



Department for Levelling Up,
Housing & Communities

The Future Buildings Standard: 2021

Consultation on changes to Part L (conservation of fuel and power) and Part F (ventilation) of the Building Regulations for non-domestic buildings and dwellings; and overheating in new residential buildings

Summary of responses received and Government response



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Department of Levelling Up, Housing and Communities
Fry Building
2 Marsham Street
London
SW1P 4DF
Telephone: 030 3444 0000

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Executive Summary

This document sets out the Government's response to the second stage of a two-part consultation on proposed changes to Part L (Conservation of fuel and power) of the Building Regulations.

The consultation contained proposals for changes to the energy efficiency standards for non-domestic buildings, as well as covering the wider impacts of Part L. The consultation also included changes to Part F (Ventilation) for domestic and non-domestic buildings and its associated Approved Document guidance, and proposals for an approach to overheating in new residential buildings.

Chapter 2

We said that from 2025, the Future Buildings Standard will deliver new non-domestic buildings that are zero-carbon ready

- ✓ With implementation starting from 2025, the Future Buildings Standard will produce highly efficient new non-domestic buildings which use low-carbon heat and have the best fabric standards possible.
- ✓ No further energy efficiency retrofit work will be necessary to enable these buildings to become zero-carbon as the electricity grid continues to decarbonise.
- ✓ We intend to start a full technical consultation on the Future Buildings Standard in 2023.

Chapter 3

We said that in 2021 we would introduce an interim uplift in energy efficiency standards for new non-domestic buildings to encourage low carbon systems and high levels of insulation and provide a stepping-stone to the Future Buildings Standard

- ✓ As well as improving the energy efficiency of new buildings in the short term, the interim uplift will make sure that construction professionals and supply chains are working to higher specifications in readiness for the introduction of the Future Buildings Standard from 2025.
- ✓ The uplift will deliver high-quality non-domestic buildings which are expected to produce 27% less CO₂ emissions compared to current standards.

Chapter 3

We proposed three performance metrics for new non-domestic buildings to be measured against as part of the 2021 standard: primary energy, CO₂ emission target, and minimum standards for fabric and fixed building services

- ✓ We will employ the performance metrics set out in the consultation: a new primary energy target, a CO₂ emissions target and minimum standards for fabric and fixed building services.
- ✓ The introduction of a primary energy metric will enable us to make good use of our nation's energy resources and prioritise the energy efficiency of each building, regardless of the heat source.

Chapter 4

As part of the 2021 uplift, we proposed to simplify the guidance on ventilation in new and existing non-domestic buildings and introduce measures to mitigate the risk of transmission of infection via aerosols in new non-domestic buildings

- ✓ We will update the guidance to reference additional measures which should be installed to reduce the risk of infection in new buildings.
- ✓ This will also update standards in guidance to mitigate the risk of transmission of infection via aerosols, including the provision of air quality monitors (CO₂ monitors) and additional standards for recirculating ventilation systems, in all new offices.
- ✓ We will maintain an ongoing review of the evidence of the benefits which may be provided by increased ventilation capacity in offices and other buildings, ahead of possible implementation in the full Future Building Standard from 2025.

Chapter 5

As part of the 2021 uplift, we proposed a new regulatory requirement for overheating mitigation in new residential buildings

- ✓ We will proceed with introducing a new part of the Building Regulations to reduce overheating risk.
- ✓ The scope of the overheating requirement will be new residential buildings. This includes houses, flats, residential care homes, student accommodation, and children's homes.
- ✓ This requirement will make sure there are high standards for new residential buildings, and it will protect the most vulnerable, the elderly and the very young where they live and sleep.

Chapter 6

As part of the 2021 uplift, we sought views on what level to set the Fabric Energy Efficiency Standards for new homes

- ✓ We will set the Fabric Energy Efficiency Standard at the full fabric specification set out in the consultation.

- ✓ This will make sure there is a meaningful uplift to the fabric of new homes and greater CO₂ savings.
- ✓ This high standard of energy efficiency will also better support the transition to the even higher fabric standards that we expect will be part of the Future Homes Standard.

Chapter 7

As part of the 2021 uplift, we proposed changes to the guidance on ventilation for existing homes to improve compliance with ventilation requirements

- ✓ We will proceed with requiring trickle vents when windows are replaced in homes.
- ✓ We will proceed with a new method for assessing ventilation when energy efficiency work is done to existing buildings to make sure any lost ventilation is replaced.

Chapter 1 – Introduction

Net zero emissions and climate change

- 1.1 The Government remains committed to meeting its target of net zero emissions by 2050 and recognises the important contribution of the energy efficiency of buildings.
- 1.2 Heating and powering buildings currently accounts for 40% of the UK's total energy usage¹. The challenges involved in improving the energy efficiency of our buildings and reducing carbon emissions are significant. Government has already made great strides forward in reducing emissions in new homes. As a result of previous uplifts to Part L of the Building Regulations, regulated emissions from homes built today equate to less than half that of homes built 20 years ago. It is an area, however, where we can and must maintain momentum. By making our buildings more energy efficient and moving to cleaner sources of heat, we can reduce carbon emissions and keep energy costs down now and in the future.
- 1.3 The Net Zero Strategy sets out the policies and proposals for decarbonising all sectors of the UK economy, including 'Heat and Buildings', to meet our 2050 target. The Heat and Buildings Strategy builds on that by giving more detail on the UK's overall approach to decarbonising buildings. It aims to provide a clear direction of travel for the 2020s; set out the strategic decisions that need to be taken this decade; and demonstrate how we plan to meet our carbon targets and remain on track for net zero by 2050. It highlights the important role that improving the energy performance standards in the Building Regulations must play in this. Alongside our focus on new and existing homes, we are making improvements to the Building Regulations and the accompanying statutory guidance for new and existing non-domestic buildings.
- 1.4 This document sets out our response to the second stage of our two-part consultation on proposed changes to Part L (Conservation of fuel and power), and Part F (Ventilation) of the Building Regulations for non-domestic buildings and dwellings; and overheating in new residential buildings. The first stage of the consultation was called *The Future Homes Standard: 2019 Consultation on changes to Part L (conservation of fuel and power) and Part F (ventilation) of the Building Regulations for new dwellings* and the Government response to it was published on 19 January 2021.
- 1.5 Together, these consultations have shaped the forthcoming 2021 changes to Parts L and F of the Building Regulations for both domestic and non-domestic buildings. This provides an interim step prior to the full Future Homes and Future Buildings Standards which cover new buildings and will be consulted upon further in 2023 and implemented in 2025. Many of the non-domestic buildings that will exist in 2050 have already been built however, and the forthcoming 2021 changes therefore also present an important opportunity to raise standards in existing

¹ Department for Business, Energy & Industrial Strategy, 2019. The Grand Challenge missions. Available online: <https://www.gov.uk/government/publications/industrial-strategy-the-grand-challenges/missions>

buildings under certain circumstances. Beyond these changes, the Government is still carrying out wider work to consider the future of existing buildings and decarbonisation.

1.6 Figure 1 sets out the scope of the recent two-stage consultation, as well as the intended scope of the Future Homes and Future Buildings Standards. Those items shown in green were the subject of the first part of the two-stage consultation, the Future Homes Standard consultation, published in October 2019. Those items in orange were the subject of the second stage of the consultation, the Future Buildings Standard consultation.

Buildings Fit for the Future					
	2021	2022	2023	2024	2025
New Homes	Part L & F uplift	Technical development of FHS proposals	FHS technical consultation		Future Homes Standard
	FEES ⁱ Overheating				
Existing Homes	Part L & F uplift				
Existing Non-Domestic	Part L & F uplift				
New Non-domestic	Part L & F uplift	Technical development of FBS proposals	FBS technical consultation		Future Buildings Standard

Figure 1: Contents of the Future Homes Standard and Future Buildings Standard consultations.
 i. The Fabric Energy Efficiency Standard (FEES) was reconsidered on in the 2021 FBS consultation, alongside some building services standards and guidance on the calibration of devices that carry out airtightness testing.

Building safety

1.7 In response to Dame Judith Hackitt’s review, *The Independent Review of Building Regulations and Fire Safety*, the Government set out its intention to “fundamentally reform the building safety system so that residents are, and feel, safe in their homes”. In line with this, our review of current policies in ventilation and overheating highlighted key issues which needed to be addressed in order to improve health and safety. In addition, as part of a systems approach to building regulation, as recommended by *The Independent Review of Building Regulations and Fire Safety*, it is important that we make sure that policies to improve energy efficiency of new homes do not have unintended consequences and increase safety risks. Our consultation therefore included proposals on these areas and how these impact on both energy performance and the health and safety of building residents and users.

- 1.8 COVID-19 has shown the importance of ventilation in reducing the spread of infection. Overheating in buildings has also been highlighted as a key risk for the health and productivity of people and businesses in the UK as the climate becomes warmer. Our proposals for ventilation and overheating improve the safety of building residents and users by simplifying and clarifying guidance to improve compliance, introducing a new legal requirement to make clear the responsibility lies with builders to reduce the risk of overheating when constructing a building and making it mandatory for more information on ventilation and overheating to be provided to building owners. These proposals align with the reformed overarching approach to safety recommended by *The Independent Review of Building Regulations and Fire Safety*.
- 1.9 Together, all the changes proposed across the two stages of the consultations provide a pathway towards creating homes and buildings that are fit for the future, better for the environment, affordable for consumers to heat, and safer.

Vision for new building standards

- 1.10 By making our buildings more energy efficient and embracing smart technologies, we can cut energy bills, reduce demand for energy, and boost economic growth while meeting our targets for carbon reduction and maintaining healthy environments. The Committee on Climate Change has stated that achieving the UK's net zero target will require the full decarbonisation of buildings by 2050.
- 1.11 The introduction of the Future Buildings Standard will achieve a considerable improvement in energy efficiency standards for new buildings. The Future Buildings Standard consultation, launched in January 2021, represented a first step in incentivising these changes by providing a clear vision for what the Standard will look like and providing proposals for its implementation.
- 1.12 In the consultation we proposed that:
- With implementation starting from 2025, the Future Buildings Standard will produce highly efficient non-domestic buildings which use low-carbon heat and have the best fabric standards possible, ensuring they are better for the environment and fit for the future.
 - Buildings built to the Future Buildings Standard will be zero carbon ready, with the ability to decarbonise over time alongside the national grid without any further energy efficiency retrofit work.
 - Implementation of the Future Buildings Standard will reflect that there is vast diversity in building type, size and end-use of non-domestic buildings.
- 1.13 In the consultation we set our proposals for non-domestic buildings for the 2021 interim uplift to the Building Regulations which will help to support the implementation of the Future Buildings Standard from 2025. The consultation also set out some proposals for domestic buildings, which will help to support the implementation of the Future Homes Standard in 2025. The Government response to *The Future Homes Standard: 2019 Consultation on changes to Part L (conservation of fuel and power) and Part F (ventilation) of the Building*

Regulations for new dwellings set out our vision for what the Future Homes Standard will look like.

Consultation overview

- 1.14 Government published the Future Buildings Standard consultation on 18 January 2021. We sought views on our plans for a Future Buildings Standard for new buildings from 2025, and proposed options for an interim increase to the energy efficiency requirements for new buildings ahead of that.
- 1.15 In the consultation we also proposed options for Part L in respect of existing buildings, as well as covering the wider impacts of Part L, including changes to Part F (Ventilation) for domestic and non-domestic buildings and its associated Approved Document guidance. We also included proposals for an approach to overheating in new residential buildings.

Consultation response

- 1.16 The Department received a total of 743 individual responses to the consultation from a wide range of organisations, representative and trade bodies, industry professionals, academics and individual members of the public. We would like to thank everyone that took the time to respond, often with detailed submissions and supporting evidence. All of the views that were shared with us have been taken into consideration.
- 1.17 A breakdown of the responses we received according to different stakeholder categories is provided in Table 1.

Respondent type	Number of responses
Builder/Developer	40
Building Control Approved Inspector	1
Competent Persons Scheme Operator	5
Designer/Engineer/Surveyor	149
Architect	209
Energy sector	23
Installer/Specialist sub-contractor	8
Local authority	43
Manufacturer/Supply chain	59
National representative or trade body	60
Professional body or institution	23
Property Management	7
Research/Academic organisation	21
Member of the public	25
Other	70

- 1.18 This response document sets out a summary of the responses we received to the 132 consultation questions and outlines the Government's response on each issue. A quantitative analysis of the responses we received to each question is provided. Where we asked for views or comments, we have summarised the main points raised by stakeholders. As a summary, however, this paper does not attempt to capture every point made during the consultation process.

Approved Documents

- 1.19 The finalised versions of *Approved Document L, Volume 1: Dwellings*; *Approved Document F, Volume 1: Dwellings*; *Approved Document L, Volume 2: Buildings other than dwellings*; *Approved Document F, Volume 2: Buildings other than dwellings*; and *Approved Document O: Overheating*, are available online through the following link:

<https://www.gov.uk/government/collections/approved-documents>

- 1.20 The drafts of *Approved Document L, Volume 1: Dwellings*; *Approved Document F, Volume 1: Dwellings*; *Approved Document L, Volume 2: Buildings other than dwellings*; *Approved Document F, Volume 2: Buildings other than dwellings*; and the *Approved Document O: Overheating* which accompanied the Future Buildings Standard Consultation are still available online via the link below. In this document, they are referred to as the 2021 draft *Approved Document L, Volume 1: Dwellings*; the 2021 draft *Approved Document F, Volume 1: Dwellings*; the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings*; the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings*; and the 2021 draft *Approved Document O: Overheating* respectively. They are available online through the following link:

<https://www.gov.uk/government/publications/building-regulations-approved-documents-l-f-and-overheating-consultation-version>

Implementation of the uplift

- 1.21 Alongside publication of this document, the 2021 uplift has been implemented through changes to the Building Regulations and publication of new statutory guidance. There is a 6-month period before the new regulations come into effect, on 15 June 2022, to allow industry to prepare.

Chapter 2 – The Future Buildings Standard

What should the Future Buildings Standard look like?

Question 1:
 Our aim is that buildings constructed to the Future Buildings Standard will be capable of becoming carbon neutral over time as the electricity grid and heat networks decarbonise. Do you agree that the outline of the Future Buildings Standard in this chapter meets this aim?

2.1 In Chapter 2 of the consultation, we outlined the Government’s high-level vision for what the Future Buildings Standard could look like and the steps required to introduce this, with implementation proposed as starting in 2025. We expect that buildings constructed to the Future Buildings Standard will need to use low-carbon heating and hot water systems in almost all circumstances and that a large proportion of this low-carbon heat will come from the national electricity grid.

Question 1	No. of responses	% of all responses	% split for Q1
(a) Yes	153	20.6%	25%
(b) No	451	60.7%	75%
Did not respond	139	18.7%	-

2.2 Support for the Government’s proposed approach was highest among respondents that identified as: local authorities; manufacturers/supply chains; national representatives/trade bodies; and energy sector. Support was lowest among respondents that identified as: builders/developers; designers/engineers/surveyors; architects; professional bodies or institutions; and research/academic organisations. In the stakeholder categories where support was low, many of the respondents said that they welcomed the focus on fabric efficiencies and low carbon technology but had concerns around the detail.

2.3 A common concern was that the proposal was not suitably ambitious. The importance of meeting the 2050 net zero target and the need to phase out fossil fuels as soon as possible were highlighted. Some concern was also expressed that the proposal only considers carbon in an operational context and does not account for whole life cycle carbon emissions, including embodied carbon.

2.4 Some respondents raised concern around the potential use of primary energy as a performance metric. This point was predominantly raised by respondents that identified as: designers/engineers/surveyors; national representatives/trade bodies; and professional bodies or institutions. Various alternative metrics were proposed, with some respondents making the case that unregulated energy (i.e. energy used in the building, but not currently regulated by the Building Regulations) should also be included.

- 2.5 Broader concerns were raised regarding the method for assessing building design and performance. Some respondents felt that the notional building model can make it difficult to judge the exact impact of a building design and can lead to inefficient buildings as a result. There were also proposals that post-occupancy evaluation should be carried out, or other methods adopted, to help to address the performance gap that currently exists.
- 2.6 Some respondents highlighted that the proposed approach is very reliant on the decarbonisation of the electricity grid and that there will be significant pressure on the grid as a result. In a similar vein, a few respondents across the stakeholder categories felt that the proposal needs to have a more holistic approach, with greater focus on passive measures, including stricter fabric requirements, and more emphasis on reducing energy demand.
- 2.7 Other key issues raised by respondents included:
- The importance of maintaining performance-based standards which are technology agnostic.
 - The need for a greater focus on alternative energy solutions, including renewable options, hydrogen-based technology and hybrid systems.
 - The benefits of bringing forward the implementation of the Future Buildings Standard.
 - Concerns around energy costs, and wider cost effectiveness, of the proposed approach.
 - The need for Government to publish a roadmap showing future targets beyond 2025 to provide direction and clarity.
 - The importance of considering behavioural factors and ensuring that clear information is provided to the occupants of buildings on effective building usage.

Government response to Question 1

- 2.8 The energy performance of buildings has a large role to play in ensuring the UK reaches net zero greenhouse gas emissions by 2050. With implementation starting from 2025, the Future Buildings Standard will produce highly efficient non-domestic buildings which use low-carbon heat and have the best fabric standards possible, ensuring they are better for the environment and fit for the future. We anticipate that buildings constructed to the Future Buildings Standard will be zero carbon ready, decarbonising over time alongside the electricity grid without any further energy efficiency retrofit work.
- 2.9 The Building Regulations will continue to set minimum energy performance standards. Developers are encouraged to go beyond the standards if they wish and continue pushing the boundaries of innovation.
- 2.10 We have noted the calls for the proposals to be more ambitious and we will take this into consideration as we develop a full technical consultation on the Future Buildings Standard. The technical consultation, which is planned to start in 2023, will provide proposals for the technical detail and associated draft guidance of the

Future Buildings Standard. Ahead of a full consultation, we will begin the work of engaging with stakeholders on the technical detail of the Future Buildings Standard. We intend to work with industry to make sure sector-specific guidance is developed for builders, designers and installers; and embed understanding of the Future Buildings Standard.

- 2.11 Concerns were raised regarding the energy performance of buildings which were beyond the scope of the consultation or existing Building Regulations, including questions about embodied carbon and tackling the performance gap. Alongside our work on the Future Buildings and Future Homes Standards, DLUHC and BEIS are developing a Statement of Intent that will consider what more needs to be done by government and industry to deliver net zero buildings by 2050. We are engaging with industry to develop this Statement, which will address both embodied carbon and the performance gap. We hope to publish this shortly and it will be part of our considerations while developing the full technical consultations for both the Future Buildings and Future Homes Standards.
- 2.12 Some consultation responses raised concerns around the potential performance metrics of the Future Buildings Standard. We have not yet determined the performance metrics for the Future Buildings Standard, these will be consulted on as part of the full technical consultation.

Question 2:

We believe that developers will typically deploy heat pumps and heat networks to deliver the low carbon heating requirement of the Future Buildings Standard where practical. What are your views on this and in what circumstances should other low carbon technologies, such as direct electric heating or hydrogen, be used?

- 2.13 The diversity of non-domestic buildings means that the solutions required to meet the Future Buildings Standard will vary across the building mix. We intend to continue to allow developers the flexibility to innovate and select the most practical and cost-effective solutions. We expect, however, that a low carbon heating system will be integral to the specification of the Future Buildings Standard.
- 2.14 There are a number of existing low carbon heating technologies which could support the scale of change that is required to meet our ambition for highly efficient non-domestic buildings which use low-carbon heat. We anticipate that heat pumps and heat networks, and to a lesser extent direct electric heating, will be the principal means of producing low-carbon heat for buildings built to the Future Buildings Standard.
- 2.15 More than half of all those who responded to this question agreed with the assumption that heat pumps and heat networks would be the principal means to deliver the low carbon requirement. Support for this approach was highest among respondents that identified as designers/engineers/surveyors; architects; local authorities; manufacturers/supply chains; and national representatives/trade bodies.
- 2.16 These same stakeholder groups also felt that direct electric heating should be used in circumstances where it would be more efficient than heat pumps/networks,

specifically where heat demand is low, in small spaces, or in highly energy efficient buildings. Overall, just over 40% of all those who responded agreed with the use of direct electric heating in such limited circumstances.

- 2.17 A quarter of those who responded to the question considered that hydrogen is an expensive, unproven, and unfeasible option for the near future. A similar number of respondents, however, considered that hydrogen should be welcomed especially when the technology and supply has developed sufficiently.
- 2.18 Around a fifth of those who responded to the question expressed the importance of ensuring that the Future Buildings Standard is technology neutral, allows innovation, and provides the flexibility to make sure the best solution is used for each individual circumstance, recognising that there is no 'one size fits all solution'. Other technology types mentioned included biofuels, solar, photovoltaic and heat batteries.
- 2.19 Just over one in ten of those who responded stated the importance of first developing highly efficient buildings and then installing low carbon technology to supply the small amount of heat that may be required. This view was favoured the most by designers/engineers/surveyors and architects.
- 2.20 Some other key issues raised by respondents included:
- The recognition that new technologies may emerge which have particular advantages and the importance of retaining pathways for such technologies to be accepted in future if they prove to offer low carbon benefits.
 - The need for the Future Buildings Standard to include a clear intent with regards to the potential of hydrogen and build flexibility into the Standard rather than precluding a technology outcome.
 - The need to acknowledge that heat network deployment is not evenly spread across the UK and offers less opportunities to decarbonise buildings outside of heat-dense, urban areas.
 - The importance of considering the impact that any increased electricity demand (e.g. by heat pumps, direct electric) might have on the load on the grid infrastructure, both locally and nationally.

Government response to Question 2

- 2.21 We will need to move away from fossil fuel heating in order to meet our commitment to net zero greenhouse gas emissions by 2050. The future is likely to see a mix of low carbon technologies used for heating and it is unlikely that there will be a one-size-fits all solution, as set out in the Heat and Buildings Strategy, so multiple technologies will play a role.
- 2.22 The Future Buildings Standard will be set in performance terms without prescribing the specific technologies used, which means that builders and developers will have the flexibility they need to innovate and select the most practical and cost-effective solutions in any particular development.

- 2.23 Electrification, however, is currently one of the few proven scalable options for decarbonising heat. As set out in the consultation, we therefore expect that the installation of heat pumps will play a key role in delivering low carbon heat for buildings built to the Future Buildings Standard. Heat pumps are highly efficient, providing significantly more heat than the electricity used.
- 2.24 Heat networks will also have an important role to play and are often an excellent solution for new buildings in towns and cities because of their ability to integrate the lowest-carbon heat sources. Heat networks are the only way we can exploit larger scale renewable and recovered heat sources such as energy from waste, waste heat and heat from rivers and mines.
- 2.25 We anticipate that direct electric heating will play a minor role in the delivery of the Future Buildings Standard and that there will also be a role, where appropriate, for other low-carbon technologies and renewable electricity generation such as solar photovoltaics.
- 2.26 Government will continue to work in partnership with industry and other key stakeholders to test and evaluate the potential of hydrogen as an option for heating buildings.

Implementing the Future Buildings Standard

Question 3:

Do you agree that some non-domestic building types are more suitable for low carbon heating and hot water, and that some non-domestic building types are more challenging?

- 2.27 We are committed to implementing higher energy efficiency standards to the fastest achievable timeline, while ensuring that new standards are introduced in a way that takes how buildings are constructed and procured into account and which act as a set of achievable minimum standards. Implementation of the standard needs to reflect this and the diversity of the non-domestic building stock affected by the regulations.

Question 3	No. of responses	% of all responses	% split for Q3
(a) Yes	217	29.2%	59%
(b) No	148	19.9%	41%
Did not respond	378	50.9%	-

- 2.28 The majority of those that responded to this question agreed that some non-domestic building types are more suitable for low carbon heating and hot water, and that some non-domestic types would be more challenging.
- 2.29 Nearly a third of respondents to the question acknowledged that while some non-domestic building types are more challenging, it is still possible for all building

types to use low carbon solutions, and that there should be no loopholes for not doing so. This view was highest among respondents that identified as designers/engineers/surveyors and architects.

- 2.30 Some respondents recommended that an overly prescriptive approach for the Future Buildings Standard should be avoided as it would limit innovation in the market. The importance of having a fabric first approach was raised, with some respondents highlighting the challenges of low carbon heat in off gas grid areas. The need to consider the ability of the current electricity network and infrastructure to meet demand was also highlighted.

Question 4:

Do you agree with the allocation of building types to space and water heating demand types, as presented in Table 2.1 of this consultation document?

- 2.31 When considering the best way to implement the Future Buildings Standard, we proposed splitting non-domestic buildings into three broad types of space and water heating demand:

- **Type 1 demand:** space heating demand more suitable for heat pumps. Domestic hot water demand more suitable for point-of-use or heat pump.
- **Type 2 demand:** space heating demand more suitable for heat pumps. High domestic hot water demand, which may be less suitable to be provided using point-of-use or heat pumps.
- **Type 3 demand:** space heating demand less suitable for heat pumps. Domestic hot water demand more suitable for point-of-use or heat pump.

- 2.32 In the consultation we provided the following table indicating which broad building types may fall into each category of demand.

Table 2 – Demand types identified for specific building types

Demand type	Building type
Type 1 demand: space heating demand more suitable for heat pumps. Domestic hot water demand more suitable for point-of-use or heat pump.	Offices, multi-residential buildings, prisons, primary schools, secondary schools, retail units, community centres, courts, libraries, museums, airport terminals, data centres, theatres
Type 2 demand: space heating demand more suitable for heat pumps. High domestic hot water demand, which may be less suitable to be provided using point-of-use or heat pumps.	Hotels, hospitals, other health care buildings, restaurants
Type 3 demand: space heating demand less suitable for heat pumps. Domestic hot water demand more suitable for point-of-use or heat pump.	Retail warehouses, distribution warehouses, industrial process buildings, sports halls

Question 4	No. of responses	% of all responses	% split for Q4
(a) Yes	145	19.5%	49%
(b) No	150	20.2%	51%
Did not respond	448	60.3%	-

- 2.33 A common concern expressed by respondents was that the proposed approach is oversimplified and that it needs to be more flexible and account for other factors. This view was particularly common among manufacturers/supply chains and national representatives/trade bodies. It was argued that usage/performance can vary between buildings in the same category and that it is not dictated by building typology alone. Similarly, several respondents felt that suitability for a given technology is not dictated by usage alone but instead by a range of factors. Many respondents, mostly designers/engineers/surveyors and architects, also emphasised the need to do more to reduce heating demand.
- 2.34 A common view among respondents who disagreed with the proposal was that the proposal is too pessimistic about the use of heat pumps for addressing the hot water demand of Type 2 buildings. It was argued that certain heat pumps, for example CO₂ heat pumps, could be capable of meeting this demand. Similarly, some respondents felt that heat pumps, or a combination of heat pumps with other solutions, could be used to address the space heating requirements of Type 3 buildings.
- 2.35 Some suggestions were made regarding the categorisation of specific building types, with several respondents recommending that smaller buildings from Type 2 should be moved to Type 1. There were also some respondents that felt that each

project should be evaluated on a case-by-case basis rather than adhering to pre-defined categorisations.

2.36 Other key issues raised by respondents included:

- The need to account for the fact that buildings can change use over time.
- The need to consider cooling of buildings and the impact that may have on the suitability of heat pumps.

Question 5:

We would like to introduce the Future Buildings Standard for all buildings as quickly as possible. When do you think the Future Buildings Standard should introduce low carbon space heating for buildings with Type 1 or Type 2 demand (buildings that have space heating demand more suitable for heat pumps)?

2.37 Our ambition is for the Future Buildings Standard to be implemented in 2025, but we recognise that there may be different timelines for implementation that may be more suitable for different building types depending on their heat and hot water demand characteristics. In the consultation we proposed that buildings with Type 1 and Type 2 demand should be ready to adopt heat pumps or other forms of low-carbon space heating in 2025.

Question 5	No. of responses	% of all responses	% split for Q5
(a) 2025	142	19.1%	42%
ASAP	26	3.5%	8%
2021	30	4.0%	9%
2021/2022	40	5.4%	12%
2022	41	5.5%	12%
2023	30	4.0%	9%
2024	2	0.3%	1%
2026-2029	1	0.1%	0%
2030-2049	1	0.1%	0%
Other	26	3.5%	8%
Did not respond	404	54.4%	-

2.38 Support for the Government's proposal to introduce low carbon space heating for buildings with Type 1 or Type 2 demand in 2025 was highest among stakeholders that identified as: manufacturers/supply chain; national representatives/trade bodies; research/academic organisations; and energy sector. Many who favoured introduction in 2025 felt that the sector needs time and certainty to make the necessary preparations.

2.39 The majority of respondents who identified as architects favoured an introductory date earlier than 2025. More than half the architects who responded to the question highlighted the fact that we are in a climate emergency and/or the importance of achieving net zero emissions by 2050.

- 2.40 Many respondents who supported an introductory date earlier than 2025 argued that there are no technical barriers to earlier implementation. They felt that the necessary technology already exists and that we can therefore move faster than proposed. It was also argued that an earlier implementation date would provide industry with the certainty and clear signal it needs to adapt. Concerns were raised by respondents that delaying implementation would lead to more buildings being constructed to lower standards, resulting in costly retrofitting in the future.
- 2.41 A few respondents suggested that it would be beneficial to align the implementation date of the Future Buildings Standard with that of the Future Homes Standard to provide consistency. Some respondents also emphasised the importance of aligning the proposals with other policies across Government, such as the ongoing work on hydrogen.

Question 6:

We would like to introduce the Future Buildings Standard for all buildings as quickly as possible. When do you think the Future Buildings Standard should introduce low carbon space heating for buildings with Type 3 demand (buildings that have space heating demand less suitable for heat pumps)?

- 2.42 We appreciate that there may be more challenges for buildings with Type 3 demand when adopting low carbon space heating, for example because they are made up of large spaces which are more suited to radiant or spot-heating for which heat pumps are not the most appropriate technology.

Question 6	No. of responses	% of all responses	% split for Q6
(a) 2025	148	19.9%	45%
ASAP	25	3.4%	8%
2021	25	3.4%	8%
2021/2022	36	4.8%	11%
2022	39	5.2%	12%
2023	18	2.4%	6%
2024	2	0.3%	1%
2026-2029	7	0.9%	2%
2030-2049	3	0.4%	1%
Other	24	3.2%	7%
Did not respond	416	56.0%	-

- 2.43 There was considerable support for an introductory date of 2025 for low carbon space heating in buildings with Type 3 demand among stakeholders that identified as: manufacturers/supply chain; national representatives/trade bodies; research/academic organisations; and energy sector. Over 70% of people who responded to Question 6 from each of these stakeholder categories favoured 2025 as the introductory date. A common view among respondents who either favoured an introductory date of 2025 or later was that the sector needs time and certainty to make the necessary preparations.

- 2.44 The majority of respondents who identified as architects favoured an introductory date earlier than 2025. They raised similar arguments to those outlined in Question 5 e.g. that the necessary technology already exists, and lack of suitable technology is therefore not a barrier to earlier implementation.
- 2.45 There were mixed views among respondents on the role of heat pumps for space heating in buildings with Type 3 demand. Some respondents argued that heat pumps are suitable; while others felt that heat pumps are not an appropriate solution and other options such as hydrogen-based technology or radiant heaters using biofuel should be considered instead.
- 2.46 Other key issues raised by respondents, and not already covered in the summary of Question 5, included:
- The importance of keeping a standard date of implementation across all building types for clarity.
 - Concerns that the proposals are too heavily focused on low carbon technology and decarbonisation of the electricity grid and that they should instead focus on passive approaches and general outcomes.
 - The need for more engagement with industry to make sure proposals are properly communicated and encouraged, and to seek input where appropriate.

Question 7:

We would like to introduce the Future Buildings Standard for all buildings as quickly as possible. When do you think the Future Buildings Standard should introduce low carbon water heating for buildings with Type 1 or Type 3 demand (buildings that have water heating demand more suitable for point-of-use heaters or heat pumps)?

- 2.47 We believe that buildings with Type 1 and Type 3 demand should be ready to adopt either electric point-of-use domestic hot water heating or heat pump domestic hot water heating in 2025.

Question 7	No. of responses	% of all responses	% split for Q7
(a) 2025	143	19.2%	43%
ASAP	21	2.8%	6%
2021	29	3.9%	9%
2021/2022	40	5.4%	12%
2022	46	6.2%	14%
2023	22	3.0%	7%
2024	2	0.3%	1%
2026-2029	0	0.0%	0%
2030-2049	0	0.0%	0%
Other	27	3.6%	8%
Did not respond	413	55.6%	-

- 2.48 There was considerable support for an introductory date of 2025 for low carbon water heating for buildings with Type 1 or Type 3 demand among stakeholders

that identified as: manufacturers/supply chains; national representatives/trade bodies; research/academic organisations; and energy sector.

- 2.49 Similar to Questions 5 and 6, many respondents who favoured an introductory date of 2025 felt that the sector needs time and certainty to make the necessary preparations. Some respondents also raised the importance of keeping a standard date of implementation across the different building types and aligning with the timings of the Future Homes Standard.
- 2.50 The majority of respondents who identified as architects favoured an introductory date earlier than 2025. Respondents raised the same arguments in favour of an early introduction as were raised in Questions 5 and 6.
- 2.51 A small number of respondents also proposed that a combination of solutions should be used to provide low carbon water heating for buildings with Type 1 or Type 3 demand. Suggestions of potential solutions included renewable options (such as solar photovoltaic systems), hydrogen-based technology and hybrid systems.

Question 8:

We would like to introduce the Future Buildings Standard for all buildings as quickly as possible. When do you think the Future Buildings Standard should introduce low carbon water heating for buildings with Type 2 demand (buildings that have water heating demand less suitable for point-of-use heaters or heat pumps)?

- 2.52 Buildings with Type 2 demand are likely to require high volume low-carbon domestic hot water production, which could include some types of heat pumps. While some suitable heat pump domestic hot water systems already exist, a longer lead-in time may be required so that these systems can become more established before adopting these system types as part of the minimum standard for buildings with Type 2 demand.

Question 8	No. of responses	% of all responses	% split for Q8
(a) 2025	146	19.7%	45%
ASAP	18	2.4%	6%
2021	27	3.6%	8%
2021/2022	39	5.2%	12%
2022	35	4.7%	11%
2023	20	2.7%	6%
2024	0	0.0%	0%
2026-2029	6	0.8%	2%
2030-2049	1	0.1%	0%
Other	29	3.9%	9%
Did not respond	422	56.8%	-

- 2.53 There was considerable support for an introductory date of 2025 for low carbon water heating for buildings with Type 2 demand among stakeholders that identified

as: manufacturers/supply chains; national representatives/trade bodies; research/academic organisations; and energy sector.

- 2.54 Similar to Questions 5 to 7, a common view among respondents who favoured either an introductory date of 2025 or later was that the sector needs time and certainty to make the necessary preparations. Some respondents who favoured introduction in 2025 or later also suggested that other solutions such as renewable systems, hydrogen-based technology and hybrid systems could be used to address this demand.
- 2.55 The majority of respondents who identified as architects favoured an introductory date earlier than 2025. Respondents raised the same arguments in favour of an early introduction as were raised in Questions 5 to 7.
- 2.56 A small number of respondents felt that suitable, affordable technology needs to be readily available to meet Type 2 demand before it is possible to set a date for the introduction of low carbon water heating for buildings in this category.

Government response to Questions 3 to 8

- 2.57 The challenges involved in improving the energy performance of our buildings and reducing carbon emissions are not insubstantial. This is particularly challenging in non-domestic buildings, where there is vast diversity in building type, size and end-use.
- 2.58 We must make sure that we are balancing our ambition to reduce the carbon and energy impact of new buildings against the desire for standards to be cost-effective, affordable, practical and safe. While all building types will be expected to adopt the Future Buildings Standard as swiftly as possible, we recognise that there may be different timelines for implementation that may be more suitable for different building types.
- 2.59 We have noted the support for a 2025 implementation date across all building types. We will take this into consideration as we continue to work with industry to determine appropriate timelines for introduction of the Future Buildings Standard for different building types and will set out our proposals as part of the full technical consultation on the Future Buildings Standard planned to start in 2023. We are grateful for all the comments that we received as part of this consultation and will use them to help shape the full technical consultation. We will also be engaging further with stakeholders ahead of the full consultation, to develop and refine the technical detail of the consultation proposals.
- 2.60 Some consultation responses suggested that the age of a building should be considered as part of the categorisation of building types and that the added challenges of addressing existing buildings compared to new buildings should be considered. The Future Buildings Standard will require new non-domestic buildings to adopt low carbon heating; it will not encompass existing buildings. The Government is carrying out work to consider the future of existing buildings and their heating requirements in the longer-term. The Heat and Buildings Strategy

sets out more detail on the UK's overall approach to decarbonising buildings, as part of setting a path to net zero by 2050.

Chapter 3 – Interim uplift to Part L standards for non-domestic buildings

Building Performance

Question 9:

We would welcome any further suggestions, beyond those provided in this consultation, for improving the modelling process; Part L and Part F compliance; and the actual energy performance of non-domestic buildings. Please provide related evidence.

- 3.1. The energy efficiency requirements of the Building Regulations set the rules and standards for when building work is carried out. This includes setting requirements for the efficiencies and controls of fixed building services installed in new or existing buildings and setting out the expected performance of the building fabric at the point of construction.
- 3.2. In the consultation we outlined how there may be a ‘performance gap’, between the outputs from design calculations and the measured energy performance of buildings, and we invited suggestions which could be applicable from 2025 (under the Future Building Standard) to address the performance gap when buildings are designed and constructed and improve the performance of buildings in operation.
- 3.3. Respondents to this question provided a wide range of suggestions on improvements that could be made to the current processes. Suggestions ranged from major and fundamental revisions to the current methodologies, including use of alternative metrics, to smaller scale changes to specific elements of the methodology.

Government response to Question 9

- 3.4. We welcome the comments and suggestions provided by respondents on modelling, compliance, and energy performance. These provide useful evidence to assist in the development of the full Future Buildings Standard.
- 3.5. Some responses provided specific editorial suggestions to enhance the clarity of the Approved Documents, these include comments on the choice of terminology and definitional issues. These have been reviewed and amendments made as appropriate.

Level of interim uplift to Part L minimum standard for new non-domestic buildings

Question 10:

What level of uplift to the energy efficiency standards for non-domestic buildings in the Building Regulations should be introduced in 2021?

3.6. In the consultation we proposed that we would use either Option 1 or Option 2 as the basis of the new primary energy and CO₂ targets for new buildings.

- i) Option 1 is intended to deliver an average 22% improvement in CO₂ emissions per building, compared to the current Part L standard, across the build-mix of non-domestic buildings. We expect this would typically be delivered by an increase in the efficiency of building services, and through onsite low carbon technology such as heat pumps or photovoltaic panels.
- ii) Option 2 is intended to deliver an average 27% improvement in CO₂ emissions per building, compared to the current Part L standard, across the build-mix of non-domestic buildings. This is the Government's preferred option, and we expect this would typically be delivered by very high fabric standards, resulting in lower levels of heat loss from windows, walls, floors and roofs, improved services such as lighting, and low carbon technologies such as heat pumps or photovoltaic panels.

Question 10	No. of responses	% of all responses	% split for Q10
(a) Option 1 – average 22% CO ₂ reduction	14	1.9%	2%
(b) Option 2 – average 27% CO ₂ reduction (this is the Government's preferred option)	107	14.4%	18%
(c) No change	5	0.7%	1%
(d) Other level of uplift	454	61.1%	78%
Did not respond	163	21.9%	-

3.7. Respondents who agreed with the Government's preferred option noted the target as being realistic and the most achievable within the proposed timeframe.

3.8. Of the respondents who suggested a different level of CO₂ reduction, most respondents were in favour of a greater reduction. A typical suggestion was for a 40-50% reduction, with evidence provided in support of this level of reduction proposing that this could be achieved through the use of heat pumps. Other respondents proposed a reduction target between 70% and 100%. Some respondents also suggested using a variety of different metrics to measure the efficiency standards to those proposed.

Government response to Question 10

3.9. The government is committed to introducing the Future Buildings Standard as quickly as possible, which will deliver highly efficient non-domestic buildings using low-carbon heat. We know that many non-domestic buildings are already built with low-carbon heating systems, but it is important that all parts of industry are ready to build buildings that are fit for a zero-carbon future. In practice, that will mean ensuring that all developers are ready to install these types of systems, and that the necessary supply chains, trained installers and products are in place. This is

particularly important in the case of heat pumps, which we expect will become the primary heating technology for the Future Buildings Standard.

- 3.10. We will, therefore, proceed with Option 2, which provides an average of 27% CO₂ reduction relative to 2013 standards. We believe that this option, as well as providing enhanced levels of CO₂ savings, acts as a better stepping-stone for industry towards the Future Buildings Standard. The Option 2 specification achieves a balance between making progress towards this standard, while providing industry with the time it needs to develop the supply chains and skills that will be necessary and accounting for market factors.
- 3.11. The Building Regulations will continue to set minimum energy performance standards. Developers are encouraged to go beyond the standards if they wish and continue pushing the boundaries of innovation.

Performance metrics for the interim uplift to Part L minimum standard for new non-domestic buildings

Question 11:

Do you agree with the way that we are proposing to apply primary energy as the principal performance metric?

- 3.12. We proposed that from 2021 primary energy will be introduced as the principal metric against which the energy efficiency of new buildings should be assessed, as the basis for the Part L performance target.

Question 11	No. of responses	% of all responses	% split for Q11
(a) Yes	113	15.2%	20%
(b) No	462	62.2%	80%
Did not respond	168	22.6%	-

- 3.13. A comment, made by a variety of respondents both in favour of and against this proposal, was that it is unhelpful to refer to metrics as 'principal' and 'secondary' if both need to be met.
- 3.14. Among those respondents who answered 'Yes' to this question there was acknowledgement that a CO₂ metric will become less important as the grid decarbonises and there is a case for a primary energy metric as long as it is used alongside the CO₂ and fabric standards metrics.
- 3.15. Some respondents noted that a primary energy metric would help make sure buildings have high energy efficiency, are cost-effective to run, and that the metric would make comparison between domestic and non-domestic buildings easier.

- 3.16. Some concerns were raised among respondents who were in favour of this proposal. These included:
- That it will be challenging to make sure calculations reflect the building in operation, data on which might not be held through the design phase.
 - A simpler way of presenting primary energy should be agreed.
- 3.17. Other respondents did not think that primary energy should be used as a metric. They stated that primary energy is too complicated and would not be properly understood by either consumers or industry. Comments included that a primary energy metric is liable to quickly be out of date both in the short-term, as it is affected by many outside factors such as energy source and suppliers, and in the longer-term as technology develops and the grid decarbonises.
- 3.18. A point was raised that primary energy may favour compliance using gas rather than electricity, as was the risk that this will disincentivise innovation and low carbon heating. Other arguments against primary energy included that different international conventions for primary energy would cause problems.
- 3.19. Some respondents suggested a variety of alternative metrics as part of their response to this question. These included delivered energy per square metre, occupancy-based metrics, embodied carbon metrics and a fabric energy efficiency standard.

Question 12:

Do you agree with using CO₂ as the secondary performance metric?

- 3.20. Despite a new focus on primary energy, reducing the CO₂ emissions of new buildings remains a key objective for the Government. Although we consider primary energy to be a good means of driving energy efficiency, it may not drive low carbon choices in all scenarios. For this reason, in the consultation we proposed that we should continue to use CO₂ targets for buildings alongside the primary energy target to encourage low-carbon fuel choices and the use of on-site renewable technologies.

Question 12	No. of responses	% of all responses	% split for Q12
(a) Yes	530	71.3%	93%
(b) No	42	5.7%	7%
Did not respond	171	23.0%	-

- 3.21. As with the response to the previous question, respondents felt that it was unhelpful to refer to metrics as 'principal' and 'secondary' if both need to be met to achieve compliance.
- 3.22. Among respondents who supported CO₂ as a metric, it was highlighted that consumers and industry are familiar with the concept and it is a useful incentive to reduce carbon emissions. It was also noted that it allows for easier comparison and

consideration with previous targets and metrics, national carbon budgets and other industries.

- 3.23. Various additional caveats were, however, raised. A frequent comment was that changing levels of emissions would need to be accounted for. Suggestions ranged from using a long-term forecast (25-30 years), to including daily varying rates to take account of shifting demand and supply profiles.
- 3.24. Some respondents opposed using a CO₂ as a metric entirely. Some felt that regulation of CO₂ from electricity should be at the source of production, rather than at the point of use, others stated that carbon factors are too variable and quickly outdated, and the risk of it being used as an excuse for lower fabric efficiency standards was raised.
- 3.25. As with the previous question, some respondents suggested alternative metrics in their response to this question. These included delivered energy per square metre, occupancy-based metrics and embodied carbon metrics.

Question 13:
Do you agree with the approach to calculating CO₂ and primary energy factors, referred to in paragraph 3.5.7 of this consultation document?

- 3.26. For more information on the proposals for primary energy and CO₂ (including an explanation of what primary energy is, how it is calculated and an explanation of carbon factors), we directed respondents in the consultation to the *Briefing Note – Derivation and use of Primary Energy factors in SBEM*, and the draft National Calculation Methodology Modelling Guide which can both be found on the SBEM website through the following link:

<https://www.uk-ncm.org.uk/>

Question 13	No. of responses	% of all responses	% split for Q13
(a) Yes	100	13.5%	19%
(b) No	426	57.3%	81%
Did not respond	217	29.2%	-

- 3.27. Many respondents used their comments on this question to repeat their arguments from Questions 11 and 12 for and against the use of Primary Energy or CO₂.
- 3.28. Additional comments, specific to the calculation methodology for the metrics, stated the need for a clearer explanation and approach; said that the values used in SAP and SBEM should be consistent; and said that having a separate PV carbon factor is unnecessary when the primary energy metric will discourage its use as a bolt-on already.
- 3.29. Other suggestions for the CO₂ factors were that they could vary depending on the longevity of the measures, that indicative monthly or hourly factors should be used in calculations (given variance over time), and that Green Book CO₂ figures should

be used to average the figure for the life of the building and component. It was suggested that nuclear should be separated to allow for easier consideration of its other environmental impacts, and that heat networks with electrical generation by Combined Heat-and-Power (CHP) should have a lower primary energy factor than grid electricity, as there will be lower transmission losses.

- 3.30. In line with previous comments, respondents also said that both the primary energy and carbon factors are based on current levels and could be out of date even by the time the regulations come into force. It was noted that the factors should be updated regularly and kept in line with the latest BEIS figures.

Government response to Questions 11 to 13

- 3.31. The energy efficiency of non-domestic buildings has a significant part to play in achieving the Government's net zero aims, but it also has other objectives. These include minimising energy bills for businesses, maintaining healthy indoor environments, and ensuring that as a nation we are making the best use of our energy resources.
- 3.32. To support these objectives, we intend to proceed for the interim uplift with the use of both the primary energy and CO₂ metrics for compliance and proceed with the approach to calculating CO₂ and primary energy factors that we outlined in the consultation. We will consider the ongoing suitability of these metrics, CO₂ and primary energy factors for implementation of the full Future Buildings Standard.

Primary energy

- 3.33. Primary energy use is a measure of the energy regulated by the energy efficiency requirements of the Building Regulations, such as lighting, heating and hot water. The calculation takes account of efficiencies and energy uses such as:
- The efficiency of the building's heating system;
 - Power station efficiency for electricity; and
 - The energy used to produce the fuel and deliver it to the building.
- 3.34. A primary energy metric therefore provides a measure of the energy use in the buildings and takes account of upstream energy uses. This will make sure that new non-domestic buildings make good use of our nation's energy resources regardless of our wider progress towards decarbonising the electricity grid. Primary energy targets will be set using the factors shown in Tables 30 to 32 of the NCM modelling guide.
- 3.35. Use of primary energy as metric also maintains consistency of approach with domestic buildings. We are committed to transparency of the calculation methodology and will continue to publish details of how this and other metrics are calculated.
- 3.36. Concerns raised by respondents around the use of primary energy included that it is not a recognisable quantity to the end users of the buildings. We believe primary energy to be an effective metric which will drive the energy efficiency of the building

fabric. Results of compliance calculations are not intended as predictions of energy use (for example they do not include energy for industrial or business process or loads from plug in devices, and they are under standardised rather than the variable real-world conditions found in practice) and as such we do not believe that these outputs are of great interest to end users. Wider work, however, is being carried out by DLUHC and more widely across Government to make sure that end users have the information that they need to take action to improve the energy efficiency of their building.

CO₂ emission targets

3.37. We can confirm that both CO₂ and primary energy will be required to prove compliance. CO₂ emission targets will be set using the factors shown in Tables 30 to 32 of the NCM modelling guide. The description of the CO₂ indicator as ‘secondary’ refers to the anticipation that CO₂ emissions will become a less effective measure of building performance over time. Alongside this, however, we recognise that we must retain a focus on CO₂ emissions to make sure that developers make low carbon choices when designing all new non-domestic buildings and to track progress against our net zero target.

National Calculation Methodology for new non-domestic buildings

Question 14:

Do you agree with the proposals for natural gas being assigned as the heating fuel for any fuels with a worse CO₂ emission factor than natural gas?

3.38. Currently, for non-domestic buildings, the water and space heating for each zone in both the actual building and the notional building, which is used to set the performance target, are modelled using the same fuel type. In the consultation we proposed to modify this approach to discourage the use of high-carbon fossil fuels in new buildings, while allowing for diversity and flexibility in the specification of heating systems.

3.39. We proposed to reduce the number of notional building space heating types in the notional building, as part of a transition to low carbon heating fuels. In our proposed approach, natural gas was assigned as the space heating fuel for the notional building for any fuel in the actual building with a worse CO₂ emission factor than natural gas, for example, oil or LPG. In all other cases, with the exception of electric heating, the fuel used for space heating was proposed to be the same for the notional and actual building.

Question 14	No. of responses	% of all responses	% split for Q14
(a) Yes	87	11.7%	17%
(b) No	438	59.0%	83%
Did not respond	218	29.3%	-

- 3.40. Among respondents who did not agree with this proposal, there were calls for any mention of gas to be removed from the notional building and that gas, or anything with higher carbon intensity than gas, should be banned with immediate effect.
- 3.41. Among those who agreed with the proposal, a few respondents noted that it would encourage the transition from gas over time and help discourage carbon intensive fuels. Others noted that gas will continue to be used in the short to medium term and that it was therefore appropriate to include it in the notional building.
- 3.42. Some respondents used their response to this question to state an opposition to the use of notional building approach in any circumstances. Others pointed out that the market is used to the current methodology.
- 3.43. Several alternative suggestions were provided. Some respondents stated that the notional building should use the most appropriate technology per building type for encouraging decarbonisation; while others suggested that a single low carbon technology should be used in the notional building irrespective of that used in the actual building, or the building types. Other respondents thought that the notional building should use the same heating source as is being proposed for the actual building or use whatever heating source is standard practice for each building type.

Question 15:

Do you agree with our proposal of using a hybrid electric/heat pump heating system in the notional building when electricity is specified as a heating fuel?

- 3.44. In the consultation we proposed an adjustment to the notional building such that, where (on peak) electric heating is specified for space heating in the actual building, the notional building is modelled as having a hybrid electric/heat pump heating system.

Question 15	No. of responses	% of all responses	% split for Q15
(a) Yes	155	20.9%	52%
(b) No	142	19.1%	48%
Did not respond	446	60.0%	-

- 3.45. Amongst respondents who supported this proposal, it was thought that the proposed approach will help keep control of the use of direct electric heating while retaining flexibility for situations in which standalone heat pumps are not viable. It was stated that hybrids are the best heating choice as they can be optimised for lowest cost and carbon.
- 3.46. Some respondents stated that this approach should only be used alongside a fabric energy efficiency standard, and that while this is a good step on the pathway to the use of standalone heat pumps, the notional building should also show an assessment against a standalone heat pump so clients are fully-informed. Some respondents raised concerns that hybrid systems may not be used in practice as

intended. It was also noted that hybrid and heat pump technology still require development, so supply chains and skills must be closely considered.

- 3.47. Some respondents thought that the efficiency in the notional building should not be set so high as to completely rule out direct electric heating. It was argued that heat pumps/hybrids are not appropriate in all buildings and the difficulty of achieving compliance with some technologies either now or in the future (e.g. heat batteries, infrared heating) was raised. It was also suggested that if low embodied carbon can be proved, direct electric heating should be allowed. Conversely, some other respondents called for more stringent measures (e.g. increased efficiency in the notional building) to make sure direct electric heating is discouraged because they believe it is too expensive and too limited to be used widely.
- 3.48. A few respondents felt that the notional building should be promoting heat pumps now and that hybrids should only be used for retrofitting. It was suggested that allowing buildings to be modelled on hybrids now could prevent them from being constructed efficiently enough for future heat pump use.

Question 16:
Do you agree with the proposal for the treatment of domestic hot water in the notional building?

- 3.49. Point-of-use electric water heating can have a lower primary energy and CO₂ impact than systems that store hot water and is to be encouraged where appropriate. We recognise, however, that these systems may not be a suitable means of meeting the needs of some buildings and their users. Where the actual building uses gas for water heating, we proposed that the notional building is modelled with electric point of-use water heating if the volume of water heated is low (less than or equal to 200 litres per m² floor area per year). Where buildings use gas for water heating and have large hot water needs (greater than 200 litres per m² floor area per year), such as changing rooms or hospital wards, we proposed that the notional building is modelled with a gas-fired hot water system.

Question 16	No. of responses	% of all responses	% split for Q16
(a) Yes	113	15.2%	44%
(b) No	146	19.7%	56%
Did not respond	484	65.1%	-

- 3.50. There was agreement among some respondents with the principle of low domestic-hot-water (DHW) demand buildings using a point-of-use (POU) electric water heater, on the basis that it is an energy efficient use of low carbon electricity. Several respondents raised concerns over the potential impact of setting a threshold at which the notional DHW system changes which is based on the volume of water heated. For example, the assessor may be incentivised to select a template on the basis of the demand being above or below the threshold in order to achieve a more favourable result.

- 3.51. Other respondents raised concerns that the efficiency standards for the notional heat pump building will make compliance for buildings using heat pumps too challenging, and evidence was provided in support of this concern. It was recommended that this concern might be overcome by either:
- Reducing the efficiency of the notional heat pump system, or
 - Setting the notional hot water generator to be either direct electric or gas boilers whenever the actual building uses a heat pump.
- 3.52. Specific concerns raised include appropriate sizing of the DHW storage tank and circulation loop, as well as concerns over the threshold being set.
- 3.53. Other respondents suggested that the notional building could include technologies such as low flow fittings to showers and taps, and waste water heat recovery; or that the assessment method could be adapted to recognise the benefits that DHW storage can provide for demand shifting.

Question 17:
Do you agree with the proposal for connecting to an existing heat network, as presented in the draft NCM modelling guide?

- 3.54. In the consultation we proposed that, where a building connects to an existing district heating system, the notional building will be served by a district heating system supplied by a gas fired CHP with an electrical efficiency of 30% and a heat efficiency of 50%, supplying 70% of the heating load (with a 15% uplift to the emission factor to account for network heat losses).

Question 17	No. of responses	% of all responses	% split for Q17
(a) Yes	64	8.6%	13%
(b) No, they give too much of an advantage to heat networks	404	54.4%	80%
(c) No, they do not give enough of an advantage to heat networks	14	1.9%	3%
(d) No, I disagree for another reason	26	3.5%	5%
Did not respond	235	31.6%	-

- 3.55. Some respondents who disagreed with the proposal pointed out that in cases where a building connects to a District Heat Network (DHN) which has a lower carbon factor than the fixed DHN carbon factor used by the notional building, then developers will be able to comply with the standard whilst using lower energy efficiency standards. Some of these respondents suggest that, to remedy this, the notional DHN carbon factor should match that of the actual DHN.
- 3.56. Among respondents who disagreed with the proposal some raised the concern that DHNs are often not a low carbon solution as a large proportion of existing and proposed DHNs use gas CHP, gas boilers and other fossil fuels. Some respondents

were also concerned about the use of other forms of combustion (e.g. energy from waste and biomass).

- 3.57. Respondents requested that the calculation method for DHN carbon and primary energy factors to be used for both the actual and notional DHNs should be clearly set out in the documentation, and that the proposed carbon factor for DHNs is calculated using the updated carbon factors.
- 3.58. Respondents raised the concern that real-world DHN performance is often significantly worse than design values or values reported by DHN operators. It was also suggested that, when it is proposed that a new building connects to a high carbon DHN, the submission should include an assessment of the likelihood/viability of that DHN reducing its carbon intensity in a given timeframe.

Question 18:
Do you agree with the proposal for connecting to a new heat network, as presented in the draft NCM modelling guide?

- 3.59. In the consultation we proposed that the standard should be even more stringent when connecting to a new heat network. Our proposal was that new heat networks should be compared to a better notional building district heating system. We sought views on what this should look like but suggested that a new district heating system could assume a proportion of low-carbon heat.

Question 18	No. of responses	% of all responses	% split for Q18
(a) Yes	68	9.2%	14%
(b) No, they give too much of an advantage to heat networks	392	52.8%	79%
(c) No, they do not give enough of an advantage to heat networks	11	1.5%	2%
(d) No, I disagree for another reason	27	3.6%	5%
Did not respond	245	33.0%	-

- 3.60. Some respondents stated that the notional DHN should be based on a higher percentage heat contribution from heat pumps. Some of these respondents suggested increases from the proposed 20% to at least 80% with some suggesting 100%. Respondents also suggested that the notional building should make no use of fossil fuels.

Government response to Questions 14 to 18

- 3.61. The notional building that we proposed in the consultation is intended to make sure there are high levels of energy efficiency, as well as incentivising low carbon heating systems including heat pumps and heat networks. It is not, however, intended to require the installation of low carbon heating systems at this interim

uplift stage, with further changes to the methodology proposed to implement this policy under the Future Buildings Standard.

- 3.62. The future is likely to see a mix of low carbon technologies used for heating. *Clean Growth: Transforming Heating, an evidence review of the options for decarbonising heat*, concluded that it is unlikely that there will be a one-size-fits all solution, so multiple technologies will play a role.²
- 3.63. Heat networks will have an important role to play and are often an excellent solution in high density areas. Heat networks enable a clean, cost effective and just transition to net-zero, delivering a wide variety of benefits to the environment, consumers and the economy. Heat networks are the only way we can exploit larger scale renewable and recovered heat sources such as energy from waste, waste heat and heat from rivers and mines.
- 3.64. In recognition of their importance to the future energy mix, the Committee on Climate Change have estimated that around 18% of UK heat will need to be delivered by heat networks in 2050 if the UK is to meet its carbon targets cost effectively, up from around 2% currently.
- 3.65. We intend to proceed with the specification of the notional building as consulted on, with some changes which will act to incentivise the installation of heat pumps and heat networks ahead of the implementation of the full Future Buildings Standard:
- i) To support the installation of heat pumps, we will be revising the specification of the heat pump notional building. This reduces the assumed efficiency of the heating system in the target building, providing additional incentive to install heat pumps.
 - ii) To support the connection of non-domestic buildings to heat networks, and better recognise that existing heat networks have the ability to decarbonise over time, we have made changes to the how these systems have been treated under the National Calculation Methodology (NCM). For existing heat networks, the carbon dioxide and primary energy factors used in the notional building will match those used in the notional building. For new heat networks, we will proceed with the notional building approach as outlined at consultation. All heat networks will need to meet minimum standards of performance. These changes are outlined in the NCM modelling guide and *Approved Document L, Volume 2: Buildings other than dwellings*.

Question 19:

Do you agree with the proposed changes to the National Calculation Methodology Modelling Guide and activity database?

- 3.66. The National Calculation Methodology is accompanied by an 'activity database', which contains assumptions about the end-use of spaces within buildings, including hot water use, occupancy, lighting and heating set-points. We reviewed the NCM

² <https://www.gov.uk/government/publications/heat-decarbonisation-overview-of-current-evidence-base>

Modelling Guide and the activity database and proposed various changes in the consultation.

Question 19	No. of responses	% of all responses	% split for Q19
(a) Yes	67	9.0%	13%
(b) Yes, but additional changes should be made	32	4.3%	6%
(c) No	404	54.4%	80%
Did not respond	240	32.3%	-

- 3.67. Some respondents suggested additional changes could be made. These included having a feedback loop from actual metered data from heat networks developed into the modelling tool, as a national anonymized data base of actual data from heat networks would help to drive good design practice and validate the model.
- 3.68. Other respondents highlighted the need for consideration to be given to the use of waste water heat recovery systems to lower the energy demand at the point of use.
- 3.69. Some specific areas in the NCM modelling guide were also identified where additional clarification may be required, or inconsistencies removed. These included clarification of wording around the 'alpha' factor and text relating to high efficiency alternative systems.
- 3.70. Some respondents also provided suggestions for major changes to the way that the NCM methodology operates. These included concerns about how the space heating and heat gains are accounted for in the NCM, and opposition to the concept of the notional building being used for compliance.

Question 20:

We would welcome any further suggestions for revising the outputs from SBEM, which would enable easier checking by building control on building completion. Please provide related evidence.

- 3.71. As set out in the consultation, we are considering how the outputs of calculation tools could be improved to provide better information to energy assessors, building control bodies, and building owners. In particular, the outputs should make it easier to check the characteristics of the building energy model against the completed building.
- 3.72. Suggestions from respondents to revise the outputs from SBEM to enable easier checking by building control on building completion included improving the accuracy of outputs, more user-friendly interface and increased transparency.
- 3.73. Respondents suggested more obvious access to existing diagnostic information such as monthly consumptions would help owners of existing buildings to identify areas of potential improvement. Respondents suggested SBEM may benefit from being converted to a web-based interface to enable easier checking.

- 3.74. Respondents also suggested including a clear list and description of the fabric specifications and building services equipment installed to aid Building Control.
- 3.75. Other suggestions included ensuring that building information is accessible to the building occupier to support the concept of a 'Building Passport' which could be used by building control. This may inform longer term decision making and engage building owners by centrally holding data to enable information to be kept up to date, accessed and updated when improvements are made to a property. Additionally, this may provide maintenance and replacement information to make sure that systems are operated efficiently.

Government response to Questions 19 and 20

- 3.76. We will proceed with the proposed changes to the NCM modelling guide, which has been adjusted in a few small areas to provide additional clarification and remove inconsistencies. These include:
- Clarification of the 'alpha' factor to be applied when thermal bridging details have not been calculated.
 - An update to the text as it relates to the assessment of high efficiency alternative systems.
 - Clarification on the treatment of low energy zones in buildings.
- 3.77. We recognise the broader concerns raised about the activity database, the NCM and SBEM, including those relating to space heating and heat gains. We accept there is a need to update and modernise both the NCM and SBEM, as well as its interface, and to review the underlying data and assumptions. We intend to undertake a renewal programme for the software and methodology in preparation for the full Future Buildings Standard.

Question 21:
Do you agree with the proposals for limiting heat gains in non-domestic buildings?

- 3.78. The current Part L guidance for non-domestic buildings includes standards for the maximum solar gain of a building (i.e. heat gains from the sun through windows). In the current guidance, limiting solar gain can be shown by demonstrating that solar gains are no greater than would occur through a reference glazing system. In the consultation we proposed an increase in the solar performance requirements by improving the performance of the reference glazing in reducing solar gains.

Question 21	No. of responses	% of all responses	% split for Q21
(a) Yes	103	13.9%	37%
(b) No, they go too far	7	0.9%	3%
(c) No, they do not go far enough	129	17.4%	46%
(d) No, I disagree for another reason	39	5.2%	14%

Did not respond	465	62.6%	-
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- 3.79. Respondents who agreed with these proposals commented that the proposals were appropriate and sensible, and they noted the fact that the approach to limiting heat gains is within the control of the designer as opposed to those related to the use/function of the building.
- 3.80. Some respondents also suggested that the proposals should be combined with an overheating assessment for certain types of buildings to reduce the risk of overheating and minimise the need for active cooling. Others suggested it would be more beneficial to use thermal comfort limits rather than the proposed approach, indicating that there may be unintended consequences such as limiting daylight.
- 3.81. Some respondents felt the proposals do not go far enough, suggesting they could be improved by using a fabric efficiency/heating and cooling demand metric. Respondents recommended that the g-value performance of the reference system be improved and assessed in relation to shading, overheating and daylight. Respondents suggested the approach also needs to consider building-specific factors such as orientation, number of aspects and glazing ratio.
- 3.82. Other respondents considered the proposals as going too far, suggesting that there is potential for cost-effective use of the excess heat in certain non-domestic environments via the use of heat pumps. Concerns were also raised that the proposal would have too great an effect on daylighting.

Government response to Question 21

- 3.83. We will proceed to set the requirements for limiting heat gains at the level we proposed in the consultation. We believe this strikes an appropriate balance between reducing heat gains and ensuring adequate daylighting.

Minimum standards for new and replacement thermal elements, windows and doors in new and existing non-domestic buildings

Question 22:

Do you agree with the proposed minimum standards for fabric performance in new non-domestic buildings as presented in Table 3.2 of this consultation document?

Question 23:

Do you agree with the proposed minimum standards for fabric performance of new thermal elements in existing non-domestic buildings as presented in Table 3.3 of this consultation document?

- 3.84. To reflect the importance of providing a thermally efficient building, we proposed that standards for new non-domestic buildings should continue to include minimum

levels of fabric performance, with an increase in the minimum standards for roofs, walls, floors, windows, and external doors.

3.85. We proposed that the same minimum standards that are applied to new non-domestic buildings, which represents an uplift to most building elements, should also be applied for new elements in existing buildings.

3.86. We provided the tables below in the consultation document:

Table 3– Standards for new thermal elements, windows, doors and air permeability for new non-domestic buildings

	2013 U-values in new non-domestic buildings (W/m ² .K)	Proposed U-values for new non-domestic buildings (W/m ² .K)
Pitched roof – insulation at ceiling level	0.25	0.16
Pitched roof – insulation at rafter level	0.25	0.16
Flat roof or roof with integral insulation	0.25	0.18
Wall	0.35	0.26
Floors	0.25	0.18
Swimming pool basin	0.25	0.25
Windows in buildings similar to dwellings	2.2	1.6 or Window Energy Rating Band B
Rooflight ⁱ	2.2	2.2 (horizontal plane)
All other windows, roof windows and curtain walling	2.2	1.6
Pedestrian doors (including glazed doors)	2.2	1.4
High usage entrance doors	3.5	3.0
Vehicle access or similar large doors	1.5	1.3
Roof ventilators (including smoke vents)	3.5	3.0
Air Permeability	10 m ³ / (h.m ²) @50Pa	8 m ³ / (h.m ²) @50Pa or 1.57 m ³ / (h.m ²) @ at 4Pa

Notes:

i. Section 3.9 of this consultation sets out our proposal to adopt the latest version of BR 443 for calculating U-values for rooflights. In current standards, the limiting U-value is based on a rooflight in a vertical position. The proposed standard is based on a rooflight in a horizontal position.

Table 4 – Standards for new thermal elements, windows, doors for existing non-domestic buildings

	2013 U-values for new elements in existing non-domestic buildings (W/m².K)	Proposed U-values for new elements in existing non-domestic buildings(W/m².K)
Pitched roof – insulation at ceiling level	0.16	0.16
Pitched roof – insulation at rafter level	0.18	0.16
Flat roof or roof with integral insulation	0.18	0.18
Wall	0.28	0.26
Floors	0.22	0.18
Swimming pool basin	0.25	0.25
Windows in buildings similar to dwellings	1.6 or Window Energy Rating Band C	1.6 or Window Energy Rating Band B
Rooflight ⁱ .	1.8 (vertical plane)	2.2 (horizontal plane)
All other windows, roof windows and curtain walling	1.8	1.6
Pedestrian doors (including glazed doors)	1.8	1.4
High usage entrance doors	3.5	3.0
Vehicle access or similar large doors	1.5	1.3
Roof ventilators (including smoke vents)	3.5	3.0
Notes:		
i. Section 3.9 of this consultation sets out our proposal to adopt the latest version of BR 443 for calculating U-values for rooflights. In current standards, the limiting U-value is based on a rooflight in a vertical position. The proposed standard is based on a rooflight in a horizontal position.		

Question 22	No. of responses	% of all responses	% split for Q22
(a) Yes	74	10.0%	13%
(b) No, the standards go too far	18	2.4%	3%
(c) No, the standards do not go far enough	446	60.0%	81%
(d) No, I disagree for another reason	13	1.7%	2%
Did not respond	192	25.8%	-

Question 23	No. of responses	% of all responses	% split for Q23
(a) Yes	73	9.8%	13%
(b) No, the standards go too far	12	1.6%	2%
(c) No, the standards do not go far enough	434	58.4%	80%
(d) No, I disagree for another reason	22	3.0%	4%
Did not respond	202	27.2%	-

- 3.87. Many respondents stated that standards could go further in new buildings, with regards to air tightness and in some cases U-values. Concerns raised included the ability of some doors (including fire doors) to comply with the required U-values.
- 3.88. Some respondents agreed with the proposed standards, but others felt they do not go far enough. One concern raised was that the increased time and effort to achieve improved U-values may be offset by improved performance throughout the building's lifetime, and the values for external walls and roofs were highlighted as not being a big enough improvement.
- 3.89. Of the respondents who stated that the proposed standards go too far, concerns were expressed that the standards may not be achievable, particularly for replacements in older buildings. Specifically, the improvements for windows, roof windows and curtain walling were challenged. Respondents stated that industry needs more time to develop the cost-effective products needed, and that account should be taken of the increased level of use of windows and doors in the non-domestic sector relative to the domestic sector.
- 3.90. Among respondents who disagreed with the proposal for other reasons, it was argued that the operational carbon improvements of the proposed standards may be outweighed by the embodied carbon and that other energy efficiency improvements may be more appropriate in such circumstances.
- 3.91. It was suggested that in some circumstances an alternative approach may be needed. For example, where fabric improvements could cause detrimental changes to the building's architectural quality and the street/community character.
- 3.92. Several risks were highlighted, including that measures may increase the likelihood of condensation and that thermal bridging may occur where an extension element is of much higher thermal performance than retained elements. The importance of considering fire safety and ensuring sufficient cross-referencing between Parts L, F and B of the Building Regulations in particular was also highlighted.

Government response to Questions 22 and 23

- 3.93. We will proceed with aligning the standards in new and existing buildings. We have considered the concerns of respondents who stated that thermal performance standards were either too high, or not high enough. In most cases, we will proceed to set the minimum standards for new and replacement thermal elements, windows

and doors in new and existing non-domestic buildings at the level we proposed in the consultation. It should be noted that these standards represent ‘backstop’ values, and that a new building would not generally be able to comply with the CO₂ and primary energy requirements of the building regulations if building elements achieved this level of performance to any great extent across the whole building.

3.94. We agree with concerns raised about the ability of some door types to meet these standards and will include the clarifications shown below:

- The minimum U-value required for external doors in new and existing non-domestic buildings has been increased to 1.6 W/m².K.
- We acknowledge that due to the materials used in fire doorsets, it may not be possible to meet the minimum U-value threshold. Therefore, these external fire doorsets are permitted to meet a U-value of 1.8 W/m².K which is in line with the previous standards.

3.95. The range of non-domestic building types means that setting a generic set of minimum standards is challenging. These are common minimum standards, however, which we believe can be applied to all new non-domestic buildings. Higher standards, for example for airtightness, are typically examples of specialist design or best practice. They may require other measures to be installed alongside them (e.g. additional ventilation) to avoid unintended consequences and are unlikely to be cost-effective or practical for all building types.

3.96. We note the concerns raised by some respondents about historic buildings. As detailed in *Approved Document L, Volume 2: Buildings other than dwellings*, there are certain building types, including places of worship, listed buildings and those in conservation areas that are exempt from some (or, in certain cases, all) energy efficiency requirements.

Question 24:

Do you agree with the draft guidance in paragraph 4.15 of the draft Approved Document L, volume 2: buildings other than dwellings on reducing unwanted air infiltration when carrying out work to existing non-domestic buildings?

3.97. Paragraph 4.15 of the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings*, that we provided alongside the consultation, included some new guidance on reducing unwanted air infiltration when carrying out work to existing non-domestic buildings.

Question 24	No. of responses	% of all responses	% split for Q24
(a) Yes	110	14.8%	27%
(b) No	300	40.4%	73%
Did not respond	333	44.8%	-

3.98. Respondents generally agreed that there should be a more explicit reference to taping and sealing.

- 3.99. Respondents called for a focus on a whole-building airtightness approach. This extended to expanding the addressing of air leakiness across all elements and not just to replacement elements.
- 3.100. There was also concern that the proposed guidance could be confusing when considered alongside the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings*, which considers some air infiltration beneficial. It was therefore requested that reference be made to the fact that increasing airtightness carries a risk of increasing the condensation and moisture within a property.
- 3.101. Some stakeholders were concerned how these measures will be implemented in buildings which are older, historic or in conservation areas with high levels of infiltration.

Government response to Question 24

- 3.102. We will proceed to publish the guidance as outlined in paragraph 4.15 of the 2021 draft *Approved Document L, Volume 2: Buildings other than Dwellings* on reducing unwanted air infiltration when carrying out work on existing non-domestic buildings, with some minor changes made to the wording to improve clarity of meaning. This includes the addition of specific reference to ‘taping and sealing’ and additional wording relating to condensation and moisture risks.
- 3.103. We acknowledge the suggestion that work on existing buildings should attempt to improve the overall airtightness of the building to a much greater degree, rather than just around the element being replaced. This would require significant additional work across the entire envelope of the building following a change to a single elements or service. We do not believe this is a proportionate approach, and consider that it would impose an undue burden.
- 3.104. We also acknowledge concerns about how these measures will be implemented in historic buildings and/or those in conservation areas. As stated in *Approved Document L, Volume 2: Buildings other than Dwellings* these building types are typically exempt from some, and in some cases all, of the energy efficiency requirements of the Building Regulations.

Limiting U-value calculations for rooflights in non-domestic buildings

Question 25:

Do you agree that the limiting U-value for rooflights in new and existing non-domestic buildings should be based on a rooflight in a horizontal position, as detailed in paragraph 4.4 of draft Approved Document L, volume 2: buildings other than dwellings?

- 3.105. In the consultation we proposed that the limiting U-value for rooflights should be based on a rooflight in a horizontal position rather than vertical, on the basis that most rooflights are tested and installed in a horizontal position. Our proposed

change was intended to reduce the need for conversion factors, which add unnecessary complexity.

Question 25	No. of responses	% of all responses	% split for Q25
(a) Yes	215	28.9%	96%
(b) No	8	1.1%	4%
Did not respond	520	70.0%	-

- 3.106. Several respondents who agreed with the proposal said that the horizontal position represents the worst-case performance and that basing the U-value on it will simplify the calculation process. They welcomed the consistency with the approach of the Future Homes Standard and highlighted the importance of ensuring that the manufacturer information is provided for the horizontal position.
- 3.107. Respondents who disagreed with the proposal expressed some concern that performance is different in each plane and that the least favourable condition should meet the minimum standard. Some respondents suggested that the U-value should be based on a rooflight in the vertical position. Furthermore, an argument was made that the full element should be taken into consideration when calculating U-values. For instance, if a window is incorporated into an external wall, then the U-value of the wall and window collectively should be calculated rather than just the window.
- 3.108. An issue raised by both respondents who agreed and disagreed with the proposal was that angled rooflights were not sufficiently addressed. The benefits of angled rooflights were highlighted, and concerns were raised that the proposed approach would lead to confusion and could even result in more flat roofs being built as a result.

Government response to Question 25

- 3.109. We will proceed with the change to set limiting U-values for rooflights in the horizontal position on the basis that most rooflights are tested and installed in this position. This will also provide consistency with the approach in *Approved Document L, Volume 1: Dwellings*.
- 3.110. We have added a note in *Approved Document L, Volume 2: buildings other than dwellings* to make it clear that for energy modelling, the U-value of the rooflight should be assessed in the plane it will be installed in.

Question 26:

Do you agree that we should adopt the latest version of BR 443 for calculating U-values in new and existing non-domestic buildings, as detailed in paragraph 4.1 of draft Approved Document L, volume 2: buildings other than dwellings?

- 3.111. The Future Homes Standard consultation proposed to adopt the new version of BR 443, which provides guidance on conventions for U-value calculations. We also proposed to incorporate these changes for U-value calculations in all non-domestic buildings.

Question 26	No. of responses	% of all responses	% split for Q26
(a) Yes	212	28.5%	93%
(b) No	15	2.0%	7%
Did not respond	516	69.4%	-

- 3.112. Among respondents who agreed with the proposal to adopt the latest version of BR 443 for calculating U-values, the importance of always using the most up-to-date guidance was raised. Some respondents felt that it will lead to more accurate measured performance of new buildings and therefore help to address the existing performance gap. Respondents in support of the proposal also highlighted the importance of being consistent with the calculation methodology for the homes.
- 3.113. Some suggestions about specific changes and corrections to both the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings* and BR 443 were made by both respondents who agreed and those who disagreed with the proposal. An argument was also made that the latest version of BR 443 should be subject to a formal call for evidence.
- 3.114. The main concern raised among respondents who disagreed with the proposal was that the latest version of BR 443 does not include guidance on the window configuration to be used, and instead only provides information on the size of a standard window. Respondents felt that greater clarity is needed as to which window configuration should be used for calculations, otherwise there is a risk of misinterpretations occurring.

Government response to Question 26

- 3.115. The Government intends to reference the latest version of BR 443 on the basis that BR 443 (2019) is an update to the 2006 edition, primarily reflecting changes in British and International standards; industry practice; and industry publications. The comments we received to the consultation were not considered significant enough to warrant a new version. Many changes were already made after the Future Homes Standard consultation. The latest version of BR443 has been published and is available online through the following link:

<https://www.brebookshop.com/details.jsp?id=328041>

- 3.116. The text in Section 4 of *Approved Document L, Volume 2: Buildings other than dwellings* has been amended to make it clear where to find window configurations.

Building services in new non-domestic buildings

Question 27:

Do you agree with the newly proposed minimum efficiencies for natural gas, oil and LPG boiler and domestic hot water system installations in new non-domestic buildings in Section 6 of draft *Approved Document L, volume 2: buildings other than dwellings*?

3.117. For natural gas-fired boilers, we proposed an increase in the minimum seasonal efficiencies for boilers in new non-domestic buildings. We also proposed an increase in the minimum system efficiencies for LPG and oil-fired boilers.

Question 27	No. of responses	% of all responses	% split for Q27
(a) Yes	107	14.4%	50%
(b) No, the standards go too far	7	0.9%	3%
(c) No, the standards do not go far enough	99	13.3%	46%
Did not respond	530	71.3%	-

3.118. Some respondents suggested that the proposals should go further, typically on the basis that they thought that higher carbon heating appliances should be banned entirely or heavily discouraged through efficiency penalties.

3.119. There were some specific comments that the minimum efficiency of a natural gas single boiler of 2MW efficiency should be increased on the basis that flue condensers should be added to any non-condensing boilers.

3.120. There were specific calls for introducing minimum standards for hydrogen boilers, to signal their potential application in buildings, and a suggestion that the non-domestic market may be more ready to adopt hydrogen than the domestic market.

3.121. Some comments were also made that the guidance should be clearer about what operating temperatures are required to achieve the stated efficiencies, and that installation should be done in a way that achieves manufacturers suggested efficiencies (e.g. low temperature returns in hydronic heating systems).

Government response to Question 27

3.122. We agree with the premise that oil and LPG boilers should not generally be installed in new buildings, and we have removed guidance relating to oil and LPG boiler installation in new non-domestic buildings for this reason, although we are proposing to retain minimum standards for installations in existing buildings.

3.123. For larger gas-fired boilers in new buildings, we have added a note to the table in *Approved Document L, Volume 2: Buildings other than dwellings* that flue condensers should be installed where feasible and appropriate. We note, however, that flue condensing kits may not offer efficiency savings for systems which operate at higher flow temperatures.

Question 28:
Do you agree with the proposed set of standards for air distribution systems for new non-domestic buildings in Section 6 of draft Approved Document L, volume 2: buildings other than dwellings?

3.124. In the consultation we made several proposals for simplifying and consolidating the minimum standards for air distribution systems. This included simplifying and incorporating the requirements for air distribution from the Non-Domestic Building Services Compliance guide into the *Approved Document L, Volume 2: Buildings other than dwellings*.

Question 28	No. of responses	% of all responses	% split for Q28
(a) Yes	111	14.9%	74%
(b) No, the standards go too far	11	1.5%	7%
(c) No, the standards do not go far enough	28	3.8%	19%
Did not respond	593	79.8%	-

3.125. Some respondents suggested that manufacturers should be compelled to publish calculated specific fan powers (SFPs) for their products for use in Part L calculations in the UK.

3.126. Some respondents who said that the standards go too far raised concerns with the SFP values in Table 6.9 of the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings*. A value of 0.4W/l/s was suggested as being more appropriate and achievable for fan coils, with several other system types also highlighted as being unachievable.

3.127. Comments raised included that Transpired Solar Collectors were not included in the technologies listed and may necessitate an increase in SFP. Therefore, not providing an allowance for their inclusion, whilst giving an additional allowance for active chilled beams, could lead to alternative renewable systems being penalised.

3.128. Among respondents who said the standards do not go far enough there were several suggestions of lower values for the different system types in Table 6.9. The importance of ensuring that the SFPs are the same or better than previous limits was highlighted.

3.129. Other technical and editorial comments were made about Table 6.9 and the surrounding paragraphs and concerns were raised about the reference to BS EN 13779 in Section 6.51, which respondents said has been withdrawn and replaced.

3.130. Other comments from respondents who said the standards do not go far enough included:

- The need to mandate heat recovery.
- Full autonomous air management systems, monitoring air quality, relative humidity, pollutants and temperature, should be specified.
- An approach to specify how much ventilation is required, both purge and background, would be beneficial to allow flexibility and innovation.
- NCM modelling should be improved so that air distribution systems are explicitly modelled, rather than the simplified method currently used.

Government response to Question 28

- 3.131. We recognise some of the challenges relating to the proposed fan coil unit specific fan power, and we have revised the guidance to 0.4W/(l.s) for these system types. This offers greater flexibility, while still offering an improvement on the previous standard. We have made further allowances for transpired solar collectors (an additional 0.3W/(l.s).
- 3.132. Although respondents expressed some concern over the feasibility of meeting SFPs for local supply and extract systems and kitchen extract, we have chosen not to relax these standards. They are very similar to the existing standards, which have existed for some time.
- 3.133. We have updated the reference to BS EN 13779 to BS EN 16798-3:2017 and clarified that SFP should be calculated at the full design load.
- 3.134. We have clarified in *Approved Document L, Volume 2: Buildings other than dwellings* that all supply and extract systems should be fitted with heat recovery systems, but we recognise that for some systems this may not be technically feasible (for example, in some specialist applications).

Question 29:

Do you agree with the proposals for self-regulating devices for new non-domestic buildings, as set out in Sections 5 and 6 of draft Approved Document L, volume 2: buildings other than dwellings?

- 3.135. In the consultation we proposed to introduce a new regulation in the Building Regulations to make sure that new non-domestic buildings must have self-regulating devices when a heating or cooling system is installed. We proposed guidance for new non-domestic buildings in Sections 5 and 6 of the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings*, which accompanied the consultation.

Question 29	No. of responses	% of all responses	% split for Q29
(a) Yes	198	26.6%	95%
(b) No	10	1.3%	5%
Did not respond	535	72.0%	-

- 3.136. Respondents who were in favour of the proposals expressed agreement for a variety of reasons. Some stated that by including self-regulating devices when heating or cooling systems are installed, it will provide more control on the thermal comfort of buildings, which would ultimately improve their energy efficiency. Others felt the proposals would aid regulatory alignment between sectors considering that the concept already exists for the domestic market. Some respondents also provided suggestions of situations where the standards would not be applicable.
- 3.137. A shared view from some respondents who agreed and some who disagreed with the proposals was that the definition of 'economically feasible' is slightly ambiguous

and it is unclear how the economic feasibility will be uniformly assessed. Concerns were also raised regarding what guidance the Competent Persons Schemes will receive to help them assess the economic feasibility.

3.138. One issue raised by those who disagreed was that ‘self-regulation’ may not fully appreciate economic feasibility and that the buffer zone for heat absorption or dissipation with high thermal mass in clause 5.15 should be explained or defined.

Government response to Question 29

3.139. We will implement the proposals for self-regulating devices for new non-domestic buildings, as set out in Sections 5 and 6 of the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings* as originally suggested in the consultation but with additional details about circumstances where they may not be feasible.

3.140. Furthermore, based on the feedback we received from stakeholders, we have decided to remove the ‘economic and financially feasible’ wording, to implement the proposals through statutory guidance (the Approved Documents) rather than introducing a new regulation, and to rename this element of the guidance as ‘thermostatic room controls’ to improve understanding.

Question 30:
Do you agree with the minimum efficacy proposals for lighting in new non-domestic buildings in Section 6 of draft Approved Document L, volume 2: buildings other than dwellings?

3.141. The performance of LED lighting has improved considerably in recent years, and LED lights are now competitively priced and suitable for nearly all indoor lighting applications. Our analysis suggests that it is cost-effective and practical to increase the minimum efficacy of lighting installations. In the consultation we proposed that the minimum efficacy for lighting installed in new non-domestic buildings should be:

- 95 luminaire lumens per circuit watt for general lighting; and
- 80 luminaire lumens per circuit watt for display lighting.

Question 30	No. of responses	% of all responses	% split for Q30
(a) Yes	178	24.0%	87%
(b) No, the standards go too far	10	1.3%	5%
(c) No, the standards do not go far enough	17	2.3%	8%
Did not respond	538	72.4%	-

3.142. Some respondents expressed concern about the application for certain specialist lighting systems, particularly display lighting.

3.143. Other respondents stated that fittings that require a high level of optical control (including spotlights, wall washers, gobo projectors etc.) often cannot achieve 80

lm/cW. Similar arguments were made for decorative lighting that will play a great role in commercial buildings for hospitality.

- 3.144. Some respondents stated that innovative light sources (e.g. innovative high excitation purity sources) be inadvertently banned by the lamp and luminaire efficacy levels proposed, despite the fact that they that are exempted from the energy efficiency requirements in the Ecodesign for Energy-Related Products and Energy Information (Lighting Products) Regulations 2021. One suggestion was that such light sources could meet a luminaire efficacy of 65 lm/cW.
- 3.145. Other comments queried the suitability of using luminaire lumens, rather than lamp or light source lumens either generally or in specific circumstances, such as where there are readily changeable shades. Lighting power densities were also suggested as a metric.
- 3.146. Further suggestions included that we should allow reduced efficacies where certain control packages have been used.
- 3.147. There was some concern that the statement in paragraph 6.58 of the 2021 draft *Approved Document L, volume 2: buildings other than dwellings* that, “Spaces should be within the recommended illuminance range and should not be over-illuminated”, and the calculation methodology in Appendix B, may oblige designers to carry out a full lighting calculation for every space, even for small spaces like a hotel bedroom or a toilet, which would be disproportionate.
- 3.148. Some respondents stated that a newer version of the Lighting Energy Numeric Indicator (LENI) methodology should be used to set lighting efficacy targets, and its targets adjusted on the basis of standard typical installations. Other responses stated that LENI is too complicated to be used in setting Building Regulations minimum standards.
- 3.149. Other comments included that that the standards do not go far enough, generally on the basis that LED technology can achieve very high efficiencies at low cost. Amongst these responses were suggestions that there should just be one standard (100lm/cW) for both display and general lighting, a suggestion of 95 lm/cW for main occupied activities and 90lm/W elsewhere.
- 3.150. There was support expressed across many different groups of respondents for referencing the CIBSE SLL Handbook.

Government response to Question 30

- 3.151. We will proceed with the proposals as set out in the consultation, with specific amendments in some areas. This includes setting a standard of 80 light lumens per circuit watt (rather than luminaire lumens) to recognise that this type of lighting is commonly fitted with removable shades and may not be photometered.
- 3.152. We have introduced a separate standard for lighting which requires a high level of optical control, including innovative high excitation purity lighting. We have also clarified that specialist process or performance lighting (such as stage-lighting) is

excluded. We have introduced an exemption for decorative lighting in spaces with low power usage.

- 3.153. We have issued a new table of maximum LENI (kWh per sqm per year) for new and existing buildings as an alternative means to compliance.
- 3.154. We recognise that some respondents believed the standard should be lower for smaller rooms where the luminaire lumens per circuit watt will be more difficult to achieve. The minimum efficacy applies as an average to the whole floor area of the building, so we are content that lower efficacies in some rooms can be offset by higher efficacies in others.
- 3.155. We have amended the text on illumination of spaces to clarify that it is not necessary to conduct full lighting calculations for small spaces.

Question 31:

Do you agree with the proposals for cooling in new non-domestic buildings in Section 6 of draft Approved Document L, volume 2: buildings other than dwellings?

- 3.156. In the consultation we proposed to increase minimum efficiencies (seasonal energy efficiency ratios) for all of the comfort cooling systems in the statutory guidance. In many cases the proposals aligned with Ecodesign requirements, although we identified opportunities to go further for some product types. Our proposed energy efficiency ratios for comfort cooling systems and associated guidance were provided in Section 6 of the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings*, which accompanied the consultation.

Question 31	No. of responses	% of all responses	% split for Q31
(a) Yes	173	23.3%	88%
(b) No, the standards go too far	4	0.5%	2%
(c) No, the standards do not go far enough	19	2.6%	10%
Did not respond	547	73.6%	-

- 3.157. Comments received included that Ecodesign requirements have been the principal driver for improvements in the cooling sector, and because of the increasingly global nature of production lines, we cannot drive change at a UK-level. It was suggested that going significantly further than other regional standards like Ecodesign could put UK manufacturers at a disadvantage.
- 3.158. A suggestion was made that the energy efficiency ratio (EER) should be used as well as the SEER which is used in the SBEM calculation, and that there should also be a single standard SEER calculation methodology adopted.
- 3.159. A call was also made for further commentary and guidance on adsorption technologies beyond scenarios where the chiller is driven by heat from a CHP and it was suggested that it should also mention heat received from a solar thermal system.

Government response to Question 31

3.160. We have considered the responses provided to this question and we consider that the minimum efficiencies proposed are reasonable and proportionate in achieving our aim without imposing a substantial burden, and we will proceed with the standards proposed at consultation.

Question 32:

Do you agree with the proposals to require building automation and control systems in new non-domestic buildings, when such buildings have a heating or air-conditioning system over 290kW?

3.161. A Building Automation and Control System (BACS) is a centralised system used to monitor and control a building's environment and services. Our analysis suggests that BACS are a cost-effective way of saving energy in buildings.

3.162. In the consultation we proposed that a heating or air-conditioning system over 290kW is used as a trigger point for the installation of BACS in new non-domestic buildings. We recognised, though, that setting a standard for BACS using a heating or air-conditioning system size trigger point could result in unintended outcomes and welcomed views on how to mitigate that risk.

Question 32	No. of responses	% of all responses	% split for Q32
(a) Yes	95	12.8%	44%
(b) No, a different trigger point should be used	101	13.6%	47%
(c) No, I do not agree that building automation and control systems should be required in new buildings	5	0.7%	2%
(d) No, I disagree for another reason	13	1.7%	6%
Did not respond	529	71.2%	-

3.163. Respondents who disagreed with the proposals included those who suggested that the trigger point should be lowered to bring more new buildings into scope, with many suggesting a trigger point of 180kW rather than 290kW or a trigger based on the floorspace rather than system output. The same concern about only a small number of buildings being in scope was also raised by some who agreed with the proposal.

3.164. Some respondents suggested changes that could be made to the Approved Document to make sure lighting systems are appropriately addressed.

Question 33:

Do you agree with the technical specification for new building automation and control systems as EN 15232, Class A?

3.165. Following Question 32, we proposed a standard for BACS installed in new buildings. We proposed to set the specification of BACS as a 'Class A' system using EN 15232, on the understanding that this is the necessary specification to meet ISO 16484. It also provides a high level of control, and our analysis suggests it is cost-effective.

Question 33	No. of responses	% of all responses	% split for Q33
(a) Yes	169	22.7%	95%
(b) No, the requirements go too far	4	0.5%	2%
(c) No, the requirements do not go far enough	4	0.5%	2%
Did not respond	566	76.2%	-

3.166. Some respondents raised concerns that for smaller buildings there may not be personnel with the necessary skills to operate the system. Suggestions were made that BACS should not be installed in such buildings or perhaps smaller buildings should require Class B systems rather than Class A.

3.167. Among respondents who disagreed with the technical specification, some felt that it is not appropriate to mandate that all BACS should be Class A. They said that it is too restrictive, as there are lots of factors which determine which class of system is most suitable for a given building.

3.168. Concerns were expressed that it was unclear in the guidance which systems a BACS was intended to control.

Government response to Questions 32 and 33

3.169. After carrying out further analysis, we have revised our proposals to require BACs in new non-domestic buildings. We will now proceed with a requirement for a BACs, when such buildings have a heating or air-conditioning system of 180kW or over, rather than 290 kW as originally proposed. Our analysis indicates that this change results in an additional net benefit of £8m over the lifetime of the policy, when expressed on the same basis as used in the consultation impact assessment.³

3.170. We have also clarified in *Approved Document L, Volume 2: Buildings other than dwellings* that a BACS is intended to control all heating, ventilation and air-conditioning systems.

Question 34:
Do you agree with the proposals for improving the commissioning guidance for new non-domestic buildings in Section 8 and 9 of draft Approved Document L, volume 2: buildings other than dwellings?

³ This estimate compares the impacts on a like-for-like basis and does not use the same methodology as used in the final impact assessment which takes into account organisational trends to net zero.

3.171. Specifying high performing services in buildings can only be effective if these services and controls are tested and adjusted properly after installation (a process known as ‘commissioning’). The Government wants to make sure that commissioning is carried out as effectively as possible. The consultation therefore set out our proposals for improving the commissioning guidance for new non-domestic buildings.

Question 34	No. of responses	% of all responses	% split for Q34
(a) Yes	116	15.6%	52%
(b) No, the standards go too far	3	0.4%	1%
(c) No, the standards do not go far enough	89	12.0%	40%
(d) No, I disagree for another reason	13	1.7%	6%
Did not respond	522	70.3%	-

3.172. There was widespread agreement that commissioning is a fundamental step in ensuring that the services in buildings are tested and adjusted post installation so that they can operate effectively.

3.173. Responses also expressed support for the proposal to make the requirements for commissioning clearer, and setting out the need for a commissioning plan, identifying roles/responsibilities, and documentation requirements in the Approved Document. There were, however, some calls for the Approved Document to be even more specific about the parameters that should be reported for each system to demonstrate the system ties up with the energy strategy requirement, and that systems are operating within reasonable margins.

3.174. A number of responses recommended going further and considering a penalty in the Part L as-built calculations until evidence of commissioning is provided, particularly for complex systems and large buildings.

3.175. There were some suggestions that commissioning inspections should be independent and mandatory to avoid buildings being managed by people with inadequate competencies. Many suggestions cited the value of seasonal commissioning and post-occupancy performance.

3.176. Other responses cited the lack of building control oversight in practice when it comes to commissioning, and some mentioned difficulties in enforcement when it comes to shell-and-core buildings or those with phased handovers.

3.177. Some responses suggested that there is often a lack of clarity surrounding where responsibility lies in construction projects, particularly in commissioning.

3.178. Some responses stated that it is important for any documentation not to be too complex and that it should be in a form that can be easily understood by the.

3.179. There was some concern expressed by stakeholders about the proposal to reference the MIS 3005 heat pump installation standard within Approved Documents L volumes 1 and 2, including that it was initially developed for a different purpose, was not particularly suited to non-domestic buildings, and may be hard to identify the most appropriate requirements from the current document format.

Government response to Question 34

3.180. While we recognise concerns about compliance and checking of commissioning, we do not consider that adding penalties to as-built calculations as a practical means of enforcement. Instead, we have restructured the guidance to make it much clearer that there is a legal requirement for developers to provide evidence of commissioning to their building control body. This aligns with our aims to improve understanding and compliance and will facilitate the work of the new Building Safety Regulator which will oversee the safety and performance of all buildings, and also actively oversee and enforce a more stringent regulatory regime for buildings in scope during their design, construction, occupation and refurbishment.

3.181. We have added guidance on the appointment of commissioning managers, and on the competencies they should possess.

3.182. We recognise the concerns raised over the direct reference to MIS 3005 and have removed this from the Approved Documents. In its place, for domestic buildings, we have enhanced the guidance given for heat pump commissioning and installation which is included directly within the relevant Approved Document. Government have procured a contractor – CIBSE – to produce up to date technical guidance to specifically address heat pump installations in larger non-domestic buildings. The guidance will be available by 2023.

Question 35:

Do you agree with the proposals for requirements relating to the assessment of overall energy performance of building services installations and providing information to building owners for new non-domestic buildings given in Sections 8 and 9 of Approved Document L, volume 2: buildings other than dwellings?

3.183. In the consultation we proposed to introduce guidance for when a new system is installed in a new non-domestic building. We proposed that the overall energy performance of the system is assessed and documented, with the results passed on to the building owner, as part of the commissioning process. We also proposed that a copy of the completed commissioning sheet, which includes commissioning information and results, should be provided to the building owner. Details of these proposals were provided in Sections 8 and 9 of the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings*, which accompanied the consultation.

Question 35	No. of responses	% of all responses	% split for Q35
(a) Yes	206	27.7%	90%
(b) No	22	3.0%	10%
Did not respond	515	69.3%	-

- 3.184. A number of respondents expressed concerns about information handover in buildings where the end-occupant is unknown, such as shell-and-core, CAT A or partially occupied buildings.
- 3.185. Responses included a suggestion that information should not need to be supplied to building control bodies when the work is done through a member of a competent persons scheme.
- 3.186. There were some concerns in consultation responses that information will become “buried in operation and maintenance manuals” and not referred to again, and suggestions that it could be better linked to a comprehensive “building passport” and should go beyond CIBSE’s TM 31 guidance and log-book.
- 3.187. There were some concerns that industry may not have the capacity to provide good quality analysis of this type.
- 3.188. Some highlighted the lack of a mechanism for redress in case any aspects of commissioning are not up to standard.

Government response to Question 35

- 3.189. We are proceeding with the new guidance. The information should be handed to the building owner and the building control body must still be notified that commissioning has been carried out according to the approved procedure, regardless of whether the person carrying out the work is a member of a competent persons scheme. There is, however, no requirement to submit full assessment or commissioning records to the building control body.
- 3.190. We have clarified that such information should be updated on first fit-out of a shell-and-core, or partially occupied building.

Question 36:
Do you agree with the guidance proposals for adequate sizing and controls of building services systems in new non-domestic buildings, as detailed in Sections 5 and 6 of draft Approved Document L, volume 2: buildings other than dwellings?

- 3.191. In the consultation we proposed to introduce new guidance on sizing and controls for building services systems. The intention was to reduce the risks from under or oversizing systems.

Question 36	No. of responses	% of all responses	% split for Q36
(a) Yes	181	24.4%	90%
(b) No, I do not agree with providing guidance on this	5	0.7%	2%
(c) No, the guidance should be improved	16	2.2%	8%
Did not respond	541	72.8%	-

- 3.192. Among those who agreed and those who disagreed with the proposals, there was some concern that providing too much guidance, or overly strict guidance, can stifle innovation.
- 3.193. Some respondents expressed the importance of considering redundancy strategies in sizing systems, for instance for hybrid systems. Some respondents who disagreed with the proposals felt that too much focus was placed on oversizing and that some systems can run efficiently at part loads.
- 3.194. Other comments included that additional clarity is needed in the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings*. Specifically, there should be a clearer definition of what constitutes adequate sizing and what is encompassed within the design load.
- 3.195. The importance of assigning clear responsibility for checking and approving the sizing and performance of systems was also highlighted.
- 3.196. Other key issues raised by respondents who said that the guidance should be improved included:
- The importance of undertaking both whole building and room-by-room sizing evaluation.
 - Weather compensation should not be compulsory.
 - The need to recognise that some systems serve multiple functions, and these functions should be considered together, rather than looking at each individually.
 - Clarifications to specific elements of the guidance considered to be ambiguous or unclear.

Government response to Question 36

- 3.197. We have proceeded with including this information on sizing within the Approved Document guidance. We have made some improvements to the guidance in response to the consultation responses. For some system types, we have removed the prescriptive percentage oversizing guidance. We have also clarified the information that should be provided to building control to demonstrate compliance with the guidance.

Question 37:

Do you agree with the proposal that wet space heating systems in new buildings should be designed to operate with a flow temperature of 55°C or lower?

- 3.198. The Future Homes Standard consultation proposed to introduce measures for new homes that would make it easier to install low carbon heating in future. Although new non-domestic buildings are more diverse in end-use and services, the same principle of ensuring that the buildings are suitable for future low-carbon heat still applies.
- 3.199. The diverse possibilities for low carbon heat in future means that it is not possible to futureproof for every scenario. One proposal, however, that would provide benefits

now and make it easier to install heat pumps or district heating in future, is for new buildings to have a space heating system which operates at a low temperature. Heat pumps operate best at temperatures of 55°C or lower.

3.200. In the consultation we proposed that wet space heating systems in non-domestic buildings should be designed to operate with a flowrate temperature of 55°C or lower in the final heating circuit.

Question 37	No. of responses	% of all responses	% split for Q37
(a) Yes, through a minimum standard set in paragraph 5.9 of the Approved Document L, volume 2: buildings other than dwellings	94	12.7%	19%
(b) Yes, through carbon and primary energy credit in SBEM	13	1.7%	3%
(c) Yes, by another means	4	0.5%	1%
(d) No, the temperature should be below 55°C	377	50.7%	75%
(e) No, this standard should not be applied to all new buildings	3	0.4%	1%
(f) No, I disagree for another reason	12	1.6%	2%
Did not respond	240	32.3%	-

3.201. Among respondents who were in favour of the proposal there was widespread agreement that should be implemented via a minimum standard set in paragraph 5.9 of the *Approved Document L, Volume 2: Buildings other than dwellings*. It was stated that this is simplest and most effective way of setting the flow temperature; that the Approved Document allows the flexibility required for all different types and sizes of buildings; that setting the flow temperature now will help people to better cope with low carbon heating in future; and overall, it is a positive step as there will be reduced energy consumption, carbon emissions and consumer bills.

3.202. A concern from some respondents included that if standard is not set in the regulations and is left to people's own preferences, then it will not be complied with due to the additional costs of installing the system. Therefore, it was suggested that the flow temperature should be legislated as a mandatory minimum standard with sufficient grounds for enforcement.

3.203. Respondents who thought that the proposal should be implemented through carbon and primary energy credit in SBEM stated that it would be hard to mandate all system types with a flow temperature of 55°C or lower and that it encourages good design and system efficiency.

3.204. Other comments included:

- The flow temperature should be below 55°C so that systems can operate at higher efficiencies.
- Lower than 55°C will speed up the adoption of heat pump technology and encourage heat pump installation.
- A 55°C flow temperature puts people at higher risk of scalding themselves.
- The flow temperature should be lower to allow significant improvement in seasonal efficiency.
- A lower flow temperature will reduce the risk of overheating due to unwanted losses in pipes.

3.205. Some respondents suggested lower temperatures (e.g 35°C -45°C) temperatures stating this will allow heat pumps to operate more efficiently and allow other types of heat emitters to be used such as underfloor heating and fan coils.

3.206. Another common response from respondents who disagreed with the 55°C flow temperature was that we should limit maximum flow temperatures in new build and retrofit installations to provide certainty and reduce risk of misinterpretation. It was also suggested that we should specify maximum flow and return temperatures to make sure that the radiators are sensibly sized for future low carbon heat sources or heat networks.

Government response to Question 37

3.207. We have set the standard so that wet space heating systems in new buildings should be designed to operate with a maximum flow temperature of 55°C through a minimum standard set in paragraph 5.9 of the *Approved Document L, Volume 2: Buildings other than dwellings*.

3.208. Some respondents expressed concerns about effects on heat emitter sizes, and performance in existing buildings which may be less suitable for lower flow temperatures. We believe that a maximum design flow temperature of 55°C allows enough flexibility for systems to work effectively and achieves the right balance between providing temperatures suitable for low carbon heat, while remaining practical to install in most cases. The Approved Document provides guidance where large enough heat emitters cannot feasibly be installed in the space.

3.209. Many respondents suggested that flow temperatures should be even lower than 55°C, to maximise the efficiency of low carbon heating systems in future. We have made it clear in the guidance that this is a maximum design flow temperature, and that designing to a lower flow temperature is preferable.

Question 38:

Do you agree with the proposals to clarify, rationalise and simplify the guidance for building services in new non-domestic buildings, and to incorporate the standards of the Non-Domestic Building Services guidance into the main body of the Approved Document L, volume 2: buildings other than dwellings?

3.210. In the consultation we made several proposals to help clarify, rationalise, and simplify the guidance for new non-domestic building services, including incorporating the standards in the Non-Domestic Building Services Compliance Guide into the main body of the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings*.

Question 38	No. of responses	% of all responses	% split for Q38
(a) Yes	124	16.7%	57%
(b) No	95	12.8%	43%
Did not respond	524	70.5%	-

3.211. Respondents who supported the proposal welcomed the simplification of the guidance. A comment made regularly was that designers and installers are often not aware of the separate guidance or do not attach much importance to it; therefore, incorporating it into the Approved Document will be beneficial.

3.212. Among those who opposed the proposal, comments included that the compliance guidance should be retained and updated as opposed to being merged into the Approved Document to avoid valuable information being lost. There were also concerns from a minority of stakeholders that areas such as insulation and seasonal efficiency were not sufficiently addressed.

Question 39:
Do you agree with the proposals to simplify the requirements in the Building Regulations for the consideration of high-efficiency alternative systems in new non-domestic buildings?

3.213. In the consultation we proposed to simplify the requirements of Regulation 25A that deals with high-efficiency alternative systems. Regulation 25A requires the person who is carrying out the work of constructing a new building to analyse and consider the technical, environmental, and economic feasibility of using high-efficiency alternative systems in the construction. We proposed to align non-domestic buildings to new domestic buildings by:

- a. removing the list of example systems at 1(a)-(d) of Regulation 25A; and
- b. removing the requirement to give notice to the local authority that states the analysis has been carried out.

Question 39	No. of responses	% of all responses	% split for Q39
(a) Yes	146	19.7%	89%
(b) No	18	2.4%	11%
Did not respond	579	77.9%	-

3.214. Some respondents suggested that there may not be a need for the requirement at all. They felt that the growing emphasis on energy efficiency and the introduction of

stricter regulations will drive consideration of high-efficiency alternative systems without the need for a specific requirement around it.

3.215. Respondents highlighted that they felt the process is a tick-box exercise and that people do not read the existing “third-tier” documents.

Government response to Questions 38 and 39

3.216. We will incorporate the standards of the Non-Domestic Building Services guidance into the main body of the Approved Document L, Volume 2: Buildings other than dwellings. This will also help to clarify, rationalise, and simplify the existing guidance. Incorporating the text into the Approved Document will make sure that the proposals are clear and more accessible to the people that need them.

3.217. *The Independent Review of Building Regulations and Fire Safety* report stated that statutory guidance has to be clear, non-complex, and unambiguous. Merging the compliance guidance into the Approved Document is aligned with this recommendation. Similarly, we have emphasised that the Approved Documents provide guidance on the minimum standards required to comply with the Building Regulations.

3.218. We intend to simplify and clarify the guidance on regulation 25A of the Building Regulations. This will not change the legal requirements including the need for the analysis to be undertaken and will not prevent local authorities from requiring evidence that such analysis has been performed.

Building services in existing non-domestic buildings

Question 40:
Do you agree with the efficiency proposals for replacement fixed building services in existing non-domestic buildings as detailed in paragraphs 5.4 to 5.7 of draft Approved Document L, volume 2: buildings other than dwellings?

3.219. If replacing a fixed building service involves a fuel switch, we proposed that the new services should not emit more CO₂ emissions and also should not have higher primary energy demand than the service being replaced. This would, for instance, mean a gas-fired boiler should not generally be replaced with an electric flow boiler, even though it may be lower carbon.

Question 40	No. of responses	% of all responses	% split for Q40
(a) Yes	455	61.2%	93%
(b) No	35	4.7%	7%
Did not respond	253	34.1%	-

3.220. Respondents suggested that the standards for existing buildings should be set to the same standard as for new builds, since in most cases it is possible to use the same plant equipment (i.e. with the same efficiency) in new and existing buildings.

Some respondents also suggested that the forecast carbon emissions reductions from grid supplied electricity should be considered, as something that currently looks poorer may be a better future choice.

- 3.221. Other respondents mentioned that the proposed requirement for replacement systems to have lower primary energy and carbon emissions than the systems it replaces is likely to prevent direct electric heating replacing a gas boiler due to its higher primary energy. A suggestion was also made that Section 5.4 should be reworded to make sure that heat pumps are not unintentionally excluded by virtue of the primary energy of electricity versus gas.
- 3.222. Some respondents who disagreed with the proposals raised concerns that the proposal allows a more polluting fuel to replace a lesser polluting fuel. For the example given in the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings*, it was suggested that the old LPG boiler should be replaced with a more efficient LPG boiler, rather than an oil boiler. A concern was also raised that the equivalence of renewable and fossil fuel primary energy may result in fossil fuels being used instead of renewables.
- 3.223. Other comments highlighted the importance of considering the needed redundancy that manufacturer controllers manage in cascade systems. The benefits of cascading were highlighted, and it was argued that they are much more efficient than a single heat source.

Government response to Question 40

- 3.224. We agree with the premise that replacement services in buildings should aim to achieve the highest feasible efficiency standards, and that aligning with the new build standards would be good practice where possible. We do, however, have to accommodate all circumstances when setting minimum standards, and there are often technical reasons why higher efficiencies cannot always be achieved when replacing services in existing buildings. We have clarified in Section 6 of *Approved Document L, Volume 2: Buildings other than dwellings* that these are minimum efficiency standards, and that best practice would be to achieve higher efficiencies.
- 3.225. We have rewritten the fuel-switching example in the Approved Document so that it no longer reads as though we are encouraging oil boiler installations.
- 3.226. Generally, we consider that gas-fired boilers should not be replaced with electric flow boilers or direct electric heaters. Although this may appear to be lower carbon, the increased cost to the consumer and the additional demand placed on the electricity grid may offset those benefits. .

Question 41:

Do you agree with the newly proposed minimum efficiencies for natural gas, oil and LPG boiler and domestic hot water system installations in existing non-domestic buildings in Section 6 of draft Approved Document L, volume 2: buildings other than dwellings?

3.227. In the consultation we proposed that the increases in minimum seasonal efficiencies in new non-domestic buildings, covered in Question 27, also apply to installations in existing non-domestic buildings.

Question 41	No. of responses	% of all responses	% split for Q41
(a) Yes	99	13.3%	47%
(b) No, the standards go too far	11	1.5%	5%
(c) No, the standards do not go far enough	100	13.5%	48%
Did not respond	533	71.7%	-

3.228. There were several suggestions in response to this question that the guidance should go further to discourage systems reliant on fossil fuels.

3.229. Several responses suggested that the efficiencies for single boilers >2MW should be higher, with a specific suggestion that they should have efficiencies of at least 93%, and that this could be achieved by:

- fitting flue condensers to non-condensing boilers;
- replacing high-temperature systems;
- adding weather compensation for terminal systems; and/or
- redesigning/controlling of domestic hot water systems.

3.230. Technical issues with the proposed standards raised included that:

- Dual fuel boilers may be needed in some settings (e.g. hospitals) and the choice is limited if the efficiency is set to the same level as that of new buildings.
- Direct-fired water heaters <30kW are difficult to replace with alternative fixed building services due to space, performance, and installation issues.
- For direct-fired water heaters <30kW, heating efficiency credits are necessary, and justified on the basis that such systems are sporadically used and the market often oversizes hot water systems. Manufacturers cannot effectively prepare for the large change, an estimated 23.5% if including removal of heating efficiency credits, and the industry suggests that this may lead to a hiatus in the market and building owners trying to extend the life of failing equipment.
- The compliance date for increased water heater replacement standards should be set for 2025, to give industry time to prepare.
- Hydrogen-ready equipment should get efficiency relaxation, with 5% suggested.
- Retrofitting condensing equipment in existing buildings is often complex and involves the replacement of the entire flue system, increasing costs significantly and may not be feasible in some locations.
- Industry has had to deal with transition costs and disruption less than three years ago in order to move to low-NO_x heaters because of changes to Ecodesign regulations.

3.231. In particular, these comments challenge some of the assumptions that these changes would be low-cost, particularly for non-condensing water heater replacements, which would involve a flue replacement.

3.232. There was a suggestion from some manufacturers that many existing non-domestic properties will not be suitable for low-temperature heating solutions.

Government response to Question 41

3.233. We have revised the guidance to state that a condensing boiler (or boiler with added condensing kit) should be installed where feasible for all boiler types. We do, however, recognise that flue replacement may not always be feasible, particularly as boiler replacements are often distress purchases, which need to be installed quickly to keep the building usable. We are therefore allowing non-condensing boilers to continue to be installed if it is not feasible to replace the existing flue system.

Question 42:
Should minimum boiler efficiency standards in existing nondomestic buildings still benefit from relaxations through the use of heating efficiency credits?

3.234. The Non-Domestic Building Services Compliance Guide 2013 edition allowed heating appliances installed in existing buildings to have lower seasonal efficiencies if these were compensated for by the addition of other energy efficiency measures. These allowances are known as heating efficiency credits. In the consultation we proposed to no longer provide this alternative guidance because the efficiency of appliances has been improved since these were published and these relaxations are no longer needed.

Question 42	No. of responses	% of all responses	% split for Q42
(a) Yes, boiler installations should continue to benefit from heating efficiency credits	38	5.1%	18%
(b) No, boiler installations should no longer benefit from heating efficiency credits (the Government's proposal)	179	24.1%	82%
Did not respond	526	70.8%	-

3.235. Some respondents felt that the process of claiming credits is difficult to enforce and therefore open to abuse.

3.236. Other respondents disagreed with the Government's proposal and felt that boiler installations should continue to benefit from heating efficiency credits. It was felt that the application of heating credits encourages an increase in the overall efficiency of systems. It was suggested that additional credits should be provided to include modulation; best practice while supporting greater system efficiency; and recognition of technologies that can use hydrogen.

- 3.237. It was also argued that removing heating efficiency credits would present a challenge to manufacturers when preparing for the part L uplift and would lead to technical and financial issues for consumers. It was felt that this may inadvertently encourage deployment of high carbon and not-fit-for-purpose technology.
- 3.238. A point was also raised that if boilers no longer benefitted from heating efficiency credits then it would make it difficult to compare new systems without credits and old systems with credits.
- 3.239. The importance of retaining relaxations for off-gas grid buildings which are difficult to heat was also raised.

Government response to Question 42

- 3.240. We believe that the removal of heating efficiency credits remains a proportionate step and will proceed with their removal as part of the 2021 uplift.
- 3.241. All space heating and domestic hot water boiler installations should install controls to improve the effective efficiency of the system.

Question 43:

Do you agree with the proposed set of standards for air distribution systems for existing non-domestic buildings in Section 6 of draft Approved Document L, volume 2: buildings other than dwellings?

- 3.242. In the consultation we proposed that the minimum standards for air distribution in new non-domestic buildings, covered in Question 28, also apply for installations in existing non-domestic buildings.

Question 43	No. of responses	% of all responses	% split for Q43
(a) Yes	168	22.6%	92%
(b) No, the standards go too far	7	0.9%	4%
(c) No, the standards do not go far enough	8	1.1%	4%
Did not respond	560	75.4%	-

- 3.243. Among respondents who agreed with the proposed set of standards, some recommended that there should be flexibility in the standards for buildings with physical constraints or limited space. Similarly, some respondents who thought the standards go too far highlighted that spatial restrictions within existing buildings may limit the performance that could be achieved. Some existing buildings would require slimline units to be installed that could not meet the proposed standards. It was further suggested that where it may be impractical to change the minimum air flow within the constraints of an existing building, it should be possible to argue for an exemption.

- 3.244. A point was raised that the inclusion of some technologies (e.g. Transpired Solar Collectors) may necessitate an increase in SFP. It was highlighted that the current proposals do not provide an allowance for their inclusion, whilst giving an additional allowance for active chilled beams, which could lead to alternative renewable systems being penalised.
- 3.245. Among respondents who said the standards do not go far enough, concern was raised that the requirements have largely remained unchanged. It was suggested that there should be greater encouragement to install new heat recovery systems and the importance of industry using a standardised, transparent SFP calculation method was highlighted.
- 3.246. Across the responses received, several additional technical and editorial comments were made about Table 6.9 in the 2021 draft *Approved Document L, volume 2: buildings other than dwellings* and the surrounding paragraphs and concerns were raised about the reference to BS EN 13779 in Section 6.51 of the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings*, which respondents said has been withdrawn and replaced.

Government response to Question 43

- 3.247. Some respondents suggested that the SFP requirements were relaxed; while others felt they should go further than the consultation proposals. Although, in general, the SFP requirements are not significantly more onerous than in the 2013 standard, we believe that they will be challenging, but still possible, in some instances. As a result, we do not consider it appropriate for the standards to go further than those proposed in the consultation.
- 3.248. In line with new non-domestic buildings we have marginally increased the SFP allowance for fan coil units to 0.4W/(l.s). We have made further allowances for transpired solar collectors (an additional 0.3w/(l.s).
- 3.249. We have replaced the reference to BS EN 13779 with reference to BS EN 16798-3:2017.

Question 44:

Do you agree with our proposed approach and guidance to mandating self-regulating controls in existing non-domestic buildings, including technical and functional feasibility, as detailed in Sections 5 and 6 of draft Approved Document L, volume 2: buildings other than dwellings?

- 3.250. In the consultation we proposed that the new requirement around self-regulating devices in new buildings, covered in Question 29, which specified that buildings must have self-regulating devices when a heating or cooling system is installed, should also apply to the replacement of a heating appliance in an existing building. We proposed that in cases where it is not technically or economically feasible to install such controls in an existing building, the requirement would not apply.

3.251. Our proposed guidance for self-regulating devices in existing non-domestic buildings was provided in Sections 5 and 6 of the 2021 draft *Approved Document L, volume 2: buildings other than dwellings*, which accompanied the consultation.

Question 44	No. of responses	% of all responses	% split for Q44
(a) Yes	191	25.7%	93%
(b) No	14	1.9%	7%
Did not respond	538	72.4%	-

3.252. Respondents who agreed with the proposal noted that it is important to consider how this proposal would be undertaken through a competent persons scheme alone in scenarios such as when a heat generator is being replaced as, without a building control body present, their knowledge may be limited on whether additional work is required. It was suggested that education and upskilling programmes for new and existing installers are proposed in association with the competent persons schemes.

3.253. Among the reasons for disagreement with the proposal was due to the 'economic and financially feasible' wording. Respondents were concerned that the 'technically and economically feasible' wording could be used as an excuse to not improve building services efficiency and suggested that this should be removed.

Government response to Question 44

3.254. We have decided to implement the proposals for self-regulating devices for existing non-domestic buildings as originally suggested in the consultation but with details about circumstances where they may not be feasible.

3.255. Furthermore, we have decided to remove the 'economic and financially feasible' wording and implement the proposals through statutory guidance rather than introducing a new regulation, and to rename this element of the guidance as 'thermostatic room controls' to improve understanding

Question 45:

Do you agree with the minimum efficacy proposals for lighting in existing non-domestic buildings in Section 6 of draft *Approved Document L, volume 2: buildings other than dwellings*?

3.256. In the consultation we proposed that the minimum standards for lighting in new non-domestic buildings, covered in Question 30, also apply for installations in existing non-domestic buildings. The standards for existing buildings would only apply when the Building Regulations are triggered by relevant building works, such as a building refurbishment. They would not be applicable in other scenarios, such as when replacing an individual lamp within an existing luminaire.

Question 45	No. of responses	% of all responses	% split for Q45
(a) Yes	175	23.6%	90%
(b) No, the standards go too far	7	0.9%	4%
(c) No, the standards do not go far enough	12	1.6%	6%
Did not respond	549	73.9%	-

3.257. Responses to this question generally repeated the concerns and comments expressed in response to Question 30, which related to the proposed guidance for lighting in new buildings.

3.258. Further to the responses given to Question 30 it was highlighted that in existing buildings (the subject of this question), some of the required efficacies may not be appropriate as they may necessitate the fitting of inappropriate modern office lighting in unsuitable settings.

Government response to Question 45

3.259. A number of changes to our proposals relating to lighting in both new and existing buildings have been made following consultation. These are outlined in our response to Question 30.

Question 46:
Do you agree with the proposals for cooling in existing nondomestic buildings in Section 6 of draft Approved Document L, volume 2: buildings other than dwellings?

3.260. In the consultation we proposed that the minimum standards for comfort cooling systems in new non-domestic buildings, covered in Question 31, also apply for installations in existing non-domestic buildings.

Question 46	No. of responses	% of all responses	% split for Q46
(a) Yes	134	18.0%	86%
(b) No, the standards go too far	7	0.9%	5%
(c) No, the standards do not go far enough	14	1.9%	9%
Did not respond	588	79.1%	-

3.261. There were suggestions that the manufacturers of these products take part in an increasingly global market, and that UK standards are not a significant driver for change in the manufacturing sector. There was a suggestion that pushing standards as far as proposed may disadvantage UK industry, as they go further than European and other regional/global requirements.

3.262. There were some suggestions that Building Regulations compliance may be difficult to check against in practice, as the installation of air conditioning equipment is specialist in nature. There were calls for Government to consider how the provision

of information can be assessed by the designer and the building control body, especially with reference to smaller buildings.

3.263. There was a call for additional guidance on how to come up with a SEER that accurately reflects operational conditions. This may be the case for split and variable refrigerant flow (VRF) systems, the efficiency of which may differ greatly depending on load profiles, pipe lengths, installation quality and maintenance quality, for example.

Government response to Question 46

3.264. Although we recognise some of the issues that manufacturers raised about the standards, we believe that the minimum efficiencies are readily available on the UK market and will proceed with the standards as proposed at consultation.

Question 47:

Do you agree with the proposals that when Building Automation and Control System is installed in an existing non-domestic building with a heating or air-conditioning system over 290 kW, it should meet the same minimum standards as new non-domestic buildings?

3.265. Questions 32 and 33 covered the requirements for BACS in new non-domestic buildings. We also consulted here on the requirements for existing non-domestic buildings, proposing that when a BACS is installed or replaced in an existing building with a heating or air-conditioning system over 290kW it should meet the same standards as in new build - i.e. a Class A system using EN 15232.

Question 47	No. of responses	% of all responses	% split for Q47
(a) Yes	95	12.8%	48%
(b) No, a different trigger point should be used	86	11.6%	43%
(c) No, a different standard should be used	5	0.7%	3%
(d) No, for another reason	14	1.9%	7%
Did not respond	543	73.1%	-

3.266. Some respondents were in favour of a trigger point that would bring more existing buildings into scope were they to install or replace their BACS. Suggestions included a 180kW threshold, and there were suggestions that a floorspace measure should be used instead.

3.267. Other responses included those who believed it did not fully cover lighting guidance. Various other issues were also raised including the importance of focusing first on the fabric of the building, the importance of considering the use and occupancy of buildings, and the importance of carrying out in-use assessments.

- 3.268. An argument was made that the proposal may not be appropriate in some buildings and that the technical feasibility and cost effectiveness of installing BACS should be considered for each building.
- 3.269. Some respondents interpreted the proposal as a requirement to install BACS in existing buildings. A concern was also raised that some developers may intentionally undersize the heating or air conditioning system to negate the requirement.

Government response to Question 47

- 3.270. To bring the requirements in line with those for new non-domestic buildings, we have changed the trigger point in guidance when a BACs system is installed in an existing building from 290kW to 180kW. If an existing non-domestic building with a heating or air-conditioning system of 180kW or over is installing or replacing a BACS, guidance will state that that BACS must usually be a Class A system using EN 15232.
- 3.271. We acknowledge the concerns raised by some respondents that a Class A BACS may not be compatible with a building's existing technical systems equipment. If this is the case, a Class B BACS may be installed. *Approved Document L, Volume 2: Buildings other than dwellings* reflects this.
- 3.272. Wording of the guidance has been reviewed to provide additional clarity on the types of systems covered by the BACs standards.

Question 48:

Do you agree with the proposals for requirements relating to the assessment of overall energy performance of building services installations and providing information to building owners for existing non-domestic buildings?

- 3.273. In the consultation we proposed to introduce requirements for when work is carried out to a building services system, or a new system is installed in an existing non-domestic building. We proposed that the overall energy performance of the altered part, and where relevant of the complete altered system, is assessed and documented, with the results passed on to the building owner. We proposed that a copy of the completed commissioning sheet, which includes commissioning information and results, should be provided to the building owner.

Question 48	No. of responses	% of all responses	% split for Q48
(a) Yes	194	26.1%	89%
(b) No, I do not agree with providing this guidance	3	0.4%	1%
(c) No, the guidance should be improved	21	2.8%	10%
Did not respond	525	70.7%	-

- 3.274. A number of responses provided suggestions for how the guidance could be improved. In particular, how it could be made to more clearly apply to work to

existing buildings. There were also some comments that the information could be better linked to a comprehensive ‘building passport’.

- 3.275. A suggestion was made that information should not need to be supplied to building control bodies when the work is done through a member of a competent persons scheme.
- 3.276. It was also suggested that commissioning and information requirements should also apply whenever regulated works have been done to the building which could affect its energy use profile (e.g. fabric efficiency, changes of use, extension etc.), whether or not there have been works to fixed building services, automation, and control systems.
- 3.277. Many respondents used this question to bring up issues with commissioning more generally, which is the subject of other questions in this consultation.

Government response to Question 48

- 3.278. We will proceed with the new guidance as set out in the consultation. The information should be handed to the building occupant. The building control body must still be notified that commissioning has been carried out according to the approved procedure, regardless of whether the person carrying out the work is a member of a competent persons scheme. There is, however, no requirement to submit full assessment or commissioning records to the building control body.

Question 49:

Do you agree with the guidance proposals for adequate sizing and controls of building services systems in existing non-domestic buildings, as detailed in Sections 5 and 6 of draft Approved Document L, volume 2: buildings other than dwellings?

- 3.279. In the consultation we proposed that the new requirements and associated guidance for the sizing and controls of building services systems for new non-domestic buildings, covered in Question 36, also apply to installations in existing non-domestic buildings.

Question 49	No. of responses	% of all responses	% split for Q49
(a) Yes	178	24.0%	92%
(b) No, do not agree with providing this guidance	3	0.4%	2%
(c) No, the guidance should be improved	12	1.6%	6%
Did not respond	550	74.0%	-

- 3.280. Among respondents who did not agree with providing this guidance, there was some concern that providing too much guidance can stifle innovation. It was suggested that responsibility for providing guidance should lie with manufacturers and that installers should then provide evidence that the system is suitable for the installed circumstance.

3.281. Various concerns were raised by respondents who disagreed with the proposals and thought that the guidance should be improved. Some respondents felt that greater clarity was needed. For instance, a more specific definition should be provided for what constitutes adequate, or inadequate, sizing. Similarly, a more specific description of what is meant by the “design load” is needed so that there is common understanding of what it encompasses.

3.282. Other key issues raised by respondents who thought that the guidance should be improved included:

- The importance of considering the needed redundancy that manufacturer controllers manage in cascade systems.
- The need to consider the future impacts of climate change when providing system sizes.
- The importance of incorporating some flexibility to allow for non-standard buildings and/or non-standard usage patterns.

Government response to Question 49

3.283. We have revised guidance to be less specific about the amount of oversizing that may be appropriate, given the wide range of circumstances that the guidance is designed to apply to.

Question 50:
Do you agree with the proposal that when whole wet space heating systems (i.e. boiler and radiators) are replaced in existing non-domestic buildings the replacement system should be designed to operate with a flow temperature of 55°C or lower?

3.284. To make it easier to install low carbon heating in future, for existing non-domestic buildings, we proposed that when a whole wet space heating system is replaced, including both the heating appliance (e.g. a boiler) and the emitters (e.g. a radiator), that the new system is designed to run at 55°C.

Question 50	No. of responses	% of all responses	% split for Q50
(a) Yes, through a minimum standard set in paragraph 5.9 of Approved Document L, volume 2: buildings other than dwellings	89	12.0%	18%
(b) Yes, through carbon and primary energy credit in SBEM	12	1.6%	2%
(c) Yes, by another means	3	0.4%	1%
(d) No, the temperature should be below 55°C	371	49.9%	74%

(e) No, this standard should not be applied to all existing buildings	14	1.9%	3%
(f) No, I disagree for another reason	10	1.3%	2%
Did not respond	244	32.8%	-

3.285. Several respondents who supported the proposal said that by implementing these measures through a minimum standard set in paragraph 5.9 of the draft *Approved Document L, volume 2: buildings other than dwellings*, it will not limit consumer choice regarding the heating system that they select; it will allow the flexibility required for different types and sizes of buildings; and it will give greater chance of achieving the individual building’s need rather than a “one size fits all” approach.

3.286. Other respondents felt that when whole wet space heating systems (i.e. boiler and radiators) are replaced in existing non-domestic buildings, the replacement system should be designed to operate with a flow temperature lower than 55°C. Several suggestions for an alternative temperature were provided, with most ranging from 35°C – 45°C. Some respondents felt that a lower flow temperature would reduce the risk of overheating and some felt that 55°C posed the risk of people scalding themselves.

3.287. Other respondents disagreed with the proposal as they felt that it would not be applicable to all circumstances. For instance, it was highlighted that some systems can run at higher temperatures (i.e. solar thermal) so the technology should not be limited and that the insulation/air leakage levels possible in existing buildings may never be adequate to fit the much larger heat emitters required.

Government response to Question 50

3.288. We will set the requirement so that wet space heating systems in existing non-domestic buildings should be designed to operate with a maximum flow temperature of 55°C through a minimum standard set in paragraph 5.9 of *Approved Document L, Volume 2: Buildings other than dwellings*.

3.289. Many respondents suggested that flow temperatures should be even lower than 55°C, to maximise the efficiency of low carbon heating systems in future. We have made it clear in the guidance that this is a maximum design flow temperature, and that designing to a lower flow temperature is preferable.

Question 51:

Do you agree with the proposals to restructure the guidance for building services in existing non-domestic buildings, and to incorporate the standards of the Non-Domestic Building Services guidance into the main body of the *Approved Document L, volume 2: buildings other than dwellings*?

3.290. In the consultation we proposed that the changes to simplify, rationalise and clarify the guidance for new non-domestic building services, covered in Question 38, also apply to guidance for existing non-domestic buildings.

Question 51	No. of responses	% of all responses	% split for Q51
(a) Yes	116	15.6%	55%
(b) No	94	12.7%	45%
Did not respond	533	71.7%	-

3.291. Respondents who supported the proposal welcomed the simplification of the guidance. Some respondents said that incorporating the standards of the Non-Domestic Building Services guidance into the main body of the Approved Document will make sure they are properly read and followed. Some respondents, however, raised concerns that valuable guidance could be lost in the rationalisation process. It was also raised that it was important that guidance was as easy to access as possible.

Question 52:
Do you agree the Government should continue to provide guidance for minimum building services efficiencies in existing non-domestic buildings, if the standard does not go significantly further than the Ecodesign regulations?

3.292. In the consultation we proposed to continue to provide guidance for minimum building services efficiencies, where the standards do not go significantly beyond the Ecodesign requirements. This provides an additional information source for designers and installers, and a mechanism for setting or increasing standards in future, potentially further than the Ecodesign mechanisms.

Question 52	No. of responses	% of all responses	% split for Q52
(a) Yes	195	26.2%	96%
(b) No, the Ecodesign regulations are sufficient	7	0.9%	3%
(c) No	1	0.1%	0%
Did not respond	540	72.7%	-

3.293. The vast majority of respondents agreed with the proposal, with some expressing the importance of having all the guidance in one clear, concise document. A few respondents also felt that not all building services are currently covered by Ecodesign regulations and therefore separate guidance is necessary.

3.294. A small number of respondents disagreed with the proposal. Among these respondents, several concerns were raised around the standard, including that by continuing to develop separate standards, Government may create confusion and make it harder for end users; that the minimum standards are often interpreted as targets; and that there may not be enough flexibility to update the minimum efficiencies in the future without waiting for a more comprehensive update of the building regulations.

Government response to Questions 51 and 52

- 3.295. We will incorporate the standards of the Non-Domestic Building Services guidance into the main body of *Approved Document L, Volume 2: Buildings other than dwellings*. This will also clarify, rationalise and simplify the existing guidance. Incorporating the text into the Approved Document will make sure that the proposals are clear and more accessible to people that need them.
- 3.296. *The Independent Review of Building Regulations and Fire Safety* stated that statutory guidance has to be clear, non-complex and unambiguous. Merging the compliance guidance into the Approved Document aligns with this objective. Similarly, we have stressed that the Approved Documents provide guidance on the minimum standards required to comply with the Building Regulations.
- 3.297. We will continue to set minimum building services efficiencies, even where they do not go significantly beyond the Ecodesign requirements. This provides an additional information source for designers and installers, and a mechanism for setting or increasing standards in future, potentially further than the Ecodesign mechanisms.

Part L guidance for non-domestic buildings

Question 53:

Do you agree with the changes made to simplify, rationalise and clarify the guidance, and the updates to external references in Appendix E and Appendix F, in Approved Document L, volume 2: buildings other than dwellings, as outlined in paragraph 3.12.1 of the consultation document?

- 3.298. We provided the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings* alongside the consultation document, with major technical changes highlighted in yellow. We aimed for the new guidance to be clearer about what is expected of builders and installers in complying with the regulatory requirements. Approved Documents deal with complex information and are an essential resource relied upon by those who enforce the regulations, advise on compliance or need to comply with the regulations. *The Independent Review of the Building Regulations and Building Safety* highlighted that the complexity of the current regulations and Approved Documents guidance “can lead to confusion and misinterpretation in their application...regulations and guidance must be simplified and unambiguous.”
- 3.299. In line with this recommendation, we set out various proposals to simplify, rationalise and clarify the guidance for new and existing non-domestic building services.

Question 53	No. of responses	% of all responses	% split for Q53
(a) Yes	125	16.8%	79%
(b) Yes, but not with the changes to the supplementary guidance	14	1.9%	9%
(c) Yes, but not with the external references	2	0.3%	1%
(d) No	18	2.4%	11%
Did not respond	584	78.6%	-

3.300. Respondents who agreed with the proposal felt that the suggested changes were helpful as they make it clearer what is required to comply with the Building Regulations and also because there are currently too many ambiguous areas in the documents.

3.301. Other respondents specified that they were in favour of the proposal but not with the proposed changes to the supplementary guidance. Respondents felt that the items we proposed to remove can be very useful in some situations and that supplementary guidance on specific areas from external bodies who specialise in those areas is extremely valuable. Suggestions included indicating which professional bodies may be able to provide additional guidance in which specific areas.

Government response to Question 53

3.302. We have incorporated the standards of the Non-Domestic Building Services guidance into the main body of the *Approved Document L, Volume 2: Buildings other than dwellings*. This has also clarified, rationalised and simplified the existing guidance. Incorporating the text into the Approved Document will make sure that the guidance is clearer and more readily accessible.

3.303. We believe that the rationalisation of guidance underlines the role of the Approved Document to provide that minimum standard. External guidance has been referred to in Appendix F and Appendix G of the Approved Document.

Question 54:

Do you agree that the measures in Tables D.1 and D.2 of Appendix D of Approved Document L, volume 2: buildings other than dwellings are likely to be technically, functionally and economically feasible under normal circumstances?

3.304. The 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings* aimed to be clearer about what is expected of builders and installers in complying with the regulatory requirements. The previous guidance required that if an existing building has a floor area over 1000m² and proposed building work meets certain criteria, further work may need to be undertaken to improve the energy efficiency of the entire building. We restructured and simplified this guidance in the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings* and sought views on the measures included.

Question 54	No. of responses	% of all responses	% split for Q54
(a) Yes	128	17.2%	88%
(b) No	18	2.4%	12%
Did not respond	597	80.3%	-

3.305. Among both positive and negative respondents, there were suggestions that the measures or the triggers that would require further work to be carried out should be changed. Suggestions included:

- Address the following improvement measure because technical competence in the advice provided is not thoroughly tested at any point: “Measures specified in the Recommendations Report that accompanies a valid Energy Performance Certificate which will achieve a simple payback of 15 years or less”.
- The requirement for new heating plant should take decarbonisation into account and not just require the replacement of existing systems with newer systems.
- An additional requirement for a survey and assessment of a property to recommend which measures are suited to the type, condition and location of each building.
- Not requiring the automatic replacement of cooling or heating systems over 15 years old if the system is fully functioning and well-maintained.
- Lowering the trigger floor area from 1000m² to 500m².

3.306. Some respondents had concerns about the ‘technically, functionally and economically feasible’ terminology, believing it to be too vague.

3.307. Several respondents disagreed with this regulation completely. Some respondents felt that it is not the right approach to helping decarbonise existing building stock and instead suggested a whole-building approach. Others felt that the measures overall are unlikely to have much of an impact as the 15-year feasibility is unlikely to be achieved with the low heat energy figures in SBEM.

Government response to Question 54

3.308. The measures included in tables D.1 and D.2 of Appendix D of *Approved Document L, Volume 2: Buildings other than dwellings* will be included as proposed in the consultation.

Modular and portable buildings

Question 55:

Do you agree with the proposals for relaxation factors for modular and portable buildings, as detailed in Tables 2.2 and 2.3 of draft Approved Document L, volume 2: buildings other than dwellings?

3.309. In light of the proposals for uplifting the Part L minimum standard for new buildings, and the introduction of primary energy targets, we reviewed the relaxation factors given to modular and portable buildings. In the consultation we proposed that the relaxation factors should continue to apply, but that we should use this opportunity to recalibrate these factors in such a way that:

- encourages older and less efficient building modules to be upgraded when used for buildings on short-term hire, and;
- sets a higher standard for long-term hire or permanent buildings constructed using refurbished modules, recognising the greater potential for improvements to these building applications.

3.310. We included a set of revised factors in Tables 2.2 and 2.3 of the 2021 draft *Approved Document L, Volume 2: Buildings other than dwellings*, which was provided alongside the consultation.

Question 55	No. of responses	% of all responses	% split for Q55
(a) Yes	95	12.8%	68%
(b) No, the requirements go too far	7	0.9%	5%
(c) No, the requirements do not go far enough	38	5.1%	27%
Did not respond	603	81.2%	-

3.311. Suggestions provided in response to this question included adding further information on definitions; a view that modular buildings can more easily achieve requirements; and that modular and portable buildings should also be subject to in-situ measurement checks to verify as-built performance on a sample basis.

Government response to Question 55

3.312. We intend to proceed with the proposals as included in the consultation. Modular and portable buildings form an important part of the non-domestic building stock and provide particular needs. It remains appropriate to provide specific guidance for these types of building and we believe that our proposals set a proportionate level of energy efficiency for these building types.

Airtightness

Question 56:
Do you think that the Pulse methodology should be an approved means of demonstrating airtightness for non-domestic buildings?

3.313. Airtightness is currently tested using the blower door method to meet the regulatory requirements of the Building Regulations. In the Future Homes Standard consultation response, we set out that we intend to allow Pulse testing as an approved methodology for determining the airtightness of dwellings. The Pulse test

dynamically measures building air leakage directly at low pressure, with the test performed at a pressure differential of 4Pa as opposed to 50Pa.

3.314. The Pulse test has been developed for application in smaller buildings, particularly dwellings, although may in theory be used in larger buildings. The Future Buildings Standard consultation sought views on whether this method would also be appropriate for use in non-domestic buildings and whether we should allow Pulse to be used to determine airtightness for complying with the energy efficiency requirements for buildings other than dwellings.

Question 56	No. of responses	% of all responses	% split for Q56
(a) Yes	145	19.5%	77%
(b) No	43	5.8%	23%
Did not respond	555	74.7%	-

3.315. Comments in favour of the proposal included that Pulse allows tests in smaller more awkward spaces like roofs or where 50Pa tests may be difficult. Furthermore, by making air testing cheaper, it will allow for tests to occur before, during and after installations which can improve overall build quality.

3.316. Concerns raised included uncertainty over the suitability of Pulse testing for use in larger non-domestic buildings, and the need for additional evidence and guidance.

3.317. Respondents highlighted the importance of ensuring flexibility to allow best practices to be met and of ensuring that we do not lock air testing to a single methodology. It was recommended that the guidance should continue to include blower door testing too as it allows for greater diagnostics and improvements during building works. Conversely, some respondents thought that having two competing methodologies may generate confusion.

3.318. Some respondents noted that there are limited suppliers of Pulse tests which could give those companies an unfair advantage/monopoly on air testing. The precision of Pulse testing was questioned, and concerns were raised at the fact that Pulse testing is low (4Pa) pressure. Respondents said that this was not enough to challenge the building envelope to simulate draughts or high winds (typical winter conditions in the UK).

Government response to Question 56

3.319. We will not be proceeding, at this point, with the approval of the Pulse methodology for non-domestic buildings. The data collection and evidence in support of the Pulse methodology for use in non-domestic buildings is weaker than in the domestic sector. As outlined in our response to the Future Homes Standard consultation, we have approved this methodology for domestic buildings under the 2021 interim uplift. Data on this technology as used in practice in the domestic sector, alongside any other testing data that may become available in non-domestic buildings, may make it possible to adopt this technology in the future. At this point, however, we consider it prudent to withhold approval until additional evidence becomes available.

Question 57:

Do you agree that we should adopt an independent approved airtightness testing methodology such as the CIBSE draft methodology for non-domestic buildings?

3.320. In the Future Homes Standard consultation response, we set out that we intend to adopt CIBSE’s TM23 as the new approved methodology for airtightness testing for dwellings. The Future Buildings Standard consultation proposed to also adopt the standard as the approved airtightness testing methodology for buildings other than dwellings.

Question 57	No. of responses	% of all responses	% split for Q57
(a) Yes, and the CIBSE methodology is appropriate	184	24.8%	92%
(b) Yes, but with a methodology other than CIBSE	9	1.2%	5%
(c) No, an independent approved airtightness methodology shouldn’t be approved	7	0.9%	4%
Did not respond	543	73.1%	-

3.321. The majority of respondents agreed to support an independent methodology provided it could generate the appropriate evidence to demonstrate adequate compliance.

3.322. Some respondents wanted to make sure that the testing process could be available to any tester, and not just driven through CIBSE’s membership as this would hamper change.

3.323. It was suggested that there could be system which allowed the use of both ATTMA and CIBSE standards.

Government response to Question 57

3.324. We will proceed to adopt CIBSE’s TM23 as the single approved methodology for testing the airtightness for non-domestic buildings. We consider that multiple testing methodologies may introduce additional practical difficulties.

Question 58:

Do you agree with the proposal for guidance on the calibration of devices that carry out airtightness testing in new and existing nondomestic buildings?

3.325. In the Future Homes Standard consultation, guidance in one of the accompanying Approved Documents was inconsistent with what was written in the CIBSE methodology on when calibration of devices that carry out airtightness testing should take place. In the Future Buildings Standard consultation, we proposed to clarify this guidance on the calibration of devices that carry out airtightness testing

in new and existing non-domestic buildings to state that it should be calibrated either within the previous 12 months, or in accordance with the manufacturer's guidance.

Question 58	No. of responses	% of all responses	% split for Q58
(a) Yes	169	22.7%	95%
(b) No	8	1.1%	5%
Did not respond	566	76.2%	-

3.326. Some respondents highlighted that currently calibration costs are too high.

3.327. Among stakeholders that disagreed, there was concern that giving the power to manufacturers to decide on calibration periods can lead to some tools never getting calibrated. Some respondents gave specific examples of tools that were calibrated every 5 years which could lead to high levels of drift and poor results.

3.328. Suggestions were made that CIBSE should write the guidance or that *ISO document ILAC-G24 – Guidelines for the determination of calibration intervals of measuring instruments* could be used. Other respondents stated that if the idea is to align the new testing methodology with ISO 9972, then this should be driven by tighter tolerances required upon the instrumentation.

Government response to Question 58

3.329. We will proceed with the proposals for devices that carry out airtightness testing to be calibrated either within the previous 12 months or in accordance with the manufacturer's guidance in both new and existing non-domestic buildings.

3.330. Though we recognise the potential issues that could be caused by long calibration intervals, we believe that mandating the calibration of these devices every 12 months would be unnecessary in the majority of cases as well as cost ineffective.

3.331. We believe, however, that there should be a recommended backstop of 24 months for when devices should be calibrated, and this has been added into the guidance.

Monitoring the as-built performance of non-domestic buildings

Question 59:

Do you agree with the proposed approach to energy sub-metering, as detailed in Section 5 of draft Approved Document L, volume 2: buildings other than dwellings?

3.332. It is important that new non-domestic buildings have the right level of metering to measure performance accurately. In the consultation we proposed to continue to reference CIBSE's TM39 as the standard to which new buildings should be sub-metered. Sub-metering installation should allow a useful comparison to be made

between design-stage energy forecasts and measured results. This should make it easier for buildings to diagnose and fix issues relating to their in-use monitored energy performance.

Question 59	No. of responses	% of all responses	% split for Q59
(a) Yes	191	25.7%	91%
(b) No	18	2.4%	9%
Did not respond	534	71.9%	-

3.333. Respondents supported the objectives of metering proposals. Some respondents provided additional suggestions in support of enhanced metering, and to gain additional value from the metering. This included suggestions to reference other requirements and guidance. Others provided alternative proposals that would support access to dynamic tariffs, or optimisation of system efficiencies.

Government response to Question 59

3.334. We will proceed with the proposals for energy sub-metering. We consider these proposals to be proportionate and provide sufficient information to allow the comparison of energy forecasts and in-use performance.

Question 60:
Do you agree with the proposed approach to energy forecasting, as detailed in paragraph 9.4 of draft Approved Document L, volume 2: buildings other than dwellings?

3.335. The outputs of Part L compliance calculations are not suitable for energy benchmarking, as they do not include all energy uses, and use standardised usage patterns rather than the actual usage pattern of the building. In the consultation we proposed that, as well as the Part L compliance calculations, the forecast energy performance of non-domestic buildings should be modelled and handed to the building owner at completion stage for the purposes of energy benchmarking. We proposed to introduce this requirement for buildings with a floor area of over 1,000m².

3.336. We proposed that the energy forecast should be based on the CIBSE TM54 framework and should present monthly energy usage figures in metered energy (kWh) broken down into fuel type and energy end-use category.

Question 60	No. of responses	% of all responses	% split for Q60
(a) Yes	472	63.5%	95%
(b) No, I do not agree with the proposed approach	15	2.0%	3%
(c) No, energy forecasting should not form part of the Building Regulations	9	1.2%	2%
Did not respond	247	33.2%	-

- 3.337. Among respondents who agreed and those who disagreed with the proposal, concerns were raised about the robustness of CIBSE TM54. It was proposed that it would be helpful to develop supplementary guidance in regard to applying CIBSE TM54 to different building types. Furthermore, it was suggested that alternative schemes would be more rigorous and comprehensive and provide more consistent outcomes than CIBSE TM54.
- 3.338. Concerns were raised that the industry does not currently have sufficient trained resource to effectively implement these requirements. It was suggested that the requirement for energy forecasting should be implemented over a longer timeframe, perhaps by implementing for larger buildings first (larger than the minimum 1,000m² floor area currently proposed), before including increasingly smaller buildings.
- 3.339. Other respondents who disagreed with the proposal noted that the value of energy forecasts depends on the quality of modelling, and respondents highlighted the potential need for third-party verification, or that specific additional consultation is required to agree on the appropriate energy forecasting methodology and process.
- 3.340. There was some concern that the proposed approach would lead to delays on projects, that may result in poor quality modelling that would not be fit for purpose or close the performance gap.
- 3.341. Respondents highlighted that the requirement to 'only' undertake TM54 modelling may lead to it becoming a tick-box exercise without an additional requirement to compare against metered data post-occupation.
- 3.342. Some respondents that agreed with the proposal provided comments that suggested that there was confusion over the use of the word 'benchmark' to refer to the energy forecasting that is being proposed. Comments indicated that some readers understood this to mean something to apply to the building, e.g. based on type, rather than something to be calculated specifically for the building.
- 3.343. Other respondents that it should look to align with other policies including:
- The BEIS consultation 'Introducing a performance-based policy framework in large commercial and industrial buildings'; and
 - The GLA's 'Be Seen' policy.

Government response to Question 60

- 3.344. Following the consultation responses, we have modified our proposals for energy forecasting to provide alternative routes to compliance. In addition to TM54 forecasts, we have modified the guidance to allow compliance by allowing forecasts to be based on design calculations or other energy benchmarks that align with the sub-metering arrangements.

Transitional arrangements

Question 61:

Do you agree with the proposals for transitional arrangements for buildings other than dwellings?

3.345. In the consultation we proposed that where a building notice, initial notice or full plans application is submitted to the local authority, transitional arrangements should apply. This means that the existing energy efficiency requirements and guidance would apply to that work. We proposed that work must commence on individual buildings within the building notice/plans to benefit from the transitional arrangements, rather than apply site wide as they have in the past. We also proposed that transitional arrangements would apply to work to a building other than a dwelling within that notice/plans so long as work on that building has commenced within 12 months of new regulations coming into effect.

Question 61	No. of responses	% of all responses	% split for Q61
(a) Yes	205	27.6%	87%
(b) No	31	4.2%	13%
Did not respond	507	68.2%	-

3.346. Some respondents provided additional suggestions, including that for the transitional arrangements to work effectively, the Building Regulations should be reviewed and updated more regularly. Respondents who agreed also requested further clarity on whether a whole site or parts of site would benefit from transitional arrangements in instances where there is a site layout change for a large development within the transitional period which does not require an amendment notice.

3.347. Some respondents who disagreed with the proposals suggested that the transition period should not be 12 months. Some respondents suggested that it should be as short as is practicable, while others thought it should be longer. A few respondents thought there should be no transitional arrangements at all based on the view that they have been abused in the past.

3.348. Respondents who disagreed requested further clarity on the definitions of what constitutes an 'individual building' and 'work commencing'. It was suggested that transitional arrangements need to be tightened to avoid minor building works being carried out and the project then stopping for an indeterminate period while retaining the transitional rights. Others suggested transitional arrangements should continue to apply to all building work on a development, irrespective of whether building work has commenced on individual buildings.

Government response to Question 61

3.349. To make sure we can deliver buildings that are ready for a zero-carbon future, it is important that suitable transitional arrangements are in place to provide developers with certainty about the standards they are building to.

- 3.350. We have decided to set a reasonable period of one year, which will allow developers 12 months from when Regulations come into effect to commence work on each individual building on site. This approach will align non-domestic buildings with the standards for new homes that was set out in the Future Homes Standard consultation response. Achieving a consistent approach across all types of buildings is important particularly for mixed-use buildings where differing approaches may cause unnecessary complexity.
- 3.351. We recognise that applying transitional arrangements to individual buildings is a significant change; however, this approach is designed to provide a balance between continuing to offer certainty to developers, while being more stringent in practice to make sure that as many new buildings as possible are meeting up to date energy efficiency standards.

Chapter 4 – Interim uplift to Part F standards for non-domestic buildings

Guidance

Question 62:

Do you agree with the proposed guidance in Section 1 and Section 2 of Approved Document F, volume 2: buildings other than dwellings on minimising the ingress of external pollutants and on the proper installation of ventilation systems in non-domestic buildings?

- 4.1. The Future Homes Standard consultation response set out our approach and guidance on minimising the ingress of external pollutants in new dwellings. In the Future Buildings Standard consultation, we proposed to take a similar approach for guidance for new non-domestic buildings. We proposed guidance in Sections 1 and 2 of the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings*, which we provided alongside the consultation.

Question 62	No. of responses	% of all responses	% split for Q62
(a) Yes	113	15.2%	80%
(b) No	29	3.9%	20%
Did not respond	601	80.9%	-

- 4.2. Some respondents suggested improvements to the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings*. For instance, it was felt that the guidance could benefit from being more specific about the risk of ingress of external pollutants and how the risk can be assessed.
- 4.3. Respondents that disagreed with the proposal said that the guidance on minimising ingress of external pollutants should include additional information on the measures to be taken in scenarios where air intakes cannot be located away from external sources of pollution.
- 4.4. Various specific technical and editorial amendments to the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings* were suggested to clarify the wording.

Government response to Question 62

- 4.5. We are proceeding with the guidance as consulted on but have made some revisions and clarifications to address specific queries raised. The inclusion and specification of filtration as a solution can be a complicated, technical decision dependent on the specific circumstances. Other technologies may also be suitable for maintaining air quality. For these reasons, we do not consider it appropriate to outline specific guidance on filtration here. Instead, we have made reference to making use of expert advice on alternative solutions to maintain internal air quality

in situations where air intakes cannot be located away from external sources of pollution, and specifically noted filtration as a possible solution.

Question 63:

Do you agree with the proposed guidance for reducing noise nuisance for ventilation systems in non-domestic buildings?

- 4.6. The 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings*, which we provided alongside the consultation, set out our proposed approach to limiting noise from ventilation systems installed in non-domestic buildings.

Question 63	No. of responses	% of all responses	% split for Q63
(a) Yes	96	12.9%	73%
(b) No	36	4.8%	27%
Did not respond	611	82.2%	-

- 4.7. Respondents who both agreed and disagreed with the proposals highlighted the lack of specific and quantifiable requirements. This could potentially lead to significant variance in application and interpretation, which could lead to occupants not being protected against excessive noise levels. It was recommended that consultation with acousticians should be undertaken to understand the appropriate requirements for non-domestic buildings.
- 4.8. Among respondents who disagreed with the proposals there were suggestions that acoustic testing of ventilation systems (both inside the building and from external plant) should be required as part of the commissioning requirements. It was suggested that Section 1.5 should include commissioning as a key measure to reduce noise from mechanical ventilation systems, and the requirement for noise testing also added to Section 1.8. It was further suggested that without setting minimum performance levels and a requirement for testing that the standards are not enforceable.
- 4.9. In addition, there was concern that the requirement is too vague for ventilation through windows, and that purge ventilation requirements may not be necessary given that purging of pollutants is only likely to be required occasionally.
- 4.10. Some respondents who disagreed with the proposals suggested other/additional acoustic requirements that should be required.
- 4.11. There were various comments on external noise from respondents who disagreed with the proposals, including that this issue is best dealt with by local planning authorities; that interaction with Part E needs to be considered for external noise; and that further explanation of key parameters associated with outside noise, and how external noise should be taken into account, is needed.
- 4.12. Various additional technical and editorial suggestions were made about the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings* and the 2021 draft *Approved Document F, Volume 1: Dwellings*.

Government response to Question 63

- 4.13. Part F of the Building Regulations is not the most appropriate mechanism for controlling noise from ventilation systems. The Government is currently considering plans to review and update the provisions provided in Part E of the Building Regulations (Resistance to the passage of sound), through which we will consider noise from building services.
- 4.14. Ahead of this, however, we consider it still remains necessary to include specific guidance on noise from ventilation systems in *Approved Document F, Volume 2: Buildings other than dwellings*. Following consultation, we have made some revisions and simplifications to the text on noise, including removal of the reference to consideration of purge ventilation. We will review whether it remains appropriate to include this information in future versions of Part F guidance (for example under the Future Buildings Standard) and following the conclusion of the Part E review process.

Question 64:

Do you agree with the additional guidance provided in paragraphs 1.18 to 1.26 of the draft Approved Document F, volume 2: buildings other than dwellings on the installation of ventilation systems?

- 4.15. This section of the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings* presented additional guidance on the installation of ductwork, and other aspects of the ventilation system.

Question 64	No. of responses	% of all responses	% split for Q64
(a) Yes	82	11.0%	74%
(b) No	29	3.9%	26%
Did not respond	632	85.1%	-

- 4.16. Some concerns were raised that adherence to the guidance will often require larger systems and larger ceiling voids to accommodate them.
- 4.17. Other comments related to the guidance on flexible ductwork. These included concerns over the flow rates referred to, and the maximum lengths of ducting.
- 4.18. Some responses expressed concerns around the requirement on terminal sizing, including that it may allow for ingress of rain and snow, and may encourage undersized ductwork, or may not be appropriate in some situations. Other responses requested additional guidance on filtering and positioning of inlets.
- 4.19. Concerns were also raised over the method by which the quality of installation is established. Some respondents suggested alternative approaches included pre-completion performance testing or installer requirements.

4.20. Among other suggestions made were those to require specific seal classes for ductwork (Class A, B etc.), and for additional guidance to be provided for other types of ventilation system.

Government response to Question 64

4.21. We consider guidance on ductwork and other associated aspects of the ventilation system to be a useful inclusion in *Approved Document F, Volume 2: Buildings other than dwellings*, which should make sure that the system operates effectively. We will proceed with the inclusion of guidance on these aspects but have reviewed the proposed text and made some revisions and simplifications to this section following the consultation process.

Question 65:
Do you agree that the guidance in Appendix B of the draft Approved Document F, volume 2: buildings other than dwellings provides an appropriate basis for setting minimum ventilation standards?

4.22. In the consultation we proposed that the underlying assumptions on ventilation rates were sufficiently robust and based on the latest available evidence. We presented a performance-based ventilation approach in Appendix B of the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings*.

Question 65	No. of responses	% of all responses	% split for Q65
(a) Yes	87	11.7%	78%
(b) No	25	3.4%	22%
Did not respond	631	84.9%	-

4.23. Among respondents who agreed with the guidance, there were some suggestions of additions. The proposed additions included guidance on the testing procedure for the pollutants identified. It was also suggested that additional consideration may be needed relating to airborne particles from printers, highlighting the increased prevalence of 3D printers in some buildings.

4.24. Other respondents stated that the TVOC metric should not be used. Various other guidance was suggested, including Public Health England’s *‘Indoor Air Quality Guidelines for selected Volatile Organic Compounds (VOCs)’*.

4.25. Some concern was also raised among a few respondents who disagreed with the guidance in Appendix B that the “surface water activity” metric in Section B.4 is an unfamiliar concept and difficult to measure.

4.26. Several respondents highlighted that the standards in Appendix B would be challenging to enforce.

4.27. Other suggestions included that pre- and post-occupancy testing of the building air quality should be carried out; the adoption of various commercial standards used in

certification schemes; and the inclusion of CO₂ levels as part of the performance standards.

Government response to Question 65

- 4.28. We will proceed with the inclusion of guidance on performance-based ventilation standards in line with our consultation proposals. We have maintained alignment (as appropriate) between these standards and those in place for domestic buildings, as outlined in *Approved Document F, Volume 1: Dwellings*. In line with the consultation proposal, we will allow designers to assess ventilation strategies against individual volatile organic compounds informed by Public Health England's *Indoor Air Quality Guidelines for selected Volatile Organic Compounds (VOCs) in the UK*⁴ as an alternative route to using a total volatile organic compound limit. In some scenarios, assessing and controlling individual VOCs could allow a more tailored approach to building and ventilation design, leading to better indoor air quality.
- 4.29. The performance-based ventilation standards presented in Appendix B, Table B.1, relate to concentrations of specific indoor air pollutants which are harmful to health. In the context of ventilation performance standards, CO₂ monitoring is typically used as an indicator of overall air quality rather than as indicative of CO₂ as a pollutant. This allows the comparison of indoor and outdoor air, for example, or used to directly control ventilation levels. As it is acting in this proxy manner, we do not therefore, consider it appropriate to include maximum CO₂ concentrations as part of the performance standards presented in this section of the guidance. We do, however, recognise the value of CO₂ monitoring and have provided information on CO₂ concentrations within a new Appendix, Appendix C. See Government response to Questions 73 to 80 below.

Question 66:

Do you agree with the list of industry guidance presented in Section 1 of draft Approved Document F, volume 2: buildings other than dwellings?

- 4.30. The previous version of Approved Document F for non-domestic buildings included a table of industry guidance for buildings other than offices. This guidance may be used by building professionals to design and install adequate means of ventilation in non-domestic buildings. In the consultation we proposed a number of updated guidance documents in the equivalent table in the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings*, which we provided alongside the consultation, and sought views on which external standards may be appropriate.

⁴ Indoor Air Quality Guidelines for selected Volatile Organic Compounds (VOCs) in the UK, Public Health England (PHE), (2019) <https://www.gov.uk/government/publications/air-quality-uk-guidelines-for-volatile-organic-compounds-in-indoor-spaces>

Question 66	No. of responses	% of all responses	% split for Q66
(a) Yes	72	9.7%	65%
(b) Yes, but additional guidance should be provided	22	3.0%	20%
(c) No	16	2.2%	15%
Did not respond	633	85.2%	-

4.31. Some respondents suggested amendments to the existing list, including ensuring that the latest versions of guidance are referred to. It was recommended that the standards referred to should be freely available for professionals to access.

Question 67:

Do you agree with the list of references to industry guidance presented in Appendix C and Appendix D in the draft Approved Document F, volume 2: buildings other than dwellings?

4.32. The 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings*, which we provided alongside the consultation, proposed to update references for British Standards, CIBSE guides and other sources in Appendix C and Appendix D. We aimed to reflect current industry practice in delivering adequate means of ventilation for buildings and we sought views on whether these sources adequately do this.

Question 67	No. of responses	% of all responses	% split for Q67
(a) Yes	64	8.6%	63%
(b) No, the Government should amend the list of references	32	4.3%	32%
(c) No, for another reason	5	0.7%	5%
Did not respond	642	86.4%	-

4.33. Some respondents felt that the long list of documents is very complex and difficult to understand. It was suggested that the relevant information should be incorporated into the Approved Document where possible to avoid unnecessary cross referencing.

Question 68:

Do you agree with the proposals to simplify, rationalise and clarify the Approved Document guidance in Approved Document F, volume 2: buildings other than dwellings as outlined in paragraph 4.3.7 of the consultation document?

4.34. In the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings*, which we provided alongside the consultation, we aimed to be clearer about what is expected of builders and installers in complying with the regulatory requirements. Approved Documents deal with complex information and are an essential resource relied upon by those who enforce the regulations, advise on compliance or need to comply with the regulations. *The Independent Review of the Building Regulations*

and Building Safety highlighted that the complexity of the current regulations and Approved Documents guidance “can lead to confusion and misinterpretation in their application...regulations and guidance must be simplified and unambiguous.” In line with this recommendation, and to make the minimum standard as clear as possible, we proposed that some of the supplementary text should be removed, new information should be added, and relevant external guidance should be referenced.

Question 68	No. of responses	% of all responses	% split for Q68
(a) Yes	112	15.1%	90%
(b) No	12	1.6%	10%
Did not respond	619	83.3%	-

- 4.35. Among respondents who disagreed with the proposals there was concern about the loss of valuable information. The importance of retaining certain areas, such as the advice on stack ventilation, was highlighted.
- 4.36. Some respondents also felt that better links are needed with the fire safety regulations. There was recognition that there is already some cross-referencing between the different Approved Documents, which is welcomed, but that there are areas where the links can be emphasised more.

Government response to Questions 66 to 68

- 4.37. We will continue with publishing the list of industry guidance presented in Section 1 of the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings* as it will provide a useful link for work being done to specific types of non-office environments.
- 4.38. In the consultation, we received suggestions of additional sources of regulations and guidance that can be followed to demonstrate compliance and have updated the list of industry guidance.
- 4.39. We will also amend our reference to “CIBSE Guide B: 2016” to “CIBSE Guide B2:2016 Ventilation and Ductwork”, and included reference to CIBSE Guide A to recognise changes in the structure of the CIBSE Guides since 2005. This will make the relevant guidance easier to find.
- 4.40. We believe the list of references to industry guidance presented in Appendix C and Appendix D of the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings* provides a useful source of information that can be used to encourage best practises. Its placement in the appendices indicates that the actual Approved Document is the source of information for ensuring compliance, but it makes sure that more information is available to those who may find it useful or instructive. Please note that these Appendices have been renamed Appendix F and Appendix G in the *Approved Document F, Volume 2: Buildings other than dwellings* in order to accommodate an addition.

4.41. The Government is committed to producing clearer standards and guidance. We therefore intend to proceed with the proposal to simplify the requirements in the Building Regulations as set out in the proposal.

Question 69:
Do you agree that purge ventilation in offices should be designed to provide at least four air changes per hour?

4.42. Purge ventilation is intended to provide a means of removing pollutants and airborne contaminants following certain activities, such as painting or refurbishment. In the consultation we proposed clarifications to the Approved Document on the requirements for purge ventilation in offices, with a rate of 4 air changes per hour proposed.

Question 69	No. of responses	% of all responses	% split for Q69
(a) Yes	78	10.5%	69%
(b) No, this standard goes too far	25	3.4%	22%
(c) No, this standard does not go far enough	10	1.3%	9%
Did not respond	630	84.8%	-

4.43. Among respondents who agreed with the proposal, some concerns were raised around the spatial and cost implications of purge ventilation in buildings which do not have opening windows. Furthermore, it was suggested that the guidance should clarify that the Part L specific fan power requirements do not apply to purge ventilation, otherwise the spatial implications would be extremely significant. Similar suggestions were also made by some respondents who disagreed with the proposal.

4.44. Some respondents felt that the requirement is excessive, and concerns were raised about potential negative impacts on system efficiency, embodied carbon, and cost. Other respondents who thought that the standards do not go far enough said that the required number of air changes per hour should be greater than 4. Some respondents also thought that evidence should be provided to demonstrate the ability of installed products to deliver the requirement.

Question 70:
Do you agree with the guidance for the ventilation of car parks and offices, as detailed in Section 1 of Approved Document F, volume 2: buildings other than dwellings?

4.45. This question related to the overall guidance for ventilation of car parks and offices, excluding the additional guidance on mitigating infection which was covered by Questions 73 to 80.

Question 70	No. of responses	% of all responses	% split for Q70
(a) Yes	74	10.0%	77%
(b) Yes, but some improvements can be made	10	1.3%	10%
(c) No, the guidance should be significantly changed	12	1.6%	13%
Did not respond	647	87.1%	-

- 4.46. Some respondents provided suggestions for improvements to be made to the guidance including that volatile organic compounds (VOCs) should be considered for enclosed car parks.
- 4.47. Concerns were also raised around the reliability of natural ventilation. Common spaces in offices were highlighted as a particular area of concern. It was argued that these spaces are often awkward shapes making them difficult to naturally ventilate and therefore mechanical ventilation should be mandatory.
- 4.48. An issue was also raised that ventilation requirements should be defined on a room-by-room basis, rather than a whole building basis, so that occupancy can be taken into account.

Government response to Questions 69 and 70

- 4.49. We recognise the concerns raised about the setting of a purge ventilation rate of 4 air changes per hour and will not be proceeding with this proposal. Specific guidance relating to mitigation of infection risk has been adjusted in line with the response to Questions 73 to 80 outlined below. We consider that the remainder of the guidance as consulted on is appropriate and proportional and will proceed with the other aspects of this part of the guidance.

Question 71:

Do you agree with the proposals in Section 3 of draft Approved Document F, volume 2: buildings other than dwellings, when replacing an existing window with no background ventilators?

- 4.50. *Approved Document F - Ventilation (2010 edition incorporating 2010 and 2013 amendments)* states that if an original window has no ventilation openings, it would be good practice to fit trickle ventilators in the replacement window unless the building has mechanical ventilation. Aligning with domestic buildings, in the consultation we proposed to clarify this guidance to state that if replacing windows is likely to make the building less compliant with the ventilation requirements than it was before the work was carried out, then additional ventilation should be provided in the form of background ventilators.

Question 71	No. of responses	% of all responses	% split for Q71
(a) Yes	88	11.8%	73%
(b) No, the standards do not go far enough	15	2.0%	13%
(c) No, the standards go too far	17	2.3%	14%
Did not respond	623	83.8%	-

- 4.51. Among respondents who agreed with the proposals, some queried the requirements being limited to ensuring that the ventilation is made no worse than existing. It was further suggested that there should be a requirement to investigate the feasibility of introducing more efficient means of ventilation, e.g. MVHR.
- 4.52. It was noted that attainment of the standards may be difficult for large rooms with small windows and, whilst this is mitigated by the requirement to achieve only where “technically feasible”, it was suggested that this may be open to different interpretation. It was queried whether background ventilation via through-wall ventilators should be included within the evaluation of technical feasibility.
- 4.53. Among respondents who thought that the standards do not go far enough, it was highlighted that the standards assume that the current ventilation provision is sufficient.
- 4.54. Some were concerned about the use of trickle vents and consideration of infiltration as part of the ventilation strategy, and highlighted shortcomings they had identified with these types of vents.
- 4.55. Some respondents expressed a preference for MVHR systems rather than passive ventilators.
- 4.56. It was suggested that the statement about replacement windows making a building more airtight may not always be correct.

Government response to Question 71

- 4.57. We intend to proceed with the proposal and recommend that replacement windows are fitted with a background ventilator unless it can be shown that replacing the windows has not reduced useful ventilation or a mechanical ventilation system is present.
- 4.58. We appreciate that noise may be an issue with façades facing noisy environments. Therefore, we will recommend that noise attenuating background ventilators are fitted in these circumstances.

Question 72:

Do you agree with the proposal to provide a completed commissioning sheet to the building owner and associated guidance in Section 4 of draft Approved Document F, volume 2: buildings other than dwellings?

4.59. In the consultation we noted that commissioning of ventilation systems is completed by the installer of the ventilation system. As part of supporting owners with information about how their ventilation system performs in practice, we proposed that a commissioning sheet should be given to the building owner, as a notice that commission has been carried out in accordance with the required procedure. We also proposed to provide additional clarity on what operation and maintenance information should be provided to building owners.

Question 72	No. of responses	% of all responses	% split for Q72
(a) Yes	123	16.6%	97%
(b) No	4	0.5%	3%
Did not respond	616	82.9%	-

4.60. Respondents highlighted the importance of ensuring that the commissioning sheets are understandable to a non-technical audience.

4.61. Some respondents made some suggestions around how the process should work in practice. These suggestions included that the commissioning sheet should be carried out by a competent, independent party and that there should be a clear, standardised method for redress if any aspects of the commissioning sheet are not up to standard.

4.62. Others stated that the commissioning sheet should also be issued to Building Control Bodies, particularly in cases where these works are part of a wider scheme of works and where works are undertaken under a competent persons' scheme. Some suggested including this document as part of a wider "Building Passport".

4.63. It was also suggested that filters should be dealt with separately since these require more frequent attention and different activities compared to inspecting and cleaning plant and ductwork surfaces. Some specific suggestions were made of revisions to specific elements of the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings*.

Government response to Question 72

4.64. We intend to proceed with the proposal for commissioning of ventilation systems. We have reviewed specific comments and made some minor clarifications to the text of *Approved Document F, Volume 2: Buildings other than dwellings*.

Reducing the risk of transmission of infection via aerosols in non-domestic buildings

Question 73:

Do you agree with requiring increased capacity of 50% within new ventilation systems in offices shown in paragraph 1.38 of the draft Approved Document F, volume 2: buildings other than dwellings?

- 4.65. We proposed that ventilation provision in offices is designed with additional fresh air capacity, which can be employed in circumstances where additional ventilation may be required. We proposed that each occupiable room in the building should be capable of providing fresh air at rates 50% higher than the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings* minimum standard.

Question 73	No. of responses	% of all responses	% split for Q73
(a) Yes	57	7.7%	50%
(b) Yes, but with qualifications	24	3.2%	21%
(c) No, the standard is too high	3	0.4%	3%
(d) No, the standard is too low	0	0.0%	0%
(e) No, I disagree for another reason	29	3.9%	26%
Did not respond	630	84.8%	-

- 4.66. While respondents generally welcomed the intention of this policy, they expressed concern that the evidence base underpinning the beneficial impact of additional outdoor air was still developing, and that additional research was required ahead of requiring any increase in standards. Respondents also expressed concerns that the increase in capacity may adversely impact on the performance of the system during normal operation when this capacity remained unused.
- 4.67. Other concerns raised included that the increase in cost and loss of space in the building, among other related issues associated with the larger plant and ducting which would be required. Some respondents believed that existing rates of fresh air were sufficient to mitigate infection risk.
- 4.68. Other respondents believed that the increase in capacity could be justified, and was in line with outdoor air rates recommended in other guidance, for example British Council for Offices.

Question 74:

Do you agree with the proposed standards for provision of outdoor air for offices, shown in paragraphs 1.35 to 1.36 of draft Approved Document F, volume 2: buildings other than dwellings?

- 4.69. The consultation also included our proposals to include in guidance additional minimum standards for ventilation in offices as a rate per m² of floor area (as well as per person). This is to make sure that ventilation rates are maintained for

variable levels of occupation. Furthermore, we proposed new guidance for ventilation rates in common spaces in offices, for which we expanded our definition to include areas such as corridors and lift lobbies.

Question 74	No. of responses	% of all responses	% split for Q74
(a) Yes	70	9.4%	65%
(b) Yes, but with qualifications	17	2.3%	16%
(c) No	21	2.8%	19%
Did not respond	635	85.5%	-

4.70. This question related to the section of the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings* which set requirements for outdoor air in both occupiable rooms and common spaces.

4.71. Many respondents repeated concerns expressed in response to the previous question, but some additional points were raised, particularly in relation to the proposal contained within this element of guidance which stated that a rate of 1 l/s.m² outdoor air should be achieved in common spaces, including corridors and lift lobbies. Respondents queried whether this rate was too high, as being equivalent to the rate required in occupied areas of offices, with reduced rates for common spaces of 0.5 l/s.m² being proposed by some respondents.

Question 75:

Do you agree that extract ventilation in bathrooms, WCs, and other sanitary accommodation should be capable of operating in a continuous mode if necessary?

4.72. In the consultation we proposed that extract ventilation in bathrooms, WCs and other sanitary accommodation should be capable of operating in a continuous mode, as outlined in paragraph 1.31 of the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings*, which accompanied the consultation.

Question 75	No. of responses	% of all responses	% split for Q75
(a) Yes	106	14.3%	93%
(b) No	8	1.1%	7%
Did not respond	629	84.7%	-

4.73. Among respondents that agreed with the proposal, some indicated that operation should always be continuous (i.e. never in intermittent mode).

4.74. Some respondents also said that continuous mode ventilation rates should be clearly defined, and some wording in the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings* clarified. Some concerns were raised about additional energy consumption of systems operating in a continuous mode.

Question 76:

Do you agree with the proposal for indoor air quality monitoring in offices as outlined in paragraphs 1.39 to 1.41 of draft Approved Document F, volume 2: buildings other than dwellings?

Question 77:

If applicable, please provide any suggestions for guidance for indoor air quality monitoring (e.g. CO₂ monitoring) in nondomestic buildings.

- 4.75. These two questions sought views on proposals to require all new ventilation systems in offices to have a means of monitoring the indoor air quality (for example, CO₂ monitoring). Such systems could be installed either in the office space or as part of the ventilation management system. Guidance included the specification of location and technical specification of the monitors.

Question 76	No. of responses	% of all responses	% split for Q76
(a) Yes	61	8.2%	53%
(b) Yes, but with qualifications	49	6.6%	42%
(c) No	6	0.8%	5%
Did not respond	627	84.4%	-

- 4.76. Respondents generally welcomed the proposals for CO₂ monitoring, but a variety of specific concerns were raised around the specification of the monitors as presented in *Approved Document L, Volume 2: Buildings other than dwellings*. These included suggestions on the resolution and range of the monitors, on their placement and power sources.
- 4.77. Some respondents thought that the proposal should be supplemented by additional requirements for relative humidity monitoring, with other respondents saying that there should always be demand-controlled ventilation based on sensing.
- 4.78. Respondents also stated that CO₂ monitoring should be extended to additional building types, other than offices, where there may be a risk of infection transmission via aerosols.

Question 78:

Do you agree with the proposals for systems that recirculate air as outlined in paragraph 1.46 of draft Approved Document F, volume 2: buildings other than dwellings?

- 4.79. The guidance also proposed new standards for systems that recirculate air in offices. The standards are state that a functionality should be available to, if required, operate in a mode which prevents the ventilation system recirculating air within spaces or between different spaces, rooms or zones within offices, unless suitable filtering or cleaning systems are in place.

Question 78	No. of responses	% of all responses	% split for Q78
(a) Yes	72	9.7%	69%
(b) No	32	4.3%	31%
Did not respond	639	86.0%	-

- 4.80. Respondents to this question included those who supported additional filtration for these types of system as an effective mechanism of limiting risk of transmission and improving air quality.
- 4.81. Concerns were raised about the technical feasibility of requiring inline HEPA filters, and that this would require oversizing of systems. Other responses proposed that lower grade of filters may be suitable.
- 4.82. Other concerns highlighted ambiguity around what was considered under the generic term “cleaning systems”, raising concerns that unsuitable technologies could be employed.

Question 79:
Do you agree with the proposed minimum ventilation standard in occupiable rooms in all types of non-domestic buildings where singing, loud speech or aerobic exercise may take place, where low temperature and low humidity environments may exist, or where members of the public may gather in large groups? These are outlined in paragraphs 1.27 and 1.28 of draft Approved Document F, volume 2: buildings other than dwellings.

- 4.83. This question related to the proposal to increase the ventilation rate to 15 l/p/s in certain types of room which are considered to pose a higher risk for infection transmission due to the activities which are likely to take place there.

Question 79	No. of responses	% of all responses	% split for Q79
(a) Yes	64	8.6%	55%
(b) Yes, but with qualifications	43	5.8%	37%
(c) No	10	1.3%	9%
Did not respond	626	84.3%	-

- 4.84. Many of the responses to this question reflected those provided to Question 73. While welcoming the intention of this policy, concerns were raised about the rapidly changing evidence base in this area, and the need for additional research. Respondents also highlighted the increased cost of larger systems.
- 4.85. Concerns were raised relating to the additional energy consumption which may result from this requirement. Additional comments also highlighted difficulties in interpreting some of the specific language used in the 2021 draft *Approved Document F, Volume 2: Buildings other than dwellings*, for example on how many members of the public would constitute a ‘large number’.

Question 80:

Do you think the mitigating measures to protect against infection via aerosols would be suitable for any non-domestic buildings other than those stated in the Approved Document guidance?

- 4.86. This question sought additional suggestions for other building types which may be suitable for the proposed measures for mitigating infection risk.

Question 80	No. of responses	% of all responses	% split for Q80
(a) Yes	52	7.0%	56%
(b) No	41	5.5%	44%
Did not respond	650	87.5%	-

- 4.87. Respondents provided several additional suggestions where mitigating measures may be suitable. These ranged from specific additional room and building types, to general comments that measures should be extended across all building types.

Government response to Questions 73 to 80

- 4.88. We recognise the potential for ventilation in non-domestic buildings to mitigate the risk of airborne infection and are committed to ensuring that our standards are set in such a way as to reduce this risk, while maintaining an approach that is cost-effective. We also recognise that this is an area where the evidence base, and ongoing research landscape, is rapidly changing.
- 4.89. For the 2021 uplift in standards, we will proceed with the requirement for CO₂ monitoring to be installed in offices. We will also extend the scope of CO₂ monitoring to other rooms, specifically 'high risk' rooms where there may be a risk of airborne infection. We have revised the wording of *Approved Document F, Volume 2: Buildings other than dwellings* to clarify the specification of the monitoring. Finally, we have provided some additional guidance, included as Appendix C to *Approved Document F, Volume 2: Buildings other than dwellings*, which indicates how CO₂ monitoring results can be interpreted and how designers may wish to adjust their designs to minimise infection risks.
- 4.90. We recognise and accept the concerns that a supply rate of 1 l/s.m² may be too high for common spaces and will amend the guidance to recommend that mechanically ventilated common spaces in offices should be provided with 0.5 l/s.m².
- 4.91. We will proceed with the changes to guidance on recirculating systems, with some clarification on wording. This will require a design which is capable of including a HEPA filter, or includes a UVC air cleaning system, unless the system is capable of operating on an 'outdoor air only mode'. We consider HEPA filters or UVC cleaning systems to be the most suitable and proven type of system to achieve the objectives of this policy and have adjusted the wording of this section of guidance accordingly.

4.92. There is extensive ongoing research in the context of the COVID-19 pandemic on the effect of ventilation on airborne transmission of infectious agents. This is a rapidly developing area of knowledge and understanding, and it seems likely research will provide additional insights in the near future, promising valuable new data on the benefits of increased ventilation rates. Against this research background, therefore, we have decided not to go ahead with the proposal to increase required ventilation capacity in offices or specify ventilation rates in 'high risk' rooms. Nor do we intend, at this stage, to increase the extent of the measures which we are including in guidance to additional types of buildings or rooms other than in the ways described above for CO₂ monitoring. It is our current intention to continue to monitor and review the available evidence, and new data which we anticipate will be generated by new research projects. We intend to reconsider whether these or similar proposals should form part of revised Part F guidance for the Future Buildings Standard.

Chapter 5 – Standards for overheating in new residential buildings in 2021

A new legal requirement

Question 81:
How should the Government address the overheating risk?

5.1. In the Future Buildings Standard consultation, we proposed tackling the issue of overheating through a new requirement in the Building Regulations.

Question 81	No. of responses	% of all responses	% split for Q81
(a) Through a new requirement in the Building Regulations and an Approved Document, as proposed in this consultation	267	35.9%	82%
(b) Through Parts L and F of the Building Regulations	31	4.2%	10%
(c) Through Government guidance	5	0.7%	2%
(d) I have an alternative approach	16	2.2%	5%
(e) It isn't an issue that needs addressing	5	0.7%	2%
Did not respond	419	56.4%	-

5.2. Respondents from across the stakeholder categories commented that overheating was a serious issue that needed addressing.

5.3. Some respondents thought that industry would not act without a legal requirement to mitigate overheating risk. Others thought that a new part of the Building Regulations would ensure that overheating is not overlooked. Those in agreement to the proposed approach commented that it would create a baseline standard and make sure everyone undertakes an equal approach to mitigating overheating.

5.4. Respondents stated that any new Building Regulation or Approved Document should remain consistent with Parts L and F.

5.5. A small number of respondents were against the introduction of new Approved Document as this could cause confusion. They instead suggested that the overheating risk be addressed in Parts L and F as these are already known.

5.6. A small number of respondents who thought overheating did not need to be addressed highlighted that this would be an expensive endeavour, and the methodology would be unpopular. Some also thought overheating may not be an

issue as we do not often have extremely high temperatures in England and homes often only overheat a few days in the year.

Government response to Question 81

- 5.7. The risk to health, well-being and productivity from our homes overheating cannot be ignored. Neither can the potential loss of life that may occur if action isn't taken. We therefore recognise the necessity of tackling overheating in homes. We will continue with plans presented at consultation to introduce a new requirement in the Building Regulations. We have worked to make sure the new requirements and the *Approved Document O: Overheating* do not contradict other parts of the Building Regulations or Approved Documents and that Approved Documents are thoroughly cross referenced. We will make sure that the new Approved Document works in tandem with Parts L and F of the Building Regulations, as well as other parts, to make introduction less confusing for industry.

Residential buildings in scope

Question 82:
Do you agree with the buildings that are in scope of this new part of the Building Regulations?

- 5.8. In the Future Buildings Standard consultation, we set out the buildings we believed should be covered by the new requirement in the Building Regulations. This included new residential buildings, outlined in Table 5 below:

Table 5 – Residential buildings in scope

	Purpose for which the building is intended to be used
Residential (dwellings)	Dwellings, which includes both houses and flats.
Residential (institutional)	Home, schools or other similar establishments, where people sleep on the premises. The building may be living accommodation for care or maintenance of any of the following: <ul style="list-style-type: none"> a. Older and disabled people, due to illness or other physical or mental condition. b. People under the age of 5 years.
Residential (other)	Residential college, halls of residence, living accommodation for children aged 5 years and older.

Question 82	No. of responses	% of all responses	% split for Q82
(a) Yes	107	14.4%	36%
(b) Yes, but they should be expanded to include more building types and/or existing buildings	182	24.5%	61%
(c) No, they should be reduced to only include flats and houses	3	0.4%	1%
(d) No, I disagree for another reason	7	0.9%	2%
Did not respond	444	59.8%	-

- 5.9. Roughly one third of all respondents said that our proposed overheating regulation should be expanded to cover existing buildings. Some respondents also suggested that the overheating standard should apply to all new buildings, including non-domestic buildings.
- 5.10. Several respondents noted that we had commissioned further research on the prevalence of overheating in the existing residential stock and said that when this research is completed that we should act on its outcomes accordingly.
- 5.11. Several respondents highlighted permitted development rights as a cause for concern, where a change of use or conversion is undertaken without overheating being considered.
- 5.12. Many respondents identified further building types that our standard should apply to. Suggestions included prisons, hospitals and other healthcare facilities, temporary accommodation, schools, nurseries and hotels. Some respondents also said that communal corridors should be accounted for.

Government response to Question 82

- 5.13. We will proceed with the proposed scope, as it makes sure there are high standards for new homes and protects the most vulnerable, the elderly and the very young where they live and sleep.
- 5.14. Some respondents highlighted occasions where the standard could apply to other buildings, for example temporary accommodation or Houses in Multiple Occupation (HMOs). These building types are included under the residential (dwellings) section of the classification.
- 5.15. We have clarified our classification of buildings to make sure that all residential buildings where people sleep will be covered in our classification in response to feedback we received at consultation. This includes clarifying that all student accommodation will need to comply.
- 5.16. Other buildings suggested by respondents included hotels, prisons, hospitals and care facilities, and schools and nurseries, as well as a suggestion that we cover all

buildings within our overheating standard. We believe nurseries and care facilities are already covered under the residential (institutional) section of our scope. We also believe that some building types do not pose the same health risks as other buildings, for example hotels, usually have more controlled environments that are maintained centrally, so they do not pose the same risk as homes or other places where people sleep.

- 5.17. Furthermore, we also believe that the vast majority of residential buildings are included in the scope and that including any further niche or specialist-use buildings would require significant modification to the proposed standard. Delivering this modification now could potentially delay the implementation of this standard.
- 5.18. We recognise that many respondents expressed concerns about overheating in existing homes and conversions of buildings such as offices into homes. We are currently undertaking research into the prevalence of overheating in existing homes. We will also consider undertaking further research to identify effective overheating mitigation techniques for the existing stock.

Compliance methods

Question 83:

Do you agree that the division of England based on overheating risk detailed in paragraph 5.6.3 of this consultation document is correct?

- 5.19. The simplified method we proposed in the consultation provides guidance based on the location of the new building. England has been split into two areas: England excluding Greater London (moderate risk of overheating) and Greater London (significant risk of overheating).

Question 83	No. of responses	% of all responses	% split for Q83
(a) Yes	98	13.2%	42%
(b) No, there should be one area	18	2.4%	8%
(c) No, there should be more areas	118	15.9%	50%
Did not respond	509	68.5%	-

- 5.20. A large number of respondents thought that the split was correct including many of the large nationally representative bodies for house building. Several people responded that they thought this was an appropriate simple approach that offered certainty and that a further split would be too complicated.
- 5.21. Some respondents commented that there could be improvement made to the two areas and that there are other locations, particularly urban heat islands, that need investigation, including Birmingham, Manchester and Leeds. Respondents also commented that a lot of Greater London is not built-up and that the boundary could be reduced to central London. Many respondents thought that London is unique in

many ways due to the density, smaller units, more flats and the usability concerns and they thought that a special case for London helps to consider these multiple risk factors. Some respondents also said that it is predicted that the number of people that live in urban areas will rise, and this further urbanisation should be considered in the standard.

- 5.22. Of those who thought that there should be one area, there were comments that everywhere is vulnerable to overheating and that the standard should take account of future temperatures. Others thought that having multiple areas is too complex or could cause issues for product manufacturers. Many did not think that London is unique and that the same principles should apply everywhere, delivering high quality houses everywhere. A few respondents also said that the scale of difference of the measures for the two areas is too great. In practical terms at the local level, respondents thought that the division creates a boundary, that could make the standards challenging to administer.
- 5.23. Of those who responded that there should be more areas, several suggestions were provided for alternative ways to divide the country, these included: split into rural, semi-rural and urban; split into population density per km²; split into urban areas in major cities and non-urban; and split into central London, the remainder of greater London, other city centres, and elsewhere.
- 5.24. Respondents felt that the south is generally warmer than the north of England and therefore there should be more areas to account for this. Specific comments made by respondents were that there is a range of solar insolation, external temperatures, and wind speeds across the country. Others thought that further areas would mean that designs can be better optimised for solar gains in winter and overheating in summer. A respondent also recommended that it should be considered how acclimatised the population is to higher temperatures.
- 5.25. Some respondents thought that local data should be used at the county, borough or site level, with several comments that micro-climate should be considered. A few respondents thought that local authorities, or specific boroughs within London should be able to set standards based on their own micro-climates. A respondent suggested that met office data be used for every area or that the data for the nearest CIBSE weather file be used. Others thought that the method should be more similar to SAP or the Passive House Planning Package (PHPP). Some respondents made comments about updating the underlying modelling using UKCP18 weather data. Developers commented that it is important that the regulations consider local climate to make sure that homes do not overheat despite complying with regulations.

Government response to Question 83

- 5.26. We have undertaken further analysis of temperatures across England, focusing on the urban heat islands of London and other cities in England using Met Office data. This data has shown that while other urban areas may have urban heat islands, the temperatures of these cities, such as Birmingham or Leeds, are not so high that they need the same level of overheating mitigation as central London.

- 5.27. We will therefore proceed with the consultation proposal to split England into two areas:
- a. Moderate risk location - England, excluding high risk parts of London.
 - b. High risk location - urban and some sub-urban parts of London detailed in the Approved Document.
- 5.28. This analysis of temperatures was also undertaken at an outward code postcode level for London. The analysis showed that the application of the higher standard can be reduced from Greater London, to a smaller area of London. The full list of the postcodes included in this high-risk location are in the final *Approved Document O: Overheating*.

Question 84:
Do you agree with the categorisation of buildings into Group A and Group B as detailed in paragraph 5.6.5 of this consultation document?

- 5.29. The guidance that we provided in the simplified method is based on both location and type of building. Houses and parts of residential buildings have been separated into two groups based on their characteristics: Group A and Group B. Group A are mainly houses and Group B are mainly flats. Full details can be found in the Future Buildings Standard consultation.

Question 84	No. of responses	% of all responses	% split for Q84
(a) Yes	122	16.4%	47%
(b) No	135	18.2%	53%
Did not respond	486	65.4%	-

- 5.30. Of those who agreed, respondents said that the approach appears sensible; it is sufficiently simple; and there is a clear difference in the characteristics of the two groups of buildings. Specific support was given to the recognition of cross-ventilation.
- 5.31. Some respondents who disagreed with the proposal felt that all buildings should be in one group. This was often because they thought the difference in the proposed glazing and ventilation areas are so small that having two groups makes the standard unnecessarily complicated. In contrast, some stakeholders thought that the categories were too crude and there should be further subdivision. A small number of respondents thought the idea of categorisation was overly prescriptive and reduces an expert designer’s ability to make an assessment.
- 5.32. There are other factors that affect overheating that respondents felt are important and some said should be recognised within the simplified method, these included: occupancy patterns; vulnerability of occupants; location; direction of glazed façade; room type; characteristics of the construction method and materials used; thermal mass; and ventilation stacks. Other occupants specifically mentioned that some of these should not be considered a priority, including cross ventilation.

- 5.33. Of those features that are included in the proposal, i.e. cross-ventilation and the number of exposed fabric elements, one respondent said that the method does not take account of the amount of cross-ventilation. Another said it is not clear how cross-ventilation is accounted for when buildings are subdivided into rooms. Using the feature of the amount of exposed fabric element in the simplified method was also questioned, as one respondent felt that it does not predict whether it will increase overheating risk through absorbing heat and releasing it at night or decrease overheating risk by heat lost through the fabric at night.
- 5.34. Respondents recommended that we note that both category A and B dwellings may be found in a single block of flats and that the proposals could affect window sizes across adjacent floors. Several respondents commented that the overheating risk of the top floor flat is very similar to the flat below. One respondent thought the rationale for having some ground floor flats being placed in Group A is sound due to ground cooling.
- 5.35. Some respondents could not categorise some types of building or thought that the rationale was not sufficiently clear. Respondents said that there should be greater clarity around definitions such as ‘fabric element’ and further guidance should be provided for corridors.

Question 85:

Do you agree with the simplified method as a means of compliance with the proposed new requirement to reduce overheating risk?

- 5.36. Two potential methods of complying with the new requirement of the Building Regulations were proposed and provided in the 2021 draft *Approved Document O: Overheating*. The simplified method offered a route to compliance based on minimising solar gains and removing excess heat.

Question 85	No. of responses	% of all responses	% split for Q85
(a) Yes	84	11.3%	31%
(b) No, the method should be more sophisticated	61	8.2%	23%
(c) No, the method is too easy to pass	9	1.2%	3%
(d) No, for another reason	113	15.2%	42%
Did not respond	476	64.1%	-

- 5.37. The majority of respondents agreed with the concept of having a simplified method, with only a small number saying in their response that they did not agree with having a simplified method and that dynamic modelling should be used for all buildings. There were also several respondents, however, who thought that while having a simplified method is necessary, there should be limits placed on when it can be used. Examples of such limits included only allowing dynamic thermal simulation for higher risk buildings; large developments; where communal heating and hot water is used; where noise or pollution levels are too high; and where there

are vulnerable occupants. Some respondents said that local authorities should be the ones to decide which method of compliance is used for each development.

- 5.38. Many respondents said that the proposed method was complicated to achieve in practice and that the simplified method as presented needs improvement. Some respondents suggested alternative methods including using the Standard Assessment Procedure, using the Passivhaus Planning Package, and using a performance-based approach. Some respondents thought that the glazing and free areas needed adjusting, with some comments that the standard for flats was too easy to pass. Others thought that the standard should be more sophisticated and should include orientation; thermal mass; other shading solutions; mechanical ventilation’s contribution to the air change rate; gains from heat networks; and ceiling heights. Some respondents said that interactions between reducing overheating risk and other benefits of solar gains should also be considered, including winter solar gains for free heating, lighting, and wellbeing of occupants.

Question 86:
Do you agree with the maximum glazing area and shading standards for limiting solar gains in the simplified method as detailed in paragraphs 1.6 to 1.9 of the draft Overheating Approved Document?

- 5.39. In the consultation we proposed a set of maximum glazing areas and shading standards for reducing unwanted solar gains as part of the simplified method.

Question 86	No. of responses	% of all responses	% split for Q86
(a) Yes	64	8.6%	13%
(b) No	441	59.4%	87%
Did not respond	238	32.0%	-

- 5.40. Where respondents agreed with the proposals, they thought the maximum glazing areas would allow for good daylight and that these limits were reasonable for houses. Some respondents also commented that a further benefit of reducing glazing was reducing embodied energy of buildings. Where respondents thought that the maximum glazing limit was too restrictive, they said that people buying new homes value large windows and a reduction in daylight could decrease health and wellbeing. Others thought that valuable winter gains could be lost through both smaller windows and through using low-g glass. A few respondents requested a minimum glazing area to make sure there is good daylight. Some respondents thought that there should be no limit on glazing area at all, commenting that shading should be installed in all homes to allow for larger glazing areas.
- 5.41. The majority of respondents who commented on this question said that the glazing areas are too high and could lead to overheating. In particular, there were comments that the concentration of glazing is too high for dwellings with one or two facades because the solar gains are not spread throughout the different times of day.

- 5.42. Some respondents suggested improvements to the guidance including limiting glazing based on orientation and that the standard should be on a room-by-room basis not for the whole dwelling, with some recommending considering the gains of different room types. Other respondents recommended an entirely different approach to maximum glazing areas including using SAP Appendix P; a performance-based approach; that glazing areas should be designed for each building; and that maximum glazing should be a function of volume, wall area or both.
- 5.43. On ways to support implementation, respondents thought that any standards on glazing sizes need consideration at planning stage. Some respondents recommended using worked examples within the Approved Document to help interpretation of the new standard. A few respondents thought that the standard should include an extra scenario involving large windows and doors with shading.

Question 87:
Do you agree with the approach to removing excess heat in the simplified method as detailed in paragraphs 1.10 to 1.13 of the draft Overheating Approved Document?

- 5.44. In the consultation we proposed a set of minimum opening areas for removing excess heat as part of the simplified method.

Question 87	No. of responses	% of all responses	% split for Q87
(a) Yes	77	10.4%	16%
(b) No	399	53.7%	84%
Did not respond	267	35.9%	-

- 5.45. Some respondents thought that the proposed opening areas were too large. Other respondents thought that the opening areas were necessary for some buildings with a higher risk of overheating. Some respondents commented that it would be preferable for overheating risk to be lowered through smaller amounts of glazing, rather than having more generous glazing then needing large openings to remove the heat. Alternative suggestions were made by respondents on the size of the opening areas, the range suggested was between 3-12% of floor area, with many recommending 8% or half of the windows fully openable.
- 5.46. On the general approach, respondents said that free areas should be calculated for each project; the amount of airflow should be calculated instead of using free areas; and that more guidance on calculating free areas is needed. Some respondents specifically said that they agreed with using windows to remove excess heat. Other respondents said there should be alternative means of removing heat recognised including non-glazed openings such as ventilation louvres; trickle vents; the stack effect in houses; and mechanical purge ventilation. Some said that these methods should be included within Approved Document guidance.
- 5.47. Respondents noted that there are reasons that make it impractical to open windows including noise, rain, security, risk of falling, air quality and high wind. Several respondents questioned whether wide window opening was appropriate for care

homes and whether high sills were inclusive. Some respondents said that the proposals do not seem compatible with other parts of the 2021 draft *Approved Document O: Overheating* on usability or other Approved Documents on areas such as secure by design and accessibility. Many respondents focussed on the issue of window restrictors, with some saying that many clients, such as social landlords, require them and another saying they might be added after sign-off.

- 5.48. Respondents were concerned that the large opening areas proposed were impractical and meant that sliding patio doors and sash windows would no longer be an option when using the simplified method. Some respondents were also concerned that large free areas may lead to more glazing, which in turn impacts thermal performance. Another concern on thermal performance raised by respondents was that the free areas proposed are easier to achieve when frame sizes are increased, which perform worse thermally than the glazing.
- 5.49. Respondents presented several ideas on heat networks, including that there should be no high temperature networks, only ambient networks circulating hot water. Others said the guidance on removing excess heat from networks should be clearer, including how to demonstrate compliance to Building Control.

Question 88:
Do you think that adequate levels of daylight will be provided and that homes will be acceptable to purchasers while meeting these proposed standards?

- 5.50. There is no requirement to provide specific levels of daylight in the Building Regulations or in the National Planning Policy Framework. The method of reducing solar gains that we set out in the consultation proposed smaller window sizes in flats compared to many common designs. While too many windows can cause a home to overheat, we recognised in the consultation that larger windows can make new homes more attractive to potential buyers.

Question 88	No. of responses	% of all responses	% split for Q88
(a) Yes	174	23.4%	67%
(b) No	85	11.4%	33%
Did not respond	484	65.1%	-

- 5.51. Some respondents highlighted the importance that daylight has for wellbeing, both mental and physical, and how restricting glazing may impact on the health of occupants.
- 5.52. Many respondents, however, highlighted that window size is not the only component in how well lit a home or room is, with the placement of the window or its elevation also being important. Some respondents also highlighted the lack of literature on sufficient daylight levels and highlighted that more research needs to be carried out. Some respondents recognised that, should more glazing be desirable, TM59 was able to give more design freedom.

- 5.53. Some respondents highlighted that an appropriate level of daylight would be entirely subjective depending on the occupier of the home.
- 5.54. Several respondents said that that a specific analysis should be carried out in homes to make sure that appropriate levels of daylight are reached. Respondents mentioned some methods of measuring appropriate levels of light, including the BRE's daylight criteria, BS EN 8206 and BS EN 17037:2018, or a daylight calculation to happen in SAP.
- 5.55. A few respondents were concerned that darker rooms would lead to increased use of lighting, which in turn would drive up energy use in homes.
- 5.56. Several respondents suggested that daylight levels could be improved under the simplified method if the method used more shading.

Government response to Questions 84 to 88

- 5.57. We have proceeded with the option of a simplified method as a means of demonstrating compliance with the new requirement of the Building Regulations. We have, however, made improvements based on the feedback of consultees and the full method can be found in the *Approved Document O: Overheating*.
- 5.58. We have made clear that when the usability requirements set out in section 3 of the *Approved Document O: Overheating* cannot be met alongside the simplified method, designers should use the dynamic method. We have revised the standard for buildings with multiple residential units with communal heating and hot water. This now sets a standard to reduce horizontal distribution pipework which will encourage designers to use the dynamic thermal method for more flexibility.
- 5.59. The simplified method no longer has groups of buildings, see the draft Approved Document for overheating, and instead sets standards based on whether the house or residential unit is cross-ventilated. This has the benefit of making the simplified method more straightforward. We carefully considered the suggested improvements for the method and balanced them against the need to keep the method simple to use. We have now included orientation in the method and introduced a standard for the maximum amount of glazing in a single room, making it more accurate. This in turn, has allowed refinements of the maximum glazing areas, which were considered to be too high for flats.
- 5.60. We have also refined the method to reduce total opening area, but the method now sets an additional standard for minimum opening areas for bedrooms. This will make sure that an opening area is targeted where it is needed and is sufficient for keeping occupants cool at night.
- 5.61. We believe that these improvements address the majority of the concerns raised by consultees in questions 84 to 88.
- 5.62. While the new requirement may make glazing areas smaller, than they are currently, for some flats using either the simplified method or the dynamic method of compliance this was not highlighted as an issue for houses by most respondents.

We agree with the majority of respondents that adequate levels of daylight will be provided under the simplified method in most circumstances.

Question 89:
Do you agree with offering dynamic thermal analysis as a means of compliance with the proposed new requirement to reduce overheating risk?

5.63. The dynamic thermal analysis method that we set out in the consultation uses CIBSE’s TM59 Design methodology for the assessment of overheating risk in homes to demonstrate compliance with the new regulation for overheating. The dynamic thermal analysis method allows more sophisticated analysis of complex buildings and is an alternative route to compliance instead of using the simplified method.

Question 89	No. of responses	% of all responses	% split for Q89
(a) Yes, as described in the draft Overheating Approved Document	100	13.5%	40%
(b) Yes, but not as described in the draft Overheating Approved Document	140	18.8%	57%
(c) No	7	0.9%	3%
Did not respond	496	66.8%	-

5.64. There were a mix of views within each stakeholder category, but the following respondents tended to be more in favour of Option (a): local authorities; manufacturers/supply chains; national representatives and trade bodies; and research/academic organisations; while the following respondents tended to favour Option (b): builders/developers; designers/engineers/surveyors; and architects.

5.65. Many respondents raised concerns around the differences between the 2021 draft *Approved Document O: Overheating* and TM59. It was felt that the variations between the two documents could lead to confusion. Respondents recommended that CIBSE are consulted and that TM59 is updated so the two documents are fully aligned with one another.

5.66. Various concerns were raised by respondents around Section 2.2(a) of the 2021 draft *Approved Document O: Overheating*. They felt that the wording incorrectly implies that high levels of insulation can cause overheating.

5.67. Several respondents also expressed concerns around Section 2.6 of the 2021 draft *Approved Document O: Overheating*. They argued that modelling all accessible windows in unoccupied rooms as closed is too inflexible and that allowances should be made for windows which have security measures in place. Some respondents also said that occupants may choose to open windows at lower temperatures than those stated.

- 5.68. A small number of respondents also raised other concerns around the modelling process. For instance, there was concern that it is not realistic to expect occupants to routinely leave bedroom doors open, particularly in multiple occupation households. The importance of including clear guidance on how to model for shading devices so that modellers do not use very different assumptions from one another was also highlighted.
- 5.69. Another common view was that a requirement should be put in place so that only accredited assessors are able to carry out the dynamic thermal analysis. Several respondents felt that a post occupancy evaluation should also be required to make sure that the building is performing as designed.
- 5.70. Other key issues raised by respondents included:
- A recommendation that if communal heating systems are proposed then the TM59 approach must be used.
 - The importance of thoroughly considering the cost implications of the proposed approach.
 - The importance of ensuring that future climate scenarios are taken into account when modelling so that homes are futureproofed.
 - The benefits of the Passivhaus Planning Package (PHPP) as an alternative approach.
 - The need to consider the balance between overheating and noise in medium and high noise exposure areas, and the effects of noise on health and quality of life.
 - Concerns around the inaccuracy of trying to predict the number of hours that a room is likely to exceed a prescribed temperature threshold.

Question 90:

Please detail any information you have about the likelihood of occupants opening doors and windows at night in unoccupied rooms.

- 5.71. While this question was intended to focus on whether windows would be left open in unoccupied rooms, respondents also covered whether they felt occupants would leave their windows open at night at all.
- 5.72. Many respondents thought that occupants of buildings would not leave windows and doors in unoccupied rooms open at night.
- 5.73. A number of factors in whether occupants would open windows and doors in unoccupied rooms were mentioned this included:
- Perception of security, which may not be influenced by whether a room is on the ground floor or in a high rise
 - Pollution outside, including one-off pollution events such as barbeques
 - Noise outside
 - Fear of children falling from windows
 - Bad weather
 - Animals escaping from the house
 - Vermin entering the house

- Privacy

- 5.74. Furthermore, respondents commented that occupant behaviour would be difficult to change. Some highlighted that occupants of buildings typically do not consider ventilation and are more influenced by factors mentioned above, and therefore our models should not rely on influencing this behaviour.
- 5.75. Other reasons given for not opening windows is that occupants may forget, impacting on the effectiveness of the overheating strategy; that the behaviour of occupants is unpredictable; and that residents may have been taught to keep certain doors closed, for example fire doors, and would prioritise safety from fire over cooling their home.
- 5.76. Other respondents highlighted instances of occupants of buildings built to Passivhaus standards being taught effectively to manage heat in their building by leaving windows and doors open. These respondents highlighted that the Home User Guide may be a place to educate the occupant of this method of cooling their home.
- 5.77. Some respondents highlighted solutions to make sure occupants felt able to open their windows. This included using openings other than windows for ventilation purposes, for example a ventilation grid, the use of shutters or louvres, and the use of smart ready windows. One respondent also suggested running the models without unoccupied windows/doors being opened to demonstrate its effectiveness to the occupant.

Question 91:

Do you agree with the proposed acceptable strategies for shading and the removal of excess heat, when following the dynamic thermal analysis method, as found in Section 2 of the draft Overheating Approved Document?

- 5.78. Section 2 of the 2021 draft *Approved Document O: Overheating*, which accompanied the consultation, detailed the acceptable strategies for reducing the overheating risk in residential buildings when following the dynamic thermal analysis method. This included guidance on limiting unwanted solar gains in the summer through shading and providing a means to remove excess heat from the indoor environment.

Question 91	No. of responses	% of all responses	% split for Q91
(a) Yes, I agree with both sets of acceptable strategies	88	11.8%	44%
(b) Yes, but with amendments to the acceptable shading strategies	30	4.0%	15%
(c) Yes, but with amendments to the acceptable strategies to remove excess heat	30	4.0%	15%
(d) Yes, but with amendments to both sets of acceptable strategies	43	5.8%	21%
(e) No, I do not agree with the acceptable strategies	11	1.5%	5%
Did not respond	541	72.8%	-

- 5.79. Those who agreed with both sets of acceptable strategies noted that it would align with the GLA's use of CIBSE TM guidance.
- 5.80. Suggested amendments to the acceptable shading strategies included many comments on trees and blinds, which are covered in more detail in Question 92. Respondents felt there may be some risk that external shading perceived to be permanent such as awnings or even other buildings could still be removed and affect the building's overheating risk. Respondents said that orientation should factor more into calculations, for example more shading on south facing walls than others. Other respondents said that shading should not be fixed, to enable better daylight in winter months when it is less likely to be in use.
- 5.81. One stakeholder suggested amending the language around fixed shading devices, as shutters, external blinds and awnings are not fixed, recommending that the word external be used instead. Another stakeholder noted how external shading strategies may not work in tandem with Approved Document B, with buildings over 4 metres unable to use flammable external shading devices.
- 5.82. Suggested amendments to acceptable strategies to remove excess heat highlighted that windows will not be opened should noise, security or pollution concerns be present, which were also highlighted in later questions. Some respondents thought that passive stack ventilation or thermal mass should be able to be used. Respondents questioned how TM59 modelling can combat the heat that may be found in communal corridors in flats, which could have a knock-on effect on the overheating risk of the dwelling. Finally, some respondents said that guidance should be clear that mechanical vent systems should not be operating in boost function due to the noise it produces, even though this may be the only effective way of MVHR removing heat.
- 5.83. Other comments in the responses to this question highlighted the importance of ceiling fans in cooling and noted the lack of comfort cooling in the 2021 draft *Approved Document O: Overheating*, arguing that heat pumps can also cool properties. Other respondents noted that the use of louvres or overhangs would

need early consideration with local planning authorities, and so Building Regulations and planning should operate together smoothly. In this space, respondents also emphasised the importance of making sure green spaces are protected, as they can help with the urban heat island effect and are beneficial for residents.

5.84. Some respondents said that we should define the term “g-value” in the *Approved Document O: Overheating*.

Question 92:
Do you agree that the overheating standard should not account for the effect of curtains, blinds and tree cover?

5.85. In the consultation we noted that not all occupants choose to have curtains or blinds and, when they are present, internal curtains and blinds offer a varying degree of shading dependent on the properties of the material. Similarly, trees can be easily removed or trimmed to make them less effective as a means of shading and the occupant of the building may not have control over the tree that provides the necessary shade. We therefore proposed that curtains, blinds and trees are not accounted for as means of shading in the overheating calculation.

Question 92	No. of responses	% of all responses	% split for Q92
(a) Yes, curtains blinds and tree cover should be excluded	186	25.0%	71%
(b) Yes, but only curtains and blinds should be excluded	22	3.0%	8%
(c) Yes, but only tree cover should be excluded	17	2.3%	7%
(d) No, none of these should be excluded	36	4.8%	14%
Did not respond	482	64.9%	-

5.86. Those who agreed with curtains, blinds and tree cover being excluded noted that this would align with the GLA’s use of CIBSE TM guidance. Some respondents also noted that the lifespan of blinds and trees is not the same as a building, with buildings having a lifespan of around 100 years. Blinds are noted as being easily removed by the occupier, and trees are noted as often being felled before reaching 100 years old, with a replacement tree taking a long time to grow. One respondent highlighted a study (Roberts, 2020)⁵ which showed closing curtains does not necessarily help to reduce air temperature.

5.87. Those who said tree cover should be included noted that trees have a very beneficial impact on the urban heat island effect, which can reduce overheating in cities overall. It was also argued that trees are beneficial for other reasons too, including preservation of green spaces and carbon. Some respondents highlighted that while some trees can be felled early, others have Tree Protection Orders

⁵ <https://doi.org/10.26174/thesis.lboro.13281293>.

placed on them, which means the tree does have permanency and it would be up to the local authority to decide when to fell the tree.

- 5.88. Those who argued that blinds should be included noted their status as a low-cost solution to overheating, and that they could be helpful in complex glazing situations such as in the instance of rooflights, where external shading is not feasible. It was also noted that it may be easy to educate residents of the importance of their blinds through the home user guide.
- 5.89. One respondent argued that homeowners only redecorate around once every seven years, and that there was anecdotal evidence showing that internal shading products are replaced less frequently than that. The respondent argued that the lifespan of blinds may be more permanent than we had anticipated, at 15 years.
- 5.90. Some respondents also highlighted other issues with acceptable strategies, such as the use of buildings as shading when buildings may not be permanent.

Question 93:
Do you agree that the building should be constructed to meet the overheating requirement without the need for mechanical cooling?

- 5.91. Our preferred means of mitigating overheating is through passive means (i.e. low or no energy needed) as far as practicable due to the Government’s net zero commitment. In the consultation we therefore proposed meeting the overheating requirement without the use of mechanical cooling.

Question 93	No. of responses	% of all responses	% split for Q93
(a) Yes	490	65.9%	94%
(b) No	30	4.0%	6%
Did not respond	223	30.0%	-

- 5.92. There was strong support from many respondents that passive measures are key and that buildings should be designed to make sure that cooling is not necessary. Some respondents thought that cooling should only be for additional comfort and that the measures in the 2021 draft *Approved Document O: Overheating* are important to reduce solar gains in order to avoid excessive cooling loads. Respondents thought that there were many negative consequences of allowing widespread cooling including high costs for residents; cooling poverty; risks to residents if there are failures of the cooling equipment or electricity network; increase in urban heat islands; added cost of cooling system for developers; long term maintenance costs for householders; noise of cooling in sleeping hours; embodied emissions of additional building services; and the increased use of appliances using coolant.
- 5.93. A large number of respondents thought that cooling is a waste of energy and made links to achieving net zero and the strain on the electricity grid. A few respondents said that the climate of the UK means that mechanical cooling is not necessary. It

was a concern of some respondents that introducing cooling into homes risks the population no longer adapting to high temperatures.

- 5.94. Some respondents, however, thought that the approach in the 2021 draft *Approved Document O: Overheating* may be an issue where there are site specific issues such as noise or air quality. Others said that this approach should only be taken when a passive standard is technically and financially possible. With some respondents specifically recommending that there should be the option of some alternative low carbon cooling options and that these should be recognised in SAP.
- 5.95. Those who did not agree said that they were unsure whether future climate scenarios or high temperatures at night had been considered and did not think it was possible to reduce overheating sufficiently without cooling. Others thought that cooling is necessary for some occupants, with care homes specifically cited. Some respondents thought that reducing overheating through passive means is too restrictive on the visual appearance of buildings or relies too much on occupant actions. Some people thought that if no cooling was installed, then occupants might install their own, less efficient, cooling. It was suggested that there could be co-benefits of a heat pump providing heating and cooling.

Government response to Questions 89 to 93

- 5.96. We will proceed with the option of dynamic thermal modelling as a means of demonstrating compliance with the new requirement of the Building Regulations. This makes sure that residential buildings are sufficiently mitigating overheating risk while offering designers the flexibility they need.
- 5.97. Consultees commented that only accredited people should be able to do the assessment. This is not possible through the Building Regulations, which cannot restrict who does the work. We will, however, work with industry over the next few years to explore the possibility of an accreditation scheme similar to air tightness testers, which could be in place by the first review of the new overheating standard.
- 5.98. We recognise that there could be some confusion caused by differences between CIBSE's TM59 and the *Limits on CIBSE TM59 modelling* in the 2021 draft *Approved Document O: Overheating*. CIBSE and DLUHC have plans to work together on the future revision of TM 59 to rationalise the guidance where possible. *Approved Document O: Overheating* will be amended in line with comments to the consultation that windows can be left open in unoccupied but easily accessible rooms in the day if this can be done so securely. We will continue with the restriction on not allowing such windows to be open at night, based on the feedback received from consultation on the low likelihood of people opening windows at night in such circumstances.
- 5.99. The guidance on acceptable strategies for limiting unwanted solar gains has remained broadly the same as consulted on, with some minor amendments. This includes not allowing most internal blinds or tree cover to be used when doing a dynamic thermal assessment. Internal curtains and blinds can be changed or removed by each occupant and offer a varying degree of shading dependent on the properties of the material. Trees can be easily removed or trimmed to make them

less effective as a means of shading. Further detail can be seen in the *Approved Document O: Overheating*.

5.100. Some respondents highlighted that there were some buildings that could not pass the usability guidance using the acceptable strategies in the 2021 draft *Approved Document for Overheating*. Therefore, the guidance of *acceptable strategies for removing excess heat* has changed to allow for the overheating criteria to be met by using mechanical cooling. Those carrying out the work must demonstrate that all possible passive means have been implemented before adopting mechanical cooling to meet the overheating criteria. The full detail can be seen in the *Approved Document O: Overheating*.

Usability for occupants

5.101. In the consultation we highlighted the need for any overheating strategy to be usable for occupants under normal scenarios. We proposed several factors in order to make overheating strategies safe and usable by occupants. This included taking into account noise and pollution near the home, the safety and usability of the windows and security, and the effect this may have on occupant behaviour.

Question 94:

Do you agree with limiting noise in new residential buildings when the overheating strategy is in use, and the proposed guidance in Section 3 of the draft Overheating Approved Document?

5.102. To make sure that people are able to sleep, a room must be both sufficiently cool and quiet. In the consultation we proposed that the overheating strategy should not introduce unacceptable levels of noise into bedrooms.

Question 94	No. of responses	% of all responses	% split for Q94
(a) Yes	136	18.3%	52%
(b) Yes, but with amendments to the guidance	114	15.3%	43%
(c) No, I do not agree with limiting noise when the overheating strategy is in use.	13	1.7%	5%
Did not respond	480	64.6%	-

5.103. A number of respondents said that levels set in the *Approved Document O: Overheating* should line up with the Acoustics & Noise Consultants' *Acoustics, Ventilation and Overheating Guide*. This guidance sets the $L_{Aeq, 8h}$ (the average sound level measured over a specified period) between 11pm and 7am at a maximum of 42 dB, and a limit for individual noise events during these hours at 65 dB $L_{AF, max}$ (the maximum sound level at an instant in time). Other respondents said that we should align the limits with BS 8233:2014 and set limits around 30 or 35 dB. A suggestion was also made that as there is currently limited research into the

impact of noise on health in the context of overheating, that Government should avoid setting hard limits in the Approved Document.

- 5.104. Some respondents noted that the 2021 draft *Approved Document for Overheating* specified that noise should be limited in bedrooms but that it did not include a definition of what a bedroom is. They said that this should be clarified to avoid noise limits being avoided by defining a room as an office rather than a bedroom. A small number of respondents also said that the limits should be extended to other rooms that are habitable, and that limits should be set during the daytime.
- 5.105. A number of respondents questioned the compliance methods that we set out in the consultation document and the 2021 draft *Approved Document for Overheating*. Some highlighted that building control do not have the experience or skills to interpret, for example, noise modelling, and that an alternative body would need to evaluate this evidence. A comment was also made that, if external noise was a chargeable planning condition, it would harm small and medium-sized enterprises (SMEs).
- 5.106. Some developers also noted that there was not much guidance on situations where a completed site fails noise assessments, and what remedial works would need to take place, if any. Others questioned the methodology of noise testing, as samples could be taken from a site when it is not complete and not accurately reflect the real noise levels present. Respondents also highlighted the need for there to be some guidance on the type of tests needed, and the level of competence required of those carrying out the tests.
- 5.107. Finally, many respondents made a wider point that guidance on noise should sit in Approved Document E rather than the *Approved Document O: Overheating*, and simply cross-referenced.

Question 95:

Do you agree with minimising the ingress of external pollutants when the overheating strategy is in use, and that the external pollutants guidance in Approved Document F, volume 1: dwellings should be followed where practicable?

- 5.108. Windows fully open in polluted areas are more likely to bring in external pollution, impacting indoor air quality. We provided guidance in the 2021 draft *Approved Document F, Volume 1: Dwellings*, which accompanied the consultation, on minimising the ingress of external pollutants. We proposed that, where the threshold criteria apply, this guidance is followed where practicable for windows that are used for removing excess heat as part of the overheating mitigation strategy.

Question 95	No. of responses	% of all responses	% split for Q95
(a) Yes	141	19.0%	57%
(b) Yes, but with amendments to the guidance	95	12.8%	38%
(c) No, I do not agree with minimising the ingress of external pollutants when the overheating strategy is in use	12	1.6%	5%
Did not respond	495	66.6%	-

- 5.109. Several respondents highlighted an interaction with TM59 which would mean that certain sites would not be able to be built on if they were too polluted due to the fact that the use of air conditioning as an acceptable strategy was not allowed in the 2021 draft *Approved Document for Overheating*.
- 5.110. Respondents also noted that the only permissible means of heat removal under the simplified method is opening windows and the use of cross ventilation. Since the 2021 draft *Approved Document F, Volume 1: Dwellings* requires air to be delivered from remote areas where there is lower pollution, it is unclear how to build in polluted areas with the simplified method.
- 5.111. Some respondents said that there should be a defined maximum allowable external pollution level for opening windows. It was noted this would render some sites unusable for residential development. There was also a suggestion that *Approved Document F, Volume 1: Dwellings* should provide guidance on minimising the ingress of external pollutants.
- 5.112. Respondents questioned when pollution levels should be determined. Specifically, should they be decided at planning stage, where if pollution is too high planning permission is not provided at all for the given development.
- 5.113. Respondents provided further comments saying that guidance should sit in *Approved Document F, Volume 1: Dwellings* rather than the *Approved Document O: Overheating*, to avoid confusion, and that the language used in the 2021 draft *Approved Document F, Volume 1: Dwellings* is not clear enough. Finally, respondents also highlighted the lack of hybrid guidance for opening windows and mechanical ventilation, and lack of clarity over the air change rate.

Question 96:

Do you agree with the proposals on security in Section 3 of the draft Overheating Approved Document in new residential buildings?

- 5.114. There may be an increased risk of crime on the ground floor of buildings or in other easily accessible rooms. Occupants should be able to use their overheating strategy while feeling safe. Therefore, in the consultation we proposed additional guidance on security for any openings which are used for the removal of excess heat at night as part of the overheating mitigation strategy.

Question 96	No. of responses	% of all responses	% split for Q96
(a) Yes	207	27.9%	89%
(b) No	25	3.4%	11%
Did not respond	511	68.8%	-

5.115. Some respondents highlighted issues with window railings as a means of making windows or doors secure. They thought that railings may further limit daylight levels in homes and thus increase daytime light use, while others highlighted that railings are unpopular amongst homeowners and likely to be removed by them when the house is occupied. Some also questioned the effect that louvres or shutters would have on the free areas of windows.

5.116. Some respondents highlighted other technology that could be used to provide security. This included alarm systems and automated roller shutters.

5.117. There was disagreement amongst respondents on the quotation of Resistance Class 2 of BS EN 1627:2011. Some supported its inclusion in the Approved Document to make shutters more secure. A separate comment was made, however, that most shutters would not meet this standard. It was noted that this standard would mean the use of roller shutters which can be noisy and would not allow for sufficient ventilation or light to come through. It was stated that while louvred shutters do not get tested against security standards, they do still help occupants feel secure in their homes.

5.118. A few respondents highlighted potential issues with the interaction of these standards and standards found in Approved Document B on windows as a means of escape. Some respondents also said that guidance on security should be kept in Approved Document Q, and cross referenced in the *Approved Document O: Overheating*.

Question 97:

Do you agree with the protection from falling guidance proposed in Section 3 of the draft Overheating Approved Document?

5.119. There is a safety risk that people could fall out of open windows where the windows are used for the removal of excess heat as part of the overheating mitigation strategy. In the consultation we therefore proposed higher guarding heights than the 800mm required in Approved Document K. There is also a risk that people could over-reach and fall out of windows when opening and closing them. We therefore also proposed a maximum distance between the inside face of the wall and the maximum position of the window handle of 600 mm.

Question 97	No. of responses	% of all responses	% split for Q97
(a) Yes	96	12.9%	21%
(b) No	369	49.7%	79%
Did not respond	278	37.4%	-

- 5.120. Some respondents who agreed with the proposed changes explained that the guarding heights set out in Part K are too short, and some contractors are intentionally building with more stringent guarding heights.
- 5.121. Respondents identified several areas, however, where they felt that our proposals clashed with other Approved Documents. The proposed guarding height of 1.25 m in bedrooms with a change in floor level between the inside and the outside of more than 2m was identified as clashing with rules for escape windows in Part B, which asks that windows be no more than 1.1m above the floor. Another clash was identified with Part M, where increased guarding heights would result in people in wheelchairs being unable to see out of their windows, and in some cases unable to reach the handle for the window.
- 5.122. Another issue identified was with the guidance that window handles be no more than 600mm from the inside face of the wall when the window is at its maximum openable angle. Respondents highlighted that this creates issues when combined with guidance earlier in the 2021 draft *Approved Document for Overheating* which asks that windows open to a minimum of 60 degrees. Respondents highlighted that because of the interplay between these two pieces of guidance, the width or height of a window could be restricted depending on the thickness of the wall. There were further comments saying that the guidance needs clarifying, and that we should make sure these rules only apply to windows that opened outwards and not sash windows or those that opened inwards.
- 5.123. Other respondents said that guidance regarding protection from falling should only be raised in Part K, especially as the provisions in the 2021 draft *Approved Document for Overheating* go beyond those in Part K. Respondents also identified areas of guidance which were repeated from Part K, which they felt was not necessary.
- 5.124. Some respondents questioned whether changes from Part K were necessary, given that it is currently possible to design dwellings with openable windows that meet the guidance set in the 2021 draft *Approved Document for Overheating* while following current guidance set in Approved Document K. The impracticalities of increased guarding heights were also raised, including residents removing railings or experiencing difficulties trying to wash windows. Using shutters as guarding was also raised as an issue, as they would need to be flush with the façade to prevent falls, which is not always the case with current design practices.

Question 98:

Do you agree with the guidance on protection from entrapment proposed in Section 3 of the draft Overheating Approved Document?

- 5.125. There is a safety risk that people can get body parts trapped in guarding or ventilation grills. This is a particular risk for small children, who may get their head or fingers trapped. In the consultation we therefore proposed size requirements for holes that prevent head and finger entrapment and that looped cords should be fitted with child safety devices.

Question 98	No. of responses	% of all responses	% split for Q98
(a) Yes	191	25.7%	85%
(b) No	34	4.6%	15%
Did not respond	518	69.7%	-

- 5.126. Generally, respondents felt that any guidance not relevant to overheating should be explained in the relevant Approved Document, in this case Approved Document K, and simply referenced in the *Approved Document O: Overheating*, in order to prevent confusion. Respondents also highlighted that information in the section on protection from entrapment in the 2021 draft *Approved Document for Overheating* was simply repeated guidance from Approved Document K, which was not necessary.
- 5.127. Some respondents highlighted that the guidance in paragraph 3.12(b) of the 2021 draft *Approved Document for Overheating* was confusing and not easily parsed. They said that diagrams should be included to make the guidance clearer.
- 5.128. Some British Standards were quoted as being appropriate for inclusion when it came to protection from entrapment and internal blinds. These included BS EN 13120:2009+A1:2014, BS EN 16433:2014 and BS EN 16434:2014.
- 5.129. Respondents suggested that further considerations are outlined in the guidance, for example holes that do not meet the guidance set in paragraph 3.12 of the 2021 draft *Approved Document for Overheating* to be placed at a height out of reach of children. Questions were also raised on louvres where the size of the openings has changed, and what configuration of louvres or blinds the guidance applies to.

<p>Question 99: Are there any further issues which affect usability that should be included in the Overheating Approved Document?</p>

Question 99	No. of responses	% of all responses	% split for Q99
(a) Yes	123	16.6%	60%
(b) No	81	10.9%	40%
Did not respond	539	72.5%	-

- 5.130. A large number of respondents said that micro-climate or other local weather should be added as a consideration in the *Approved Document O: Overheating*. Respondents felt that this was needed to better counteract the urban heat island effect, which TM59 and our proposed simplified method did not tackle. Some respondents highlighted the Good Homes Alliance's guidance on this subject.
- 5.131. Respondents also highlighted the importance of considering the occupancy of the house as part of the guidance. A range of suggestions were made, including that guidance should provide details of maintenance provisions or make sure that proper access is possible for maintenance, and that information should be provided to the resident for any mechanical ventilation systems so that they are used efficiently and

not turned off because of noise or perception of cost. Further suggestions also included that the guidance should consider who will be living in the house, and their age, to mitigate more for those who are at higher risk of overheating, and that the guidance should take into consideration appliances which may be in use by the occupier which can emit heat.

- 5.132. Another issue highlighted to respondents was that more references to other Approved Documents may be necessary, such as references to Approved Document M or Approved Document B. References to Approved Document M would make sure that occupants are still able to see out of their windows in houses designed for wheelchair users, especially when guarding to address security or protection from falls, or ventilators, are in place. References to Approved Document B would make sure that residents are still able to escape in the event of a fire, even if the egress window uses shutters or louvres.
- 5.133. Some other information was provided through this question. This included that MVHR must have a summer bypass function to prevent unwanted heat being retained, and the possibility of further guidance on thermal mass or passive stack ventilation in the Approved Document.

Government response to Questions 94 to 99

- 5.134. We recognise that the references to post-completion testing in our guidance regarding noise would be difficult to implement in practice as highlighted by consultees. These references have been removed and the guidance simplified where possible. We have also included references to the National Model Design Code: Part 2 – Guidance Notes to signpost guidance on reducing the passage of external noise into buildings.
- 5.135. We have simplified the section on pollution in line with respondents' suggestions, and referenced to guidance in *Approved Document F, Volume 1: Dwellings*.
- 5.136. In response to issues highlighted in both Question 94 and 95 regarding the interaction between our usability guidance and TM59 which may prevent developments happening in areas with significant pollution or noise, we have altered our guidance on air conditioning. Please see the Government response to Questions 89 to 93 for more detail.
- 5.137. Guidance provided on security provisions has been simplified, as well as references to Resistance Class 2 of BS EN 1627:2011 removed as suggested by respondents to make sure the appropriate shutters are installed in buildings.
- 5.138. We have altered the guidance provided to prevent falling in response to feedback. This includes altering the appropriate guarding heights down from 1.25 metres to 1.1 metres. This aligns the guidance with Approved Document M and Approved Document B.
- 5.139. Guidance relating to the distance of window handles from the inside walls which formed part of the protection from falling guidance has also been edited; the measurement has been expanded from 600mm to 650mm. We have also clarified

that this only applies to outward opening windows. We understand that this may restrict the width or height of individual casements, but it would not mean that less glazing is provided.

- 5.140. Some respondents said there should be more references to Approved Document B and Approved Document M. It should be noted that the *Approved Document O: Overheating* does reference these documents in the beginning of the guidance.

Providing information

Question 100:

Do you agree with the proposed requirement to provide information on the overheating strategy to the building owner?

- 5.141. In order for occupants to use the overheating strategy, they must understand it. There are already requirements in Part 8 of the Building Regulations for the purposes of energy efficiency and ventilation (Regulations 39 and 40) that developers should provide information about the building so that it can be operated effectively. In the consultation we proposed that there should be a new requirement in Part 8 of the Building Regulations to provide the building owner with information on the overheating strategy.
- 5.142. We provided guidance in Section 5 of the 2021 draft *Approved Document O: Overheating*, which accompanied the consultation, on what information should be provided to the building owner. We also provided guidance that for dwellings this information should be provided within the Home User Guide format within the 2021 draft *Approved Document L, Volume 1: Dwellings*.

Question 100	No. of responses	% of all responses	% split for Q100
(a) Yes, I agree with the requirement, the list provided and that this should be within a Home User Guide	264	35.5%	93%
(b) Yes, I agree with the requirement, but think that the list provided should be changed or that this should not be provided within a Home User Guide	19	2.6%	7%
(c) No, I do not agree with providing information	1	0.1%	0%
Did not respond	459	61.8%	-

- 5.143. Respondents who agreed with the proposals thought that providing occupants with guidance on how to use their systems will help them to control the indoor environment. Respondents also thought that by improving occupants' knowledge on

the systems in their property, it would benefit them by helping them identify issues and systems that require maintenance.

- 5.144. Although the majority of respondents were in favour of this proposal, several raised concerns regarding how the information would be passed to the current occupant of the property, as the building owner will not always be the occupant. Suggestions were made that a system should be introduced to make sure that the occupier receives the information and that it should be the responsibility of the building owner to provide successive occupiers with the guidance.
- 5.145. Some respondents made suggestions for how the guidance could be improved such as including information on thermal mass and how it is best managed using night-time ventilation. Another suggestion made was that diagrams explaining the overheating mitigations and how they should be used should be included e.g. external shading systems, cross ventilation, ceiling fans, summer bypass modes on MVHR, etc.
- 5.146. Furthermore, it was suggested that non-technical details based on the *Approved Document O: Overheating* assessment and mitigation measures should be included in the Home User Guide, but that the full overheating analysis should not be provided as it is highly technical and is likely open to misinterpretation from those who do not have a technical background. Respondents stressed that the Home User Guide needs to be user friendly and engaging.
- 5.147. It was suggested that for both new and existing buildings, there should be a digital building passport which would allow building owners to easily identify which products have been used in the specification, construction, improvement or refurbishment of the property and which would be beneficial should any issues arise. Respondents stated that it could include details of energy performance ratings, operation and usage of energy using measures, and any maintenance schedules required.
- 5.148. Several respondents raised concerns regarding safety and security. The felt that advice such as avoiding the position of beds below an overheating mitigation ventilator in a child's bedroom should be provided. Other safety concerns related to the advice to open internal non-fire doors overnight whether they are fire resistant or not for fire safety reasons and it was suggested that the Home User Guide should include information on fire prevention and property level flood protection.

Government response to Question 100

- 5.149. We will proceed with the proposal to require the person carrying out the work to provide information on the overheating strategy to the building owner in the form of a Home User Guide.
- 5.150. It is expected that many developers will use the text provided, but tailor it to the specific circumstances and supplement with further information and illustrations. At this time, we will limit the scope of the Home User Guide to the three complementary topics of energy efficiency, ventilation and overheating. These are

areas where people need to actively interact with their building and are the subject of this two-stage consultation process.

Policy interactions

Question 101:

How do you see this new Building Regulation interacting with policies in local plans?

- 5.151. Some Local Planning Authorities already require overheating mitigation within their local plans. In particular, the Greater London Authority (GLA) require overheating mitigation through the London Plan.
- 5.152. Many responses to this question highlighted that local authorities should be able to set standards more stringent than those in the Building Regulations in their local plan. Particularly, some local authorities requested the ability to mandate the use of TM59 modelling by developers, rather than allowing them to use the simplified method. This was highlighted as being especially important if communal heating systems are used, or if the building will house higher risk occupants.
- 5.153. Conversely, many respondents also said that local authorities should not be able to set standards further than those in the Building Regulations. Many highlighted that this would cause confusion with several different pieces of guidance and would mean that standards are not consistent across the UK. Some suggested that an optional requirement be put in place to reduce the complexity of local authorities who want to go further, or that full impact assessments are undertaken if higher standards are desired, especially regarding the impact that higher standards may have on small or medium enterprises.
- 5.154. A specific issue was highlighted between the GLA's current use of TM59 and our version of TM59, which contains some key changes. Developers raised concerns that this may mean them having to pay for two sets of modelling: one to satisfy the Building Requirements and one for the GLA. It was also highlighted that this would be a confusing system for developers, who may not understand or realise that two different sets of modelling are necessary.
- 5.155. It was also raised that as the simplified method has no limits for its use, some will use this less robust method. In areas such as London, which has asked for TM59 modelling in the past, this would mean a reduction in standards.
- 5.156. Other considerations brought up through this question focused on conservation areas and listed buildings, asking whether the local conservation officer will make the final decision on development in conservation areas. It was also highlighted that some other cities, apart from London, had also started to ask for TM59 modelling from developers, including Bristol.

Government response to Question 101

- 5.157. The new overheating standard is a part of the Building Regulations and is therefore mandatory, so there will be no need for policies in development plans to duplicate this. This is made clear in the Written Ministerial Statement published alongside the regulations.
- 5.158. As described above, the simplified method has been further developed to be more robust, giving people the certainty they need that no additional requirements are needed. The Building Regulations' system offers a robust framework to make sure that building work is thoroughly checked once complete and local authorities have a duty to enforce standards; we believe that the Building Regulations' framework of checking and enforcement is more suitable in this scenario than planning requirements and enforcement.
- 5.159. This approach is in line with the requirements of many other parts of the Building Regulations, such as Part C, where we take account of local weather or geological conditions and set consistent standards for these conditions.

Question 102:

Do you agree that this guidance on limiting the effects of heat gains in summer, in both Approved Document L guidance for new dwellings and SAP Appendix P, can be removed?

- 5.160. In the consultation we proposed removing the guidance on heat gains in summer from *Approved Document L, Volume 1: Dwellings* and removing SAP Appendix P in order to make it clear how to comply with standards and remove potential overlaps.

Question 102	No. of responses	% of all responses	% split for Q102
(a) Yes	206	27.7%	88%
(b) No	27	3.6%	12%
Did not respond	510	68.6%	-

- 5.161. The majority of respondents agreed with the proposals. It was particularly favourable among designers/engineers/surveyors and architects.
- 5.162. A popular opinion amongst those who agreed was that it makes sense for all regulatory guidance and requirements relating to overheating to be consolidated. Some respondents also felt that by removing the guidance on limiting the effects of heat gains in summer, it would help to avoid confusion if the *Approved Document O: Overheating* is introduced. Respondents felt that there should not be any overlap with information in other Approved Documents provided that all relevant guidance from Part L and SAP are included in the *Approved Document O: Overheating*.
- 5.163. Another common topic amongst respondents who agreed with the proposal was mechanical cooling. Some respondents felt that if mechanical cooling is proposed then Part L should evaluate the probable cooling load and fan power and include the energy consumption within the assessment. Others said that the Approved

Document should focus on ensuring that homes do not suffer excess overheating in any home, including when mechanical cooling is not installed or not functioning and that this should drive down any cooling loads quantified within Part L. Some stakeholders pointed out that TM59 does not result in a cooling load being calculated, therefore the load and the energy required to minimise overheating must be assessed in *Approved Document L, Volume 1: Dwellings*.

5.164. Further suggestions made by respondents who agreed with the proposals were:

- SAP Appendix P should be retained for reference purposes only and not be used as a method of proving compliance against the new overheating requirement.
- It is important to make sure that the assessments under *Approved Document L, Volume 1: Dwellings* and *Approved Document O: Overheating* are consistent – separating the methods may mean they are carried out by two different people or organisations and the assumptions may end up inconsistent.

5.165. A small number of respondents were not in favour of the proposal to remove the guidance on limiting the effects of heat gains in summer. Some respondents who disagreed felt that it would be a better idea to retain and update SAP Appendix P rather than replacing it with the simplified method proposed, as SAP Appendix P offers more flexibility than the simplified method. Another respondent suggested that we should invest in methodology to improve SAP to provide a better indication of an overheating risk.

5.166. There was a misunderstanding regarding pipework insulation from several respondents who disagreed with the proposal to remove the guidance on limiting the effects of heat gains in summer. Some respondents thought that the consultation was proposing to remove all guidance on pipework insulation; however, this was not the case. Standards for limiting losses from all pipes including communal heating remain in *Approved Document L, Volume 1: Dwellings*.

5.167. Other reasons for respondents disagreeing with the proposal included that:

- Removing the guidance would reduce the value of SAP and allow simplified methods to be used. There should be a more stringent up-front assessment under the simplified method before moving to the dynamic approach.
- Given that heat gains impact appliance sizing and achieving the target rates in *Approved Document L, Volume 1: Dwellings*, there should still be guidance in *Approved Document L, Volume 1: Dwellings* and SAP Appendix P.
- Removing overheating in SAP ignores the opportunity to address the issue at the design stage and it overlooks the energy element of measures. It should be a function of SAP and included in the new BRUKL.

Government response to Question 102

5.168. We have proceeded with removing guidance on heat gains in summer from the Approved Documents, where they apply to residential buildings. Guidance remains in *Approved Document L: Volume 2, Buildings other than dwellings*, for any buildings that are not controlled by the *Approved Document O: Overheating*.

Guidance also remains in both volumes of Approved Document L for reducing heat gains and losses from pipes. Any fixed air mechanical cooling will still be controlled using the minimum standards in Approved Document L. The building will also need to meet the target primary energy and emission rates, which means the primary energy and emissions of the cooling will need to be compensated for.

Transitional arrangements

Question 103:

Should the transitional arrangements that apply to the overheating requirements align with the proposed transitional arrangements for Part L and F 2021 for new dwellings, as described in paragraph 5.10.2 of this consultation document?

5.169. In the Future Homes Standard consultation response, we set out our intention to provide more stringent transitional arrangements for the 2021 Part L standard for new homes. This includes how transitional arrangements will only apply to individual homes and not entire developments, with a transitional period of one year. Question 103 in the Future Buildings Standard consultation sought views on aligning the transitional arrangements that apply to the overheating requirements with the proposed transitional arrangements for Part L and F 2021 for new dwellings.

Question 103	No. of responses	% of all responses	% split for Q103
(a) Yes	228	30.7%	90%
(b) No	24	3.2%	10%
Did not respond	491	66.1%	-

5.170. The majority of respondents agreed that the transitional arrangements that apply to the overheating requirements should align with the proposed transitional arrangements for Part L and F 2021 for new dwellings. Respondents noted that these arrangements will reduce confusion and considered it logical and pragmatic to align the overheating requirements rather than drawing the issue out over a prolonged period.

5.171. Some respondents who disagreed with the proposal felt that the transition should be introduced immediately, suggesting that there is a significant threat of overheating and its consequences particularly for major development projects. Other reasons for disagreement included protection against minor building works being carried out and the project stopping for an indeterminate period whilst retaining the transitional rights.

5.172. A suggestion was made that local authorities could introduce supplementary planning guidance to require higher standards in the interim period in readiness for the Future Homes Standard in order to avoid a legacy of lower standard buildings in the interim period.

5.173. Respondents who felt that the transition date is too early suggested that special consideration should be given to allow for a longer transition period where the specification and capacity planning for the utilities was carried out prior to the requirements of the Future Buildings Standard (and Future Homes Standard) becoming clear.

Government response to Question 103

5.174. In the Future Homes Standard consultation response, we committed to provide more stringent transitional arrangements for the 2021 Part L standard for new homes. We recognise that many housebuilding sites are built over a number of years; however, in the context of net zero we must make sure that as many homes as possible are built to the latest energy efficiency standards. For example, we must address instances where housing developments are being built out to energy efficiency requirements that have been outdated more than twice with changes to Part L of the Building Regulations.

5.175. Given the importance of considering overheating risks when setting higher building insulation standards proposed under the 2021 uplift to Part L, we have decided to align the transitional arrangements for overheating with that of the 2021 uplift to Part L and F of the Building Regulations.

Chapter 6 – Part L standards for domestic buildings in 2021

Minimum standards for new and replacement thermal elements, windows and doors in existing homes

Question 104:

Do you agree with the proposed minimum fabric standards for existing domestic buildings set out in Table 6.1 of this consultation document?

6.1 The minimum fabric standards set the standards for when a new or replacement part to an existing building is built. They apply when:

- providing a new element in an existing building, for example as part of an extension;
- replacing a controlled fitting; or
- completely renovating and replacing an existing thermal element (i.e. walls, floors, roofs).

6.2 We reviewed the standards for each fabric element in order to identify improvements, with the aim of consolidating standards between new builds and existing buildings as far as possible and eliminating inefficient practices. The consultation set out our proposed standards for new thermal elements, windows and doors in existing dwelling. We have provided the summary table below.

	Current standard's U-values (W/m².K)	Proposed standard's U-values (W/m².K)
Pitched roof – insulation at ceiling level	0.16	0.15
Pitched roof – insulation at rafter level	0.18	0.15
Flat roof or roof with integral insulation	0.18	0.15
Wall	0.28	0.18
Floors	0.22	0.18
Swimming pool basin	0.25	0.25
Window, roof window	1.6 or Window Energy Rating Band C	1.4 or Window Energy Rating Band B
Rooflight ¹	1.6 or Window Energy Rating Band C	2.2
Doors with >60% of internal face glazed	1.8 or Doorset Energy Rating Band E	1.4 Or Doorset Energy Rating Band C
Other doors	1.8	1.4

	or Doorset Energy Rating Band E	or Doorset Energy Rating Band B
Notes:		
i. Section 6.4 of this consultation sets out our proposal to adopt the latest version of BR 443 for calculating U-values for rooflights. In current standards, the limiting U-value is based on a rooflight in a vertical position. The proposed standard is based on a rooflight in a horizontal position.		

Question 104	No. of responses	% of all responses	% split for Q104
(a) Yes	103	13.9%	20%
(b) No	421	56.7%	80%
Did not respond	219	29.5%	-

- 6.3 Several respondents agreed with the standards with the reasoning that they align with standards for new dwellings, which can eliminate inefficient practices in industry. A point made mainly by the heat pump manufacturing industry was that these standards will lower heating demand, allowing for lower flow temperatures and could equip homes for heat pumps sooner. Some respondents commented that it would reduce some inefficient practises that arose from having a large difference in standards between new and existing buildings.
- 6.4 Other respondents who agreed in principle expressed some caution that the uplifted standards may lead to some unintended consequences such as an increase in moisture build-up in the property. Another common response was that the regulations should move towards a whole-house approach.
- 6.5 The majority of responses indicated that the proposed standards did not go far enough. Some respondents who agreed in principle said they would like to see a further uplift by 2025 and some said that the fabric standards should mirror those of the Passivhaus standard. Other stakeholders commented that measuring cost-effectiveness through payback for investment was too simplistic and other metrics such as embodied carbon, energy security and economic productivity should be considered.
- 6.6 The main areas of concern for stakeholders were the proposed standards for controlled fittings such as windows and doors. For doors, whilst it was generally agreed that uPVC doors can and already are meeting the proposed standards for existing replacements, there were responses that indicated particular challenges for solid-core timber doors. Another concern was that of external fire doorsets (as defined in Appendix A of Approved Document B: Fire Safety). Some respondents were concerned that these doors could not meet the required energy efficiency standards.
- 6.7 Some stakeholders in the window manufacturing sector expressed challenges with the proposed uplift in U-values for aluminium and timber framed windows. Others said that the standards were reachable if there was a suitable supply of low emissivity glass. Some respondents noted that the standards would be achievable, but they would need more time to retool and change their production lines and this would be challenging to achieve by the proposed enforcement date of Summer 2022.

- 6.8 A minority of respondents were also critical of the usage of window energy ratings (WER). It was commented that they may not factor in orientation of the dwelling and that in urban areas, the solar gain will be lessened by surrounding buildings.

Government response to Question 104

- 6.9 In line with the proposals in the consultation document, we will set fabric standards for existing domestic buildings as set out in Table 6.1 of the consultation. The proposal is the highest standard for each element which is still cost-effective using a simple measure of payback for investment over the life of the product or work. These standards are also technically achievable for the vast majority of work currently being done to existing dwellings and, from assessments made before consultation, will not pose a significant increase in moisture risk.
- 6.10 We acknowledge that due to the materials used in fire doorsets, it may not be possible to meet the minimum U-value threshold. Therefore, these doorsets are permitted to meet a U-value of 1.8 W/m².K which is in line with the previous standards, this is provided by a note in Table 4.2 of *Approved Document L volume 1:dwellings*.
- 6.11 Stakeholders raised the issue that to meet the new standards when replacing timber doors and retaining the frame would be a challenge. We would like to highlight Section 10 of *Approved Document L volume 1:dwellings* where it is stated that when replacing a door without a frame, the door does not have to meet the energy efficiency requirements.
- 6.12 For windows, we appreciate that there may be multiple changes to the production lines as this consultation will be followed by a consultation on proposals to change Part Q of the Building Regulations to make it apply to some existing dwellings. For many timber windows manufacturers, who use a more bespoke approach and would have to make more extreme changes to their designs, it would be too burdensome to expect them to retool twice in such a short space of time. We will therefore delay the implementation of these improved U-values for timber windows so that timber window manufacturers can retool only once. The current U-value standard of 1.6 W/(m².K) will be retained for timber windows, however we would strongly urge all manufacturers to build to the lowest possible U-values. We intend to lower the U-value in line with the value we consulted on at the same time that any Part Q changes come into force, giving wooden window manufacturers around another year to retool. There are a large number of uPVC and aluminium windows on the market that can already achieve either the U-value or window energy rating target. We therefore do not believe the same dispensation is needed for these manufacturers.

Question 105:

Do you agree with the draft guidance in section 4 of the draft Approved Document L, volume 1: dwellings on reducing unwanted air infiltration when carrying out work to existing homes?

- 6.13 The 2021 draft *Approved Document L, Volume 1: Dwellings*, that we provided alongside the consultation, included some new guidance on reducing unwanted air infiltration when carrying out work to existing homes.

Question 105	No. of responses	% of all responses	% split for Q105
(a) Yes	111	14.9%	24%
(b) No	354	47.6%	76%
Did not respond	278	37.4%	-

- 6.14 Local authorities; competent persons scheme operators; manufacturers/supply chains; national representatives and trade bodies were the groups most in favour of the proposed guidance. These respondents acknowledged the importance of reducing the airtightness of buildings to make sure there is suitable energy efficiency.
- 6.15 Many of these respondents were concerned that the guidance does not reference the fact that increasing airtightness carries a risk of increasing the condensation and moisture within a property.
- 6.16 Another common reason for disagreement came from stakeholders who did not support the element-by-element approach in the Approved Documents and instead suggested a whole-house approach.
- 6.17 A small number of respondents were concerned about the enforcement of airtightness standards. They suggested that measures to increase testing and improve enforcement procedures are needed.

Government response to Question 105

- 6.18 We will proceed to publish the guidance as outlined in Section 4 of the 2021 draft *Approved Document L, Volume 1: Dwellings*. The guidance in the Approved Document only applies when specific work is done, not to the rest of the dwelling.

Question 106:

Do you agree that we should control the primary energy and fabric energy efficiency of new extensions to existing homes when using the SAP method of compliance?

- 6.19 It is important that extensions are built with a high standard of fabric efficiency and efficient building services. In the consultation we proposed that the SAP method of compliance for a new extension evaluates, in addition to the CO₂ emissions, the primary energy and fabric energy efficiency of the proposed home plus notional extension.

Question 106	No. of responses	% of all responses	% split for Q106
(a) Yes	120	16.2%	25%
(b) No	365	49.1%	75%
Did not respond	258	34.7%	-

- 6.20 Among those who agreed with the proposal, there were several caveats or further suggestions raised. Some welcomed that consequential improvements were not proposed here; although others suggested that they should be included and used to encourage improved loft and cavity wall insulation of the entire property.
- 6.21 It was suggested that the proposal should bring extension SAP compliance in line with the requirements for new builds under the Part L uplift and that SAP should be reviewed to account for local standards that are more ambitious than the regulations. It was also suggested that builders should be able to demonstrate compliance using Building Information Management lite software modelling.
- 6.22 Many more respondents disagreed with this question than agreed, with some commenting that the proposals are not ambitious enough.
- 6.23 The most common comments from those who disagreed were that the metrics used should be FEES, Energy Use Intensity (EUI) and Space Heating Demand rather than those proposed. There were also suggestions for operational, cooling and heat loss coefficient metrics or the use of The Reference Method. Others thought that the FEES requirement should only apply to the extension and that the 'whole dwelling method' is already complicated and the addition of further metrics is not helpful.
- 6.24 The possibility of unintended consequences was raised with examples of consumer desire for large glazed areas not being met and a possible reduction in the number of extensions built.
- 6.25 Some respondents who disagreed with the proposal felt that the system needs to be more flexible and allow further architectural choice.
- 6.26 Respondents across the board also said that SAP is not the best tool to use and suggested PHPP or CIBSE TM54 and NABERS is used.
- 6.27 Primary energy was also unpopular amongst both respondents who agreed and disagreed, with comments being made that it is too complicated and variable and gives preference to fossil fuels.

Government response to Question 106

- 6.28 We will proceed with the proposal to introduce metrics of fabric energy efficiency and primary energy when assessing extensions using the SAP method of compliance. Many respondents recommended that we go further than this, making extension standards more stringent. Others recommended that we change metrics. The metrics we are proceeding with align with those for new homes, which were decided in the response to the Future Homes Standard consultation. The metrics will make sure that the fabric energy efficiency is good and that direct electric heating systems are not used in unsuitable circumstances resulting in high bills for householders, as well as taking account of upstream energy uses. The need for new metrics is primarily due to the new lower CO₂ emissions of grid electricity. The new metrics, however, also make sure that good energy efficiency and the

possibility of having further energy efficiency work being done across the house if the design flexibility is wanted.

Limiting U-value calculations for rooflights in existing homes

Question 107:

Do you agree that the limiting U-value for rooflights in existing domestic buildings should be based on a rooflight in a horizontal position, as detailed in Section 4 of draft Approved Document L, volume 1: dwellings?

6.29 In the consultation we proposed that the limiting U-value for rooflights should be based on a rooflight in a horizontal position rather than vertical, on the basis that most rooflights are tested and installed in a horizontal position. Our proposed change was intended to reduce the need for conversion factors, which add unnecessary complexity.

Question 107	No. of responses	% of all responses	% split for Q107
(a) Yes	210	28.3%	93%
(b) No	16	2.2%	7%
Did not respond	517	69.6%	-

6.30 Respondents who agreed with the proposal welcomed the reduced need for conversion factors and the resulting simplification they felt this would provide. Some respondents felt that the proposed approach is appropriate since the horizontal position represents the worst-case performance.

6.31 An issue raised by respondents who both agreed and disagreed with the proposal was that angled rooflights were not sufficiently addressed. It was argued that angled rooflights are far more common than horizontal rooflights and that specific criteria should therefore be provided for them.

6.32 Among respondents who disagreed with the proposal there were some concerns that the proposed horizontal approach is not a sensible position for a rooflight. Various suggestions of alternative approaches were made including that the U-value should be based on a rooflight in the vertical position and that separate requirements should be provided for both the horizontal and vertical positions.

Government response to Question 107

6.33 We will proceed with the change to set limiting U-values for rooflights in the horizontal position on the basis that most rooflights are tested and installed in this position. This will also provide consistency with the approach for new dwellings in *Approved Document L, Volume 1: Dwellings*. There are key terms in *Approved Document L, Volume 1: Dwellings* which provide a clear definition of rooflights and roof windows. A note is also in the Approved Document to make it clear that for energy modelling, the U-value of the rooflight should be assessed in the plane it will be installed in.

Question 108:

Do you agree that we should adopt the latest version of BR 443 for calculating U-values in existing domestic buildings, as detailed in Section 4 of draft Approved Document L, volume 1: dwellings?

- 6.34 The Future Homes Standard consultation proposed to adopt the new version of BR 443, which provides guidance on conventions for U-value calculations. We also proposed to incorporate these changes for U-value calculations in existing dwellings.

Question 108	No. of responses	% of all responses	% split for Q108
(a) Yes	209	28.1%	94%
(b) No	13	1.7%	6%
Did not respond	521	70.1%	-

- 6.35 The vast majority of people who responded to this question were in support of the proposed approach. Respondents who agreed with the proposal expressed the importance of always using the most up-to-date guidance. Some respondents felt that it will make sure that assessments of new buildings are more accurate and therefore help to address the existing performance gap. It was said that there is a need to make sure that practitioners undertaking calculations in accordance with BR 443 are suitably assessed and that the software being used is providing accurate outputs.
- 6.36 Some suggestions about specific changes and corrections to both the 2021 draft *Approved Document L, Volume 1: Dwellings* and BR 443 were made by respondents who both agreed and disagreed with the proposal. An argument was also made that the latest version of BR 443 should be subject to a formal call for evidence.
- 6.37 A key concern among respondents who both agreed and disagreed with the proposal was that the latest version of BR 443 does not include guidance on the window configuration to be used, and instead only provides information on the size of a standard window. Respondents felt that greater clarity is needed as to which window configuration should be used for calculations, otherwise there is a risk of misinterpretations occurring.
- 6.38 Some respondents who disagreed with the proposal felt that the current calculation methods are suitable. A separate argument was also made that the full element should be taken into consideration when calculating U-values. For instance, if a window is incorporated into an external wall then the U-value of the wall and window collectively should be calculated rather than just the window.

Government response to Question 108

- 6.39 The Government intends to reference the latest version of BR 443 on the basis that BR 443 (2019) is an update to the 2006 edition, primarily reflecting changes in

British and International standards; industry practice; and industry publications. The comments we received to the consultation were provided to the BRE, however there were none that warranted a new version. Many changes were already made after the Future Homes Standard consultation. The latest version of BR443 has been published and is available online:

<https://www.brebookshop.com/details.jsp?id=328041>

6.40 The text in Section 4 of *Approved Document L, Volume 1: Dwellings* has been amended to include standard window sizes and window configurations.

Minimum standards for the renovation of thermal elements in existing homes

Question 109:

Do you agree with the proposed minimum fabric standards set out in Table 6.2 of this consultation document, and Sections 4 and 11 of draft Approved Document L, volume 1: dwellings?

6.41 Through Approved Document L we set standards for when a thermal element (i.e. walls, floors, roofs) in an existing building is renovated. These standards apply:

- When a material change of use takes place (e.g. an office to flat conversion);
- When an existing fabric element becomes a thermal element (e.g. a cold roof in a loft conversion), i.e. a change to energy status takes place; or
- In many cases when a thermal element is being renovated.

6.42 In considering whether it would be appropriate to lower the U-values for all thermal elements, we considered technical feasibility, thermal performance, practicality, and potential risks. In the consultation we proposed an uplift in the minimum fabric standards for some thermal elements and proposed that the standards for other thermal elements are reasonable and should not be uplifted for the 2021 standard. We provided the below table in the consultation.

Element	Current standard's U-values (W/m ² .K)		Proposed standard's U-values (W/m ² .K)	
	Threshold U-value	Improved U-value	Threshold U-value	Improved U-value
Pitched roof – insulation at ceiling level	0.35	0.16	0.35	0.16
Pitched roof – insulation between rafters	0.35	0.18	0.35	0.16
Flat roof or roof with integral insulation	0.35	0.18	0.35	0.16
Wall - cavity insulation	0.70	0.55	0.70	0.55
Wall - external or internal wall insulation	0.70	0.30	0.70	0.30
Floor	0.70	0.25	0.70	0.25

Question 109	No. of responses	% of all responses	% split for Q109
(a) Yes	117	15.7%	25%
(b) No	353	47.5%	75%
Did not respond	273	36.7%	-

- 6.43 Respondents who agreed with the proposed standards said that the values were a fair balance of feasibility, cost-effectiveness, and practicality. Some noted that while they agreed in principle, they would want to see a future uplift of standards that goes further again.
- 6.44 Some respondents who disagreed with the proposed standards stated that they did not think the standards were ambitious enough. This included comments that threshold values should be set with lower U-values so more energy efficiency measures occur in existing buildings. It was suggested that embodied carbon should form part of the process of the energy efficiency calculations and that all fabrics must be made to a net-zero standard. There was also a specific comment around providing guidance on suspended flooring.

Government response to Question 109

- 6.45 We will proceed with implementing the standards proposed for upgrading retained thermal elements in existing dwellings. These standards are cost-effective and cover the most common upgrades to retained elements. Increasing standards in existing buildings could put homes at risk of condensation and fabric decay after some energy efficiency measures take place. Also, changes to threshold values would only capture a negligible amount of new work, and in the case of cavity walls could bring filled cavities into scope, and they therefore have not been changed.

Setting the Fabric Energy Efficiency Standard in new homes

Question 110:
What level of FEES should be used for Part L 2021?

- 6.46 We presented two options for FEES based on the fabric specification that will be used in the notional building for Part L 2021: the full fabric specification with no changes applied (Option 1), and the fabric specification with a 1.15x multiplier applied to each element (Option 2), which would make the standard less stringent and easier for developers to meet.

Question 110	No. of responses	% of all responses	% split for Q110
(a) Option 1, full fabric specification	95	12.8%	18%
(b) Option 2, fabric specification x1.15	35	4.7%	7%
(c) Neither, it should be higher	370	49.8%	72%
(d) Neither, it should be lower	15	2.0%	3%
Did not respond	228	30.7%	-

- 6.47 The most common response was that FEES should be higher than either of the proposed options. Of these responses, almost half came from architects and the majority of the rest from designers/engineers/surveyors. Those in favour of Option 1 were spread across the respondent categories, with designers/engineers/surveyors; local authorities; manufacturers/supply chains; and national representatives/trade bodies sharing most of the responses. Option 2 was less favoured than Option 1, with the largest respondent category being builders/developers, closely followed by manufacturers/supply chains. There was no notable trend in the category of respondents who thought FEES should be lower than both Options 1 and 2.
- 6.48 Many respondents preferred a fabric first approach, pointing out its importance given that fabric lasts the lifetime of the building. They therefore felt that stringent FEES should be set at the outset. Conversely, there were a very small number of respondents who felt the focus should be on encouraging low carbon heating options over more stringent FEES.
- 6.49 A significant proportion of respondents, predominantly architects and designers/engineers/surveyors said that setting FEES at a more stringent level would encourage, or not actively discourage, low carbon heating installations. Comparatively few respondents thought the opposite and stated that more stringent FEES would discourage low carbon heating.
- 6.50 One of the most common comments in responses was that the air permeability requirements should be improved. This was noted by 26% of respondents to this question and, about half the time, was accompanied by the suggestion that mechanical ventilation with heat recovery systems should be mandated.
- 6.51 The Passivhaus standards were highlighted in a number of comments with the suggestion that the aim should be to match them across the board of FEES. Similarly, there were several respondents who said the standards should make sure there is carbon negativity in construction of material and operation or that the full 2025 uplift should go further than is proposed.
- 6.52 There were concerns raised that, in several ways, Option 1 could cause problems for parts of industry. Some builders/developers stated that the increase in standards to Option 1 in 2021 would leave no time for planned developments to be redesigned. Several comments were made that the glass and window industry is not ready yet for window U-values to be set at 1.2 W/m².K. The possibility of disruption to supply chains and materials availability was also raised. Several

respondents suggested an extra interim step was needed to make sure industry could scale up to the full, Option 1, FEES.

Government response to Question 110

- 6.53 We will proceed with the government's preferred option of Option 1, full FEES. Full FEES will make sure that homes are very energy efficient and that there are greater CO₂ savings, particularly when a home is built with low carbon technology. This level of energy efficiency will also better support the transition to the even higher fabric standards that we, and the construction sector, expect will be part of the Future Homes Standard.
- 6.54 We expect that many new homes will be built with heat pumps under Part L 2021, particularly those off the gas grid. It is therefore important that full FEES is in place to make sure homes with heat pumps are built to high levels of energy efficiency. Our estimates of heat pump uptake can be seen in the final Impact Assessment for Part L 2021. The extent to which heat pumps are cost-effective will undoubtedly evolve and this is likely to be an area of flux in the short term. The relative cost advantage of a home built with a heat pump versus the notional building specification can also be found in the final stage impact assessment.
- 6.55 One issue raised during the consultation process around the choice of full FEES was that thicker walls may mean site layout plans will need to be amended due to the increased footprint of the buildings. This may necessitate amending the planning permission. We estimate, however, that the increase in wall thickness under full FEES is small so only very small and/or very constrained sites/buildings are likely to be affected. In such instances, the planning system already provides mechanisms to amend permissions. We have investigated fully the costs of amending planning permissions and this is reflected in the Part L domestic final stage impact assessment.
- 6.56 Given that we plan to introduce more stringent transitional arrangements for the 2021 uplift to Building Regulations and the uplift will likely change the appearance of many new homes by adding solar panels or heat pumps, there will be many permissions granted a number of years ago where developers may seek to amend their permission. We will therefore make sure that LPAs and developers are well sign-posted to the relevant existing planning guidance to smooth the transition to the 2021 uplift to Building Regulations.

Building Services in new and existing homes

Question 111:

Do you agree that we have adequately covered matters which are currently in the Domestic Building Services Compliance Guide in draft Approved Document L, volume 1: dwellings for existing homes?

- 6.57 Part L of the Building Regulations requires minimum standards for the efficiency and controls for building services such as heating, lighting and hot water. In the

Future Homes Standard consultation, we consulted on incorporating the minimum standards from the Domestic Building Services Compliance Guide into the draft *Approved Document L, Volume 1: Dwellings*. In the Future Buildings Standard consultation, we sought views on whether the guidance in the 2021 draft *Approved Document L, Volume 1: Dwellings*, which accompanied the consultation, adequately covered matters for existing homes which were in the Domestic Building Services Compliance Guide.

Question 111	No. of responses	% of all responses	% split for Q111
(a) Yes	93	12.5%	42%
(b) No	129	17.4%	58%
Did not respond	521	70.1%	-

6.58 Those that agreed with the proposal noted that the previous draft of *Approved Document L, Volume 1: Dwellings* and the Domestic Building Services Compliance Guide did not always work in tandem, and there were many inconsistencies or contradictory statements which could be resolved through merging the two documents.

6.59 Respondents who disagreed with the proposal to merge the Domestic Building Services Compliance Guide into *Approved Document L, Volume 1: Dwellings* argued that useful guidance may be lost. It was noted that the supplementary guidance found in this document was useful and helped to put regulatory requirements into context and reflect the statutory minimum.

Government response to Question 111

6.60 We have incorporated the standards of the Non-Domestic Building Services guidance into the main body of the *Approved Document L, Volume 1: Dwellings*. This has also clarified, rationalised and simplified the existing guidance. Incorporating the text into the Approved Document will make sure that the proposals are clear and more accessible to the people that need them.

Question 112:

Do you agree with the proposed minimum standards for building services in existing homes, as detailed in Sections 5 and 6 of draft Approved Document L, volume 1: dwellings?

6.61 There are some areas where technological advancements or improved design and installation practices mean that we can improve minimum standards for building services, to prevent the least efficient systems from being installed in homes. In this context, the consultation set out our proposed changes to building services standards.

Question 112	No. of responses	% of all responses	% split for Q112
(a) Yes	82	11.0%	38%
(b) No, the standards go too far	14	1.9%	7%
(c) No, the standards do not go far enough	119	16.0%	55%
Did not respond	528	71.1%	-

- 6.62 Some respondents commented that the Government should introduce more regulation on building services that exceed existing energy efficiency standards. There were also concerns that parts of the 2021 draft *Approved Document L, Volume 1: Dwellings* were too technical for non-specialists to understand.
- 6.63 There were multiple comments on the use of coefficient of performance (COP) for heat pumps. For air-to-air heat pumps outputting more than 12kW, there was concern that using COP could lead to wide variation in values depending on the weather. For heat pumps under 12kW, there was concern that increasing the SCOP would increase the challenges of putting heat pumps into existing buildings.
- 6.64 A significant number of respondents who responded that the proposed standards do not go far enough raised concerns around the efficiencies of different boiler/heater types. There were views that solid fuel heating needs to be banned for air quality reasons. There were also concerns around the emissions of oil burners and a suggestion to uplift oil burner efficiency in line with gas burners. Some stakeholders had concerns on the use of ERP and it was suggested that the 'Seasonal efficiency of a domestic boiler in the UK' methodology (SEDBUK) is a better measurement for boiler efficiency.
- 6.65 Concerns around lighting standards were also raised, with multiple stakeholders wanting an uplift in lighting efficiency from 75 lamp-lumens/W to 100 lamp-lumens/W. There were some specific technical comments about the 2021 draft *Approved Document L, Volume 1: Dwellings* proposals on lighting efficiencies and it was highlighted that it was unrealistic to expect full lighting designs as this is currently rarely done in industry.
- 6.66 Multiple respondents were concerned that the 73% value for MVHR systems was too low and some respondents provided anecdotal evidence that most systems could achieve at least 85-95% efficiency.

Government response to Question 112

- 6.67 We consider that the proposed efficiencies for heating appliances set out in the consultation should be achievable in practice, while providing a step forward from current standards. We did not receive significant evidence to the contrary and will proceed with the efficiencies set out in the consultation.
- 6.68 For lighting, we have revised some of the technical text, although the standard remains the same as set out in consultation. We have proceeded with the heat

recovery efficiency as set out in consultation to allow for a range of heat recovery technologies to continue to be applied to ventilation systems in existing homes.

Question 113:
Do you agree with the proposals for replacement fixed building services in existing homes, as detailed in Section 5 of draft Approved Document L, volume 1: dwellings?

6.69 In the consultation we proposed that when a replacement service uses a different fuel, the new services should not emit more CO₂ emissions and should not have higher primary energy demand than the service being replaced. This would, for instance, mean a gas-fired boiler should not generally be replaced with an electric flow boiler, even though it may be lower carbon.

Question 113	No. of responses	% of all responses	% split for Q113
(a) Yes	94	12.7%	45%
(b) No	116	15.6%	55%
Did not respond	533	71.7%	-

6.70 Among respondents who both agreed and disagreed with the proposals, some felt that the 2021 draft *Approved Document L, Volume 1: Dwellings* should go further and make sure that replacement services are better than those they are replacing, leading to reduced energy demand and carbon emissions. The importance of phasing out fossil fuel systems was highlighted, and a suggestion was made that there should be more encouragement to change to renewable systems. A concern was raised that the example provided in the 2021 draft *Approved Document L, Volume 1: Dwellings* was not appropriate as the replacement fuel is still carbon intensive.

6.71 There were comments that the introduction of the primary energy demand metric could act as a barrier to the move to lower carbon heating. Several concerns were raised that the requirement for replacement systems to produce less primary energy per kWh of heat may prevent gas boilers from being replaced with heat pumps or by direct electric systems (which may be an appropriate solution in some scenarios). It was also felt that this requirement does not take into account the complexity of the system being retrofitted. Several respondents suggested that the wording in the 2021 draft *Approved Document L, Volume 1: Dwellings* should be amended, in particular to clarify that it is acceptable to replace gas boilers with heat pumps.

6.72 A small number of respondents felt that some of the language in Section 5.7 of the 2021 draft *Approved Document L, Volume 1: Dwellings* was too vague and should be firmer to make sure that installers do not disregard connections to existing heat networks. Concerns were also raised around Section 6 of the 2021 draft *Approved Document L, Volume 1: Dwellings*, including that Section 6.15 should make sure that wood fuelled heat generation is not permitted in any urban areas due to its link to high urban air pollution levels.

6.73 Additional measures were proposed by some respondents, including feasibility studies being required to encourage consideration of heating systems other than gas boilers and connection to district heat networks. Waste-water heat recovery

systems (WWHRS) were also suggested where technologically and financially feasible.

- 6.74 Several concerns were expressed with the guidance on sizing space heating systems including around limiting flow temperatures and around recommending the CE54 Domestic Heating Sizing Method.

Government response to Question 113

- 6.75 The introduction of primary energy as an additional check when replacing an existing service does mean that, in most circumstances, replacing a gas boiler with electric heating will not meet the standard. We recognise, however, that in a very low energy dwelling, for example, as part of a deep energy efficiency retrofit, the higher primary energy from direct electric heating is less important. We have therefore introduced a note that the primary energy of the heating appliance may be increased in circumstances where the heat loss from the property is very low.
- 6.76 This issue should not be of concern when replacing a gas boiler with a heat pump. So long as the replacement heat pump meets the minimum efficiencies set out in the guidance, its primary energy would never be higher than the gas boiler it replaces. We have introduced text in *Approved Document L, Volume 1: Dwellings* to clarify this.
- 6.77 We have revised some of the guidance on sizing space heating systems in response to technical comments in the consultation response. In response to concerns that CE54 may lead to oversizing, it is no longer referenced as a method.

Question 114:

Do you agree with our proposed approach to mandating self-regulating controls in existing domestic buildings, including technical and economic feasibility, as detailed in Sections 5 and 6 of draft Approved Document L, volume 1: dwellings?

- 6.78 In the consultation, we proposed a new regulation to make sure that existing domestic buildings must have self-regulating devices when a heating appliance, such as a boiler, is replaced. We proposed that the requirement would not apply if it can be shown that the measure would not be technically or economically feasible.

Question 114	No. of responses	% of all responses	% split for Q114
(a) Yes	194	26.1%	93%
(b) No	15	2.0%	7%
Did not respond	534	71.9%	-

- 6.79 The proposal was particularly favoured among designers/engineers/surveyors; architects; and local authorities. Many respondents felt that the introduction of a regulation will help to provide clarity for installers and consumers.
- 6.80 Although in agreement with the proposal, some respondents raised queries around the 'economically feasible' wording with regards to thermostatic radiator valves

(TRVs). Respondents agreed with the self-regulating devices in each room/zone but thought that there is no justification for subjecting TRVs to economic viability.

- 6.81 A common concern among respondents who disagreed with the proposed approach was around the pay-back period for TRVs, with some respondents stating that it should be longer than 7 years. It was suggested that the payback period should be 15 years. A further suggestion was that guidance should be included for builders on how to calculate the payback period in order to demonstrate compliance.

Government response to Question 114

- 6.82 When analysing the consultation responses, we found that even though stakeholders were largely in favour of proposals for self-regulating devices, some also made valuable suggestions of situations where the standards would not be applicable.
- 6.83 Therefore, we have decided to implement the proposals for self-regulating devices for existing domestic buildings but with an additional list of exemptions where the requirement would be unreasonable in order to provide further clarity to industry.
- 6.84 Furthermore, based on the feedback we received from stakeholders, we have decided to remove the ‘economic and financially feasible’ wording and implement the proposals through statutory guidance rather than introducing a new regulation.

Question 115:

Do you agree with the proposed specifications for building automation and control systems installed in a new or existing home, as detailed in Section 6 of draft Approved Document L, volume 1: dwellings?

- 6.85 A Building Automation and Control System (BACS) is a centralised system used to monitor and control a building’s environment and services. There is currently no guidance for the installation of BACS in a new or existing home. We proposed to provide guidance for these systems.

Question 115	No. of responses	% of all responses	% split for Q115
(a) Yes	110	14.8%	56%
(b) No	85	11.4%	44%
Did not respond	548	73.8%	-

- 6.86 Those who supported the proposals were predominantly builders/developers; local authorities; manufacturers/supply chains; national representatives/trade bodies; professional bodies or institutions; and energy sector. Those who disagreed were predominantly designers/engineers/surveyors, and architects.
- 6.87 Several stakeholders expressed concern around some of the language used in Section 6 of the 2021 draft *Approved Document L, Volume 1: Dwellings*. A small

number of respondents felt it was too vague to be useful and did not provide any guidance or insight beyond what industry already knows.

- 6.88 Concerns were raised that the proposed specification could easily be mistaken for a requirement to install BACS, which may not be cost effective in some situations. The importance of ensuring widespread understanding and awareness of BACS was also highlighted.

Government response to Question 115

- 6.89 We have included the new guidance on BACS in Section 6 of *Approved Document L, Volume 1: Dwellings*. We have clarified, however, that it is not a requirement for BACS to be installed in domestic buildings.

Question 116:
Do you agree with the proposals for extending commissioning requirements to Building Automation and Control Systems and on-site electricity generation systems, as detailed in Sections 8 and 9 of draft Approved Document L, volume 1: dwellings?

- 6.90 In the consultation we proposed to extend the commissioning requirements for new and existing homes to both Building Automation and Control Systems, and on-site electricity generation systems.

Question 116	No. of responses	% of all responses	% split for Q116
(a) Yes	205	27.6%	96%
(b) No	8	1.1%	4%
Did not respond	530	71.3%	-

- 6.91 There was strong support for the proposals, with many respondents saying that effective commissioning will play an important role in closing the performance gap.
- 6.92 Respondents who disagreed with the proposals raised a mixture of concerns, including that the requirement is not appropriate for all systems and also that the language in the 2021 draft *Approved Document L, Volume 1: Dwellings* should be reviewed to make sure it is stringent enough.

Government response to Question 116

- 6.93 We will proceed with the requirement to commission on-site electricity generation systems. As controlled services, building automation and control systems will fall under the existing commissioning requirement. .

Question 117:
Do you agree with the proposals for requirements relating to the assessment of overall energy performance of building services installations and providing information to homeowners, as detailed in Sections 8 and 9 of draft Approved Document L, volume 1: dwellings?

- 6.94 In the consultation we proposed a new minimum standard in the Approved Document for when work is carried out to a building services system or a new system is installed in an existing home. We proposed that the overall energy performance of the altered part, and where relevant the complete altered system, is assessed and documented, with the results passed on to the homeowner.
- 6.95 To inform occupiers about how their services perform in practice, we also proposed that for both new and existing homes, that a copy of the commissioning sheet should be provided to the homeowner.

Question 117	No. of responses	% of all responses	% split for Q117
(a) Yes	119	16.0%	25%
(b) No, I do not agree with providing this guidance	3	0.4%	1%
(c) No, the guidance should be improved	358	48.2%	75%
Did not respond	263	35.4%	-

- 6.96 Nearly all respondents agreed with the principle of assessing the energy performance of services installations, but many believed that the guidance should be improved. In general, those who thought it should be improved believed that more information should be handed to building owners. A number of respondents suggested that information should be transferable to new occupants via a “Digital Passport”.
- 6.97 Some respondents questioned whether the requirement to notify the building control body was necessary where the work is carried out through a competent persons scheme.
- 6.98 Most respondents suggested that the guidance should be improved. These suggestions included that:
- Information should be added about on-site electricity generation.
 - Information about whether emitters are sized ready for retrofit of heat pumps (e.g. low flow temperatures) should be specifically included in the pack to the occupier/owner.
- 6.99 There were calls for the guidance to be produced in a format understandable to non-specialists (e.g. homeowners).
- 6.100 Additional proposals suggested that information provided to the owner should cover the building and all its systems, not just “building services” and “technical building systems”.
- 6.101 Specific points were raised that the term “a heating system fiche” in Section 9.8C of the 2021 draft *Approved Document L, Volume 1: Dwellings* is not recognised and that technically, the “Energy Related Products Directive” which is referred to does not exist.

Government response to Question 117

- 6.102 We have retained the guidance which states that the assessment of overall energy performance should be provided as part of the information handed to homeowners. We have, however, made a number of changes to the guidance to make it clearer what information should be provided and in what format, with the aim of improving usability for householders.
- 6.103 We have removed reference to a heating system fiche and made corrections to references to energy related products legislation.

Question 118:

Do you agree with the proposed changes to water treatment guidance and removing formal guidance on water softening?

- 6.104 In the consultation we proposed to update guidance on water treatment for boiler installations to reference BS 7593. We also proposed to remove specific guidance on water softening, as it is not directly an energy efficiency measure.

Question 118	No. of responses	% of all responses	% split for Q118
(a) Yes	163	21.9%	85%
(b) No	28	3.8%	15%
Did not respond	552	74.3%	-

- 6.105 Some respondents who agreed with the proposals stated that they were in favour as long as the proposed changes had no impact on the energy performance of the heating system.
- 6.106 Some respondents who disagreed with the proposal suggested that water hardness can have an effect on energy efficiency in some circumstances and therefore the removal of guidance on water softening could contribute to reducing the efficiency of heating system performance.
- 6.107 Several respondents suggested that the formal guidance on treating the feedwater when hardness exceeds 200ppm must remain a requirement within Part L.
- 6.108 Additionally, some responses challenged the assumption that the requirement to treat the feed water does not relate directly to the scope of *Approved Document L, Volume 1; Dwellings*, as it directly impacts on the overarching objective for the conservation of fuel and power. Respondents said that even very fine levels of scale can adversely affect the energy needed to heat water.
- 6.109 It was suggested that proven, non-chemical water treatment methods are available and growing in popularity in the UK and therefore space should be left open for their inclusion. Similarly, it was noted that there are many devices available that are proven to reduce the limescale deposition without the need to soften water.

Government response to Question 118

6.110 Although system treatment and preparation is not a direct energy efficiency measure, a number of consultation responses set out evidence that water hardness can have an effect on energy efficiency in some circumstances. This is addressed in BS 7593, which we have referenced in *Approved Document L, Volume 1: Dwellings*. We have also clarified that we consider a ‘hard water area’ as one which has a total water hardness of greater than 200ppm of CaCO₃.

6.111 We have revised the guidance, in recognition of the fact that various technologies exist rather than just chemical treatment. We have decided not to extend the recommendation to treatment of water feeds to domestic hot water systems.

Question 119:

Do you agree with the guidance proposals for adequate sizing and controls of building services systems in domestic buildings, as detailed in Sections 5 and 6 of draft Approved Document L, volume 1: dwellings?

6.112 In the consultation we proposed to introduce new guidance on sizing and controls for building services systems, the aim of which was to reduce the risks involved in under or oversizing systems. Our proposed guidance was provided in Sections 5 and 6 of the 2021 draft *Approved Document L, Volume 1: Dwellings*, which accompanied the consultation.

Question 119	No. of responses	% of all responses	% split for Q119
(a) Yes	99	13.3%	47%
(b) No, I do not agree with providing this guidance	6	0.8%	3%
(c) No, the guidance should be improved	105	14.1%	50%
Did not respond	533	71.7%	-

6.113 Some respondents who disagreed with providing this guidance said that the requirements are suitable for new builds but not existing builds. A specific point was made that the energy efficiency of existing dwellings should be such that existing radiators can be used to provide heating using heat pumps; otherwise, the increase in size of radiators required to meet the output would lead to them dominating rooms.

6.114 Suggestions of further references which should be added included various MSC standards. Some concerns were raised around CIBSE Guide A, which respondents thought was out of date. It was recommended that more up-to-date guidance, such as CIBSE Code of Practice 1 (2021) (CP1 2021), should be used to prevent oversizing. Similarly, it was noted that CE54 Domestic Heating Sizing Method may be out of date and concerns were also raised over the Plumbing Engineering Services Design Guide which respondents felt does not reflect current approaches.

6.115 A particular concern was expressed that referencing CIBSE’s Design Guide A as the basis for space cooling system specifications is not appropriate. It was argued

that the suggested cooling set point of 21°C is too low and that a higher set point of 25°C, with a corresponding increase in seasonal efficiency to a minimum of 5, would be far better.

6.116 Several respondents who disagreed with the proposals and recommended that the guidance should be improved (Option C) felt that the proposed oversizing thresholds are not appropriate in many situations considering the ability of modern boilers to modulate their output. Some respondents also felt that the requirement in Section 6.60 of the 2021 draft *Approved Document L, Volume 1: Dwellings* for on-site generation to be “sized appropriately for the site” is unclear and thus difficult to enforce.

Government response to Question 119

6.117 Although a number of respondents suggested referencing CIBSE CP1, this is a standard for heat networks rather than a standard for sizing domestic heating systems.

6.118 We recognise the issues raised that the boiler sizing guidance is not suitable for all boiler types (e.g. combi boilers are typically sized to the domestic hot water load). We have removed the specific reference to ‘120% of the design heating load’, retained guidance on reducing oversizing, and introduced guidance on modulating combination boilers.

Question 120:

Do you agree with the guidance proposals on sizing a system to run at 55°C when a whole heating system is replaced, as detailed in Section 5 of draft *Approved Document L, volume 1: dwellings*?

6.119 In the consultation we proposed the introduction of a new minimum standard in the *Approved Document* that when a whole wet heating system is replaced, including both the heating appliance (e.g. a boiler) and the emitters (e.g. radiators), that the new system is designed to run at 55°C. The proposed standard would not apply if only replacing the heating appliance.

Question 120	No. of responses	% of all responses	% split for Q120
(a) Yes	91	12.2%	38%
(b) No, I do not agree with providing this guidance	18	2.4%	8%
(c) No, the guidance should be improved	130	17.5%	54%
Did not respond	504	67.8%	-

6.120 Although a large number of respondents agreed with the proposed guidance, the majority of stakeholders felt that it could be improved. This view was favoured among designers/engineers/surveyors and architects.

- 6.121 Those who agreed with the proposals felt that this guidance is required in order to allow the retrofit of low carbon technology (i.e. heat pumps) at a later date and that by reducing the temperature of the system, it will ultimately improve energy use and thermal loss.
- 6.122 A small number of respondents thought that the guidance should not be provided at all. The main reason for this was because they felt that the systems should run at a lower temperature than 55°C. This was also the main concern of those who agreed with the guidance but thought that it should be improved. Various suggestions were made for alternative temperatures, with most in the 35°C – 45°C range.
- 6.123 Some respondents noted that the energy efficiency of dwellings should be high enough for heat pumps to provide sufficient heat with existing radiators or the insulation and airtightness should be improved. Several concerns were also raised around the cost to the consumer, with a comment being made that homeowners are unlikely to want larger radiators until the cost is comparable with standard sized radiators.

Government response to Question 120

- 6.124 We will set the requirement so that wet space heating systems in existing domestic buildings should be designed to operate with a maximum flow temperature of 55°C through a minimum standard set in paragraph 5.9 of *Approved Document L, Volume 1: Dwellings*.
- 6.125 We have made some amendments to the original draft guidance. Many respondents suggested that flow temperatures should be even lower than 55°C, to maximise the efficiency of low carbon heating systems in future. We have made it clear in the guidance that this is a maximum design flow temperature, and that designing to a lower flow temperature is preferable.

Part L guidance changes for existing homes

Question 121:

Do you agree with the proposed changes to the supplementary guidance and the external references in Appendix D and Appendix E, in the draft *Approved Document L, volume 1: dwellings* as outlined in paragraph 6.8.2?

- 6.126 The guidance in the 2021 draft *Approved Document L, Volume 1: Dwellings* aimed to be clearer about what is expected of builders and installers in complying with the regulatory requirements. To make the minimum standard as clear as possible, we proposed various changes in the consultation to remove supplementary information, make clarifications and add some new information.

Question 121	No. of responses	% of all responses	% split for Q121
(a) Yes	79	10.6%	40%
(b) Yes, but not with the changes to the supplementary guidance	14	1.9%	7%
(c) Yes, but not with the external references	3	0.4%	2%
(d) No	101	13.6%	51%
Did not respond	546	73.5%	-

- 6.127 The proposals were not favoured by designers/engineers/surveyors and architects. The majority of those who agreed with the proposals were local authorities.
- 6.128 Of the respondents who disagreed, thermal bridging guidance was the most common cause of concern. Respondents noted that whilst referring to Accredited Construction Details is not ideal (especially for existing buildings), there does need to be some guidance/standards. Some responses stated that if the Accredited Construction Details remains a means to demonstrate thermal bridging has been limited, then reference to the details should be retained.

Government response to Question 121

- 6.129 We have removed supplementary information from the Approved Documents to make sure that guidance is tailored to the needs of the people who use it, and clear about what is expected of home builders in complying with regulatory requirements. Much of the supplementary guidance that was removed is not in the scope of the Building Regulations and therefore does not belong in the Approved Documents. This approach is aligned with the Government's 2018 commitment to produce clearer standards and guidance.
- 6.130 The additional clarity provided around cavity wall insulation, installing a boiler interlock and maintenance and commissioning information will all aid installers in ensuring existing dwellings are compliant with the Building Regulations.
- 6.131 We will proceed with our proposal to remove the Government Approved Construction Details from *Approved Document L, Volume 1: Dwellings*. There was some concern regarding small projects and the access they have to methods of assessing thermal bridging details. We have provided a new section on thermal bridging in existing dwellings in *Approved Document L, Volume 1: Dwellings*, to provide this information.

Airtightness testing

Question 122:

Do you agree with the proposal for guidance on the calibration of devices that carry out airtightness testing in new and existing domestic buildings?

6.132 In Question 58 of the consultation, we sought views on our proposals to clarify guidance on the calibration of devices that carry out airtightness testing in new and existing non-domestic buildings. We proposed that the guidance state that calibration of devices should either be in the previous 12 months or according to the manufacturer's guide.

6.133 In Question 122 we sought views on the proposed approach for new and existing domestic buildings, which aligns with the proposals for non-domestic buildings.

Question 122	No. of responses	% of all responses	% split for Q122
(a) Yes	191	25.7%	94%
(b) No	12	1.6%	6%
Did not respond	540	72.7%	-

6.134 Among respondents who agreed with the proposed approach, it was noted that good calibration practises are an essential part of closing the performance gap and accurately evaluating the airtightness of buildings. Respondents enquired as to how the Government will make sure these standards are kept relevant and accurate. Some stakeholders who agreed expressed concern at the costs of calibration which could act as a deterrent to calibrate machinery often.

6.135 Of the respondents that disagreed, a key comment was that the proposed approach might incentivise manufacturers to extend calibration periods and that even now, calibration periods can often be as high as 5 years.

6.136 A small number of respondents raised concerns around the proposed 12-month period. It was suggested that the manufacturer's guidance should be the only metric used. It was also suggested that the Government should continue to consult technical experts to evaluate if the 12-month calibration period is too burdensome or not.

Government response to Question 122

6.137 We will proceed with the proposals for devices that carry out airtightness testing to be calibrated either within the previous 12 months or in accordance with the manufacturer's guidance in both new and existing domestic buildings.

6.138 Though we recognise the potential issues that could be caused by long calibration intervals, we believe that mandating the calibration of these devices every 12 months would be unnecessary in most cases as well as being cost ineffective.

6.139 We believe, however, that equipment should be calibrated at least every 24 months, which has now been added into the Approved Document.

Chapter 7 – Part F standards for existing domestic buildings in 2021

Guidance

Question 123:

Do you agree that we have adequately covered matters for existing dwellings which are currently in the Domestic Ventilation Compliance Guide in draft Approved Document F, volume 1: dwellings?

- 7.1 *Approved Document F - Ventilation (2010 edition incorporating 2010 and 2013 amendments)* is supported by the Domestic Ventilation Compliance Guide. The consultation sought views on whether the 2021 draft *Approved Document F, Volume 1: Dwellings* adequately covers matters for existing dwellings which are covered in the Compliance Guide.

Question 123	No. of responses	% of all responses	% split for Q123
(a) Yes	75	10.1%	44%
(b) No	97	13.1%	56%
Did not respond	571	76.9%	-

- 7.2 Those who disagreed with the merging of the Domestic Ventilation Compliance Guide with the 2021 draft *Approved Document F, Volume 1: Dwellings* stated that valuable guidance would be lost in the process. They noted that the Compliance Guide contains guidance on installation of products, which may not be replaced by manufacturers in its absence. It was also noted that the Compliance Guide is widely used within industry, that the format is well established and that it is important for ensuring best practice is carried out.

Question 124:

Do you agree with the proposed changes to supplementary guidance and the external references used in Appendix E and Appendix F, for existing domestic buildings from the draft Approved Document F, volume 1: dwellings?

- 7.3 The new guidance in the 2021 draft *Approved Document F, Volume 1: Dwellings* aimed to be clearer about what is expected of builders and installers in complying with the regulatory requirements. The consultation proposed various changes to help achieve this, including the removal of some of the supplementary text, the addition of some new information, and the inclusion of references to relevant external guidance.

Question 124	No. of responses	% of all responses	% split for Q124
(a) Yes	74	10.0%	45%
(b) Yes, but not with the changes to the supplementary guidance	9	1.2%	6%
(c) Yes, but not with the external references	4	0.5%	2%
(d) No	76	10.2%	47%
Did not respond	580	78.1%	-

7.4 On supplementary guidance, respondents said that guidance on trickle vents should not be removed, as it is the most common form of background ventilator. It was also suggested that methods in EN ISO 16987-3:2017 be referenced in Section 2 of the Approved Document and in the supplementary guidance section, to make sure there is sufficient filtration and to protect occupant health. Some stakeholders also highlighted that the cost of accessing all supplementary guidance was an issue particularly for SMEs.

Government response to Questions 123 and 124

7.5 The Government is committed to ensuring that guidance is clear and tailored to the needs of people who need to use it. At present, the status of the Compliance Guides is unclear to some stakeholders, in particular which parts are necessary to meet the regulatory requirements, and which are best practice guidance. We will therefore proceed with the proposal to incorporate parts of the Compliance Guides into the Approved Documents.

Question 125:
Do you agree with the proposal to align the guidance and standards for work to existing homes to that outlined in Chapter 4 of the Government Response to the Future Homes Standard?

7.6 *Approved Document F - Ventilation (2010 edition incorporating 2010 and 2013 amendments)* provides guidance on the following ventilation solutions for new and existing dwellings:

- System 1: Background ventilators and intermittent extract fans;
- System 2: Passive stack ventilation;
- System 3: Continuous mechanical extract ventilation; and
- System 4: Continuous mechanical supply and extract with heat recovery

7.7 In the consultation document, we proposed a simplified approach to align the system specific guidance on work done to existing homes with that of new homes, as set out in the Government response to the Future Homes Standard consultation. This included discontinuing guidance on passive stack ventilation. The Future Homes Standard consultation proposed that guidance should be provided for natural ventilation (formerly system 1), continuous mechanical extract ventilation

(formerly system 3) and continuous mechanical supply and extract ventilation (formerly system 4).

- 7.8 The Future Homes Standards consultation also proposed a revised set of simplified guidance. This included proposed changes to minimum ventilation equivalent areas and guidance on noise, location, controls, performance testing and minimising the ingress of external pollutants. The Future Buildings Standard consultation proposed that guidance for work on existing homes aligns with these proposed standards.

Question 125	No. of responses	% of all responses	% split for Q125
(a) Yes	103	13.9%	56%
(b) No	82	11.0%	44%
Did not respond	558	75.1%	-

- 7.9 Many stakeholders agreed with the proposal; they highlighted that standards should be consistent to make sure they are easy to use.
- 7.10 There was some concern that the guidance in the 2021 draft *Approved Document F, Volume 1: Dwellings* was not robust or ambitious enough and that the guidance for existing dwellings should be improved further, particularly in regard to airtightness and ventilation. Some respondents thought it was not sufficient to make sure that a dwelling's ventilation is not made worse. It was highlighted that many existing dwellings are under ventilated.
- 7.11 There was also concern raised around the simplification of the ventilation systems' guidance in the 2021 draft *Approved Document F, Volume 1: Dwellings*. There were suggestions to change "natural ventilation" to "natural ventilation with intermittent extract" to align with the 2021 draft *Approved Document L, Volume 1: Dwellings* and PAS 2035. Similarly, it was suggested that continuous mechanical supply and extract ventilation should be named with MVHR as heat recovery is required with supply and extract ventilation in a packaged system.
- 7.12 Others disagreed with the removal of passive stack ventilations and wanted to see it reinstated, with positive input ventilation and single room heat recovery ventilation also included.

Government response to Question 125

- 7.13 In line with the consultation proposal, we will align the guidance for existing dwellings with that of new dwellings.
- 7.14 The Manual to the Building Regulations explains that Approved Documents only provide guidance on how to meet the legal requirements for some common situations. Other forms of ventilation, such as passive stack ventilation, can still be used to achieve compliance but are not common enough for inclusion in the Approved Documents.
- 7.15 Retaining system numbers would likely be confusing in the Approved Document once guidance on passive stack ventilation (formerly System 2) is removed. Based

on feedback from industry we have renamed continuous mechanical supply and extract ventilation to mechanical ventilation with heat recovery (MHVR), this is used throughout the Approved Document and will apply to new and existing dwellings. This revised nomenclature covers all common forms of ventilation systems and we have made it clear in the key terms of the Approved Document that the guidance for MVHR is applicable to mechanical supply and extract ventilation both with and without heat recovery.

Work on existing homes

Question 126:

Do you agree with the proposed guidance for installing energy efficiency measures in existing homes, as detailed in Section 3 of draft Approved Document F, volume 1: dwellings?

- 7.16 The installation of energy efficiency measures is likely to reduce the amount of air entering the home, for example, if adding wall or roof insulation. This may lead to dwellings becoming under-ventilated and less compliant with Part F of the Building Regulations. The consultation therefore proposed to expand the current guidance on work to existing homes to address the issue of under ventilating when installing common energy efficiency measures.

Question 126	No. of responses	% of all responses	% split for Q126
(a) Yes	91	12.2%	49%
(b) No	96	12.9%	51%
Did not respond	556	74.8%	-

- 7.17 Builders/developers; local authorities; manufacturers/supply chains; and national representatives/trade bodies were the groups most in favour of the proposal. Some of these respondents wanted more preference given to natural ventilation.
- 7.18 Of those that disagreed, there were also wider concerns about ventilation in existing dwellings, a common view was that the guidance should make sure there is adequate ventilation and not just consist of a non-worsening provision. Some respondents were against the provision of natural ventilation guidance and wanted the minimum standards to only include guidance on MVHR systems. Others expressed concern that the proposals do not go far enough to reduce the embodied energy in mechanical ventilation systems.
- 7.19 Some respondents who both agreed and disagreed with the proposed guidance expressed concern around defining who constitutes an expert when determining the additional measures needed. Respondents wanted assurances that this process will not create barriers or expensive third-party documentation. There were also concerns that the process would be reliant on installers' awareness of assessment needs and that there might not be suitable independent oversight available.

Question 127:

Do you agree with the content of the proposed checklist for ventilation provision detailed in Appendix D of draft Approved Document F, volume 1: dwellings?

- 7.20 The consultation proposed two methods for determining what further ventilation provisions could be employed to meet the requirements of the Building Regulations. Appendix D of the 2021 draft *Approved Document F, Volume 1: Dwellings*, which accompanied the consultation, provided a checklist to support the use of method one: the simplified method.

Question 127	No. of responses	% of all responses	% split for Q127
(a) Yes	72	9.7%	43%
(b) No	94	12.7%	57%
Did not respond	577	77.7%	-

- 7.21 Stakeholders were welcoming of a mechanism to check for unintended consequences associated with increasing airtightness. It was also viewed as a welcome resource for installers and multiple respondents were happy to see alignment between England and Wales. Some respondents enquired whether the checklist could be digitalised, there was a view that an interactive flowchart could improve useability of the Approved Document.
- 7.22 As with other parts of the consultation, respondents said that the Approved Document should prioritise MVHR as the ventilation type of choice in new builds and any retrofits, with an additional suggestion that background ventilation should be a last resort. Some stakeholders had specific concerns around trickle vents, including that the effective area is hard to check effectively with trickle vents. Other stakeholders suggested that positive input ventilation should be directly referenced as well.
- 7.23 There were concerns raised that the proposed checklist was incomplete. It was suggested that the categories should have a major/minor tag which could aid in using the simplified model. It was highlighted that there is not a way to note existing infiltration in existing buildings which contribute to the ventilation of the property and there was also a request for more specific questions on kitchen hoods to be included in the checklist. Another area of incompleteness highlighted was the lack of provision to check that ventilation systems function as intended.
- 7.24 A concern shared with a minority of stakeholders was that this checklist is invasive. They expressed serious concerns that a homeowner would reject a window installer if they insisted on performing a whole of house check on ventilation before installing a window. They argued this would drive consumers to unlicensed vendors who wouldn't adhere to building regulations.

Government response to Questions 126 and 127

- 7.25 We will introduce a new requirement to ensure that when energy efficiency work is done in buildings, the ventilation is made no worse; this is already in place for

controlled services and fittings. This will be accompanied by the Simplified Method as consulted on, it provides a checklist for renovators to easily understand the impact of historic and potential future work to the building and use it to assess if the ventilation provision in the building will be sufficient. It is recommended to seek external advice if the building differs significantly from a standard dwelling with a mix of purpose build ventilation and infiltration. We recognise that there are concerns with the introduction of this new guidance around installer awareness and competence. We will work with industry, including competent person schemes, to inform renovators of the change and that appropriate checks are made to guarantee compliance.

- 7.26 We will continue to include replacement windows and doors as part of the Simplified Method. It is important that renovators check if windows or doors have been replaced since the building was built, due to their effect on airtightness. We believe that Table 1.3 in *Approved Document F, Volume 1: Dwellings* is clear that a separate procedure can be followed if only windows are being replaced in an existing dwelling.
- 7.27 In line with the consultation proposal, we will introduce a checklist for ventilation provision in Appendix D of *Approved Document F, Volume 1: Dwellings*.
- 7.28 The checklist is a simple tool for the most common forms of ventilation in existing dwellings, we have therefore not included other forms of ventilation, such as passive stack ventilation or positive input ventilation. We also think that adding minor or major tagging to each part of the checklist would complicate the list and make it harder to use.
- 7.29 While we recognise that following the checklist will mean that people doing energy efficiency work may need to look at most rooms in the home, this is necessary for ensuring good ventilation. We trust that these people doing such work will explain the need for fresh air and adequate ventilation within the dwelling to the occupier before work is carried out. Our new user guide on ventilation can be used by such installers to support these conversations.

Question 128:

Do you agree with the guidance in Section 3 of draft Approved Document F, volume 1: dwellings when replacing an existing window with no background ventilators?

- 7.30 In the consultation we proposed to clarify the existing guidance that said it was good practice to fit trickle ventilators in replacement windows. We proposed to amend the guidance to state that if replacing windows is likely to make the building less compliant with the ventilation requirements than it was before the work was carried out, then additional ventilation should be provided in the form of background ventilators; this is in line with the current requirement in the Building Regulations on not making ventilation less compliant when replacing controlled fittings. The proposed minimum equivalent areas of background ventilators aligned with those set out in the Future Home Standard consultation for new dwellings.

7.31 We recognised that for some renovation work in existing buildings, it may be challenging to meet the proposed minimum standards. We therefore proposed to add an additional note in the 2021 draft *Approved Document F, Volume 1: Dwellings* which states that if it is not technically or functionally feasible to adopt the equivalent areas for new dwellings, the background ventilators should adopt equivalent areas as close to the minimum value as is feasible.

Question 128	No. of responses	% of all responses	% split for Q128
(a) Yes	68	9.2%	38%
(b) No, the standards go too far	20	2.7%	11%
(c) No, the standards do not go far enough	89	12.0%	50%
Did not respond	566	76.2%	-

7.32 A few issues were raised by respondents who agreed with the proposed guidance, including concerns over supply chain restrictions of certain background ventilators. Others wanted a reintroduction of specific advice for the installation of positive input ventilation. There were also concerns regarding how this policy would work within conservation areas or for listed buildings.

7.33 Among those who disagreed with the guidance, concerns were raised that homeowners do not like the aesthetic of trickle ventilators and that it may lead to some homeowners installing windows with installers who are not members of a competent persons scheme. There was also concern expressed about how trickle ventilators would impact the energy efficiency of replacement windows and that there may be subsequent increases to energy bills as an unintended consequence. Furthermore, some respondents thought that trickle ventilators may decrease the noise dampening effect that windows have. This could have a particular impact for dwellings close to areas of sustained and loud noise, such as a busy road.

7.34 There were concerns that homeowners/occupiers were unable to effectively use the ventilation provision in their dwelling. There were comments that homeowners were likely to block up background ventilators.

Government response to Question 128

7.35 Regulation 4(3) of the Building Regulations requires that ventilation is not made worse when controlled fittings, such as windows, are replaced. Replacing the windows in a dwelling is likely to increase the airtightness which in turn will worsen the ventilation provision in the dwelling. The purpose of the ventilation standards is to protect the safety of occupants; therefore we will go forward with the proposal and recommend that all replacement windows are fitted with a background ventilator, unless it can be proven that the ventilation was not made worse.

7.36 We appreciate that noise may be an issue with façades facing noisy environments. Therefore, we will recommend that noise attenuating background ventilators are fitted in these circumstances. We also expect that the industry will design increasingly more aesthetically pleasing trickle vents for their customers.

- 7.37 We understand that installing ventilation will have an impact on the energy usage of a dwelling. The purpose, however, is not to increase ventilation, it is to make sure that any lost infiltration is replaced with purposeful ventilation. An assessment of energy demand due to replacement windows with ventilators has made within the final stage Part F impact assessment. The health and safety of people in the dwellings they occupy are paramount and should not be made worse to reduce energy use.
- 7.38 With regard to the concerns that homeowners may get people to install their windows outside of the Building Regulations regime, competent person schemes are a deregulatory measure under which installers can be registered as competent to self-certify that their work complies with the Building Regulations. We believe that these schemes provide an alternative and cost-effective means of ensuring compliance with the Building Regulations and help to reduce the level of unauthorised work carried out.
- 7.39 Ensuring that building work complies with all applicable requirements of the Building Regulations is the responsibility of those carrying out the work, for example installers and the building owner. If a homeowner believes a builder or installer hasn't carried out work with reasonable care and skill, they may be in breach of their statutory obligations under Consumer Rights Act 2015. If they think they have breached the Act or acted unfairly, they can report them to Trading Standards. The Building Regulations can be contravened by not following the correct procedures or not meeting the technical performance requirements.
- 7.40 Under Sections 35, 35A and 36 of the Building Act the local authority has the power to take enforcement action. Local authorities can take action against the building owner and those carrying out the works and this can include requiring that the works are pulled down or removed. If the building owner or those carrying out the works contravene the Building Regulations, the local authority may prosecute them in the magistrates' court, where an unlimited fine may be imposed (Sections 35 and 35A of the Building Act). We will work with the window industry, encouraging compliance with our regulations.
- 7.41 We also acknowledge that not all homeowners will have a full understanding of how best to use and maintain ventilation in their dwelling. Therefore, we will recommend that all installations of mechanical extract ventilation and installations of new background ventilators come with guidance on why ventilation is important for the health of buildings and their occupants. This will be available online and as a printable leaflet for window installers to provide to their customers. This guidance can be found on the gov.uk website available at the following link:

<https://www.gov.uk/government/publications/home-user-guide-template>

Question 129:

Do you agree with the proposals in paragraphs 3.29 to 3.31 of draft Approved Document F, volume 1: dwellings in 7.4.11 of this consultation document on work to existing kitchens or bathrooms?

7.42 *Approved Document F - Ventilation (2010 edition incorporating 2010 and 2013 amendments)* states that if a kitchen or bathroom with no ventilation system is refurbished, it is not necessary to provide a ventilation system in the refurbished room. Although we recognise that kitchen ventilation is important, the Building Regulations do not generally mandate improvement works in existing buildings. The consultation proposed to clarify this guidance to state that additional ventilation is necessary if refurbishment work is likely to make the building less compliant with the ventilation requirements of the Building Regulations than it was before the work was carried out.

Question 129	No. of responses	% of all responses	% split for Q129
(a) Yes	72	9.7%	43%
(b) No, the standards go too far	4	0.5%	2%
(c) No, the standards do not go far enough	93	12.5%	55%
Did not respond	574	77.3%	-

7.43 Some respondents indicated that the proposed standards for work to existing kitchens or bathrooms did not go far enough. Respondents raised concerns that existing buildings have very poor purposeful ventilation, and that the standard should go further.

7.44 There were specific concerns raised around the wording in 3.31 of the 2021 draft *Approved Document F, Volume 1: Dwellings*, where it states that if an extract fan or cooker hood is replaced with a similar type, and using existing cabling, a building control body need not be notified. Respondents thought that the use of “similar type” may be ambiguous and lead to a potential drop in standards. Another area highlighted by respondents as ambiguous was in paragraph 3.30, where it states that “additional ventilation may be necessary if refurbishment work is likely to make the building less compliant with the ventilation requirements of the Building Regulations than it was before the work was carried out.”

7.45 There were some concerns about how this guidance affects the requirements in Part J (Heat producing appliances and Fuel storage system) of the Building Regulations. A few respondents also wanted to make sure that there will be commissioning tests mandated for mechanical ventilation systems.

Government response to Question 129

7.46 In line with the consultation proposal, we will clarify the guidance on work to existing kitchens or bathrooms.

7.47 We will edit our guidance for replacing extract fans or cooker hoods to state that a building control body need not be informed if an extract fan or cooker hood is replaced and uses existing cabling.

7.48 We will also make more explicit that those carrying out energy efficiency work should refer to the Simplified Model in *Approved Document F, Volume 1: Dwellings* and Appendix D in the same document to assess whether a building has been made less compliant with the Building Regulations.

Question 130:
Do you agree with the proposal to provide a completed commissioning sheet to the homeowner, as detailed in Section 4 of draft Approved Document F volume 1: dwellings?

7.49 To inform occupiers about how their ventilation system works in practice, we proposed that a copy of the completed commissioning sheet in Appendix C of the 2021 draft *Approved Document F, Volume 1: Dwellings*, which includes commissioning information and results, should be provided to the building owner. This was detailed in Section 4 of the 2021 draft *Approved Document F, Volume 1: Dwellings*, which accompanied the consultation.

Question 130	No. of responses	% of all responses	% split for Q130
(a) Yes	184	24.8%	95%
(b) No	10	1.3%	5%
Did not respond	549	73.9%	-

7.50 Many respondents who agreed with the proposal wanted the commissioning sheet to be provided to all occupiers of a dwellings, such as tenants renting accommodation. Others wanted to see the development of interactive, online building passports that can be passed from owner to owner.

7.51 Of those that did not agree with the proposal, some felt that more details should have been included in the completion checklist. Suggestions included:

- The addition of a question that makes sure there is a visual observation of the cleanliness of ventilation.
- The addition of a question to check that appropriate filters have been chosen.

7.52 Several respondents thought that the checklist was too heavy handed and would be difficult to operate in practice and some homeowners may find it invasive.

Government response to Question 130

7.53 In line with the consultation proposal, a commissioning sheet and checklist should be provided when ventilation systems are installed. This should include both design flow rates and maintenance requirements. The information should be provided in a clear manner, for a non-technical audience. A copy of the completed commissioning sheet in Appendix C of *Approved Document F, Volume 1: Dwellings* should be provided to the owner of the dwelling.

7.54 As the checklist covers the installation and commissioning of the ventilation system, it is not appropriate to add further questions about inspecting the ventilation for

cleanliness or filters after the fact. We will ask that installers of ventilation systems refer homeowners to the Home User Guide that was consulted on in the Future Homes Standard consultation for tips on how to effectively use common forms of ventilation.

Chapter 8 – Impact and equalities assessment

Question 131:

Please provide any feedback you have on the impact assessment here, including the assumptions made and the assessment of the potential costs and benefits of the proposed options we have made.

- 8.1 The consultation stage impact assessment was carried out in line with HM Treasury's Green Book guidance and based on the best available evidence and policy proposals at that time. For the analysis a proportionate approach was taken, with some areas further explored in the final Impact Assessment.
- 8.2 Many of the responses received focused on the level of ambition of the consultation proposals, rather than the impact assessment. Responses to the impact assessment predominantly focused on the estimation of costs and benefits, the underlying assumptions, the difference between build and performance of buildings and distributional analysis. We also received suggestions that the scope of analysis should be extended to consider whole life carbon, noting the need to capture embodied carbon in assessments.
- 8.3 Responses received in relation to the costs included concerns that costs were overestimated, cost estimates had changed from the original Future Homes Standard consultation and that costs should be included for the reintroduction of FEES. Responses in relation to the estimation of benefits suggested that more analysis could have been included on indirect benefits, and that the benefits of bringing forward proposed timescales for implementation were not considered.
- 8.4 In terms of differences between build and performance, responses suggested that there should be reference made to dwelling performance 'as built' and 'in use' and that the method used for assessing carbon and energy is outdated.
- 8.5 The responses received related to distributional analysis mainly expressed concern over the impact the changes would have on certain groups, including BAME communities, people with disabilities and rural communities.

Government response to Question 131

- 8.6 All costs for the consultation impact assessment were based on the latest available data at the time, relative to the counterfactual case and therefore represent additional costs. Sensitivity analysis was conducted to try and capture some of the uncertainty in the estimation of costs and benefits, with the central estimates feeding into the main Cost-Benefit-Analysis modelling. We did not analyse the impact of different implementation dates because the analysis was based on the timescales proposed in the policy.

- 8.7 We have updated and refined the analysis included in the consultation stage Impact Assessment for the Final Impact Assessment, taking careful consideration of the detailed comments that were provided by consultation respondents. We have also tried to reflect changes based on an improved evidence base and our evolving understanding of markets and supply chains from research and engagement with stakeholders. Please refer to the final stage Impact Assessment, which has been published alongside this Government Response.
- 8.8 The modelling in the consultation stage impact assessment assumed 100% compliance with current standards rather than any difference between build and performance. This has been revisited in the final impact assessment through sensitivity analysis. All modelling has been done using the latest versions of SBEM and SAP.
- 8.9 Race and disability are protected characteristics and have therefore been considered as part of the equalities assessment, outlined in Question 132. In terms of rural properties, further considerations have been made in the final impact assessment.

Question 132:

Please provide any feedback you have on the potential impact of the proposals outlined in this consultation document on persons who have a protected characteristic. Please provide evidence to support your comments.

- 8.10 The Public Sector Equality Duty requires ministers to have due regard to the need to eliminate discrimination and other conduct prohibited under the Equality Act 2010 and to advance equality of opportunity and foster good relations between persons who share protected characteristics and those who do not.
- 8.11 The consultation sought views on the potential impacts of any of the proposals in the consultation on persons who have a protected characteristic. Protected characteristics as defined by the Equality Act 2010 are:
- Age
 - Disability
 - Gender reassignment
 - Marriage and Civil partnership
 - Pregnancy and Maternity
 - Race
 - Religion or belief
 - Sex
 - Sexual orientation
- 8.12 Some respondents suggested that when dwellings and non-domestic buildings are upgraded for energy efficiency, they should be assessed for accessibility/mobility so that both works can be carried out at the same time.

Overheating

- 8.13 There were some concerns around the maximum glazing area proposed as part of the new overheating requirement, which could limit window sizes. It was suggested that by using the floor area to calculate the maximum glazing area, there will be more of an impact on those living in smaller houses and therefore poor and deprived neighbourhoods could be more adversely affected. It was also suggested that within those neighbourhoods, households with people from ethnic minority backgrounds may be particularly affected since they are more likely to be multi-generational and may therefore have a lower amount of window space per person.
- 8.14 Another concern was that the protection from falling requirements could also have a significant impact on guarding heights, making it difficult for some populations to see outside or open the window sufficiently, for example wheelchair users, and that limiting glazing may also harm people who are sensitive to artificial lights.
- 8.15 Protecting vulnerable populations from overheating was a common theme. Respondents noted that these populations are more likely to spend time indoors, often with a reduced capacity to adapt to their environments. It was therefore suggested that overheating standards are also introduced in buildings in which these populations are usually situated and/or accommodated, including offices, schools, nurseries, care homes, prisons, detention centres, and healthcare facilities. Another concern was that, in extreme situations, excess heat exposure can have serious health impacts and can lead to fatalities, especially for those with improper access to outdoor facilities e.g. low income and disabled populations. A suggested option that could soften the impact on these populations was to engage with them during policy making to successfully identify their needs. It was also suggested that air pollution should be considered in the context of safe limits for people with chronic conditions (e.g. asthma and heart disease).

Ventilation

- 8.16 Several respondents raised concerns around the proposals for trickle vents, including that:
- Elderly people can be averse to them as they are not draught-free.
 - Due to their positioning (usually at the top of a window/door), some populations such as those who are disabled may find it difficult to reach them.

Ease of operation for homeowners/occupiers

- 8.17 Respondents highlighted the importance of ensuring that the new standards do not make it more complicated for a homeowner/occupier to understand how to operate their property in the optimum manner. Respondents felt that it is therefore essential that any controls or information provided on the overheating strategy are accessible to those with special characteristics e.g. reading disabilities. Similarly, any feature or control system that requires user operation will need to be configured such that those with impaired mobility can operate them with ease e.g. the operational running characteristics of heat pumps, which are different from natural gas boilers such that some populations may find it especially challenging to get used to.

Government response to Question 132

8.18 We are grateful for all of the responses received regarding the impact of our proposals on persons who have a protected characteristic. We have carefully considered the issues raised and they have helped to shape each stage of our policy development.

Overheating

8.19 We recognise that there is a balance that must be made between preventing overheating and ensuring sufficient daylight, as both high temperatures and insufficient access to light can pose a risk to the welfare of building occupants. We asked a specific question on levels of daylight within the consultation to assess whether our proposals would have any impact on building inhabitants. We found that the majority respondents agreed with our proposals and thought that adequate levels of daylight would be provided under the simplified method in most circumstances.

8.20 In response to the concerns raised by respondents on protection from falling guidance and the negative impact it may have on people who use wheelchairs, we have adjusted our guarding heights and made them lower. This will mean that wheelchair users are able to see out of their windows.

8.21 We have undertaken work to make sure that our new overheating regulations protect those most vulnerable to overheating. This includes ensuring that buildings that typically house vulnerable populations, such as residential care facilities and temporary accommodation, are sufficiently covered by our scope. While other building types were suggested that our not covered, we believe that including any further niche or specialist-use buildings would require significant modification to the standard we have applied to our current scope. Modification could potentially delay the implementation of this standard, which would have further impact on vulnerable people.

8.22 More detailed information on our overheating policies can be found in Chapter 5.

Ventilation

8.23 Our proposals for trickle vents are designed to protect the safety of occupants and make sure they have sufficient ventilation in their homes, which is more important for those who spend more time in their homes, such as the elderly or disabled.

8.24 We recognise that not all homeowners understand how to ventilate their home, or understand why ventilation is important to their health, and may see background ventilators as an inconvenience. We will be recommending that all installations of mechanical extract ventilation and new background ventilators come with guidance on why ventilation is important.

- 8.25 Background ventilators are designed to require little operation to work. Trickle vents, for example, only need to be opened once, and then should remain open. Therefore, we don't believe this will pose an issue for accessibility.
- 8.26 The elderly and disabled, in particular, may be more susceptible to respiratory and other airborne infections and could be considered most likely to benefit more from increased levels of ventilation. We believe our final policy decisions in this area achieve the right balance in mitigating the risk of infection at this point in time, given the rapidly changing evidence base and research background. It is our intention to continue to monitor and review the available evidence, and new data which we anticipate will be generated by new research projects. We intend to reconsider whether additional proposals should form part of revised Part F guidance for the Future Buildings Standard.
- 8.27 More information on our proposals for ventilation can be found in Chapters 4 and 7.

Ease of Operation

- 8.28 We recognise that the ability to understand how your home or building is meant to run is very important. In the Government's response to the Future Homes Standard consultation, we confirmed that we would continue with the implementation of a standardised Home User Guide to help people adjust to new technology in their homes and operate it properly, as well as understand what strategy is in place to prevent overheating and how to make use of it.
- 8.29 Home User Guides are provided by developers to the homeowner when the building is completed. We expect that developers will provide accessible formats when required.