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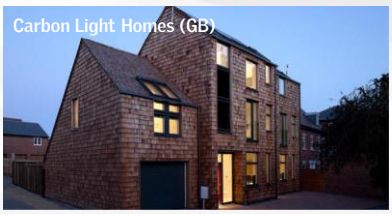
THE MODEL HOME 2020 PROGRAMME

Six buildings to explore if it is possible to build healthy and sustainable buildings for the future – today.
2009-2016



2

POST-OCCUPANCY EVALUATIONS AND MONITORING

Continuous hourly measurements in each room:

- Temperatures
- lux
- Humidity
- CO_2-level
- Energy production and consumption
- Position of windows and solar shading

Post Occupancy Evaluations by anthropologists

Dorfstetter family in Sunlighthouse

Oldendorf family in LichtAktiv Haus

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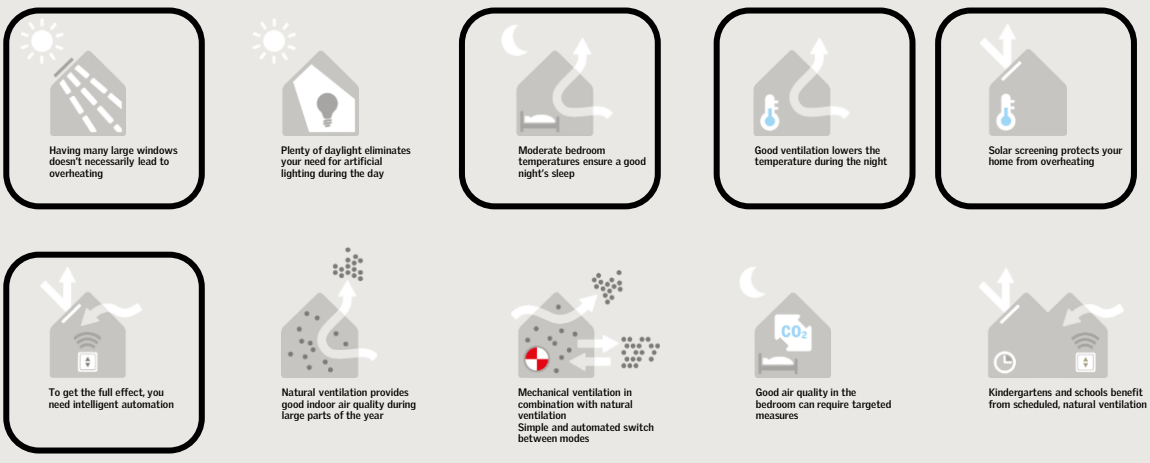
KEY RESULTS FROM MODEL HOME 2020



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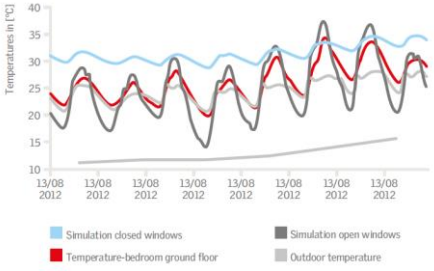
MODEL HOME 2020: MAISON AIR ET LUMIÈRE

It was possible to keep the **indoor temperature below the outdoor temperature** during daytime

Indoor temperature was typically 5-8°C lower than without ventilative cooling



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MODEL HOME 2020: MAISON AIR ET LUMIÈRE

"During the summer heat wave the outside temperature reached 32 °C, but inside we had a bearable temperature of 26 °C thanks to the awnings.

At night the house quickly cooled down when windows at ground floor level and roof windows were opened to create a flow of cool night air through the house

6

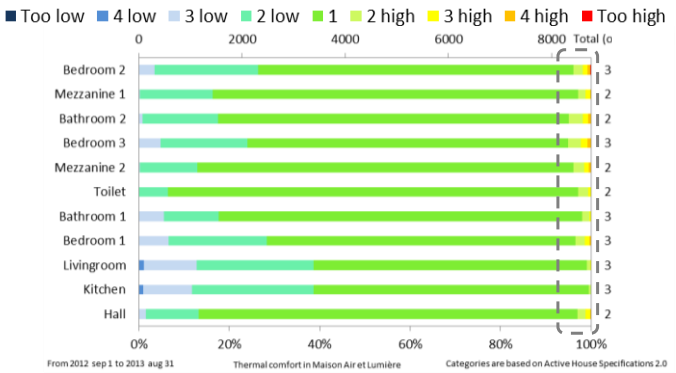
HIGH AIR FLOWS WITH VENTILATIVE COOLING CAN BE MEASURED AND CALCULATED

- Good correspondence between measured and simulated air change rate in main room in summer
- Air change rates between 10 and 23 ACH

		Wind speed m/s	Tracer Gas ACH	Simulated CONTAM ACH
Morning	Closed door	3.6	13.4	13.9*
	Open door	2.8	22.5	20.6
Afternoon	Closed door	2.3	13.2	16.6*
	Open door	2.3	19.8	19.5
Morning	Closed door	3.6	13.4	14
	Open door	3.6	14.6	17.4
Afternoon	Closed door	2.9	10.6	13.2
	Open door	2.8	13.1	17

Max 30% difference per case, 10% difference in average

HIGH DAYLIGHT LEVELS WITHOUT OVERHEATING



Maison Aire et Lumiere, Paris, France

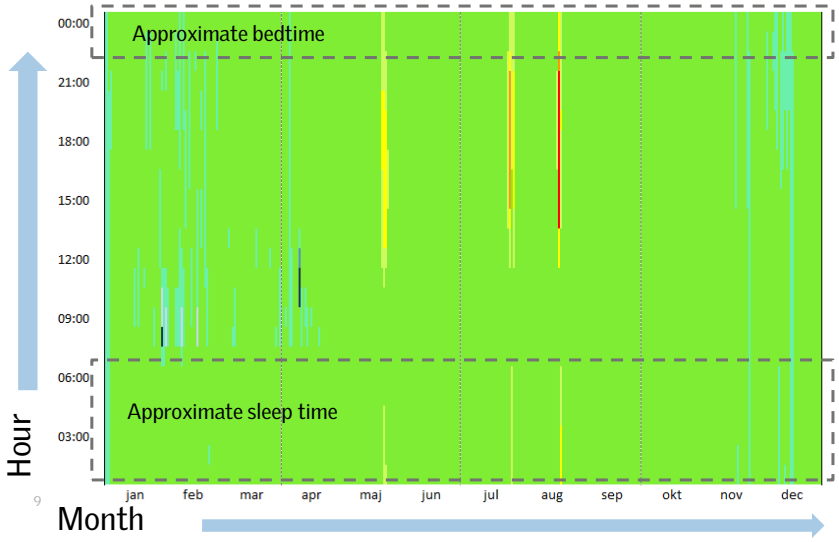
Each hour is categorised according to the measured temperature, following the Active House Specification (corresponds to EN 16798-1)

Daylight factor in all main rooms: 5% average

Almost all main rooms achieve EN 16798-1 category 1 for summer comfort

MODERATE BEDROOM TEMPERATURES

Bedroom room LichtAktiv Haus



Too High	0,1%
4 high	0,1%
3 high	0,4%
2 high	0,9%
1	94%
2 low	5%
3 low	0,1%
4 low	0,%
Too low	0,%

From 2012 jan 1 to 2012 dec 30

Room is in category 2

Green squares: Hours in category 1

Yellow - > red squares: Hours above category 1

Grey - > blue squares: Hours below category 1

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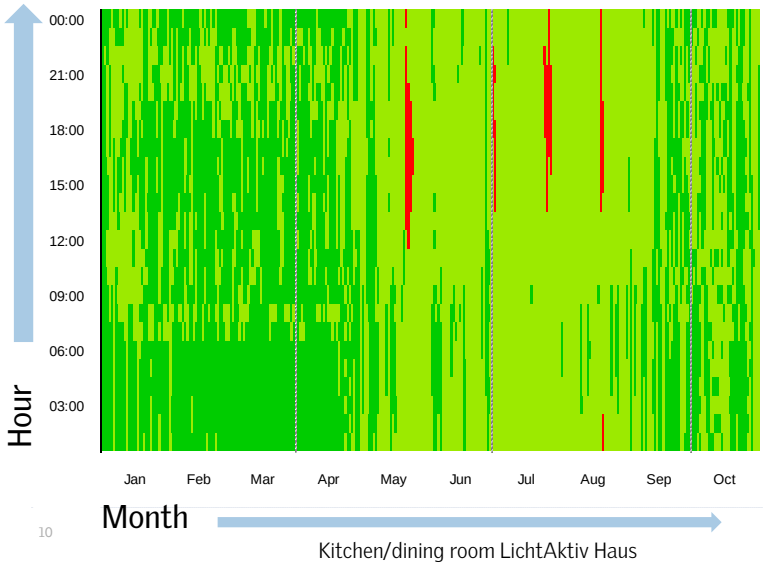
FREQUENT USE OF VENTILATIVE COOLING



Kitchen/dining room LichtAktiv Haus

Cat 1 or 2, windows closed

Cat 1 or 2, windows open

Cat 3 or 4, windows closed

Cat 3 or 4, windows open

Category refers to Active House / EN 16798-1 category

"Open window" if one or more windows are open in the room

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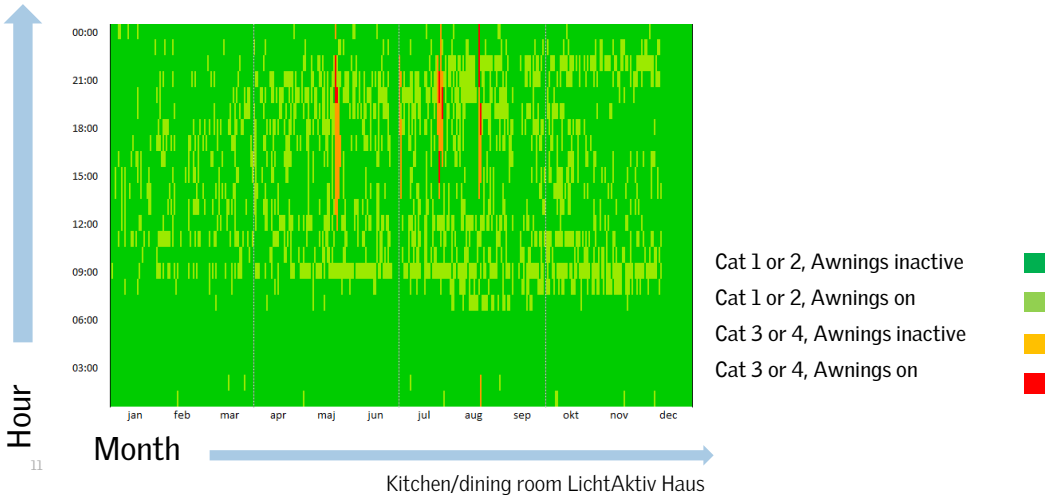
SOLAR SHADING IMPORTANT



AUTOMATION IS ESSENTIAL

Automated solar shading and window openings were used frequently during work-hours on weekdays, and during the night

.. e.g. at times when the families cannot be expected to be able to operate the products themselves

The indoor climate could not have been achieved with only manual products.

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VELUX®
RenovActive
Replicable and affordable renovation
of run-down social housing in Bruxelles
Photo: Adam Mørk

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VELUX®

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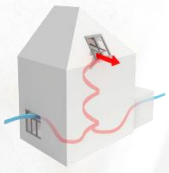
RenovActive - the 7 elements

Growing from within

Daylight treatment

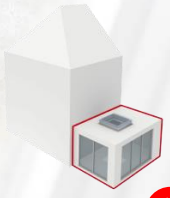


Respiratory channel

3rd skin

Hybrid breathing

Envelope upgrade



New life space

Challenge: Overheating
RenovActive elements

3rd skin

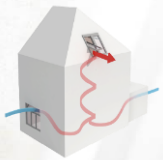
- Use sun screening to prevent the building from getting too hot.
- Equip windows with automated sun screening.

Envelope upgrade

- For better thermal comfort, keep your home cool in summer.
- Some glasses can protect you from sun gains
- Ensure you have well insulated windows, walls and roof so you keep the heat outside.

Hybrid breathing

- In summer, prioritise natural ventilation. In winter, combine natural and mechanical ventilation.
- Use automated cross-ventilation and stack effect to increase ventilation rates.



Respiratory channel

- Use automated ventilative cooling to cool the building when too hot.
- To do so efficiently, you may want to place the staircase in the center of your home, with 1 or 2 roof windows over it.

Improved insulation and air-tightness create a need for preventive solutions against excessive heat

Back

Documentation

RenovActive | VELUX

Ventilation shaft

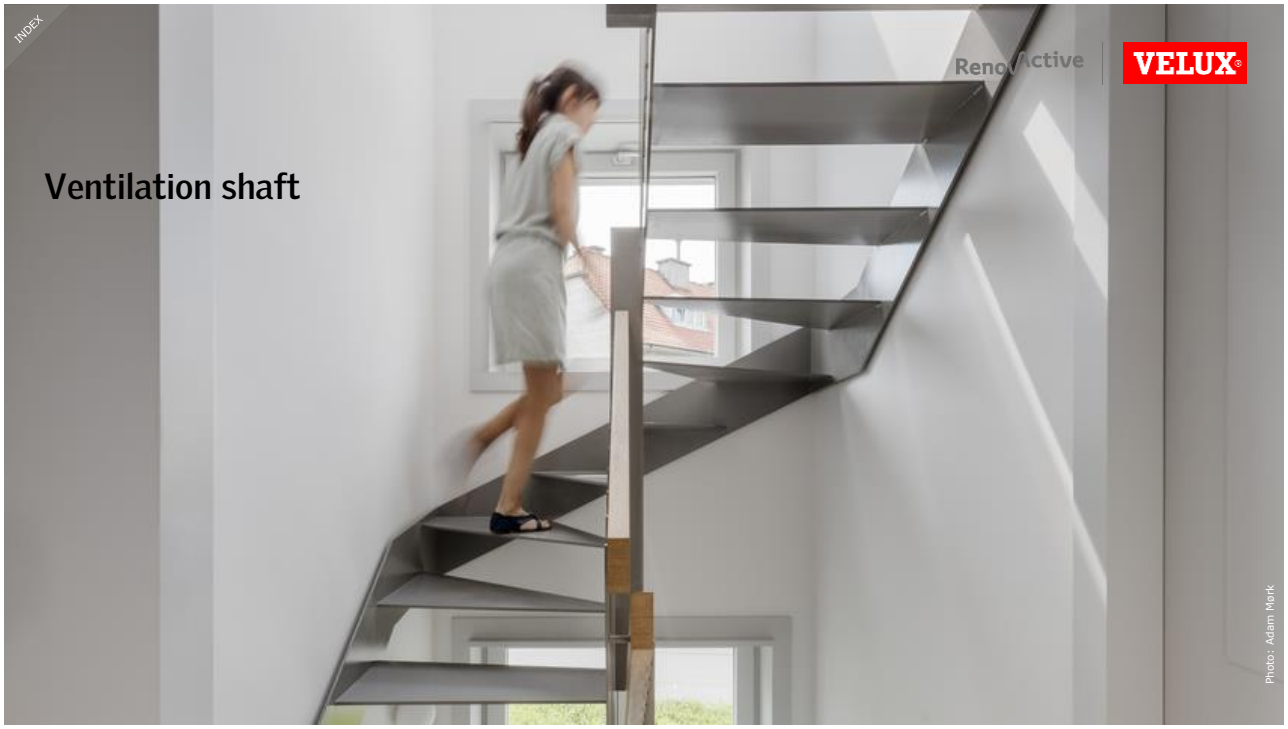


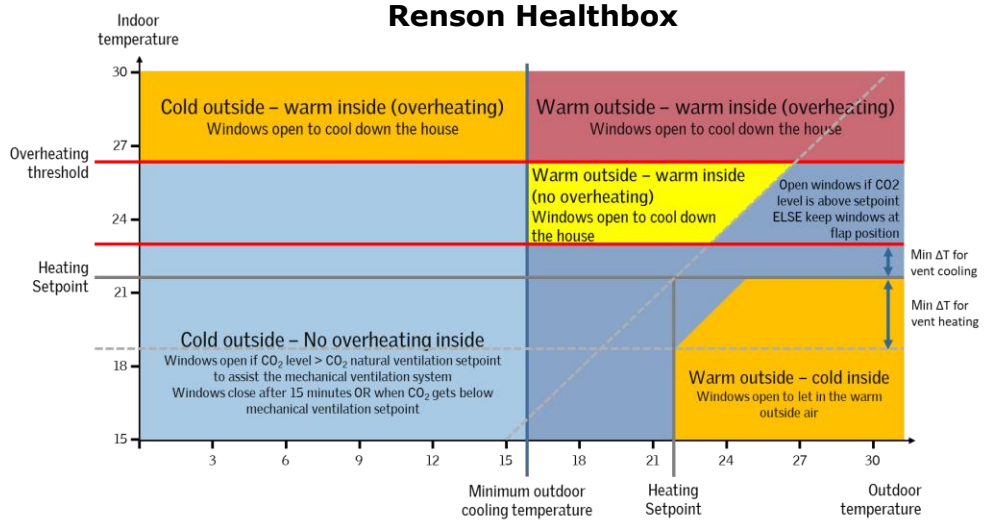
Photo: Adam Mørk

RenovActive | VELUX

Ventilation of RenovActive

- Ventilation system in RenovActive (Renson HealthBox):
  - Ventilation system C (extract ventilation)
  - Natural supply vents above the windows
  - Extraction by fan
  - Automatically controlled window openings.
- The switch between hygienic and peak ventilation is controlled based on indoor air quality and in order to prevent overheating.

Renson Hybrid ventilation system + control of window opening



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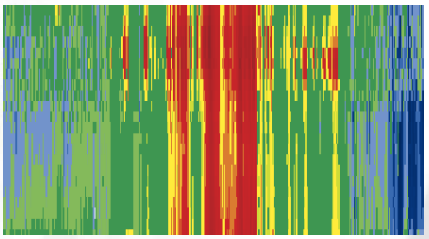
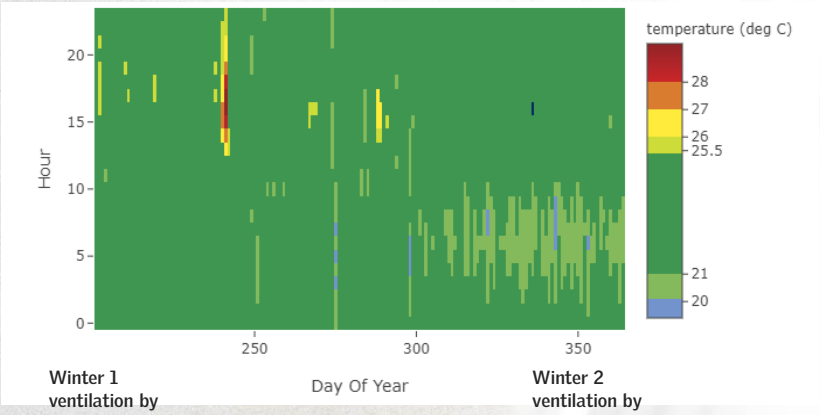
Indoor temperature

- The temperatures in the house stay for more than 95% of the time between 21°C and 26°C (e.g. similar to category II of EN 16798-1)
- The attic has slightly higher values, but stays under 28°C, after improved staircase- and attic-window openings
  - Added new solar shading
  - Added VELUX Active
- We encouraged the family to use cross ventilation in the attic to reduce peak temperatures.
- During the 2018 hot spell, the indoor temperatures were too high, and the automatic system did not resolve this, but could have been improved by ensuring cross-ventilation operation.



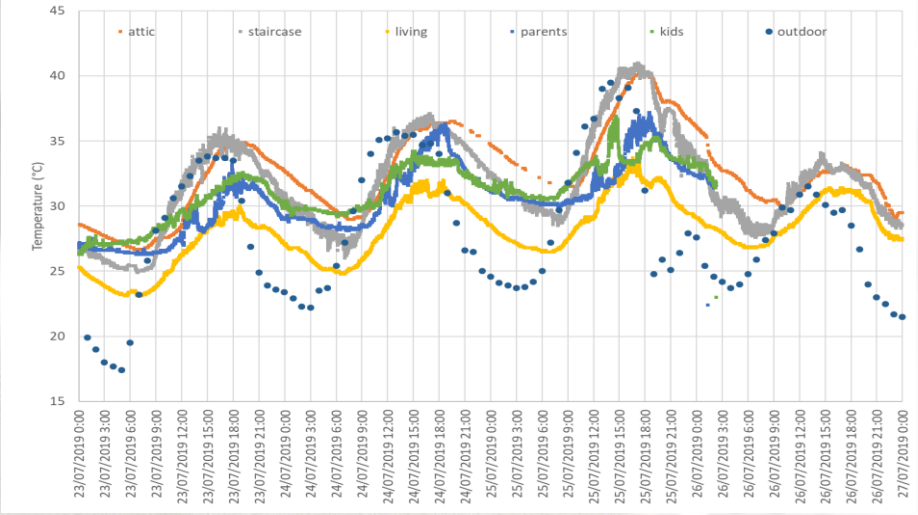
Temperature in the living room



Winter 1
ventilation by
- pivoting windows
- fan extraction

Winter 2
ventilation by
- natural supply vents
- fan extraction

Temperature in RNA during a Hot Spell



- Attic
- Staircase
- Living
- Parents
- Kids
- Outdoor

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