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Mitsubishi Electric Guide to Multi-Residential Buildings: Heating, Hot Water and Ventilation Technologies

Information Guide 76

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This is an independent guide produced by Mitsubishi Electric to enhance the knowledge of its customers and provide a view of the key issues facing our industry today.

This guide accompanies a series of seminars, all of which are CPD certified.

Contents

Multi-residential homes - a growing market focused on quality

Multi-residential dwellings most commonly take the form of medium and high-rise apartments. They are generally leased to private tenants, and they are a growing part of the UK property sector with an increasing pool of potential tenants looking for high-quality living space and well-maintained facilities.

According to NHBC registration figures, the new homes market in 2020 was evenly split between detached homes, semi-detached homes and apartments[1]. But it is the apartment sector that looks set for significant financial investment and growth. Research reported by Construction Global highlights that 78% of high-rise buildings being planned in the UK are residential (or mixed use, with a majority residential)[2].

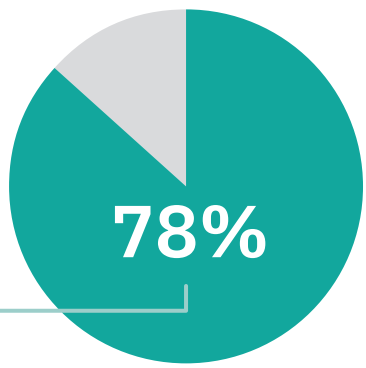
One of the main factors driving this growth is increasing investment in the UK build-to-rent (BtR) sector. Figures from property specialist Knight Frank[3] indicate that 2020 saw around £4 billion invested in BtR property development. This capital is sourced from both established and new investors who regard BtR as a sound long-term venture, with less volatility than the commercial and retail property sectors are currently experiencing.

Rising prices in the UK housing market have created a flourishing demand for rental properties that offer high quality accommodation, not only for singles and couples but also for families. Demand for this type of property is partly fuelled by the UK's changing demographics. The private rented sector (PRS) has previously been dominated by younger tenants in their early to mid-twenties. However, government research shows that this is changing, with around a third of PRS tenants now in their mid-thirties to mid-forties[4].

An interesting development has been the rise of the full-service multi-residential property. For example, in 2021 retailer John Lewis announced[5] its interest in developing around 10,000 build-to-rent homes on sites that it already owns. Tenants will have the option to rent the properties furnished with John Lewis furniture and home technologies. Another example of the full-service BtR market is Quintain Living (formerly Tipi) which offers tenants leases that include facilities such as free Wi-Fi, bookable social spaces, and itemised utility bills.

As with all dwellings, multi-residential buildings must comply with Building Regulations. They must therefore be designed and constructed to meet targets on areas such as low-carbon construction and operation, as well as ensuring occupants have adequate ventilation and protection from overheating. This Guide will consider these challenges and how they impact on the multi-residential market, and look at the technologies that can support their design and operation.

78% of high-rise buildings in 2020 are being planned for residential use



A net-zero future for UK dwellings - reducing our reliance on fossil fuels

Developments in the home-building market must be set against the background of the UK's net zero carbon ambitions. Almost 75% of the UK's demand for heating and hot water is met with natural gas and 23 million homes are on the gas grid (with a further 4 million off the grid and using LPG or oil) - making this a significant target for decarbonisation.

Scotland and Northern Ireland are developing their own net zero carbon plans, with Scotland setting its target of net zero emissions by 2045, ahead of England and Wales. All four nations are working on plans to decarbonise heating using technologies most suitable to their geographies and economies. In general, however, there is a national recognition that we must transition away from fossil fuels for heating and hot water as soon as feasible.

A number of leading organisations have examined the best approach to achieving net zero carbon in the built environment. In 2019, the UK Green Building Council (UKGBC) published *Net zero carbon buildings: A framework definition*[6]. This document focuses not only on creating zero carbon dwellings and other buildings at the design stage, but also on ensuring that the whole-life carbon impacts are considered. The aim therefore is to design buildings to reduce demand for energy and materials, only using offsetting as a final resort for residual emissions.

Consulting engineer Arup also published a document titled *Net zero carbon buildings: Three steps to take now*[7]. This defines a 'net-zero enabled' building as one that operates at an energy use intensity (EUI) 'threshold' required to achieve net zero carbon.

A net-zero future for UK dwellings - reducing our reliance on fossil fuels

The need to re-think the design, construction and operation of homes has been captured in two key government documents: the *Future Homes Standard* and the *Future Buildings Standard*[8]. These publications summarise the government's views on how Building Regulations such as Part L (Energy Conservation), Part F (Ventilation) and other standards will be updated to drive change in UK homes.

One example of the forthcoming changes is an update to the Standard Assessment Procedure (SAP)[9] which is used to demonstrate the energy performance of new dwellings and ensure compliance with required energy standards. The updated version, SAP 10.2, has already been introduced – though it is not yet required to be applied on projects.

SAP10.2 includes an important change to the 'carbon factors' applied to fuels used in dwellings. In older versions of SAP, the carbon factor of electricity was double that of gas - reflecting the UK's reliance on coal for power generation. With renewables now at the heart of electricity production, its carbon factor is much lower, taking it closer to that of gas.

The government set out its vision for achieving the 2050 net zero emissions goal in a document titled *Ten-point plan for a green industrial revolution*[10]. It highlights technologies that it views as crucial for its strategy to reduce the UK's reliance on natural gas for domestic heating and hot water provision. Two of these are heat pumps and heat networks.

The national target set out in the Ten Point Plan is to achieve 600,000 heat pump installations per year by 2028. A large proportion of these installations will be in dwellings. There are several legislative proposals in the pipeline to support this.

The government introduced its *Heat and Buildings Strategy*[11] in October 2021 and it states: “Our ambition is to phase out the installation of natural gas boilers beyond 2035.” The Strategy notes that heat pumps are already a “predominant technology” in some countries.

In addition, proposed updates to Part L of the Building Regulations will require that new dwellings are designed to operate low-temperature heating systems, suitable for heat pumps to ‘future proof’ them for retrofit at a later date. Heat networks also provide the opportunity to address heating and hot water requirements at large scale, and particularly in high-density cities and multi-residential buildings.

Heat networks can be designed to exploit low-carbon heat sources and use heat pumps to deliver space heating and hot water in conjunction with heat pumps. It is interesting to note that the *London Plan (2021)*[12] focuses on heat networks as a low-carbon technology for the capital’s future heating needs.

Overheating and indoor air quality

Alongside new regulations on energy use and lowering carbon, there is also a growing focus on occupant health in buildings, including dwellings. The *Future Homes Standard* and *Future Buildings Standard* therefore also address the issues of overheating and indoor air quality (IAQ) as important factors to consider in the design of new homes.

While the UK may benefit from a relatively mild climate, our increasingly hot summers pose a growing health problem. Overheating in buildings has a negative impact on occupants not only in workplaces, but also at home.

Recent government figures indicated that there are currently around 2,000 heat-related deaths each year in England and Wales, with this number expected to rise to 7,000 per year by 2050[13]. London is regarded as a particular risk area due to its geographical location and high building density which contributes to the urban heat island effect.

The Chartered Institute for Building Services Engineers (CIBSE) also offers guidance on managing the problem of overheating in homes[14] (TM59:2017), stating: "The health and wellbeing impacts of overheating can be significant for residents, resulting in stress, anxiety, sleep deprivation and even early deaths in heatwaves, especially for vulnerable occupants."

The *Future Buildings Standard* includes proposals to mitigate against the effect of overheating, particularly in new dwellings. There is also a *Draft Approved Document on Overheating (January 2021)*[15] which focuses on the need to limit unwanted solar gains in summer, while also providing an "adequate means to remove excess heat from the indoor environment".

These documents highlight that heat loss from heating and hot water pipes can also contribute to the overheating problem. This is particularly the case with heating based on ‘communal systems’, such as heat networks. Mechanical ventilation and ‘non-glazed openings’ are recommended as solutions for this problem. Heat loss from these systems can be reduced by the application of technologies such as heat pumps (discussed later in this Guide).

Another important factor for the design of future homes is indoor air quality (IAQ). This topic is quickly rising up the government agenda, as the impact of pollutants on health is becoming better understood.

Indoor air quality is affected by pollutants that enter the home as well as those that arise indoors from activities such as cleaning or burning candles. Moisture and mould found indoors are also harmful to health. (See the Mitsubishi Electric CPD Guide to Indoor Air Quality for further information on this topic: **https://library.mitsubishielectric.co.uk/pdf/book/Indoor_Air_Quality**)

Mitsubishi Electric has also worked with the Building Engineering Services Association (BESA) on a number of guides to help engineers and clients understand and improve IAQ in all types of buildings, including a Beginner’s Guide to Indoor Air Quality:
https://library.mitsubishielectric.co.uk/pdf/book/Indoor_Air_Quality_Guide

Overheating and indoor air quality

The challenge for designers and installers, therefore, is to balance requirements for energy efficiency, mitigation of overheating and good indoor air quality.

For example, it has been suggested that openable windows could help to reduce the issue of overheating in homes. This is a cost-effective solution, however, in a high-rise multi-residential dwelling in a city centre, open windows will inevitably allow the ingress of harmful pollutants, greatly reducing indoor air quality.

As CIBSE also notes in its *Overheating position statement*[16]: "The effectiveness of natural ventilation as an overheating mitigation strategy should be evaluated in relation to any site constraints, such as exposure to outdoor pollutants, noise levels and security concerns that would impact its effectiveness."

In a fast-developing market such as multi-residential dwellings it is therefore important to find technical solutions which can meet these requirements in a way that provides for occupant health and comfort, as well as affordability and energy efficiency.

Solutions for the multi-residential challenge: heat networks and ambient loops

Heat networks are viewed by government as an important element of its strategy to decarbonise heating and hot water. There are currently over 14,000 heat networks in the UK, providing heating and hot water to 480,000 consumers.

That represents around 3% of UK heat, and the Climate Change Committee (CCC) estimates that this needs to rise to 18% by 2050 to help the UK meet its net zero carbon target. To support this growth, in September 2021 the government announced a Green Heat Network Fund (GHNF)[17] which will open to applicants in April 2022 and is anticipated to remain open until 2025. This is a successor to the Heat Networks Investment Project (HNIP).

The Fund aims to increase the total amount of low-carbon heat used in new and retrofitted heat networks. It will support low-carbon technologies such as heat pumps, solar and geothermal technologies as applied in heat networks.

The Department for Business Energy and Industrial Strategy (BEIS) also produced a report in September 2021 titled *Opportunity areas for district heating networks in the UK*.[18]

This report highlights the role that government expects heat networks to play in the future of low-carbon heating in the UK. The BEIS publication also includes heat maps across England, Wales, Scotland, and Northern Ireland, including existing and planned heat networks.

Solutions for the multi-residential challenge: heat networks and ambient loops

CIBSE recently published *Heat Networks: Code of Practice for the UK 2020 (CP1)*[19]. CP1 offers guidance on carrying out feasibility studies for heat networks as well as ensuring that the network delivers energy efficiency and environmental benefits. This document highlights that heat networks not only reduce carbon emissions compared to gas boilers, but can also help to alleviate fuel poverty which is another government concern.

Another useful document to consider is CIBSE's AM16:2021 *Heat pump installations for multi-unit residential buildings*[20] The publication provides guidance on the design and installation of heat pump systems for multi-residential buildings including medium and high-rise apartments. AM16 also covers retrofit projects for applying heat pumps in existing buildings of this type.

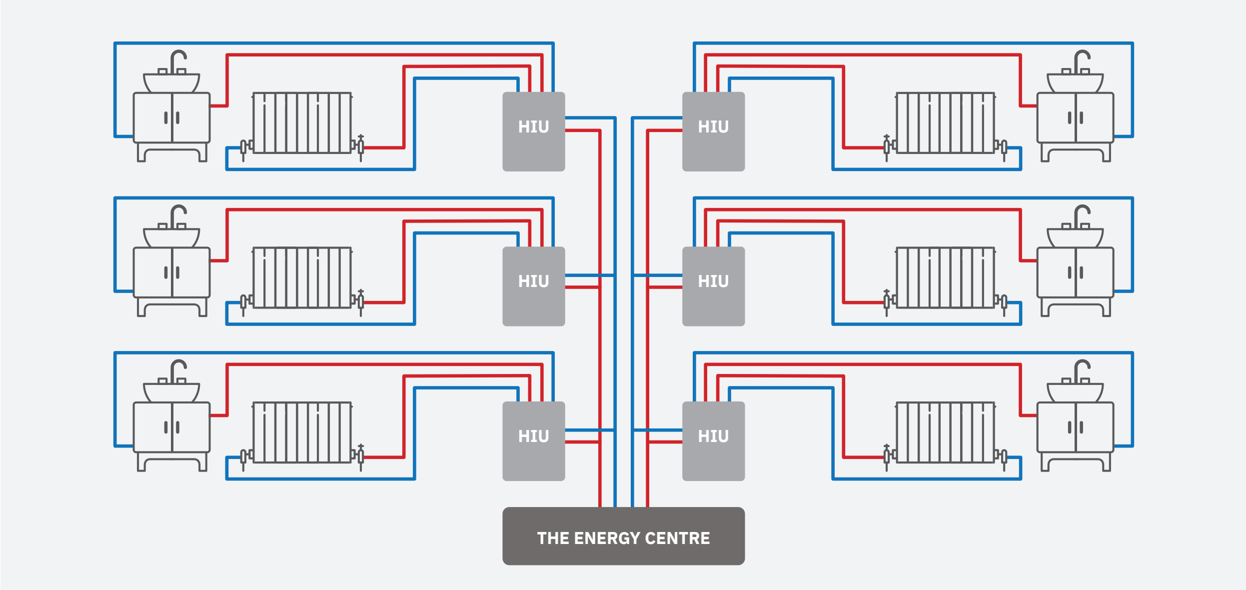
CIBSE notes that there are different types of heat network. For example, communal heating is a heat network which serves a single building; a district heating system serves the heating needs of more than one building.

The Code of Practice also references ultra-low temperature fifth generation systems, known as 'ambient loops'. CIBSE defines this as a non-traditional topology with decentralised plant (usually heat pumps) supplying heat along ultra-low-temperature headers in a spine.

Fifth generation heat networks - using water-to-water heat pumps

If we take a communal heating system in a multi-residential building, heat is generated in a centralised energy centre which can be served by a gas boiler or CHP unit, for example. The hot water generated from the energy centre is circulated to each apartment, and each of these is served by a heat interface unit (HIU).

The traditional approach to a communal heating system using HIUs.



The flow temperature out of the energy centre is around 60ºC and the HIUs in each apartment create low temperature hot water (LTHW) and instantaneous domestic hot water (DHW). No DHW storage is required.

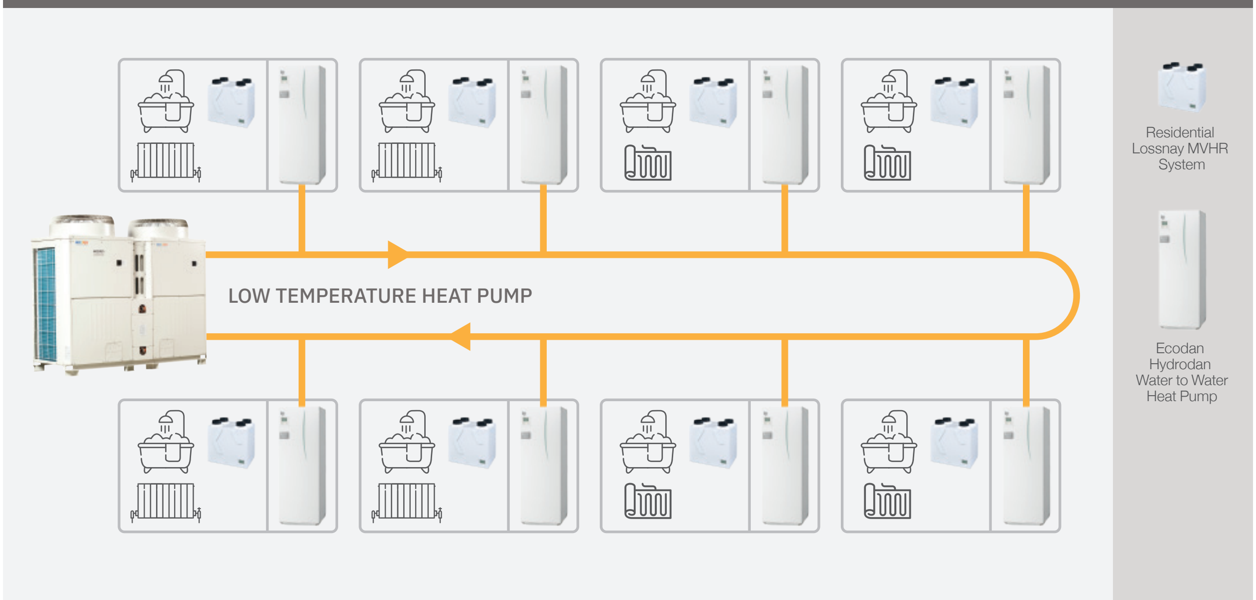
There are a few challenges with this approach. Firstly, the use of gas boilers for energy centres is becoming less feasible as the UK moves to decarbonise its heating. As previously noted, the latest SAP carbon weightings reflect the UK's greener electricity grid. Gas boilers also produce NOx which increases local air pollution and requires the use of flues in the building. This can cause issues where local authorities are legislating for better air quality.

What's more, a high temperature communal heating system has more potential for heat losses in the distribution system. Hot water pipes throughout the building, particularly in communal areas, can create problems with overheating in the building because of the high temperature flow. This increases the burden on building ventilation systems and can increase energy use as a result.

An alternative approach is the application of water-to-water heat pumps (for example, the Mitsubishi Electric Ecodan Hydrodan) in an ambient loop set-up. Rather than taking high temperature water around a building, it is possible to make use of water at a temperature of around 25ºC. A water-to-water heat pump in each apartment then heats the water supply to a usable temperature for space heating and DHW needs.

In the case of the Ecodan Hydrodan, the heat pump includes a 170l integrated tank. As a result, the heat pump in each apartment can supply both LTHW and DHW up to 60ºC for a highly energy efficient transfer of heat through a single low-carbon system.

A fifth generation, or ambient loop, communal heating system that uses a low temperature heat pump as the 'energy centre'



Solutions for the multi-residential challenge: heat networks and ambient loops

One of the added benefits of an ambient loop with heat pump technology is that because it uses low-temperature water as the backbone of the system, the energy centre can also use a heat pump. This could be an air-to-water heat pump, or one that uses a local water source such as a nearby river, lake, or canal.

Not only does this greatly reduce the carbon footprint of the whole heating and hot water system, but it also means no gas connection is required in the building.

One example of the growing interest in heat networks that use heat pumps is the London Plan (2020)[21] which regards heat networks as an important element of its low-carbon heating future. The Plan states that major development proposals with London's heat network priority area should have a 'communal low temperature heating system'. The Plan also places heat pumps high on its hierarchy of heat sources for such a system, particularly in conjunction with "zero-emission or local secondary heat sources".

The Climate Change Committee's recent Sixth Carbon Budget[22] also calls for the expansion of heat networks, particularly in cities. The CCC also states that we should "prepare to shift away from using fossil fuel CHP as a supply source" to using low-carbon and waste-heat "by preference from the mid-2020s."

Ecodan Hydrodan
Water to Water Heat Pump

This is another benefit of water-to-water heat pumps in an ambient loop: They can use low-temperature water from a wide range of sources, whether that is a heat pump or waste heat.

With the growing number of mixed-use developments that combine multi-residential buildings with offices, leisure facilities and retail property, ambient loops can also re-use heat from one part of a mixed-use estate in another.

For instance, the heat rejected from office cooling systems can be re-used, via water-to-water heat pumps to contribute to the domestic heating and hot water requirements of dwellings. In the right circumstances, these fifth-generation heat networks can exploit variations in daily and seasonal energy demands to minimise required plant size, while optimising energy efficiency.

The communal heating approach is set for growth across the UK, and the ability to apply energy-efficient heat pumps, including water-to-water technology, provides designers with an important option for delivering decarbonised heating and hot water in a single system and at scale.

Ventilation - balancing IAQ with energy efficiency

The need to ensure that our homes are safe from pollutants has received renewed focus in the *Future Homes* consultation. A draft *Approved Document F (2021 Consultation Version)* is available[23] and government has forecast publication in 2021.

The latest recommendations from the World Health Organisation[24] highlight the very significant impacts that poor air quality can have on human health – and the costs to health organisations such as the NHS that this creates. With more of us spending time in our homes, the need to ensure good IAQ is becoming more pressing and is particularly true for multi-residential homes in city centres where there is heavy road traffic (a main source of pollution).

However, ensuring good ventilation is not always straightforward. Air tightness requirements for dwellings are in place to support energy efficiency, but they can also exacerbate IAQ problems such as damp and mould if not accompanied by appropriate ventilation. What's more, simply bringing outdoor air into an occupied space may cause discomfort from cold temperatures, creating a requirement for more heating and therefore more energy use. It also allows external pollutants to enter the space, reducing indoor air quality.

The minimum standards for air permeability of a new dwelling are set out in the draft Approved Document Part L for Dwellings (2021 Consultation version).[25] To show compliance with the Building Regulations, a dwelling primary energy rate, dwelling emission rate and dwelling fabric energy efficiency (calculated using the measured air permeability) must not exceed the target rates.

The *Draft Approved Document Part L* has increased the minimum allowable air permeability to $8m^3/(h.m^2)$ at 50Pa from a previous level of $5m^3/(h.m^2)$ at 50Pa in order to allow natural ventilation to provide good indoor air quality. However, it is important to note that the notional dwelling air permeability rate remains at $5m^3/(h.m^2)$ at 50Pa.

Therefore, any increased energy loss must be offset by improving other components of the dwelling. It must also be noted that there is a proposed limit to recognition within SAP of the energy benefit when using natural ventilation up to an air tightness level of $3m^3/(h.m^2)$ at 50Pa. This discourages the use of natural ventilation as the strategy for air tight homes and further emphasises the importance of IAQ.

The *Draft Approved Document* on Overheating includes mechanical ventilation as a solution for dealing with excess heat in new residential buildings. However, it notes that any method to reduce overheating must also comply with other parts of the Building Regulations, including Part L for energy efficiency.

Mechanical ventilation with heat recovery (MVHR) offers a reliable solution for domestic ventilation in multi-residential buildings. In winter, MVHR extracts stale air continuously from the dwelling, while recovering heat from the outgoing air and transferring it to the incoming air. And during the warmer months, the system supplies cooler outdoor air to the dwelling.

Ventilation - balancing IAQ with energy efficiency

This ensures that air coming into the home is nearer to the required indoor temperature, with minimal energy penalty for the air changes. And as a continuous extract approach, MVHR can operate at very low levels and with low noise levels – making it ideal for multi-residential buildings where noise attenuation is crucial. This quiet operation is particularly important given the increased background ventilation rates included in the proposed changes to Part F of the Building Regulations.

Some of the latest MVHR systems (such as Mitsubishi Electric's Residential Lossnay MVHR system) can also filter incoming air, further enhancing IAQ. And there are also options such as integral bypass dampers (to stop heat recovery in summer months for example) to avoid overheating in warmer months and enhance energy efficiency.

For further support of good indoor air quality, it is also possible to install filters in MVHR systems. Some specifically target the removal of particulate matter – one of the most dangerous forms of air pollution. The Lossnay MVHR, for instance, offers a filter option to remove NOx (nitrogen oxide) from incoming air, and does this within the MVHR unit itself so there is no need for additional duct-mounted filters which carry additional costs and are more difficult to install and maintain.

MVHR is an excellent technology for removing indoor pollutants, including humidity, and avoiding problems with overheating. For the typical multi-residential building, MVHR provides an all-in-one solution that provides a high-quality indoor environment that helps to attract high-value occupants in the build-to-rent market.

Residential Lossnay
MVHR System

Conclusions

In the fast-developing multi-residential sector, keeping pace with upcoming legislation and requirements for low-carbon solutions is a challenge. Add to this a more discerning demographic of tenants, and the pressure is on to find technical solutions that offer tangible benefits such as better indoor air quality and year-round comfort in a building that is protected from overheating.

The combination of water-to-water heat pumps in an ambient loop heating system, along with mechanical ventilation and heat recovery offers a solution that meets all of these requirements. Not only this, but the technology has also been widely applied and offers a reliable and robust performance.

Using low-carbon heating and hot water systems now ensures that a multi-residential property is future-proofed against the costs and upheaval of switching from a gas-based system in years to come. The ability to offer low-carbon and net-zero enabled solutions that also provide energy efficient and cost-effective heating, hot water and ventilation is one that developers should see as an opportunity to provide their building and its tenants with added benefits, high quality indoor environments and marketable features.

References

1. **NHBC New Home Statistics review 2020**
https://www.nhbc.co.uk/media-centre/statistics/2021/01/29/2020-new-home-statistics-review

2. **From Construction Global:**
https://constructionglobal.com/construction-projects/residential-demand-spurs-uk-high-rise-construction

3. **Knight Frank, Multihousing 2020 (produced with Home Views)**
https://content.knightfrank.com/research/2088/documents/en/knight-frankhomeviews-multihousing-report-2020-7486.pdf

4. **ONS figures on demographics and renting**
https://www.ons.gov.uk/peoplepopulationandcommunity/birthsdeathsandmarriages/ageing/articles/livinglonger/changesinhousingtenureovertime

5. **John Lewis plans 10,000 rental homes, The Guardian 04/07/2021**
https://www.theguardian.com/business/2021/jul/04/john-lewis-plans-to-build-10000-rental-homes-on-its-land-waitrose

6. **The UK Green Building Council, Net Zero Carbon Buildings: A Framework Definition, 2019**
https://ukgbc.s3.eu-west-2.amazonaws.com/wp-content/uploads/2019/04/05150856/Net-Zero-Carbon-Buildings-A-framework-definition.pdf

7 **Arup, Net zero carbon buildings: Three steps to take now**
https://www.arup.com/perspectives/publications/research/section/net-zero-carbon-buildings-three-steps-to-take-now

8 **Future Homes Standard**
https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings

and

Future Buildings Standard
https://www.gov.uk/government/consultations/the-future-buildings-standard

9. **Standard Assessment Procedure**
https://www.bregroup.com/sap/sap10/

10. **Ten Point Plan for a Green Industrial Revolution**
https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution

11. **Heat and Buildings Strategy 2021**
https://www.gov.uk/government/publications/heat-and-buildings-strategy

12. **The London Plan**
https://www.london.gov.uk/what-we-do/planning/london-plan

13. **House of Commons Environmental Audit Committee, 2018. Heatwaves: Adapting to climate change**
https://publications.parliament.uk/pa/cm201719/cmselect/cmenvaud/826/826.pdf

14. **CIBSE TM:59 (2017) Design methodology for the assessment of overheating risk in homes**
https://cibse.org/

15. **Draft Overheating Document (January 2021)**
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/953752/Draft_guidance_on_heating.pdf

16. **CIBSE Overheating position statement**
https://www.cibse.org/news-and-policy/policy/overheating-position-statement

17. **Green Heat Network Fund**
https://www.gov.uk/government/consultations/green-heat-network-fund-proposals-for-the-scheme-design

18. **Department for Business Energy and Industrial Strategy (BEIS) September 2021 Opportunity areas for district heating networks in the UK.**
https://www.gov.uk/government/publications/opportunity-areas-for-district-heating-networks-in-the-uk-second-national-comprehensive-assessment

19. **CIBSE CP1 Heat networks: Code of Practice for the UK (2020)**
https://www.cibse.org/knowledge/knowledge-items/detail?id=a0q3Y00000IMrmGQAT

20. **CIBSE AM16: 2021 Heat pump installations for multi-unit residential buildings**
https://www.cibse.org/news-and-policy/september-2021/cibse-launches-design-guidance-for-heat-pumps-in-h

21. **London Plan 2021 (Page 349 for reference)**
https://www.london.gov.uk/sites/default/files/the_london_plan_2021.pdf

22. **Climate Change Committee, Sixth Carbon Budget**
https://www.theccc.org.uk/publication/sixth-carbon-budget/

23. **Draft Approved Document F (Volume 1: Dwellings) 2021**
https://www.cibse.org/getmedia/f4533a36-ab2e-4165-afbf-74478e7e4a18/Draft-Approved-Document-F-(ventilation).pdf.aspx

24. **World Health Organisation**
https://www.who.int/health-topics/air-pollution#tab=tab_1

25. **Draft Guidance Approved Document L Volume 1: Dwellings**
(Please note: Minimum standards for air permeability of a new dwelling are set out in Table 4.1 of Section 4).
https://www.gov.uk/government/publications/building-regulations-approved-documents-l-f-and-overheating-consultation-version

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Telephone: **01707 282880**

email: **livingenvironmentalsystems@meuk.mee.com**
web: **les.mitsubishielectric.co.uk**

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UNITED KINGDOM Mitsubishi Electric Europe Living Environment Systems Division
Travellers Lane, Hatfield, Hertfordshire, AL10 8XB, England
General Enquiries Telephone: 01707 282880 Fax: 01707 278881

IRELAND Mitsubishi Electric Europe Westgate Business Park, Ballymount, Dublin 24, Ireland
Telephone: Dublin (01) 419 8800 Fax: Dublin (01) 419 8890 International code: (003531)

Note: The fuse rating is for guidance only. Please refer to the relevant databook for detailed specification. It is the responsibility of a qualified electrician/electrical engineer to select the correct cable size and fuse rating based on current regulation and site specific conditions. Mitsubishi Electric’s air conditioning equipment and heat pump systems contain a fluorinated greenhouse gas, R410A (GWP:2088), R32 (GWP:675), R407C (GWP:1774), R134a (GWP:1430), R513A (GWP:631), R454B (GWP:466), R1234ze (GWP:7) or R1234yf (GWP:4). *These GWP values are based on Regulation (EU) No 517/2014 from IPCC 4th edition. In case of Regulation (EU) No.626/2011 from IPCC 3rd edition, these are as follows. R410A (GWP:1975), R32 (GWP:550), R407C (GWP:1650) or R134a (GWP:1300).

Effective as of January 2022

Green Gateway greengateway.mitsubishielectric.co.uk