

**CIBSE National Conference**  
**Engineering Excellence**

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**To mechanically ventilate or not -  
is there a right answer for school  
ventilation?**

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## History:

- Traditionally schools have been naturally ventilated and passively cooled;
- Historically there have been very few problems associated with natural ventilation;
- Good educational standards have been achieved in naturally ventilated schools;
- In the past, problems such as overheating have tended to be minimal.



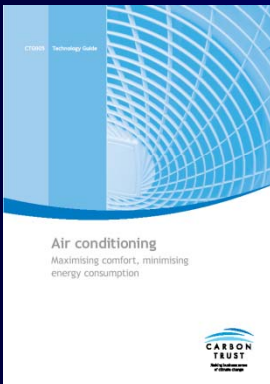
# What the Government Advisors Say



**The Commission for Architecture and the Built Environment (responsible for UK secondary school design):** “Many basic issues of energy performance have been overlooked including the potential to minimise mechanical ventilation by using passive ventilation”.

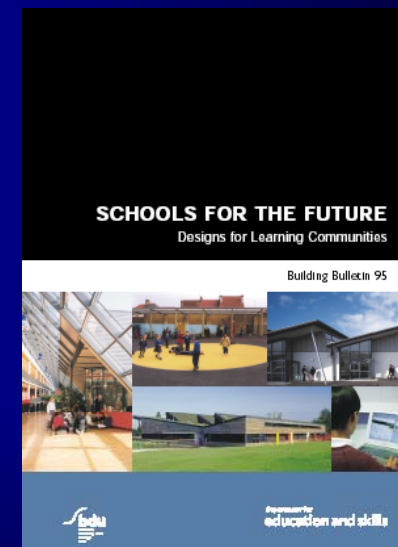
## BB95 Schools for the Future:

- Aim for Natural ventilation where possible;
- Avoid A/C which is not generally required in schools.



**The Carbon Trust:** “A typical air conditioned building has double the energy cost and associated CO<sub>2</sub> emissions of a naturally ventilated building. It is also more likely to have increased capital and maintenance costs”.

**The Department for Communities and Local Government** “More efficient systems and passive cooling are important options. Future Building Regulations should therefore consider a way of prioritising the reduction of energy demands through the elimination of active cooling.”.



## **Perceived Problems and Issues:**

- Poor Ventilation;**
- Excessive Winter Energy and Heat Loss;**
- Summer Overheating;**
- Poor Outdoor Air Quality;**
- Outdoor Noise;**
- Cost.**

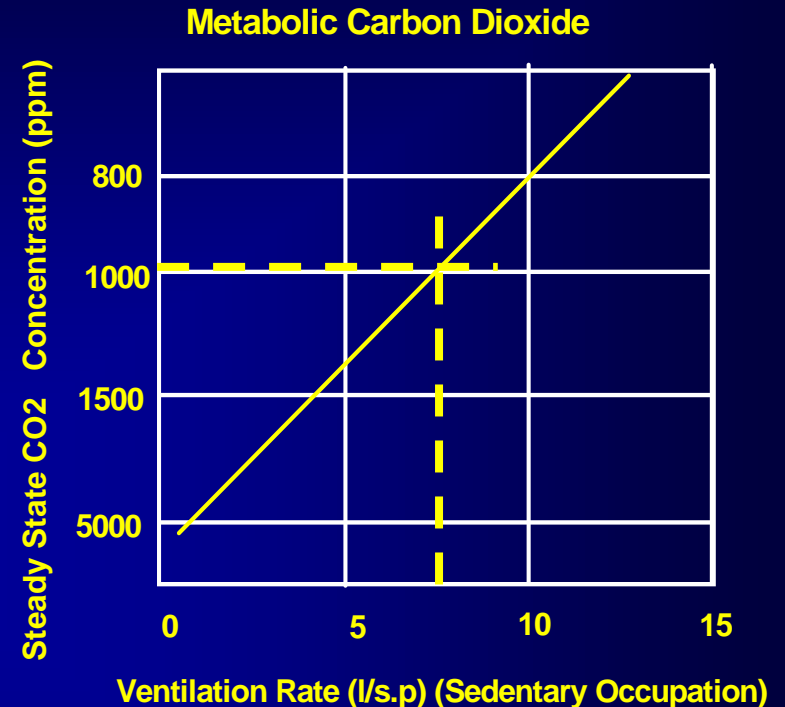
# Providing Good Ventilation

Section 21 of the School Premises Act 1999 states that:

- All occupied areas of a school building shall have a controllable ventilation at a minimum of 3 L/s for each of the maximum Number of persons the area will accommodate.
- Teaching accommodation ... shall also be capable of being ventilated at a minimum of 8 L/s ...

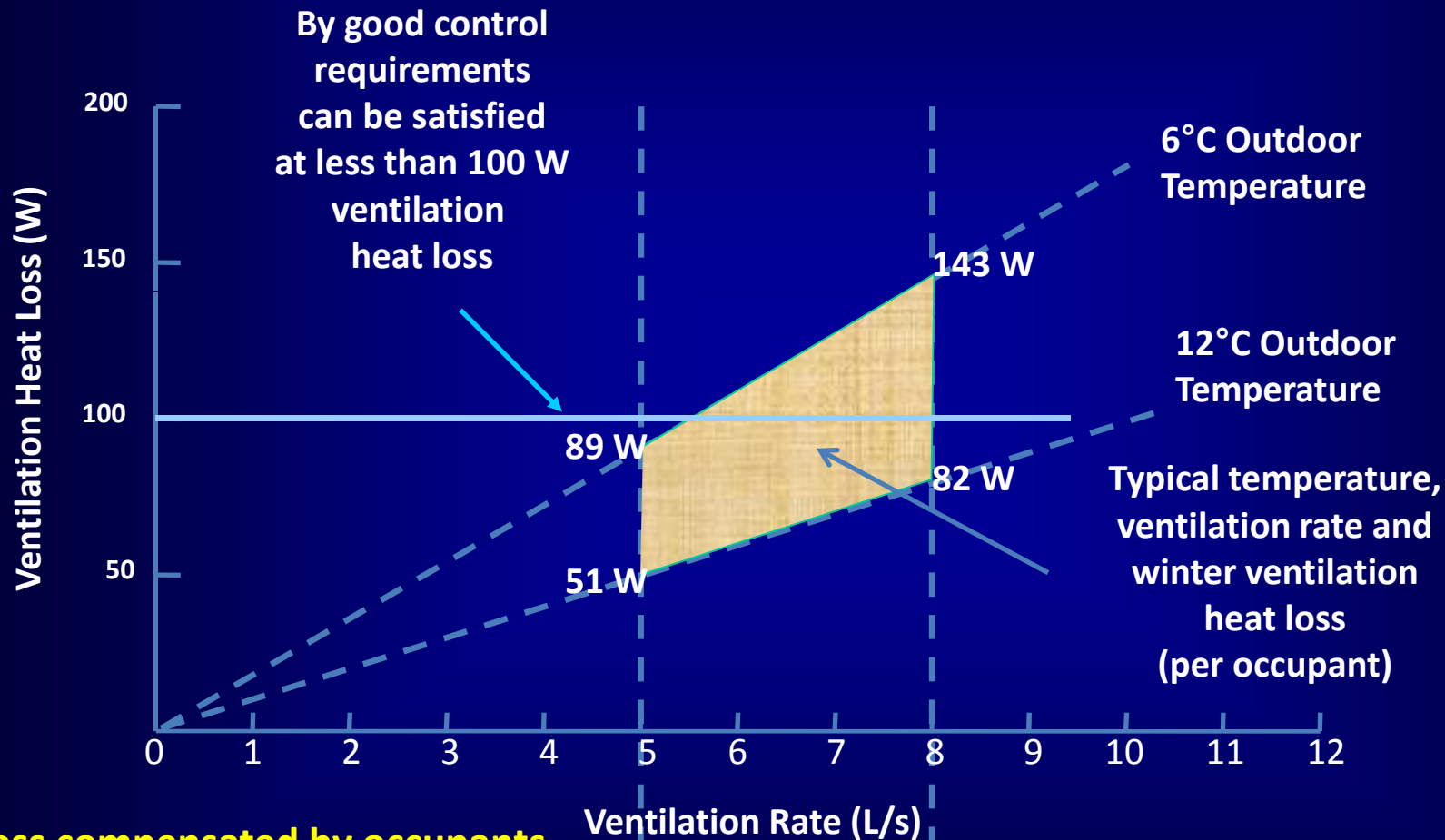
**WHEN SUCH AREAS ARE OCCUPIED!**

**Ventilation needs have traditionally and can continue to be met by natural means**



# Minimising Winter Heat (Energy) Loss

## Ventilation Heat Loss for Typical Winter Daytime Temperatures



Loss compensated by occupants and incidental gains – classrooms are “free – running”

5 L/s for 1500 ppm CO<sub>2</sub>      8 L/s for 1000 ppm CO<sub>2</sub>



## Avoiding Summer Overheating

- Risk of excessive high outdoor air temperature (especially in term time) is still quite low. Normally summer temperatures in popular overseas holiday resorts are far higher;
- High classroom temperatures occur through high internal heat gains and high solar gain;
- The huge growth in classroom computers and electronic teaching aids has not been thought through;
- High levels of insulation and airtightness trap summer heat gain.
- Passive summer cooling solutions should be considered separately to the winter heat loss conditions imposed on buildings by current Regulations..
- **Mechanical air conditioning is not an affordable solution.**

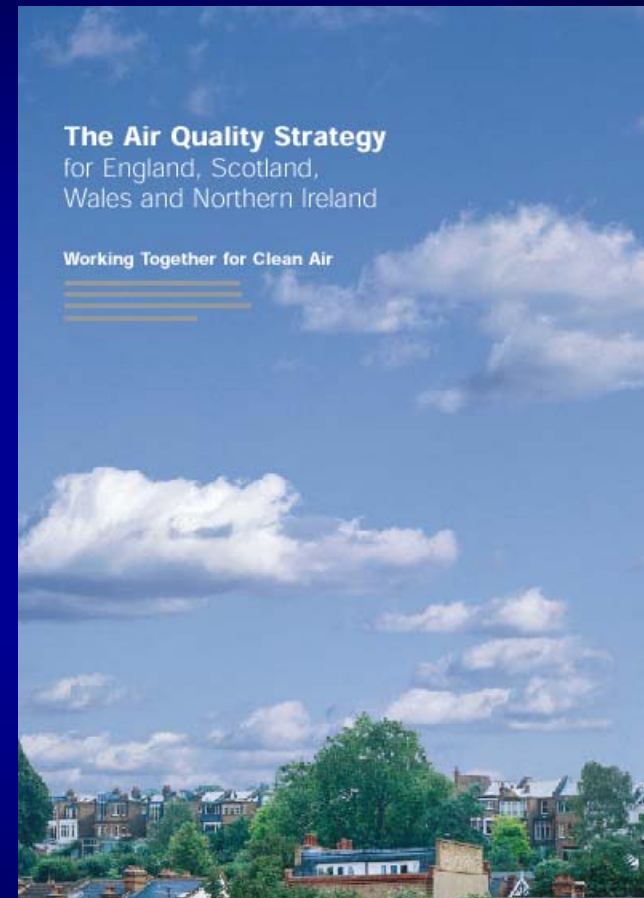


# Outdoor Air Quality

- UK air quality is vastly improved;
- Local Authorities are required to monitor outdoor air quality and identify air quality management areas where improvements must be made;

## In any event:

- Mechanical systems are unlikely to perform better than natural ventilation systems in relation to gaseous and fine particle pollutants.



## Controlling Outdoor Noise

- Outdoor noise is a pollutant and should be treated as such;
- Sources should be identified and reduced or eliminated, e.g:
  - School speed limits or traffic bans
  - Noise traffic enforcement cameras
  - Noise restrictions on outdoor machinery



**Noise should not be treated as an immovable boundary condition.**

**Mechanical solutions create their own noise especially when there is no resource for school maintenance.**

**Natural ventilation is noiseless.**

## Mechanical Systems – The Hidden Cost

- As identified by the Carbon Trust, mechanical systems and air conditioning require expensive, ongoing maintenance to ensure safety and correct performance.
- Schools cannot afford the cost of this commitment.



# Summary

