2.3.6 Thermal comfort 2

Key terms

Term	Definition
Thermal comfort	The combinations of thermal, environmental and personal factors that will produce the thermal environmental conditions acceptable to most of the occupants.
Building Management System (BMS)	Computer-based systems used to monitor overall power distribution and energy consumption and control the full range of building services.

Controlling thermal comfort

Controlling thermal comfort will involve replacing hot air with cold air, or cold air with hot air, as required; humidifying, or dehumidifying air; increasing air movement by ventilation or air conditioning; and reducing draught discomfort by directing ventilation so that it does not blow directly onto occupants.

Thermal control is likely to require a combination of space heating, air movement and air conditioning.

Space heating – systems such as hot air-based heating systems; water-based central heating systems using radiators; combined heat and ventilation systems using air conditioning systems; electrical heaters and under-floor heating systems using either electrical coils or heated fluids.

Air movement – generally, this involves the use of fans that can provide air movement over a wide area and are useful for removing heated air and drawing in cooler air from the outside.

Air conditioning – systems ranging from small units that lower air temperature but do not control humidity levels or air movement, to large units that can manage temperatures as well as humidity and air movement.

System controls

Heating and cooling systems are controlled using input sensors. These transmit information to a microprocessor unit that compares actual conditions with the required (pre-programmed) conditions and activates output devices, such as heaters, as required. These control systems range from simple thermostat, clock and control units found in domestic heating systems to sophisticated Building Management Systems (BMS), used to control the full range of building services, including the following:

- Lighting
- Heating, ventilation, and air conditioning (HVAC)
- Fire, smoke detection and alarms
- Motion detectors, CCTV, security, and access control
- ICT systems
- Lifts
- Industrial processes or equipment
- Shading devices
- Smart meters.

Historically, BMS has been associated with large commercial buildings. However, as equipment has become easier to control, monitoring and detection has become less expensive, and wireless technology has become available, buildings of all sizes are having increasingly complex control systems installed. This can allow homeowners, for example, to connect to their home and switch on devices such as lights and heating before they arrive.

BMS may be integrated with Building Information Models (BIM) to allow performance in use to be compared with design criteria and design simulations. This can help identify potential problems in operation or design and can help to check the accuracy of modelling techniques.

Moisture and condensation

The risks associated with moisture in a building include:

- damp patches and mould growth
- damage to surface finishes
- corrosion and decay of the building fabric
- frost damage
- poor performance of insulation.

Lack of moisture control may lead to adverse health effects, and damage to the building, its mechanical systems, and its contents.

Common forms of moisture include:

- surface condensation – which occurs when hot or warm air collides with a cold surface
- interstitial condensation – which occurs when moist air penetrates through elements of the building fabric such as an enclosed wall, roof, or floor cavity
- penetrating damp – which occurs when water penetrates an external wall into a building.

Methods that can be used to manage moisture include:

- increasing temperatures (air and surface) to reduce surface condensation
- dehumidifying to reduce water vapour
- natural ventilation
- vapour barriers to limit interstitial condensation.

Methods that can be used to prevent penetrating damp include:

- general maintenance, such as the repair of faulty guttering, defective roofing, or cracks in external walls
- maintenance and repair
- external treatments such as over-cladding, sealants, and tanking (using a membrane or cement-based coating)
- tanking must be applied to all new build structures below ground, and can also be applied to existing buildings, to prevent water from penetrating into basements and cellars.