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Mitsubishi Electric Guide to the Sustainable Buildings Landscape

Information Guide 79

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Mitsubishi Electric Guide to the Sustainable Buildings Landscape

An overview of policy, legislation and guidance in 2022 and beyond

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.

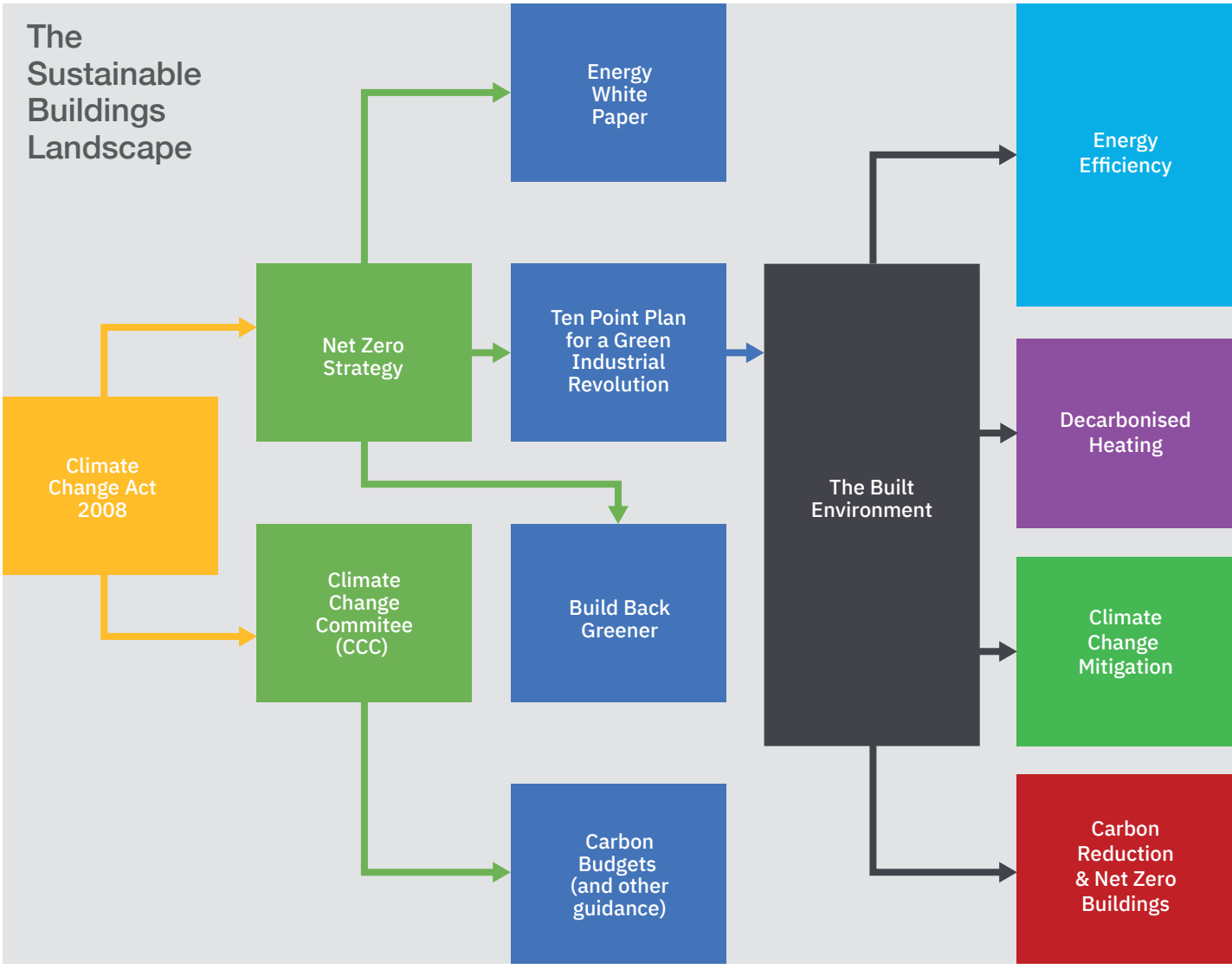
This guide accompanies a series of seminars, all of which are CPD certified.

Contents

Introduction

This guide offers a bird's eye view of the sustainable buildings landscape in the UK. It provides an overview of the increasingly complex network of government policy, legislation and guidance which is sending the UK's built environment along the road to net zero carbon.

This complex area touches on issues such as energy efficiency, decarbonisation of heating, the UK's greening electricity grid, and embodied carbon (to name a few). Different pieces of legislation on the design, construction and operation of buildings intersect, creating a challenge for those trying to navigate their way through it.



The objective of this guide is to offer some clarity and act as an index for users who will be directed to other sources (produced by Mitsubishi Electric or authoritative external organisations) for further in-depth information.

After referring to this document, readers should have a clearer view of how the legislation and other documentation fit together under the UK government's broad umbrella of moving the UK's built environment closer to net zero emissions. In doing so, it will also provide information for those making decisions on the design, specification, installation and operation of HVAC systems.

How this guide works

This guide will focus on the **main levers of policy** around the areas of net zero and energy efficient buildings. It points to the legislation currently in place to push those levers through regulation or incentives.

It will also include guidance from organisations such as CIBSE, BSRIA and the BSI etc., where they are included or mentioned in legislation or provide helpful advice for the building services sector. Mitsubishi Electric has also produced a library of information on legislation and technical issues in the industry, and these will also be referenced for further in-depth reading.

Why net zero buildings?

The UK government made a legal commitment, established in the **Climate Change Act of 2008** and updated in 2019, that the UK will reduce its greenhouse gas emissions by at least 100% of 1990 levels ('net zero') by 2050.

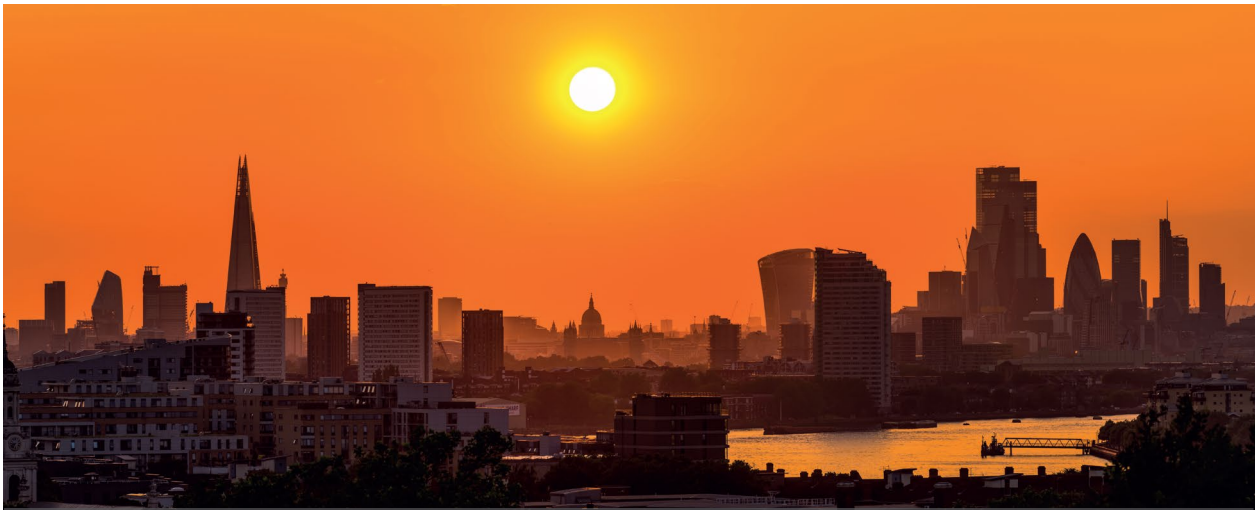
The Climate Change Committee (CCC) was also established in 2008 (under the Climate Change Act) as an independent statutory body to track and report on the UK government's progress in achieving targets for greenhouse gas emissions reduction. The CCC publishes regular reports, including **Carbon Budgets** which offer detailed analysis of sectors such as buildings. The most recent, **Sixth Carbon Budget** was published in 2020.

The CCC is an important advisory group as it holds the government accountable and produces regular expert insights into future pathways for achieving net zero.

Following the 2019 net zero goal announcement, the government published its **Ten Point Plan for a Green Industrial Revolution** in November 2020.

The Ten Point Plan provides a view of government thinking on 'building back better, supporting green jobs, and accelerating our path to net zero'. Topics include greening public transport from cycles to aircraft and developing renewable energy sources such as offshore wind and nuclear power. The subject of 'Greener buildings' is also addressed, and the Plan estimates that developing 'greener' buildings could deliver 71MtCO_2e (CO_2 equivalent) between 2023 and 2032 - which is 16% of UK emissions at 2018 levels.

In December 2020, the government published its **Energy White Paper** which sets out how the UK intends to 'make the transition to clean energy' by 2050'. This includes policies such as shifting from gas to electricity for our heating requirements and improving the insulation of homes and non-dwellings. The document also considers other broader issues, such as the use of hydrogen and carbon capture technologies.



A third document, **Net Zero Strategy: Build Back Greener**, was published in October 2021, and this provides further details on how the UK will remove carbon from its economy, including 'green' power generation and cutting the use of fossil fuels for heating.

Together the Energy White Paper, Ten Point Plan and Net Zero Strategy set the scene for why and how the UK will achieve its net zero carbon goal. And while they all deal with the entire UK economy and environment, the built environment has a vital role to play in getting to that objective.

For example, The Ten Point Plan sets out key government policy aims that impact the built environment:

- Development and implementation of a **Future Homes Standard** and **Future Buildings Standard**. These documents informed the development of updates to **Part L of the Building Regulations** (energy conservation) in 2021 and set out the trajectory for a future update in 2025.
- Decarbonising heating by moving away from our current reliance on natural gas.
- Encouraging take-up of heat pumps as an alternative to gas boilers, including setting a target of 600,000 heat pump installations per year by 2028.
- Launching a Public Sector Decarbonisation Scheme to provide grants (via Salix) to enable schools, hospitals, universities, and other public sector buildings to decarbonise.
- Setting higher EPC standards for private landlords in the domestic and commercial rental markets.

These goals set the background for many pieces of legislation that, when drawn together, deliver significant change in how buildings are designed, constructed and used to deliver energy and carbon savings. This legislation acts as a mechanism that pulls on several **levers for change** to improve the performance of all buildings - new-build and existing; residential and commercial - and the equipment used in them.

These levers are:

- Energy efficiency
- Decarbonisation of heat in buildings
- Climate change mitigation
- Carbon reduction and Net zero carbon

This document will analyse each of these areas and highlight the legislation and guidance that impacts them.

SUMMARY OF REFERENCES FOR THIS SECTION			
	CCC Sixth Carbon Budget (December 2020)		
	Ten Point Plan for a Green Industrial Revolution (Nov 2020)	**Future Homes Standard** (responses to consultation published January 2021)	**Part L of the Building Regulations Volumes 1 and 2** (dwellings and non-dwellings) updated and in force from June 2022
Climate Change Act of 2008 (updated in 2019 with the Net Zero 2050 target)	**Energy White Paper** (December 2020)	**Future Buildings Standard** (responses to consultation published December 2021)	
Establishment in 2008 of the Climate Change Committee	**Net Zero Strategy: Build Back Greener** (October 2021)		

The levers of change - 1. Energy efficiency

Building energy efficiency is closely linked to achieving the UK's national net zero objective in several ways. Currently, the UK relies on natural gas to produce most of its electricity which is a process that creates greenhouse gas emissions. Therefore, reducing the amount of electricity we use can help to pull back those emissions.

At the same time, the UK has been successfully reducing its reliance on fossil fuels to produce electricity, with wind (offshore and onshore) being a key renewable source. This 'greening' of our electricity grid is a vital step in getting to net zero.

However, we also need to reduce demand on the electricity grid while this transition takes place. Being efficient with our electricity use will allow us to move away from natural gas more quickly. To be 'green', we must also be 'lean'.

Energy efficiency - Legislation

Part L of the Building Regulations Conservation of Fuel and Power
Volume 1 (Dwellings)

Part L of the Building Regulations was updated in 2021, and the latest edition has been in force since June 2022. Part L focuses on homes and non-residential buildings of all types. Its overarching aim is to drive the construction and property sectors to deliver energy efficient and lower-carbon dwellings and other buildings. It therefore also covers the decarbonisation of heating (discussed in the next section in more detail).

Part L requires a new dwelling to achieve a 'minimum standard of total energy performance'. This is tested by comparing the dwelling's performance against that of a 'notional' residence of the same size and shape.

Part L 2021 states that, as long as a new dwelling meets the requirements for fabric energy efficiency (space heating or cooling requirements per square metre of floor area), it can meet the targets for primary energy and emissions using any combination of the following:

- Fabric efficiency
- Efficient building services
- Low and zero carbon technologies integrated in an 'appropriate mix'

Part L of the Building Regulations Conservation of Fuel and Power
Volume 2 (Non-dwellings)

As with dwellings, other buildings demonstrate compliance with Part L by meeting targets established with a notional building that is the same size and shape as the actual building. The full detail of the notional non-dwelling is set out using the National Calculation Methodology (NCM) Modelling Guide. This model is applied to a project using government-approved software such as the Simplified Building Energy Model (SBEM).

Part L 2022 requires new-build non-dwellings to achieve two targets:

- Target primary energy rate in kWh/m^2 per year.
- Target emission rate in $kgCO_2/m^2$ per year. Part L 2021 sets a target emission rate for new buildings that is 27% lower than the requirements of Part L 2016.

FURTHER READING

Mitsubishi Electric CPD Guide to the Updated Building Regulations 2021
https://library.mitsubishielectric.co.uk/pdf/book/Updated_Building_Regulations_2021_CPD_Guide

Energy Performance Certificates and Minimum Energy Efficiency Standards

Energy Performance Certificates (EPCs) were introduced in 2008 under the **Energy Performance of Building Regulations**.

The Regulations introduced several requirements for buildings focused on energy efficiency. This included the assessment and certification of a building with an EPC rating grade from A (highly efficient) to G (inefficient). The energy performance of a building is shown as a CO_2 based index. The use of EPCs applies to homes and non-dwellings.

It is important to note that an EPC is based on the potential energy performance of a building and does not examine the actual energy use of a building in operation. Ratings are based on characteristics such as fabric and services, including heating, ventilation and lighting, making the EPC and 'asset rating'.

The fact that EPCs are asset ratings rather than energy use measurements has been an issue. The predicted performance of a building (e.g., one with a high EPC rating) may not necessarily reflect its actual energy efficiency. This has created market demand for more accurate measures (see below) from building owners keen to access more accurate data.

Minimum Energy Efficiency Standards (MEES) were introduced through the **Energy Efficiency (Private Rented Property) Regulations 2015**. These set minimum EPC ratings required before the sale or rental of a domestic or non-domestic property. The MEES currently in place mean that a commercial building cannot be leased to a new tenancy if it has an EPC lower than E.

MEES has been a successful mechanism in driving energy efficiency in commercial buildings. And the government is using MEES to drive energy efficiency with proposed updates to the Standards. For example, from April 2023, the MEES requirements will extend to cover existing commercial leases (not just new ones).

Furthermore, the minimum EPC for the non-domestic private rented sector is set to rise to a C grade by 2027 and to require a minimum B rating by 2030. While there are exemptions for some buildings, MEES rules capture a significant proportion of commercial properties in the UK. The Department for Business Energy and Industrial Strategy (BEIS) has set the future trajectory for MEES to 2030.

FURTHER READING

Mitsubishi Electric CPD Guide to Minimum Energy Efficiency Standards for Non-dwellings
https://library.mitsubishielectric.co.uk/pdf/book/Issue_69_MEES

Product Energy Efficiency

In the 1990s, the European Union introduced the principles of Ecodesign and Ecolabelling for products to help consumers select the most energy efficient products. Since then, the legislation was extended, and product energy performance requirements have been raised.

Although the UK left the European Union, the legislation around the **ecodesign of energy using products** remains in place. This is known as the ecodesign of energy using products regulations (2010) or ErP.

The legislation includes building services equipment such as air conditioning, fans, electric motors, ventilation and heating and requires that products must:

- Have supporting technical documentation to demonstrate compliance
- Have a Declaration of Conformity
- Display the appropriate conformity mark, which is known as the UKCA mark in Great Britain or CE mark in Northern Ireland

The ErP regulations set out standard ways in which the energy efficiency of products is measured. This ensures that all manufacturers use the same approach to measuring, certifying and expressing the energy use of their products.

SEER - Seasonal Energy Efficiency Ratio

Shows the seasonal energy efficiency of the product in cooling mode

SCOP - Seasonal Coefficient of Performance

Shows the seasonal energy efficiency of a product in heating mode

Both figures must be calculated using the Standard BS EN 14825.

In the UK, these measures are applied through legislation such as Part L of the Building Regulations, for example, to set minimum requirements for product performance of heating and cooling systems within buildings.

FURTHER READING

www.gov.uk/guidance/placing-energy-related-products-on-the-uk-market

Energy efficiency in buildings - and other standards

Several voluntary assessment schemes for construction projects focus on energy efficiency and many other aspects of sustainability and low-carbon approaches to buildings. These are widely used in the UK and can impact the specification of building services since they often set higher standards than those required by legislation such as Part L.

BREEAM

The Building Research Establishment Environmental Assessment Method (BREEAM) is one of the longest-established assessment and certification methods for sustainable buildings. It provides a way for clients to establish their environmental goals for a building, as well as an independent assessment of asset performance. BREEAM now offers a range of tools covering many types of building, including refurbishment as well as new-build projects.

NABERS

This certification scheme was developed in Australia (its full title is the National Australian Built Environment Rating System). NABERS was introduced into the UK in 2020 and is a voluntary scheme focused on the energy efficiency of office buildings.

In this way, it differs from BREEAM, which includes broader consideration of a building's environmental impact. NABERS is currently only available for office buildings, and certifications are based on a one to six-star rating, with six being the most energy efficient ("Market Leading").

One of the most important characteristics of NABERS is that it helps bridge the gap between building owners and building occupiers so that both sides can benefit from best energy efficiency practices. Furthermore, NABERS closes the gap between how much energy a building is designed to use and how much energy it consumes in use – thus addressing the widely-acknowledged problem with the EPC rating approach.

The NABERS certification scheme in the UK is operated by BRE, working alongside other organisations such as the British Council for Offices, British Property Federation, CIBSE and RIBA. More information can be found on the website.

LEED

The Leadership in Energy and Environmental Design (LEED) is a 'green building' rating system developed by the US Green Building Council but now used globally and in the UK.

LEED is a points-based assessment and certification system that covers different areas such as energy, water efficiency and indoor environmental quality.

SKA Rating

SKA rating is an environmental assessment method owned by the Royal Institute for Chartered Surveyors (RICS). It is aimed at fit-out projects which are assessed against a set of good-practice sustainability criteria.

As RICS points out, around 11% of UK construction spend is on fit-outs, and buildings may have as many as thirty to forty fit-outs across their lifetime - making this an important area for focusing on efficiency and use of resources.

SKA ratings can be carried out informally as a self-assessment approach, but projects can also commission an independent assessment and certification from a RICS-accredited assessor. The SKA rating is also a way of benchmarking good practice across the industry.

WELL Building Standard

The WELL standard focuses specifically on the impact of buildings on occupant health and wellbeing. It is an independent certification scheme that looks at areas such as indoor air quality, light, comfort, and water as well as nourishment, comfort and mental wellbeing.

WELL's focus reflects the fact that humans spend 90% of their time indoors, so the built environment should support health and wellbeing in all aspects. The assessment covers over 100 features applied to each project and WELL can be applied in new and existing buildings, interiors and core-and-shell projects.

SUMMARY OF REFERENCES FOR THIS SECTION

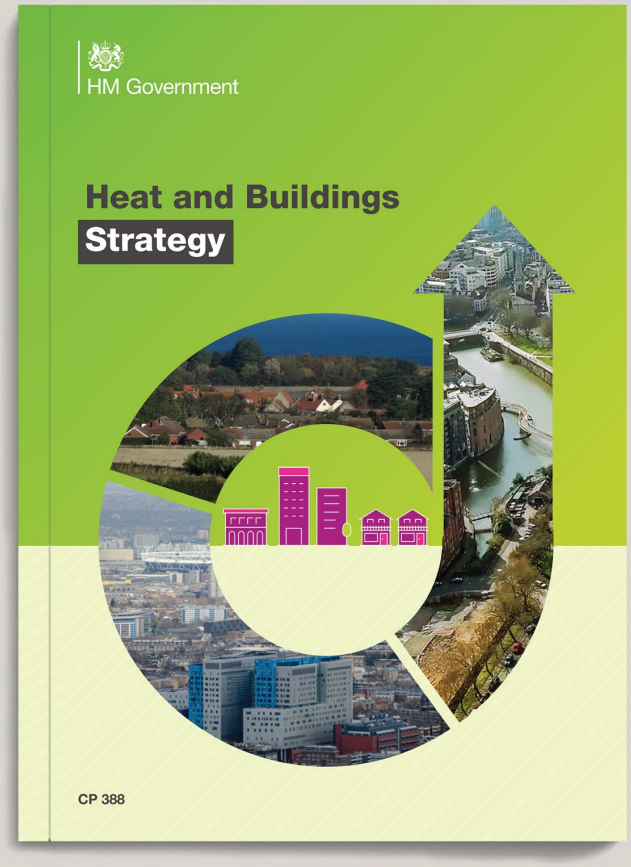
Energy Efficiency (Private Rented Property) Regulations 2015 (introduced Minimum Energy Efficiency Standards MEES)	**Energy Performance of Building Regulations** (introduced in 2008, but with amendments in 2020)	**Part L of the Building Regulations Volumes 1 and 2** (dwellings and non-dwellings) updated and in force from June 2022	**The Non-domestic private rented sector minimum energy efficiency standards - trajectory to 2030**	**Assessment & Certifications: BREEAM LEED NABERS SKA Rating WELL**
				Mitsubishi Electric CPD Guide to Minimum Energy Efficiency Standards for Non-dwellings
Ecodesign for Energy Related Products Regulations (2010) or ErP.	**UKCA mark** SEER and SCOP			

2. Decarbonisation of heating

The heating of homes, businesses, and industry is responsible for a third of the UK's greenhouse gas emissions. To meet the 2050 net zero target, the UK must reduce its reliance on fossil fuels to meet heating requirements.

To tackle this challenge, the government set out a **Heat in Buildings Strategy** published in October 2021. It builds in large part on an earlier document (published December 2018) titled **Clean Growth: Transforming heating – overview of current evidence**.

Both documents focus on making buildings energy efficient and ready to adopt technologies for low-carbon heating such as heat pumps and district heating.



Decarbonisation of heating - Legislation

Part L of the Building Regulations includes several requirements that focus on making it easier to apply low-carbon heating systems in homes and other buildings.

- New homes must be designed so that the maximum heating system temperature is 55ºC. This is so that they can make the most of lower carbon heat sources such as heat pumps. Even where a home is not completed with a heat pump system, it must be designed to allow for a change in the future. This rule also applies in the case of home improvements.
- The Standard Assessment Procedure (SAP) version 10.2 came into force from summer 2022. SAP provides the basis for the notional building, used to measure against the performance of the actual building. The updated SAP includes new carbon factors, which reflect the UK's increasing use of renewables to produce electricity. For designers, this means that electric heating systems such as heat pumps are a more attractive option when meeting Part L requirements.
- Non-dwellings must also achieve fabric energy efficiency while adopting efficient building services and low and zero-carbon technologies integrated in an appropriate mix.

Grants and schemes to support heat decarbonisation

To drive the take-up of alternatives to gas boilers, such as heat pumps, the government has introduced several schemes and grants.

Public Sector Decarbonisation Scheme - Launched in September 2020, the PSDC provides grants for public sector bodies to fund heat decarbonisation and energy efficiency measures. Administered by Salix, this scheme is sometimes referred to as the 'Salix' scheme.

Boiler Upgrade Scheme - Opened to applications in May 2022, it offers grants to property owners to install equipment such as heat pumps. The scheme is open to domestic and small non-domestic properties in England and Wales. It runs from 2022 to 2025.

Social Housing Decarbonisation Fund (Wave 2.1) - Established in 2020, with Wave 2.1 running from September 2022, to help upgrade a significant amount of the UK's social housing stock currently below EPC rating C. The aim is to deliver warm and energy efficient homes while also reducing carbon emissions.

Decarbonisation of heating - Guidance and other standards

Local Authorities

Many local authorities are exercising their planning powers to decarbonise heating within their local cities and towns. **The London Plan** has set the tone that many other cities are following.

As part of its goal of achieving net zero carbon for the capital, the Greater London Authority (GLA) used its 2021 Plan to highlight district heating and heat pumps as crucial technologies for helping to shift London's buildings away from a reliance on fossil fuels.

The GLA explored the positive impact of heat pumps in its 2018 report **Zero Carbon London: A 1.5°C Compatible Plan.** The publication points to a goal of 120,000 heat pump installations per year in London by the 2030s.

Manchester also raises the importance of decarbonisation in its **Five Year Environment Plan for Greater Manchester 2019 - 2024**. This sets out a pathway to 2040, to phase out gas boilers 'so that they account for less than 35% of home heating, with 60% of all domestic and commercial heating' being low carbon by 2040.

CIBSE

The Chartered Institution for Building Services Engineers (CIBSE) has produced guidance around net zero and energy efficiency. It has also recently launched AM17: Heat pumps for large non-domestic buildings. This document, authored by Arup and sponsored by BEIS, is free for designers and building owners.

Decarbonisation of heating - Guidance and other standards

SUMMARY OF REFERENCES FOR THIS SECTION

Clean Growth - Transforming Heating (December 2018)	**Heat and Buildings Strategy** (October 2021)	**Part L of the Building Regulations Volumes 1 and 2** (Updated 2021 and in force from June 2022)	**Public Sector Decarbonisation Scheme** (Launched September 2020)	**The London Plan** **Five Year Environment Plan for Greater Manchester 2019 - 2024.**
			Boiler Upgrade Scheme (Runs from 2022 to 2025)	**AM17: Heat pumps for large non-domestic buildings**
			Social Housing Decarbonisation Fund (Wave 2.1) (Runs from September 2022)	
			The Mitsubishi Electric CPD Guide to Commercial Renewable Heating	**Mitsubishi Electric CPD Guide to the London Plan 2021**

FURTHER READING

Mitsubishi Electric CPD Guide to the London Plan 2021
https://library.mitsubishielectric.co.uk/pdf/book/Issue_72_The_London_Plan_2021

The Mitsubishi Electric CPD Guide to Commercial Renewable Heating
https://library.mitsubishielectric.co.uk/pdf/book/Issue_71_Commercial_Renewable_Heating

3. Mitigating the effects of our changing climate

Climate change is impacting the UK in several ways. One of the most noticeable is in our hotter summers. The summer of 2022 saw temperatures reach 40ºC in some areas, with night-time temperatures remaining above 20ºC for several consecutive days.

This is not only a question of occupant comfort, but also of health and wellbeing. The UK Health Security Agency noted that in 2020 there were over 2,500 deaths attributable to excess heat and that number could triple by 2050.

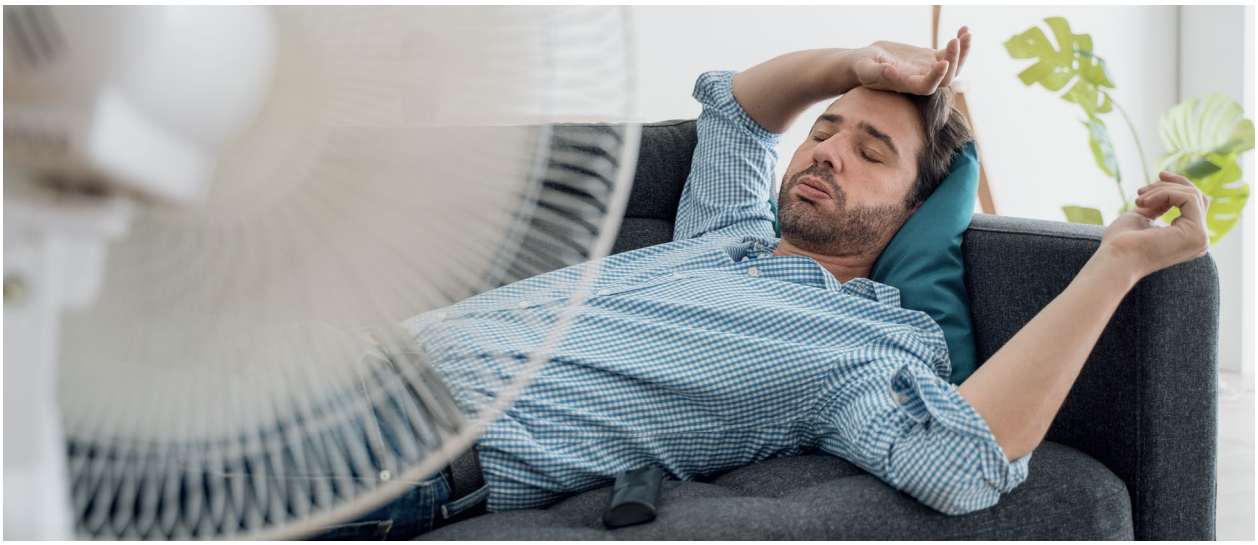
Managing climate risks is also an issue that has been raised by the Climate Change Committee which highlighted the problem of increasing temperatures in the UK as far back as 2014 in its report **Managing climate risks to wellbeing and the economy** and raised the issue more recently in its 2019 report **UK Housing: Fit for the future?**

With this issue in mind, Part O (Overheating) was added to the Building Regulations in 2021. Part O applies to dwellings only, and has two key objectives:

- To limit unwanted solar gains in summer
- To provide an adequate means of removing excess heat from the indoor environment

Designers must demonstrate compliance with Part O, and one method is to use CIBSE TM59 Design methodology for the assessment of overheating risk in homes.

Another impact of climate change related to rising temperatures is air quality. Higher outdoor temperatures can result in higher pollution which in turn can create issues with air quality indoors. The UK government addressed the challenge of air quality in its **2019 Clean Air Strategy**.



Mitigating the effects of our changing climate

In part, poor indoor air quality is also an unintended consequence of regulations to make buildings more airtight and energy efficient. As a result, **Part F of the Building Regulations** was updated in 2021 and includes a new requirement in non-dwellings to measure CO_2.

The regulation advises against 'snapshot' readings as these can be misleading and instead advises on continuous monitoring throughout the day. It's also important that CO_2 measurements are used as a "broad guide to ventilation" within a space, rather than safe thresholds.

SUMMARY OF REFERENCES FOR THIS SECTION

Managing climate risks to wellbeing and the economy Published 2014	**Part F of the Building Regulations** (Updated in 2021 and in force from June 2022)	
UK Housing: Fit for the future? Published 2019		**Mitsubishi Electric CPD Guide to the Updated Building Regulations 2021**
Clean Air Strategy Published 2019		

FURTHER READING

Mitsubishi Electric CPD Guide to the Updated Building Regulations 2021
https://library.mitsubishielectric.co.uk/pdf/book/Updated_Building_Regulations_2021_CPD_Guide

Mitsubishi Electric CPD Guide to Indoor Air Quality (IAQ)
https://library.mitsubishielectric.co.uk/pdf/book/Indoor_Air_Quality

A Beginner's Guide to Indoor Air Quality by Mitsubishi Electric and BESA
https://library.mitsubishielectric.co.uk/pdf/book/Indoor_Air_Quality_Guide

Buildings as Safe Havens by Mitsubishi Electric and BESA
https://les.mitsubishielectric.co.uk/the-hub/making-our-buildings-safe-havens

4. Carbon reduction and net zero buildings

The overarching goal of achieving net zero emissions by 2050 means driving carbon out of the UK economy at every stage. While energy efficiency in buildings will help to make progress in that direction by reducing emissions from power generation, we also need to consider other areas where carbon or other greenhouse gases may be present.

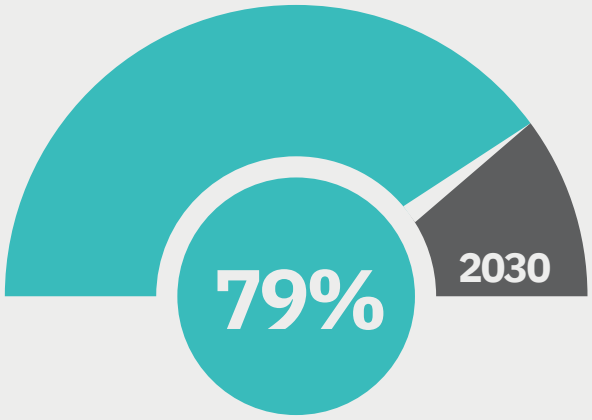
One example that has impacted building services significantly is in the use of fluorinated gases for refrigerants in air conditioning and heat pumps. In 2014, the European Union began a process of reducing the amount of environmentally damaging chemicals known as hydrofluorocarbons (HFCs) available across the EU. The approach was established as a phase-down - a gradual reduction over time of the amount of HFCs allowed onto the market.

The phase down was established under a set of rules known as the **Fluorinated Gas Regulations (F Gas Regulations)**. The Regulations identified chemicals with a high Global Warming Potential (GWP). This is expressed as a number, with higher GWPs indicating greater potential damage to the atmosphere.

The F Gas regulations not only reduced the amount of high GWP chemicals on the market, but also introduced other requirements such as regular leak checks on air conditioning equipment and certification for anyone handling these chemicals.

Although the UK is no longer a member of the EU, the UK government has committed to follow the same phase-down schedule, aiming for a 79% reduction in F gases by 2030 against a baseline of the average volume of HFCs on the market between 2009 and 2012. The regulations are now overseen by the Department for Environment, Food & Rural Affairs (DEFRA).

The impact of the F Gas regulations on air conditioning systems is significant and has seen the phase-out of once widely used refrigerants such as R22 and increasing use of lower GWP refrigerants such as R32. An important point to note about changes in the refrigerant market is that some refrigerants are covered by the British Standard BS EN378. This requires that where a refrigerant meets the criteria, leak detection must be used.



UK committed to
79% REDUCTION
in F gases by 2030

Carbon reduction and net zero buildings

However, while the F Gas Regulations focus on one aspect of building technology, there are wider considerations. Much has been written about the concept of 'Net Zero buildings', yet they are not currently defined in regulations such as Part L, for example. Nor is there a standard assessment approach to certify a building as 'net zero'.

There is a growing awareness of the impact of embodied carbon in the built environment, along with operational carbon emissions and as a result, the construction and property sectors have been leading the way on this issue. The UK Green Building Council launched a **Whole Life Carbon Roadmap for the Built Environment** which provides a 'common vision and agreed actions' for achieving net zero carbon in the construction, operation and demolition of buildings and infrastructure.

CIBSE has been working with several other organisations including RIBA, RICS, BRE and the Carbon Trust to develop a **Net Zero Carbon Buildings Standard**. This Standard would provide the necessary definitions, as well as a standard methodology for assessing and certifying 'net zero' buildings. The project is underway with the aim of launching towards the end of 2022.

A number of organisations, including CIBSE, RIBA and the UK Green Building Council are also supporting the development of **Part Z of the Building Regulations** which will cover the assessment of whole life carbon in the built environment, with a view to limiting embodied carbon emissions.

FURTHER READING

Mitsubishi Electric Guide to F Gas Regulations and the Future of Refrigerants
https://library.mitsubishielectric.co.uk/pdf/book/Issue_78_F_Gas_Regulations_and_the_Future_of_Refrigerants

SUMMARY OF REFERENCES FOR THIS SECTION		
European Union F Gas Regulation	BS EN 378 Refrigerating systems and heat pumps. Safety and environmental requirements - Basic requirements, definitions, classification and selection criteria	
UK F Gas Regulation operated by DEFRA		Mitsubishi Electric Guide to F Gas Regulations and the Future of Refrigerants
Net Zero Carbon Buildings Standard	Part Z proposal	

Outlook for the HVAC sector - technologies and techniques

The four main levers used by government to move the UK towards the net zero 2050 goal are having a significant impact on the design, installation and operation of building services. As a result, product manufacturers, consultants and building managers must explore and adopt new ways to provide services such as heating, hot water, ventilation and air conditioning to all types of buildings.

If we consider each of the levers in turn, we can see how government legislation and other guidance can be viewed as an opportunity to make different decisions about equipment choice and use.

The Four Levers

Energy Efficiency

Leading manufacturers have been working to the higher efficiency standards set by legislation such as EcoDesign requirements, ensuring that their equipment can provide optimum performance with minimal energy waste.

However, it is important to ensure that buildings are designed so that they require less heating and cooling, but still deliver healthy and productive indoor environments. New buildings must adhere to the standards set out in the recently updated Parts L and F. And while it is more challenging to change the heating and cooling demand of existing buildings, it is possible to update systems using modular chillers, for example, which are easier to apply in existing spaces.

Heat recovery chillers are also another option which provide a highly energy-efficient approach to heating and cooling in commercial buildings. Heat recovery systems capture rejected heat from one part of a building and transfer it to another part of the building, or to support domestic hot water requirements. An added benefit of heat recovery chillers is that they have a small footprint compared to using separate plant for heating and cooling, making them an excellent option for sites with less space for plant.

Monitoring and control are equally important for operational energy efficiency. The latest heating and cooling technologies should include control systems that can be stand-alone or which link to building energy management systems (BEMS). This is not only important for energy use monitoring but can also be used to track other factors such as indoor air quality.

In addition, it is important to remember that service and maintenance can play a crucial role in energy efficient buildings. Working with a service and maintenance provider to focus on efficient operation of equipment can pay dividends in reduced downtime and long-term optimal performance.

FURTHER READING

Mitsubishi Electric CPD Guide to Modular Chillers
https://library.mitsubishielectric.co.uk/pdf/book/Modular_Chillers

Mitsubishi Electric CPD Guide to Controls & Monitoring
https://library.mitsubishielectric.co.uk/pdf/book/Controls_Monitoring_CPD

Mitsubishi Electric CPD Guide to Heat Recovery Chillers
https://library.mitsubishielectric.co.uk/pdf/book/67_HEAT_RECOVERY_CHILLERS

OTHER USEFUL LINKS

Mitsubishi Electric Service & Maintenance:
https://les.mitsubishielectric.co.uk/end-users/service-and-maintenance

Decarbonisation of heating

Perhaps the biggest single change for the future of building services is the UK's switch away from fossil fuels such as natural gas for the provision of heating and hot water in our buildings. This means making the most of the UK's 'green grid' as we increase our renewable electricity generation while also adopting a communal approach to heat generation and use where possible.

The UK government has highlighted two key technologies which it views as important alternatives to traditional equipment such as gas boilers:

- Heat pumps
- District heating

Heat pumps are now well-established in the UK and recognised as key to decarbonising UK heating. In the Ten Point Plan, the government set its target for 600,000 annual heat pump installations by 2028. While this may seem ambitious, heat pump technology has advanced considerably in the past ten years to the point where it can be used to meet the hot water demands in commercial environments.

District heating systems can also make use of heat pumps, for example, in communal heating systems for multi-residential buildings. A heat pump can be used to produce high temperature water (e.g., 80°C) to supplement an existing heat network, produce lower temperature water (e.g., 60°C) for a new 4th generation heat network, or low temperature to serve a balanced energy network (or ambient loop).

In this approach, water at approximately 20-30°C can be delivered to each apartment, and its own water-to-water heat pump then adds additional heat to serve the space heating and hot water needs (cooling can also be provided if necessary).

FURTHER READING

Mitsubishi Electric CPD Guide to Commercial Renewable Heating
https://library.mitsubishielectric.co.uk/pdf/book/Issue_71_Commercial_Renewable_Heating

Mitsubishi Electric CPD Guide to Multi-Residential Buildings - Heating, Hot Water and Ventilation Technologies
https://library.mitsubishielectric.co.uk/pdf/book/Issue_76_Multi_Residential_Buildings_Heating_Hot_Water_and_Ventilation_Technologies

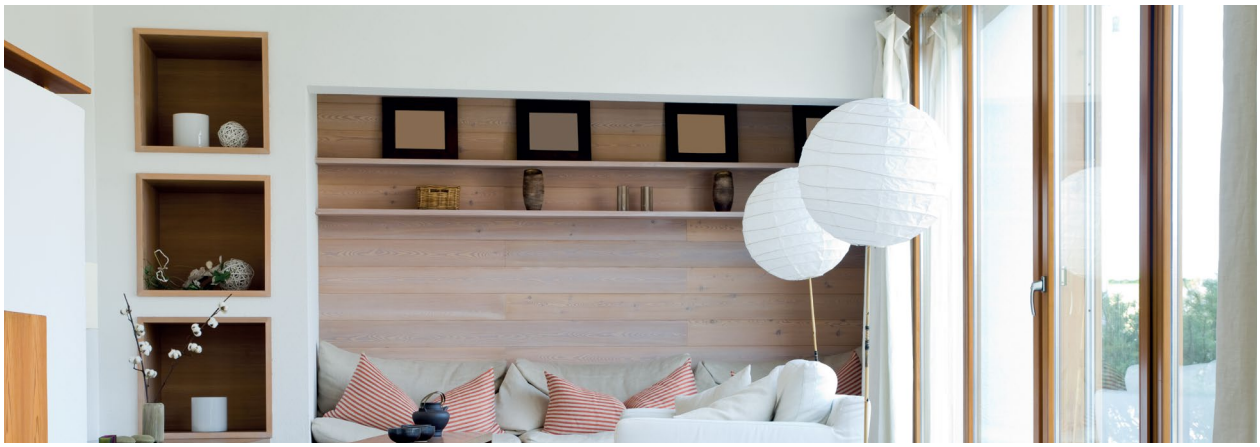
Mitigating the effects of our changing climate

The introduction of Part O (Overheating) of the Building Regulations in 2021 reflects a growing awareness that the UK's climate is changing. Part O focuses on the provision of ventilation in dwellings, particularly in urban spaces, such as London.

While natural ventilation has a part to play, this is not always a practical solution in cities where issues such as noise, outdoor pollution and security must also be considered. Technologies such as mechanical ventilation with heat recovery (MVHR) are therefore becoming more important in the design of homes because it can deliver improved indoor air quality in an energy-efficient way. But other buildings including offices and schools can also benefit from MVHR in that it supports occupant health and wellbeing along with energy efficient re-application of waste heat to incoming air.

People are increasingly aware of the importance of indoor air quality whether they are at home or work. Unfortunately, as the UK faces hotter summers, outdoor air pollution is becoming more of a problem as it impacts indoor air quality.

Modern MVHR systems can also be fitted with filters to enhance pollution filtration, including NOx filtration. And there are bolt-on filtration options for commercial environments that can provide enhanced filtration to air conditioning systems.



FURTHER READING

Mitsubishi Electric CPD Guide to Indoor Air Quality
https://library.mitsubishielectric.co.uk/pdf/book/Indoor_Air_Quality

OTHER USEFUL LINKS

Mitsubishi Electric - Indoor Air Quality:
https://les.mitsubishielectric.co.uk/indoor-air-quality

Carbon reduction and net zero buildings

The air conditioning sector has been adopting new refrigerants for several years now. We have seen increased use of R32 (with a GWP of 675) in VRF systems, for example, as well as the adoption of hydrofluoro-olefins (HFOs) such as R1234ze (with a GWP of 7).

These new generation refrigerants change the performance of equipment, so it is important to be aware that the choice of air conditioning system will affect the type of refrigerant that can be applied - and vice versa.

For example, refrigerants can be categorised as high or low-density. Low-density refrigerants are better suited for use with screw compressor systems; on the other hand, high-density refrigerants, such as R32, work better in inverter-driven systems. It is therefore increasingly important for consultants and installers to speak with manufacturers to understand which system will provide the best performance for a building's requirements.

FURTHER READING

Mitsubishi Electric CPD Guide to F Gas Regulations and the Future of Refrigerants
https://library.mitsubishielectric.co.uk/pdf/book/Issue_78_F_Gas_Regulations_and_the_Future_of_Refrigerants

Mitsubishi Electric Overview of Embodied Carbon in the Built Environment
https://les.mitsubishielectric.co.uk/sustainability/embodied-carbon

OTHER USEFUL LINKS

Mitsubishi Electric – Understanding embodied carbon
https://les.mitsubishielectric.co.uk/sustainability/embodied-carbon

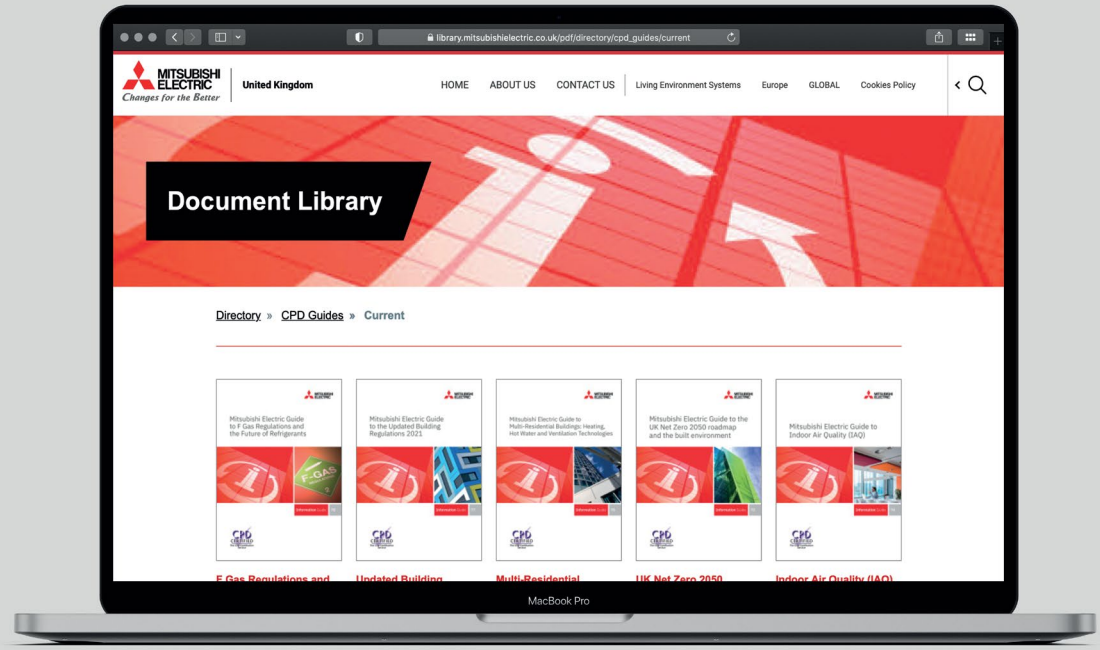
Mitsubishi Electric – Sustainability and the built environment
https://les.mitsubishielectric.co.uk/sustainability-and-the-built-environment

Conclusions

Awareness of the current and future legislative landscape for the built environment and building services is more important than ever.

As we approach the 2050 net zero deadline, we will see increasingly tight targets for energy use in buildings and a greater focus on achieving net-zero buildings in design and performance. Making the right decisions about system design will be vital to ensuring that clients have buildings that retain their value in the long term.

Mitsubishi Electric has set out to provide its customers, and the wider industry with a library of CPD guides to many of the issues raised in this document. We aim to help raise awareness and support our sector as it meets the net zero challenge – and allows the UK to achieve its low-carbon future.



Visit **library.mitsubishielectric.co.uk/pdf/directory/cpd_guides**

To receive a CPD seminar on ‘the Sustainable Buildings Landscape’, you can call your Mitsubishi Electric Regional Sales Office to arrange an in-house presentation of this information.

If you would like to receive invitations to future CPD events, please email **livingenvironmentalsystems@meuk.mee.com**

Further information

Regional Sales Offices, please call one of the numbers below:

Birmingham
Tel: 0121 329 1970

Bristol
Tel: 01454 202050

Wakefield
Tel: 01924 241120

Scotland
Tel: 01506 444960

Manchester
Tel: 0161 866 6060

London South Region
Tel: 01737 387170

London North Region and East Anglia
Tel: 01707 282480

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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 November 2022

Green Gateway greengateway.mitsubishielectric.co.uk