Webinar VELUX
6.2.2025

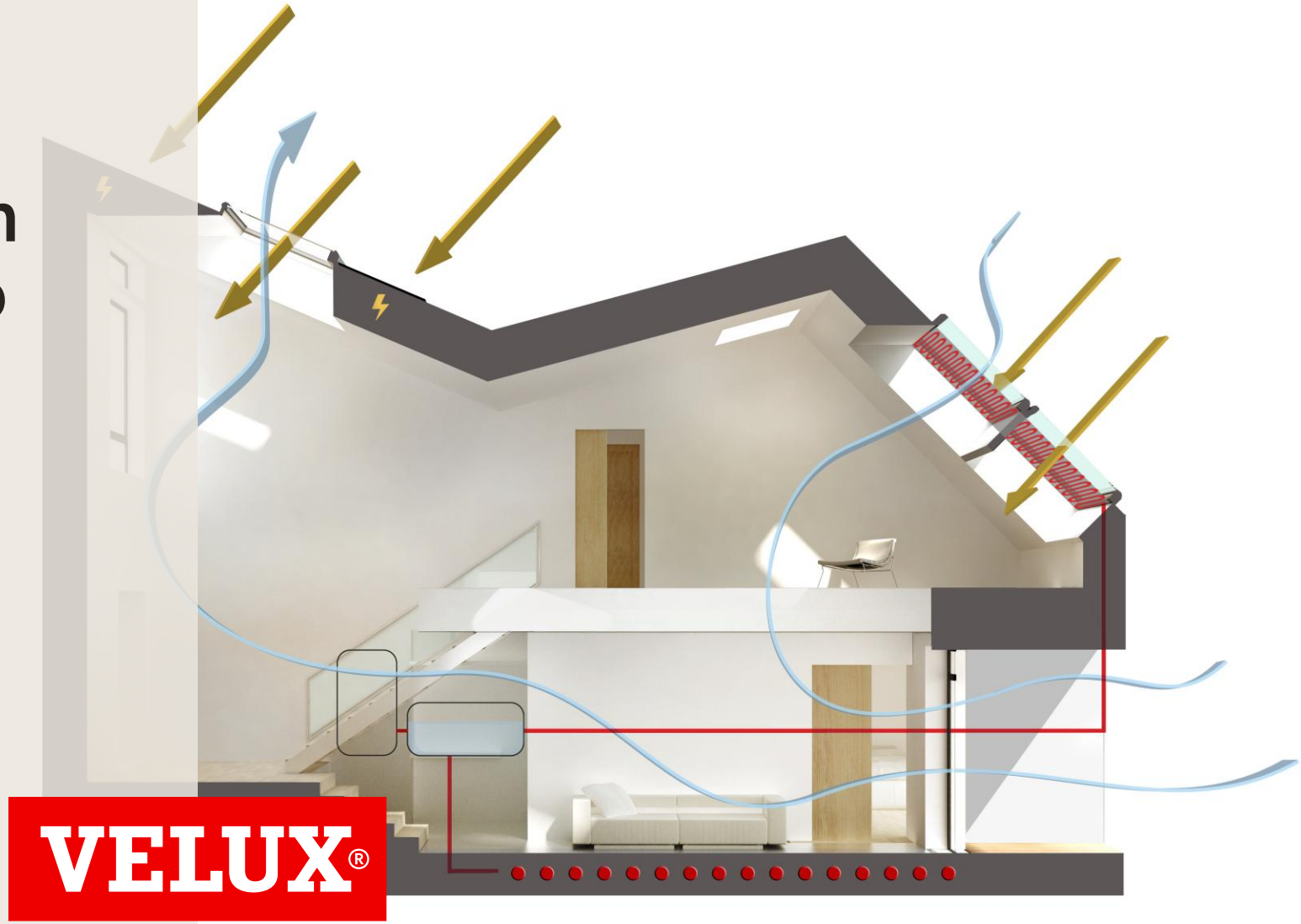
Prezračevanje stavb in ohlajevanje s pomočjo prezračevanja

Vloga naravnega prezračevanja

Ventilation and ventilative cooling

Benefits of natural ventilation

Christoffer Plesner MSc.Eng.
Neža Močnik u.d.i.a.



Potek webinarja

60 min + 15 minut za vprašanja

Imejte mikrofon izklopljen

Vprašanja v “pogovorno okno”

Snemanje webinarja in objava na spletu (posnetek)
https://www.velux.si/pro/seminarji/webinar

Pretekli webinarji

VELUX Webinar 16:

Dnevna svetloba v regulativi - PURES3 in orodja za načrtovanje

- Zagotavljanje osvetljenosti stavb; pregled regulative.
- Večplastna vloga okenskih odprtin v stavbi; zdravje, bivalno ugodje in energijski vidik.
- Kako obravnava dnevno svetlobo PURES3 in tehnična smernica TSG-1-004; uvajanje faktorja dnevne svetlobe.
- Kako v praksi upoštevati faktor dnevne svetlobe in uporaba izračuna s programom.
- Kako je dnevna svetloba integrirana v BIM modeliranju stavbe.

VELUX Webinar 15:

Koncept stanovanjske gradnje Living Places

Koncept gradnje, ki odpira nove poglede na način gradnje in bivanja v prihodnje ter na vlogo stavb pri reševanju globalnih izzivov z rešitvami, ki so trajnostne, praktične in pri katerih se uporablja obstoječa tehnologija. Pet ključnih principov projekta "Living Places":

- Zdravje - planet; pristop k znižanju ogljičnega odtisa
- Zdravje - ljudje ; pristop k doseganju odlične notranje klime
- Enostavnost gradnje; demontaža
- Prilagodljivosti v načinu gradnje; konstrukcija
- Prilagodljivost glede cenovne dostopnosti
- Bivanje v skupnosti; delitev prostorov

Strateško orodje "Kompas za pomoč pri načrtovanju trajnostnih stavb".

VELUX Webinar 14:

Izkušnje iz terena o strešnih oknih – vrzeli med načrtovanjem in izvedbo

- najpogostejši primeri, kjer prihaja do odstopanj med načrtovanim in možnostjo vgradnje na licu mesta (pozicija vgradnje, izvedba špalet, priprava konstrukcije...)
- situacije, kjer je potrebno paziti na primeren izbor tehničnih karakteristik strešnega okna (vpliv snega, minimalni naklon, dolžina oken...)
- situacije, kjer je potrebno upoštevati določene zakonitosti pri pripravi strešne konstrukcije in izvedbene detajle
- izkušnje o tem, kako stranke razumejo načrt, ko gre za višino vgradnje strešnega okna
- kakšen vpliv ima na projekt »barva okna po izbiri«
- in druge izkušnje iz prakse

VELUX Webinar 13:

Osvetlitev prostorov pod ravno streho

- argumenti za osvetlitev prostorov pod ravno streho
- kako postavitev oken v ravni strehi vpliva na osvetlitev in izgled prostora
- predstavitev različnih primerov osvetlitve prostorov pod ravno streho
- ključni podatki in pripomočki za načrtovanje z okni za ravne strehe
- nov priročnik Design Guide za načrtovanje prostorov pod ravno streho

VELUX Webinar 12:

Elektrifikacija strešnih oken za večje udobje bivanja

- načini upravljanja oken in prednosti elektrifikacije na primerih iz prakse
- kako lahko nadzorovano odpiranje oken pripomore k bivalnemu ugodju pozimi in poleti
- kakšne so izkušnje uporabe naravnega prezračevanja v kombinaciji z mehanskim prezračevanjem z rekuperacijo
- komponente elektrificiranega okna in možnosti zasnove pametnega sistema upravljanja izdelkov
- na kaj morate biti pozorni pri načrtovanju in izvedbi

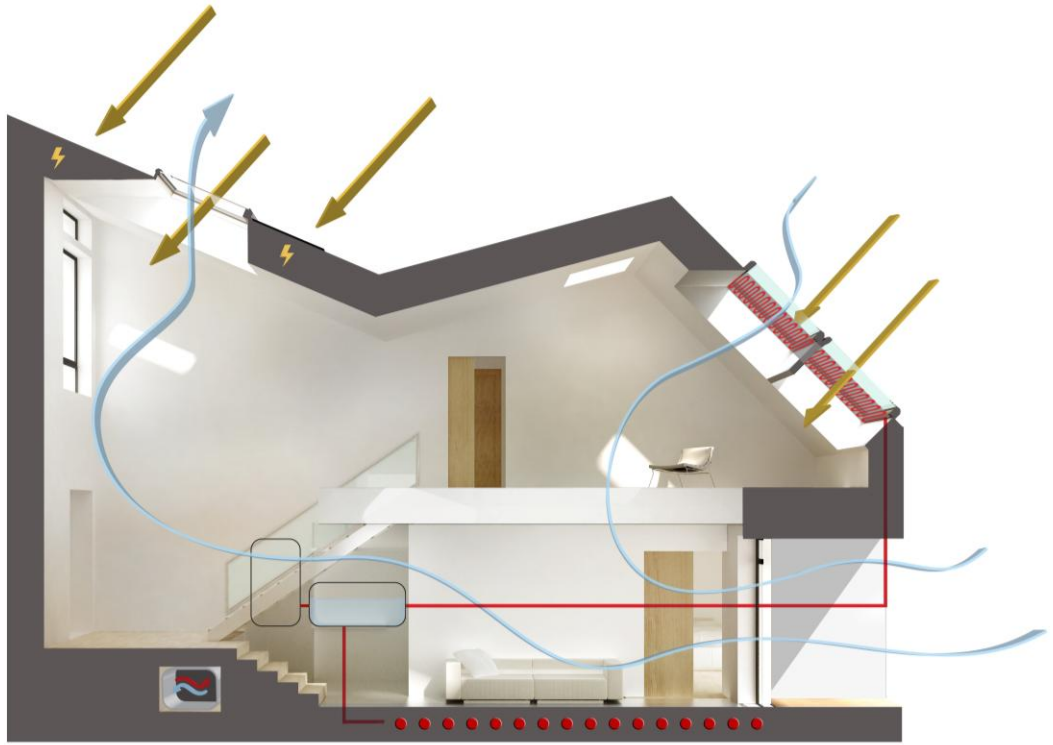
VELUX Webinar 11:

Kombinacije strešnih oken

- kakšne so sistemske rešitve za vgradnjo več oken skupaj in katere so bistvene lastnosti posameznih rešitev
- priporočila za izbor ustrezne kombinacije
- zahteve za pripravo načrta mansarde za različne kombinacije
- na kaj morate biti pozorni pri načrtovanju (odmiki, kompatibilnost s kritinami in senčili...)
- za navdih: izgled različnih kombinacij v praksi

Vsebina webinarja

1. Svež zrak in bivalno ugodje
2. Razlogi za prezračevanje stavb in načini prezračevanja
3. Energijska učinkovitost
4. Pregrevanje stavb
   - Ohaljevanje s pomočjo naravnega prezračevanja
   - Pomen senčenja
5. Novosti s področja standardov
6. Primeri iz prakse & napotki za načrtovanje
7. Napotki za vpis kreditnih točk
8. Vprašanja in odgovori



Health in **EU** homes

31%

of the EU population is affected by

unhealthy homes

This is equal to over **162,8 million** people

5 %
- lack of daylight

18 %
- excess cold

18 %
- excessive noise

13 %
- damp and mould

N.B: a share of the population experiences multiple indoor climate hazards

Health in **SLO** homes

33%

of the SLO population is affected by

unhealthy homes

This is equal to over **0,68 million** people

4 %
- lack of daylight

8 %
- excess cold

15 %
- excessive noise

21 %
- damp and mould

N.B: a share of the population experiences multiple indoor climate hazards

A healthy home is considered of primary importance for healthy living

90%

of Europeans see it as ‘of above-average importance’ to let fresh air into their homes.

86%

of Europeans see it as ‘of above-average importance’ to have plenty of daylight in their homes.

Predavatelj, gost:

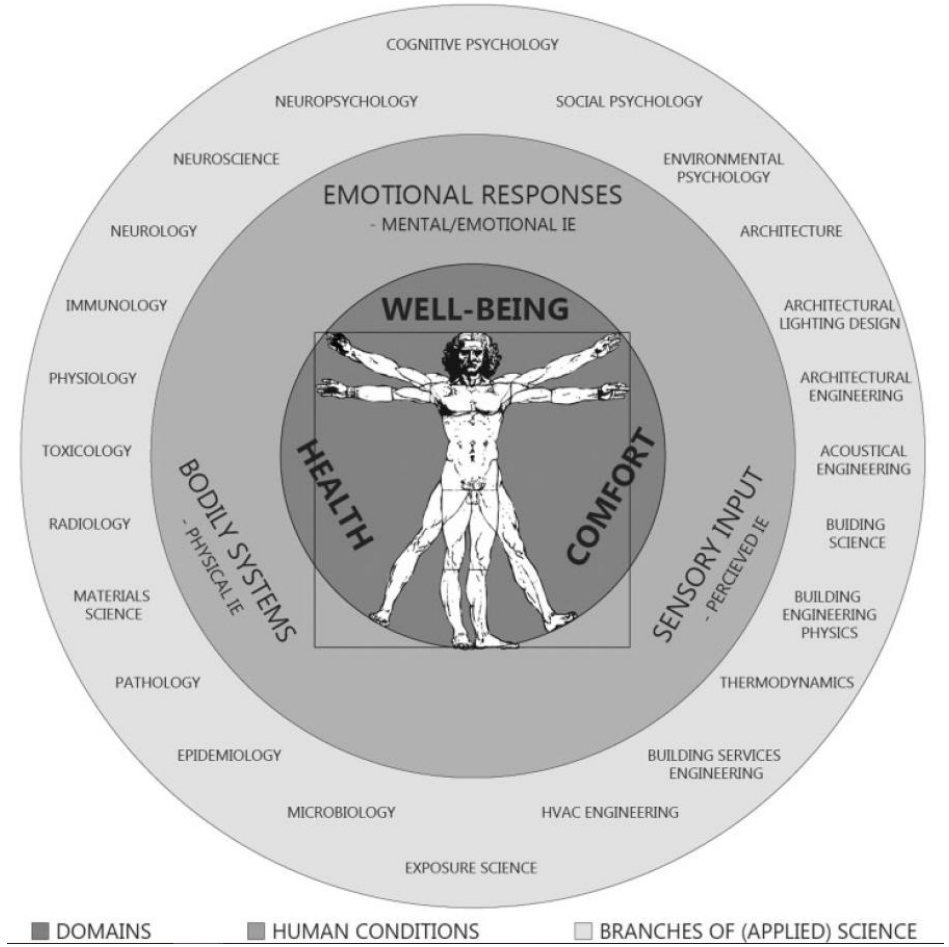
Christoffer Plesner

MSc. Eng. (2010) [DK] + IPMA level C – “Certified project manager” [DK] (2016, 2021)

From 2010	**Senior Ventilation Specialist** in VELUX for +14 years
	Works with indoor air quality (ventilation) and thermal comfort (ventilative cooling) • Standards, legislation and compliance tools • Business strategy responsible • +5 bigger research projects (IEA etc.) • +20 scientific articles and publications
High interest	**Building design and new built legislation**
Contact	**christoffer.plesner@velux.com**

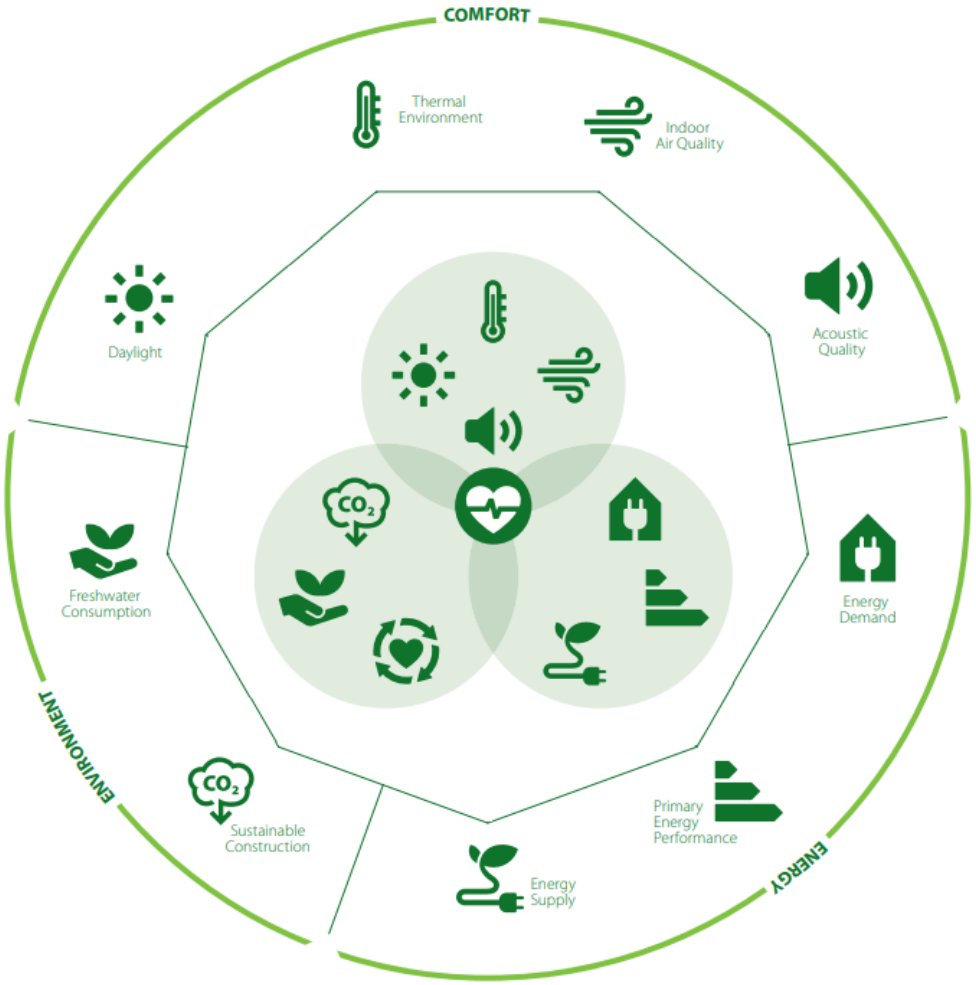
Well-being in buildings

- Buildings (and hence products) must ensure:
  - Good daylight conditions
  - View to outside
  - Sufficient fresh air flows
  - Prevention of overheating (using ventilative cooling)
  - Offer a good connection to outside using windows
  - Resilience to e.g. power cuts
- Buildings must be designed carefully - thinking of the above – to create a building where you feel in well-being
- Also, a good and robust building design is a must!



Holistic view of a building

- **Indoor environmental quality (IEQ):**
  - Thermal comfort
  - Indoor air quality (IAQ)
  - Light (Daylight)
  - Acoustics
- **But also other aspects relevant for a building:**
  - Energy use…
  - Environment… (sustainability)
- **Sensible IEQ (what we <u>can "sense"</u>)**
  - **Temperature, light, bad smells**
- **"Invisible" IEQ (what we <u>can't "sense"</u>)**
  - **Radon, particles, substances in paint, materials**



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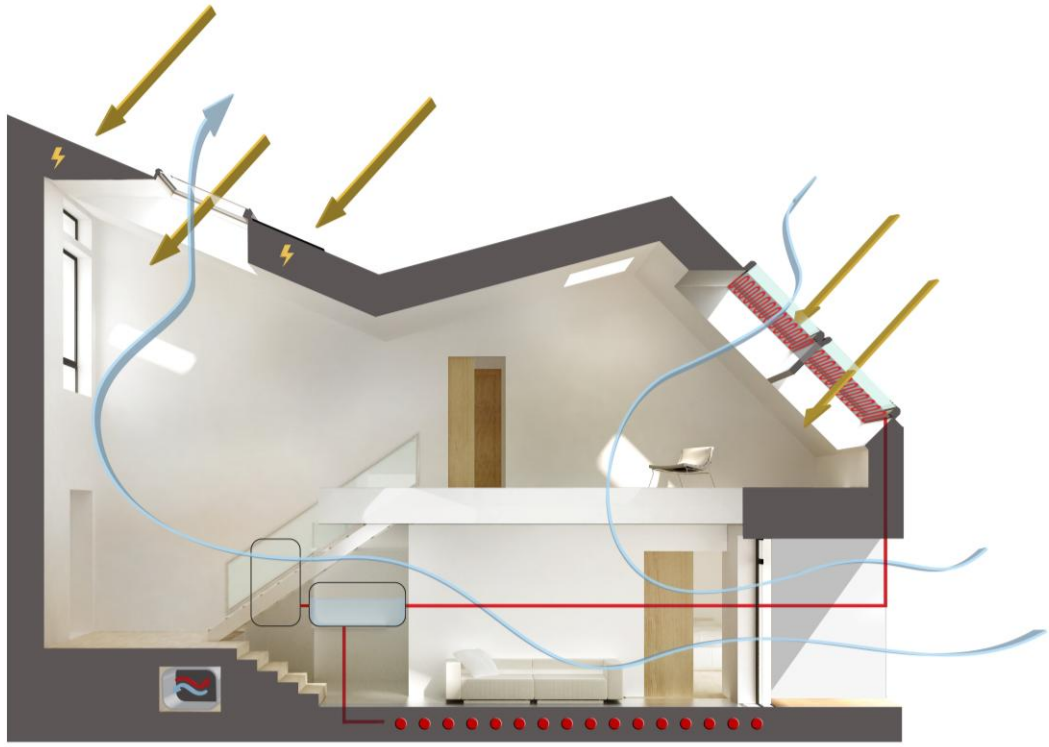
Ventilation



WHY ventilate buildings?

1. **Health and Comfort:** Ensures a supply of fresh air, reducing pollutants and allergens, which improves respiratory health and overall comfort.

2. **Indoor Air Quality:** Controls indoor air quality by diluting and removing contaminants like CO2 and VOCs.

3. **Energy Efficiency:** Enhances energy efficiency by regulating indoor temperatures, reducing the need for heating and cooling systems.

4. **Preventing Mold:** Controls humidity levels to prevent mold and mildew growth, protecting both health and building integrity.

5. **Safety:** Reduces the concentration of hazardous gases and fumes, ensuring a safer environment for occupants.

Ventilation definitions

- **Airing**: Air replacement through manual operation (by user) of windows, doors and other openings.
- **Natural ventilation**: Ventilation whose operating principle is based solely on the effect of wind and stack effect
- **Mechanical ventilation:** Ventilation whose principle is based solely on the operation of fans
- **Hybrid ventilation:** Ventilation whose operating principle is based on the combination of natural ventilation and mechanical ventilation
- **Ventilative Cooling**: Free cooling that relies on the actual temperature or natural elements like air, aimed at improving indoor thermal comfort or decreasing cooling load in buildings. Air transfer may be by natural, mechanical or hybrid means.

HOW ventilate buildings?

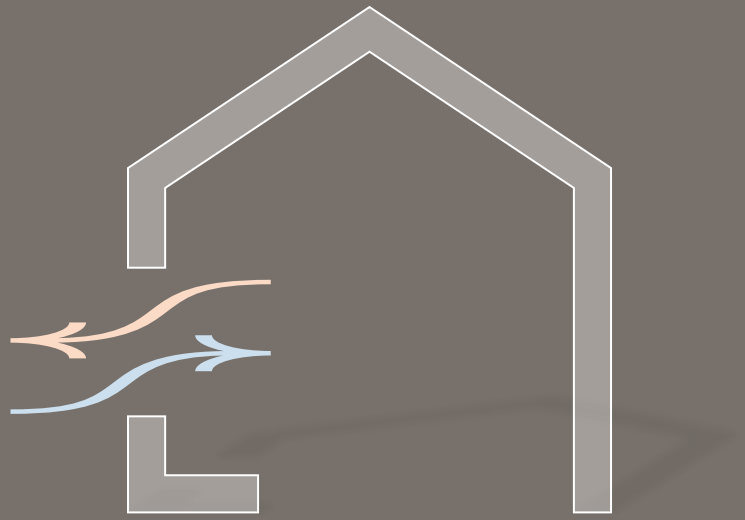
1. Airing

- Manual opening of windows or doors or both to allow fresh air to enter and stale air to exit.
  - Used when it feels needed and relies on natural air movement and human feelings.
  - Simple and immediate way to refresh indoor air, often used in homes and small spaces.
  - Good for **quick** peak pollutant removals

2. Ventilation

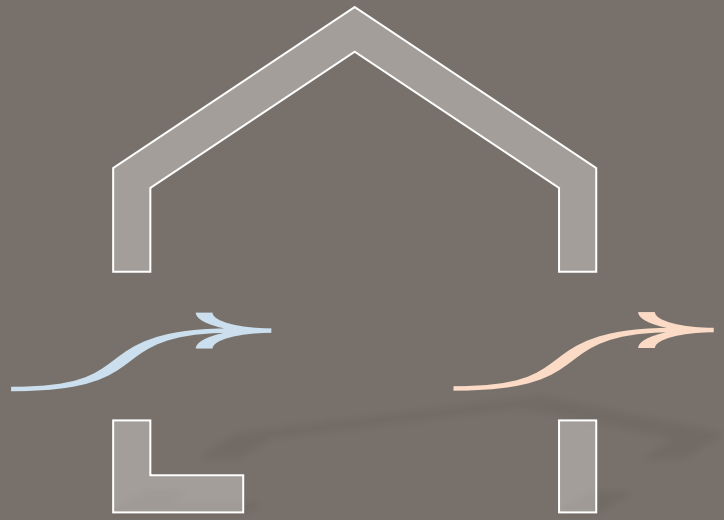
- Can be natural (using windows, vents) or mechanical (using fans, HVAC systems).
  - Allows good indoor air quality by removing pollutants, controlling humidity, and maintaining a comfortable indoor environment.
  - Works good with sensors, to ensure optimal IEQ and fulfillment of regulations

Types of natural ventilation



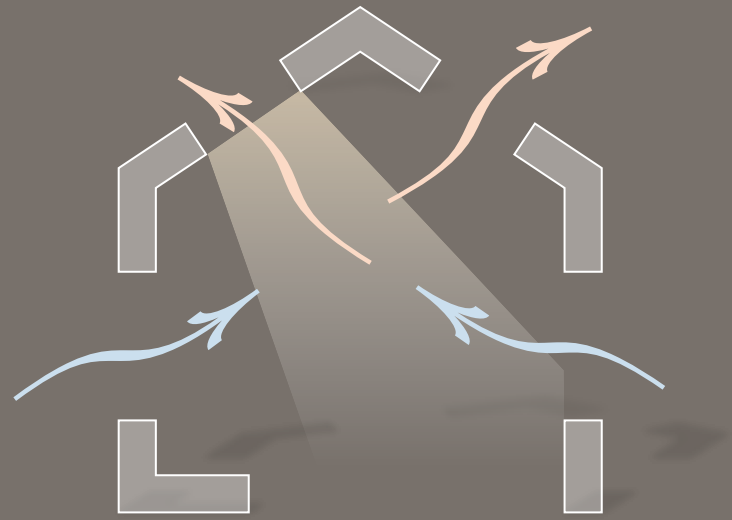
Single-sided ventilation

when there are windows present on only one façade, where air can flow in and out on the same side of the space.



Cross-flow ventilation

is achieved when there are windows present on opposite facades, where air can flow in and out directly through opposite sides of the space.

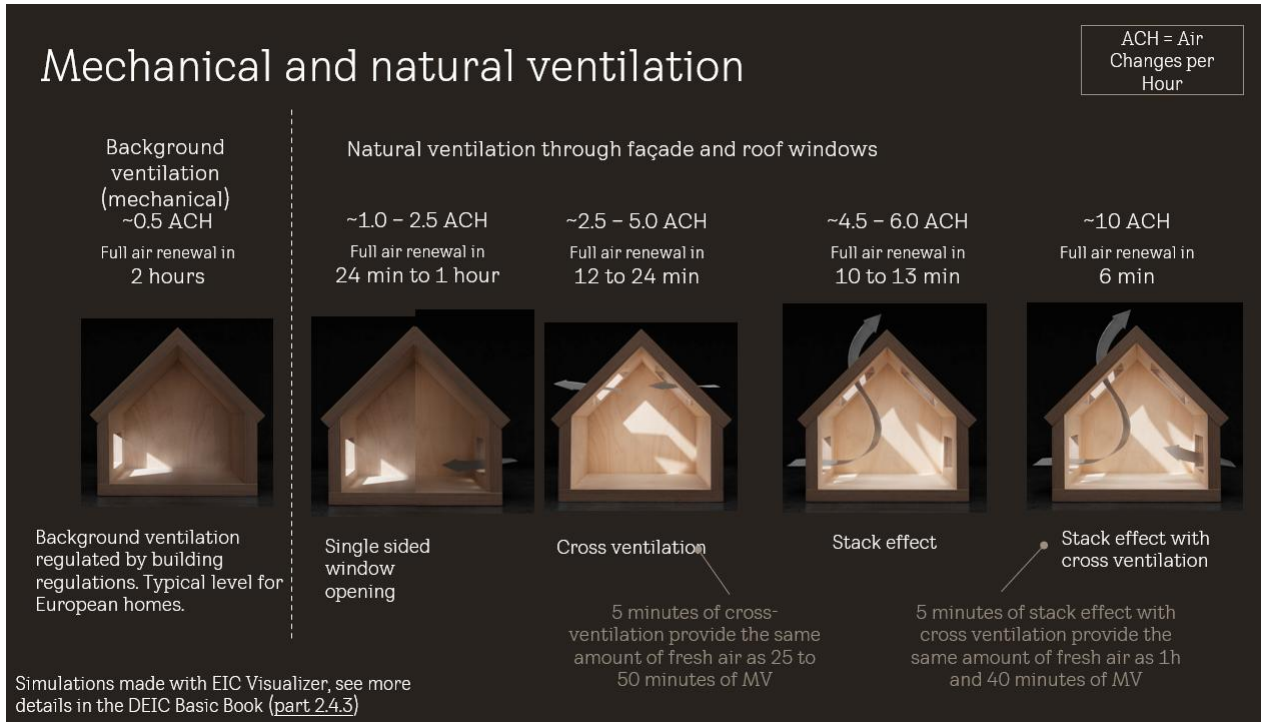


Stack effect ventilation

As warm air is lighter than cold air, warm air rises while cold air sinks. This upward movement of warm air causes it to flow out through windows positioned at the top of a space, while cooler air simultaneously enters through windows located at the bottom.

Stack ventilation

- Full air renewal in a building (*)
  - 2 hours for a typical house using MV (0,5 ACH)
  - 6 mins for a typical house using NV (combined stack effect and cross ventilation) (10 ACH)
- To achieve good IEQ, typical mechanical ventilation alone is not sufficient – fx use additional stack effect with openable windows



5 minutes
of cross-ventilation
=
25 to 50 minutes
of mechanical ventilation

5 minutes
of stack effect with cross ventilation
=
1h 40 minutes
of mechanical ventilation

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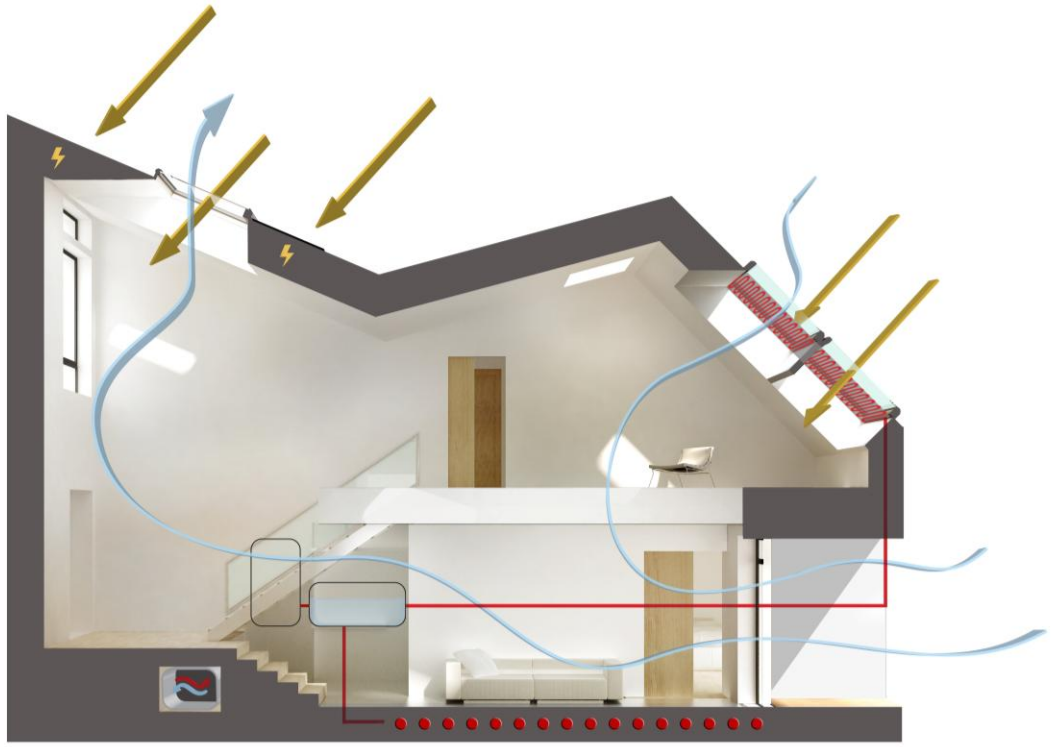
Energy efficiency



Different solutions for health and energy efficiency

Natural ventilation

- ✓ Fast and intuitive
- ✓ Operable windows are a must-have in homes
- ✓ Lack of heat recovery

Hybrid ventilation

- ✓ Good indoor environmental quality all year round
- ✓ Lowest total energy consumption

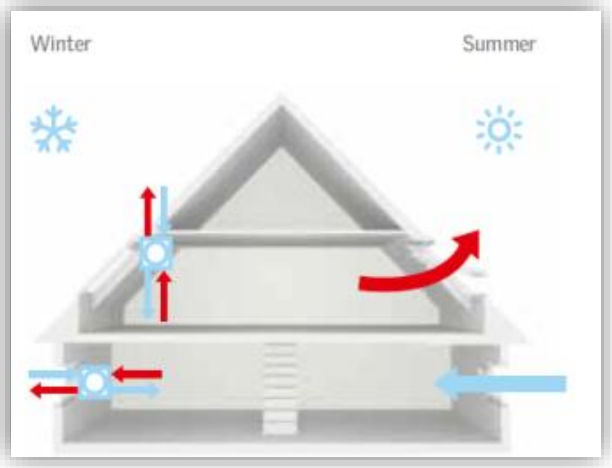
Mechanical ventilation

- ✓ Reduces heat losses
- ✓ Independent from user behaviour
- ✓ Less user-friendly and prone to failures

Hybrid ventilation

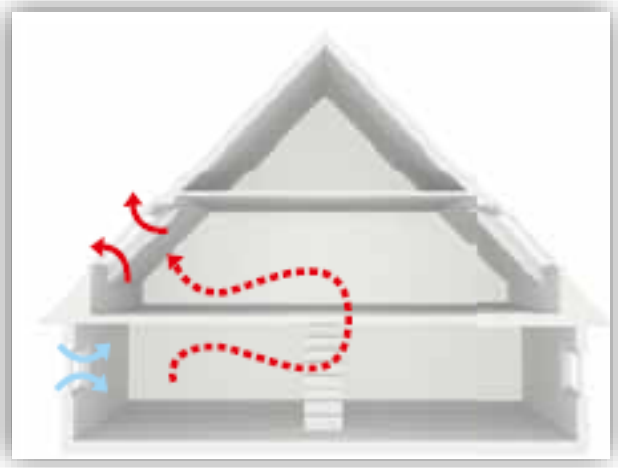
HV = combination of NV and MV

- **NV** during summer and part of the transition periods
- **MV** during winter (with or without heat recovery)



Or

- **NV** running (basic ventilation) + MV assisting (when driving forces are low)
- **MV** running (basic ventilation) + NV openable windows during optimal weather

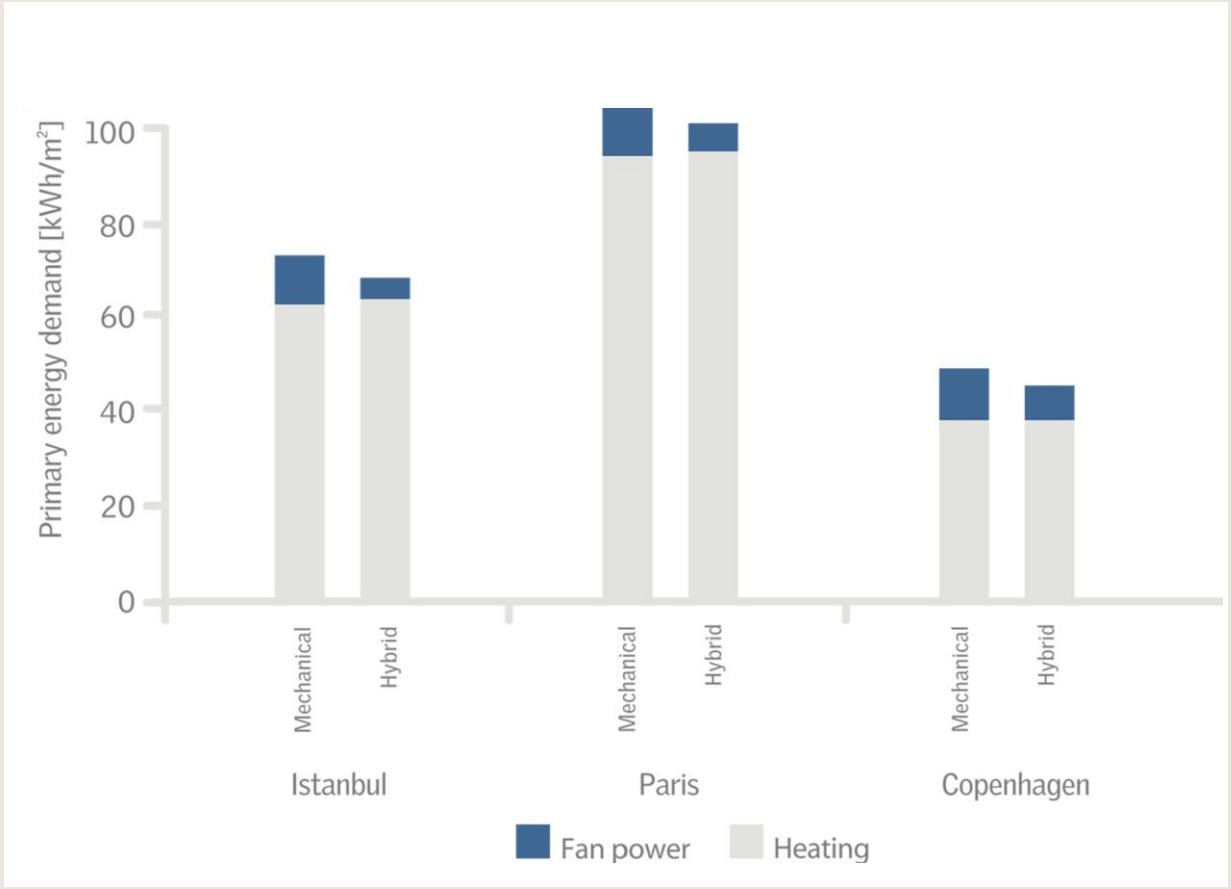


Energy efficiency and use of natural ventilation

A study for **residential buildings**:

Hybrid ventilation is **more energy efficient** than mechanical ventilation (with heat recovery) running all year.

- Because of the saved electricity during warm periods.
- Use of MV in cold periods and NV in warmer periods
- Decrease in the total energy demand for all locations
- The decrease is largest with automatic control (switching between MV and NV and opening/closing windows)

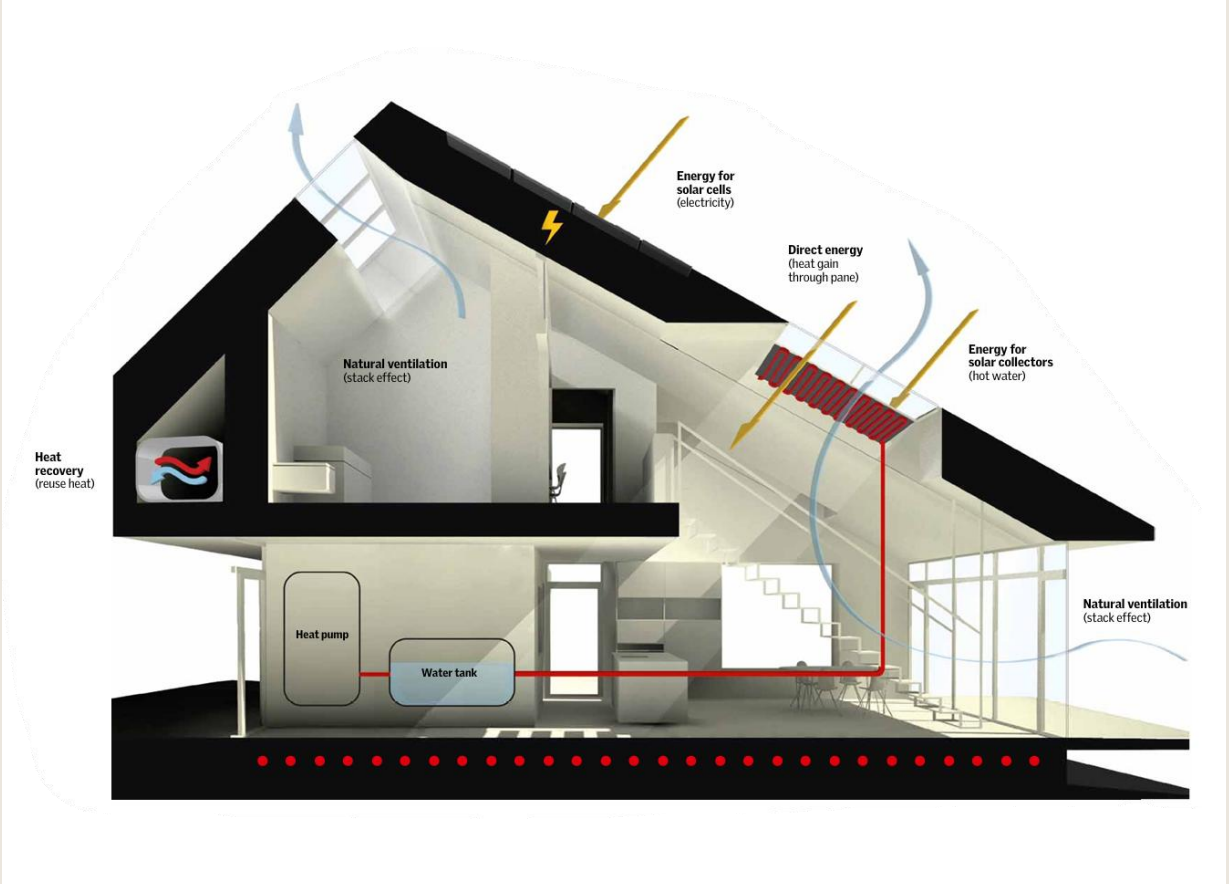


Energy efficiency and use of natural ventilation

Hybrid ventilation in buildings is usually the most energy efficient solution, combining the best of both worlds:

- **NV saving cooling energy**
- **MV saving heating energy**

Use of openable windows is an important aspect of hybrid ventilation.



Benefits of natural ventilation

Solution for “peak load” situations

A good way to get rid of polluted air in particular after highly-polluting events such as cooking or cleaning, or when many people are gathered.

- Airing can be used for quick removal of peak loads by the user

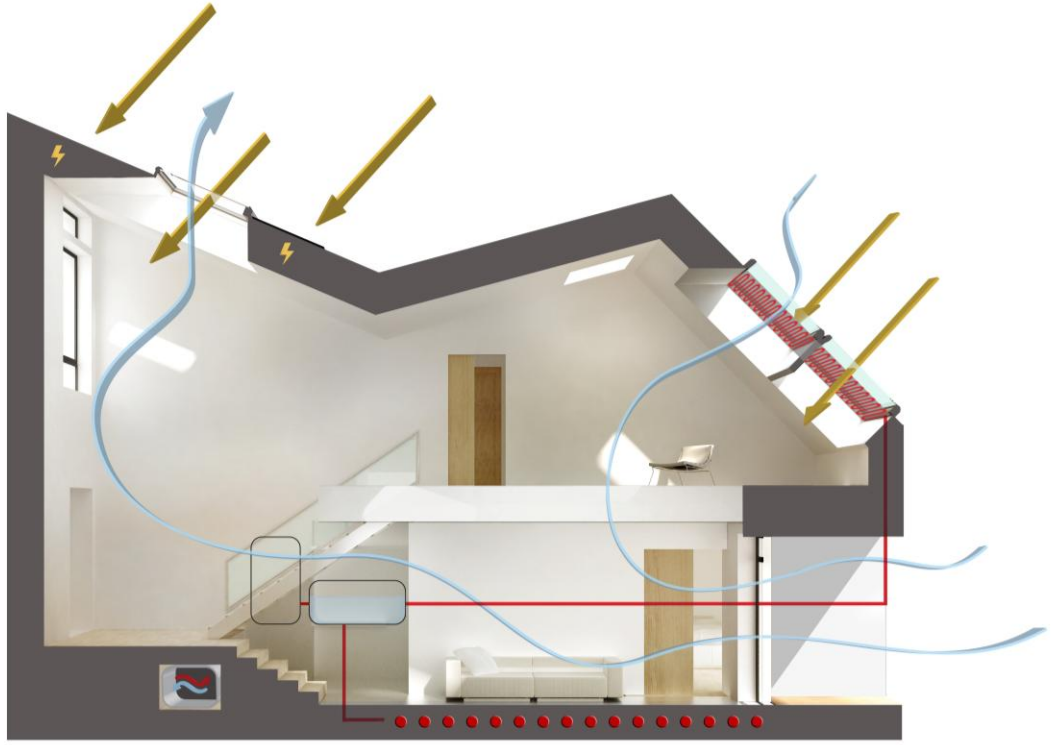
Effective ventilation principle

Intense and effective ventilation to enhance indoor environmental quality (stack effect).

Humans needs

People need openable windows to relate and have connection with outdoor space (physical in psychological need).

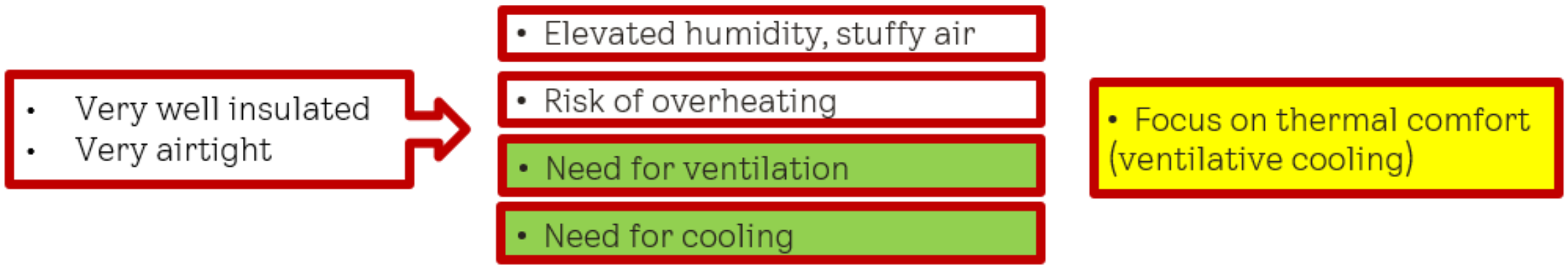
Overheating



WHY is cooling interesting?

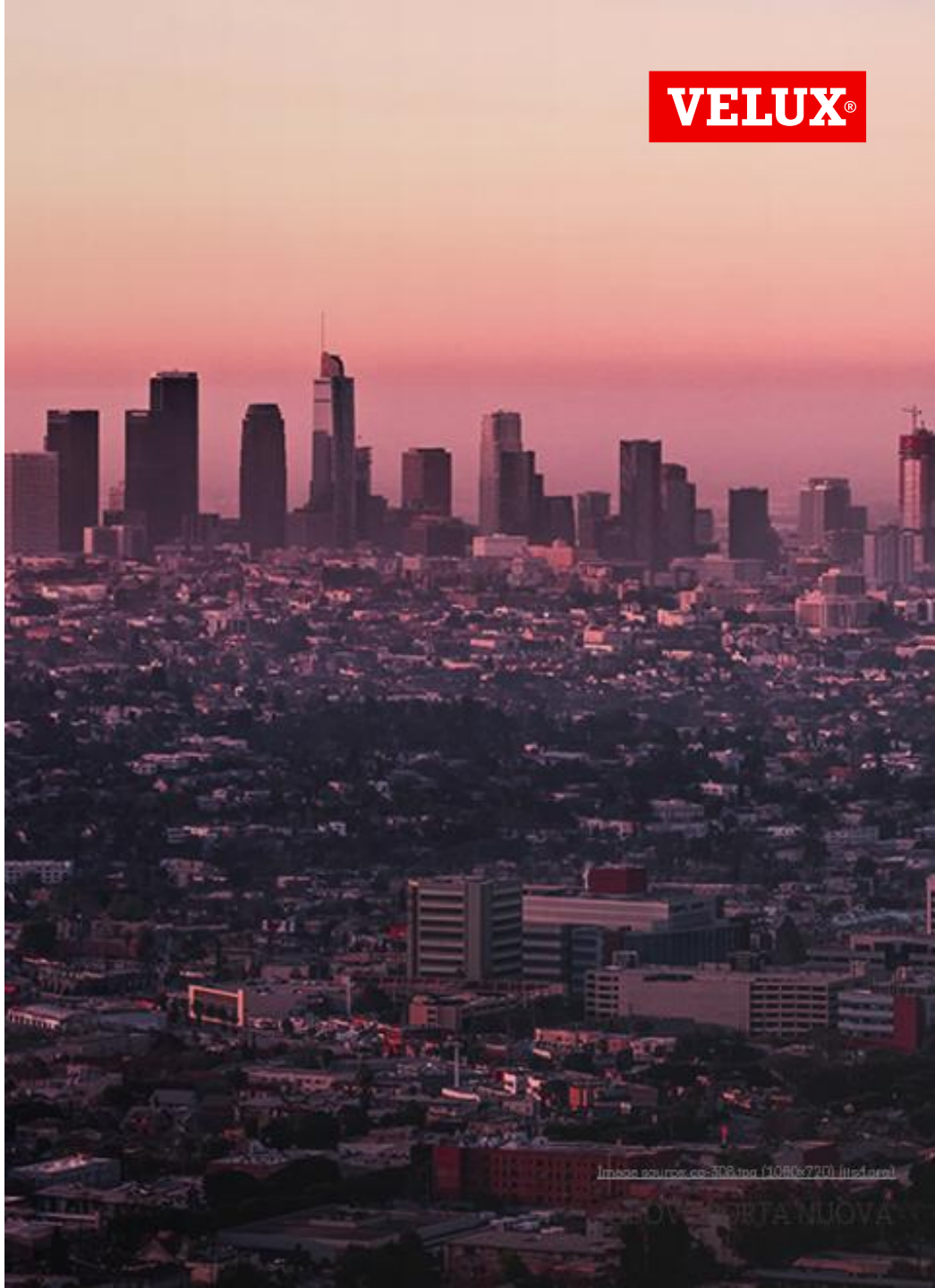
Increased regulation on insulated and airtight buildings have consequences…

(Space) **cooling** solutions in buildings should be re-evaluated. **Use passive cooling first, before active** !



Why is overheating an issue?

- **Peak** and mean summer **temperatures** will **increase by 10 ℃** across most European capitals **by 2080** [1]
- **Energy use for cooling** of buildings **rose +212% from 2010-2019** [2].
- **3 x increase in the global energy use for space cooling** towards 2050 [1] corresponds to almost a **2 x in CO_2 emissions** for space cooling. [3]

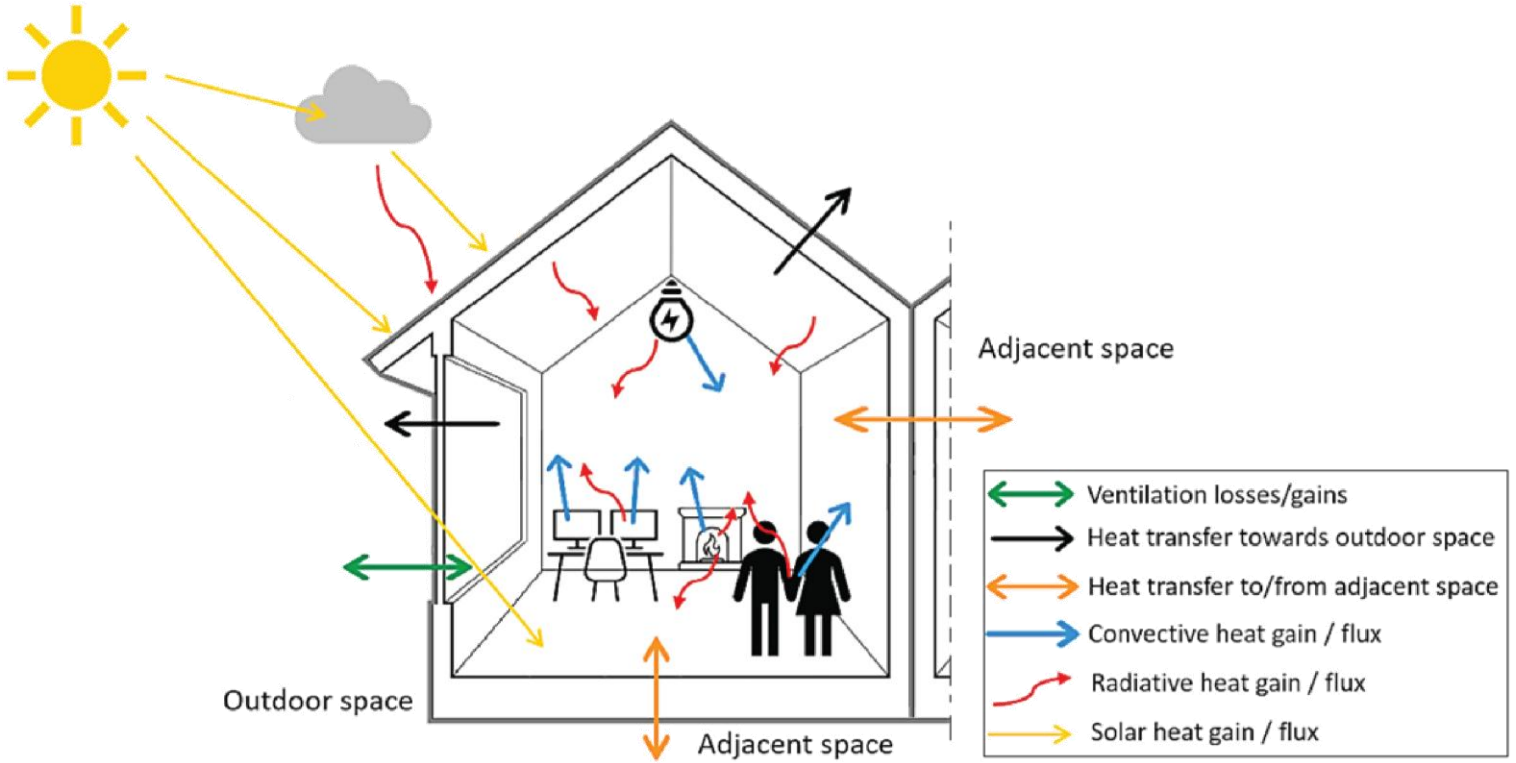


[1] Overheating calculation methods, criteria, and indicators in European regulation for residential buildings (Attia et al., 2023).
[2] European Energy Agency Europe. https://www.eea.europa.eu/publications/cooling-buildings-sustainably-in-europe.
[3] IEA 2018, The Future of Cooling. https://www.iea.org/reports/the-future-of-cooling.

WHY we need to understand overheating?

- Overheating in buildings is not an easy “task” to understand for researchers or companies…
- Many reasons for overheating in buildings

- **Ventilative cooling** is one solution to mitigate overheating



Overheating mitigation

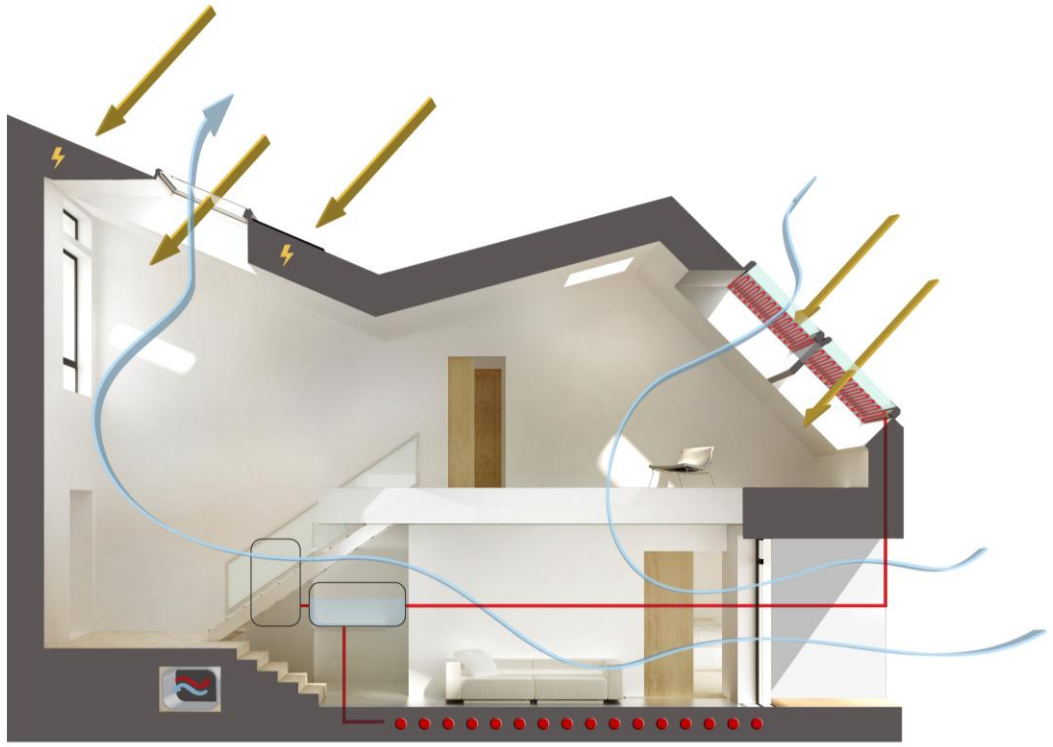
Overheating **prevention** measures:

- Solar shading
- High thermal mass
- Night cooling (fx. using ventilative cooling)
- Surrounding trees for shading

Overheating **removal** measures:

- Active cooling
  - Mechanical cooling (air condition)
- **Free cooling (Ventilative cooling)**
  - Natural ventilative cooling (fx. Openable windows)
    - Day ventilation
    - Night ventilation (e.g. night cooling) – combine with thermal mass

Ventilative cooling



Ventilative cooling

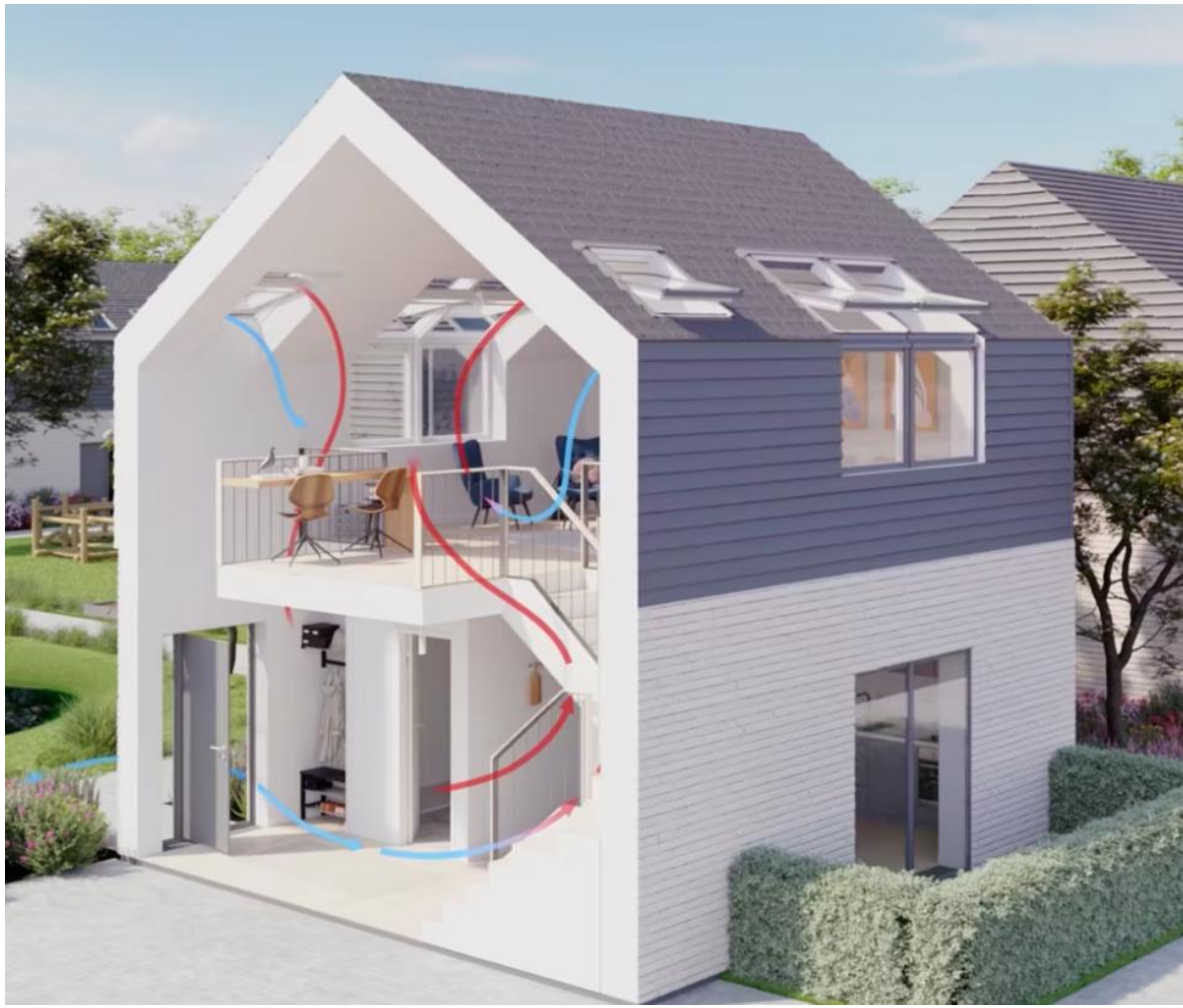
Air conditioning already represents **9%** of the world's **electricity use** – and it is expected to triple by 2050!

Ventilative cooling is about using the **outdoor air** (ex: in the evening and at night) to cool down the **building mass**. No cooling devices involved!

WHAT are the issues for ventilative cooling design

Current design tools and approaches to minimize overheating mainly **focus** on the **detailed design stage** and **LOW consideration** of **early-stage design decisions** such as:

- **Site** and building **layout**, fx Stack ventilation
- nor **holistic consideration of overheating risk**
- and **linked design issues** (e.g., ventilation and noise).

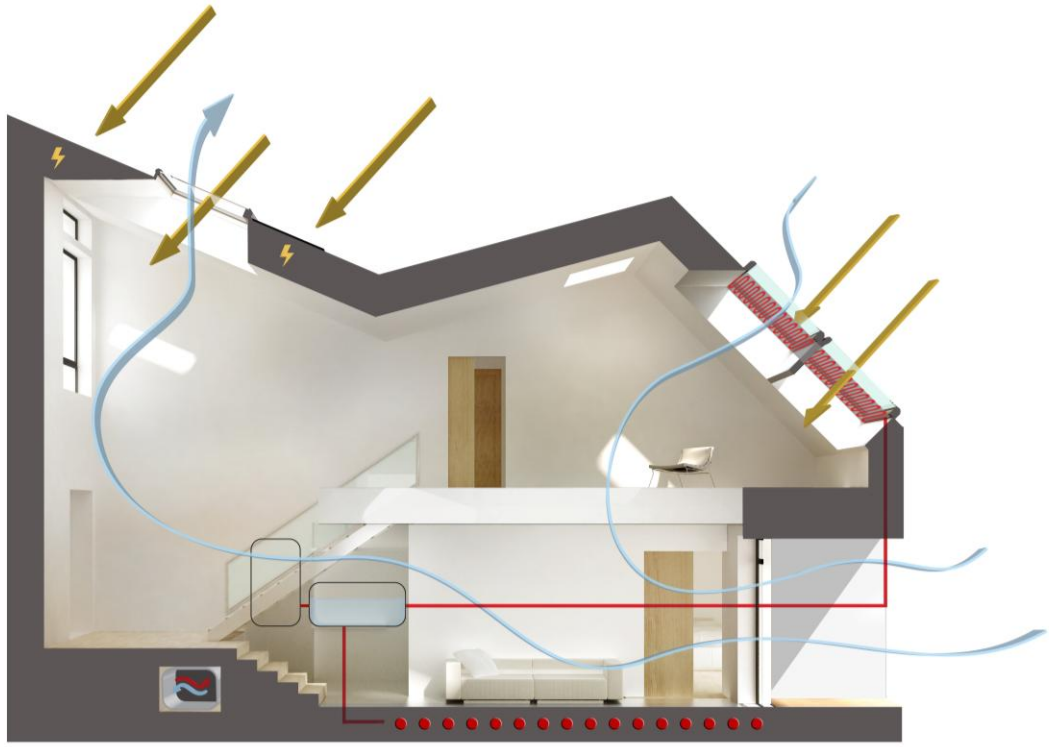


Overheating mitigation

A French VELUX Model Home 2020 near Paris was tested and lived in from August 2012-January 2013

- Hybrid ventilation used (NV + MV)
- It was found that indoor temperature decreased by ~5° by use of Ventilative cooling (comparing simulations & measurements)
  - 4 m stack effect
- High airflow during summer (ΔT=0°C, wind=3 m/s) for good Ventilative cooling effect

Solar shading



Solar shading can reduce overheating significantly

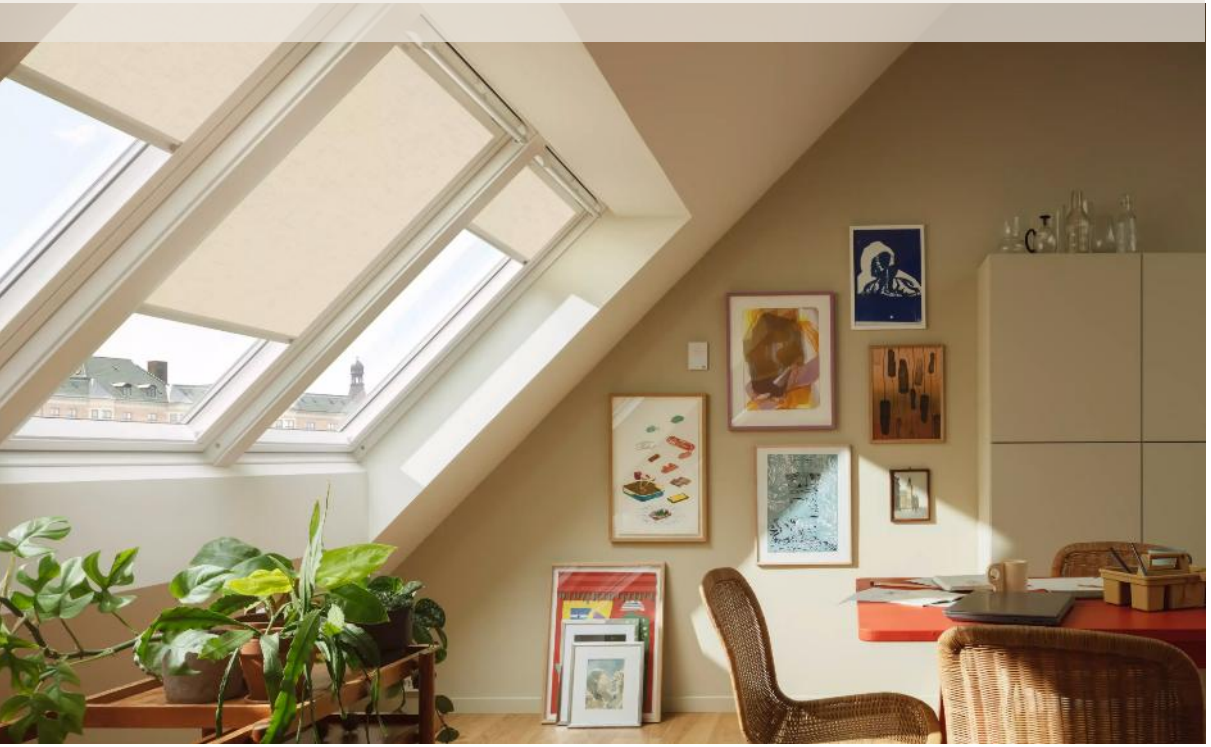
Solar shading protects the house from overheating in hot periods.

Enables to keep a sufficient glazed area for daylight and ventilation and allows useful solar gains in the colder months.

According to simulations in **Ljubljana (SLO)** placing **exterior shutters** on roof windows can reduce the indoor temperature **by up to 6°C** and **up to 3°C** with **internal blackout blinds.**

External or internal solar shading?

Internal shading – VELUX roller blinds
Removes 11-25% of incoming heat*



External shading - VELUX Roller shutter
Removes 90-93% of incoming heat*

* Based on calculations using an initial roof window with a g-value of 0,44 using 3 layered window glass, 66SG (86)

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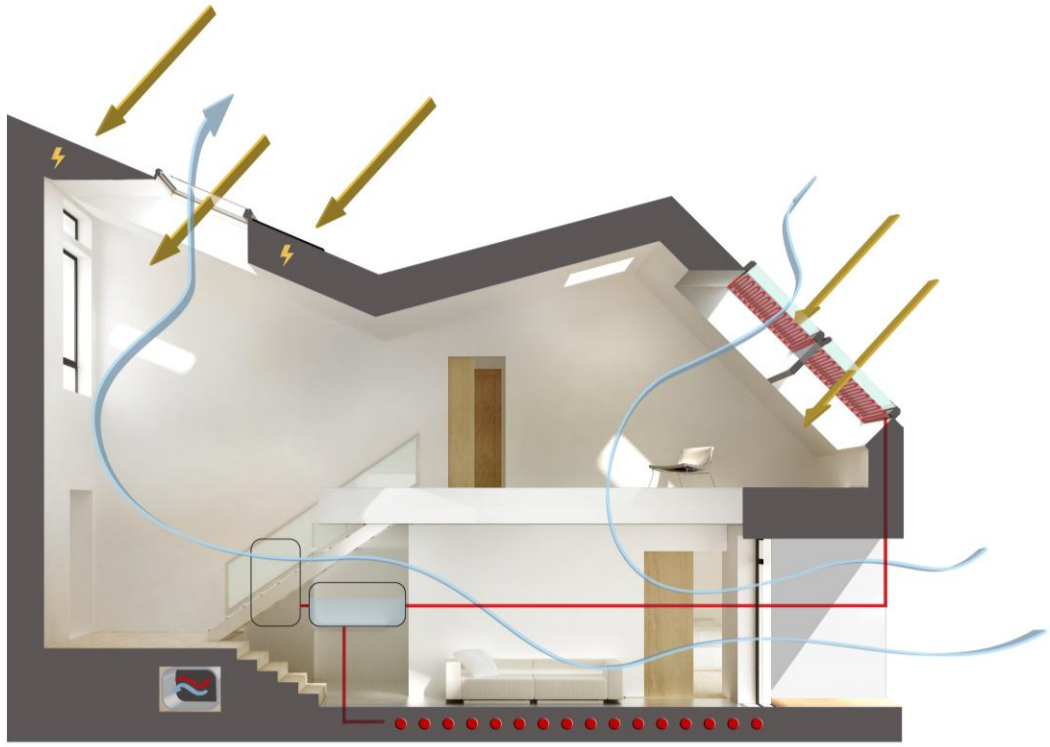
Ventilation & standards



WHAT says EU Directives?

- At EU level, the Energy Performance of Buildings Directive (EPBD, 2024/1275) prioritises reducing overheating through passive cooling measures.
- However, passive cooling measures are not prioritised in all countries
- **Passive cooling before active cooling!**
- **Well-being now a term in the latest 2024 recast**

Future building legislation

- To ensure full compliance with current and future building legislation, sensor-based ventilation is an advantage to have.
- VELUX offers solutions using our electric sloped roof and flat roof windows that can be connected to sensors, have built-in solar cells and rain sensors.

WHY ventilative cooling?

1: Resiliency

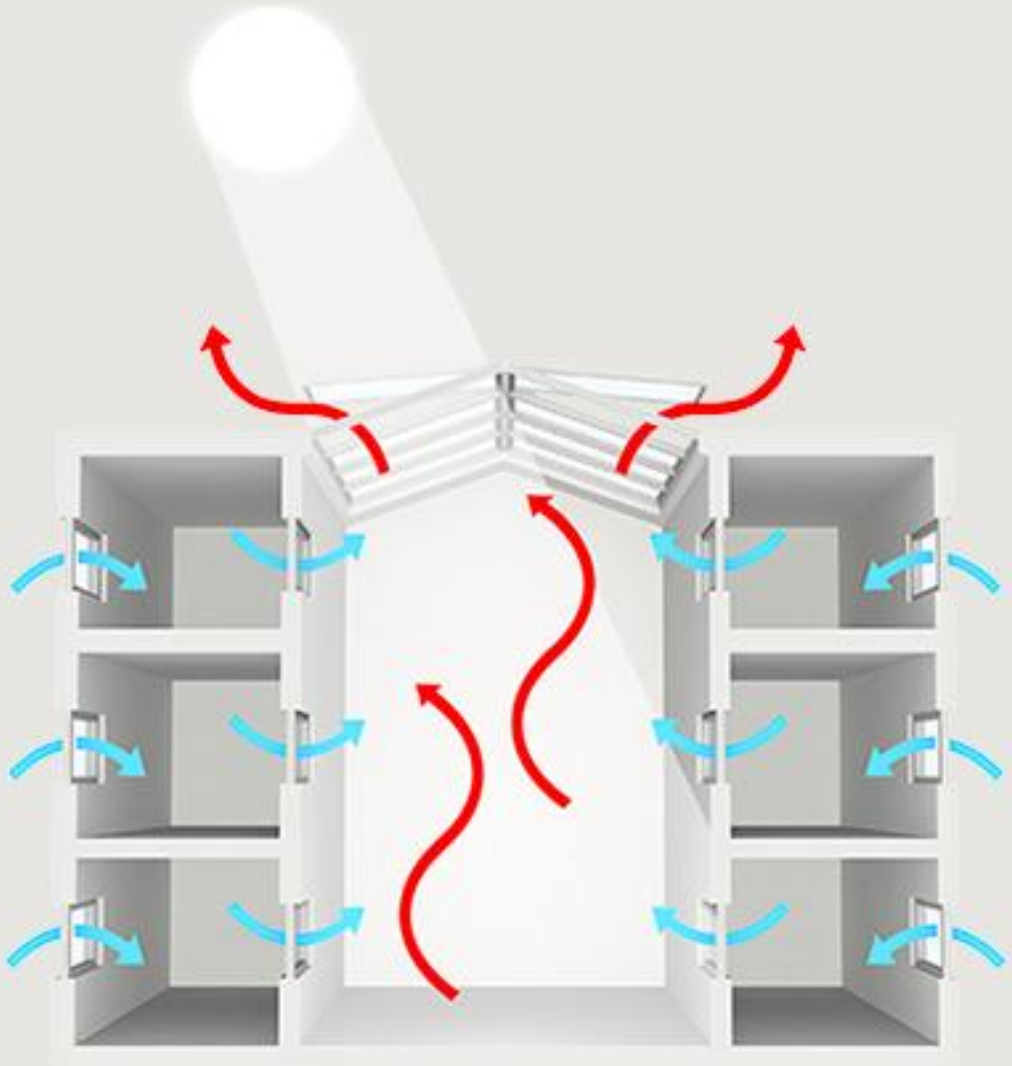
Ventilative cooling can support the robustness & resilience of buildings by using manual openable windows or solar-powered solutions.

2: Indoor climate

Ventilative cooling can effectively reduce buildings' energy use, meeting some or all the cooling requirements, limiting the use of A/C.

3: Environmental impact

Ventilative cooling can support saving resources and can be considered a renewable energy solution for cooling, according to EU Renewable Energy Directive II, 2018.



New ventilation standards in CEN & ISO

- **What:**
  - New technical documents in CEN/TC 156 and ISO/TC 205 underway, dealing with Design of "**Ventilative cooling systems**"
  - Plan is to support content of European EPBD standards (indoor climate/energy performance)
  - These technical documents should:

    Refer to relevant standards (performance requirements and calculation standards)

- **Overall purpose:**
  - Make technical documents focusing on setting criteria and giving guidance to design of ventilative cooling systems in buildings, through a **common design platform using e.g. openable windows**
  - Designers/engineers will know what to be aware of when designing ventilation systems in order to fulfill the set criteria

New ventilation standards

1.
“Ventilative cooling systems – Design” (in all buildings)

- Main focus: Thermal comfort (reduce overheating)
- Type: A CEN Technical specification
  - Applicable to Natural, mechanical and hybrid ventilative cooling (systems)
  - Expected: 2026

2.
Design process of ventilative cooling systems; Part 1 - Non-residential buildings”

- Main focus: Thermal comfort (reduce overheating)
- Type: An ISO standard
  - Applicable to Natural and hybrid ventilative cooling (systems)
  - Expected: 2027

3.
"Ventilation systems in residential buildings – Design” (prEN 15665:2025)

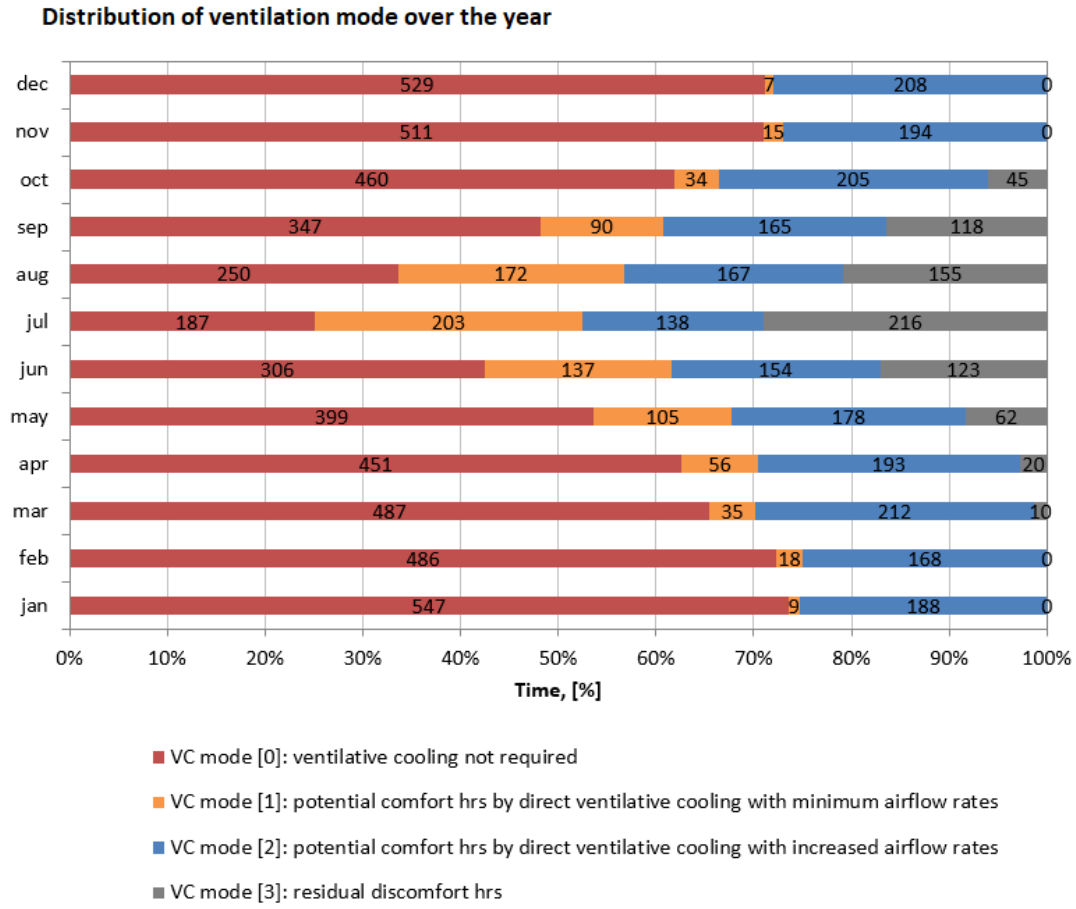
- Main focus: Indoor air quality
- Type: A CEN standard
  - Applicable to: Natural, mechanical and hybrid ventilation (systems) + airing
  - Expected: 2027

Ventilative cooling standard methods

- Ventilative cooling potential method **can estimate the potential of the outdoor air for cooling** in all locations **in a simplified manner** (VC modes #0-3).

- **Can be used by architects already** (version 1 available online, where version 2 is underway in new ventilative cooling standard..) **to design passive cooling systems.**

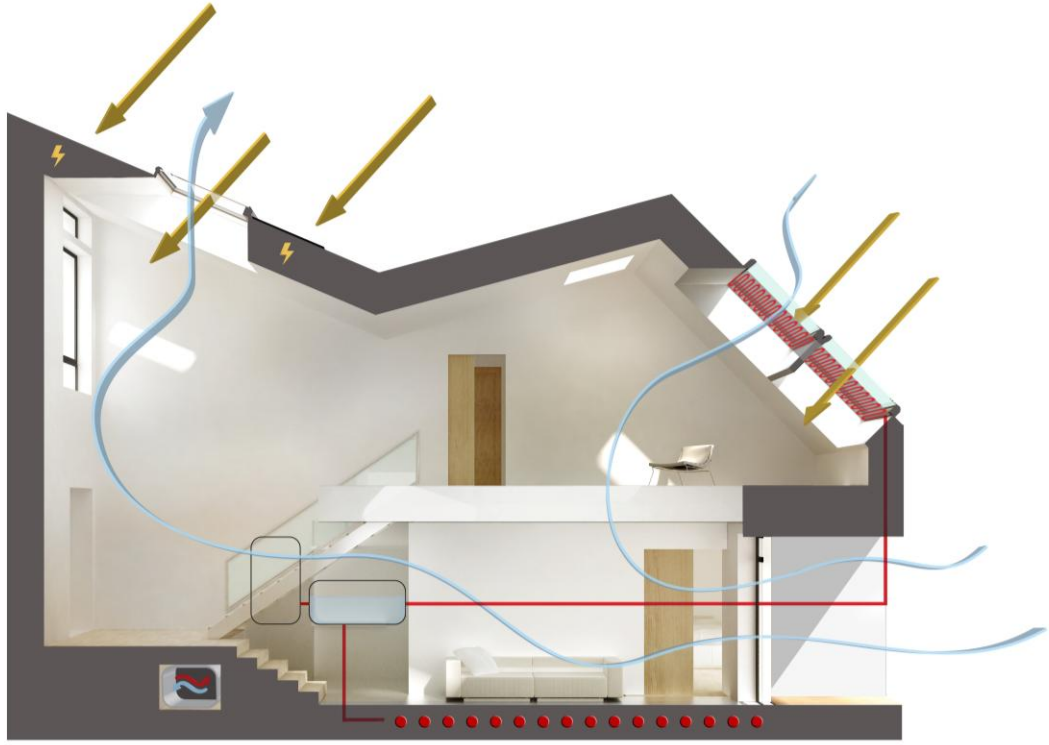
https://venticool.eu/wp-content/uploads/2017/05/V1.0_Ventilative-cooling-potential-analysis-tool.xlsm



Conclusions

- **Openable windows in regulatory documents for:**
  - Good indoor air quality all year using **openable windows for intensive ventilation**
  - Good thermal comfort (overheating purposes) in cooling period using **ventilative cooling + solar shading**
- To allow and support:
  - **Performance based ventilation systems (sensors)** for fulfillment of regulations
  - **Hybrid ventilation systems** (to be compatible with and maybe provider of these)
  - **Cooking hood supplement**; Using automatic openable windows to give supply air when the cooking hood is running
  - **Airing** as the manual operation of windows (non-sensor based) - good for intensive ventilation (quick removal of pollutants) for short periods of time
- **Natural ventilation and ventilative cooling, if installed with sensors are good to fulfil legislation – and can fulfil annual requirements based on fx. a max temperature level**

From practice



Sunlighthouse, Austria

Juri Troy Architects

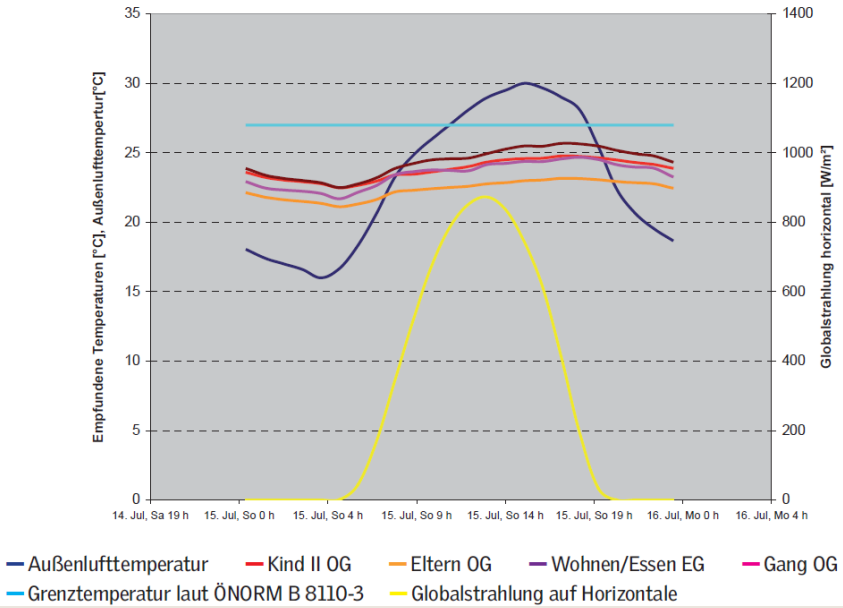
Sunlighthouse - Austria

Automated, intelligent control of windows

Primary source of ventilation in spring, summer and wintertime.

In **wintertime: mechanical ventilation** system with heat recovery.

The home uses **no energy for cooling**, but **stack-effect ventilation** through windows, night cooling and **awning blinds** ensures a comfortable indoor climate throughout the warm summer months.



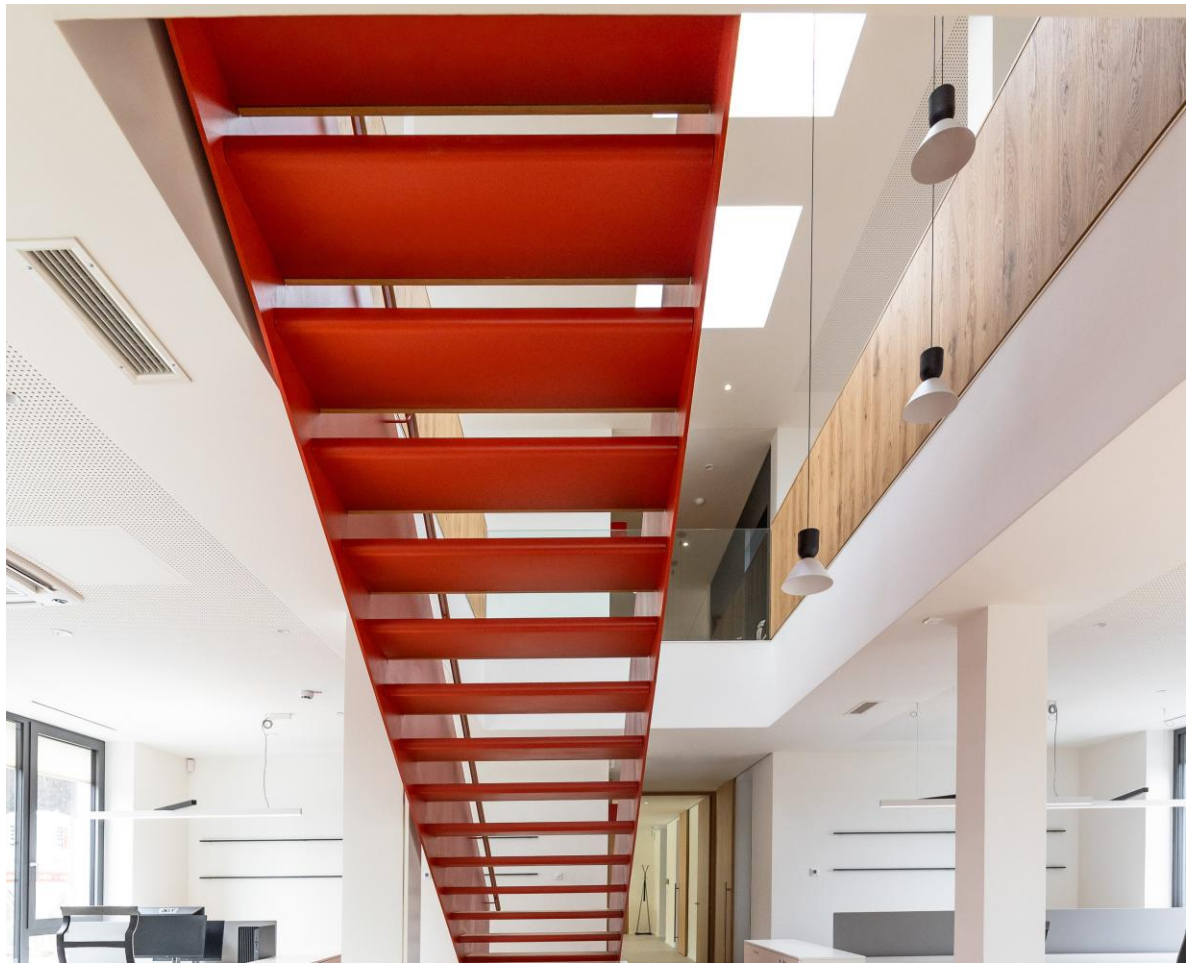
Empfundene Temperatur	Außenlufttemperatur	Kind II OG	Eltern OG	Wohnen/Essen EG
Durchschnitt	23	23,8	22,4	24,3
Maximum	30	**24,8**	**23,2**	**25,7**
Grenzwert		**<= 27°C**	**<= 27°C**	**<= 27°C**
Maximum	16	22,5	21,1	22,5

Der geforderte Grenzwert von 27° wird deutlich unterschritten.

Baumit office building, Trzin, SLO

Arhitekti: STUDIO.A+V

Baumit office building, Trzin, SLO



Primary School Normandy - France

Key-results:

10 minutes automatic opening VELUX Electrical windows:

- Morning before school start = **eliminate VOC* pollution** accumulated during the night
  * Volatile Organic Compounds
- During recess and lunch periods = **reduce CO_2 concentration by at least 30%***
  *Below 1000 ppm CO_2 concentration threshold recommended by Departmental Health Régulations
- **Non lasting & limited indoor temperature decrease by only 1,5°C** (back to its previous level when children return into the classrooms)
- **Natural ventilation efficiency**: 10 min are enough to decrease CO_2 by 300 ppm (compared to 20 min needed for a 100 ppm decrease with mechanical ventilation alone)

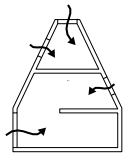
Relevant & necessary complementarity between mechanical ventilation and natural ventilation to ensure good IAQ in the classrooms all over the school day.

Living Places, Copenhagen

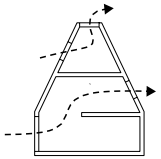
Foto: Adam Mørk

Living places

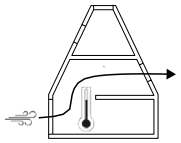
For better indoor air quality and thermal environment



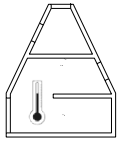
FAST AIR CHANGE
It lowers CO2 concentration



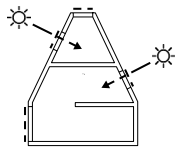
DAMPNESS CONTROL
Controlling dampness for a healthier and more comfortable living environment.



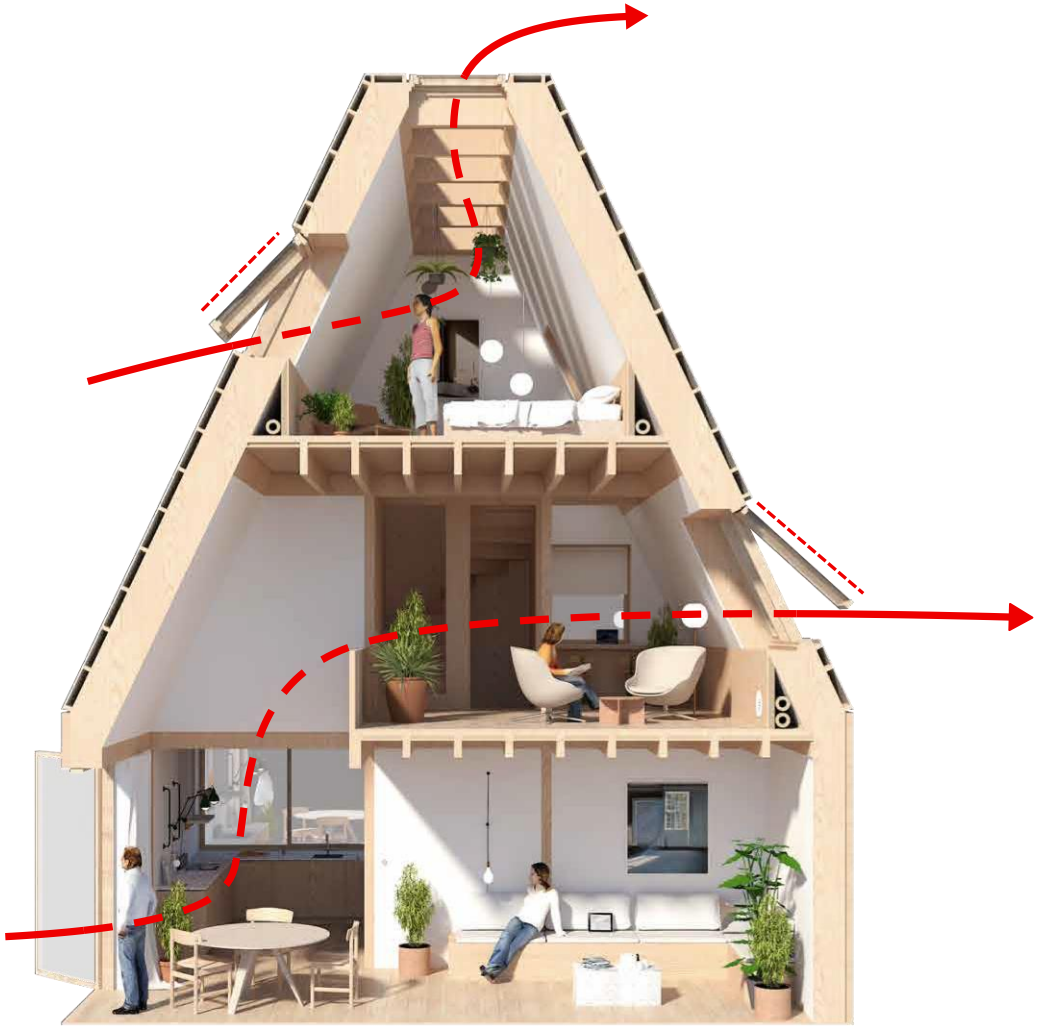
VENTILATIVE COOLING
Thermal comfort by maintaining a more consistent and comfortable indoor temperature



SENSOR BASED OPERATION
Sensors adjust shading and ventilation times based on occupancy and environmental conditions, reducing energy waste and lowering utility bills



DYNAMIC SHADING
It reduces the need for artificial cooling and lighting, leading to lower energy consumption and utility bills.



Design checklist for a healthy indoor climate

- ☑ **Think passive first**
  Many indoor climate issues can be avoided by making decisions early on in the design process – orientation, layout, thermal mass, etc.

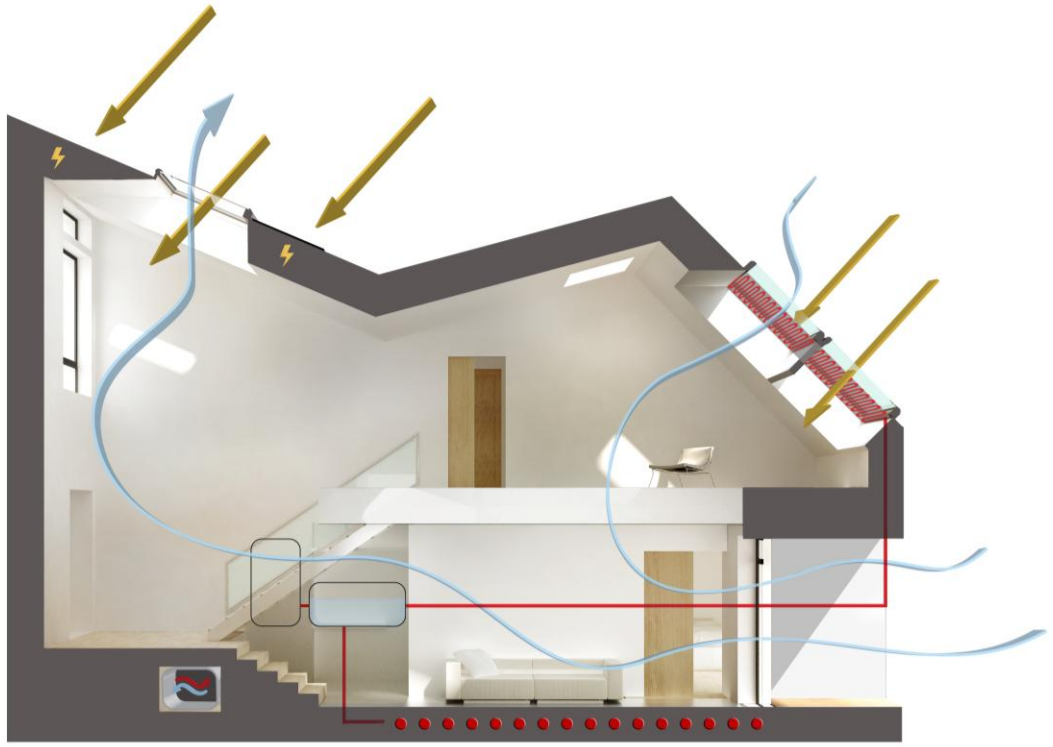
- ☑ **Choose healthy building materials**
  Source control should be the first strategy for a healthy home. Choose low-emitting materials, furnishings, paints, floorings, etc. Use carefully selected products with certified origin.

- ☑ **Plan for hybrid ventilation in newbuilds**
  The combination of mechanical ventilation (in cold months) and natural ventilation (the rest of the year) provides great indoor air quality at the lowest energy and carbon cost.

- ☑ **Position windows strategically**
  Introduce apertures on two opposite sides of the building and at different heights – enabling both cross-ventilation and stack effect ventilation. Ensure air can flow between the spaces where windows are located.

- ☑ **Use of exterior shading**
  Ensure glazed areas have proper external shading (roller shutters, awnings, overhangs, etc.). This permits to let in plenty of daylight during cold months and avoid overheating during warm months.

Napotki & kreditne točke

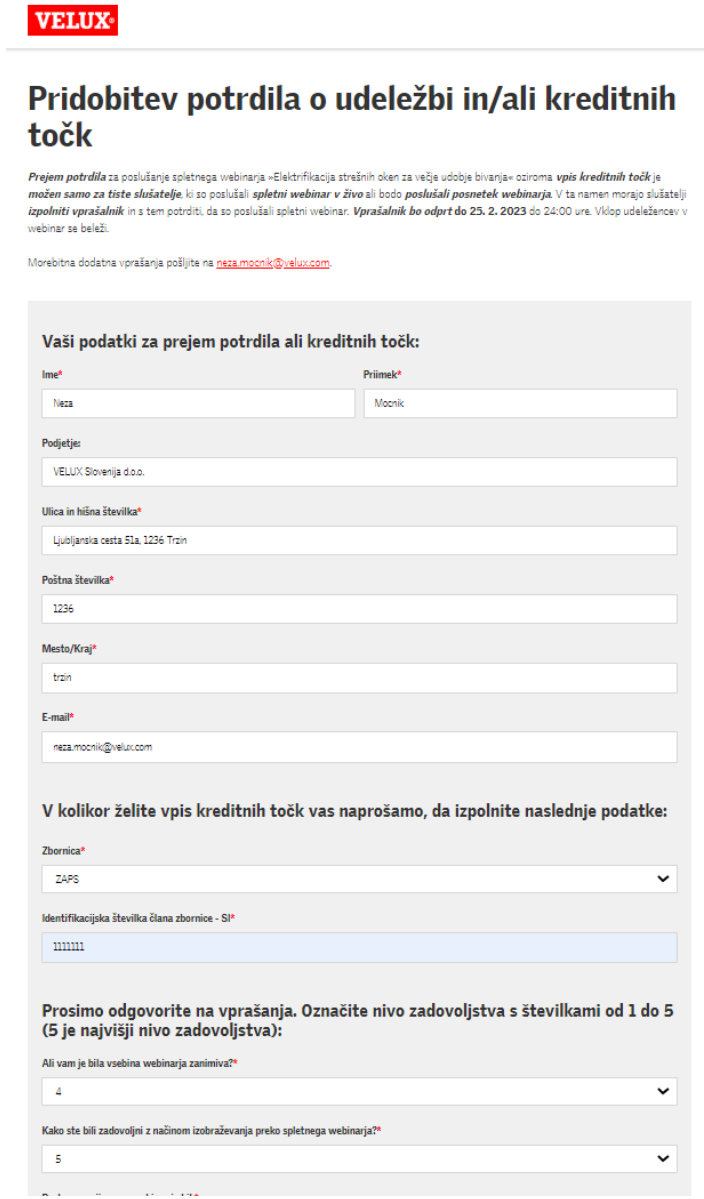


Potrdilo o udeležbi / vpis kreditnih točk

Potrdilo o udeležbi in/ali vpis kreditnih točk

- **Link** do **vprašalnika** prejmete **na mail** po zaključku webinarja
- **Izpolniti čimprej** (zaključek petek 7.2.2025 ob 24:00)
  - Vnos podatka v polje “Zbornica” – **ZAPS ali IZS**
  - Številka članstva
- **Vpis točk** na ZAPS/IZS **uredimo mi**
- **Potrdilo** bo poslano po el.pošti

Vprašanja: neza.mocnik@velux.com



VELUX

Pridobitev potrdila o udeležbi in/ali kreditnih točk

Prejem potrdila za poslušanje spletnega webinarja »Elektrifikacija strešnih oken za večje udobje bivanja« oziroma *vpis kreditnih točk* je *možen samo za tiste slušatelje*, ki so poslušali *spletni webinar v živo* ali bodo *poslušali posnetek webinarja*. V ta namen morajo slušatelji *izpolniti vprašalnik* in s tem potrditi, da so poslušali spletni webinar. *Vprašalnik bo odprt* **do 25. 2. 2023** do 24:00 ure. Vklop udeležencev v webinar se beleži.

Morebitna dodatna vprašanja pošljite na neza.mocnik@velux.com.

Vaši podatki za prejem potrdila ali kreditnih točk:

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Podjetje: VELUX Slovenija d.o.o.

Ulica in hišna številka* Ljubljanska cesta 51a, 1236 Trzin

Poštna številka* 1236

Mesto/Kraj* trzin

E-mail* neza.mocnik@velux.com

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Identifikacijska številka člana zbornice - SI* 1111111

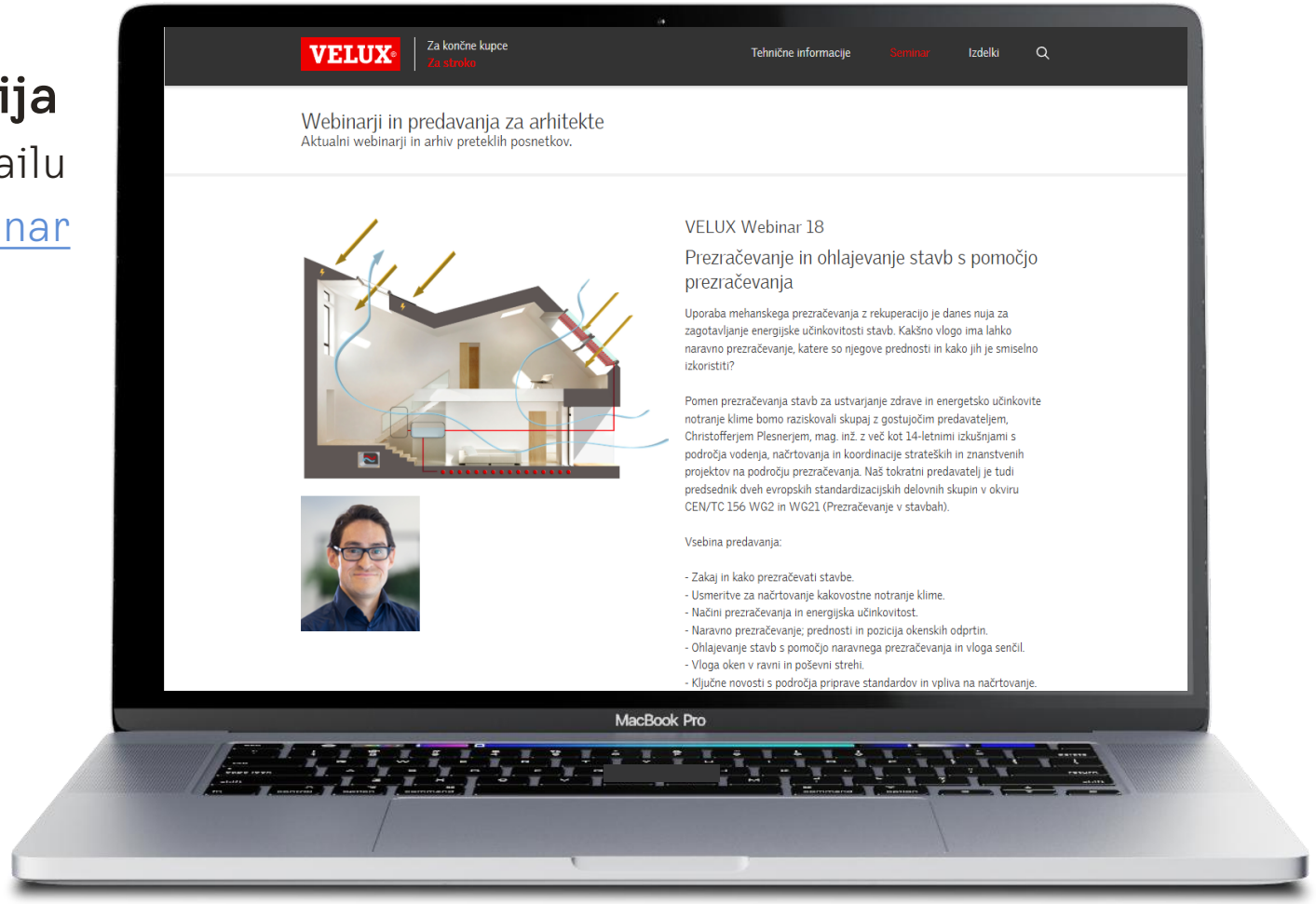
Prosimo odgovorite na vprašanja. Označite nivo zadovoljstva s številkami od 1 do 5 (5 je najvišji nivo zadovoljstva):

Ali vam je bila vsebina webinarja zanimiva?* 4

Kako ste bili zadovoljni z načinom izobraževanja preko spletnega webinarja?* 5

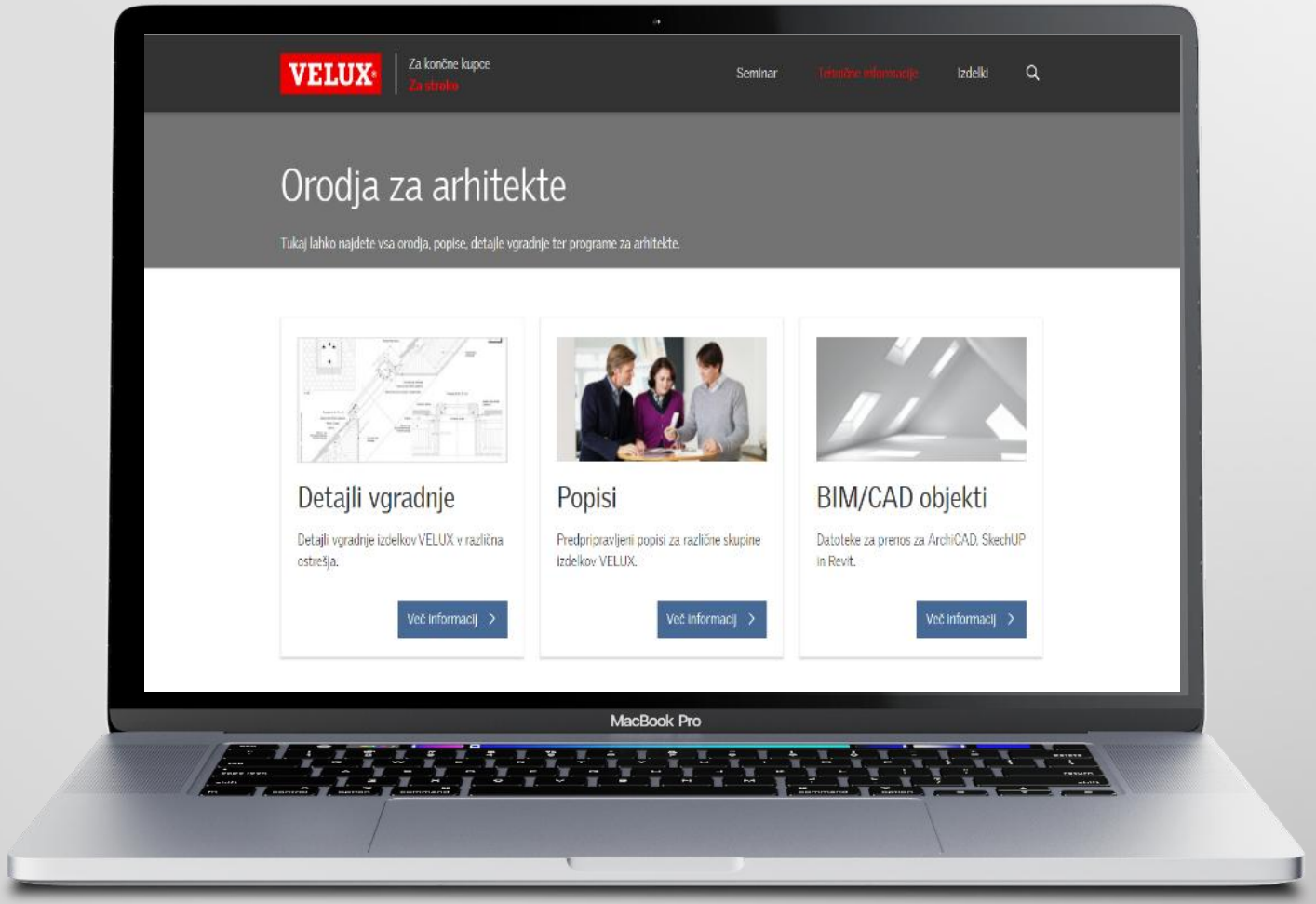
Kako do podatkov o webinarju?

- **Objava posnetka + PDF prezentacija**
  - Link do objave bo poslan v zahvalnem mailu
  - https://www.velux.si/pro/seminarji/webinar



Arhitekturna podpora

- Arhitekturni oddelek:
  domen.pogorevc@velux.com
  - Analize osvetlitve
  - Umestitev/izbor oken
  - Detajli
  - BIM/CAD orodja
  - Popisi
  - Ocena stroška
  - Priročniki



https://www.velux.si/pro/stran-arhitekti

Dogodek Lunch & Learn

- ✓ Vsebina po vaši meri: sami lahko izbirate med predlaganimi strokovnimi temami.
- ✓ Poglobljeno znanje s področja načrtovanja dnevne svetlobe.
- ✓ Dogodek poteka med kosilom.
- ✓ Za hrano poskrbimo mi.
- ✓ Naš arhitekt pride k vam – vi ostanete na svojem delovnem mestu.
- ✓ Trajanje izobraževanja prilagodimo vašemu urniku (cca 1-2 uri).

Prijava na dogodek Lunch&Learn

HVALA!