Resilient Ventilative Cooling in practice

- VENTILATIVE COOLING INTEGRATED DESIGN

1

Our business areas

Stand-alone solutions or full integration with BMS

Provide and control

- Natural ventilation
- Mixed mode ventilation
- Smoke ventilation

Additional control of

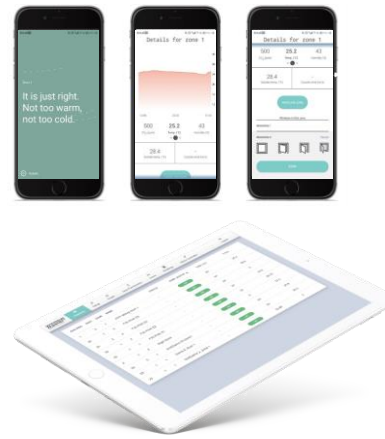
- Sun screening
- Cooling
- Heating
- Light
- Mechanical ventilation

2

Cloud-based control system

How does it works?

App and dashboard



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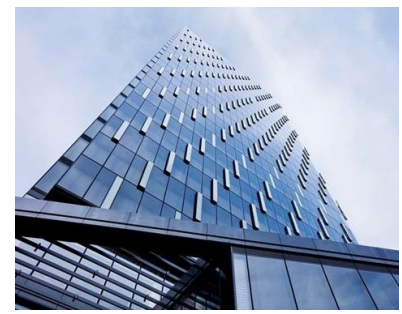
Cases

Municipality building

- 0-energy office building utilising Hybrid ventilation.

Court building

- Mechanical- and natural ventilation depending on the area.



PNC Tower

- Hybrid ventilated office building.

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Office building in Denmark

Solution

Hybrid ventilation

Solar shading

Buildings

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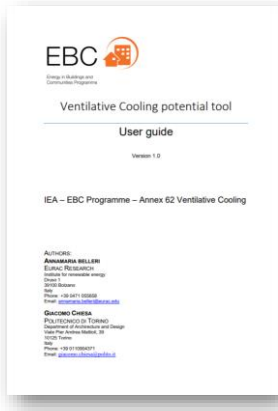
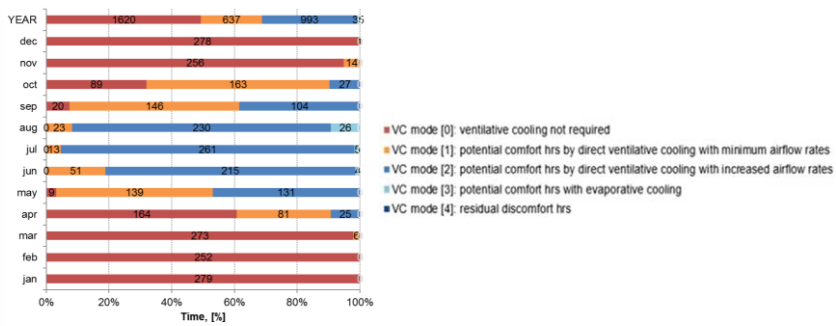
IEA Annex 62 – tool to analyse the VC climate potential

https://venticool.eu/information-on-annex-62/annex-62-publications/deliverables/

User guide



Results from tool



	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average airflow rate	-	-	-	2.91	3.22	3.53	3.69	3.58	2.85	2.68	-	-
Standard deviation	-	-	-	0.37	0.76	1.11	1.22	1.38	0.33	0.21	-	-

Table 3. Required ventilation rates (average and standard deviation over each month) to cool the building during occupied hours when direct ventilative cooling with increased airflow rate is required (VC mode [2]). Data refer to example 1: office building in Copenhagen.

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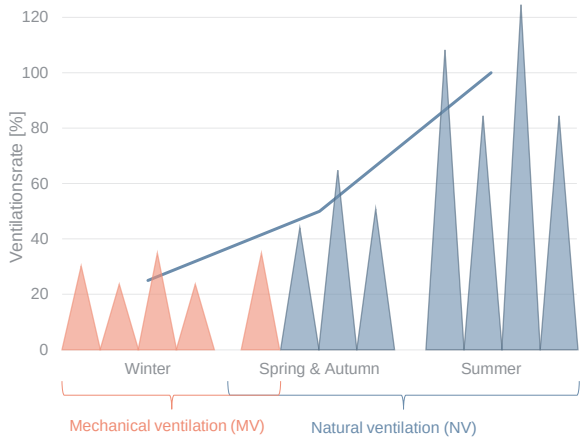
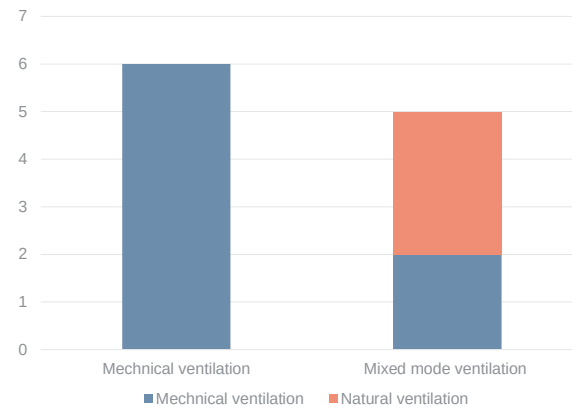
Hybrid ventilation

Lowered; capital cost, energy consumption and solar panels.

Hybrid ventilation strategy



Capital cost of the systems



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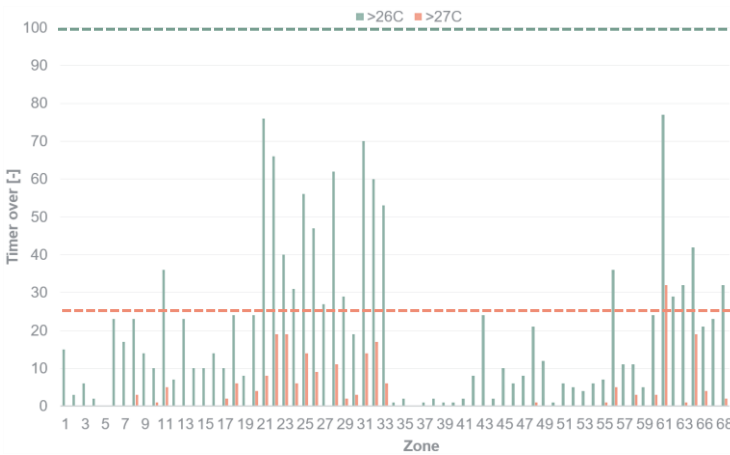
One year temperature data

Worst performing rooms



Requirements (DK)

Indoor temperature:

- Not more than 100 hours above 26°C
- Not more than 25 hours above 27°C

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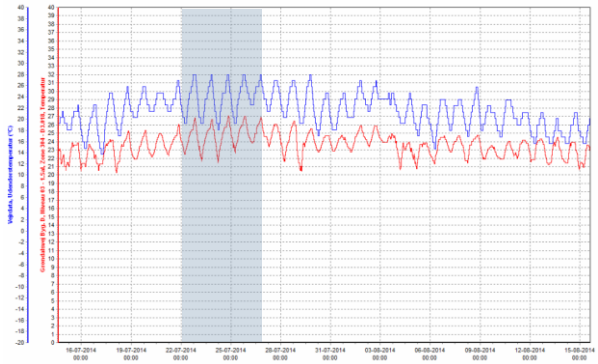
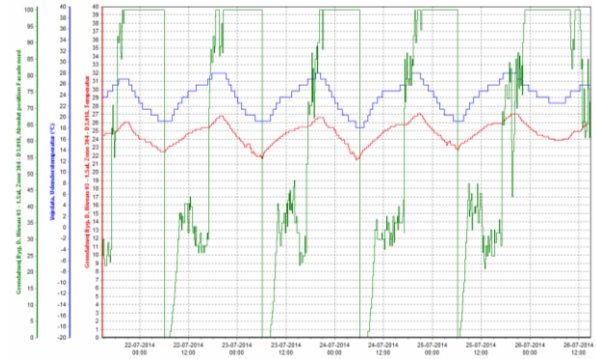
Night time cooling

External vs. internal temperatures



External vs. internal temperatures and opening degree



Court House (Retten på Frederiksberg)

Copenhagen, Denmark

Court House (Retten på Frederiksberg)

Copenhagen, Denmark

Solution and control of

Natural ventilation

Mechanical ventilation

Hybrid ventilation

Smoke ventilation

Solar shading

Heating

Layout

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Court rooms at ground floor level

are mechanical ventilated

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Ventilation overview

Plan drawing

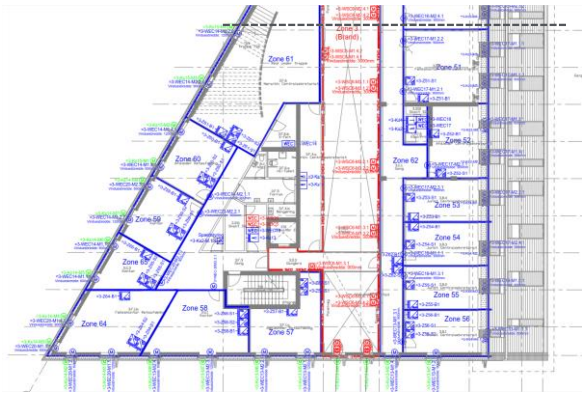
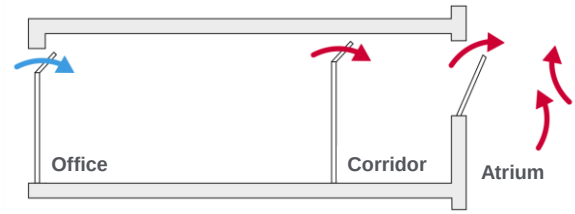


Illustration of the ventilation principle



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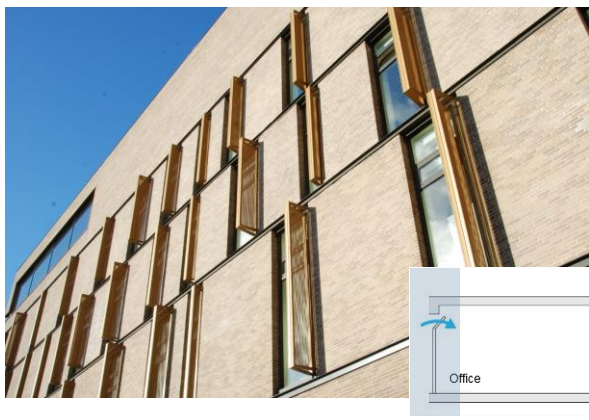
Ventilation walk-through

Façade



Corridor

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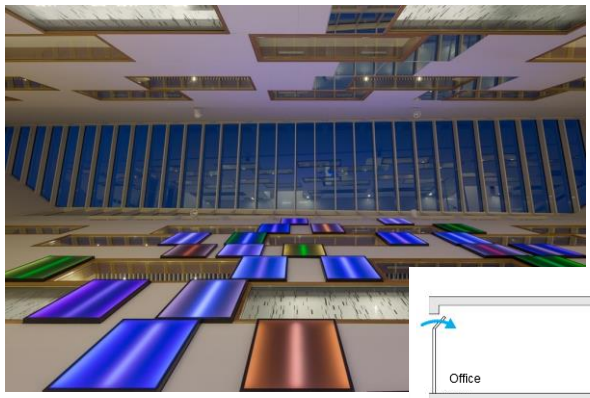
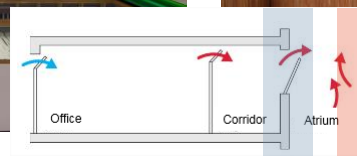
Ventilation walk-through

Atrium

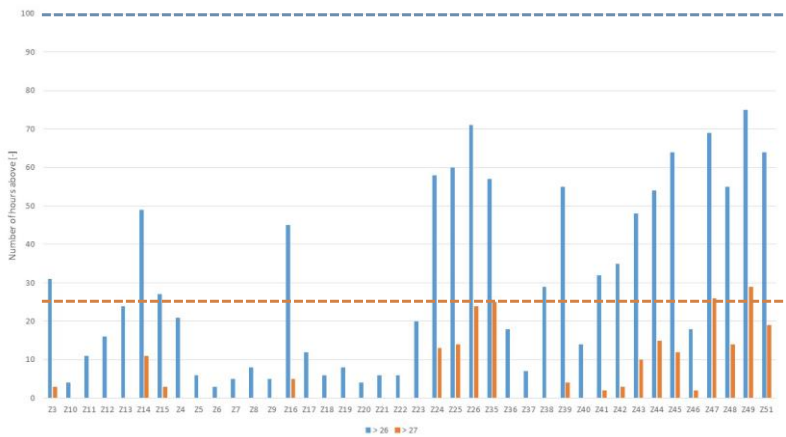


Atrium



In line with thermal requirements

Measured indoor climate during 1 year



Requirements (DK)

Indoor temperature:

- Not more than 100 hours above 26°C
- Not more than 25 hours above 27°C

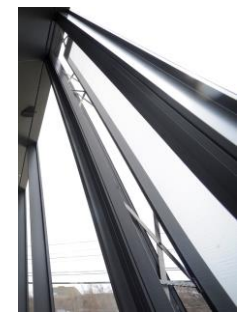
Statement from the Head of Administration

Jesper Christiansen:

”The natural ventilation works well. It is possible to control the air temperature and the employees are satisfied.”

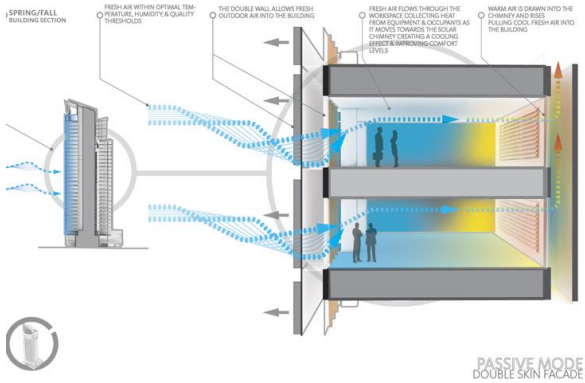
The Tower at PNC Plaza, Pittsburgh, US

“45% of the time we would be able to open our windows for fresh air…”

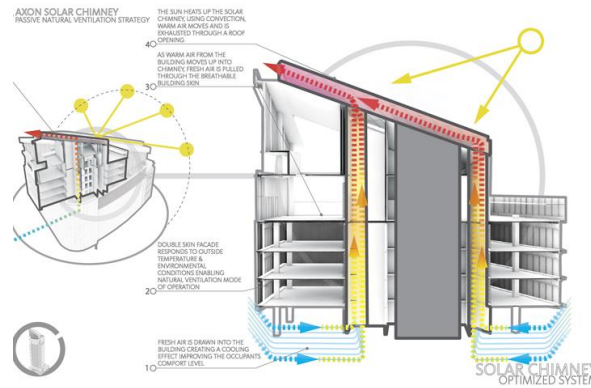


Ventilation principle

The Tower's façade delivers fresh air at low velocity



The Tower's solar chimney pulls cooler air into the building



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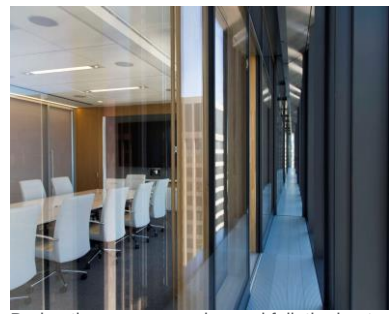
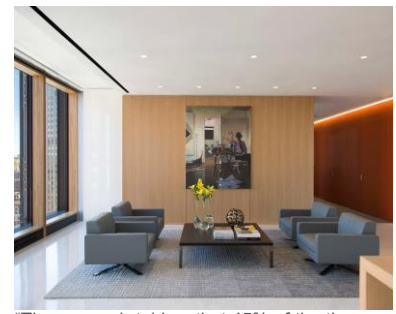
Ventilation principle

6300 MotorLink actuators to control:

- synchronization of 4 actuators on 1 parallel window, 700 parallel windows in the outer DSF
- 1450 automated air vents in the inner facade.
- Feedback & control position via BMS.



During the summer, spring and fall, the heat at roof level pulls air from the building up and out through the solar chimney. This facilitates natural ventilation and helps PNC maintain a comfortable indoor temperature within The Tower.



"The research told us that 45% of the time we would be able to open our windows for fresh air and essentially turn off the mechanical ventilation in the building."

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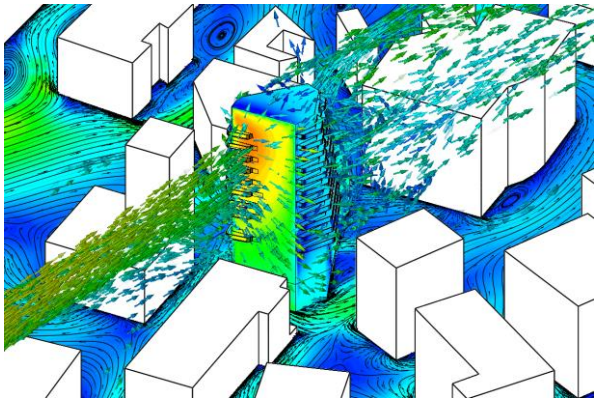
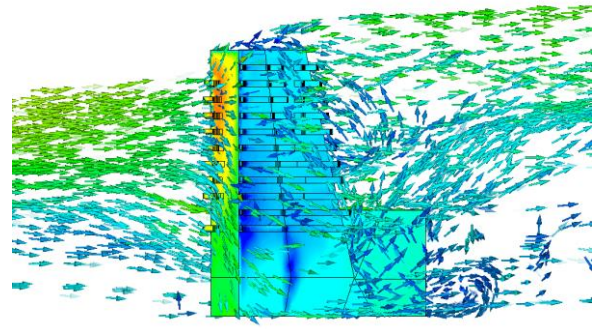
Sophisticated control of the openings

…based on external CFD simulation

Animation of wind and pressure distribution



Elevated wind speeds at higher levels



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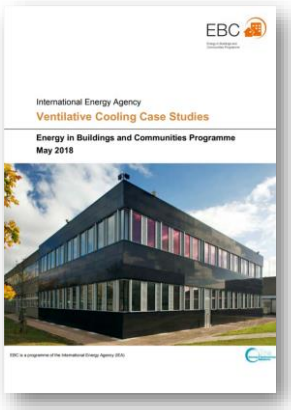
IEA Annex 62 - Deliverables

Ventilative cooling case studies

Case studies - book



Ventilative Cooling Application - buildings incl. ventilative cooling from several countries

Download: www.venticool.eu/annex-62-publications/deliverables/

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Questions

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