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By Mitsubishi Electric

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# Mitsubishi Electric Service & Maintenance

## Evolution not revolution - existing buildings and the net-zero challenge


Guide

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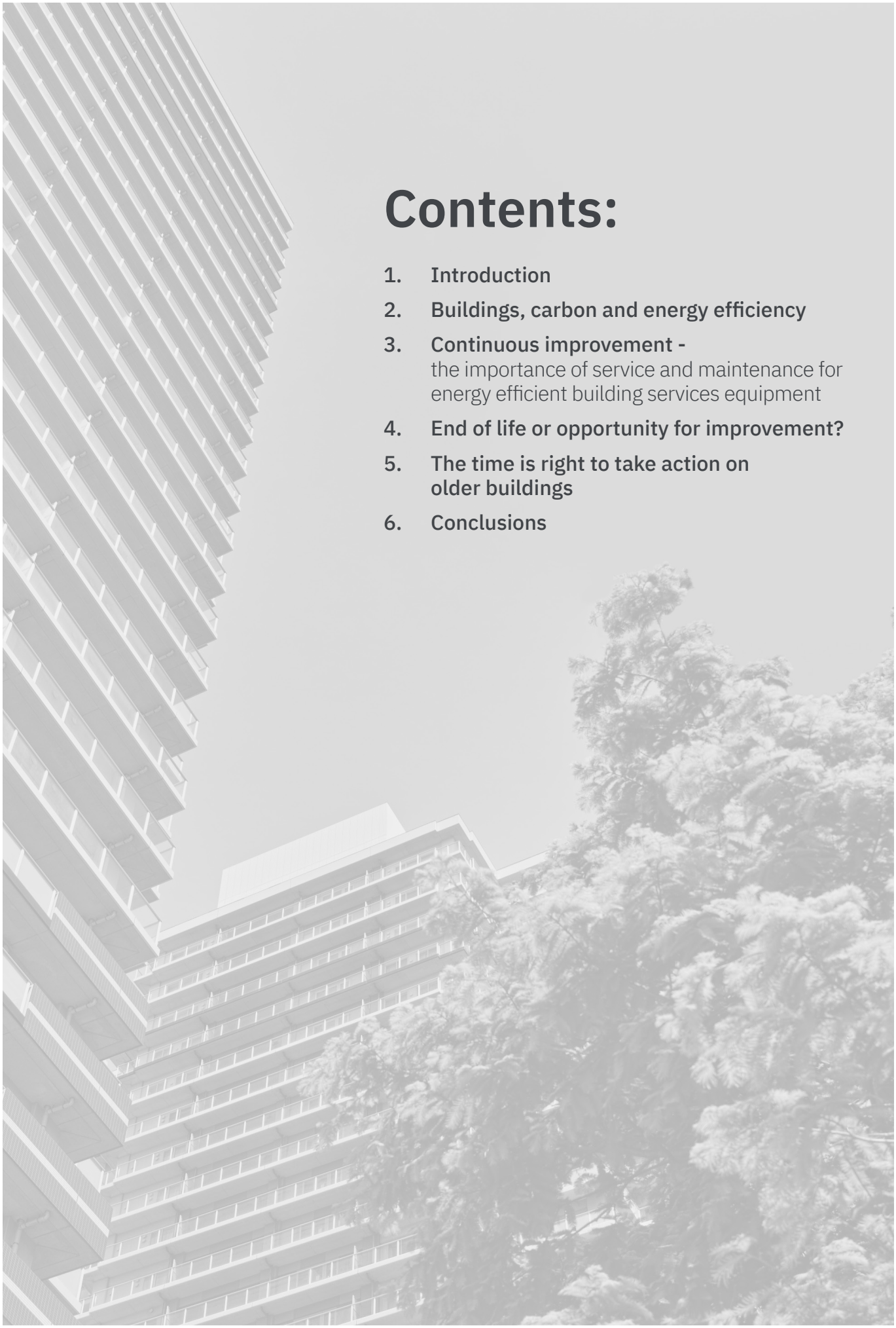

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# Introduction

The UK government is focused on reducing the carbon footprint of our built environment as a vital part of achieving Net Zero emissions by 2050, **However, it is increasingly evident that our existing commercial building stock poses several significant challenges.**

Most commercial buildings we see today will still be with us in 2050. They have been designed and constructed to previous building regulations, which set lower energy performance standards than the new Part L 2021. What's more, **these older commercial buildings are falling further behind** their modern counterparts with every update of the Building Regulations.

It's not only in terms of energy efficiency and carbon emissions that the older building stock is behind the times. Issues such as indoor air quality (IAQ) must also be considered. As one of the cornerstones of occupant wellbeing, IAQ is directly addressed in the recently updated Part F 2021. Again, older buildings are performing to lower ventilation and indoor health standards - creating issues for landlords and tenants alike.

The question is, how do we tackle the challenge of our existing commercial building stock? Demolition and rebuild is not always a practical solution and is being increasingly prevented at the local planning stage. This start-over approach is becoming less attractive in the face of increasing concern over the embodied carbon of buildings. Demolition simply moves the problem to landfill unless materials from the building can be re-used, which can be a challenge with buildings not designed with this end in mind.

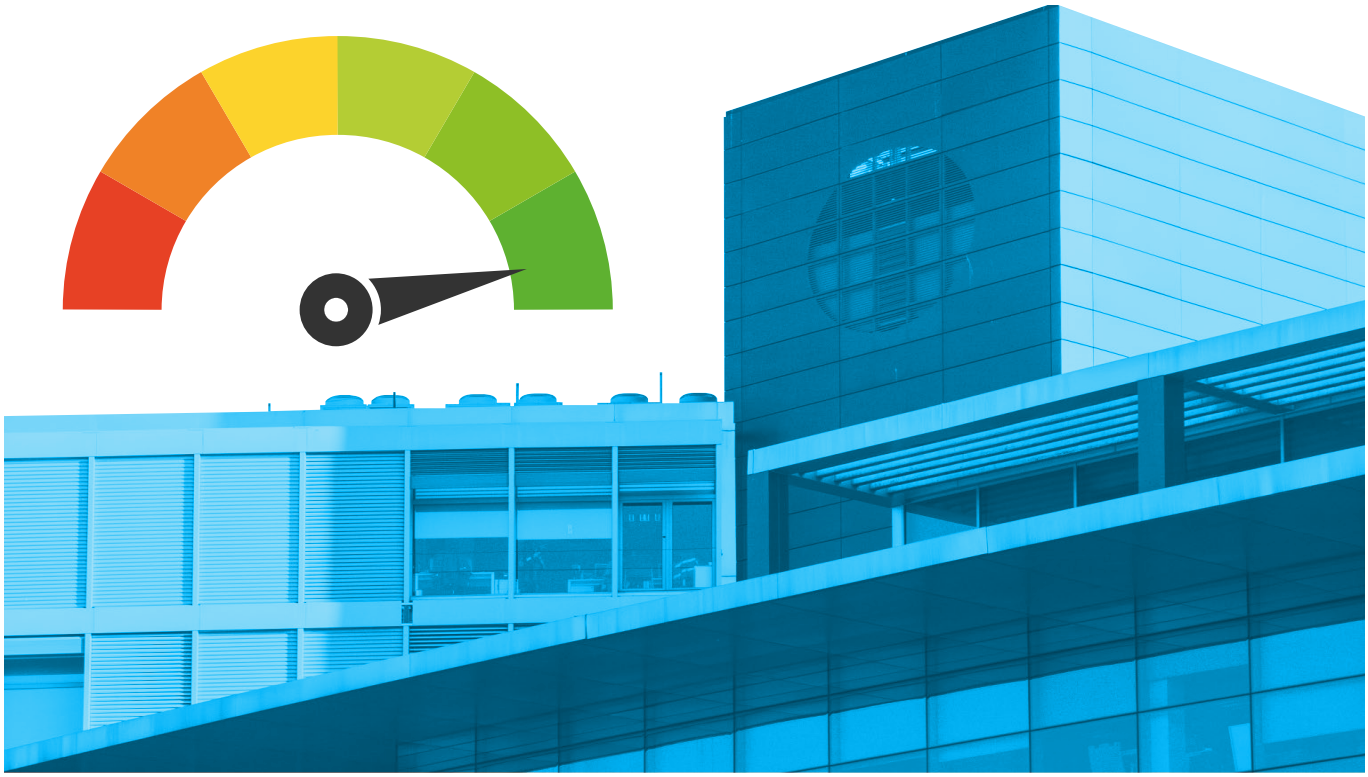
**The latest thinking is that it's much better to preserve and improve the buildings we have.** For example, guidance from the Mayor of London on Whole Life-Cycle Carbon Assessments (March 2022)[1] says that demolition should be considered as a last resort.

It states: **"Retaining existing built structures for reuse and retrofit, in part or as a whole, should be prioritised before considering substantial demolition, as this is typically the lowest-carbon option."**

Commercial buildings are more than spaces for tenants and occupants. They are investment instruments used by almost all the leading insurance and pension companies as a store of wealth for their customers. Therefore, the value of these assets over time has significant implications for fund managers and investors.

It is clear then, that we need careful consideration of how we address the issue of existing commercial buildings to improve their energy performance, retain their commercial value and ensure that they provide comfortable, safe and healthy environments for occupants for many years to come.

**1. Mayor of London: London Plan Guidance – Whole Life-Cycle Carbon Assessments, March 2022**
https://www.london.gov.uk/sites/default/files/lpg_-_wlca_guidance.pdf



# Buildings, carbon and energy efficiency

There are two categories of carbon emissions associated with buildings: Embodied carbon and Operational carbon. **Together, these make up what is referred to as the Whole Life Carbon of a building.**

Facilities management teams can impact both types, and decisions made around service and maintenance can help improve the whole life performance of an existing building.

Embodied carbon refers to the carbon emissions created when a building is constructed. This includes the carbon emissions from manufacturing all materials, including concrete, steel and glass. It also encompasses their transportation to site and installation. Similarly, there is embodied carbon in every piece of equipment within a building, from carpets and furniture to heating and cooling systems.

**Constructing a new building is very 'carbon intensive', hence there is growing reluctance from central and local governments to continue a demolish-and-rebuild-approach for commercial buildings.**

**Therefore, steps that can be taken to extend the life of the building and the equipment in it can help to ensure this embodied carbon is mitigated over time.** If we calculate the embodied carbon of the products that make up air conditioning systems, for example, then every year we can keep those systems running will help to offset that initial environmental impact. Therefore, service and maintenance have a key role in reducing the building's overall carbon footprint.

Operational carbon can be 'direct' in the form of emissions from on-site burning of fossil fuels, for example in gas or oil boilers. However, 'indirect' emissions make up the bulk of a building's operational carbon. This is produced by gas (or sometimes coal) fired plants during electricity generation.

Although the UK has made a successful move to using more 'green' electricity generated by wind, we still rely on fossil fuels for power generation. Optimising the energy efficiency of buildings can therefore reduce operational carbon emissions considerably. Products that heat, cool or ventilate create significant operational carbon emissions over their lifetimes. Chillers, for instance, have a lifespan of fifteen to twenty years, so ensuring that performance is optimised over that time is vital. It is another good reason to make service and maintenance central to achieving this in the long-term.

Another critical point about operational carbon and energy efficiency is that the UK will be better positioned to move to zero carbon generation if we use less energy in our buildings. Simply switching to green tariffs is not acceptable or practical in the long term. Furthermore, if UK buildings continue to use energy at the same rate and switch to electric heating as an alternative to gas, we cannot generate sufficient renewable energy to meet those requirements, putting the Net Zero 2050 target at risk. The link between building energy efficiency and carbon emissions reduction is therefore crucial for FM teams to understand. Service and maintenance strategies should focus on energy efficiency to improve the whole life carbon performance of buildings.

## **Energy use intensity:** linking energy and carbon

Measuring energy use and carbon emissions in the built environment is increasingly important. Although the UK government currently focuses on EPCs (Energy Performance Certificates), many building engineers and property managers feel these lack accuracy. An EPC is a theoretical measure of how much energy a building might use, which can differ widely from actual energy use.

An alternative measure is becoming more popular with leading property groups, including RICS, RIBA and CIBSE. This is Energy Use Intensity (EUI).

EUI includes all energy use in the building as measured at the meter and set against the building floor area. It is calculated as kWh/$m^2$. Many building energy and carbon reduction groups, such as the UK Green Building Council and Better Buildings Partnership, are recommending the official adoption of EUI as a measure for all buildings

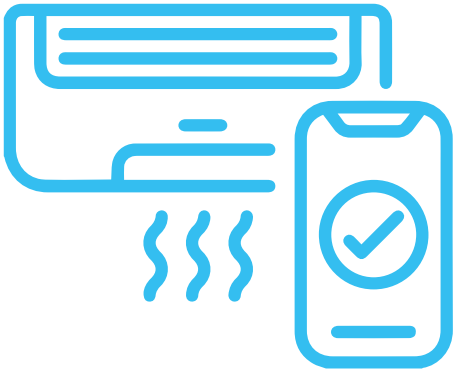
# Continuous improvement -

## the importance of service and maintenance for energy efficient building services equipment

Building services such as heating, cooling and ventilation are significant energy users in most commercial buildings. Setting up a maintenance strategy for equipment such as chillers, air handling units and VRF systems will reduce energy waste. Most building services equipment manufacturers require a minimum level of maintenance to maintain warranty coverage.

**But regular servicing must go beyond a minimum yearly tick-box exercise to have a real impact on long-term performance.**

# Mitsubishi Electric Service & Maintenance



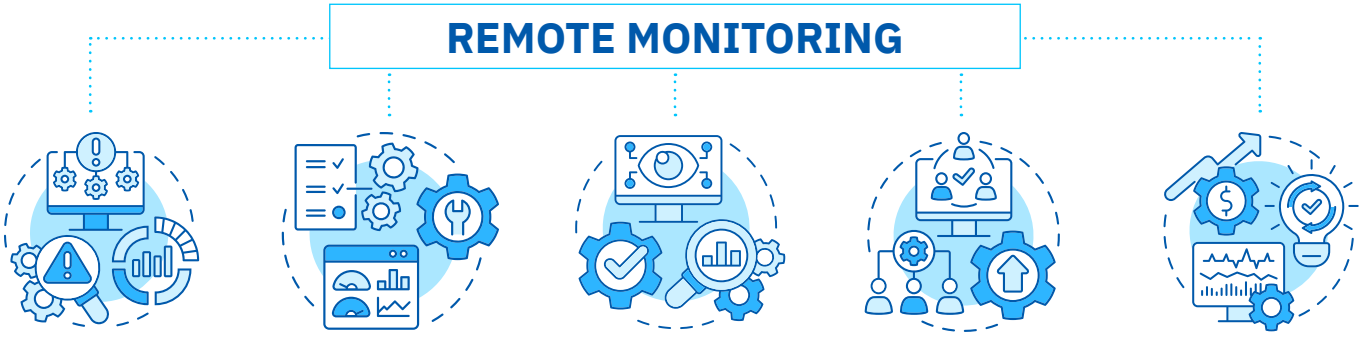
**Modern HVAC equipment is built to last but needs regular service and maintenance to achieve a long and effective lifetime.** Left to its own devices, equipment won't necessarily develop faults, but performance will degrade over time. As that happens, the equipment will probably use more energy and reach its end-of-life sooner.

Planned Preventative Maintenance (PPM) means that building services equipment is regularly checked to ensure continued efficient performance. Scheduled visits reduce the likelihood of costly emergency call-outs - and the breakdown of vital services such as air conditioning, for example. If PPM is combined with remote monitoring technology, service teams can continuously monitor the performance of HVAC, even when not on-site. Remote monitoring is becoming more widely used as a vital tool for facilities management, and internet-enabled sensors are more common in today's buildings.

Remote monitoring allows engineers to observe the performance of chillers, for example. Any changes in performance patterns create an immediate alert. Adjustments can be made remotely, or a maintenance expert can be sent to site. Data from equipment can be collected and sent via the internet to remote monitoring centres where it is analysed. Any deviation in performance patterns (no matter how small) will be detected automatically and, if necessary, generate a response from maintenance teams. As an added benefit, if there is a problem with a piece of equipment, remote monitoring makes it more likely that an engineer can arrive with the correct part to put things right.

As buildings are becoming smarter, facilities teams and maintenance providers are finding ways to make the most of connected technologies. Combining regular, PPM with remote monitoring is ideal for optimising equipment performance, such as chillers. And adding remote monitoring reassures building managers of continuous monitoring to spot potential problems before they result in breakdowns.

At Mitsubishi Electric Service and Maintenance, we build long-term solutions for our clients. PPM is the ideal approach as, in our view, it costs more to fix a fault than it does to anticipate and prevent it from happening to extend the life of an asset.



# End of life or opportunity for improvement?

Another benefit of PPM, when combined with continuous monitoring, is that data **allows building owners and managers to understand exactly how a piece of equipment is performing.**

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**It is always good to be aware of performance issues that might indicate problems ahead. For instance, several early signs might indicate a chiller that is not operating at peak performance:**

**1. Chillers are suddenly less reliable**

Had years of problem-free operation, but now you're seeing a build-up of niggling issues? A recent series of glitches may indicate that it's time to take a closer look to find what's behind this downturn in performance.

**2. Chillers are becoming energy-hungry**

If you've been tracking energy use from your chillers (for instance, via the building management system) and noticed that they're using more energy for the same performance, the chances are that something's not right. Chillers can be significant energy users, so it's vital to ensure they're as efficient as possible throughout their lifetimes.

**3. Indoor temperatures are unstable**

Complaints from building occupants that they're experiencing 'hot spots' as the weather warms up could indicate that chiller performance is falling away. This could be the result of changes within the building (moving partition walls or increased occupancy in certain areas, for example). However, it would be wise to ensure that the chiller is still performing optimally.

**4. Chillers have been standing idle for some time**

If your building (or parts of it) closed during the last 18 months, it's likely that your chiller has been shut off or running at minimal levels. While that might not seem like a problem, it can be an excellent idea to double-check performance and restart it correctly.

**5. Chillers are ageing**

Chillers generally have a long life, but there are limits to how long it will last. This is particularly true if you've been carrying out the bare minimum of maintenance. It might be time to let the experts take a look and perhaps give it a new lease of life.

In the long term, this data can help decide whether a piece of equipment needs a refurbishment or replacement. At Mitsubishi Electric Service and Maintenance, we discuss the option of an upgrade very carefully with clients.

Sometimes, it's simply not practical to change the entire system. However, with good advice and planning, we can help to prolong the life of existing equipment. We can review what is in the building today and help to plan a maintenance programme that will improve IAQ and energy efficiency - without the immediate need to replace an entire system. When considering replacing an air conditioning system, speaking with service and maintenance experts is a good idea. At Mitsubishi Electric, we have found that in some cases, we can save clients the cost and disruption of replacing an old system simply by providing an updated maintenance schedule. We never like to condemn a system that can be salvaged because the cost is as much environmental as financial.

# The time is right to take action on older buildings

With the introduction of Part L 2021, performance standards for new buildings are rising. The new regulations came into force in June 2022 and require new non-dwellings to achieve a 30% reduction in carbon emissions against previous regulations. **And in 2025, the government will introduce the New Buildings Standard which will push that target even higher.**


**The Minimum Energy Efficiency Standards (MEES) for commercial buildings are also changing. The current minimum EPC rating required by law for a leased non-dwelling is E.** However, the government has stated that from 2030 it intends to introduce a minimum EPC rating of B requirement for privately rented non-domestic buildings.

| **No. of lodgements** (non domestic buildings with EPC) | **EPC Rating** | **Percentage of total lodgements** |
|---|---|---|
| 553 | A+ | 0.05% |
| 18,634 | A | 1.80% |
| 94,975 | B | 9.18% |
| 296,275 | C | 28.62% |
| 317,828 | D | 30.70% |
| 175,494 | E | 16.95% |
| 59,545 | F | 5.75% |
| 71,845 | G | 6.94% |

Data from Government Live Tables on Energy Performance of Buildings Certificates from England & Wales

**The table above shows cumulative figures (from 2009) on EPCs for non-domestic buildings that are legally required to have the certificates. The data represents 1,035,149 'lodgements', as the buildings are referred to, which is around 730,000,000m² total floor area.**

Approximately 88% of buildings currently have EPC certificates less than Grade B. As a result, a significant amount of refurbishment work and maintenance will be needed to bring those buildings up to standard by 2030.

However, it is not only legislation driving the need for well-maintained and operationally efficient buildings, particularly where offices are concerned. The increasing adoption of a hybrid approach that combines working-from-home with office-based work means that buildings must be more flexible than ever. As corporate employers reassess their use of offices, they are increasingly looking for high-quality space that supports productive work, face-to-face collaboration and creativity - all of which help to retain a valued workforce. As we switch away from old work patterns, the building services must be more adaptable and able to provide very high standards of indoor environmental health and comfort.

**2. Non-domestic EPCs lodged from 2009 to 2021**
https://www.gov.uk/government/statistical-data-sets/live-tables-on-energy-performance-of-buildings-certificates#epcs-for-non-domestic-properties.

# Conclusions

Service and maintenance have a crucial role to play in today's buildings. ESG strategies are increasingly dealt with at the boardroom level, and building performance is a vital element of any corporate carbon measures. **Sustainable FM is therefore, no longer an 'add-on', but central to the role.**

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**Facilities teams contribute to success at the strategic and tactical levels. They can contribute to building long-term operational efficiency plans while helping deliver practical solutions on the ground.**

Not only can service and maintenance strategies ensure that equipment operates efficiently and effectively, but they can also help prolong the lifetime of that equipment. And as we increasingly consider the embodied carbon of a building and the services in it, the potential to refurbish rather than replace equipment is one that building owners should always consider.

Working with a service and maintenance team that understands the requirements of the modern building and its occupants means that you can make the most of the latest methods and technologies to ensure optimal building operation now and for many years into the future.

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*Changes for the Better*

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By Mitsubishi Electric

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Note: The fuse rating is for guidance only and 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), R290 (GWP:3), R32 (GWP:675), R407C (GWP:1774), R134a (GWP:1430), R513A (GWP:631), R454B (GWP:466), R454C (GWP:148), 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 September 2023**


Green Gateway
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