is 1-8°C below the room temperature. This makes it possible to introduce a cooling effect, which is normally only possible with a combination of ventilation and cooling ceilings.

Easy to conceal other installations

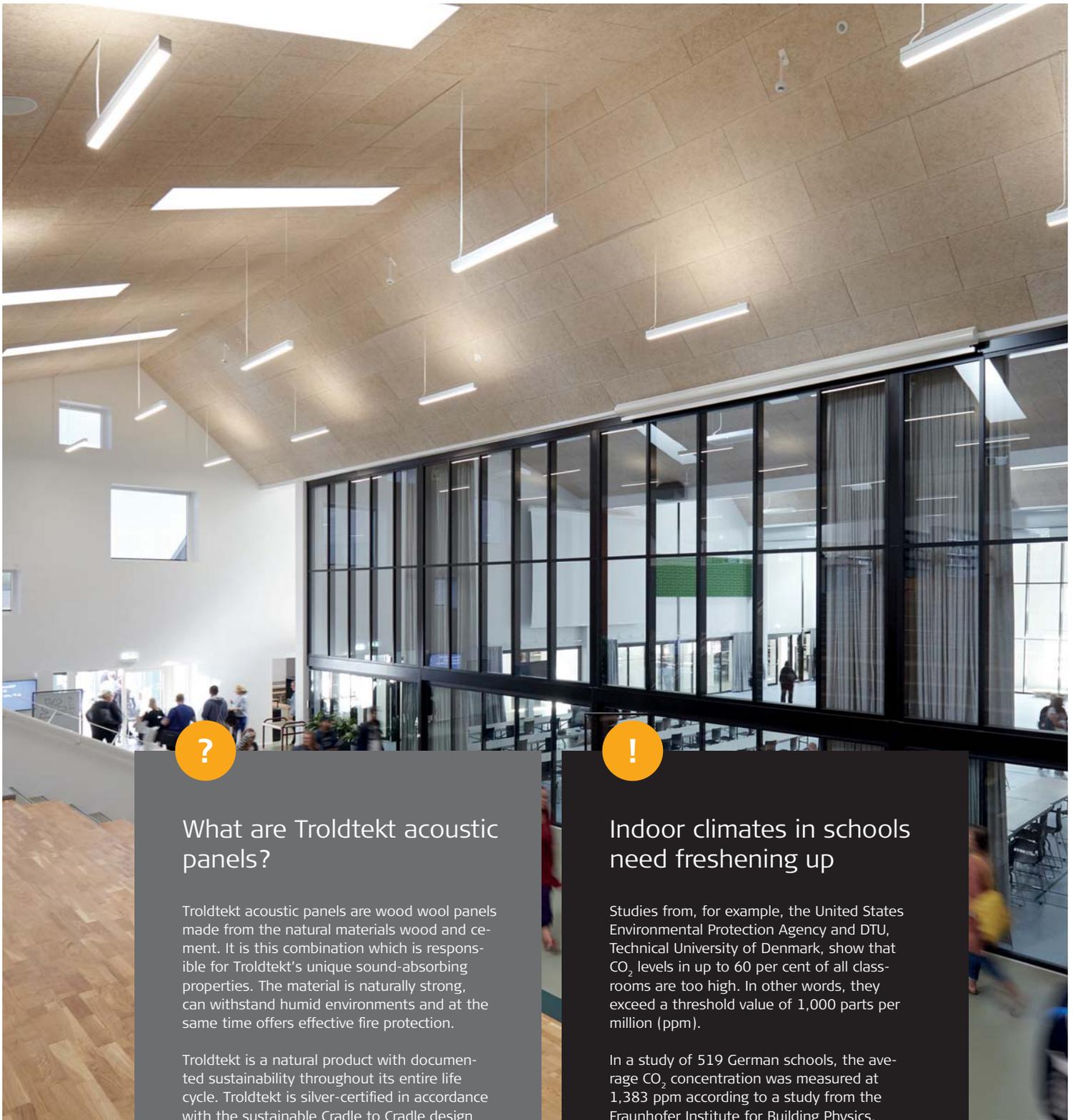
The suspended ventilation ceiling is only approx. 200 mm thick, but makes it possible to hide all other installations and technical fittings (for example water, heating, electricity and sprinklers) in the cavity between the ceiling and the ventilation surface. Thanks to the flexible suspension system, it is simple to remove the panels, providing easy access in order to replace or inspect the installations.



With Troldtekt ventilation, fresh air flows in at low pressure. The entire ceiling functions as a ventilation surface, ensuring an even distribution of fresh air into the room.

Dimensions		Active panels	Passive panels
Thickness	(mm)	25/35	50/60
Width	(mm)	600	600
Length	(mm)	600/1200	600/1200
Weight	(kg/m ²)	9,7/12,0	11,7/14,0





What are Troldekt acoustic panels?

Troldekt acoustic panels are wood wool panels made from the natural materials wood and cement. It is this combination which is responsible for Troldekt's unique sound-absorbing properties. The material is naturally strong, can withstand humid environments and at the same time offers effective fire protection.

Troldekt is a natural product with documented sustainability throughout its entire life cycle. Troldekt is silver-certified in accordance with the sustainable Cradle to Cradle design concept.

Choosing a Troldekt acoustic solution also gives you the opportunity to integrate concealed functions in ceilings such as speakers, lighting – and ventilation.



Indoor climates in schools need freshening up

Studies from, for example, the United States Environmental Protection Agency and DTU, Technical University of Denmark, show that CO₂ levels in up to 60 per cent of all classrooms are too high. In other words, they exceed a threshold value of 1,000 parts per million (ppm).

In a study of 519 German schools, the average CO₂ concentration was measured at 1,383 ppm according to a study from the Fraunhofer Institute for Building Physics.

Bad air quality impacts comfort and concentration. You can read more on page 7 about a PhD study which has shown that pupils perform better in well-ventilated rooms.

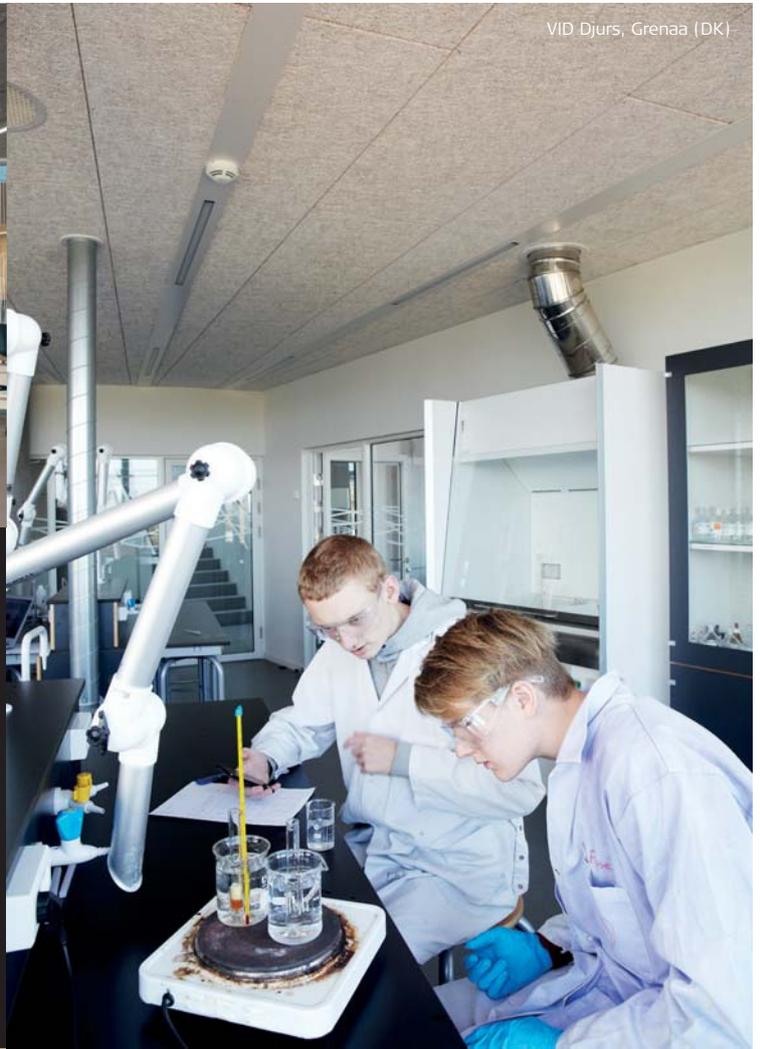


Vestegnen HF & VUC, Rødovre (DK)

60%

Around six out of ten classrooms have an excessive CO₂ concentration (above 1,000 ppm).

Source: United States Environmental Protection Agency and DTU, Technical University of Denmark



VID Djurs, Grenaa (DK)



Vallensbæk School (DK)

15,000

A child spends around 15,000 hours of their life at school.

Source: World Green Building Council

70%

The trial project shows that low-pressure ventilation can reduce energy consumption by more than 70 per cent compared to conventional solutions.

Source: Technical University of Denmark



Roskilde Cathedral School (DK)

1,383 ppm

Average CO₂ concentration in 519 German schools: 1,383 ppm.

Source: Fraunhofer IBP

Grønløkke School, Tranbjerg (DK)



Roskilde Cathedral School (DK)



10%

Experiments show that low-pressure ventilation increases the ability to learn by 10 per cent. This corresponds to an extra year of school during 10 years of schooling.

Source: Technical University of Denmark

UC Syd Aabenraa (DK)



UCN Aalborg (DK)



12,3%

There is a 12,3% higher risk of failure on a hot day when the temperature is 32°C outside, compared to when the temperature is 24°C.

Source: Harvard T. H. Chan School of Public Health

An aesthetic solution that is efficient and thoroughly tested

Architectural quality, good acoustics and a healthy indoor climate. Selected examples of buildings where Troldekt ventilation is part of the perfect combination are presented below.



VID Gymnasier (senior high schools) in Grenaa

Friis & Moltke have designed the extension to VID Gymnasier in Grenaa. The building houses laboratories, classrooms and communal rooms for science subjects. The ceiling surfaces have been clad throughout with white painted Troldekt ventilation ceilings, which provide fresh air in the rooms.



Psychiatric hospital in Vejle

Scandinavian attention to detail is evident throughout the new psychiatric hospital, designed by Arkitema Architects. There is an emphasis on good materials that interact well together – light brick, untreated wood edging, red linoleum floors and grey Troldekt acoustic ceilings with integrated ventilation.



Vestas Technology R&D Centre

Vestas Technology R&D Centre is the first building in Denmark to have achieved certification in the platinum category in the US LEED sustainability programme. The building in western Jutland has been designed by aarhus arkitekterne a/s. Troldekt ceilings have been integrated with Troldekt lighting and concealed Troldekt ventilation, ensuring even supply air without draughts.

Read more and see more pictures from these and countless other cases at www.troldekt.com.

Researchers confirm the advantages

There are major advantages to diffuse ceiling ventilation, where an acoustic ceiling acts as a ventilation surface and fresh air is blown in at very low pressure. This has been shown by researchers from Aalborg University in a PhD project.

The research project was conducted from 2013 to 2016 and combines three known technologies: diffuse ventilation, natural cooling and thermo-active concrete decks. The project received the ELFORSK award in 2017, which honours innovative electricity research which contributes to Denmark's transition to green energy.

High comfort and low costs

For more than 15 years, Troldekt ventilation ceilings have been put to the test in offices, institutions and schools.

Following the project at Aalborg University, researchers have now also given the system a clear stamp of approval.

The project has shown, among other things, that:

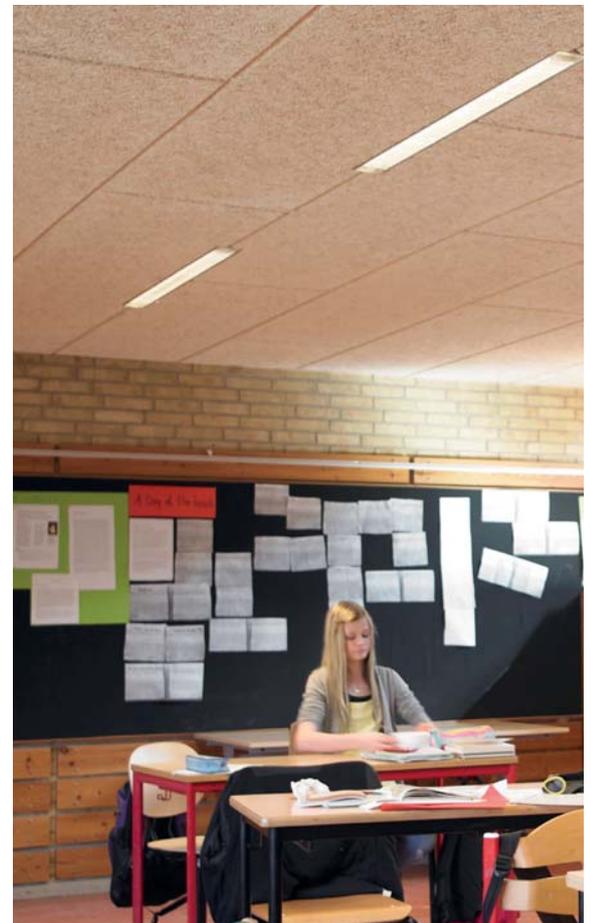
- The combination of cooling and diffuse ceiling ventilation provides high comfort in the room.
- Even on cold winter days (down to -6°C) outdoor air can be supplied without causing draughts.
- An acoustic ceiling combined with a ventilation ceiling can reduce system costs by up to 5-10 per cent compared to conventional ventilation, and there are no visible ventilation ducts or supply air fittings.
- The supply air is supplied at low pressure, thereby saving energy.



Find knowledge in the design guide

The project from Aalborg University has produced a comprehensive design guide, which aims to share knowledge with developers and consultants who are considering using a ventilation ceiling in their construction projects.

- Download the entire design guide from www.troldtekt.com.



Fresh air has the same effect as an extra year at school

Pupils perform 10 per cent better when air quality is excellent. These are the findings of a study conducted by DTU—Technical University of Denmark at Vallensbæk School in south-west Copenhagen, where two rooms were fitted with a ventilation ceiling from Troldekt. The study was part of a PhD thesis.

The results were striking: In an improved indoor climate, the pupils completed 5 per cent more assignments and made half as many errors.

“When we compare the two results, our findings show that pupils perform 10 per cent better when the air quality is good. In other words, during 10 years spent at school, this corresponds to an extra year of learning,” says Søren Terkildsen, MSc in Engineering, who defended his PhD thesis in September 2013.

Before the new ventilation system was installed at Vallensbæk School, the CO_2 concentration could exceed 2,000 parts per million (ppm) in the hours that the school pupils were using the classrooms. The level of 2,000 ppm is twice as high as the recommended limit value. After installing the Troldekt ventilation ceiling, the measured CO_2 concentration remained below 900 ppm.

Read more about the trial project at Vallensbæk School at www.troldtekt.com.

HEALTHY INDOOR CLIMATE SINCE 1935

Troldtekt A/S has been designing, developing and manufacturing Troldtekt acoustic panels since 1935 – from natural local materials and under modern conditions with minimal environmental impact. Our products are developed and manufactured in Denmark, and distributed in numerous countries around the world.

We set trends

It is our vision to be a trendsetter in relation to intelligent acoustic solutions that focus on a sustainable indoor climate. We therefore develop new solutions in close collaboration with industry experts, architects and other building consultants. One example is Troldtekt ventilation panels, which combine good acoustics with fresh air in buildings.

We take responsibility

It is important to us to take responsibility for society around us – in part for our own sake. We believe companies do well by doing good. We have therefore systematised our responsibility efforts by committing to the UN Global Compact – the world's largest voluntary corporate social responsibility initiative.

We create added value

The sustainable Cradle to Cradle design concept is a key part of our business strategy. This concept has a focus on materials creating added value for the environment, society and our business. We work with Vugge til Vugge Danmark to ensure that our initiatives are in line with international Cradle to Cradle principles.