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Ventilative Cooling Antwort auf urbane Hitze?



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IEA EBC Annex 62 Ventilative Cooling

- 13 contributing countries worldwide
- Lead: Prof. Per Heiselberg, Aalborg Univ., DK
- Subtask A: methods & tools
- Subtask B: solutions
- Subtask C: case studies

<http://venticool.eu/annex-62-home/>



Scope

Ventilative Cooling is application of ventilation flow rates to reduce the cooling loads in buildings.

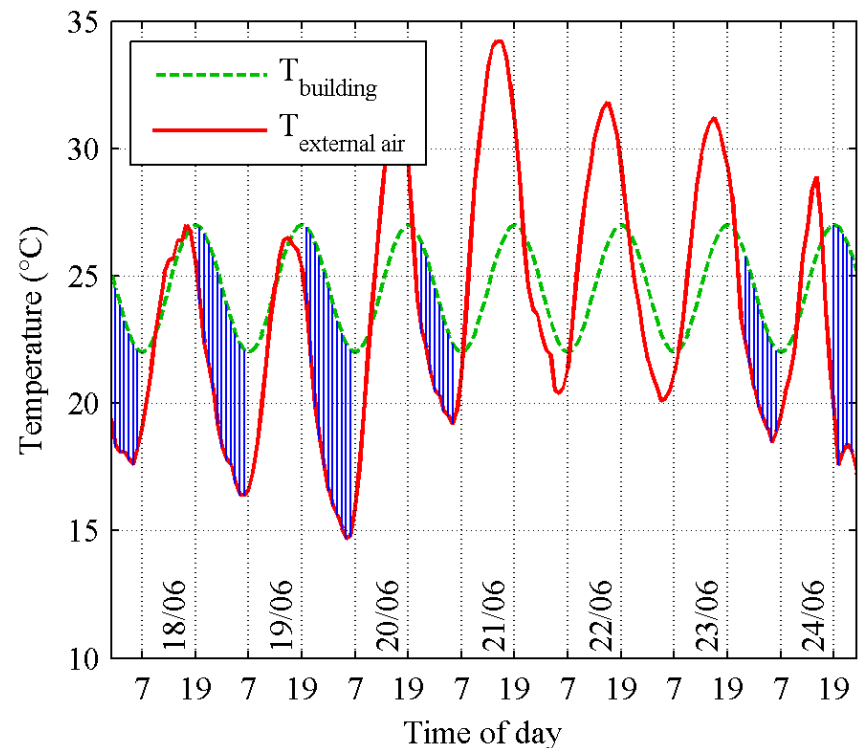
*Ventilative Cooling utilizes the **cooling potential** and **thermal perception potential** of outdoor air.*

The air driving force can be natural, mechanical or a combination.

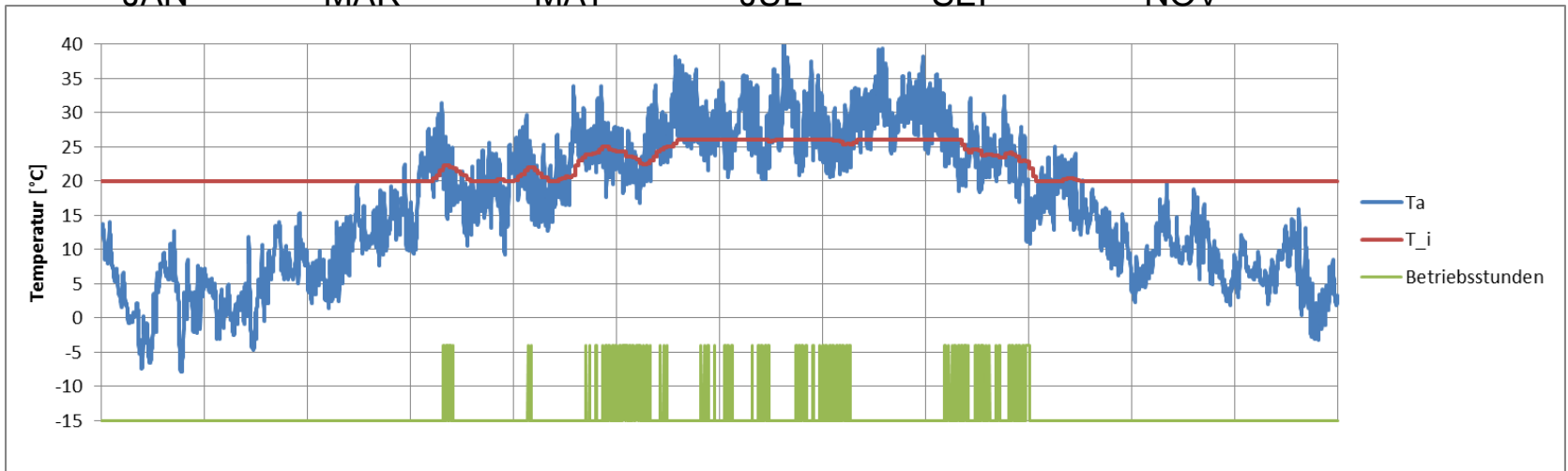
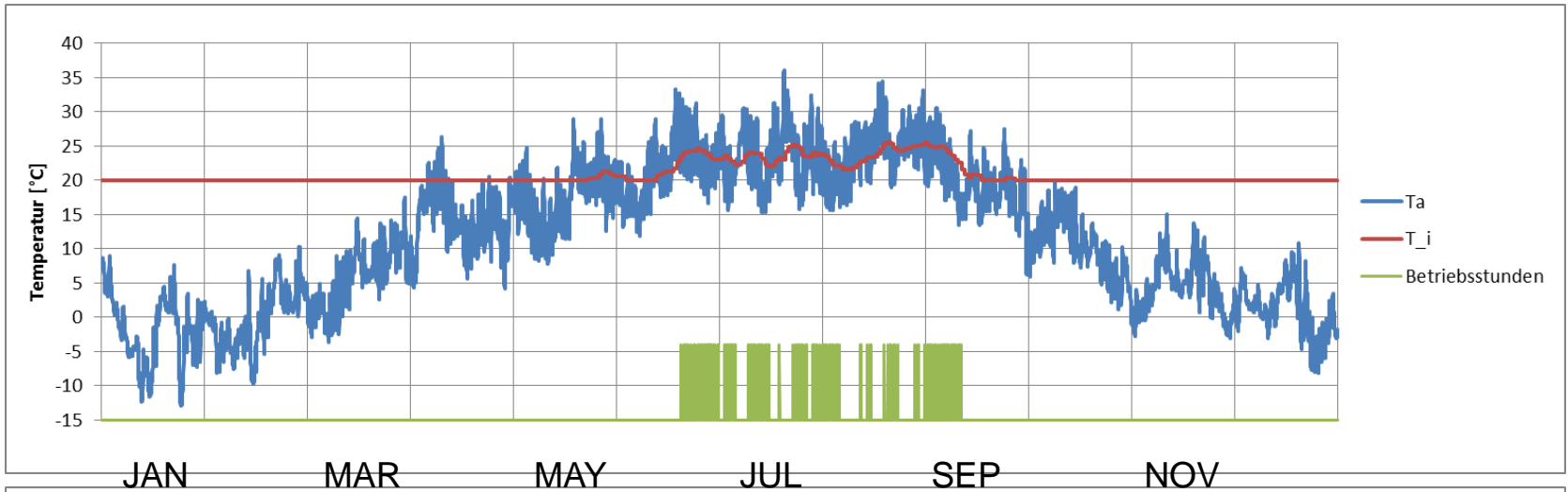


Cooling, because ist hot. Cooling, though ist hot?

- Method of CCP
Climatic Cooling Potential
in Kh/a oder Kh/d
- e.g. $T_i = 24,5 \pm 2 \text{ } ^\circ\text{C}$
- e.g. VC from 19:00 to 07:00
if $(T_i - T_e) > 3 \text{ K}$



Cooling, because its hot. Cooling, though its hot?



Residential Building Lorenz Reiter Straße, Vienna

- Net Heating Demand (HWB)
 17,1 kWh/m²a (building 1)
 18,5 kWh/m²a (building 2)
- Heat supply by district heating
- Comfort ventilation
 via central exhaust unit
 together with noise-insulated
 façade-integrated supply-air-vents



Exhaust ventilator on roof
 source: Peter Holzer

Night Ventilation concept

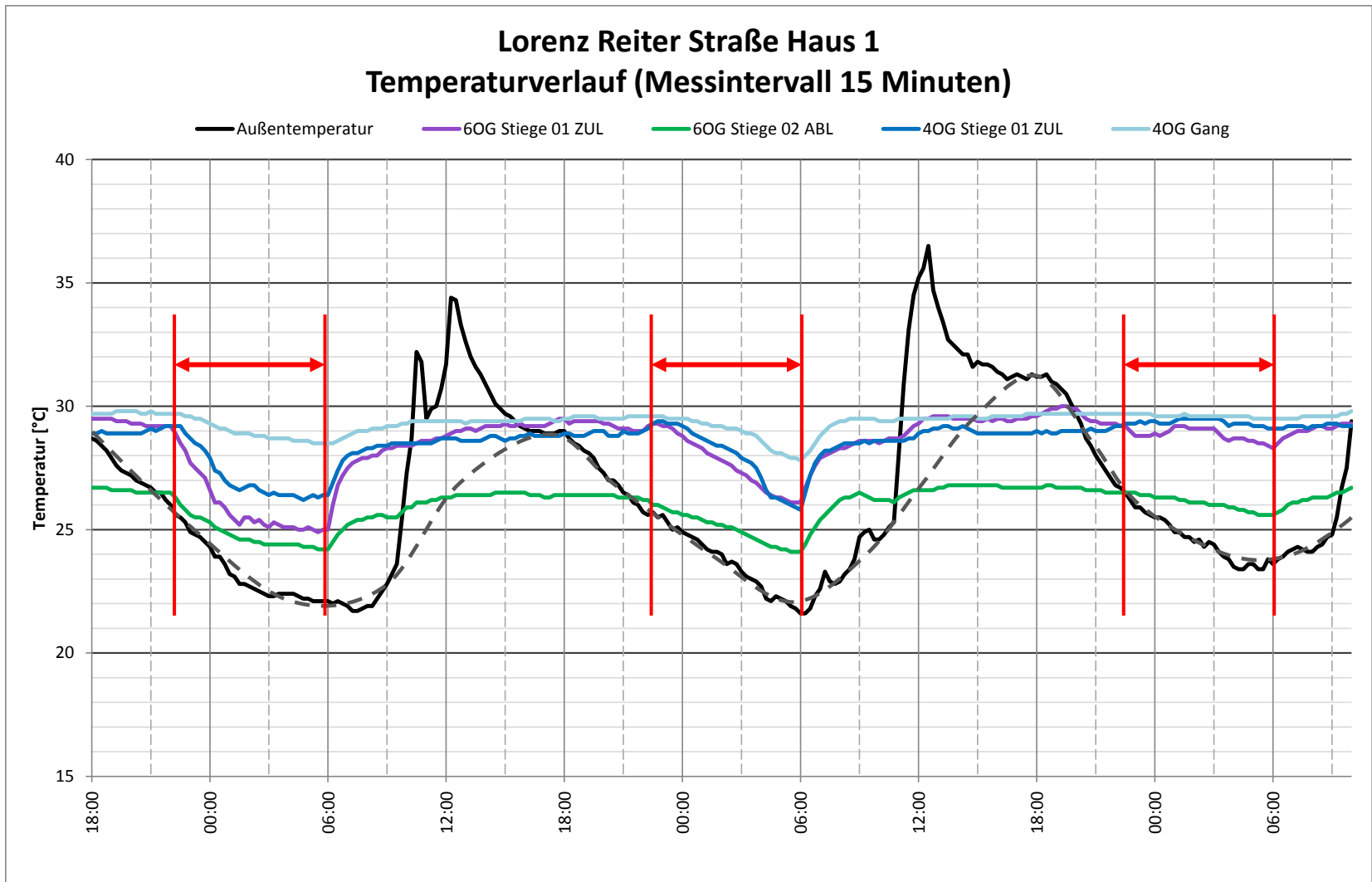
- Air intake via automated top-hung windows in the supply-air-staircase, one at each floor (incl. smart safety)
- Overflow through the interior corridors, via magnetic opened fire-protection-doors
- Air exhaust through extract-air-staircase and roof-mounted mechanical exhaust vent with sound damper
- VC operation between 11 pm and 6 am if $\Delta T_{(i-e)} \geq 2K$ and if $T_i > 22^\circ C$

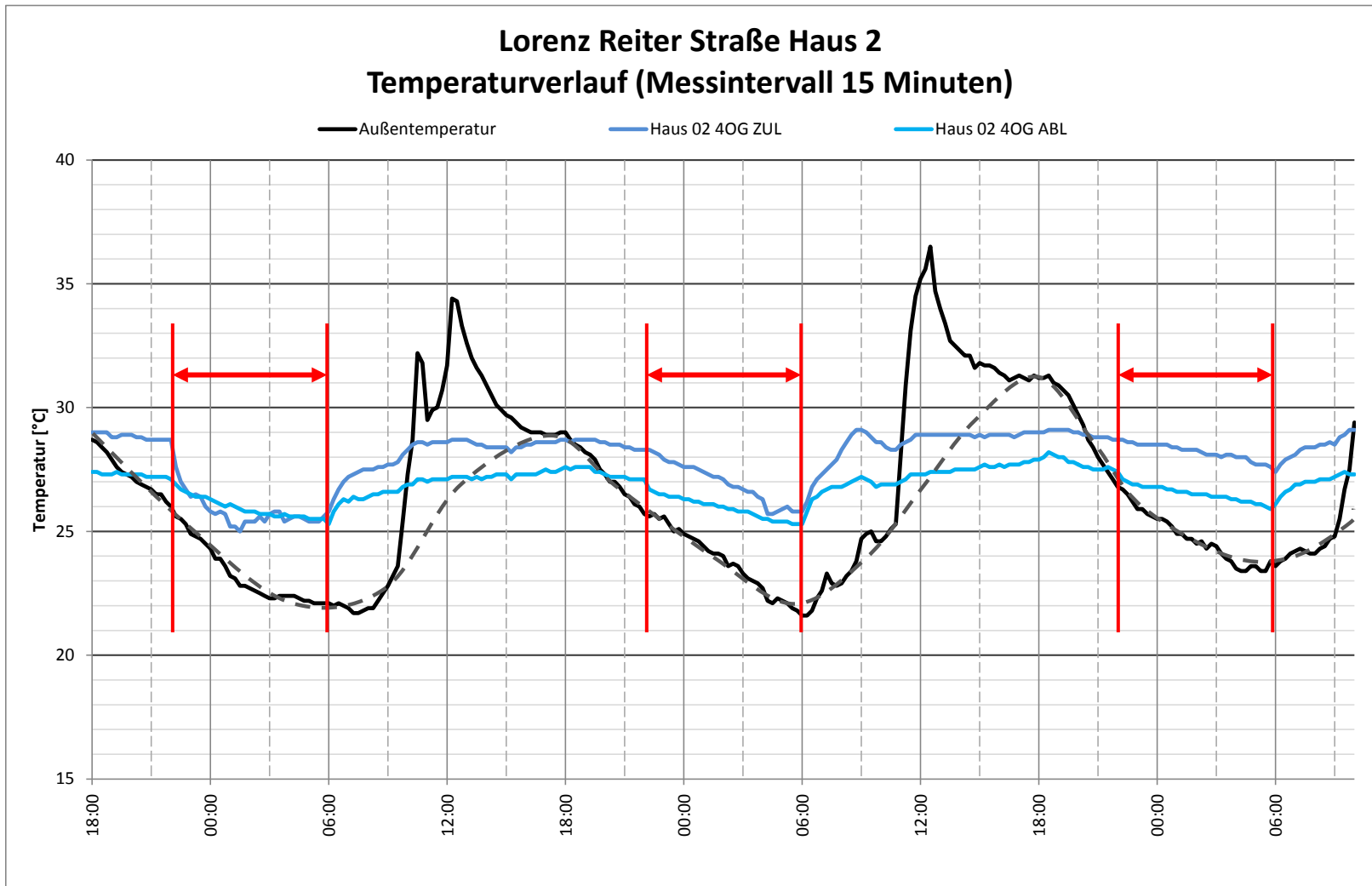


Extract ventilation unit and supply air window
 source: Peter Holzer

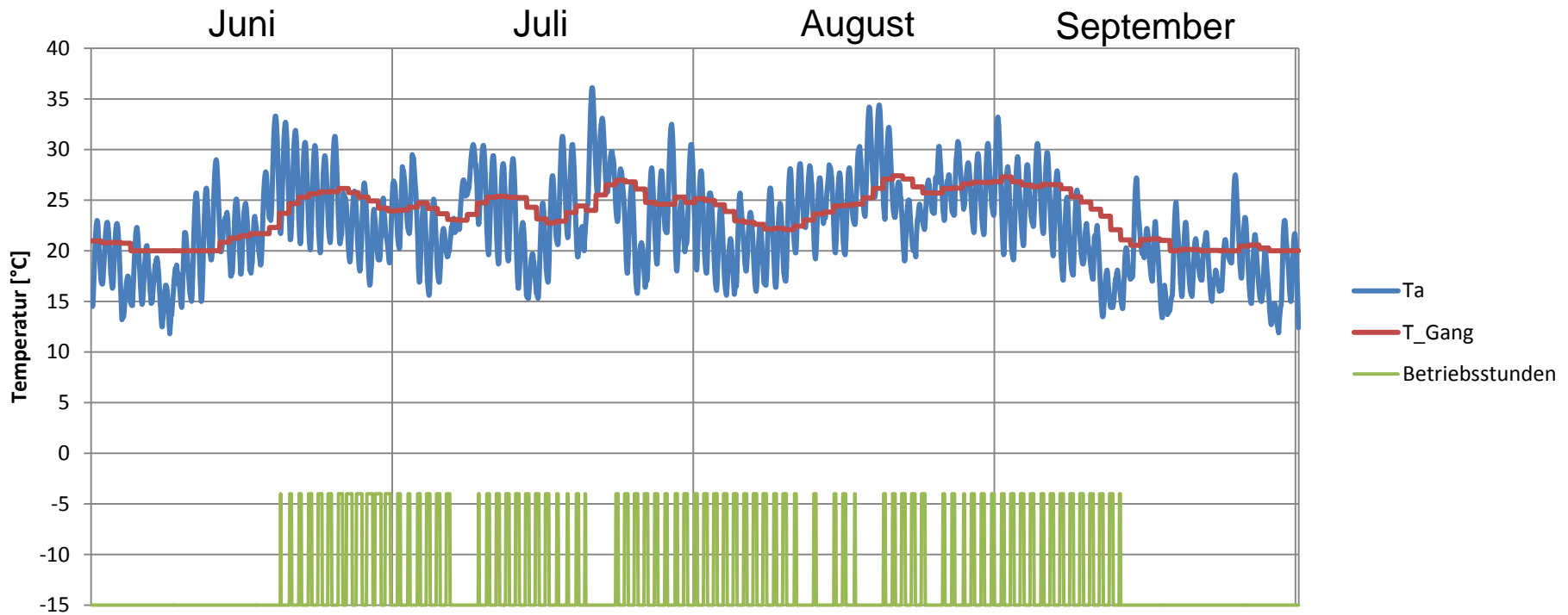
VC System Indicators

	building 1	building 2
Number of air inlet windows	6	6
Nominal geometric cross section per inlet window	0,8 m ²	0,8 m ²
VC effected floor area (corridors only)	996 m ²	750 m ²
Total inlet ross section per VC affected floor area	0,5 %	0,6 %
Volume flow of Ventilative Cooling	22.000 m ³ /h	11.000 m ³ /h
Ceiling height	2,6 m	2,6 m
Air change rate of Ventilative Cooling	8,5 h ⁻¹	5,6 h ⁻¹





VC Annual Performance Extrapolation



Hourly outdoor temperature from Meeonorm Vienna 2050 extreme

Indoor temperature based on min 20°C and correlation to outdoor running mean temperature

source: Peter Holzer

VC Performance Indicators

	building 1	building 2
Volume flow Ventilative Cooling	22.000 m ³ /h	11.000 m ³ /h
Electrical power drain of ventilators	1.040 W	520 W
Electric efficiency of Volume flow	0,05 W/(m ³ h ⁻¹)	0,05 W/(m ³ h ⁻¹)
Annual operating hours	601 h/a	601 h/a
Annual Discharged cooling energy	23,2 MWh/a	11,6 MWh/a
Discharged cooling energy in relation to corridor area	23,3 kWh/m ² _{NF} a	15,5 kWh/m ² _{NF} a
Annual electrical power consumption of ventilators including controls	974 kWh/a	487 kWh/a
Seasonal Energy Efficiency Ratio	24	24

- Ventilative Cooling has a high potential to (partly) substitute mechanical cooling energy efficiently and cost effectively
- In HVAC key figures, for Vienna Climate and IEQ standards:
Achievable Cooling load reduction via VC: $\sim 20 \text{ W/m}^2$
Achievable Cooling Energy (heat) reduction $\sim 10 \text{ kWh/m}^2\text{a}$
- Climate change and heat islands are no severe obstacles, only game-changers towards hybrid systems
- Major threats to VC come from rotten outdoor space: i.e. noise, pollution, criminalism
- Challenges are simplicity, costs, robustness, design rules, standards and legal restrictions (!). Annex 62 will offer solutions on that.
- International IEA cooperation turned out extremely beneficial. Many thanks to IEA, bm:vit and ffg!



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Publikation der VC application database

venticool
the international platform for ventilative cooling



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Ventilative Cooling Application Database

The Ventilative Cooling Application Database contains buildings which make use of Ventilative Cooling from several countries contributing to the Annex 62. Each datasheet holds basic building specifications as well as information about Ventilative Cooling Site Design Elements and Ventilative Cooling Architectural Design Elements. Further descriptions of Technical Components, Control Strategies and Building Energy Systems are also given and allow a better understanding of the implementation of Ventilative Cooling.

The setting up of the database is an ongoing project. Further contributions are still possible and very welcome. Please refer to ventilative.cooling@building-research.com for more detailed information.

Country	Building name
Austria	AT_Auersthal_zu-haus
	AT_Ernstbrunn_Windkraft Simonsfeld AG
	AT_Feldkirchen_Ecoport

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Recent updates

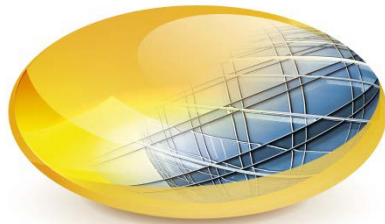
- 12-14 October 2016, Vienna, IEA EBC Annex 62 Ventilative Cooling- 6th Expert Meeting & Symposium
- New release: Energy Efficiency and Indoor Climate in Buildings
- CIBSE Natural Ventilation News | September 2016 issue now available
- venticool becomes Associated Partner of the Covenant of Mayors
- SAVE THE DATE for the 4th venticool conference in Nottingham



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Thank You



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