EUROPEAN SOLAR-SHADING ORGANIZATION

Energy Savings & Comfort

rehva

REHVA Seminar for Supporters & Members
"Responses to the EPBD requirements"

ENERGY SAVINGS AND IMPROVED INDOOR ENVIRONMENT WITH SOLAR SHADING

Amsterdam, May 14, 2009

Dick Dolmans, secretary general ES-SO

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ES-SO is a neutral umbrella

- Members are trade associations or representative industrial companies
- ES-SO is a REHVA supporter
- Now has members from 15 European countries
- Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Ireland, Italy, Netherlands, Poland, Spain, Sweden, Switzerland, UK
- Objective: inform European authorities of the merits of solar shading as an energy-efficient building technology

‘Energy consumption for cooling in buildings can be reduced by 50% through solar shading’

J. van Wolferen

TNO Bouw & Ondergrond in *Koeltechniek,* April 2008

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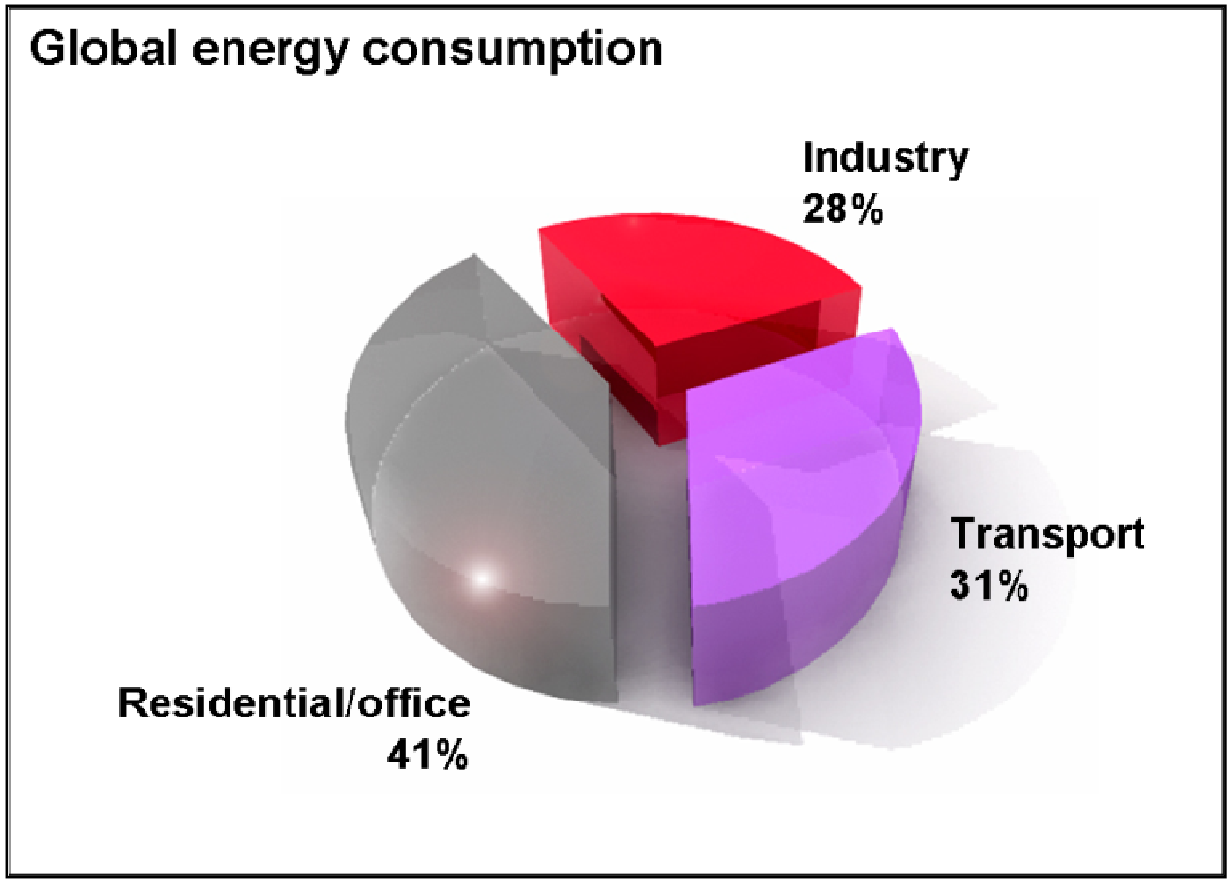
In a nutshell: my topic for today

- Energy savings is top of bill
- Buildings use most of the energy
- In buildings windows are the weak spot
- Solar shading (shades, blinds, awnings etc.) helps make windows more energy-efficient
- The contribution of shading can be quantified
- Therefore, solar shading must be recognized as an energy-efficient building technology contributing to sustainable building

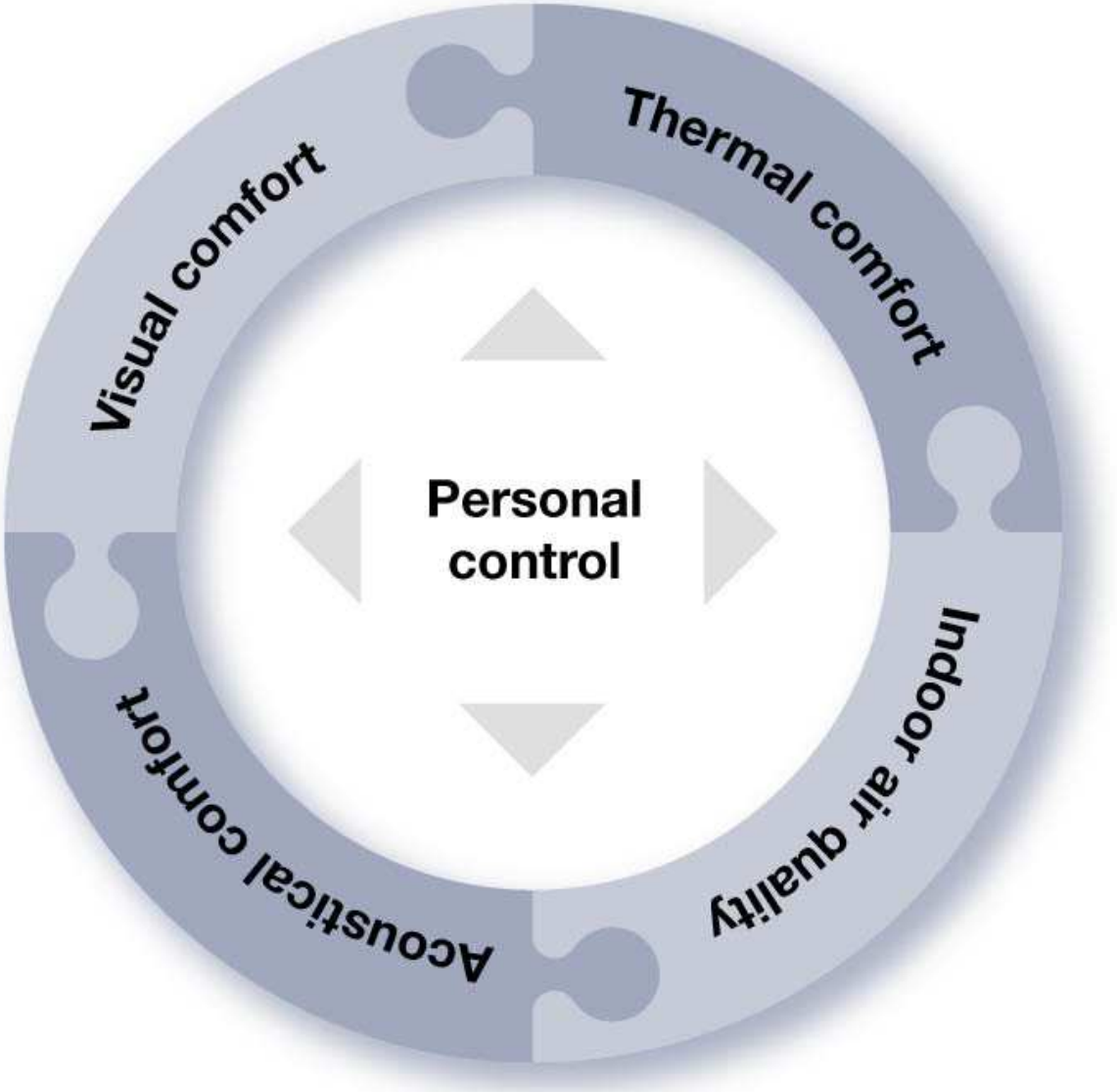
European built environment: 41%



Energy efficiency in buildings now top political priority

- EPBD now in effect all EU member states
- Various projects monitor progress & results
- EPBD Recast now voted by European Parliament
- Refurbishment: 1000 m² threshold abolished
- Eco-Design to be extended to windows (labeling)
- EP expects buildings to be 'zero net energy' by 2019
- EP promotes voluntary Europe-wide EPC for commercial buildings by 2011

Indoor Environmental Quality



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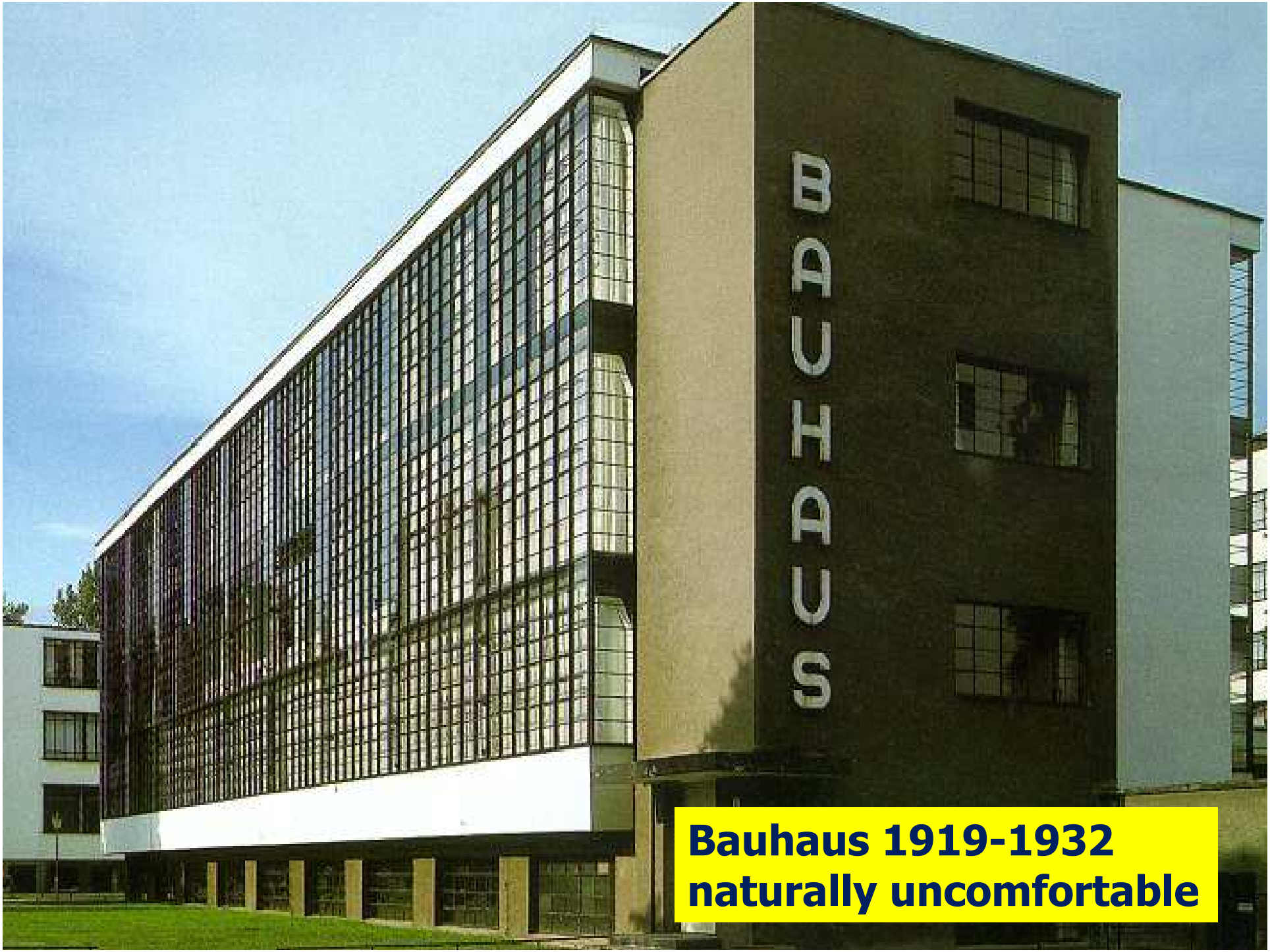
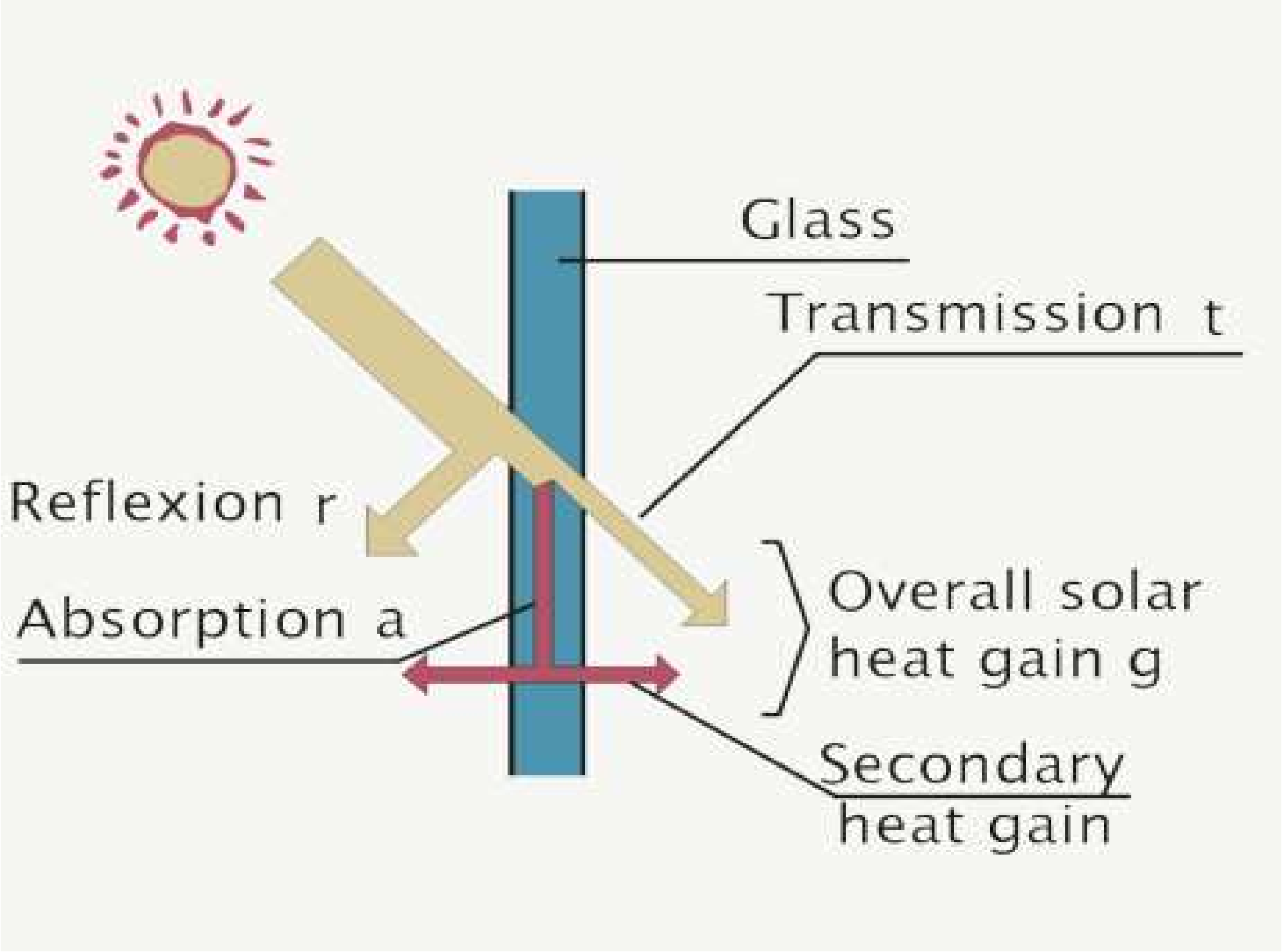
Energy Savings

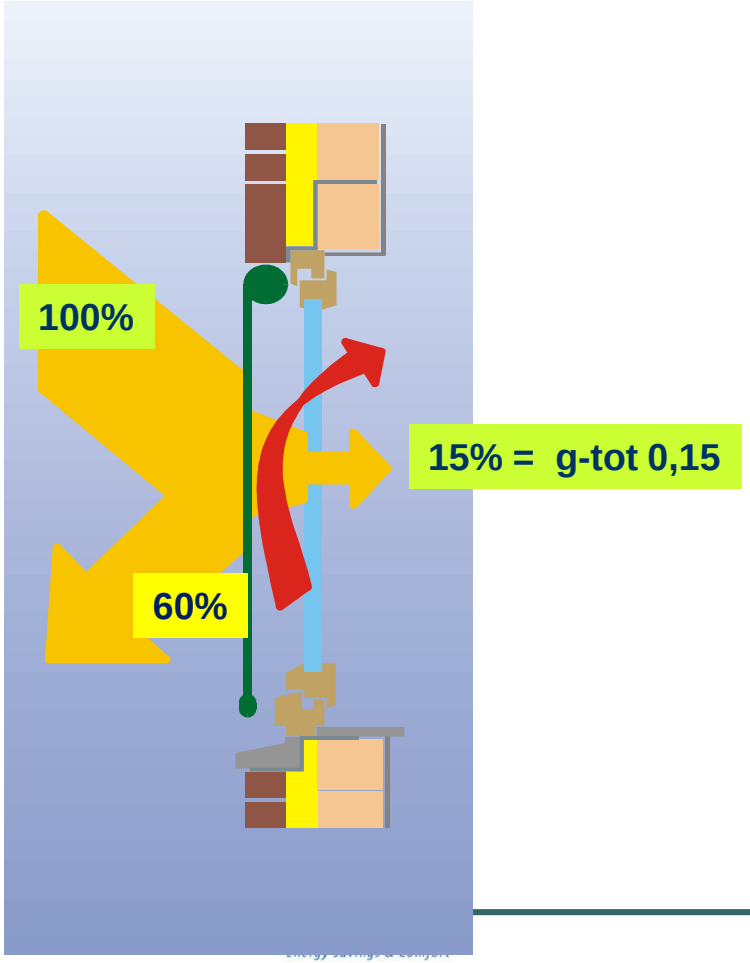

naturally comfortable

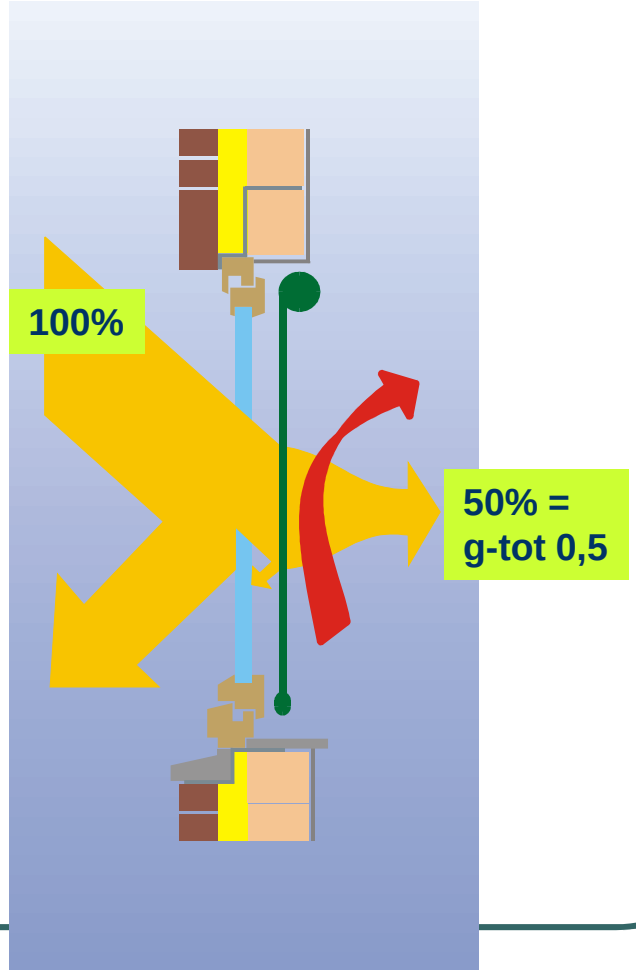


Bauhaus 1919-1932
naturally uncomfortable


Glass
Transmission t
Reflexion r
Absorption a
Overall solar
heat gain g
Secondary
heat gain

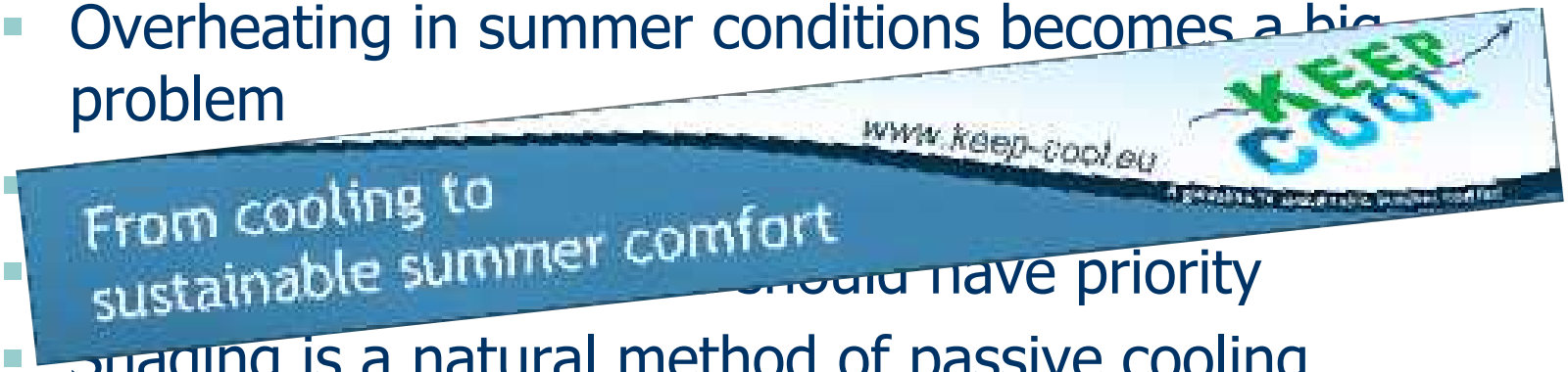
Typical values for external and internal solar shading





Why consider solar shading?

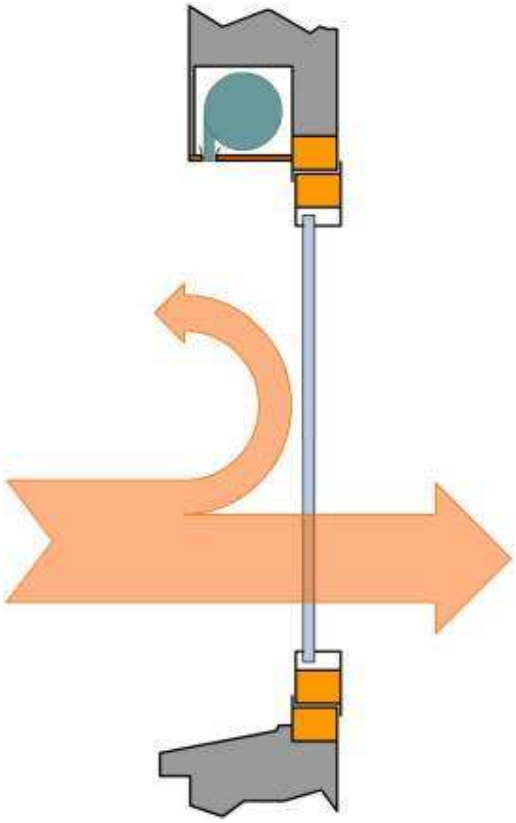
- Buildings consume over 40% of all primary energy
- Insulation of buildings is not sufficient
- Overheating in summer conditions becomes a big problem
- [illegible]
- [illegible] should have priority
- Shading is a natural method of passive cooling
- Solar shading is **the smart, dynamic insulation of the transparent parts** of the building



What does solar shading contribute?

- Reduction of cooling load and of installed cooling capacity
- Smart use of free solar energy in winter time from intelligent controls
- Improved use of natural, free daylight and savings on electricity for lighting
- Improved comfort for occupants
- Better visual comfort and better working conditions
- Enhanced productivity of office workers

Situation n° 1: daytime in winter



Intelligently controlled sunblind will let free solar heat gains enter the building, which means less energy for heating.

Shown here is an external roller blind in the 'up'-position. The glass will reflect part of the solar energy, but a large part will pass through.

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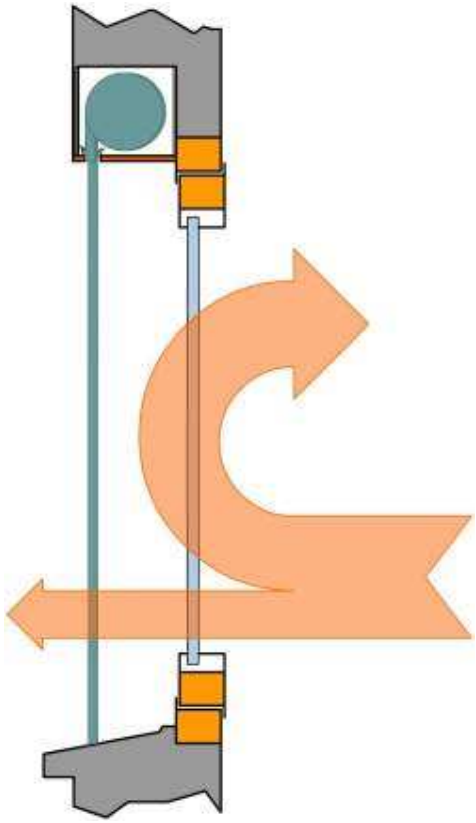
Situation n° 2: nighttime in winter



Solar blind in 'down'position helps provide an extra layer of insulation, reducing heat loss. That means less energy for heating.

The sketch shows an external roller blind in the 'down'position. The cover of the blind acts as an insulator.

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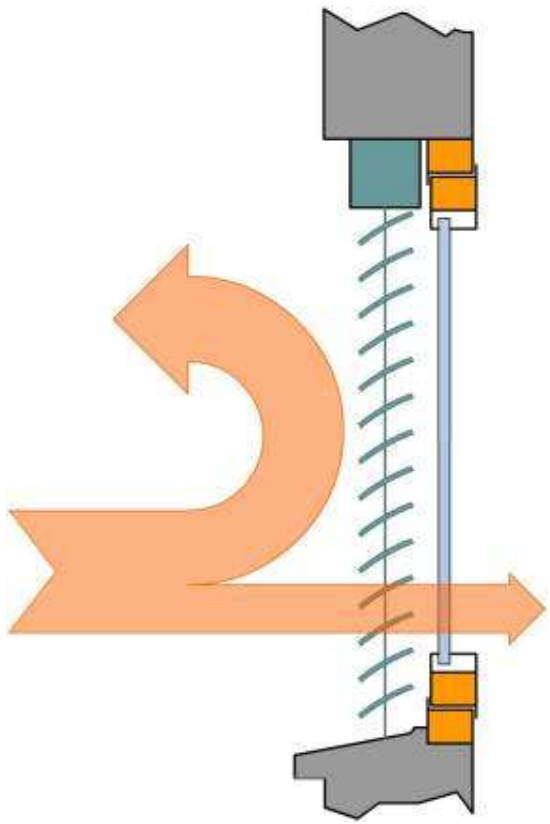
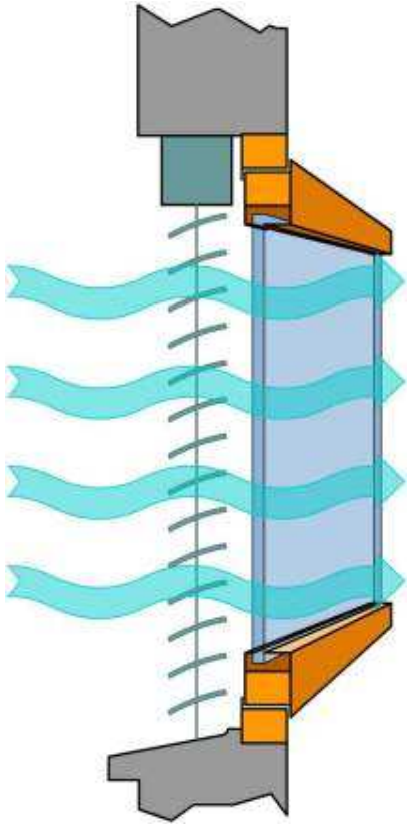
Situation n° 3: daytime in summer



External solar shading keeps the excess heat out of the building, reducing the cooling load on the airconditioner. That means much less energy for keeping the building comfortably cool.

The sketch shows an outside blind in the 'down' position. Up to 90% of the incoming energy will be arrested before it hits the glass.

Situation n° 4: nighttime in summer



When the building can be naturally ventilated during the night ('night flush'), the mass of the building will cool down and less energy will be needed the next day for the airconditioner.

The sketch shows an open window creating a natural draft and evacuating the heat that is accumulated in the building's structure.

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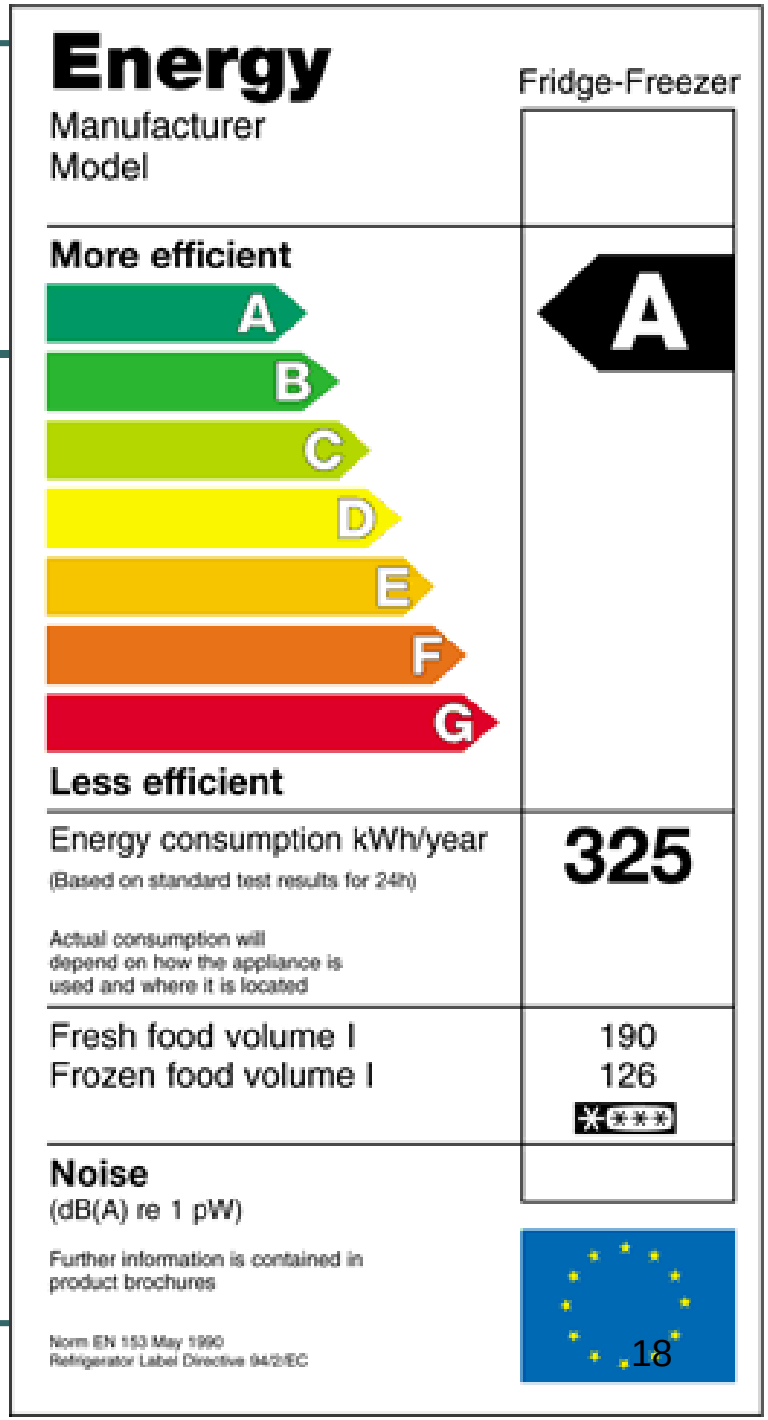
Using building simulation calculations: how much energy will be saved?



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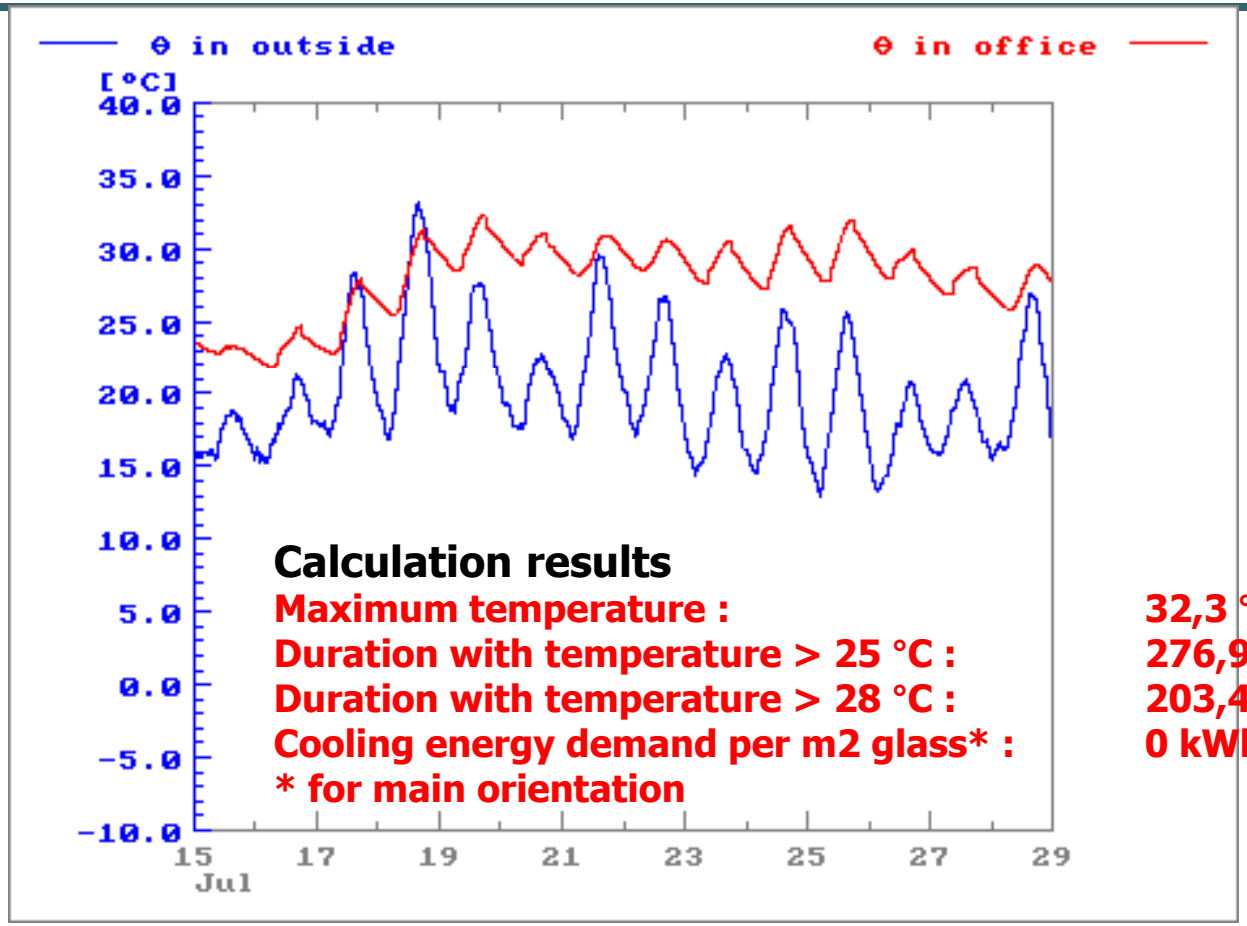
Example for a building in Vienna

- Climate of Vienna
- Office building, one façade
- Period chosen: July 15-30
- Percentage of glass in the façade: 65
- Glass values: U=1,1 W/m²K, g=0,47
- Internal heat gains 15 W/m²
- Ventilation (changes/hour): 0,5 in winter, 2 in summer
- Calculations made for three scenarios:
  - Neither solar shading nor air conditioning
  - Comfort from air conditioning; resulting energy demand
  - External solar shading: roller blind
  - Both external solar shading and air conditioning

Outdoor & indoor temperature, neither shading nor air conditioning



Calculation results

Maximum temperature :	32,3 °C
Duration with temperature > 25 °C :	276,9 h
Duration with temperature > 28 °C :	203,4 h
Cooling energy demand per m2 glass* :	0 kWh

* for main orientation

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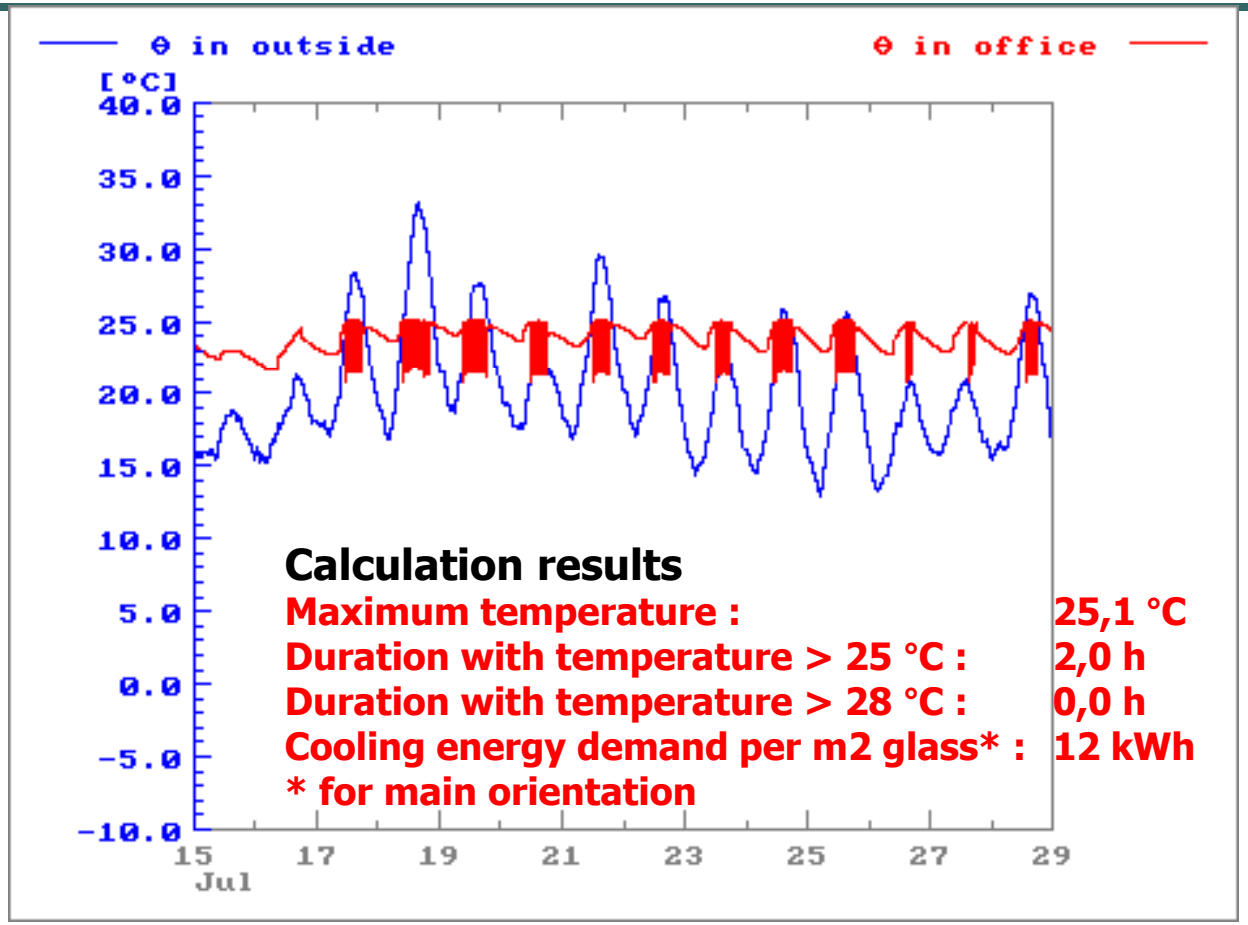
Outdoor & indoor temperature, no shading, only air conditioning at 23°C ± 2°C



Calculation results

Maximum temperature :	25,1 °C
Duration with temperature > 25 °C :	2,0 h
Duration with temperature > 28 °C :	0,0 h
Cooling energy demand per m2 glass* :	12 kWh

* for main orientation

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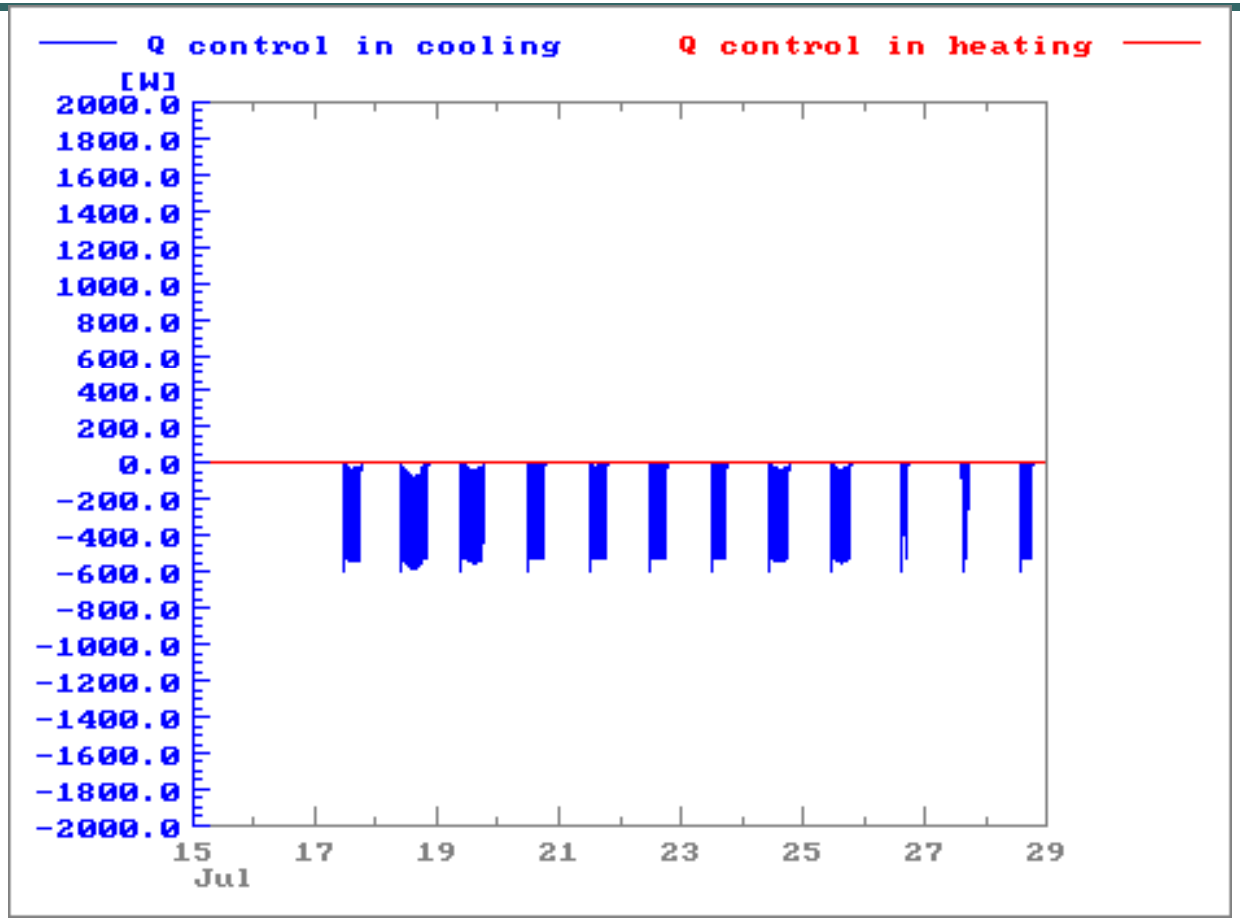
Pattern of energy demand, no shading, air conditioning at 23°C ± 2°C



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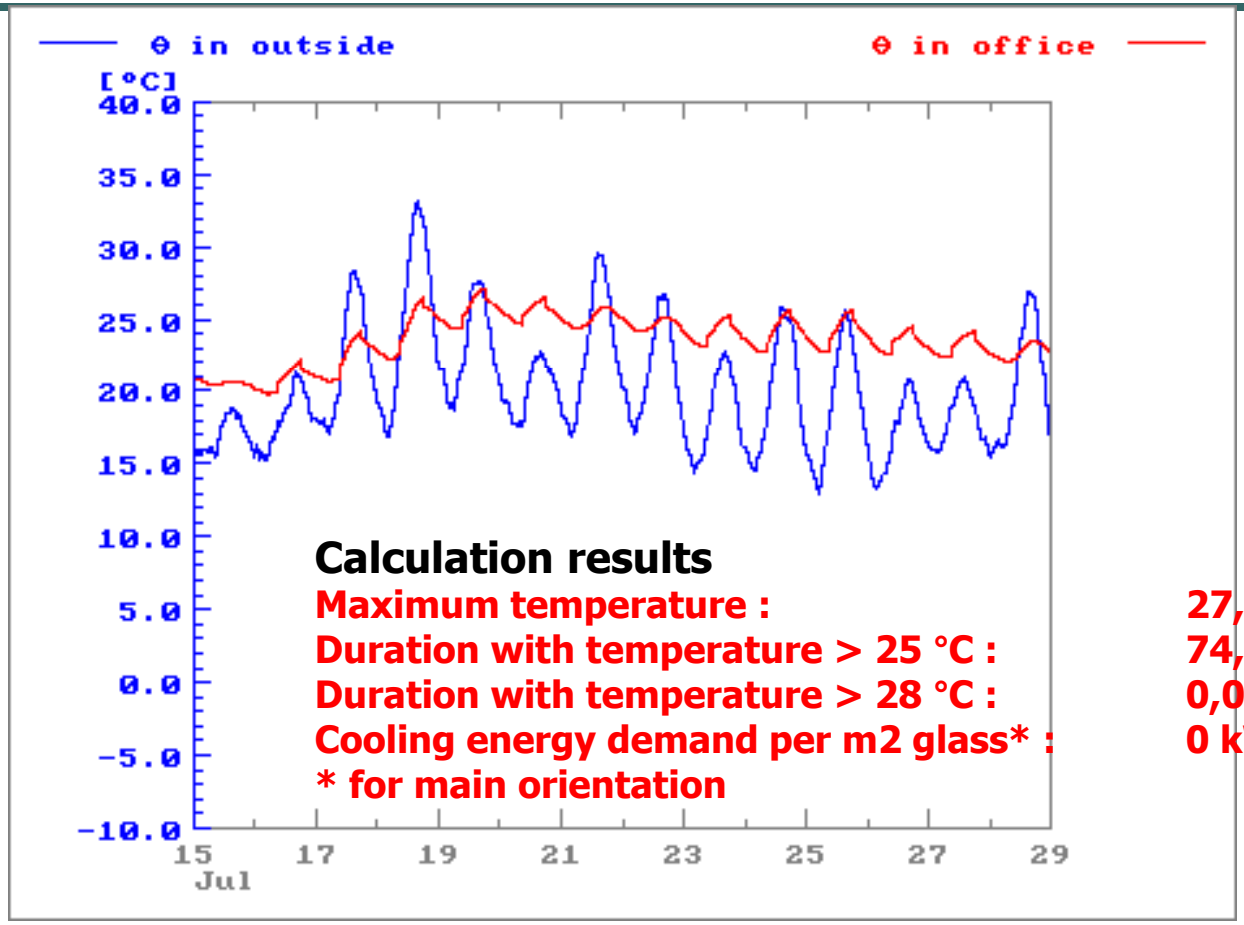
Outdoor & indoor temperature, external solar shading, no air conditioning



Calculation results

Maximum temperature :	27,1 °C
Duration with temperature > 25 °C :	74,8 h
Duration with temperature > 28 °C :	0,0 h
Cooling energy demand per m2 glass* :	0 kWh

* for main orientation

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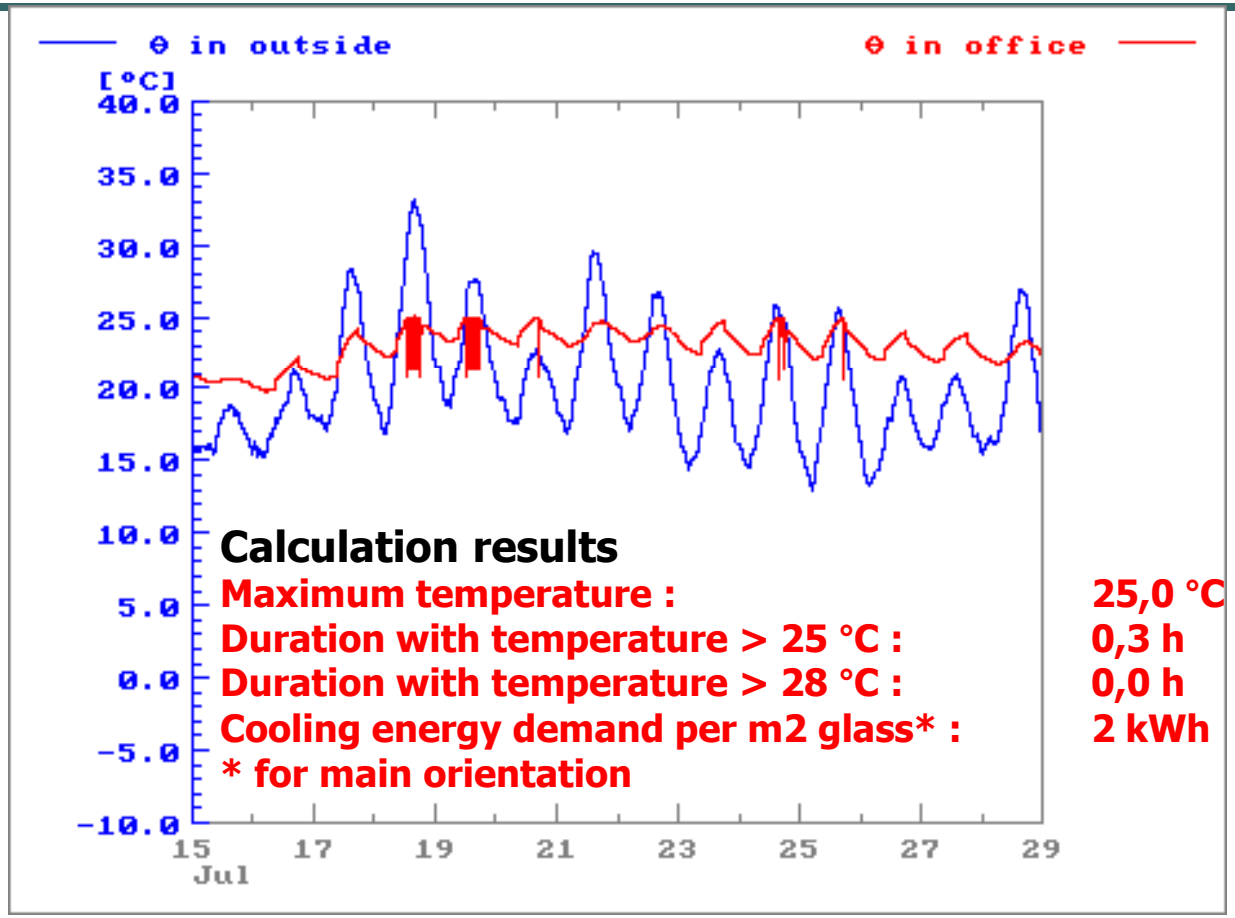
Outdoor & indoor temperature, both external solar shading and air conditioning



Calculation results

Maximum temperature :	25,0 °C
Duration with temperature > 25 °C :	0,3 h
Duration with temperature > 28 °C :	0,0 h
Cooling energy demand per m2 glass* :	2 kWh

* for main orientation

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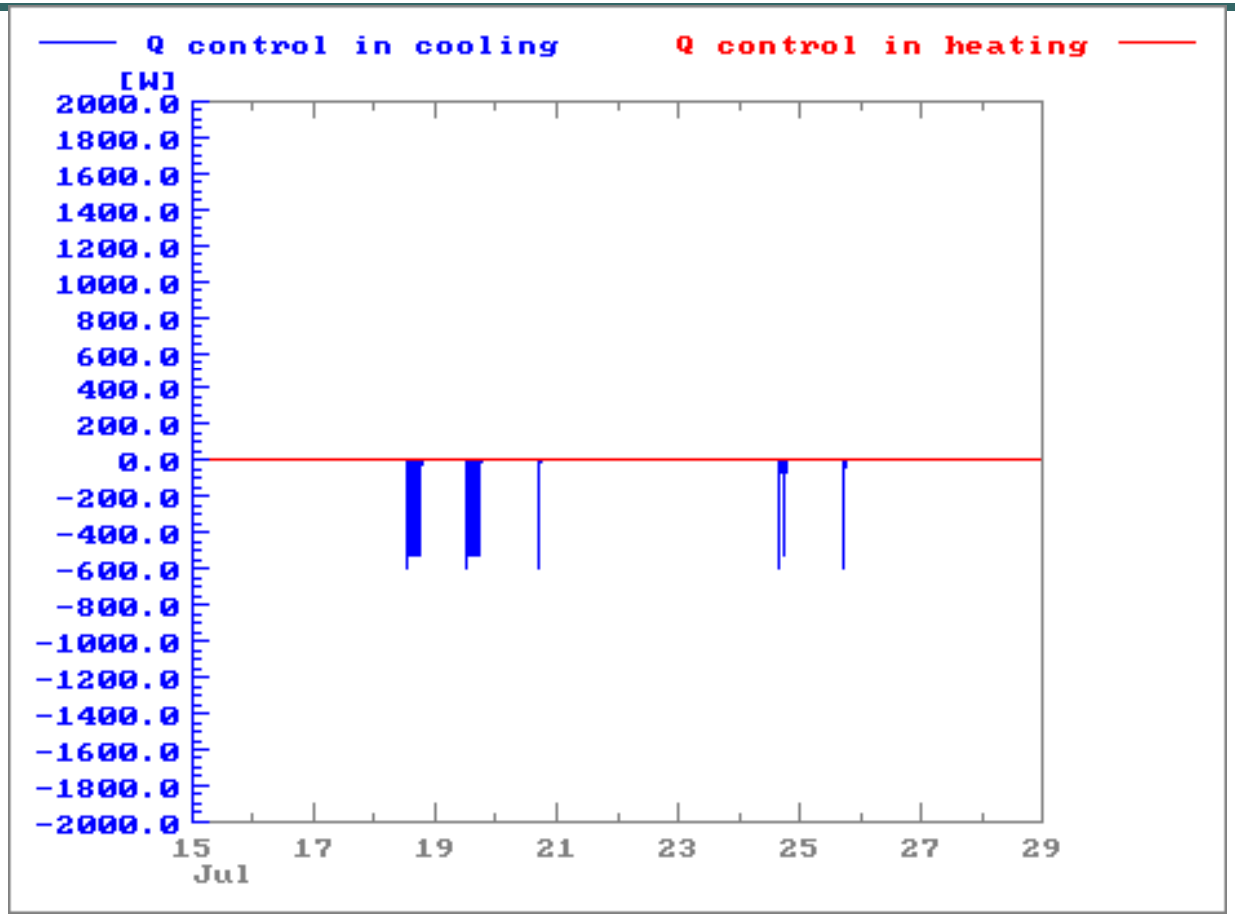
Pattern of energy demand, both external Shading and air conditioning at 23°C ± 2°C



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Example shows:

- Solar shading reduces max. indoor temperature by over 5°C in this case
- Cooling load is reduced considerably compared with base scenario
- Example is based on excellent glass quality and only 65% glass in façade – often it's more
- Simulation calculation based on real climate data shows what common sense dictates: if you keep the heat out, you do not have to cool it down.

Cooperation REHVA/ES-SO

REHVA – ES-SO Guidebook on Solar Shading

Objective of the guidebook:

To give the designers (architects and building services engineers) state-of-the-art information on the new possibilities in solar shading and its integration with other building services, and how it affects the energy use of buildings

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REHVA/ES-SO Guide Book

Main topics to be dealt with:

- solar radiation
- effects of windows on indoor environment
- effects of solar radiation on energy use of buildings
- properties of solar shading
- solar shading as a passive cooling technology
- integration of solar shading into building systems
- controls systems for solar shading
- modeling and calculations of effects of solar shading
- solar shading in the EPBD context

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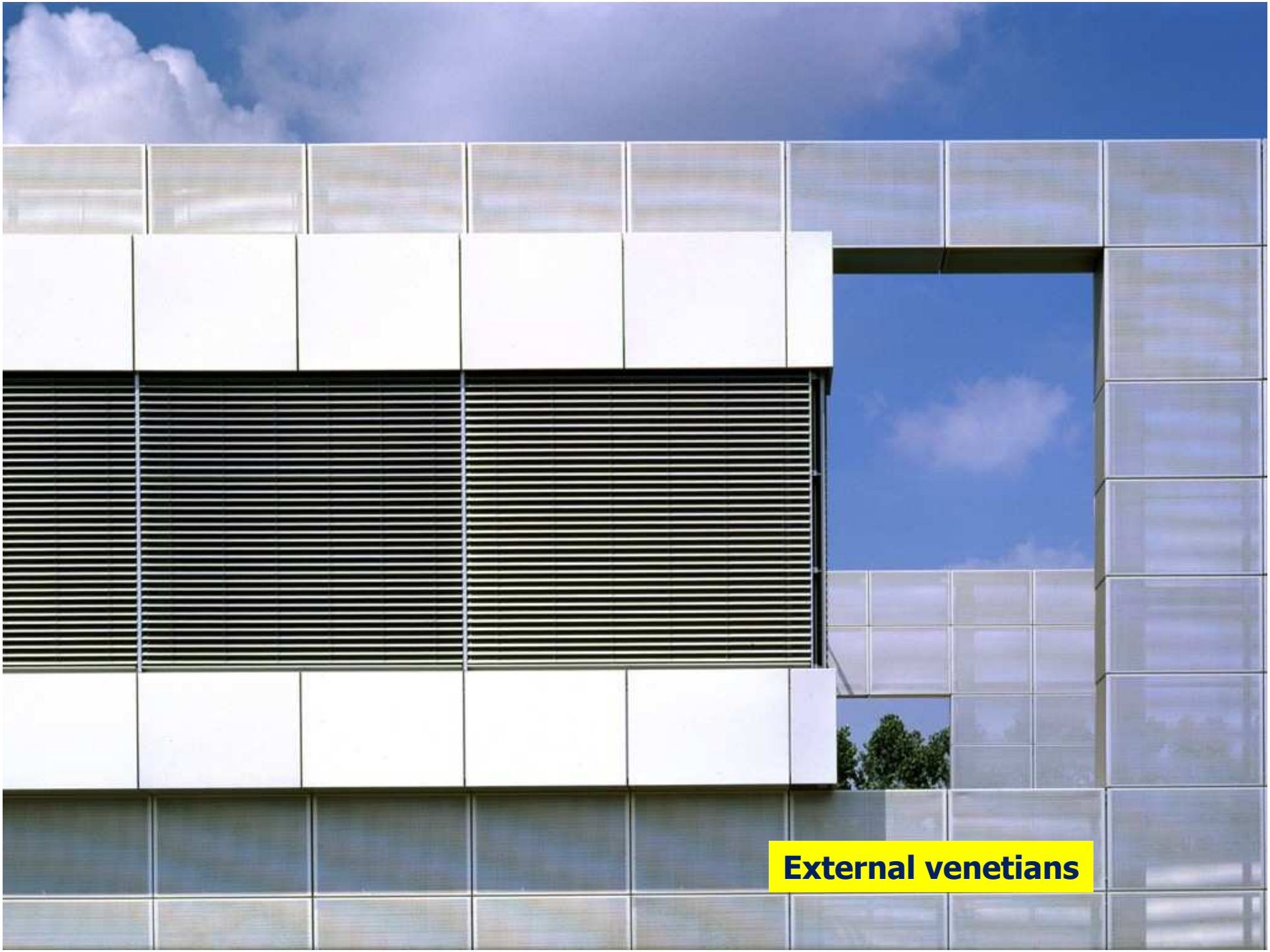
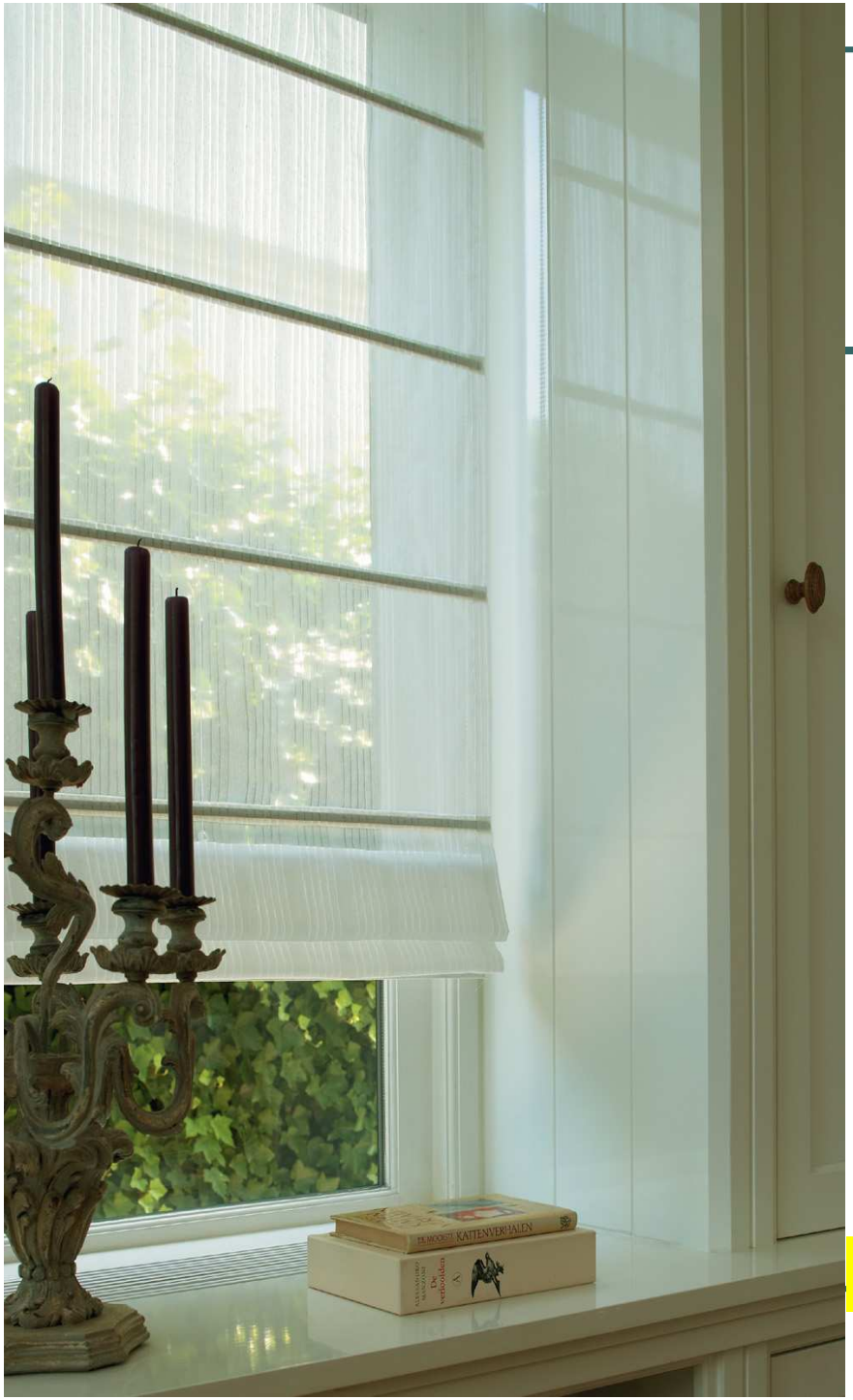
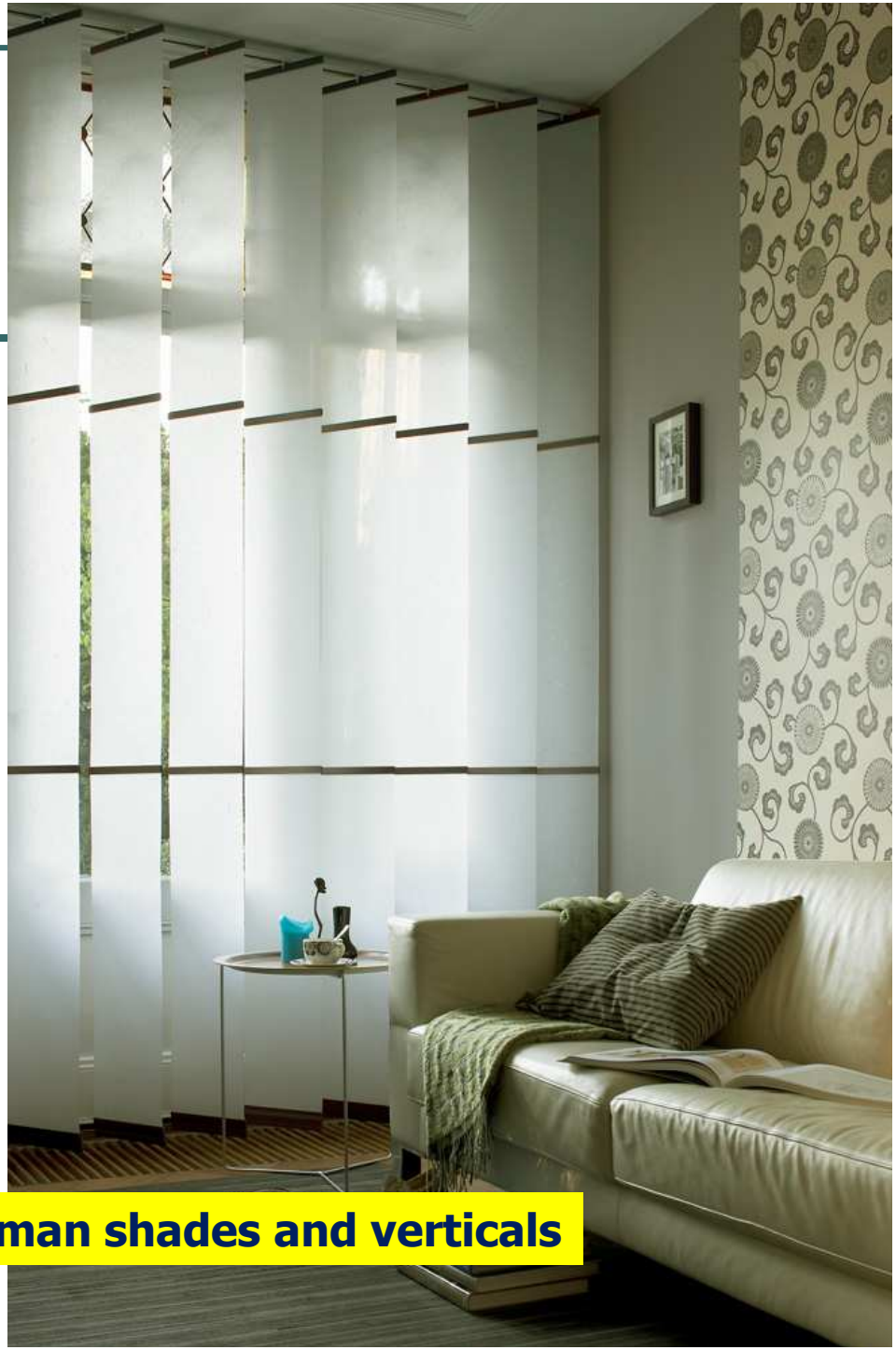

External venetians

External roller blinds twofold: vertical roller blinds and drop-arm roller blinds


Wooden venetians





Roman shades and verticals

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THANK YOU!