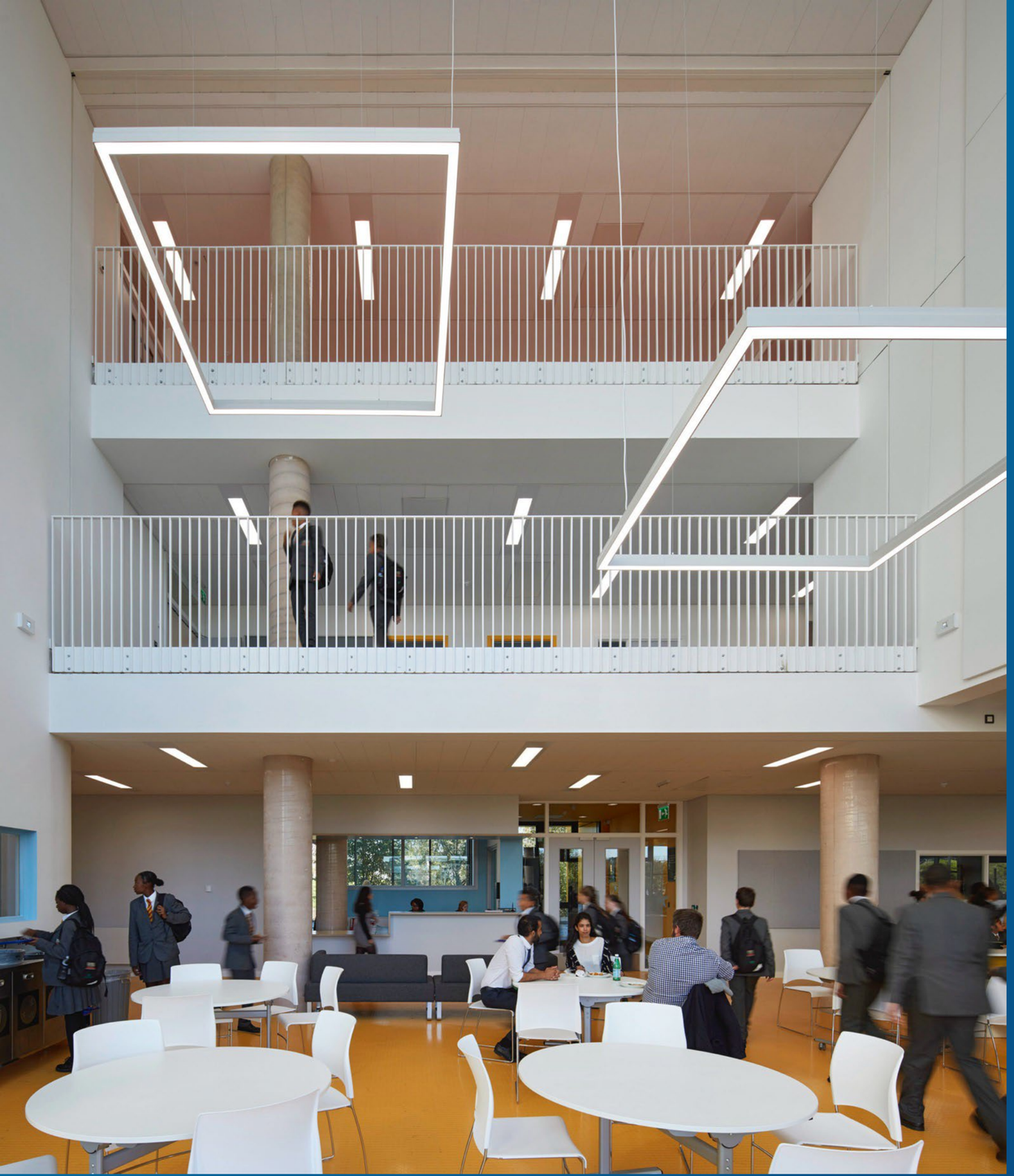


Monodraught

The Apex of Ventilation

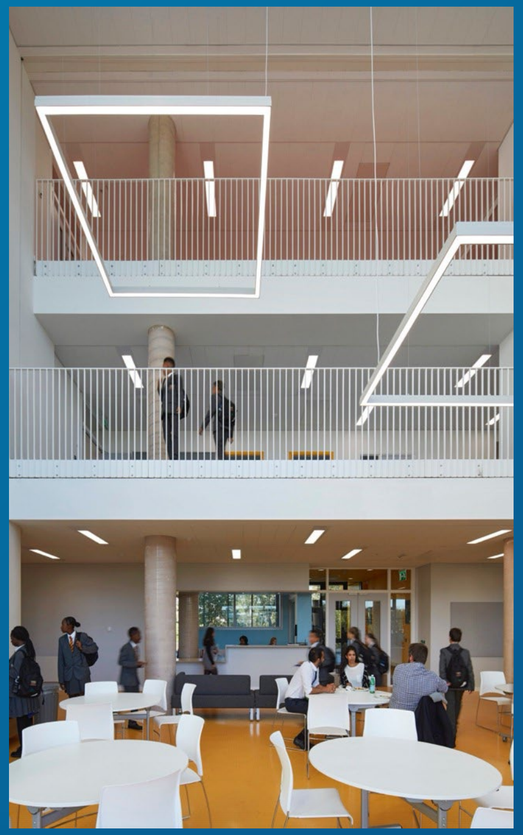
July 2024

Nick Hopper
Technical Director

Monodraught

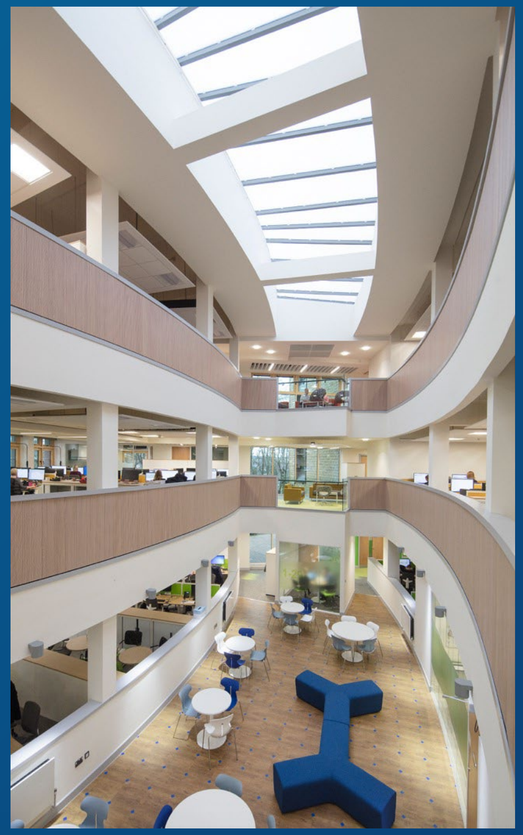
We are
Pioneering British Greentech

Innovation is a crucial part of the company DNA



Over 50 years of experience

1000’s of projects UK and global



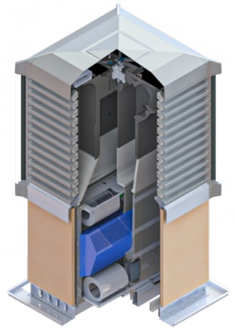
Designed and manufactured in the UK

Education dominant

Product Range

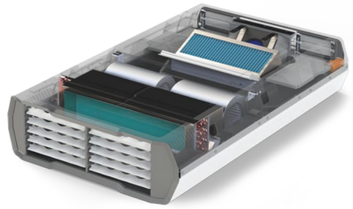
Range Zero

Monodraught



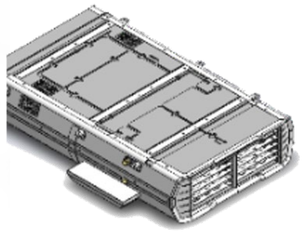
Natural Ventilation HR

Windcatcher Zero



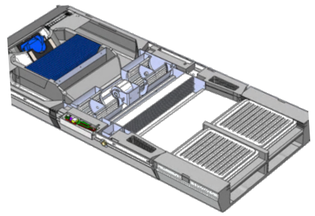
Hybrid Ventilation HR

HVR Zero



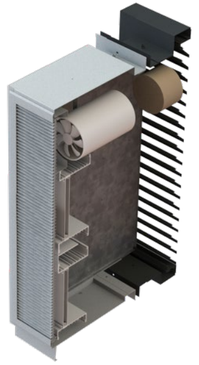
Hybrid Cooling HR

HVR Zero XC+



Natural Cooling HR

Cool-phase Zero



Natural Ventilation

ResiVent Zero

Domestic

HomeZero

Natural Daylight

Sunpipe

Acuity Control

Centralised IoT

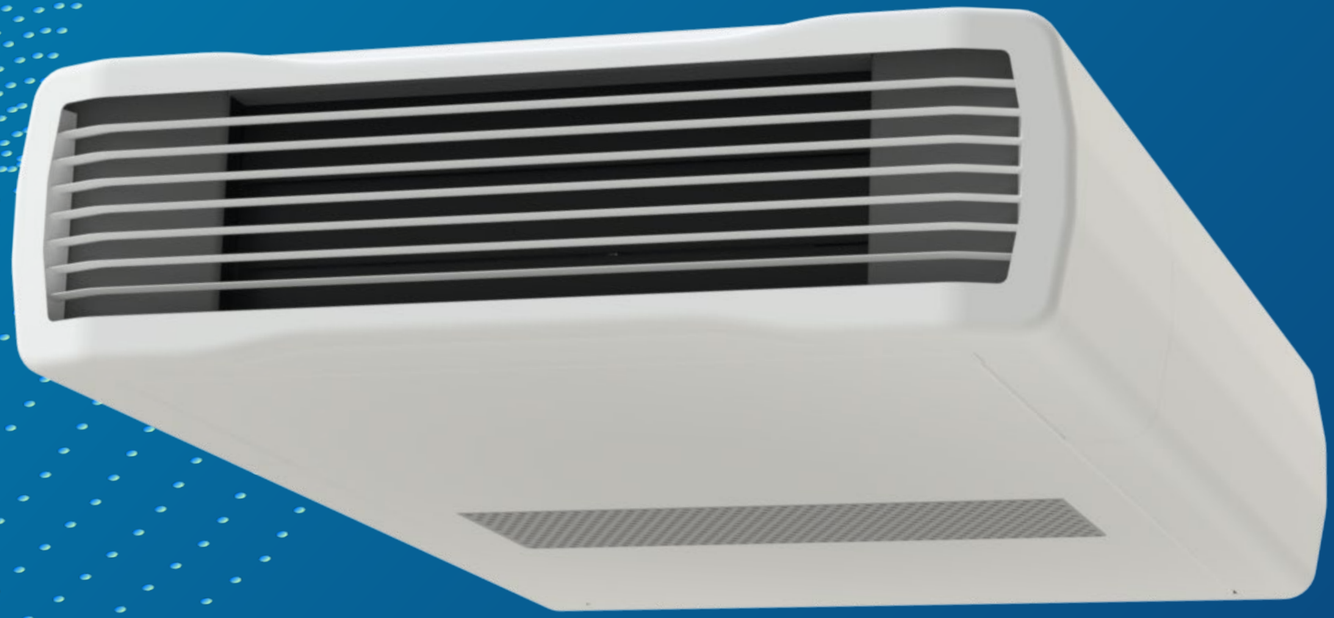
Monodraught

TECHNOLOGY:
VENTILATION AND ENERGY

A very exciting industry!

Monodraught

HVR ZERO APX



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THE VENTILATION CONUNDRUM:

Provide ventilation and year-round comfort using the least amount of power and heating energy as possible.

ROOM TEMPERATURE

ACOUSTICS

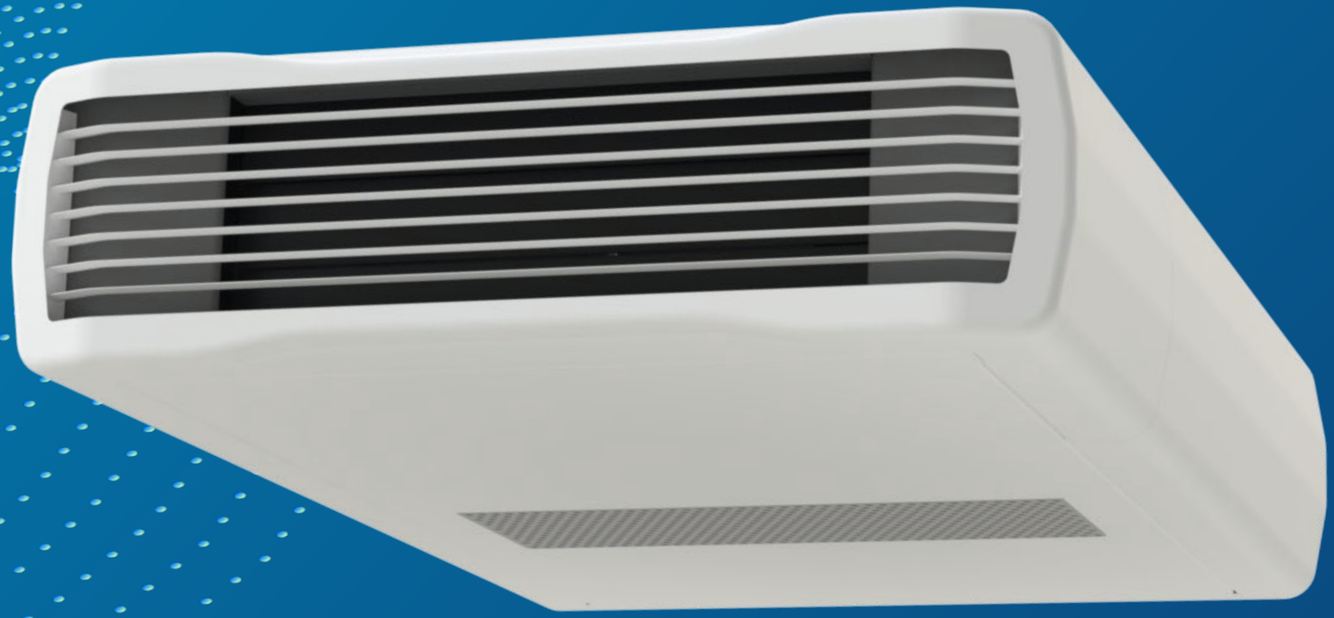
AIR QUALITY

EMBODIED CARBON

ENERGY USE

Monodraught

HVR ZERO APX



Heat Recovery

Air Tightness

Sensor Driven

Cooling

AT THE FOREFRONT OF IAQ INNOVATION

HTM 2013
Hybrid ventilation

- CO2 and temperature sensors

Openable tilt and turn windows

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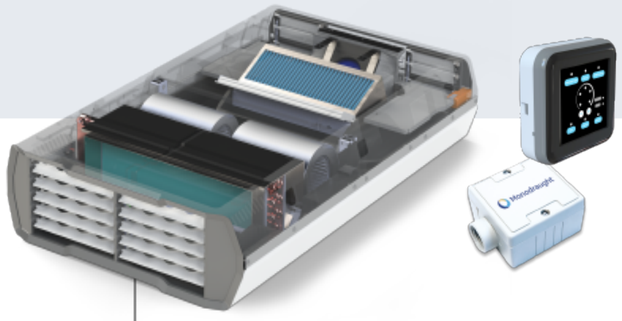
AT THE FOREFRONT OF IAQ INNOVATION

HTM 2013
Hybrid ventilation

- CO2 and temperature sensors

Openable tilt and turn windows



HVR Zero 2020
Hybrid ventilation with heat recovery

- IoT monitoring CO2 and temperature sensors
- Low energy consumption
- Carbon neutral

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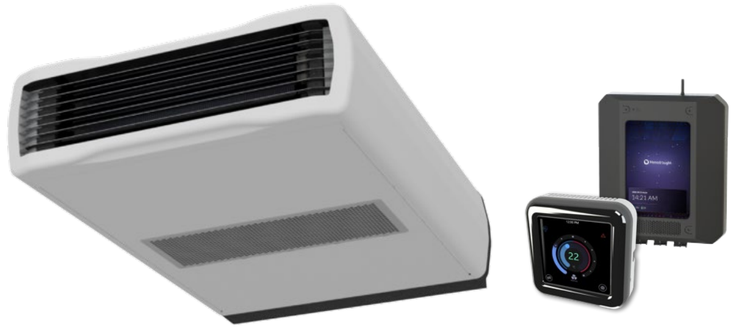
AT THE FOREFRONT OF IAQ INNOVATION

HTM 2013
Hybrid ventilation

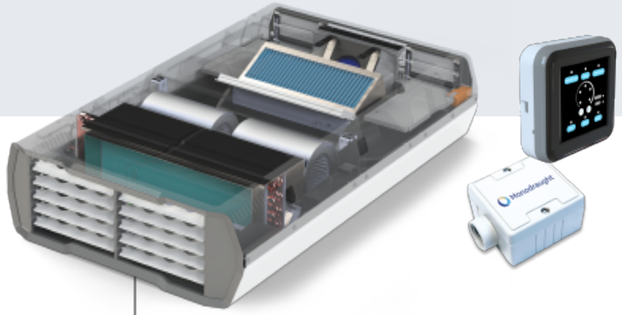
- CO2 and temperature sensors



HVR Zero APX
Hybrid ventilation with heat recovery 2nd gen

- CO2, temperature, PM 2.5, VOC and airflow sensors
- Low energy consumption
- Heat pump ready
- Remote monitoring

Openable tilt and turn windows



HVR Zero 2020
Hybrid ventilation with heat recovery

- IoT monitoring CO2 and temperature sensors
- Low energy consumption
- Carbon neutral

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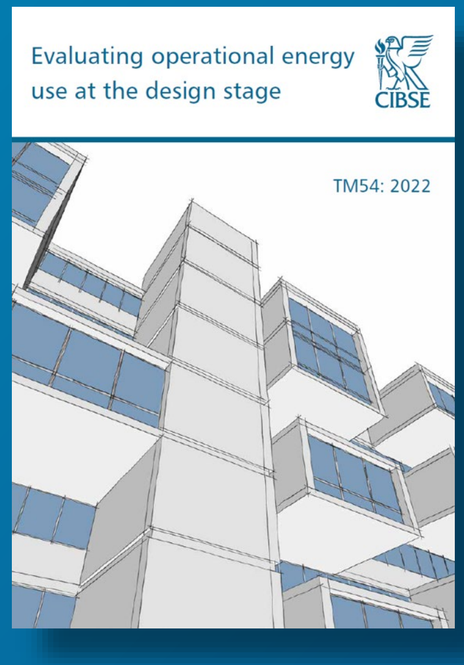
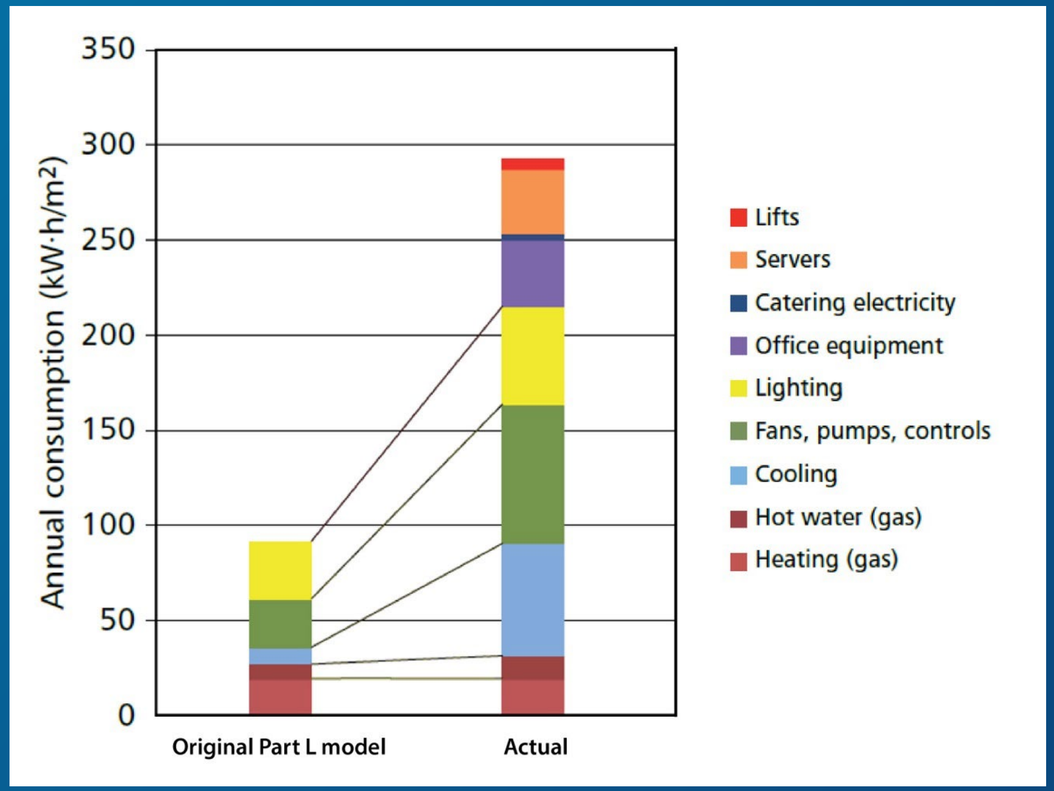
TM54

Evaluating Operation Energy

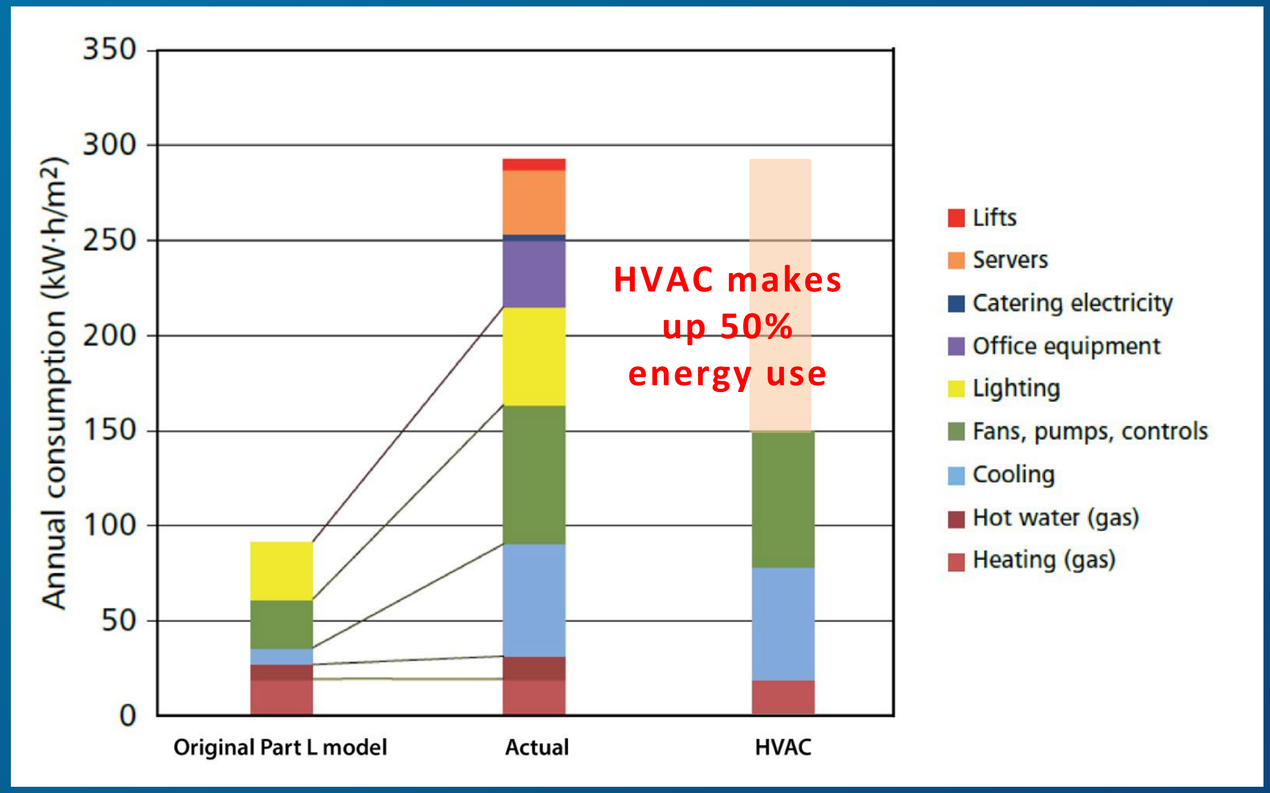




TM54 – Figure 4.3 Comparison of Building Regulations Approved Document L2A (HM Government, 2010) calculations and monitored energy use after five years of operation, for an example office building.

TM54

Building Regulations and Calculations



TM54 – Figure 4.3 Comparison of Building Regulations Approved Document L2A (HM Government, 2010) calculations and monitored energy use after five years of operation, for an example office building.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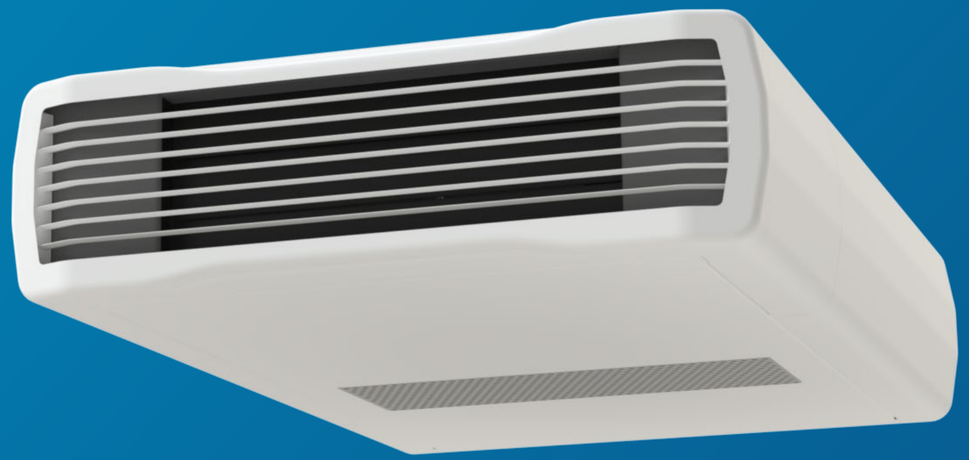
The buildings sector, which includes energy used for constructing, heating, cooling and lighting homes and businesses, as well as the appliances and equipment installed in them, accounts for over one third of global energy consumption and emissions.
Source – International Energy Agency, Jul 2023

Monodraught



Heat Recovery

50.1% heat recovery
Zero energy balance

ELECTRICITY COST

Monodraught

Electricity is **4 times** the cost of Gas

Electricity and gas unit prices and standing charges, 1 July to 30 September 2024

	Energy price cap per unit and standing charge 1 April to 30 June 2024	Energy price cap per unit and standing charge 1 July to 30 September 2024
Electricity	24.50 pence per kWh 60.10 pence daily standing charge	22.36 pence per kWh 60.12 pence daily standing charge
Gas	6.04 pence per kWh 31.43 pence daily standing charge	5.48 pence per kWh 31.41 pence daily standing charge

Source ofgem

Heat Pumps

Monodraught

Heat pump technology can provide **3 times** the heat compared to input energy

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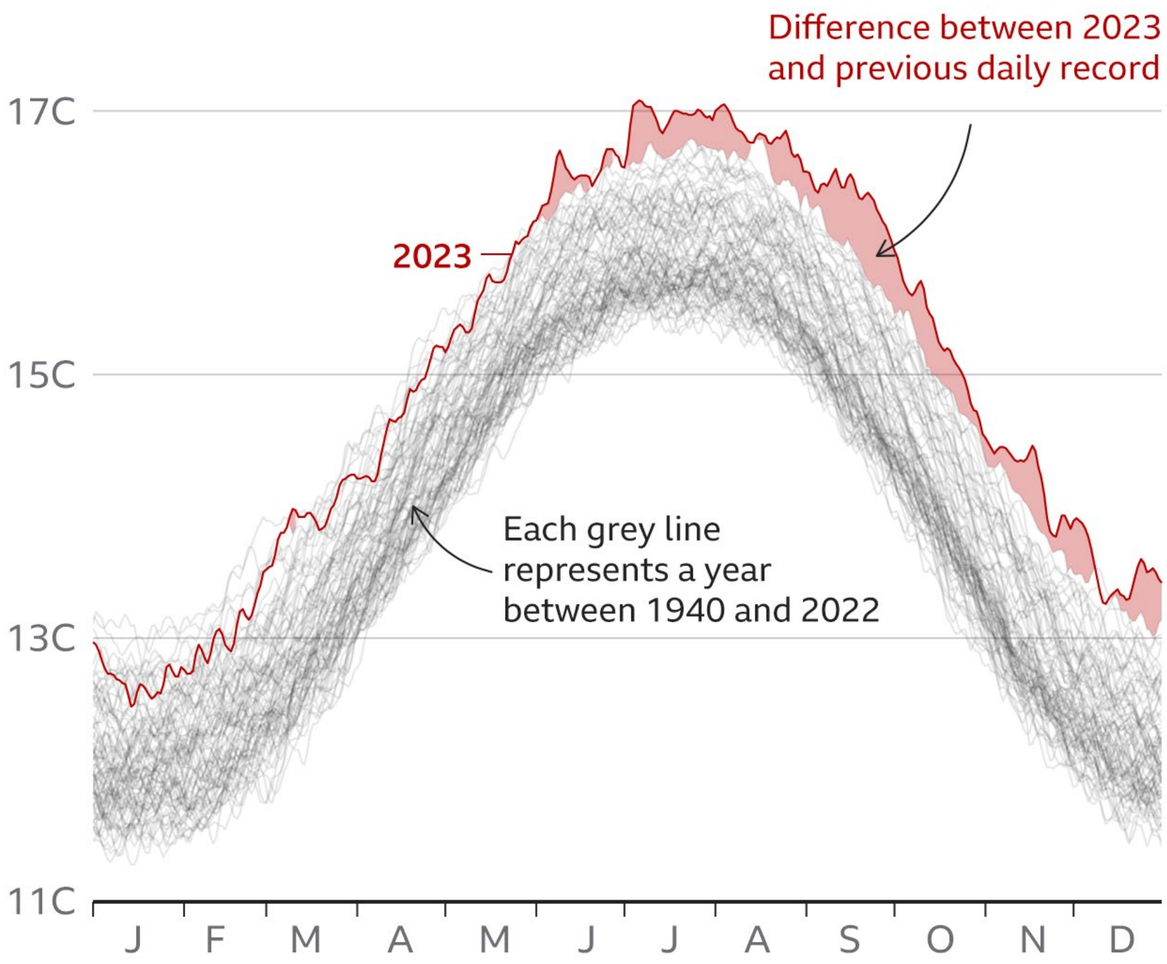
Global temperatures at record levels in 2023

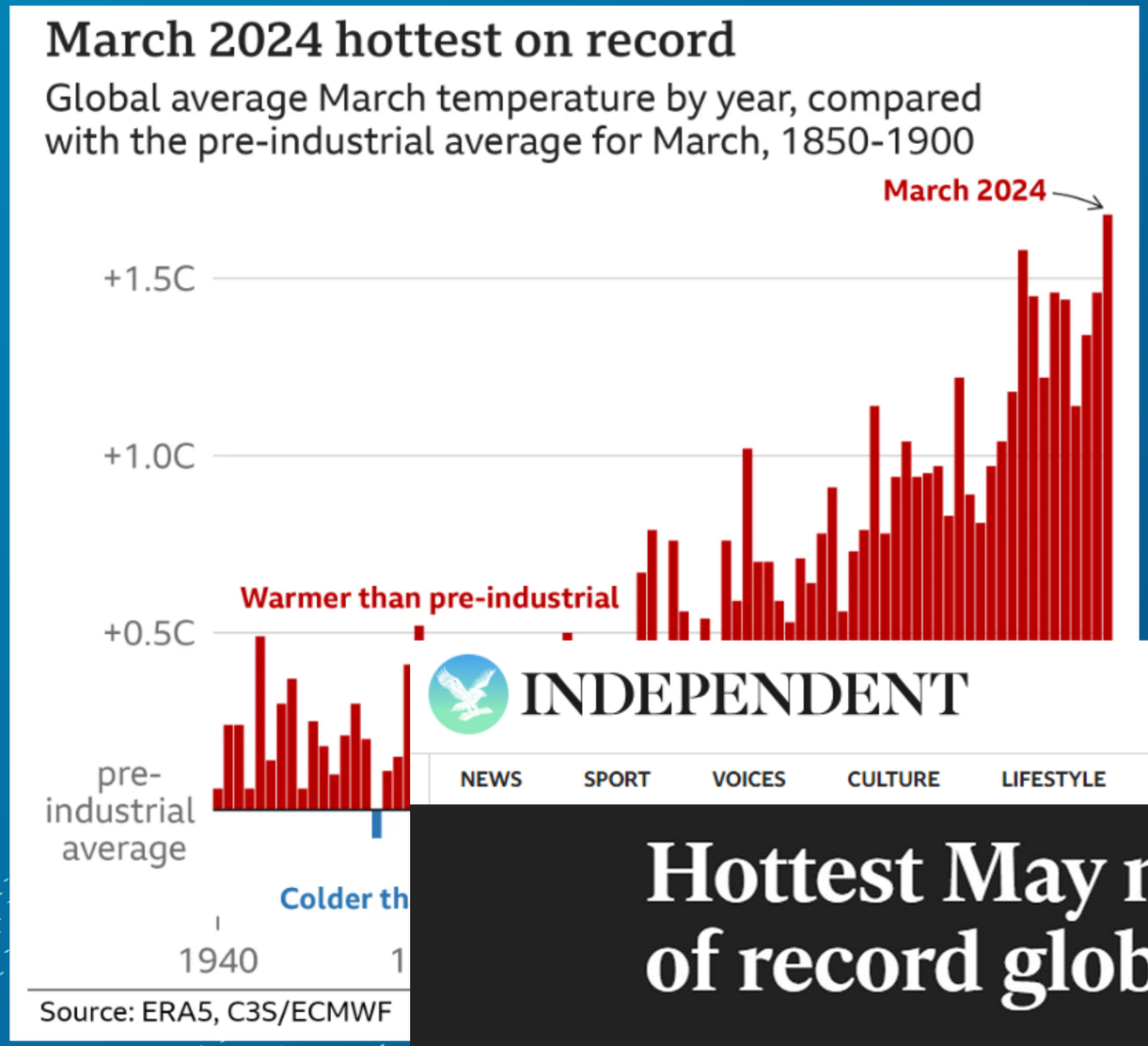
Daily global average air temperature, 1940-2023



Source: ERA5, C3S/ECMWF

BBC

Monodraught



INDEPENDENT

General election › IndyBest ›

NEWS SPORT VOICES CULTURE LIFESTYLE TRAVEL PREMIUM MORE INI

Hottest May makes 12 straight months of record global temperatures

It comes as UN secretary-general Antonio Guterres calls for urgent action to avert 'climate hell'

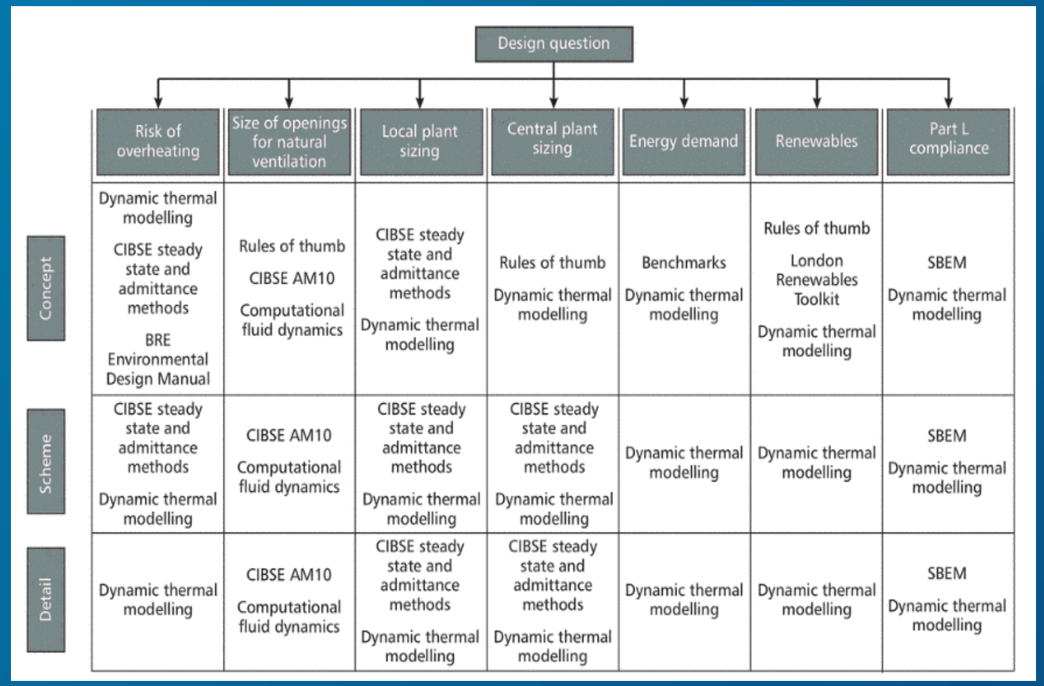
Stuti Mishra Asia Climate Correspondent • Wednesday 05 June 2024 19:20 BST

• 4 Comments

WINTER-TIME DESIGN

Monodraught

INDUSTRY RULE OF THUMB – Heat loss calculations based on a worst-case scenarios of -5.



Design question	Risk of overheating	Size of openings for natural ventilation	Local plant sizing	Central plant sizing	Energy demand	Renewables	Part L compliance
Concept	Dynamic thermal modelling CIBSE steady state and admittance methods BRE Environmental Design Manual	Rules of thumb CIBSE AM10 Computational fluid dynamics	CIBSE steady state and admittance methods Dynamic thermal modelling	Rules of thumb Dynamic thermal modelling	Benchmarks Dynamic thermal modelling	Rules of thumb London Renewables Toolkit Dynamic thermal modelling	SBEM Dynamic thermal modelling
Scheme	CIBSE steady state and admittance methods Dynamic thermal modelling	CIBSE AM10 Computational fluid dynamics	CIBSE steady state and admittance methods Dynamic thermal modelling	CIBSE steady state and admittance methods Dynamic thermal modelling	Dynamic thermal modelling	Dynamic thermal modelling	SBEM Dynamic thermal modelling
Detail	Dynamic thermal modelling	CIBSE AM10 Computational fluid dynamics	CIBSE steady state and admittance methods Dynamic thermal modelling	CIBSE steady state and admittance methods Dynamic thermal modelling	Dynamic thermal modelling	Dynamic thermal modelling	SBEM Dynamic thermal modelling

CIBSE Guide A – Examples of design tools

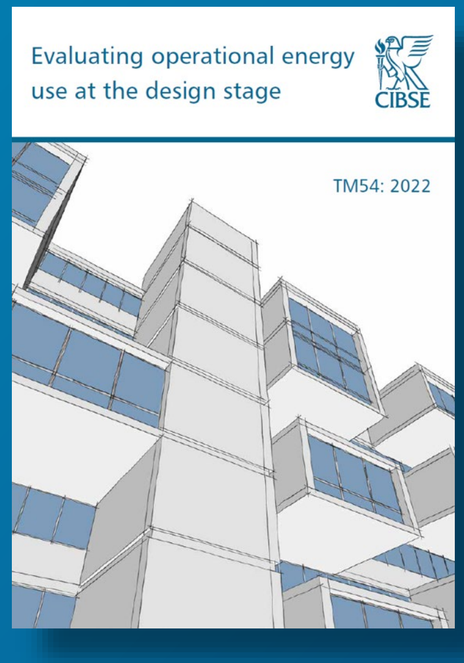
Table 2.5 Low temperatures: dry bulb (DB) temperature (°C) equalled or exceeded for given percentages of hours in the year (1982–2011*), together with average coincident wet bulb (WB) temperature (°C) for the 14 UK sites

Location	Temperature (°C) equal to or exceeded for stated percentage of year							
	99.6%		99%		98%		95%	
	DB	WB	DB	WB	DB	WB	DB	WB
Belfast	–3.2	–3.4	–1.5	–1.9	–0.3	–0.7	1.2	0.6
Birmingham	–5.1	–5.2	–3.2	–3.4	–1.8	–2.4	0.3	–0.2
Cardiff	–3.1	–3.8	–1.5	–2.2	–0.3	–1.0	1.5	0.7
Edinburgh	–5.4	–5.6	–3.2	–2.2	–1.7	–3.5	0.3	–0.3
Glasgow	–5.6	–5.8	–3.5	–3.8	–1.9	–2.4	0.2	–0.4
Leeds	–3.3	–3.6	–1.9	–2.3	–0.8	–1.4	1.0	0.4
London	–3.0	–3.6	–1.7	–2.3	–0.5	–1.2	1.5	0.7
Manchester	–4.5	–4.8	–2.7	–3.1	–1.3	–1.9	0.7	0.0
Newcastle	–3.7	–4.1	–2.0	–2.4	–0.8	–1.5	0.9	0.3

CIBSE Guide A – Low temperature data

TM54

Building Regulations and Calculations



4.3 Basis for the methodology

- the use of modelling of the appropriate level of detail to reliably estimate energy use for heating, cooling, fans and pumps, using more realistic profiles and inputs .

WEATHER DATA

CIBSE TRY Weather File 7days 0900-1600		
Location	Hours below 0°C	Hours below -1°C
London	7	0
Birmingham	45	20
Manchester	33	19
Newcastle	28	15

CIBSE TRY Future Weather File 2020H50 7days 0900-1600		
Location	Hours below 0°C	Hours below -1°C
London	0	0
Birmingham	26	12
Manchester	21	13
Newcastle	19	8

CIBSE TRY Future Weather File 2050H50 7days 0900-1600		
Location	Hours below 0°C	Hours below -1°C
London	0	0
Birmingham	12	4
Manchester	12	5
Newcastle	8	1

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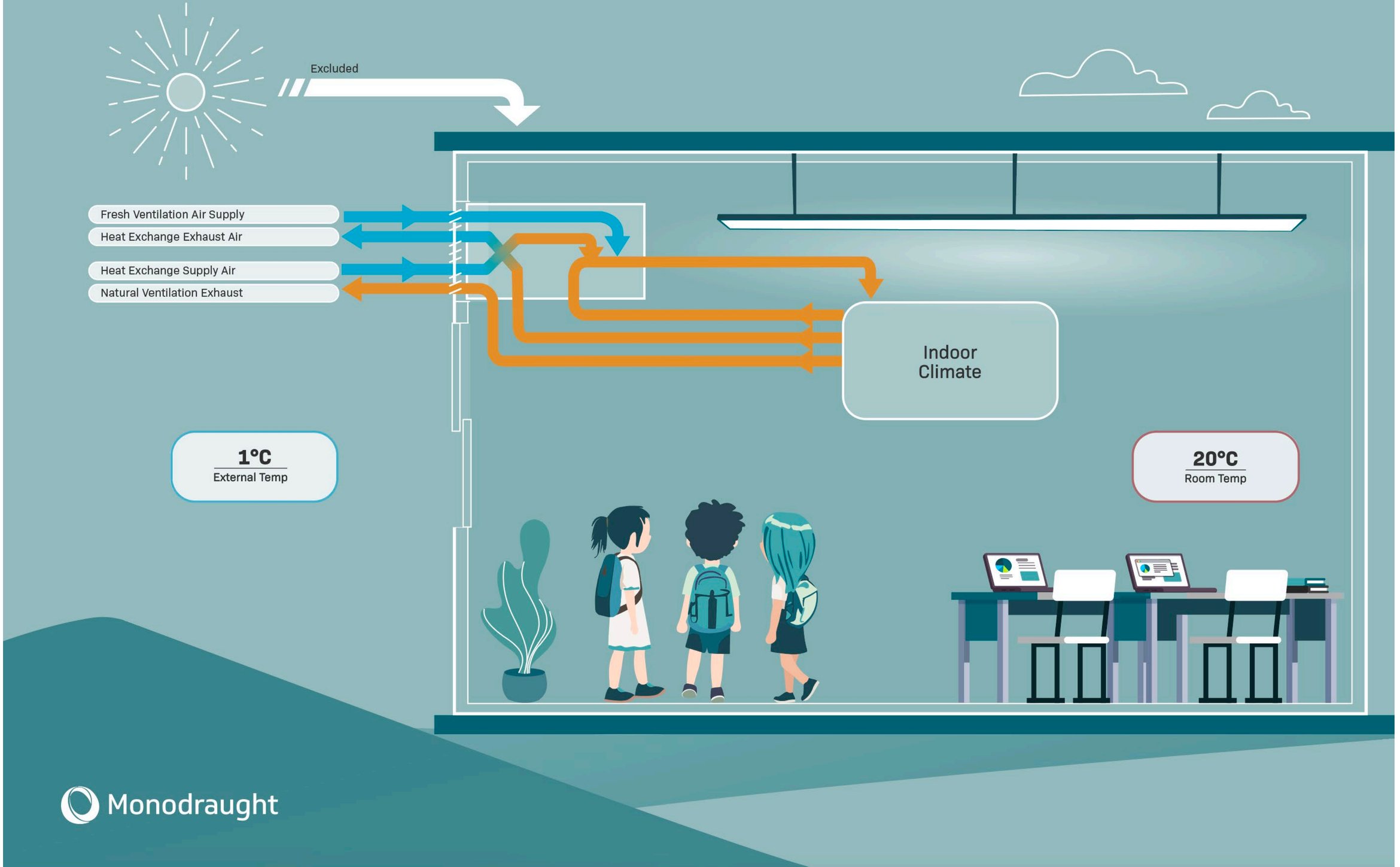
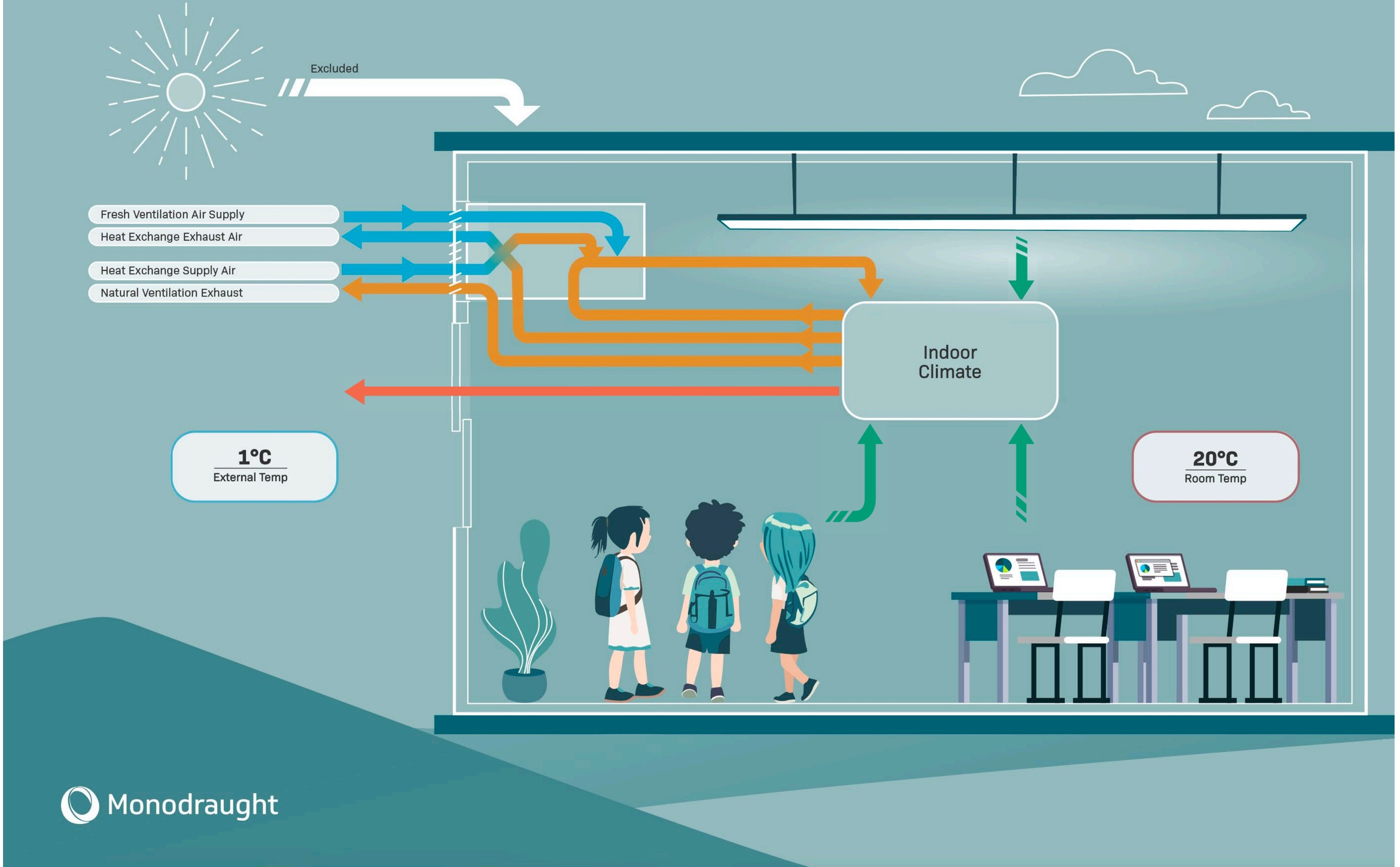
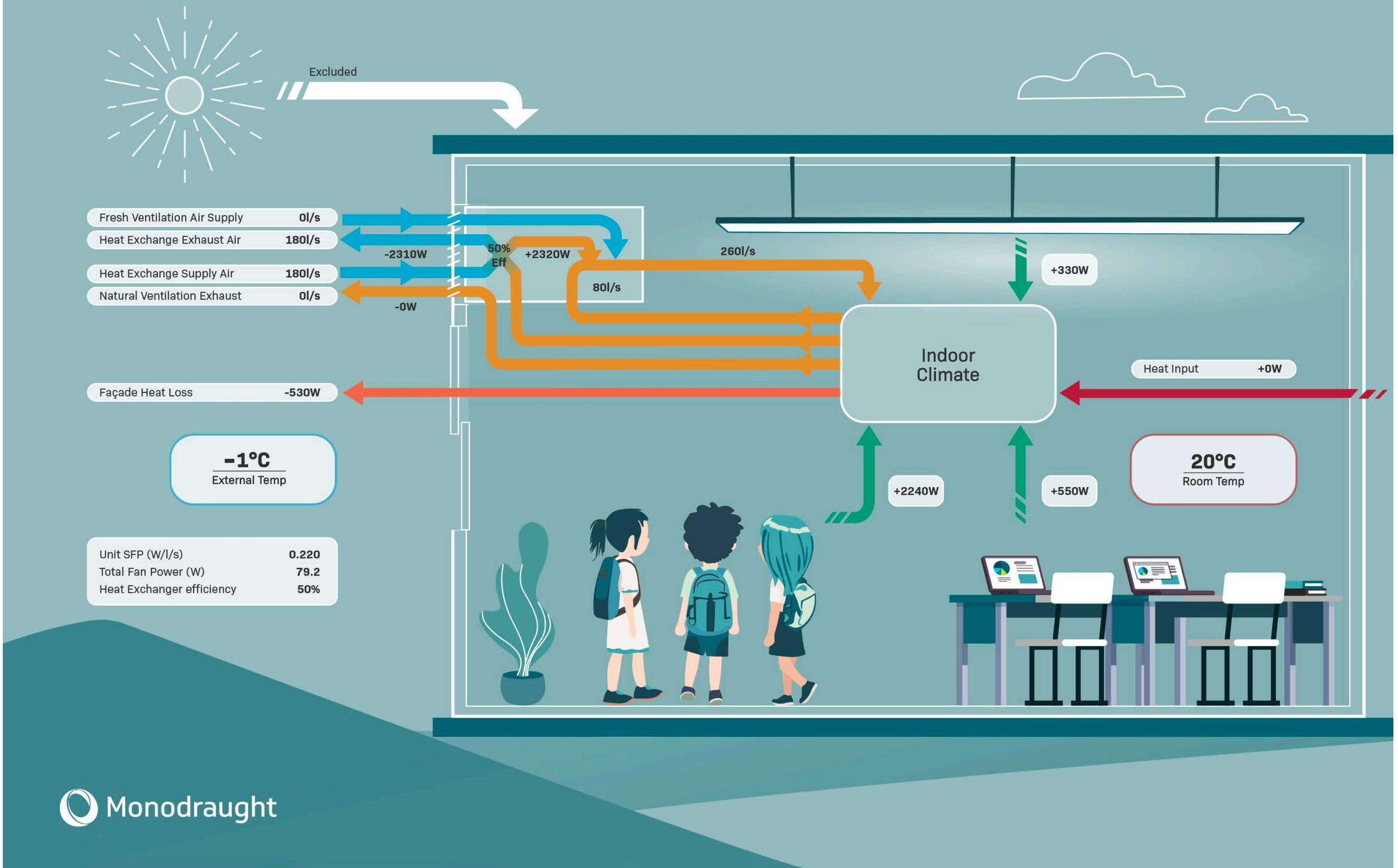
WINTER-TIME DESIGN – Coolest weather file used to assess winter-time design conditions.

TEST REFERENCE YEAR (TRY) – Coolest weather file used to assess winter-time design conditions between 9am and 6pm.


Monodraught


Excluded
Fresh Ventilation Air Supply
Heat Exchange Exhaust Air
Heat Exchange Supply Air
Natural Ventilation Exhaust
Indoor Climate
1°C
External Temp
20°C
Room Temp
Monodraught


Excluded
Fresh Ventilation Air Supply
Heat Exchange Exhaust Air
Heat Exchange Supply Air
Natural Ventilation Exhaust
Indoor Climate
1°C
External Temp
20°C
Room Temp
Monodraught


Excluded
Fresh Ventilation Air Supply 0l/s
Heat Exchange Exhaust Air 180l/s
Heat Exchange Supply Air 180l/s
Natural Ventilation Exhaust 0l/s
-2310W
-0W
50% Eff
+2320W
80l/s
260l/s
+330W
Indoor Climate
Heat Input +0W
Façade Heat Loss -530W
-1°C
External Temp
+2240W
+550W
20°C
Room Temp
Unit SFP (W/l/s) 0.220
Total Fan Power (W) 79.2
Heat Exchanger efficiency 50%
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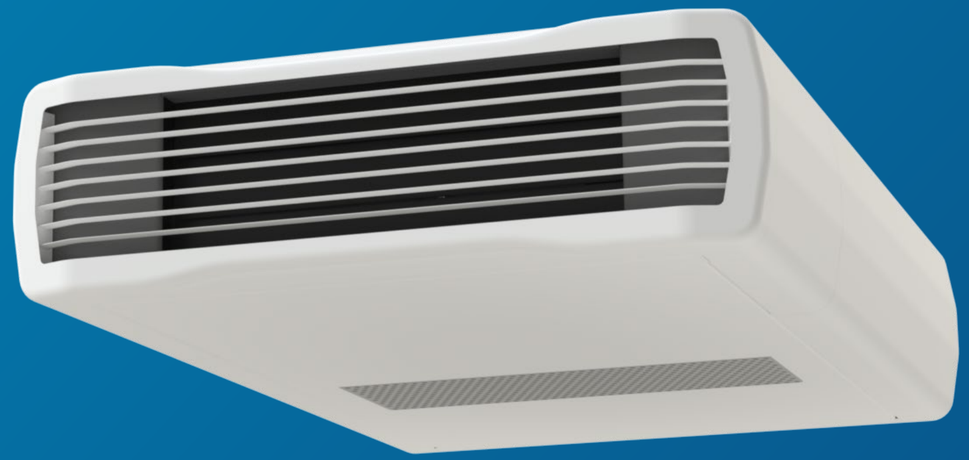
Monodraught



Air Tightness

Passivhaus levels of
Air Tightness
CIBSE TM23 compliant

CIBSE TM23 : 2022

Air Leakage Testing standards

Monodraught

TM23 : 2022

Table 1 TM23 preparation of building openings for regulatory purposes

Method of air leakage testing BS EN ISO 9972:2015, Method 3 and CIBSE TM23:2022	
Purpose of air leakage testing Regulation 43 of the Building Regulations for England and Wales	
Building completion status Building services systems installed; envelope penetrations and permanent sealing complete No temporary sealing measures, except where allowed to the building openings as described below	
Building openings	**Status**
Windows, doors, trapdoors, in envelope	Closed, not sealed
Ventilation openings for natural ventilation, e.g. trickle vents[1]	Closed, or temporarily sealed where no operable closing mechanism exists[2]
Openings for whole building mechanical ventilation or air conditioning	Closed, or temporarily sealed where no operable closing mechanism exists[2]
Openings for mechanical ventilation or air conditioning (intermittent use only)	Closed, or temporarily sealed where no operable closing mechanism exists[2]
Openings not intended for ventilation, e.g. letter box, cat flap, key holes	Closed, not sealed

[1] For consistency of approach with other sources of air leakage, as trickle vents do have a closing mechanism, when testing for regulatory purposes according to this TM trickle vents should be closed, but not sealed.

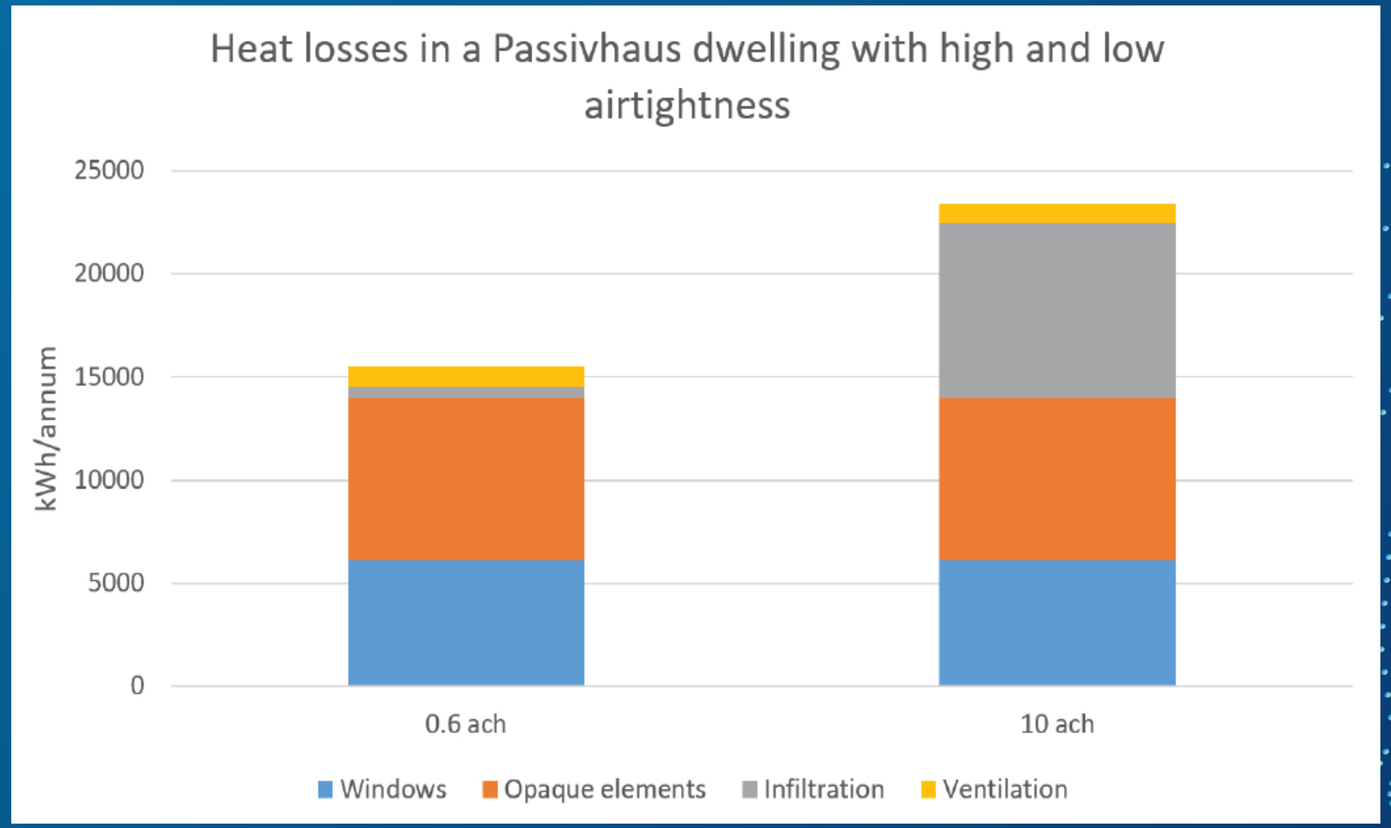
[2] Where no closing mechanism exists and temporary sealing is used, it should only seal the opening part of the component, not the junction between the component and the wall, window, or other adjacent elements.

Any building designed after January 2022

WHY?

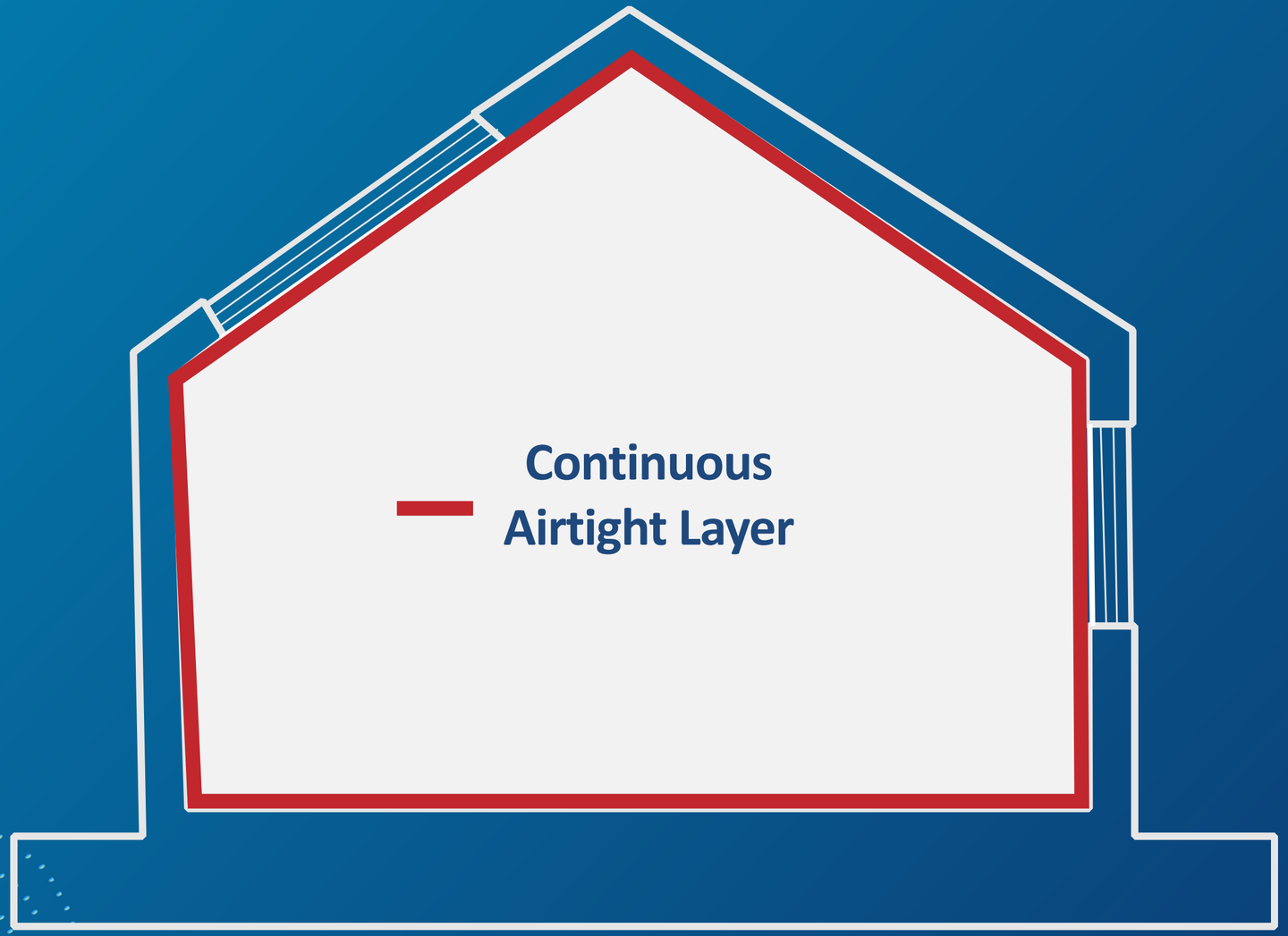
Passivhaus and air tightness

- Uncontrolled Ventilation
- Reducing energy consumption
- Heat recovery used for ventilation
- High thermal performance
- Infiltration requires greater heating and cooling to be applied



Good Practice Guide : Passivhaus Trust

Monodraught



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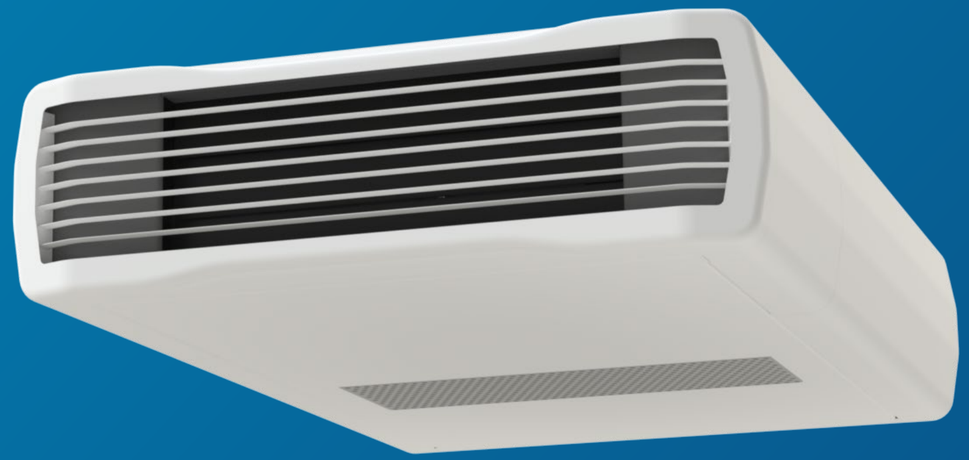
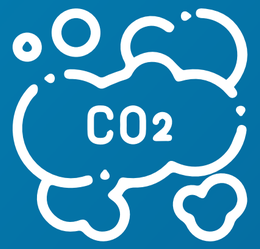
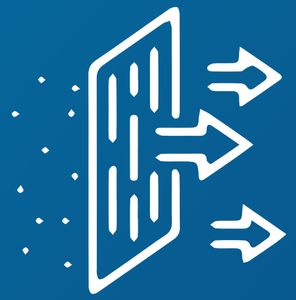


Sensor- Driven

Focus on WELL air quality standards
Flow Sensor

EXPLORING IAQ PARAMETERS





Carbon Dioxide (CO2)

A key parameter in indoor air quality monitoring. It is a natural byproduct of human respiration and can be an indicator of ventilation effectiveness.

Temperature (°C)

Monitoring temperature is essential for indoor comfort and well-being. Maintaining a comfortable temperature contributes to a productive and healthy indoor environment for occupants.

Particulate Matter (PM) Monitoring

PM sensors are crucial for assessing the presence of harmful airborne particles and pollution.

Volatile Organic Compounds (VOCs)

VOC monitoring is essential for identifying potential indoor pollutant sources and ensuring occupant well-being.

Airflow (l/s)

Effective ventilation helps control CO2 levels, remove pollutants, and regulate temperature. Monitoring airflow is vital for ensuring that indoor spaces have adequate ventilation and circulation.

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ACUITY

Centralised Control System

TOUCH SCREEN – Mounted in the plant room. 10” touch screen displays relevant information quickly without the need for training.

ALWAYS SAFE OPERATION – Passcode needed only for system changes.

SOFTWARE-OVER-THE-AIR (SOTA) – Remote diagnostics and firmware updates happen automatically without user interruption.

DATA ANALYSIS – Data sent via dedicated 4G/5G connection to cloud based analysis software.

DATA MONITORING

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DATA MONITORING

Monodraught

DATA MONITORING

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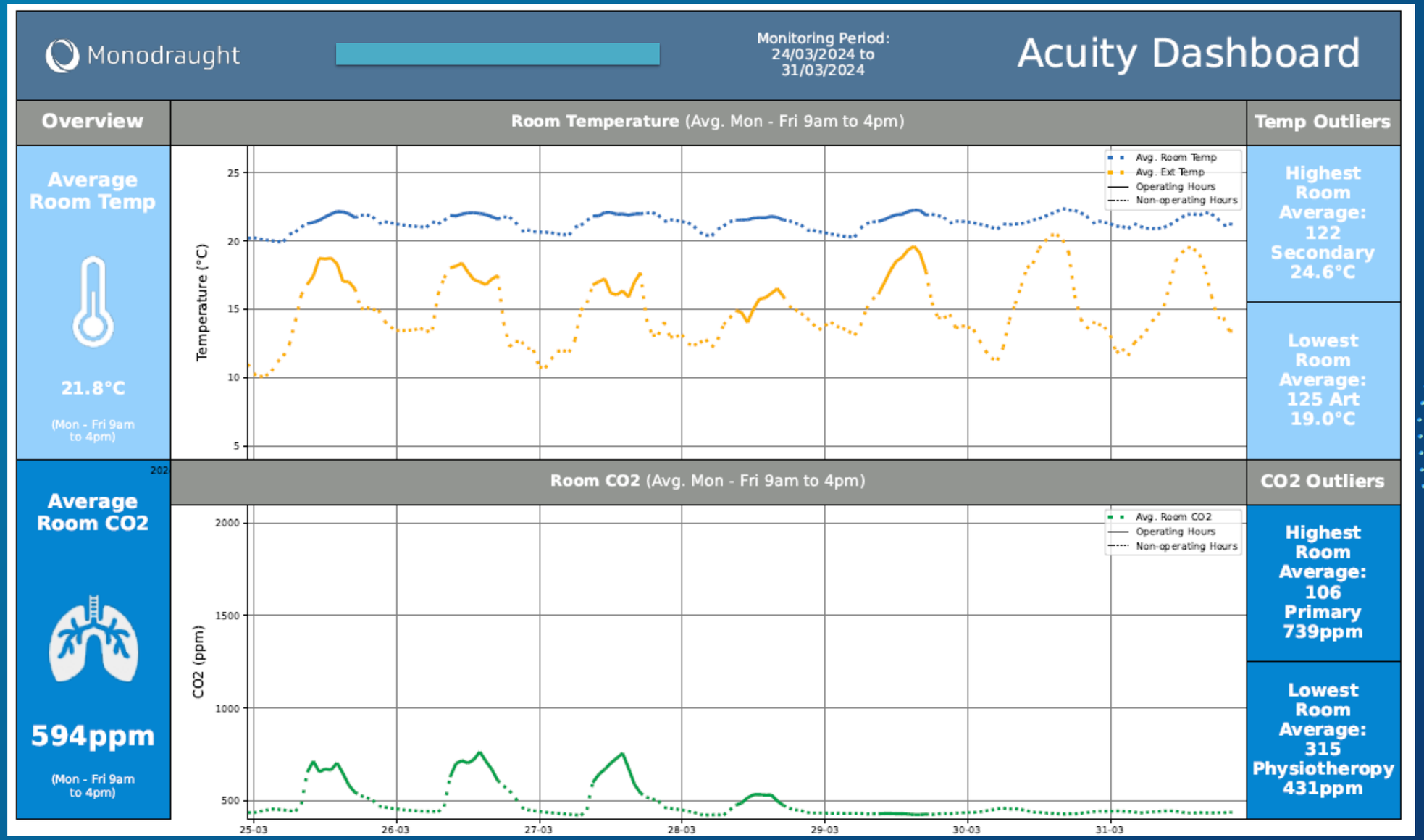

NEURAL NETWORK

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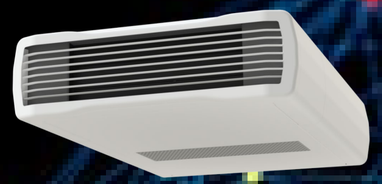

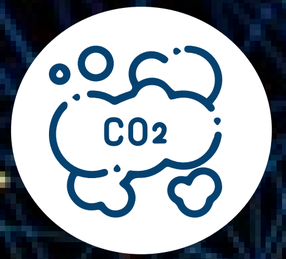

Thank you!

Monodraught

50 YEARS