MITSUBISHI ELECTRIC

Mitsubishi Electric Guide to the Future of Air Conditioning

Information Guide

CPD CERTIFIED
The CPD Certification Service

Mitsubishi Electric Guide to

the Future of Air Conditioning

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Buildings and air conditioning linked in a low-carbon future

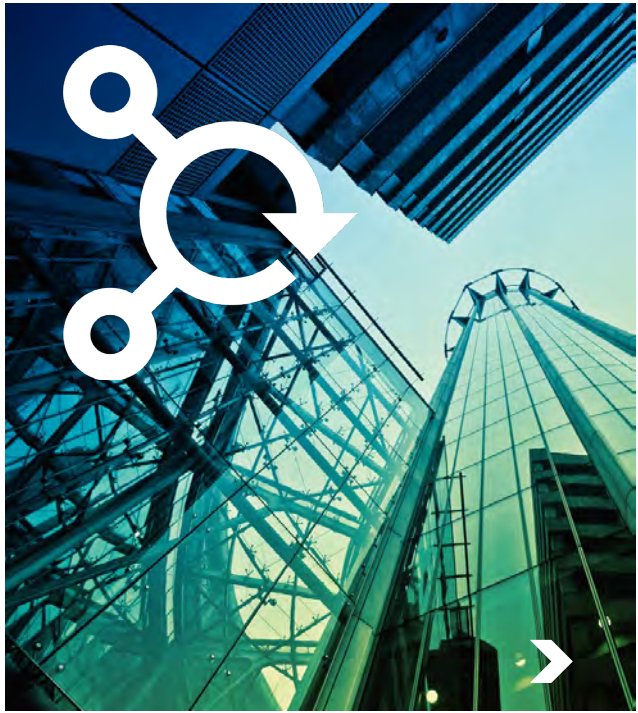
- Low carbon buildings drive impacts air conditioning
- Every element of a building scrutinised for its carbon impact
- GLA: 21% of building WLC allocated to building services

Decarbonisation driving demand for alternatives to fossil fuel systems

- Gas/oil heating systems replaced by electric systems
- Making the most of the UK’s renewable electricity

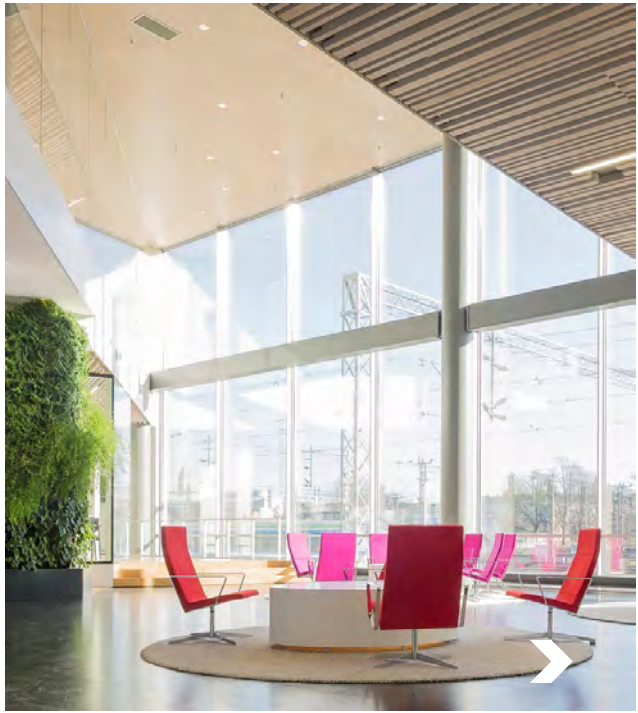
Carbon emissions - some definitions

- **Whole Life Carbon** (WLC) - carbon emissions across the building life cycle: construction, operation, maintenance and demolition
- **Embodied Carbon** - included in WLC: emissions arising from the manufacture, transportation and installation of all materials and equipment in a building
- **Operational Carbon** - included in WLC: emissions produced in the building from use of on-site fossil fuel systems (direct emissions) and emissions from electricity purchased from the grid (indirect emissions)



The specification challenge

- Reduce energy consumption in buildings
- Shrink building carbon footprint
- Legislation, standards & planning rules



Part L of the Building Regulations (2022)

- 27% lower target carbon emission rate
- Minimum energy efficiency requirements for building services

Minimum Energy Efficiency Standards (MEES)

- EPC band E is current minimum for non-dwellings
- Applies to ongoing tenancies
- Proposed lift to EPC minimum of C by 2027 and B by 2030

Reducing the carbon footprint of public sector buildings

- Removing fossil fuel heating and hot water systems from public sector buildings
- Funding to help the transition - Public Sector Decarbonisation Scheme (PSDS)
- Phase 4: targeting schemes that offer ‘best value for money based on direct carbon reductions”

Corporate ESG strategies

- Many client tenants in the office market demanding low-carbon spaces
- Office buildings reflect corporate carbon commitments
- Market is seeing rents for these spaces rise due to demand

F Gas Regulations: Impact on refrigerants

- Introduced by the EU in 2006 - direct impact on air conditioning systems
- February 2024: EU set a steeper schedule for phasing down fluorinated gases
- UK following previous EU schedule - announcement expected on updated schedule

Time period	Previous EU phase-down programme – currently applied in the UK in 2024	Updated EU phase down adopted in February 2024
2021 - 2023	45%	
2024 - 2026	31%	23.6%
2027 - 2029	24%	10.1%
2030	21%	5%
2048		2.38%

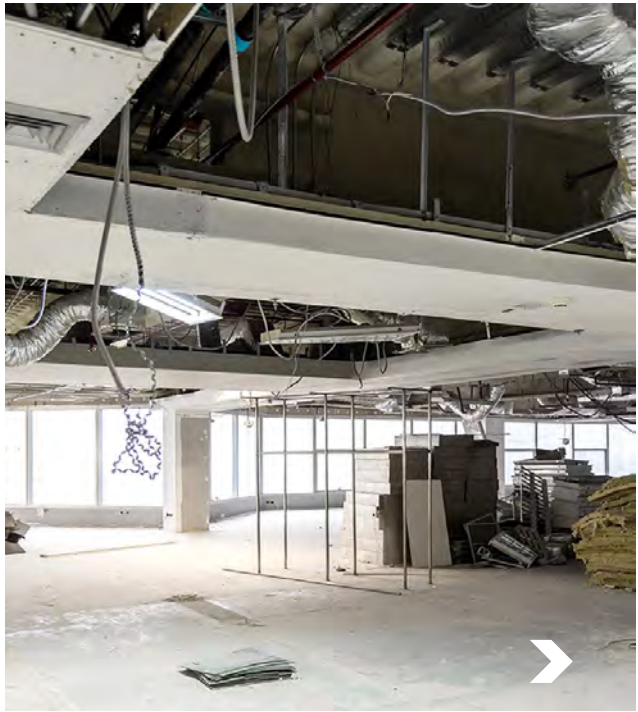
F Gas Regulations: Prohibition of product categories

- Chillers, Heat Pumps and Split Air Conditioning systems

Split Air-to-Water		
X <= 12 kW at 150 GWP	→	1st January 2027
X <= 12 kW full F Gas prohibition	→	1st January 2035
X > 12 kW at 750 GWP	→	1st January 2029
X > 12 kW at 150 GWP	→	1st January 2033

Impact of regulations

- Building retrofits: avoiding stranded assets
- 31% of VRF systems more than ten years old (BSRIA)
- Updating is critical to meet new standards - and ensure performance



The evolution of air conditioning systems

- Refrigerants
- Hydronics
- Advanced controls

Modern refrigerants - new characteristics

Refrigerant	Characteristics
R32 (GWP 675)	■ Efficiency remains the same ■ Capacity increases ■ Technology only available for small inverter-driven compressors ■ Cost neutral ■ Specified due to availability of small DX compressors using inverters to manage higher discharge temperature
R290 - Propane (GWP 3)	■ Used in industrial refrigeration for many years; known domestically in use for outdoor heaters and cookers ■ Low GWP ■ Non-toxic ■ Good thermodynamic properties, making it highly energy efficient in systems ■ Flammable
R410A (GWP 2088)	■ Good energy efficiency ■ Higher cooling capacity ■ Superior heat transfer coefficient which allows for better heat exchange ■ Higher operating pressures which should be reflected in system design - correctly sized components are essential to optimise energy efficiency

New refrigerants - new rules

- Relative flammability

Refrigerant	GWP	Safety class ISO 817; PED (EU)
R718 (Water)	**0**	**A1** (non-flammable)
R744 (CO_2)	**1**	**A1** (non-flammable)
R290 (Propane)	**3**	**A3** (higher flammability)
R1234yf	**4**	**A2L** (mildly flammable)
R1234ze	**7**	**A2L** (mildly flammable)
R454b	**466**	**A2L** (mildly flammable)
R513A	**631**	**A1** (non-flammable)
R32	**675**	**A2L** (mildly flammable)
R410A	**2088**	**A1** (non-flammable)

Managing risk

- DSEAR risk assessments
- Selecting the right standard
  - BS EN IEC 60335
  - BS EN 378 2016

Managing risk

BS EN IEC 60335

- Manufacturing of electrical products
- Products must meet the requirements of this standard to achieve a CE mark

BS EN 378 2016

- A safety standard providing guidance on risk assessments
- For businesses that design, construct, installer, operate, maintain and use vapour compression systems
- Refrigeration, air conditioning, heat pumps, chillers - and similar

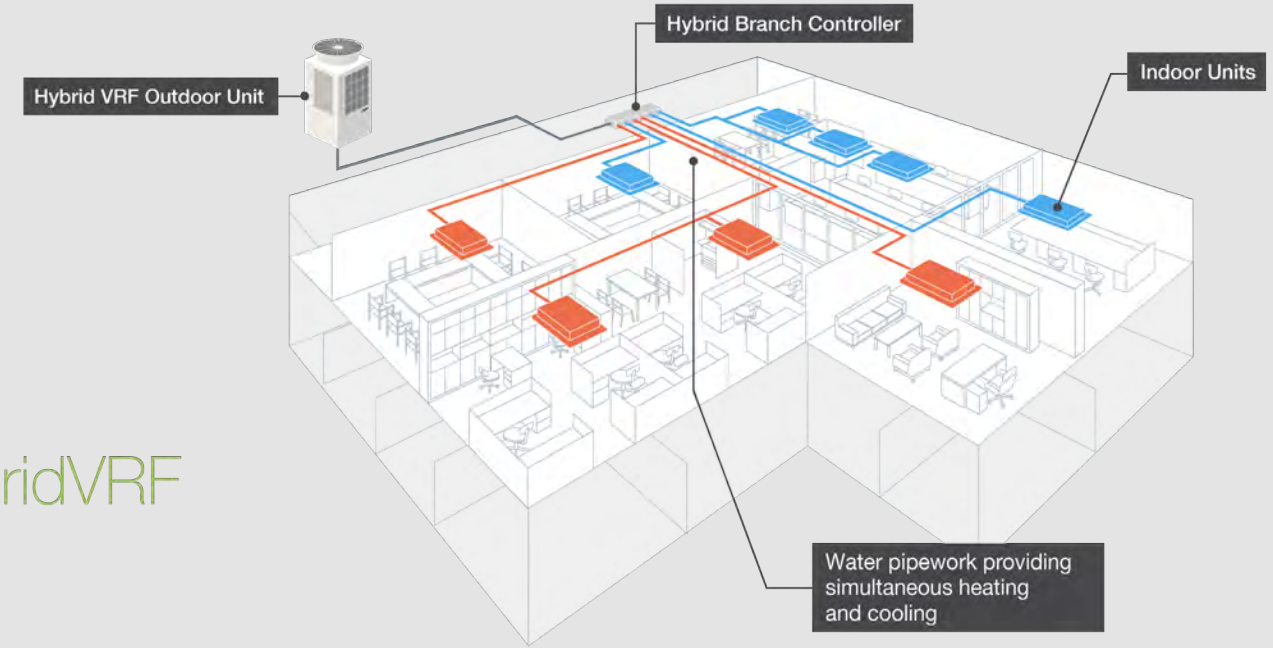
Hydronic systems

- Rise of heat pump technology
- Applied in a range of air conditioning systems:
  - Heat pump chillers
  - Ambient networks
  - High temperature heat pumps
- Replacing gas boilers even in high-use buildings

Combining hydronics with ‘traditional’ air conditioning

- A transitional approach
- More practical for some projects
- Example: Hybrid VRF with R32 refrigerant

City Multi Hybrid VRF system



R32 | HybridVRF

Building controls

- Internet of Things (IoT)
- Ecosystem of devices connected to the internet
- Data gathering, insights into performance, system control
- Continuous monitoring

MELCoud Commercial

- Remote Control and Monitoring
- Optimise Energy Use
- Minimise Downtime
- Scalable Solutions

Intelligent application of controls

CIBSE TM54: Evaluating operational energy use at the design stage

- Thermostat profiles
- Implementation of variable temperature and volume
- Plant sequencing
- Hours of operation
- Zoning

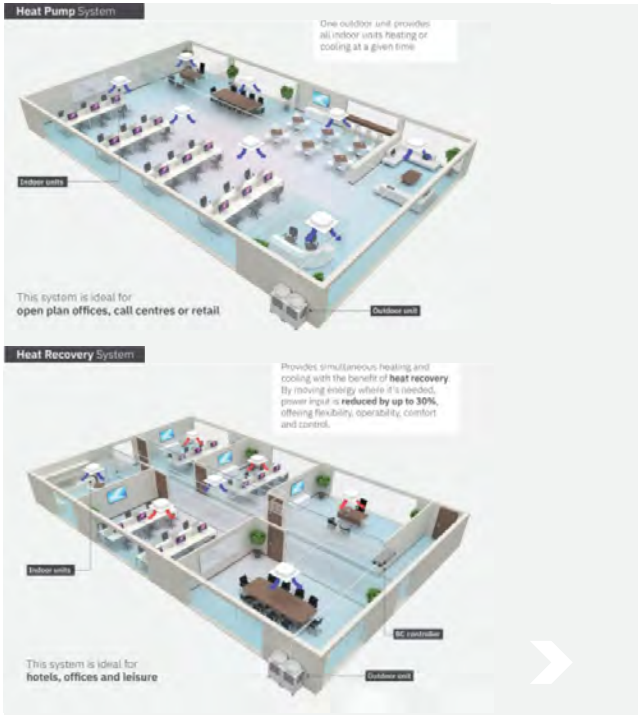
Evolution leads to choice

Technology	Characteristics and benefits
Variable Refrigerant Flow (VRF)	■ An option that can be applied to a wide range of projects ■ The Mitsubishi Electric 2-pipe approach requires fewer joints and brazing points with reduced leak risks ■ It offers smaller pipe sizes (less material use) and tray space ■ VRF technology is now highly flexible, with options that provide a plug-and-play approach as well as low-noise modes ■ Straightforward maintenance regimes

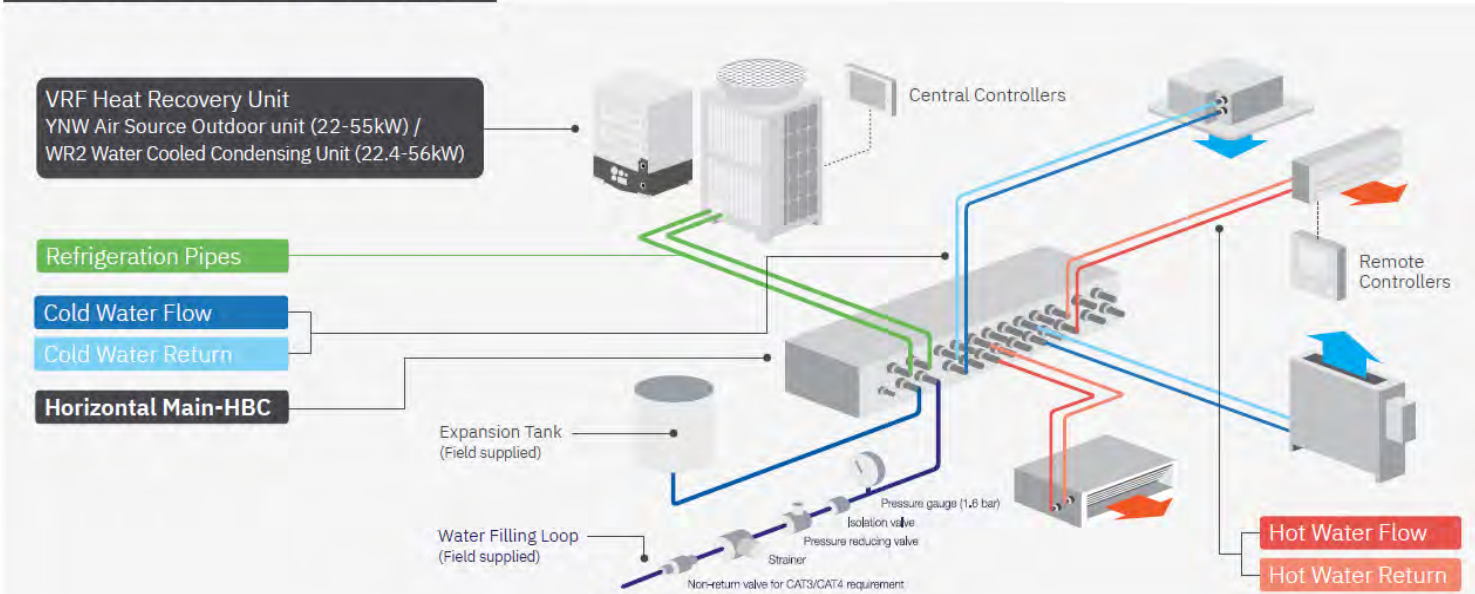
City Multi VRF

City Multi: A market leader in VRF technology

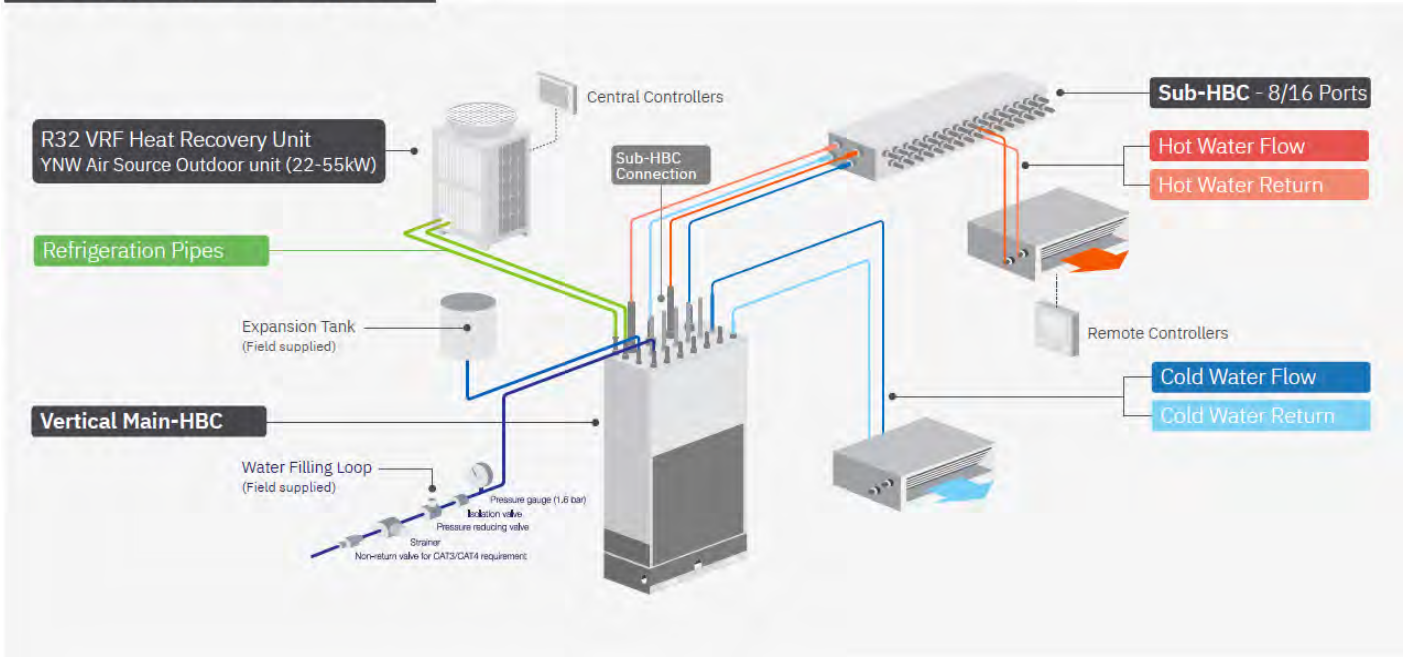
- Flexibility in design, installation and operation
- Heat pump and Heat recovery models
- Wide variety of applications



Horizontal Main-HBC layout



Vertical Main-HBC layout



R32 VRF YXM

The scalable, sustainable, reliable VRF solution for the future

- F-Gas phase down is driving VRF sector decarbonisation
- R32: Flexible, efficient, low-GWP refrigerant
- Simple plug & play with safety measures
- Expanded City Multi portfolio enhances choice

Evolution leads to choice

Technology	Characteristics and benefits
Room Air Conditioning (RAC)	■ Room air conditioning systems are ideal for small commercial spaces or residential ■ Quick to install and quiet to operate ■ Modern RAC systems use low-GWP R32 refrigerant and inverter technology for optimum energy performance
Packaged Air Conditioning (PAC)	■ Provides a range of solutions for a variety of end-user needs ■ Modern PAC systems operate on low-GWP R32 refrigerants ■ Extended pipe runs make installation straightforward ■ The latest models include controls for optimum energy performance

Future influences:

- Achieving low-carbon buildings
- Growth of hydronic technologies and low-GWP refrigerants
- Advanced control and monitoring systems
- The retrofit challenge
- Balance: what's possible and what's practical

Q & A

Thank You