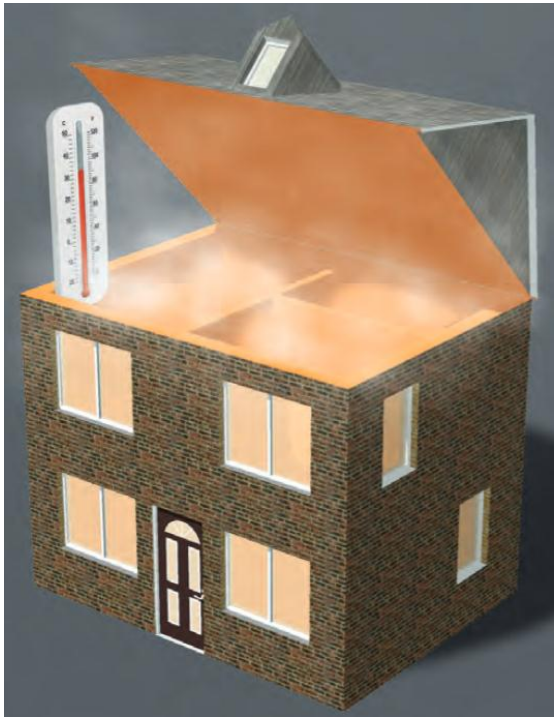
# Tackling overheating in homes

## Zero Carbon Hub review



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# Overheating in homes

HOUSING OVERHEATING

## HOME IS WHERE THE HEAT IS

As global temperatures rise, overheating is becoming an urgent problem for the residential sector. With no government-enforced sanctions on maximum temperatures and little incentive for developers, **Liza Young** finds out what can be done to keep cool

The consequences of climate change are not a problem for future generations – they are an immediate threat. Already, there is growing evidence of overheating in homes. According to the Committee on Climate Change (CCC), one fifth of domestic properties could be overheating, even during a cool summer. Flats, which make up 40% of new dwellings, are especially vulnerable.[1]

By the 2040s, half of all summers are expected to be as hot, if not hotter, than in 2003, when temperatures of up to 38°C led to more than 2,000 excess deaths in the UK. A recent CCC adaptation sub-committee report predicts that annual deaths caused by high UK temperatures will triple to 7,000 on average by the 2050s.[2]

Yet at the same time, we are designing and building for winter energy efficiency,

> We've forgotten how to design for natural ventilation in dwellings – we've lost the art
> **Michael Swainson**

*Article by Liza Young*
*CIBSE Journal August 2014*

# What is overheating?

- Not one definition fits all
- Comfort is subjective
- Depends on both environmental and human factors
- Duration/ timing of high temperatures is important
- Very high temperatures > 35°C lead to **Heat stress**
- No statutory maximum temp in UK building regulations

Image from ZCH *Overheating in homes - Where to Start - An introduction for planners, designers and property owners,* 2013

# Why do homes overheat?

- Increasing insulation and airtightness
- Warmer cities
- Internal heat gains
- Design of modern flats:
  - high density
  - low thermal mass
  - single sided
  - large glazing areas
  - lack of effective ventilation
  - lack of secure ventilation
  - pipework gains to corridors


Image from ZCH *Overheating in homes - Where to Start - An introduction for planners, designers and property owners,* 2013

# Impacts of overheating

Overheating can be defined with respect to:

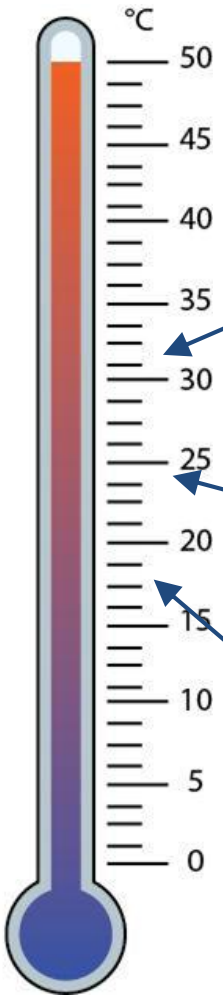
Thermal Comfort

Health

Productivity

Design of buildings is primarily focusing on thermal comfort

# 1 – Definitions and Thresholds




**Design for comfort, health and well being**

<u>Outdoor temperature thresholds for London</u>

Daytime maximum outdoor air temperature

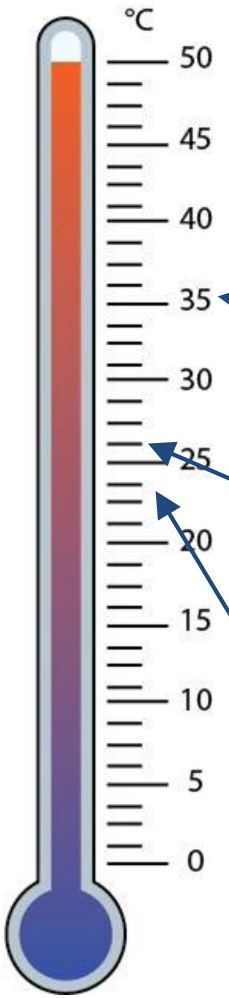
Heat-Health Warning Level 3 and 4 trigger (32°C)

Daily maximum outdoor air temperature

Excess heat-related mortality (24.7°C)

Night time maximum outdoor air temperature Heat-Health Warning Level 3 and 4 trigger (18°C)

# 2 – Definitions and Thresholds




**Design for comfort, health and well being**

<u>Indoor temperature thresholds</u>

Indoor air temperature (°C): Use of fans should be avoided (Heatwave Plan for England 2014 )(35°C)

Indoor operative temperature (°C): Overheating in bedrooms in free running dwellings (CIBSE Guide A)(26°C)

Summer indoor temperature (°C) as modelled in SAP Appendix P - High likelihood of high internal temperatures during hot weather (23.5°C)

# Design for overheating

Design methodology:

- Definition of overheating and pass/fail criteria

*Adaptive comfort model: Is it appropriate for use in the domestic sector?*

- Calculation algorithm

*SAP or dynamic simulation tools?*

- Description of a building and its occupancy

*Need a consistent way to describe the internal gains and occupancy patterns (small changes at input stage could mask the issue of overheating)*

- Description of external conditions – weather data

*SAP is currently using monthly averages. CIBSE Design Summer Years available for dynamic simulation.*