



Ministry of Housing,
Communities &
Local Government

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

Summary of responses received and Government response



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Executive Summary

The challenges involved in improving the energy efficiency of our buildings and reducing carbon emissions are not insubstantial. However, new build is an area where we can and must maintain momentum.

This document sets out the Government's response to the first 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 new homes, as well as the wider impacts of Part L, including changes to Part F (Ventilation), its associated Approved Document guidance, airtightness and improving the 'as-built' performance of the constructed home.

Chapter 2

We have said that from 2025, the Future Homes Standard will deliver homes that are zero-carbon ready

- ✓ We intend to set the performance standard of the Future Homes Standard at a level which means that new homes will not be built with fossil fuel heating, such as a natural gas boiler.
- ✓ These homes will be future-proofed with low carbon heating and high levels of energy efficiency.
- ✓ No further energy efficiency retrofit work will be necessary to enable them to become zero-carbon as the electricity grid continues to decarbonise.
- ✓ Our work on a full technical specification for the Future Homes Standard has been accelerated and we will consult on this in 2023. We also intend to introduce the necessary legislation in 2024, ahead of implementation in 2025.

Chapter 2

We acknowledged the need to clarify Local Planning Authorities' role in setting energy efficiency requirements for new homes that go beyond the minimum standards set through the Building Regulations

- ✓ The new planning reforms will clarify the longer-term role of local planning authorities in determining local energy efficiency standards.
- ✓ To provide some certainty in the immediate term, we will not amend the Planning and Energy Act 2008, which means that local authorities will retain powers to set local energy efficiency standards for new homes.

Chapter 3

We said that in 2020, we would introduce an interim uplift in Part L standards that delivered a meaningful reduction in carbon emissions and provided a stepping stone to the Future Homes Standard

- ✓ A low carbon heating system will be integral to the specification of the Future Homes Standard and we anticipate that heat pumps will become the primary heating technology for new homes.
- ✓ We must ensure that all parts of industry are ready to meet the Future Homes Standard from 2025, which will be challenging to deliver in practice, by supporting industry to take a first step towards the new standard.
- ✓ A 2021 interim uplift will deliver high-quality homes that are in line with our broader housing commitments and encourage homes that are future-proofed for the longer-term.
- ✓ These homes will be expected to produce 31% less CO₂ emissions compared to current standards.

Chapter 3

We asked if the Fabric Energy Efficiency Standard should be removed as a performance metric for new homes, to minimise complexity and avoid confusion

- ✓ We have settled on a revised package of performance metrics that will ensure a fabric first approach is at the heart of all new homes alongside a low carbon heating system.
- ✓ The Fabric Energy Efficiency Standard will be one of four performance metrics that achieves this balance.

Chapter 6

We put forward a comprehensive package of measures to improve compliance, reduce the performance gap and provide more information to energy assessors, building control and homeowners

- ✓ We will introduce all of the proposals set out in the consultation to help address the performance gap.
- ✓ This will reduce the performance gap by improving the accuracy of as-built energy calculations and providing clearer information about the as-built specifications of new buildings to both building control bodies and homeowners.

Chapter 7

We said that we would introduce more stringent transitional arrangements to ensure as many homes as possible are being built to new energy efficiency standards

- ✓ Transitional arrangements provide all developers with certainty about the standards they are building to.

- ✓ To ensure as many homes as possible are being built in line with new energy efficiency standards, transitional arrangements will now apply to individual homes rather than an entire development and the transitional period will be one year.
- ✓ This approach will support successful implementation of the 2021 interim uplift and therefore better support the wider implementation timeline for the Future Homes Standard from 2025.

Chapter 1 - Introduction

Net zero emissions and climate change

- 1.1 The UK was the first major world economy to pass a net zero emissions target into law. This target, which was recommended by the Committee on Climate Change, is one of the most ambitious in the world and requires the UK to bring all greenhouse gas emissions to net zero by 2050.¹
- 1.2 In 2018, heating and powering homes accounted for 22% of all greenhouse gas emissions in the UK. The UK has already made considerable progress in this sector by reducing total emissions by 43% since 1990, despite there being approximately a quarter more homes.² The homes that are constructed now and in the next decade will still exist in 2050 and we have acknowledged that more must be done to decarbonise all buildings.³
- 1.3 The minimum energy efficiency standards that we set for buildings must put us on the right path to achieve our net zero target. The Government believes that by improving energy efficiency and moving to cleaner sources of heat, we can reduce carbon emissions and keep energy costs for consumers down now and in the future.
- 1.4 Energy efficient, low carbon homes will become the norm. It is significantly cheaper and easier to install energy efficiency and low carbon heating measures when homes are built, rather than retrofitting them afterwards. This means we will need to improve the fabric standards of our homes and build the supply chains and technology options for low carbon heat that will save carbon through the next decade and put us on a cost-effective pathway to 2050.
- 1.5 This document sets out our response to the first 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. Alongside this document, the Government is publishing the second stage of the consultation process through *The Future Buildings Standard - 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*.⁴ Together, these changes provide a pathway towards creating homes and buildings

¹ Net Zero – The UK's contribution to stopping global warming, The Committee on Climate Change, 2019
[https://www.theccc.org.uk/publication/netzero-the-uks-contribution-to-stopping-global-warming/](https://www.theccc.org.uk/publication/net-zero-the-uks-contribution-to-stopping-global-warming/)

² Based on net emissions from homes which includes both direct emissions (those from domestic combustion) and indirect emissions (those from electricity generation at power stations for domestic electricity use). Source: Final UK greenhouse gas emissions national statistics: 1990 to 2018, table 19, BEIS (2020)
<https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-to-2018>

³ Clean Growth Strategy, BEIS (2018) <https://www.gov.uk/government/publications/clean-growth-strategy>

⁴ The Future Buildings Standard: 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, MHCLG (2021)
<https://www.gov.uk/government/consultations/the-future-buildings-standard>

that are fit for the future, a built environment with lower carbon emissions, and homes adapted to the overheating risks caused by a warming climate.

- 1.6 In Clean Growth: Transforming Heating we made a commitment to produce a roadmap for heat policy.⁵ We plan to publish a Heat and Buildings Strategy which provides that but will also go much further - by taking a holistic approach to energy use in buildings and considering product and thermal efficiency as well as heat decarbonisation. The strategy will provide a clear direction of travel for the 2020s, demonstrating how we will meet our carbon targets and ensure we are on track for net zero. It will also set out how we are approaching the big strategic choices that need to be taken this decade.

The Future Homes Standard vision

- 1.7 We made a commitment in the 2019 Spring Statement that by 2025 we will introduce a Future Homes Standard for new build homes to be future-proofed with low carbon heating and world-leading levels of energy efficiency.⁶ By making our homes and other buildings more energy efficient and embracing smart and low carbon technologies, we can improve the energy efficiency of peoples' homes and boost economic growth while meeting our targets for carbon reduction.
- 1.8 The introduction of the Future Homes Standard will achieve a considerable improvement in energy efficiency standards for new homes. The Future Homes Standard consultation, launched in October 2019, represented a first step in incentivising these changes by providing a clear vision for implementation and setting an ambitious uplift to the energy performance requirements in the Building Regulations for new homes.
- 1.9 In the consultation we proposed that:
- From 2025, new homes built to the Future Homes Standard will have carbon dioxide emissions at least 75% lower than those built to current Building Regulations standards.
 - Introducing the Future Homes Standard will ensure that the homes this country needs will be fit for the future, better for the environment and affordable for consumers to heat, with low carbon heating and very high fabric standards.
 - All homes will be 'zero carbon ready', becoming zero carbon homes over time as the electricity grid decarbonises, without the need for further costly retrofitting work.

⁵ Clean growth: transforming heating - overview of current evidence, BEIS (2018) <https://www.gov.uk/government/publications/heat-decarbonisation-overview-of-current-evidence-base>

⁶ Spring Statement: Written Ministerial Statement, HM Treasury (2019)
<https://www.gov.uk/government/publications/spring-statement-2019-written-ministerial-statement>

Consultation overview

- 1.10 The Ministry of Housing, Communities and Local Government (MHCLG) published the Future Homes Standard consultation on 1 October 2019. We sought views on our plans for a Future Homes Standard for new homes from 2025, and proposed options for an interim increase to the energy efficiency requirements for new homes ahead of that.⁷
- 1.11 The consultation also covered the wider impacts of Part L for new homes, including changes to Part F (Ventilation), its associated Approved Document guidance, airtightness and improving the as-built performance of the constructed home. It also included proposals for a new approach to transitional arrangements.

Consultation response

- 1.12 The Department received a total of 3,310 individual responses to the consultation from a wide range of organisations, representative and trade bodies, industry professionals, academics and individual members of the public. There was a significant level of interest in this consultation and 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.
- 1.13 A breakdown of the responses we received according to different stakeholder categories is provided in Table 1. The totals in the table do not correlate directly with the 3,310 individual responses that we received as some stakeholders did not state their stakeholder category. In addition, respondents that replied to the consultation using our online survey were able to identify as belonging to more than one stakeholder category in their response.

Table 1 – Consultation responses by type or organisation	
Respondent type	Number of responses
Builder / Developer	134
Building Control Approved Inspector	15
Competent Persons Scheme Operator	7
Designer / Engineer / Surveyor	1,449
Energy sector	83
Installer / Specialist sub-contractor	51
Local authority	247
Manufacturer / Supply chain	88
National representative or trade body	48
Professional body or institution	56
Property Management	37

⁷ The Future Homes Standard: changes to Part L and Part F of the Building Regulations for new dwellings, MHCLG (2019)
<https://www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings>

Research / Academic organisation	96
Other	638

- 1.14 A significant proportion of the responses we received were based on, or inspired by, campaign responses coordinated by external groups that had a particular focus on environmental and energy efficiency issues. Many of these responses raised issues and concerns regarding the energy efficiency of buildings which went beyond the scope of our consultation proposals and the existing Building Regulations. These topics included: embodied carbon; Modern Methods of Construction; suggestions for how we can further address the performance gap of new buildings; and the actions that will be required to ensure consumers are familiar with and have the confidence to use the products and the spaces that they occupy, in smarter, greener ways.
- 1.15 Alongside our work on the Future Homes Standard, we will carry out wider work to consider the future of energy efficient and low carbon buildings, looking beyond the scope of Building Regulations. This will examine some of the broader and more fundamental questions around how we can ensure that all new buildings are designed and constructed to be fit for a zero carbon future, including those raised through the consultation process, such as the role of Modern Methods of Construction and low carbon materials, including timber, in delivering low carbon construction where these can be used safely.
- 1.16 This response document sets out a summary of the responses we received to the 69 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. However, as a summary, this paper does not attempt to capture every point made during the consultation process.

Revised draft guidance

- 1.17 Revised versions of the draft *Approved Document L, Volume 1: Dwellings* and *Approved Document F, Volume 1: Dwellings* have been published alongside this response document. In this document, they are referred to as '2021 draft *Approved Document L, Volume 1: Dwellings*' and '2021 draft *Approved Document F, Volume 1: Dwellings*' respectively. The revised approved documents are available online through the following link:
- <https://www.gov.uk/government/publications/building-regulations-approved-documents-l-f-and-overheating-consultation-version>
- 1.18 Drafts of *Approved Document L, Volume 2: Buildings other than dwellings*, *Approved Document F, Volume 2: Buildings other than dwellings* and the *Approved Document for Overheating* have also been published on the above webpage. These should be read alongside the *Future Buildings Standard Consultation*.⁴
- 1.19 The drafts of *Approved Document L, Volume 1: Dwellings* and *Approved Document F, Volume 1: Dwellings* which accompanied the 2019 Future Homes

Standard Consultation are still available online via the link below. In this document, they are referred to as the ‘2019 draft Approved Document L, Volume 1: Dwellings’ and ‘2019 draft Approved Document F, Volume 1: Dwellings’ respectively. They are available online through the following link:

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

Timetable for implementation

- 1.20 The Prime Minister’s ten-point plan for a green industrial revolution noted that we must ensure that implementation of the Future Home Standard is completed in the shortest possible timeline.⁸
- 1.21 The Future Homes Standard consultation provided an implementation roadmap that included our intention, at that time, to publish the second Part L consultation early in 2020 and then implement the interim Part L uplift for all building types soon after. Subject to the outcome of the second Part L consultation published alongside this response document, our aim is now for the interim Part L (Conservation of fuel and power), Part F (Ventilation) and Overheating Regulations outlined in both consultations, with associated guidance, to be regulated for in late 2021, coming into effect in 2022.
- 1.22 Further information regarding the wider implementation timeline for the Future Homes Standard can be found in the Government response to Question 5, in Chapter 2 of this document.

⁸ The ten point plan for a green industrial revolution, BEIS, Prime Minister’s Office, 10 Downing Street (2020)
<https://www.gov.uk/government/publications/the-ten-point-plan-for-a-green-industrial-revolution>

Chapter 2 - The Future Homes Standard

What should the Future Homes Standard look like?

Question 1:

Do you agree with our expectation that a home built to the Future Homes Standard should produce 75-80% less CO₂ emissions than one built to current requirements?

- 2.1 Chapter 2 of the consultation outlined the Government's vision for the Future Homes Standard, which included a high-level specification incorporating very high fabric standards and low carbon heating. We expect an average semi-detached home built to meet the Standard would produce 75-80% less carbon dioxide emissions than one built to current Building Regulations requirements.

Question 1	No. of all responses	% of all responses	% of responses to Q1
a) Yes	522	16%	18%
(b) No – 75-80% is too high a reduction in CO ₂	65	2%	2%
(c) No – 75-80% is too low a reduction in CO ₂	2,388	72%	80%
Did not respond	335	10%	-

- 2.2 Support for the Government's proposed level of uplift for the Future Homes Standard was highest among stakeholders that identified as: designers / engineers / surveyors; local authorities; manufacturers / supply chain; and builders / developers. There was a broad level of support from many stakeholders around a standard for new homes that responds to the challenges caused by climate change and supports our overall efforts in reaching net zero.
- 2.3 Many of the respondents that argued a 75-80% reduction in carbon emissions was too low said that the Future Homes Standard should ensure all new homes are designed to be net zero in order to provide an urgent response to climate change. Most stakeholder categories demonstrated a majority in favour of this view, and some argued that the Government should be pushing for even higher standards.
- 2.4 The most common concerns raised by respondents that thought the Future Homes Standard was too ambitious related to a potential increase in fuel costs for householders; and that Government should consider the wider impact of the Future Homes Standard on the economy and housing delivery. These arguments were not made by the majority of any stakeholder groups, although there was some support among: designers / engineers / surveyors; builders / developers; and national representative or trade bodies.
- 2.5 The importance of taking a 'fabric first' approach when setting a new standard was highlighted by many stakeholders, particularly those that identified as: designers / engineers / surveyors; local authorities; and builders / developers. It was argued

that the Future Homes Standard should not rely on grid decarbonisation in order to achieve a reduction in emissions and that new buildings should be designed to reduce the burden on the national grid because doing so would help the grid decarbonise more swiftly.

2.6 Other key issues raised by respondents included:

- A need to improve compliance under the Future Homes Standard to close the performance gap between the design intent and build quality of new homes.
- That the Future Homes Standard should create homes that do not require further energy efficiency retrofitting work in future.
- Proposals to base the Future Homes Standard on the operational performance of the building using metered energy use, taking account of both regulated and unregulated energy usage.
- The Future Homes Standard should incentivise sustainable development practices and address the embodied carbon of new homes, with some calling for this to be regulated through performance metrics.
- That Government should look beyond 2025 and consider other options to deliver net zero homes.

Government response to Question 1

- 2.7 The Government has dual ambitions of achieving net zero emissions by 2050 and continuing our progress towards achieving 300,000 homes a year by the mid-2020s. These objectives are not mutually exclusive, and with good planning and smart design we can build the homes we need while protecting and enhancing the natural environment and adjusting to climate change.
- 2.8 The introduction of the Future Homes Standard will ensure that an average home will produce at least 75% lower CO₂ emissions than one built to current energy efficiency requirements. In the short term this represents a considerable improvement in the energy efficiency standards for new homes. Homes built under the Future Homes Standard will be ‘zero carbon ready’, which means that in the longer term, no further retrofit work for energy efficiency will be necessary to enable them to become zero-carbon homes as the electricity grid continues to decarbonise.
- 2.9 Homes built under the Future Homes Standard will be future-proofed with low carbon heating and world-leading levels of energy efficiency. By delivering carbon reductions through the fabric and building services in a home rather than relying on wider carbon offsetting, the Future Homes Standard will ensure new homes have a smaller carbon footprint than any previous Government policy (Table 3). In addition, this footprint will continue to reduce over time as the electricity grid decarbonises.
- 2.10 Many consultation responses raised wider issues and concerns regarding the energy efficiency of buildings, some of which were beyond the scope of the consultation or existing Building Regulations. As set out in chapter 1, we intend to carry out some longer-term work to consider the future of energy efficient buildings beyond the Future Homes Standard, which will enable us to examine wider and

more fundamental questions around how we can ensure that all new buildings are designed and constructed to be fit for a zero carbon future.

Question 2:

We think heat pumps and heat networks should typically be used to deliver the low carbon heating requirement of the Future Homes Standard. What are your views on this and in what circumstances should other low carbon technologies, such as direct electric heating, be used?

- 2.11 The consultation acknowledged that reducing demand for heat through improved fabric standards in new homes would not on its own meet our ambitions for the Future Homes Standard. Therefore, in addition to a high level of fabric efficiency we reasoned that a low carbon heating system would be integral to the specification of the Future Homes Standard. We anticipate that the installation of heat pumps, particularly air-to-water and air-to-air heat pumps, will play a major role in delivering low carbon heat for homes built to the Future Homes Standard. However, the consultation also detailed some other technologies that could be used to achieve this aim.

Heat pumps

- 2.12 70% of respondents to this question agreed that heat pumps should play a role in delivering the Future Homes Standard, and there was particular support from stakeholders that identified as: designers / engineers / surveyors; local authorities; builders / developers; and the energy sector. It was noted that the design, installation and operation of a heat pump was important to ensure that it works well in practice and does not lead to additional running costs for households. 6% of respondents raised specific concerns in relation to heat pumps, including some stakeholders that agreed with their use. These concerns included:

- That the skills and supply chains for heat pumps require further support and expansion in order to meet the demand that will be created by introducing the Future Homes Standard.
- That heat pumps will require a change in behaviour and use for consumers used to operating traditional gas central heating systems.
- Concerns regarding noise, vibration and size requirements of installing heat pumps in new homes.
- The use of refrigerants in heat pumps.

Heat networks

- 2.13 26% of respondents agreed that heat networks had a role to play in delivering the Future Homes Standard, including stakeholders that identified as: designers / engineers / surveyors; local authorities; the energy sector; and research / academic organisations. However, 32% of respondents, including those that agreed heat networks had a role to play, expressed some concern about their use. Many argued that the definition of a heat network needed to be made clearer on the basis that there is a difference between local building or site-based communal networks for dense urban development, and large regional district heating

networks. Respondents also highlighted the environmental difference between a heat network served by a gas fired combined heat and power plant and a low carbon network served by fossil fuel free heat. Respondents said that there needed to be a clear justification for the use of heat networks in a development. There were also consistent calls for the use of fossil fuels to be avoided in new heat networks and that a clear path to decarbonising existing heat networks was necessary.

2.14 Specific issues raised in relation to heat networks included:

- The efficiency of heat networks due to heat losses, with some respondents drawing a link to the risk of overheating in homes.
- A lack of consumer choice, on the basis that heat networks remove an occupant's ability to switch energy supplier.
- There were advocates for the use of ambient temperature networks with building level heat pumps in order to reduce losses and facilitate energy sharing.

Direct electric heating

2.15 8% of respondents felt that direct electric heating had a role to play in delivering the Future Homes Standard, with the largest support from stakeholders that identified as: designers / engineers / surveyors; local authorities; the energy sector; and builders / developers. 46% of the responses we received to this question from a range of stakeholders expressed concern regarding the use of this heating technology on the basis that it is less efficient than heat pumps and would carry expensive running costs for consumers. Around a third of the responses we received argued that direct electric heating would only be appropriate for delivering space heating in homes that have an extremely low heat demand.

Other comments

2.16 Stakeholders that identified as: designers / engineers / surveyors; local authorities; and the energy sector expressed concern that a move towards the electrification of heating could place an additional burden on the electricity grid, which in turn would require more upgrading of the grid and more storage or standby generation. Respondents were concerned that these costs would be passed back to the public through energy bills. There was also concern that the additional burden placed on the grid could slow the UK's overall progress towards decarbonisation.

2.17 There was support from stakeholders that identified as: designers / engineers / surveyors; local authorities; and manufacturers / supply chains, for the Government's position that the Future Homes Standard would not mandate the use of any specific technologies. Many respondents recognised that the best heating solution would depend on the specific circumstances of a development and that the Building Regulations should set performance-based targets that allowed developers to take an innovative approach.

2.18 A wide range of alternative technological solutions were suggested by respondents, although there was no overall consensus around any of the options

that were mentioned. Of the technologies suggested as playing a role in the Future Homes Standard, the greatest support was shown for; solar panels; green gas such as hydrogen and biomethane; and mechanical ventilation with heat recovery.

Government response to Question 2

- 2.19 The Prime Minister's ten point plan for a green industrial revolution noted that, as well as increasing the energy efficiency of our buildings, we will need to move away from heating our homes with fossil fuels in order to meet our net zero target.⁸ The Building Regulations will continue to set a performance-based standard rather than mandating or banning the use of any technologies. However, to ensure that new homes are zero carbon ready, we intend to set the performance standard of the Future Homes Standard at a level which means that new homes will not be built with fossil fuel heating, such as a natural gas boiler.
- 2.20 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.⁵ To meet the Future Homes Standard, industry will need to develop the necessary supply chains, skills and construction practices to consistently deliver high quality homes that incorporate low-carbon heat and high levels of energy efficiency.
- 2.21 Currently, electrification is one of the few proven scalable options for decarbonising heat. As set out in the consultation, we expect heat pumps will become the primary heating technology for new homes under the Future Homes Standard and we believe that it is therefore important to build the market for them now. Heat pumps are highly efficient, providing around three times the amount of heat compared to the electricity used.
- 2.22 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.

Question 3:

Do you agree that the fabric package for Option 1 (Future Homes Fabric) set out in Chapter 3 and Table 4 of the impact assessment provides a reasonable basis for the fabric performance of the Future Homes Standard?

- 2.23 To illustrate the type of homes we expect to be built under the Future Homes Standard, the consultation proposed a draft specification that included the minimum fabric standards we expect these homes might incorporate.

Question 3	No. of all responses	% of all responses	% of responses to Q3
a) Yes	340	10%	13%
b) No – the fabric standard is too demanding	73	2%	3%
c) No – the fabric standard is not demanding enough	2,249	68%	84%
Did not respond	648	20%	-

- 2.24 While there was recognition from some respondents that the proposed U-values for the Future Homes Standard were aligned with those of the Passivhaus standard, there were calls for the Government to push fabric standards even further on the basis that the Government's legally-binding target of net zero emissions by 2050 required urgent action, particularly from: designers / engineers / surveyors; local authorities; builders / developers; and research / academic organisations.
- 2.25 Among the designers / engineers / surveyors, local authorities, professional body or institutions, and research / academic organisations that responded, there was a particular concern that the fabric standards proposed may require further retrofit work at a later time in order to meet the net zero emissions target. Over half of the respondents to this question argued that the minimum fabric standards proposed would not be enough to ensure high fabric standards in new homes, if the Fabric Energy Efficiency Standard was not retained as a performance metric.
- 2.26 Respondents that thought the fabric standards were too demanding included those that identified as: manufacturers / supply chains; builders / developers; and national representative or trade bodies. Some commented that there may be unintended consequences, such as difficulty in meeting the requirements of Part B of the Building Regulations (Fire). Others argued that the standard would carry higher costs and present practical challenges by necessitating the use of thicker walls and triple glazing.
- 2.27 We received suggestions, mostly from designers / engineers / surveyors, that the airtightness of the Future Homes Standard should be improved, and that Government could introduce form factors to take account of the shape of homes.

Government response to Question 3

- 2.28 We consider the principle of a fabric-first approach to be sound and this will inform our approach as we introduce Part L 2021 and transition to the Future Homes Standard in 2025. Under the Future Homes Standard, we will be pushing building fabric standards further than ever before while ensuring that low carbon heating is integral to the design of all new homes.
- 2.29 As set out in chapter 3, we intend to retain the Fabric Energy Efficiency Standard as a performance metric. This, alongside the fabric standards set out in the draft notional building specification for the Future Homes Standard (Annex A) will form the basis of the Future Homes Standard specification.

- 2.30 While the draft specification for the Future Homes Standard is not final and will be subject to further technical work and full consultation in due course, we are sharing this now so that we can begin to engage with all parts of industry on the indicative technical detail of the standard.
- 2.31 Table 2 offers a comparison between some of the building fabric and services standards of the draft notional building specification for the Future Homes Standard, with those of previous Government standards.

Table 2 - Fabric and services comparison with the 2021 Part L and draft Future Homes Standard specification				
	Proposed 'zero carbon homes' standard ¹	Current 2013 Part L standard	2021 Part L Standard	Indicative FHS specification
Floor U-value (W/m ² .K)	0.13	0.13	0.13	0.11
External wall U-value (W/m ² .K)	0.18	0.18	0.18	0.15
Roof U-value (W/m ² .K)	0.13	0.13	0.11	0.11
Window U-value (W/m ² .K)	1.4	1.4	1.2	0.8
Door U-value (W/m ² .K)	1.0	1.0 - opaque 1.2 – semi-glazed	1.0	1.0
Air permeability at 50 Pa	5.0 m ³ /(h.m ²)	5.0 m ³ /(h.m ²)	5.0 m ³ /(h.m ²)	5.0 m ³ /(h.m ²)
Heating appliance	Gas boiler	Gas boiler	Gas boiler	Low-carbon heating (e.g. Heat pump)
Heat Emitter type	Regular radiators	Regular radiators	Low temperature heating	Low temperature heating
Ventilation System type	Natural (with extract fans)	Natural (with extract fans)	Natural (with extract fans)	Natural (with extract fans)
PV	30% ground floor area	No	40% ground floor area	None
Wastewater heat recovery	No	No	Yes	No
y value (W/m ² .K)	0.05	0.05	0.05	0.05
<i>Notes:</i>				
1. This table reflects the zero carbon homes specification that was proposed under a previous Government.				

- 2.32 As set out in our response to Question 1, by delivering carbon reductions through the fabric and building services in a home rather than relying on wider carbon offsetting, the Future Homes Standard will ensure new homes have a smaller carbon footprint than any previous Government policy (Table 3). In addition, this footprint will continue to reduce over time as the electricity grid decarbonises.

Table 3 - On-site carbon targets for a typical semi-detached home¹

	Current 2013 Part L standards	Proposed 'zero carbon homes' standard ²	2021 Part L	Indicative FHS specification
Carbon (kgCO ₂ /m ² /yr)	16.0	13.5	11.0	3.6

Notes:

1. All figures use the same 10.1 version of SAP software and carbon factors as the Part L 2021 uplift for accurate comparison.
2. This table reflects the zero carbon homes specification that was proposed under a previous Government. This standard was set at 11.0 using carbon factors and SAP software at the time.

Certainty and consistency in setting energy efficiency standards

Question 4:

When, if at all, should the Government commence the amendment to the Planning and Energy Act 2008 to restrict local planning authorities from setting higher energy efficiency standards for dwellings?

- 2.33 At present, local planning authorities may include policies in their local plans which require developers to comply with energy efficiency standards for new homes that exceed the minimum requirements of the Building Regulations.
- 2.34 The Planning and Energy Act 2008 was amended in 2015 to provide Government with powers to stop local planning authorities from being able to exceed the minimum energy efficiency requirements of the Building Regulations, but this amendment has not been commenced. In the same year, the then Government set out in a Written Ministerial Statement an expectation that local planning authorities should not set energy efficiency standards for new homes higher than the energy requirements of Level 4 of the Code for Sustainable Homes, which is equivalent to a 19% improvement on the Part L 2013 standard.
- 2.35 The Future Homes Standard consultation recognised that the current position has caused confusion and uncertainty for local planning authorities and home builders, alike. While some local planning authorities are unclear about what powers they have to set their own energy efficiency standards and have not done so, others have continued to set their own energy performance standards which go beyond the Building Regulations minimum and in some cases beyond the Code for Sustainable Homes. Equally, for developers we have heard that this has resulted in disparate energy efficiency standards across local authority boundaries, the inconsistency of which can create inefficiencies in supply chains, labour and potentially quality of outcomes.
- 2.36 The consultation proposed that one way of clarifying the role of local authorities would be to amend the Planning and Energy Act 2008 alongside a future uplift in Part L standards so that in future, developers will be required to build to a single higher standard that is applied consistently across England.

Question 4	No. of all responses	% of all responses	% of responses to Q4
(a) In 2020, alongside the introduction of any option to uplift the energy efficiency standards of Part L	257	8%	9%
(b) In 2020 but only in the event of the introduction of a 31% uplift (option 2) to the energy efficiency standards of Part L	77	2%	3%
(c) In 2025 alongside the introduction of the Future Homes Standard	81	2%	3%
(d) The Government should not commence the amendment to the Planning and Energy Act	2,584	78%	86%
Did not Respond	311	9%	-

- 2.37 Most respondents to this question were in favour of retaining local planning authorities' flexibility to set standards on the basis that they are best placed to assess local need and viability. Stakeholders argued that the role of the Building Regulations was to set minimum standards and that local authorities should not be prevented from going beyond these, in order to meet their climate change objectives.
- 2.38 Those in favour of removing local planning authorities' powers argued that in many cases, local authorities do not have the in-house technical expertise to determine local standards, and that a lack of consistency across the country could lead to inefficient supply chains, confusion and uncertainty for developers.

Government response to Question 4

- 2.39 All levels of Government have a role to play in meeting the net zero target and local councils have been excellent advocates of the importance of taking action to tackle climate change. Local authorities have a unique combination of powers, assets, access to funding, local knowledge, relationships with key stakeholders and democratic accountability. This enables them to drive local progress towards our national climate change commitments in a way that maximises the benefits to the communities they serve. As part of this, the Government wishes to ensure that we have a planning system in place that enables the creation of beautiful places that will stand the test of time, protects and enhances our precious environment, and supports our efforts to combat climate change and bring greenhouse gas emissions to net zero by 2050.
- 2.40 We recognise that there is a need to provide local authorities with a renewed understanding of the role that Government expects local plans to play in creating a greener built environment; and to provide developers with the confidence that they need to invest in the skills and supply chains needed to deliver new homes from 2021 onwards. To provide some certainty in the immediate term, the Government will not amend the Planning and Energy Act 2008, which means that local planning authorities will retain powers to set local energy efficiency standards for new homes.

- 2.41 Last year, the Planning for the Future white paper set out how a simpler planning process could improve certainty about what can be built where, as well as offering greater flexibility in the use of land to meet our changing economic and social needs.⁹ The white paper indicated that while development management policies would focus on identifying areas for development and protection, they would be set nationally. Further, as we move to ever higher levels of energy efficiency standards for new homes with the 2021 Part L uplift and Future Homes Standard, it is less likely that local authorities will need to set local energy efficiency standards in order to achieve our shared net zero goal.
- 2.42 The planning white paper consultation closed on 29 October 2020. The responses we received will be considered carefully, and a Government response will be published in due course. The new planning reforms will clarify the longer-term role of local planning authorities in determining local energy efficiency standards.

Roadmap to the Future Homes Standard

Question 5:

Do you agree with the proposed timings presented in Figure 2.1 showing the Roadmap to the Future Homes Standard?

- 2.43 The consultation acknowledged that in order to meet the Future Homes Standard, industry will need time to develop the necessary supply chains, skills and construction practices to deliver homes that incorporate low-carbon heat and very high fabric standards. The consultation set out a proposed implementation roadmap for the Future Homes Standard, with indicative timings for further research, industry engagement and a full technical consultation in 2024.

Question 5	No. of all responses	% of all responses	% of responses to Q5
a) Yes	325	11%	12%
b) No – the timings are too ambitious	93	3%	3%
c) No – the timings are not ambitious enough	2,289	69%	84%
Did not respond	603	18%	-

- 2.44 The proposed 2025 timeline received the greatest support from stakeholders that identified as: designers / engineers / surveyors; local authorities; manufacturers / supply chain; and builders / developers.
- 2.45 Most respondents to this question argued that the proposed roadmap to 2025 was not suitably ambitious in order to meet the 2050 net zero target. Stakeholders that identified as designers / engineers / surveyors, local authorities; builders /

⁹ Planning for the future, MHCLG (2020) <https://www.gov.uk/government/consultations/planning-for-the-future>

developers, and research / academic organisations, argued that the necessary evidence, technologies, supply chains and skills were already in place. However, we received some responses from the same stakeholder groups that acknowledged the necessary supply chains and skills for low carbon heat and construction require further development and support in order to deliver the Future Homes Standard.

- 2.46 Respondents that argued the proposed timeline was too ambitious included stakeholders that identified as: designers / engineers / surveyors; builders / developers; national representative or trade bodies; and manufacturers / supply chain. The most common constraints referred to by respondents related to the availability of the necessary supply chains and skills for low carbon heat and construction skills required for the fabric.
- 2.47 Many respondents suggested that a full technical consultation on the Future Homes Standard was necessary as soon as possible in order to provide industry with early certainty and to support successful implementation, and there were calls for the Government to work closely with industry to develop more detailed proposals.

Government response to Question 5

- 2.48 The challenges involved in improving the energy efficiency of our buildings and reducing carbon emissions are not insubstantial. However, new build is an area where we can and must maintain the momentum that began with the Future Homes Standard consultation.
- 2.49 In their most recent annual progress report to Parliament, the Committee for Climate Change recommended that the Government commits to a robust definition of the Future Homes Standard, which is legislated for well ahead of 2025.¹⁰ Through consultation we received similar feedback from stakeholders, many of whom requested an early consultation on the technical detail of the standard and a clearer pathway to full implementation.
- We have listened to these calls for a swifter and more certain pathway. Our work on a full technical specification for the Future Homes Standard has been accelerated and we will consult on this in 2023.
 - We intend to introduce the necessary legislation in 2024, ahead of full implementation of the Future Homes Standard in 2025.
- 2.50 While we have advanced two key steps in order to support successful implementation of the Future Homes Standard, we are aware that many respondents were keen to see the standard come into force before 2025.
- 2.51 We know that some home-builders are already building to fabric standards above the current Building Regulations or installing low carbon heating systems, but it is important that all parts of industry are ready to build homes that are fit for a zero

¹⁰ Reducing UK emissions: 2020 Progress Report to Parliament, Committee on Climate Change (2020) <https://www.theccc.org.uk/publication/reducing-uk-emissions-2020-progress-report-to-parliament/>

carbon future. In practice, that will mean ensuring that all developers are ready to build to higher fabric specifications, 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 new homes under the Future Homes Standard.

- 2.52 In the Prime Minister's ten-point plan for a green industrial revolution we committed to ensure that implementation of the Future Home Standard is completed in the shortest possible timeline.⁸ We believe that the timeline set out in this document delivers on our net zero commitments, while providing industry with the time it needs to develop the supply chains and skills that will be necessary to deliver the Future Homes Standard and accounting for market factors; providing the good quality, warm homes that consumers expect and continuing to keep energy bills low.

Implementation of the Future Homes Standard

- 2.53 We are not waiting until 2025 to take action. It has been eight years since we last reviewed the energy efficiency standards for new homes and in that time, the Government has made a commitment to net zero greenhouse gas emissions by 2050. In the short term, our priority will be to implement an interim 2021 Part L uplift for new homes and non-domestic buildings as swiftly as possible. This is a key stepping stone that will enable us to successfully implement the Future Homes Standard and Future Buildings Standard.
- 2.54 Implementation of the Future Homes Standard will be progressed through four phases of activity as summarised in Table 4:

Table 4 - Future Homes Standard implementation timeline	
Timing	Milestones
Phase 1 – Introduce interim 2021 Part L uplift for all building types	
Jan 2021	– Publish <i>The Future Buildings Standard consultation</i> document
Dec 2021	– Interim Part L, Part F and Overheating Regulations made for domestic and non-domestic buildings
June 2022	– Interim Part L, Part F and Overheating Regulations come into effect – Developers must submit building notice / initial notice or deposit plans by June 2022, for transitional arrangements to apply
Phase 2 – Technical work and engagement	
Ongoing	– Industry engagement, including through BRAC and technical working groups
Autumn 2021 – summer 2022	– Research and analysis to develop proposed technical specification
Summer 2022 – 2024	– Develop sector-specific guidance and embed understanding of the technical specification of the Future Homes Standard
Phase 3 – Consultation & policy development	
Spring 2023	– Technical consultation on the proposed specification for the Future Homes Standard
Phase 4 – Full FHS implementation	

2024	– Part L FHS Regulations made
2025	– Part L FHS Regulations come into effect

- 2.55 Many of the responses we received to the consultation asked the Government to work closely with industry and carry out early engagement. A full technical consultation on the Future Homes Standard is planned for spring 2023, which will provide proposals for the exact technical detail, associated draft guidance and an impact assessment for the introduction of the Future Homes Standard from 2025.
- 2.56 Ahead of a full consultation, we will begin the work of engaging with industry on the technical detail of the Future Homes Standard. In the first instance, this will include engagement with:
- Publicly appointed expert committees, the Building Regulations Advisory Committee (BRAC) and its successor the Building Advisory Committee (BAC),¹¹ will continue to support work on energy efficiency standards;
 - An overarching technical industry working group, which consists of experts from academia, major housebuilders, product manufacturers and designers; and
 - Industry working groups reporting to the technical working group, will provide expertise and advice on emerging analysis and options.
- 2.57 We intend to work with industry to ensure sector-specific guidance is developed for housebuilders, designers and installers; and embed understanding of the technical specification of the Future Homes Standard.
- 2.58 We will also need to consider the alignment of our work with the recommendations and plans that emerge from the Home Builder Federation's Future Homes Task Force, which potentially offers an additional mechanism through which we can engage with industry and support implementation of the Future Homes Standard.
- 2.59 In the meantime, to provide greater certainty for all stakeholders, we have published a draft notional building specification for the Future Homes Standard alongside this consultation response (Annex A). The specification is not final and will be subject to further technical work and full consultation. However, the draft specification provides a basis on which we can begin to engage with all parts of industry on the indicative technical detail of the Future Homes Standard.

Transitioning to low carbon heating

- 2.60 The Government recognises the challenges of transitioning to low carbon heating, in particular for the replacement heating sector. However, we agree with the Committee on Climate Change that there is an opportunity to start to establish a mass market solution for low carbon heating with new buildings.¹ The introduction of the Future Buildings Standard and Future Homes Standard will facilitate this.

¹¹ Draft Building Safety Bill - Explanatory Notes, Clause 9, MHCLG (2020)

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/901869/Draft_Building_Safety_Bill_PART_2.pdf

- 2.61 The Government's engagement with stakeholders shows that many construction workers and heating engineers are willing to reskill, provided there is sufficient demand for those skills. Similarly, many low-carbon technology manufacturers have signalled that they are ready to increase production runs as and when demand grows. To help build that demand, the Government has set a clear direction on green policy and green construction.
- 2.62 We believe that confirming the Future Homes Standard timeline will encourage investment in low carbon heating as well as the training and upskilling required to successfully implement the standard from 2025. Alongside the changes we are making to Part L, recent Government policy announcements that should help build that demand include the following:
- The Prime Minister's ten-point plan for a green industrial revolution announced an ambition to grow the Heat Pump market to 600k installations per annum by 2028.⁸
 - To ensure the Gas Act is in line with the Future Homes Standard, the Energy White Paper confirmed that we will seek views on the feasibility of ending the connection of new build homes to the natural gas grid.¹²
 - The Clean Growth Strategy committed to 'phase out installation of high carbon fossil fuel heating in buildings not connected to the gas grid, starting with new build, during the 2020s'.³
 - The Green Homes Grant is a key part of our green economic recovery following COVID-19, which will help build demand for low carbon technology in the short term, while strengthening supply chains of low carbon materials for the longer term.
 - The Government is making £50 million available for social housing through a demonstrator project for the Social Housing Decarbonisation Fund (SHDF)
 - The Public Sector Decarbonisation Scheme (PSDS) will help public sector organisations in England install energy efficiency and low carbon heating measures. Installations under the PSDS are expected to support up to 30,000 low-carbon jobs.
 - The upcoming Heat and Buildings Strategy will guide action in the 2020s and transformation to net zero.
- 2.63 More widely, in order to create the right environment for investment in the UK, The Department for Business, Energy & Industrial Strategy (BEIS) commissioned research into the heat pump manufacturing supply chain which investigates the opportunity for additional manufacturing in the UK.¹³ To give businesses in the UK heat network supply chain certainty and the opportunity to make longer-term strategic investment decisions and expand their current UK offerings, there will also be continued Government support through the Heat Networks Delivery Unit, the Heat Networks Investment Project, the Green Heat Network Fund and, from 2022, the Heat Network Market Framework. The Government will monitor the

¹² Energy white paper: Powering our net zero future, BEIS (2020) [https://www.gov.uk/government/publications/energy-white-paper-powering-our-netzero-future](https://www.gov.uk/government/publications/energy-white-paper-powering-our-net-zero-future)

¹³ Heat pump manufacturing supply chain research project, BEIS (2020) <https://www.gov.uk/government/publications/heat-pump-manufacturing-supply-chain-research-project>

supply chains of items not currently used widely in new build construction and we will continue to engage with industry to understand what challenges exist and how Government can help address these.

- 2.64 We are also aware that more needs to be done to build the necessary skills base by supporting existing workers in high-carbon roles to retrain and attract new workers into a thriving green jobs market. Across Whitehall work is underway to ensure that there is sufficient training capacity to expand the installer base and that standards are set so that installation quality is maintained for consumers. The Energy White Paper confirmed that we will be developing a strategy for upskilling through the 'Green Jobs Taskforce' and a National Skills Fund, to be launched in 2021.¹²

Chapter 3 - Part L Standards for new homes in 2021

Interim uplift of Part L minimum standards

Question 6:

What level of uplift to the energy efficiency standards in the Building Regulations should be introduced in 2020?

- 3.1. The introduction of the Future Homes Standard will require a considerable step up in energy efficiency standards compared to the level currently required by the Building Regulations. To help prepare the supply chains and skills that will be necessary to deliver the Future Homes Standard, we have adopted a two-stage approach to implementation and proposed an initial uplift in Part L standards in 2020.
- 3.2. The outbreak of COVID-19 meant that much of the Department's resources were rapidly mobilised to support those in need. As a result, the timing of the interim uplift was delayed from its original 2020 date. Subject to outcome of *The Future Buildings Standard consultation*,⁴ our aim is to now implement the interim uplift in 2021.
- 3.3. As a first step towards the Future Homes Standard, the consultation included two potential options for an interim Part L uplift.
 - **Option 1 - 'Future Homes Fabric'** would be a 20% reduction in CO₂ from new dwellings, compared to current standards.
 - **Option 2 - 'Fabric plus technology'** would be a 31% reduction in CO₂ from new dwellings, compared to current standards.
- 3.4. Option 2 was the Government's preferred option because it represents a meaningful and achievable interim increase to the energy efficiency standards for new homes. As well as delivering high carbon savings of 31%, option 2 was designed to encourage the use of low-carbon heating in new homes, therefore preparing the supply chains and skills that will be necessary to deliver the Future Homes Standard, while accounting for market factors.

Question 6	No. of all responses	% of all responses	% of responses to Q6
a) No change	12	<1%	<1%
b) Option 1 – 20% CO ₂ reduction	106	3%	4%
c) Option 2 – 31% CO ₂ reduction (the Government's preferred option)	320	10%	13%
d) Other	2,115	64%	83%
Did not respond	757	23%	-

- 3.5. Across the responses we received to this question, there was a strong consensus that increasing the energy efficiency standards for new homes is the right thing to do.
- 3.6. The respondents that expressed the greatest level of support for the Government's preferred option 2 uplift included: designers / engineers / surveyors; local authorities; manufacturers / supply chains; and the energy sector. These stakeholders mainly responded in line with the arguments set out in the consultation around encouraging the installation of low carbon heating in new homes ahead of the Future Homes Standard. Respondents also felt that of the two options presented, it would be advantageous to take a more significant step towards the Future Homes Standard now and that option 2 would achieve the greatest carbon reductions.
- 3.7. Many local authorities, housebuilders and representatives of the house building industry responded that they would prefer the option 1 uplift. Some stakeholders qualified this position by proposing a three-phased approach to implementing the Future Homes Standard, with option 1 and option 2 acting as independent stepping stones ahead of 2025. Respondents that supported the option 1 uplift were often specifically in favour of the high fabric specification.
- 3.8. Many of the respondents that argued in favour of a higher uplift than either of the options set out in the consultation were: designers / engineers / surveyors; local authorities; builders / developers; and research / academic organisations. It was argued that a higher uplift would make a greater contribution to net zero. There were also specific concerns that the Government's preferred option would mean that new homes built under this standard would require retrofitting for energy efficiency in the future and that the fabric standards proposed under this option were lower than those proposed for the Future Homes Standard, which may impact the comfort and wellbeing of households.
- 3.9. Some respondents expressed concern that the reduction in carbon emissions for both options were overstated and relied on grid decarbonisation, due to the change in emission factors between 2013 and the present day. However, the emission factors used in calculating both a home built to 2013 standards and the consultation options were the same, and the consultation options presented were therefore robust.

Government response to Question 6

- 3.10. The consultation options we presented were based on the lowest cost and most cost-effective ways of reducing CO₂ emissions from new homes and did not rely on the use of complex, high maintenance technologies that may not appeal to many home buyers. We will introduce the option 2 uplift, which was the Government's preferred option in consultation. As well as delivering high carbon savings without relying on additional carbon offsetting measures, the option 2 specification achieves a balance between making progress towards the Future Homes Standard while providing industry with the time it needs to develop the supply chains and skills that will be necessary to deliver the Future Homes Standard and accounting for market factors.

- 3.11. Homes built under the Future Homes Standard will need to be fit for a zero carbon future, with low carbon heating and very high fabric standards. Our priority is to implement this standard as quickly as possible, and this must be done in a way that ensures that all parts of industry are ready to meet what will be a challenging standard to deliver in practice. The option 2 specification provides a meaningful and achievable increase to the energy efficiency standards for new homes in the short term – a typical semi-detached home built to the 2021 version of Part L will emit 31% less CO₂ than one built to current standards – and will act as a first step towards the Future Homes Standard.
- 3.12. The 2021 uplift will ensure the delivery of high-quality homes that are in line with our broader housing commitments and encourage homes that are future-proofed for the longer-term. We need as many homes as possible to be built with low carbon heating going forwards and the feedback we received from developers based on our consultation proposals indicated that many will start to do so under option 2, therefore increasing the capacity of supply chains and readying installer skills for the introduction of the Future Homes Standard.
- 3.13. Chapter 2 of this consultation sets out a timeline for the Future Homes Standard, which will ensure that homes are built to a very high energy efficiency standard. We believe that confirming this timeline now will encourage investment in low carbon heating as well as the training and upskilling required to successfully implement the Future Homes Standard from 2025. Chapter 2 also sets out some recent Government announcements which we expect to encourage investment in low carbon heating and summarises the action we will be taking to ensure a sufficient provision of skills and supply for low carbon technologies.
- 3.14. As set out in this chapter, we have decided to retain the Fabric Energy Efficiency Standard as a performance metric in Part L 2021. Subject to the outcome of *The Future Buildings Standard consultation*,⁴ the decision to retain the Fabric Energy Efficiency Standard may make it less appealing for some developers to install heat pumps under Part L 2021 in some circumstances, as there will be lower cost savings possible. However, we anticipate that a home built under the option 2 specification with a heat pump will still have a lower capital cost than one built with a gas boiler.
- 3.15. While we are confident that many developers will start to build new homes using low carbon heating under the interim 2021 Part L uplift, where there is insufficient supply, or the right skills are unavailable, we envisage that many developers will instead install solar panels. However, our approach remains technology-neutral and designers will retain the flexibility they need to use the materials and technologies that suit the circumstances of a site and their business.
- 3.16. The notional building specification for the interim 2021 Part L standard is available in Annex B of this response document. It can also be found in the 2021 draft *Approved Document L, Volume 1: Dwellings*.

Performance metrics

- 3.17. The consultation proposed a revised set of performance standards for new homes, which consisted of four performance metrics for Part L 2021.

Current 2013 Part L metrics	Consultation proposals for 2021 Part L metrics
i) CO ₂ emission target ii) Fabric energy efficiency target (Question 13) iii) Minimum standards for fabric and fixed building services	i) Primary energy target (Question 7) ii) CO ₂ emission target (Question 8) iii) Householder affordability rating (Questions 9 & 10) iv) Minimum standards for fabric and fixed building services (Question 11 & 12)

Question 7:

Do you agree with using primary energy as the principal performance metric?

- 3.18. At present, CO₂ emissions are used as the primary performance metric for new homes. The decarbonisation of the UK's electricity grid has been a significant success in recent years but as we continue to make progress, CO₂ emissions will become a less effective measure of the energy performance of buildings. The modelled energy performance of a home takes the carbon intensity of the grid into account through emission factors – as a result, if we were to continue to use CO₂ emissions as the primary performance metric for homes, it will not be possible to tell whether a home that performs well under this metric does so because it is actually energy efficient, or if this is a consequence of a decarbonised electricity grid.
- 3.19. A new home may therefore have low CO₂ emissions but continue to consume a great deal of energy. Given our energy efficiency objectives are broader than simply reducing CO₂ emissions, the consultation proposed that the principal performance metric for new homes should become a primary energy target.

Question 7	No. of all responses	% of all responses	% of responses to Q7
(a) Yes – Primary energy should be the principal performance metric	376	11%	16%
(b) No – CO ₂ should remain the principal performance metric	209	6%	9%
(c) No – another measure should be the principal performance metric	1,832	55%	76%
Did not respond	893	28%	-

- 3.20. The proposal to introduce primary energy as the principal performance metric received the greatest support from stakeholders that identified as: local authorities; designers / engineers / surveyors; manufacturer / supply chains; and builders / developers. It was argued that primary energy provides a more robust and long-term measure of the energy efficiency of buildings, that will not be influenced by grid

electricity decarbonisation as much as a CO₂ target. There was recognition that as a metric, primary energy could help minimise energy demand on the grid and in individual homes. There was also support around the fact that primary energy is used as a metric in other countries, which could make international energy efficiency comparisons more straightforward.

- 3.21. The respondents that argued in favour of retaining CO₂ as the primary metric mainly identified as: designers / engineers / surveyors; local authorities; and the energy sector. These stakeholders reasoned that it was important to focus on CO₂ emissions given the Government's overall net zero target and that CO₂ emissions would remain a relevant metric until the electricity grid was fully decarbonised.
- 3.22. The majority of respondents that argued in favour of an alternative principal performance metric identified as: designers / engineers / surveyors. There was concern that a primary energy metric would not be easily understood by industry or homeowners, which could obscure the connection between the primary energy rating and actual performance of a house. Among these respondents, it was argued that a kWh/m²/year metric would be something that homeowners were already familiar with and could be helpful in informing decisions around minimising energy use.
- 3.23. Some respondents expressed concern that a primary energy metric may obscure the actual building performance of a house because primary energy includes upstream activities involved in the production of the fuel. Alternative energy demand metrics were proposed by stakeholders, which some argued should take account of both regulated and unregulated energy use (i.e. energy not regulated by the energy efficiency requirements of the Building Regulations, such as plug loads).
- 3.24. Broader concerns were raised regarding primary energy factors, including the frequency at which they are updated, their complexity, and the fact that changing the factors over time may mean that buildings are not directly comparable.

Question 8:

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

- 3.25. The consultation proposed a new principal performance metric in the form of primary energy, as a good means of driving energy efficient buildings. However, the Government has been clear that reducing CO₂ emissions remains a key priority. On its own, a primary energy performance metric may not drive low carbon design choices in all scenarios and the consultation therefore proposed retaining CO₂ emissions as a secondary performance metric.

Question 8	No. of all responses	% of all responses	% of responses to Q8
(a) Yes	487	15%	21%
(b) No	1,873	57%	79%
Did not respond	950	29%	-

- 3.26. Respondents that agreed with this proposal mainly identified as: designers / engineers / surveyors; local authorities; manufacturer / supply chains; and builders / developers. They highlighted the importance of retaining CO₂ emissions as a performance metric on the basis that it would be relevant in monitoring progress towards net zero and because low primary energy does not necessarily equate to low carbon emissions in all circumstances. Respondents felt that a CO₂ emissions metric was well understood by industry and the general public, and that retaining this would make statistical comparisons with previous years more straightforward so that progress towards zero carbon homes can be determined.
- 3.27. The majority of respondents that answered no to this question identified as: designers / engineers / surveyors; with wider support from builders / developers; local authorities; manufacturer / supply chains; and research / academic organisations. 28% of stakeholders that responded to this question argued that CO₂ emissions are now less relevant, even as a secondary metric, because of the decarbonisation of the electricity grid. A smaller number wanted to retain CO₂ as a performance metric but argued that it should remain the principal metric over primary energy, given the Government's net zero commitments.
- 3.28. Some alternative secondary metrics were proposed, such as a measure of energy in use.

Question 9:

Do you agree with the proposal to set a minimum target to ensure that homes are affordable to run?

- 3.29. As a result of decarbonisation of the grid, the CO₂ emission factor of electricity is now lower than that of natural gas. Through Part L 2021, the installation of direct electric heating solutions in new homes could become an appealing low capital cost option for some developers. However, direct electric heating installed in new homes is likely to result in higher energy bills for occupants compared to gas heating.
- 3.30. To ensure that homes remain affordable to run for consumers, the consultation proposed the introduction of a new Part L householder affordability rating performance metric.

Question 9	No. of all responses	% of all responses	% of responses to Q9
(a) Yes	2,193	66%	90%
(b) No	251	8%	10%
Did not respond	866	26%	-

- 3.31. The responses we received emphasised the importance of keeping energy bills low, particularly for households on low or fixed incomes. There was also support behind the idea of furnishing home buyers with more information about the likely running costs of a home, although this is available on a home's Energy Performance Certificate.

- 3.32. Some respondents felt that a stronger emphasis on energy efficiency throughout Part L would provide a more appropriate and permanent way of minimising energy costs rather than a separate performance metric. There were also concerns that a national standard may be inappropriate because affordability could vary across the country, and there were mixed views on whether local authorities should have a greater role to play in determining local affordability standards.
- 3.33. The main arguments made by respondents that disagreed with this proposal were that the addition of an affordability metric would make the Building Regulations complicated and that household energy use was too variable to create a robust standard. Some stakeholders were in favour of providing affordability information to consumers rather than using this as a minimum standard in Regulations.
- 3.34. There were also calls from some respondents for more details on how the metric would work in practice and for further engagement ahead of implementation.

Question 10:

Should the minimum target used to ensure that homes are affordable to run be a minimum energy efficiency rating?

- 3.35. The consultation suggested that a householder affordability rating metric could be based on the energy efficiency rating, which currently forms part of a home's Energy Performance Certificate (EPC). The Energy Efficiency Rating is an energy cost calculation that takes account of the combined theoretical costs of heating, lighting and hot water in a home. For this to be used as a performance metric, it would be necessary to determine a minimum energy efficiency rating that needs to be achieved.

Question 10	No. of all responses	% of all responses	% of responses to Q10
(a) Yes	472	14%	20%
(b) No	1,859	56%	80%
Did not respond	979	30%	-

- 3.36. Those in favour of using a minimum energy efficiency rating felt that the fact EPCs are well-established and familiar to the general public would make this an effective metric.
- 3.37. Some respondents expressed concern around the ability of SAP to effectively predict energy costs and that an EPC rating does not reflect real energy costs.¹⁴ It was suggested that some form of adjustment factor would be needed if this measure was used.
- 3.38. Across the responses received, there was no consensus on what the minimum energy efficiency rating should be; suggestions ranged between an A to C rating

¹⁴ The Standard Assessment Procedure (SAP) is the methodology used by the Government to assess and compare the energy and environmental performance of dwellings.

and some respondents suggested that the current rating scale should be extended to incorporate A+ and A++ ratings.

- 3.39. Some alternative measures were proposed by respondents, including metered energy use, thermal performance of the building, a measure based on zero energy usage, or an absolute target linked to national fuel poverty metrics or the minimum wage. However, there was no overall consensus around the suggestions made.

Question 11:

Do you agree with the minimum fabric standards proposed in table 3.1?

- 3.40. We need to ensure that Part L 2021 encourages good fabric performance in new homes, because reducing the demand for heating has an important role to play in meeting our net zero emissions target. The consultation set out the following proposed minimum insulating standards for individual fabric elements.

Question 11		No. of all responses	% of all responses	% of responses to Q11
a) minimum standards for external walls (0.26 W/m ² .K)	Agree	164	5%	7%
	No, too insulating	22	1%	1%
	No, more insulating	2,053	62%	92%
	Did not respond	1,071	32%	-
b) minimum standards for party walls (0.20 W/m ² .K)	Agree	218	7%	10%
	No, too insulating	32	1%	1%
	No, more insulating	1,946	59%	89%
	Did not respond	1,114	34%	-
c) minimum standards for a floor (0.18 W/m ² .K)	Agree	192	6%	9%
	No, too insulating	20	1%	1%
	No, more insulating	1,984	60%	90%
	Did not respond	1,114	34%	-
d) minimum standards for a roof (0.16 W/m ² .K)	Agree	186	6%	8%
	No, too insulating	20	1%	1%
	No, more insulating	1,992	60%	91%
	Did not respond	1,112	34%	-
e) minimum standards for windows (1.60 W/m ² .K)	Agree	182	6%	8%
	No, too insulating	26	1%	1%
	No, more insulating	2,005	61%	91%
	Did not respond	1,097	33%	-
f) minimum standards for rooflights (2.20 W/m ² .K)	Agree	160	5%	7%
	No, too insulating	20	1%	1%
	No, more insulating	2,025	61%	92%
	Did not respond	1,105	33%	-
g) minimum standards for a door (1.60 W/m ² .K)	Agree	194	6%	9%
	No, too insulating	25	1%	1%
	No, more insulating	1,980	60%	90%
	Did not respond	1,110	34%	-

h) minimum standards for air permeability (8 m ³ /(h.m ²) @50 Pa)	Agree	192	6%	9%
	No, too insulating	23	1%	1%
	No, more insulating	1,989	60%	90%
	Did not respond	1,106	33%	-

- 3.41. Many respondents that argued in favour of minimum values that were higher than those proposed expressed concern that new homes would require further retrofitting in future, in order to meet the Government's net zero ambitions in 2050.

Stakeholders supported a fabric first approach to improving airtightness and reducing energy consumption as far as possible. There was also particular concern that the proposals to remove the Fabric Energy Efficiency Standard and the new carbon factors could lead to a decrease in fabric standards compared to current values, and therefore that the minimum values should be higher. A range of alternative minimum fabric standards were suggested by respondents although there was no overall consensus around the suggestions made.

- 3.42. We received detailed comments on specific fabric elements. In the case of windows, arguments were made both in favour and against triple glazing. It was noted that the requirements for windows and doors may restrict design choice by preventing the use of traditional rolled steel. The requirement that upstands in rooflights should meet the performance of walls were raised as a concern on the basis that this could not be met by any existing product or design. Some respondents argued in favour of better airtightness, and it was noted that 5 m³/(h.m²) is the current average amongst new builds. Respondents suggested that proposals for external walls would limit the ability of builders to install more sustainable insulation products because natural materials do not tend to perform as well as plastic-based insulants for the same thickness.

Question 12:

Do you think that the minimum fabric standards should be set in the Building Regulations or in the Approved Document (as is the current case)?

- 3.43. The Fabric Energy Efficiency Standard is a regulatory standard underpinned by Regulations 26A and 27A. Given that the consultation proposed to discontinue the Fabric Energy Efficiency Standard (Question 13), these Regulations would need to be revoked. This would leave the functional requirement of Part L of Schedule 1 to the Building Regulations as the requirement against which building control bodies would check fabric performance.

- 3.44. The consultation sought views on whether the minimum fabric efficiency values should become regulatory minima through a new regulation.

Question 12	No. of all responses	% of all responses	% of responses to Q12
(a) In the Building Regulations	375	11%	17%
(b) In the Approved Document	1,880	57%	83%
Did not respond	1,055	32%	-

- 3.45. Respondents in favour of setting standards through the Building Regulations anticipated that the clarity that this would provide about the minimum required standard would facilitate enforcement and increase compliance. It was also argued that the Government should consider an approval process, similar to energy assessors producing EPCs, for U-value software application (U-value competency Scheme).
- 3.46. Those respondents in favour of setting standards in the Approved Document commented that setting minimum standards in regulation would cause confusion among industry professionals, and that it was preferable to continue the current, well-established industry practice as Approved Documents are often used as a single point of reference. It was also pointed out that minimum values could be amended more easily in future if situated in statutory guidance rather than in regulations.

Question 13:

In the context of the proposed move to a primary energy metric and improved minimum fabric standards, do you agree with the proposal to remove the Fabric Energy Efficiency target?

- 3.47. We proposed four performance metrics for new homes under Part L 2021, including two new metrics: Primary energy and householder affordability. To minimise complexity and avoid the use of overlapping metrics that may cause confusion, we proposed that the Fabric Energy Efficiency Standard (commonly referred to as FEES) should be removed as a metric. The consultation argued that the remaining performance metrics would encourage good fabric in homes and encourage the use of low carbon heat.

Question 13	No. of all responses	% of all responses	% of responses to Q13
(a) Yes	232	7%	9%
(b) No	2,261	68%	91%
Did not respond	817	25%	-

- 3.48. Among the stakeholders that agreed with this proposal, there was acknowledgement that the proposed performance metrics would be onerous and complicated if we were to retain a Fabric Energy Efficiency target in the calculation, particularly if there were any trade-offs between metrics. Some of the responses we received agreed with the proposal to remove the Fabric Energy Efficiency Standard in principle, but only on the basis that the minimum fabric standards outlined in the consultation should be made more stringent.
- 3.49. The main concern of those that disagreed with this proposal was that it could lead to poorer fabric standards than those currently in place under Part L 2013. Respondents argued that in situations where low carbon heating was installed, such as a heat pump, removing the Fabric Energy Efficiency Standard would enable a poorly insulated building to meet the proposed performance metrics. This could mask poor building fabric and lead to wider issues such as higher energy costs for occupants, or that these homes would require further retrofitting in the future.

- 3.50. Respondents expressed a specific concern that removing the Fabric Energy Efficiency Standard could lead to no assessment of thermal bridging, which in turn could cause liveability problems such as condensation or mould. It was argued by some stakeholders that the importance of the Fabric Energy Efficiency Standard meant that it should be retained as a metric and that a higher standard should be introduced.

Government response to Questions 7 to 13

- 3.51. The energy efficiency of buildings has a significant part to play in achieving the Government's net zero aims, but it also carries wider benefits for consumers and the country at large. We know that, in addition to reducing CO₂ emissions, energy efficient homes minimise energy bills, provide healthier and more comfortable environments to live in, and ensure that as a nation we are making the best use of our energy resources which in turn will help facilitate a faster transition to low carbon energy sources for all. Given our broader objectives around building energy efficiency, it is important that the metrics we use to assess the performance of new homes are fit for a net zero future – this means homes built with world-leading levels of energy efficiency and low carbon heating.
- 3.52. The interim 2021 Part L uplift provides a meaningful incentive to developers to install low carbon heating options in new homes now, to ensure that the necessary supply chain capacity and industry skills are in place to support the implementation of the Future Homes Standard.
- 3.53. Based on these dual objectives, we have settled on a revised package of performance metrics that will ensure a fabric first approach is at the heart of all new homes alongside a low carbon heating system. The following four performance metrics will be used for new homes through Part L 2021:
- i) Primary energy target
 - ii) CO₂ emission target
 - iii) Fabric energy efficiency target
 - iv) Minimum standards for fabric and fixed building services

Primary energy

- 3.54. 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 property's heating system;
 - Power station efficiency for electricity; and
 - The energy used to produce the fuel and deliver it to the property.
- 3.55. A primary energy metric therefore provides a measure of the energy use in dwellings and takes account of upstream energy uses. This will ensure that new homes are energy efficient and making good use of our nation's energy resources regardless of our wider progress towards decarbonising the electricity grid.

- 3.56. More information on primary energy, including an explanation of what primary energy is and how it is calculated, can be found in the *Briefing Note – Derivation and use of primary energy factors in SAP*, which is available on the SAP website:

<https://www.bregroup.com/sap/sap10/>

CO₂ emission targets

- 3.57. While we anticipate that CO₂ emissions will become a less effective measure of building performance over time, we must retain a focus on CO₂ emissions to ensure that developers make low carbon choices when designing all new homes and to track progress against our net zero target.

Fabric energy efficiency target

- 3.58. Many stakeholders expressed concern that removing the Fabric Energy Efficiency Standard metric could in some circumstances lead to lower fabric energy efficiency than desirable when heat pumps are installed in a new home. We consider the principle of a fabric-first approach to be sound and this will inform our approach as we introduce Part L 2021 and transition to the Future Homes Standard in 2025. We will therefore retain the Fabric Energy Efficiency Standard as a performance metric in Part L 2021.
- 3.59. While we could retain the existing Fabric Energy Efficiency Standard metric for Part L 2021, there is scope to introduce a more stringent target. A more demanding Fabric Energy Efficiency Standard would mean better fabric standards for new homes, which may support a smoother transition to the Future Homes Standard. We welcome stakeholders' views on this issue and are consulting on it through *The Future Buildings Standard consultation*, which has been published alongside this document.⁴

Minimum standards for fabric and fixed building services

- 3.60. We will introduce the minimum standards for thermal elements as proposed in the Future Homes Standard consultation. These standards will remove the worst performing 25% of each thermal element currently being built.
- 3.61. While the consultation response was generally in favour of better U-values than those proposed, many of the responses we received were provided in the context of our proposal to remove the Fabric Energy Efficiency Standard. We anticipate that the Fabric Energy Efficiency Standard proposed in *The Future Buildings Standard consultation*,⁴ combined with the minimum fabric standards will drive high overall fabric standards in new homes, while allowing some flexibility in how the Target Fabric Energy Efficiency Rating is met.
- 3.62. As we are retaining the Fabric Energy Efficiency Standard, we will continue to set minimum U-values for thermal elements within the Approved Document. Providing the U-values within the Approved Document does not cause any issues and offers a single point of reference.

Householder affordability rating

- 3.63. The consultation proposed a new householder affordability metric on the basis that it would ensure costly direct electric heating could not be used in new homes, without other mitigating factors being in place to minimise the cost of energy bills. However, the 2021 uplift and the four Part L 2021 performance metrics set out in this chapter, combined with proposals for the level of the Fabric Energy Efficiency Standard in *The Future Buildings Standard* consultation,⁴ will together ensure that energy bills remain affordable. We therefore do not intend to introduce a separate affordability metric on the basis that this is no longer required and would add unnecessary complexity.
- 3.64. By reducing energy demand through good levels of energy efficiency, we can directly address fuel poverty by minimising the energy costs for consumers. The good energy efficiency of homes built to the current Part L 2013 standard already helps to minimise energy bills: householders pay around £379 a year on energy regulated under the Building Regulations. Under the interim Part L 2021 standard, we anticipate that householders will pay around £168 per year on their regulated fuel costs in a home with a gas boiler and a solar panel or around £369 per year on their energy bills in a home with a heat pump (the energy costs associated with a home with a heat pump are subject to the consultation question in *The Future Buildings Standard consultation* on the level of the Fabric Energy Efficiency Standard).⁴
- 3.65. More widely, BEIS have consulted on an updated fuel poverty metric to better track progress towards our statutory fuel poverty target and will publish an updated Fuel Poverty Strategy for England in early 2021.

Question 14:

Do you agree that the limiting U-value for rooflights should be based on a rooflight in a horizontal position?

- 3.66. The consultation 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. The proposed change was intended to reduce the need for conversion factors, which add unnecessary complexity.

Question 14	No. of all responses	% of all responses	% of responses to Q14
(a) Yes	2,027	61%	94%
(b) No	131	4%	6%
Did not respond	1,152	35%	-

- 3.67. Respondents that agreed with this proposal acknowledged the arguments set out in the consultation regarding simplification and consistency.

- 3.68. Those that disagreed were concerned that the proposed roof-light angle was ambiguous. In their responses, some stakeholders were unclear about the definition of a roof-light and the calculation of roof-lights when not used in the horizontal plane.

Government response to Question 14

- 3.69. 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.
- 3.70. We have added new key terms to the Approved Document to provide a clear definition of rooflights and roof windows. We have revised the wording in the 2021 draft *Approved Document L, Volume 1: Dwellings* regarding how to calculate the U-value of rooflights when not used in the horizontal plane, to clarify that for the purposes of assessing whether an element passes the limiting U-values, it should be assessed in the correct plane. The correct plane for windows and roof windows is vertical and for rooflights is horizontal. A note has also been added 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 15:

Do you agree that we should adopt the latest version of BR 443?

- 3.71. The consultation proposed to adopt the new version of BR 443, which offers guidance on the conventions for U-value calculations.

Question 15	No. of all responses	% of all responses	% of responses to Q15
(a) Yes	1,960	59%	97%
(b) No	53	2%	3%
Did not respond	1,297	39%	-

- 3.72. Among respondents that agreed with this proposal, there was acknowledgement that industry should always work to the latest guidance and construction practices possible. It was suggested that there should be a more stringent audit process on U-value calculations to ensure BR 443 is applied across industry consistently. It was also pointed out that the latest version of BR 443 should be clear enough for all users to understand and therefore comply with.
- 3.73. Stakeholders that disagreed with this proposal argued that the new version of BR 443 was out of date and should be revised to reflect the Government's net zero target. Some responses suggested that there may be a need for further consultation on BR 443, given the important role it played in demonstrating compliance with the Building Regulations. A minority also suggested that there were inconsistencies between BR 443 and BS EN 14351-1 or BS EN 16012.
- 3.74. A small number of responses suggested alternative standards, but there was no consensus around the suggestions made.

Government response to Question 15

- 3.75. 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.
- 3.76. As a result of the consultation feedback we received, BRE have made the following changes to BR 443, set out in Table 5.

Table 5 - Summary of amendments to BR 443 based on consultation feedback	
Section	Amendment
1.1	Added explanation why BR443 mentions standards for testing materials
1.2	Added explanation why BR443 mentions linear and point thermal bridges
3.10.2	R=1.7 and footnote deleted
3.10.2	Section on multi-foil insulation aligned with BS EN 16012
3.10.3	Section on thickness of multi-foil insulation aligned with BS EN ISO 16012 and BS EN 832
4.5.2	New section added on dealing with Posi-joists
4.7.4	Slightly ventilated airspace
4.8.4	Wind-posts and masonry support brackets – clarification added
4.10	Light steel-framed walls BRE Digest 465 – made available on BRE Bookshop
9	Now reads “if the ground type is unknown, use category 2 (sand/gravel)”.
9	Added guidance on suspended floor decks
9.2	Added guidance on suspended floors thermal resistance
9.4	Added guidance on semi-exposed floors
9.5	Added guidance on the effect of ground water
11.1	Added dimensions of standard windows
11.3	Added examples for establishing the effect of shutters
14	Added dimensions of standard doors
18	Added example of calculating U-value for elements with multi-foil insulation
Other	Calculation of heat capacity deleted from the document
References	Added possible references
Standards	Updated years of publication for standards published in 2018-2020

- 3.77. The new version of BR443 has been published and is available online:

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

Question 16:

Do you agree with the proposal of removing the fuel factors to aid the transition from high-carbon fossil fuels?

- 3.78. Since 2006, Approved Document L1A has included a table of ‘fuel factors’ that provide some relief to new homes that are built using more carbon intensive fuels

than gas for heating, either because there is no gas main available or because the Government wanted to encourage electrical heating, such as heat pumps.

- 3.79. Grid electricity now has a lower carbon emission factor than gas, which means it no longer needs a fuel factor to support its use. The Government has also made a commitment to phase out high-carbon fossil fuels in the 2020s, starting with new buildings.³ The consultation therefore proposed removing the fuel factors for high carbon fossil fuels such as LPG, oil, and solid mineral fuels to support this transition.
- 3.80. The removal of fuel factors means that any new building would need to meet the full primary energy and CO₂ emissions targets produced by the gas-heated notional building. This would mean that if a developer chooses to use oil, LPG or solid mineral fuel in a new home, considerable mitigating measures would need to be installed, such as more insulation, to achieve the Part L targets.

Question 16	No. of all responses	% of all responses	% of responses to Q16
(a) Yes	2,051	62%	95%
(b) No	118	4%	5%
Did not respond	1,141	35%	-

- 3.81. Respondents in favour of removing fuel factors agreed with the principle of moving away from high carbon fuels and welcomed the simplification this would bring to calculations. There was some support around a phased approach to removing fuel factors.
- 3.82. Some stakeholders highlighted the issue of rural housing, which may be built off both the gas and electricity grid. There were specific concerns around the affordability of energy bills if high carbon fossil fuels could not be easily installed. Others predicted higher build costs or construction challenges for these homes, and it was argued that exemptions would be appropriate in scenarios where no grid fuel sources are available.
- 3.83. There was some support around introducing a direct ban on the use of high-carbon fossil fuels in new homes, while other responses appreciated that the proposed approach would provide developers with some flexibility to meet the target through additional mitigating measures such as increased insulation.
- 3.84. It was suggested by some respondents that the fuel factor for LPG should remain in place on the basis that it has the lowest emission factor of the high-carbon fossil fuels and in recognition of the fact that LPG is being decarbonised through the introduction of bio-LPG. Others suggested that emission factors for bio-LPG and bio-oil should be available in SAP so that they can be distinguished from higher carbon varieties.

Government response to Question 16

- 3.85. The Government remains committed to phasing out the installation of high carbon fossil fuel heating in new and existing homes currently off the gas grid during the

2020s, starting with new homes. It is essential that the standards we set for new homes support this ambition and we will therefore remove fuel factors.

- 3.86. We are mindful of the impact on new rural homes, particularly given concerns that were raised regarding the affordability of heating costs if high carbon fossil fuels are discouraged. Our analysis shows that it is most likely that new homes will be built using heat pumps, which for consumers we anticipate will result in regulated energy fuel bills of £369 per year. In new homes where high-carbon fossil fuels continue to be the most appropriate fuel, for example due to a lack of an electricity network, the mitigating measures required on the home, such as insulation, will mean that fuel bills will be even lower for occupants.
- 3.87. Concerns were raised regarding the lack of recognition of bio-fuels within SAP. Part L remains technology neutral, which means that it is possible to build homes with any fuel as long as appropriate mitigating measures are in place, and there are many possible solutions for new homes that do not rely on the use of biofuels, such as a heat pump. We consider the use of biofuels, such as biolPG, a potential option in the decarbonisation of existing homes that are currently using high carbon fossil fuels. However, due to limited feedstocks, it is likely not possible for biofuels to be widespread in new buildings which are suitable for heating by a heat pump or heat network. Furthermore, a key concern regarding the use of biolPG in new homes is the ability of consumers to switch to using regular LPG, making a newly built home more polluting than was intended. We intend to continue to explore the best use of biofuels in new buildings, and how policies should be designed to deliver the best outcomes for a net zero future.

Question 17:

Do you agree with the proposed changes to minimum building services efficiencies and controls set out in table 3.2?

- 3.88. The consultation proposed that minimum standards for building services should be set in the Approved Documents rather than the Domestic Building Services Compliance Guide, and that the guidance should be simplified. We also proposed uplifts to minimum building services efficiencies and controls where:
- Evidence suggested that specifying higher performance or controls for certain technologies had become cost-effective;
 - Evidence suggested that the minimum standards were below that of typical practice; and
 - Other regulatory requirements applied which increased the minimum standard (for example, Ecodesign requirements).

Question 17	No. of all responses	% of all responses	% of responses to Q17
a) Minimum standard for Gas Boiler efficiency (92% ErP)	Agree	456	14%
	Too far	166	5%
	Not far enough	1,427	43%
	Did not respond	1,261	38%

b) Minimum standard for Heat Pump efficiency (SCOP 2.80)	Agree	407	12%	20%
	Too far	169	5%	8%
	Not far enough	1,421	43%	71%
	Did not respond	1,313	40%	-
c) Minimum standard for Comfort Cooling efficiency (SEER 3.87)	Agree	344	10%	17%
	Too far	171	5%	9%
	Not far enough	1,470	44%	74%
	Did not respond	1,325	40%	-
d) Minimum standard for Lighting (60 lamp lumens per circuit-watt)	Agree	339	10%	17%
	Too far	174	5%	9%
	Not far enough	1,483	45%	74%
	Did not respond	1,314	40%	-

- 3.89. Most local authorities, building control approved inspectors, competent persons scheme operators, manufacturers and national representative/trade bodies agreed with the proposed standards. Installers and specialist sub-contractors expressed mixed views, but the majority of those who responded still supported the proposals.
- 3.90. Increased efficiency values were put forward by some respondents. In the case of boilers, it was suggested that the minimum efficiency should be even higher while others argued that the existing proposal went too far, to the point that the market may not be able to support the change. However, few respondents overall thought that the proposed standards went too far, and no sector of industry overwhelmingly disagreed on the basis that the standards were too onerous to meet.
- 3.91. Some respondents noted that efficiency in use is more important than manufacturers' values, as quality of installation can affect efficiencies. A small number of respondents noted that more standards could be included, including waste water heat recovery, heat networks, direct electric heating and liquid fuel fired heating systems.

Government response to Question 17

- 3.92. The minimum standards are designed to remove the worst performing products from the new build market, while leaving room for design approaches that differ from the notional building specification. We expect that, in most cases, the efficiency of fixed building services will be higher than these minimum standards so that the building can meet the whole building energy performance standards.
- 3.93. We have carried out further market analysis based on the evidence provided in consultation responses from manufacturers, individuals and other organisations. As a result, we will increase some of the minimum services efficiencies beyond those presented in the consultation (Table 6).

Table 6 – Revisions to minimum building services efficiencies and controls for new dwellings

Application	Current Part L 2013 Standard	Proposed Part L 2020 standard	Final Part L 2021 standard
a) Gas Boiler efficiency	88% SEDBUK 2009	92% ErP	92% ErP
b) Heat Pump efficiency	SCOP ‘D’ if $\leq 12\text{kW/COP}2.5$	SCOP 2.80	SCOP 3.00
c) Comfort Cooling efficiency	EER 2.4 if air cooled and EER 2.5 if water cooled	SEER 3.87	SEER 4.00
d) Lighting	45 lamp lumens per circuit-watt	60 lamp lumens per circuit-watt	75 lamp lumens per circuit-watt

- 3.94. For **gas boilers**, we consider a minimum efficiency of 92% to be reasonable based on the products available on the market.
- 3.95. For **heat pumps**, we recognise that many systems perform better than a minimum efficiency of 3.00. However, we wish to allow for a range of different heat pump technologies and approaches, particularly where the application in new homes builds a larger market for systems which can be of benefit in the existing housing stock.
- 3.96. For **comfort cooling**, a minimum efficiency of 4.00 will ensure that only the most efficient cooling systems can be used in new homes.
- 3.97. For **lighting**, in recognition of recent technological advances, we will increase the minimum efficacy to 75 lamp lumens per circuit-watt. Many responses suggested a minimum efficacy of 80 lamp lumens per circuit-watt. Setting a standard at 80 would, however, prevent many replaceable LED lamps from being installed in new homes.

Question 18:

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

Question 19:

How should we encourage new dwellings to be designed to operate with a flow temperature of 55°C?

- 3.98. Low carbon heating systems will play an integral role in delivering the Future Homes Standard and in achieving our wider net zero aims. The diverse possibilities for low carbon heat in the future means that we cannot future-proof current standards for every possible scenario. However, we are committed to introducing measures for new homes through the interim 2021 Part L uplift, which will make it easier to install low carbon heating in future.
- 3.99. The consultation proposed that new homes should have a space heating system that is designed to operate at a flowrate temperature of 55°C or lower, which will

make it easier to install heat pumps or district heating in the future. In the short term, this flow temperature will also have the additional benefit of increasing the efficiency of condensing boilers, providing an immediate energy saving to the consumer.

Question 18	No. of all responses	% of all responses	% of responses to Q18
(a) Yes	363	11%	17%
(b) No, the temperature should be below 55 °C	327	10%	15%
(c) No, dwellings should not be designed to operate with a low flow temperature	33	1%	2%
(d) No, I disagree for another reason	1,413	43%	66%
Did not respond	1,174	34%	-

3.100. The consultation asked how we can require or encourage new dwellings to be designed to operate with a flow temperature of 55 °C.

Question 19	No. of all responses	% of all responses	% of responses to Q19
(a) By setting a minimum standard	1,921	58%	91%
(b) Through the target primary energy and target emission rate (i.e. through the notional building)	98	3%	5%
(c) Other	92	3%	4%
Did not respond	1,199	36%	-

3.101. Respondents that agreed with the proposed flow temperature of 55°C recognised that this would future-proof homes for different types of low-carbon heat and provided immediate efficiency benefits for other heating systems, while allowing a degree of flexibility in heating system design. Some respondents suggested that 55°C should be the maximum temperature with designers opting for lower if appropriate.

3.102. Those who thought dwellings should not be designed to operate with a low flow temperature argued that it would restrict design flexibility and limit technologies. Respondents reasoned that large radiators may be difficult to position in small dwellings or suggested that designing systems to be compatible with other technologies may not be feasible in practice.

3.103. Some argued in favour of a lower flow temperature as this could lead to more efficient heat pump operation in future and reduce the risk of homes overheating. Respondents suggested 50°C or 45°C as a more appropriate temperature to support transition to efficient heat pumps. A small number of respondents suggested 35°C or 30°C.

3.104. Some respondents suggested that the Government should provide additional guidance on low temperature radiator connections and district heating network

integrations. It was noted that there was a necessity for legionella prevention, with the need to distinguish between hot water and space heating.

- 3.105. The majority of respondents agreed that low temperature heating should be part of the Approved Document guidance, rather than encouraged through SAP or other means. Some manufacturers and energy sector groups commented that the standard should include design requirements for pipework, heat emitters and include weather compensation. It was suggested that the guidance should refer to the BRE guide for the design of low temperature Domestic Heating Systems (FB 59). There was support around including additional guidance, including storage requirements relating to legionella growth, installation, hydraulic balancing and examples of suggested technologies that perform at the low temperature.
- 3.106. Those who agreed with encouraging use through the notional building highlighted that this would allow flexibility of design and innovation. It was noted that the design flow temperature should be based on the system being installed and the overall building strategy. A particular concern was raised regarding the fact that some large-scale schemes could be rendered non-compliant if a minimum standard is set, as future phases of development may be connected to existing heat networks that may not be designed to operate at a low flow temperature.

Government response to Questions 18 and 19

- 3.107. We have introduced guidance into the 2021 draft *Approved Document L, Volume 1: Dwellings* to encourage new heating systems to be designed to operate at a flowrate temperature of 55°C or lower.
- 3.108. We have improved the guidance by referencing the BRE guide for the design of low temperature Domestic Heating Systems (FB 59) in the Approved Document. This defines a low temperature system as operating at a mean water temperature of 50°C or lower (note that 55°C flow temperature is compatible with this). We have also added a note about legionella control into the Approved Document.

Question 20:

Do you agree with the proposals to simplify the requirements in the Building Regulations for the consideration of high-efficiency alternative systems?

- 3.109. Regulation 25A of the Building Regulations requires that the technical, environmental and economic feasibility of high-efficiency alternative systems, if available, is considered and taken into account before construction starts on a new building. Examples of these systems include:
- Heat pumps;
 - District or block heating or cooling, particularly where it is based entirely or partially on energy from renewable sources;
 - Decentralised energy supply systems based on energy from renewable sources; and
 - Cogeneration.

3.110. The consultation proposed to simplify this requirement by removing the list of example systems, and by removing the requirement to give notice to the local authority that states the analysis has been carried out.

Question 20	No. of all responses	% of all responses	% of responses to Q20
(a) Yes	2,017	61%	96%
(b) No	95	3%	4%
Did not respond	1,198	36%	-

3.111. Respondents that supported this proposal, including most industry groups, agreed with the reasoning set out in the consultation around simplifying the requirement and some emphasised the positive impact this would have on innovation and developing skills within industry. Some responses suggested going further and asked whether Regulation 25A should be repealed entirely on the basis that local authority notice would not be required and new Part L standards will mean that some form of high-efficiency system, for example a heat pump, will become more mainstream in new homes.

3.112. Some respondents, including councils, were concerned that local authorities would not be notified and that this could lead to disparities of information held between regions. It was argued by some stakeholders that maintaining the list of example systems would be useful for those who have little knowledge of high-efficiency alternative systems, while others argued the list should be kept and updated frequently with new innovations.

Government response to Question 20

3.113. 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 by removing the list of example systems and the requirement to give notice to the local authority that the analysis has been carried out.

3.114. This will not change the need for this analysis to be undertaken and will not prevent local authorities from requiring evidence that such analysis has been performed.

Calculating the primary energy rate and emission rate

Question 21:

Do you agree with the proposal to adopt the latest Standard Assessment Procedure, SAP 10?

3.115. The Standard Assessment Procedure (SAP) is the methodology used by the Government to assess and compare the energy and environmental performance of dwellings. The consultation proposed adopting the latest version of SAP, SAP 10, as the tool used to determine compliance with the energy efficiency requirements of the Building Regulations.

Question 21	No. of all responses	% of all responses	% of responses to Q21
(a) Yes	411	12%	19%
(b) No	1,797	54%	81%
Did not respond	1,102	33%	-

3.116. Most respondents to this question did not fundamentally disagree with the use of the Standard Assessment Procedure in principle, but we received suggestions aimed at improving the system of energy modelling for compliance with Part L of the Building Regulations. There was some concern that SAP predicts poorly, particularly for heating demand. Respondents suggested the inclusion of dynamic thermal modelling as an option for demonstrating compliance with Part L, particularly in relation to larger, complex buildings. There were also calls for Government to consider using measured data to assess as-built compliance.

3.117. It was suggested that more frequent reviews of SAP should take place, including the carbon emission factors, and there was some interest in moving to 15-year projections of emissions rather than the 5-year projection proposed.

Government response to Question 21

3.118. We will adopt the latest version of SAP, which will be SAP 10.3, at implementation of Part L 2021.

3.119. The Government and the BRE have undertaken significant development work on SAP to ensure that it reflects the latest research and available technologies. Such development work ensures that SAP is a modern tool, able to calculate the energy demand of buildings accurately. We recognise that including the option of modelling using dynamic thermal tools would be convenient and more accurate in some circumstances, such as a block of flats. Such a change would require validation between SAP and dynamic thermal simulation software to ensure that the outputs are comparable and further consultation would be required. This will not be possible in time for the Part L 2021 uplift, but we will investigate this for SAP 11, which will be implemented alongside the Future Homes Standard.

3.120. The Government would like to make some minor amendments to SAP, including amendments to how natural gas Combined Heat and Power (CHP) units and recovered heat sources are modelled. A separate consultation will be launched in early 2021.

3.121. Respondents provided some comments and suggestions regarding specific parts of SAP 10, and Table 7 sets out a response to the issues that were raised most frequently.

Table 7 - Summary of suggested amendments to SAP 10

Suggested Amendment	Response
<i>Comment that SAP should balance the need to reduce overheating with heating demand in winter.</i>	<p><i>The Future Buildings Standard consultation includes proposals to introduce a new overheating mitigation requirement in the Building Regulations for new residential buildings.⁴ Within this consultation we have proposed providing two methods to demonstrate compliance with the new requirement. Due to this we have also proposed removing the guidance on limiting the effects of heat gains in summer in the Approved Document for new dwellings in Approved Document L1A and removing the SAP Appendix P summer heat gain check.</i></p> <p><i>SAP will continue to assess thermal mass (including k-values) to calculate space heating and look at the impact of shading on solar gains, PV and solar thermal.</i></p>
<i>Comment that the default heat interface unit heat loss is too high, compared to many on the market.</i>	<p><i>The treatment of heat losses from heat interface units (HIUs) will be adjusted for SAP 10.2. The default standing heat loss rate will be updated (based on recent testing data). A new table will also be added to the Product Characteristics Database (PCDB), which will enable the input of measured heat loss performance data (where an accredited testing methodology has been used).</i></p>
<i>Emission factors requested for hydrogen and bio-LPG.</i>	<p><i>We are not yet including hydrogen in SAP as it is yet to be a heating option offered in homes. Further research will be needed to determine the emission factors for hydrogen once in use. On bio-LPG, as with electricity we will be reflecting bio-LPG in the emissions factors for all LPG. SAP 10.2 will allow for new fuel types to be added via the PCDB between SAP updates if relevant.</i></p>
<i>Concern about the way results from blower tests are converted into infiltration rates (i.e. the “divide by 20 rule”).</i>	<p><i>This would require significant research and a change to the method which will not be possible in time for the Part L 2021 uplift. Making this change to SAP would require suitable consultation with relevant stakeholders. We will investigate this for SAP 11 which will be implemented alongside the Future Homes Standard.</i></p>
<i>Request that the effect of MVHR ductwork length on system efficiency is taken account of.</i>	<p><i>This would require significant research and a change to the method which will not be possible in time for the Part L 2021 uplift. Making this change to SAP would require suitable consultation with relevant stakeholders. We will investigate this for SAP 11 which will be implemented alongside the Future Homes Standard.</i></p>

<i>Request that the impact of filters on efficiencies of ventilation systems is taken account of.</i>	This would require significant research and a change to the method which will not be possible in time for the Part L 2021 uplift. Making this change to SAP would require suitable consultation with relevant stakeholders. We will investigate this for SAP 11 which will be implemented alongside the Future Homes Standard.
<i>Use of recovered heat in heat networks.</i>	We plan to amend SAP Appendix C to more accurately represent the varied sources of recovered heat available for use in heat networks. More detail will be set out in the SAP consultation in early 2021.
<i>Suggestion that the calculation for the quantity of domestic hot water and its associated CO₂ emissions is incorrect.</i>	We will be updating SAP 10 to account for the changing efficiency of waste water heat recovery systems with shower flow rates. We have also changed SAP so that it no longer double-counts the 5% reduction associated with Part G of the Building Regulations (Sanitation, hot water safety and water efficiency).

Question 22:

Do you agree with the proposal to update the source of fuel prices to BEIS Domestic energy price indices for SAP 10.2?

3.122. Within SAP, fuel prices have previously been informed by data from Sutherland Tables. The consultation proposed to use data from BEIS's 'Domestic energy price indices' on the basis that this was more robust than Sutherland Tables' data for some fuel prices. Where figures are not available from the BEIS source, data would continue to be sourced from the Sutherland Tables.

Question 22	No. of all responses	% of all responses	% of responses to Q22
(a) Yes	1,935	59%	96%
(b) No	80	2%	4%
Did not respond	1,295	39%	-

3.123. While there was broad agreement around the proposed approach, some respondents queried the frequency of updates to these tables. BEIS domestic energy price indices are updated quarterly, so respondents from almost all areas of industry wanted to know if SAP would be updated to reflect changes to BEIS's indices.

3.124. Respondents that supported the proposal felt it would ensure that SAP calculations reflect real prices. It was suggested that accuracy could be improved even further if the live variation of prices was considered, for example with seasonal and annual fluctuations.

Government response to Question 22

3.125. BEIS's Domestic energy price indices is the most robust fuel price data source available. We therefore intend to use this data as the source of fuel prices for SAP 10. We will use the most up-to-date version of these fuel prices, which are published on this website:

<https://www.gov.uk/government/statistical-data-sets/monthly-domestic-energy-price-statistics>

3.126. Making a change to SAP to reflect live prices would require changes in how fuel prices are treated in SAP and the SAP software, which cannot be done without suitable consultation with relevant stakeholders. We will consider whether the SAP fuel prices should be updated annually for the next version of SAP: SAP 11.

Question 23:

Do you agree with the method in Briefing Note – Derivation and use of Primary Energy factors in SAP for calculating primary energy and CO₂ emissions factors?

3.127. The consultation included a Briefing Note that set out the proposed method for calculating the primary energy and CO₂ factors which would be used within SAP to convert the modelled energy use into primary energy and CO₂. This generally followed the methodology set out in the 2013 version of Part L, with fuel prices, CO₂ and primary energy factors updated to reflect the latest data and the decarbonising grid. We also moved from a three-year to a five-year average of predicted values.

Question 23	No. of all responses	% of all responses	% of responses to Q23
(a) Yes	321	10%	17%
(b) No	1,616	49%	83%
Did not respond	1,373	42%	-

3.128. There was agreement with the proposed approach among local authorities, manufacturers and suppliers, and national representative or trade bodies. A small proportion of respondents stipulated that they would support these measures on the condition that the factors are kept up to date.

3.129. Respondents that disagreed with this proposal argued that the calculation or derivation of primary energy factors was not clear, and that a clear calculation methodology should be set out in the document. There were also calls for further explanation regarding the grid electricity primary energy factor. It was suggested that the factors calculated do not account for variation, both daily and seasonal, in electricity emissions and that the fuel mix used for the calculation of factors relating to electricity were not clear.

Government response to Question 23

3.130. We have improved the Briefing Note by more clearly setting out the methods used for deriving factors. An improved and reissued Note has been published on the following website:

3.131. Many stakeholders requested that primary energy and CO₂ factors should be kept up to date. The factors we use were based on the period 2020 to 2025, ensuring that they will stay up to date for the life of the Part L 2021 policy. While we recognise that no prediction can be completely accurate, dynamic factors would lead to changing Part L targets. It is important to give industry the certainty they need to plan buildings, which is why we do not have dynamic factors.

3.132. Some respondents raised the issue that the factors do not account for the variation in daily and seasonal primary energy and CO₂ emissions of electricity. We do not intend to move to marginal emission factors for this version of SAP because it would require a major change to the calculation method which has not been consulted on. However, we are investigating this for SAP 11.

Question 24:

Do you agree with the removal of Government Approved Construction Details from Approved Document L?

3.133. In previous versions of Part L, the Government developed and published a series of detailed drawings to help home builders minimise heat losses at joints, junctions and corners (known as thermal bridges) and to help achieve performance standards. Over time, these Approved Construction Details have become out of date and the consultation proposed to remove the option of using these on the basis that they will no longer work with the new fabric specifications for Part L 2021

Question 24	No. of all responses	% of all responses	% of responses to Q24
(a) Yes	299	9%	14%
(b) No	1,835	55%	86%
Did not respond	1,176	36%	-

3.134. Some respondents that disagreed with this proposal argued that smaller projects are unable to employ a consultant to undertake calculations and therefore rely on Approved Construction Details. There was concern that smaller projects would choose to offset the default thermal bridges by over-compensating the building fabric in other areas. It was argued that significant upskilling would be required across industry, which may not be available or cost effective. We received suggestions that Government should provide a comprehensive library of thermal bridging details, especially for smaller projects, to use as a stepping stone to bespoke thermal bridging calculations alongside the Future Homes Standard. There was support for a move towards more accurate thermal bridging calculations and reduced thermal bridging in homes. Some respondents suggested that if Approved Construction Details are not updated, alternative more accurate guidance is required to establish how to deliver continuity of insulation.

3.135. Respondents that agreed with this proposal felt that the Approved Construction Details were out of date and frequently misapplied. We received suggestions that there should be an up to date online database which can be easily accessed.

3.136. Some respondents argued that the energy assessor's accrediting bodies and building control officers should play a more active role in ensuring appropriate psi-values/calculations and some respondents went on to say that it is critical that the assessors are adequately competent.

Government response to Question 24

3.137. We will proceed with our proposal to remove the Government Approved Construction Details from *Approved Document L, Volume 1: Dwellings* on the basis that they are out of date and will no longer work with the new fabric specifications for Part L 2021.

3.138. While there was some concern for small projects and the access they had to methods of assessing thermal bridging details, we will continue to provide these methods in the 2021 draft *Approved Document L, Volume 1: Dwellings* under Continuity of Insulation.

3.139. In addition, set out in the Government's Standard Assessment Procedure (SAP) are several different possibilities for specifying thermal bridging, including a comprehensive library of thermal bridging details that would assist smaller projects, to use as a stepping stone to bespoke thermal bridging calculations alongside the Future Homes Standard.

Question 25:

Do you agree with the proposal to introduce the technology factors for heat networks, as presented in the draft Approved Document?

3.140. In recognition of the fact that district heat networks comprise an important part of our energy future in England, the consultation proposed the introduction of 'technology factors' to be applied in calculations for the target emission rate and target primary energy rate for new dwellings where the design incorporates heat networks. Technology factors are intended to encourage connections to existing heat networks where they have the ability to decarbonise over time and incentivise the construction of new low carbon networks.

Question 25	No. of all responses	% of all responses	% of responses to Q25
(a) Yes	255	8%	12%
(b) No - they give too much of an advantage to heat network	1,258	38%	60%
(c) No - they do not give enough of an advantage to heat network	46	1%	2%
(d) No – I disagree for another reason	538	16%	26%
Did not respond	1,213	37%	-

3.141. Those respondents in favour of this proposal agreed with incentivising the adoption of low carbon heat networks and the ability to continue to connect to existing heat networks that were designed to be compliant with previous versions of Part L.

However, some argued that the technology factors proposed do not give enough of an advantage to heat networks.

- 3.142. Among the respondents that disagreed with this proposal, it was felt that the proposed factors gave too much of an advantage to heat networks. Respondents suggested that Part L should be technology neutral or that there is an insufficient basis for heat networks to be treated preferably given the relatively high capital costs, high distribution losses and unsuitability in some circumstances. There was concern that the policy would encourage the continuing use of fossil fuels, such as through using gas CHP boilers, when low carbon heating should be a priority. Some respondents highlighted the risk of unintended consequences, such as poorer fabric efficiency. Respondents suggested that any policy to support new connections to existing fossil-fuelled heat networks as part of the transition to low carbon heating should ensure that the building is future-proofed and a strategy put in place to ensure low carbon heating in the future.
- 3.143. Stakeholders expressed concerns regarding a lack of detail on how the factors were derived and that the factors were overly stringent, making it too challenging to build to deliver the policy intent. It was highlighted that the final set of technology factors are dependent on, and should account for, a finalised version of SAP 10 including changes to the primary energy and CO₂ emission factors and the distribution loss factors, and the use of the Products Characteristic Database by heat networks.

Government Response to Question 25

- 3.144. To further investigate the issues of heat networks within Part L and SAP we established a new industry working group which included experts in heat network design, local planning issues and housing development. In addition to this we have been doing further analysis across Government on the benefits of gas CHP compared to individual gas boilers.
- 3.145. By generating heat and power simultaneously from the same fuel, CHP can reduce carbon emissions compared to the separate generation of heat through a gas-fired boiler and an electricity power station. SAP 10.1 was not reflecting the carbon emission reduction benefits of gas CHP because marginal emissions factors would be required, which SAP does not have. A wholesale change to marginal emission factors would complicate SAP and offer little accuracy benefit for most technologies. To address this, we intend to change the emissions and primary energy factor in SAP 10.2 for heat networks using gas CHP. A separate consultation will be launched by the Department of Business, Energy and Industrial Strategy in early 2021, entitled *SAP 10.2 – updates for heat networks*. This will include a number of proposed reforms to SAP but primarily addresses the carbon performance of gas-fired CHP and proposes reforming the PCDB to allow networks to more easily and accurately enter their heat loss statistics.
- 3.146. We think it is important to transition to low carbon heat networks as soon as possible. To encourage the decarbonisation of existing heat networks and the building of new lower carbon heat networks in future, we will not provide technology factors or any other relaxation in standards for heat networks. Therefore, new

homes connected to heat networks will need to meet the full primary energy, emission and fabric energy efficiency rate.

Guidance

Question 26:

Do you agree with the removal of the supplementary guidance from Approved Document L, as outlined in paragraph 3.59 of the consultation document?

3.147. The consultation proposed removing supplementary information from the Approved Documents, with the aim of providing guidance which is clearer about what is expected of home builders in complying with regulatory requirements. This aligns with recommendations in Dame Judith Hackitt's final report on the Independent Review of Building Regulations and Fire Safety.

Question 26	No. of all responses	% of all responses	% of responses to Q26
(a) Yes	250	8%	13%
(b) No	1,745	53%	87%
Did not respond	1,315	40%	-

3.148. Respondents that agreed with this proposal broadly accepted the reasoning in the consultation document. It was noted that increasing the clarity of the guidance would remove ambiguity on what was needed to achieve compliance with the Regulations. There was also acknowledgement that the proposal would remove outdated guidance and improve accessibility.

3.149. Respondents that disagreed with this proposal felt that additional guidance is useful in meeting complex mandatory requirements. Many builders and developers noted that supplementary information is especially useful for professionals who are less experienced or belong to a small to medium sized company. It was argued that removing this information risked poorer design choices and some respondents noted that the proposal may result in increased reliance on British Standards or other industry guidance, which may come at a cost to the user. There were calls for the supplementary guidance to be updated or made available as a live document to provide digital and updated references.

3.150. We received detailed comments on specific topics, where respondents disagreed with the removal of the supplementary information.

Government response to Question 26

3.151. We will remove supplementary information from the Approved Documents to ensure 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.

3.152. Based on stakeholder feedback that we received through the consultation, we will retain the following supplementary information:

- A section on commissioning;
- A section on Energy Performance Certificates; and
- A reference and definition under the system specific guidance with regards to domestic hot water heating.

Question 27:

Do you agree with the external references used in the draft Approved Document L, Appendix C and Appendix D?

3.153. In order to provide further useful guidance, the consultation included external references in the 2019 draft *Approved Document L, Volume 1: Dwellings*, Appendix C and Appendix D to a variety of standards and reference guides.

Question 27	No. of all responses	% of all responses	% of responses to Q27
(a) Yes	1,828	55%	96%
(b) No	85	3%	4%
Did not respond	1,397	42%	-

3.154. The responses we received emphasised the importance of ensuring that external references are updated.

3.155. We received suggestions that BR 497 should be added as a reference. We also received the suggestion that documents should be referenced without a date in order to allow people to use the latest version, or that the Government's position on industry using the latest version should be clarified.

3.156. There was some disagreement with the external references used in the 2019 draft *Approved Document L, Volume 1: Dwellings*, Appendix C and Appendix D. However, there was no consensus around the additional references that were suggested. There were also calls for external references to be made easily and freely accessible, with some respondents suggesting a web page with external references and links, updated methodologies and standards.

Government response to Question 27

3.157. We intend to include the external references used in the 2019 draft *Approved Document L, Volume 1: Dwellings* Appendix C and Appendix D. Following consultation feedback, we have made some minor amendments, including:

- Referencing the most up to date versions of standards, such as BS EN 14351-1 [2006(+AMD 2:206)]; and
- Including standards, such as CIBSE/ADE Guide CP1: Heat Networks Code of Practice for the UK, BRE Report BR 497 Conventions for calculating linear thermal transmittance and temperature factors (2007 and 2010 amendment and conventions) and BS 7593 Code of practice for the preparation, commissioning and maintenance of domestic central heating and cooling water systems (2019).

3.158. We will continue to use references with a version date in order to ensure that external references are the correct and appropriate version for the guidance. We have also already made progress on modernising guidance by publishing a fully searchable PDF of all Approved Documents.

Question 28:

Do you agree with incorporating the Compliance Guides into the Approved Documents?

3.159. The Compliance Guides serve an important purpose in providing additional guidance to the Approved Documents, comprising a mixture of good practice guidance, minimum standards and references to regulations other than the Building Regulations.

3.160. To clarify the status of the Guides, the consultation proposed to incorporate all of the minimum standards from the Domestic Building Services Compliance Guide and the Domestic Ventilation Compliance Guide into the Approved Documents. To match the style of the Approved Documents, this included removing all ‘good practice’ guidance, supplementary information, and guidance relating to non-Building Regulation matters.

Question 28	No. of all responses	% of all responses	% of responses to Q28
(a) Yes	489	15%	24%
(b) No	1,518	46%	76%
Did not respond	1,303	40%	-

3.161. Respondents in favour of this proposal agreed that guidance formerly in the Compliance Guides would have a clearer status and clarified structure in the Approved Document. It was noted that this approach would help users to distinguish between Regulations and best practice methods. Several respondents noted the availability of guidance from industry, commercial organisations and trade bodies who are well placed to provide supplementary information.

3.162. For those who disagreed with this proposal the main concern was that useful guidance may be lost, however, it was not clear that losing this guidance would cause any specific issues. Some respondents, particularly small to medium sized builders, considered the supplementary, best practice guidance and background methodology to be useful. Some respondents felt that this proposal would result in infrequent updates of standards as technology evolves or lead to complicated and unwieldy approved documents. There were also concerns around the lack of freely

available or easily accessible information, and the potential confusion for building control bodies on the status of differing industry guidance and related flexibility.

Government response to Question 28

- 3.163. 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 informative guidance. We will therefore proceed with the proposal to incorporate parts of the Compliance Guides into the Approved Documents.
- 3.164. To meet our objectives of clarity and utility, it is crucial that building services guidance is set at an appropriate level for the Approved Documents. We will therefore base the Approved Document guidance around minimum standards. This will provide an opportunity for industry, who are better placed to provide best practice and sector-specific guidance, to provide their own guides to supplement the Building Regulations minimum guidance.

Question 29:

Do you agree that we have adequately covered matters which are currently in the Domestic Building Services Compliance Guide in the new draft Approved Document L for new dwellings?

Question 30:

Do you agree that we have adequately covered matters which are currently in the Domestic Ventilation Compliance Guide in the new draft Approved Document F for new dwellings?

- 3.165. The consultation sought views on whether the draft Approved Documents for new dwellings adequately covered matters which are currently in the Domestic Building Services Compliance Guide and Domestic Ventilation Compliance Guide.

Question 29	No. of all responses	% of all responses	% of responses to Q29
(a) Yes	418	13%	22%
(b) No	1,456	44%	78%
Did not respond	1,436	44%	-

- 3.166. Respondents that agreed with the proposed approach acknowledged that appropriate reference material was provided in the 2019 draft *Approved Document L, Volume 1: Dwellings*.

- 3.167. Those that disagreed with the proposed approach expressed concern around the potential loss of useful guidance. We received detailed comments from some stakeholders on specific topics which they felt were not adequately covered in the 2019 draft *Approved Document L, Volume 1: Dwellings*.

Question 30	No. of all responses	% of all responses	% of responses to Q30
(a) Yes	240	7%	13%
(b) No	1,621	49%	87%
Did not respond	1,449	44%	-

3.168. Respondents expressed concern around the potential loss of useful guidance, explanatory diagrams and best practice information on installation, inspection, testing and commissioning. It was suggested that introducing the proposal over a longer period of time would offer industry time to develop their own guidance, potentially in collaboration with the British Standards Institution.

3.169. We received detailed comments from some stakeholders on specific topics which they felt were not adequately covered in the 2019 draft *Approved Document F, Volume 1: Dwellings*.

Government response to Questions 29 and 30

3.170. We will proceed with the proposal to incorporate sections of both Compliance Guides into the 2021 Approved Documents L and F for new dwellings. Based on the feedback we received through consultation, we have made the following amendments to *Approved Document L, Volume 1: Dwellings*:

- Including references such as BS 7593 2019 and CIBSE/ADE CP1 Heat Networks: Code of practice for the UK (2015);
- Including further definitions such as Primary Pipework; and
- Rephrased unclear terms under the sub-heading mechanical ventilation.

3.171. The 2021 draft *Approved Document L, Volume 1: Dwellings* contains more guidance on building services, particularly for those services likely to be installed in existing dwellings. These standards will also be applicable for new dwellings, and stakeholders may wish to review these consultation proposals.

3.172. We have made the following amendments in the 2021 draft *Approved Document F, Volume 1: Dwellings*:

- Updated naming conventions for ventilation system types;
- Clarified the meaning of ‘expert advice’;
- Revised the commissioning checklist; and
- Revised guidance on background ventilator sizing (see Question 42).

Question 31:

Do you agree with the proposals for restructuring the Approved Document guidance?

3.173. The consultation proposed collating all guidance for dwellings into a single document and restructuring the Approved Documents to align with the legislative requirements. It was noted that a new overheating standard in a different part of the Building Regulations may result in guidance on limiting heat gains in summer being removed from the 2021 draft *Approved Document L, Volume 1: Dwellings*.

Question 31	No. of all responses	% of all responses	% of responses to Q31
(a) Yes	371	11%	18%
(b) No	1,652	50%	82%
Did not respond	1,287	39%	-

- 3.174. Respondents that agreed with the proposed approach noted that it would keep standards accessible for industry and acknowledged that it was advantageous to closely match guidance with clear legislative requirements. It was noted that a single point of reference provided increased clarity and may help improve compliance.
- 3.175. The main concern expressed by respondents that disagreed with this proposal was that they felt all sections of the new Approved Documents were needed, including for existing homes and non-domestic buildings, to adequately assess the restructure. Some stakeholders argued that the proposed approach was more complex as professionals rarely referred to the Regulations. Others argued that they are familiar with the current four volumes for Approved Document L, and that they are well understood and logical for how work is approached on different building types.
- 3.176. The lack of overheating or daylight requirements was raised by some respondents and others highlighted the importance of ensuring there was appropriate alignment between Approved Documents B (Fire Safety), L (Fuel and Power), F (Ventilation) and Q (Security).

Government response to Question 31

- 3.177. While we appreciate stakeholders are familiar with the existing structure of the Approved Documents, we intend to restructure the Approved Document guidance as proposed to ensure alignment with the other Approved Documents and deliver our commitment to ensure that guidance is as clear as possible and aligns with regulations.
- 3.178. We recognise the concerns raised about daylight and overheating. *The Future Buildings Standard consultation* includes proposals for a new overheating requirement within the Building Regulations.⁴ There are no minimum daylight requirements within the Building Regulations, which is why we do not have guidance on this matter.
- 3.179. We received no specific feedback on any conflicting standards across the Approved Documents. We have made clear within the sub-section *Interactions with other parts of the Building Regulations* of Approved Documents L and F where there are interactions between different requirements.

Question 32:

Do you agree with our proposed approach to mandating self-regulating devices in new dwellings?

Question 33:

Are there circumstances in which installing self-regulating devices in new dwellings would not be technically or economically feasible?

3.180. The consultation proposed to introduce a new regulation in the Building Regulations 2010 to ensure that new homes must have self-regulating devices. This would typically mean including devices for the separate regulation of the temperature in each room or designated heating zone, such as using thermostatic radiator valves (TRVs).

Question 32	No. of all responses	% of all responses	% of responses to Q32
(a) Yes	674	20%	33%
(b) No	1,355	41%	67%
Did not respond	1,281	39%	-

Question 33	No. of all responses	% of all responses	% of responses to Q33
(a) Yes	1,561	47%	82%
(b) No	345	10%	18%
Did not respond	1,404	42%	-

3.181. Those who supported the proposed approach made several recommendations, including suggesting that a clear definition of a self-regulating device is added to ensure that certain technologies are not excluded.

3.182. Some respondents reasoned that the specific type of self-regulating devices should not be mandated so as to not limit innovation. It was suggested that TRVs can affect the performance of heat pump systems, with some citing the findings from the Energy Saving Trust Report No. 6507 (2011). Others, however, noted that the conflict between low carbon heating and TRVs could be avoided if heat pumps were required to have an interlock. Some respondents suggested that research has shown that consumers often do not use TRVs properly.

3.183. Many respondents suggested situations in which zone-control is more appropriate than room-by-room control, including small homes, those heated by solid-fuels like biomass, and homes with a very low heat demand. The importance of a whole system approach was highlighted as individual regulating devices may be incompatible with centralised systems, or more technologically advanced systems. Some responses discussed the possibility of including smart technology such as building automation and control systems, with support predominantly from the manufacturing and supply chain sectors.

3.184. Respondents made suggestions for additional guidance, with some requesting commissioning guidance that requires system balancing. It was highlighted that interlocks would avoid short cycling, reduce wastage of pump energy and minimise the need for a system bypass. Respondents also noted the benefits of retaining guidance currently provided in the Domestic Building Services Compliance Guide

that states TRVs should not be located in the same room as a thermostat. Some respondents gave the example of technical infeasibility in houses with buffer zones for heat absorption or dissipation with high thermal mass that would be better manually controlled.

3.185. Some respondents that answered no to Question 33 argued that the economic and technical feasibility of self-regulating devices depends on the users. For example, in some care settings, those with certain medical conditions may need support to use self-regulating devices effectively. Respondents also argued that some fuel-poor users may need education on how to use self-regulating devices with top-up keys so that they are economically viable.

3.186. Respondents highlighted that the technical and economic feasibility criteria for installing self-regulating devices will not apply for new buildings. This is because the need for temperature self-regulation at room level can be addressed in the design phase, which prevents technical barriers from appearing.

Government response to Questions 32 and 33

3.187. It has been made clear in the 2021 draft *Approved Document L, Volume 1: Dwellings* that zone control is permitted in appropriate circumstances, and that the policy allows for different approaches. A number of responses identified legitimate situations where self-regulating devices would be uneconomical or unfeasible for new builds, and we have accommodated for this in the final guidance. We have clarified in the guidance that in the vast majority of cases it will be economically and technically feasible to install SRDs in new homes.

3.188. We consider that systems which cannot provide control of individual rooms (e.g. air-to-air heat pumps) should only be used where the designer can justify controlling the whole zone, such as in small homes or those with very low heat demand.

3.189. In the 2021 draft *Approved Document L, Volume 1: Dwellings* we have:

- Stated that TRVs should not be located in the same room as a thermostat;
- Introduced guidance for interlocks on heat pump systems;
- Stated that wet heating systems should ensure a minimum flow of water to avoid short-cycling;
- Introduced guidance on system sizing; and
- Produced a list of circumstances where it would be technically unfeasible, including:
 - Buildings with very low heat demand (e.g. <10W/m²) where zoning / controls would not be economic; and
 - Homes with buffer zones for heat absorption or dissipation with high thermal mass.

Question 34:

Do you agree with proposed guidance on providing information about building automation and control systems for new dwellings?

3.190. The consultation proposed that if a building automation and control system is installed in a new dwelling, the information about the energy performance of the system must be provided to the Building Owner.

Question 34	No. of all responses	% of all responses	% of responses to Q34
(a) Yes	1,958	59%	97%
(b) No	53	2%	3%
Did not respond	1,299	39%	-

3.191. Some respondents wanted us to provide more guidance. It was also suggested that the guidance should be used to encourage the uptake of smart systems in homes.

Government response to Question 34

3.192. We will proceed with the approach proposed in the consultation, which mirrors that of information provided for other building services types. *Approved Document L, Volume 1: Dwellings* will not specify the content and form of the information to be provided because it will depend on the nature of the installed systems.

Chapter 4 - Part F Changes for new homes in 2021

4.1. The Government is committed to improving housing standards and the energy efficiency of homes. We have reviewed the ventilation standards of the Building Regulations for new homes, to ensure that the standards promote good indoor air quality and are healthy for occupants. The consultation set out proposed changes for Part F of the Building Regulations, which included:

- Simplifying the approach for determining the ventilation rate and system design requirements for a dwelling;
- Reviewing the way that ventilation systems are presented in *Approved Document F, Volume 1: Dwellings* to reflect common design practices;
- Bringing guidance designed to reduce the ingress of external air pollution into the main body of *Approved Document F, Volume 1: Dwellings*, and reviewing its technical content;
- Making technical changes to guidance for ventilation systems in line with the latest evidence and understanding; and
- Simplifying the structure and content of guidance relating to Part F.

Performance based ventilation standards

Question 35:

Do you agree that the guidance in Appendix B to draft Approved Document F provides an appropriate basis for setting minimum ventilation standards?

4.2. The consultation 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 2019 draft *Approved Document F, Volume 1: Dwellings*.

Question 35	No. of all responses	% of all responses	% of responses to Q35
(a) Yes	303	9%	21%
(b) No	1,128	34%	79%
Did not respond	1,879	57%	-

4.3. Support for the proposal was high among installers, building control, competent persons scheme operators and manufacturers who answered the question. Local authorities and building control respondents noted that the proposed guidance was clearer than the section in the current Approved Document F.

4.4. Many of those who disagreed with the proposal expressed concern regarding the infiltration assumptions. Respondents reasoned that the allowance of a 0.15 air changes per hour infiltration rate for less airtight dwellings should be omitted,

because the distribution of infiltration cannot be designed to be beneficially situated and may cause inadequate indoor air quality. It was also noted that infiltration depends on weather conditions and may deliver contaminated air.

- 4.5. Concerns were also raised regarding assumptions used in the whole dwelling ventilation calculations. It was suggested that the air exchange values were too high for airtight buildings as mechanical units would supply a higher rate in occupied rooms, even when the whole house average is below the proposed figure. There was concern that the proposal would result in the oversizing of background ventilators which would lead to occupants closing them due to draughts, as a result of using 0.6 Pa and 1.0 Pa for the pressure difference across the opening in single storey and multi storey dwellings respectively. It was suggested that the whole dwelling ventilation rate should follow the Passivhaus example and be calculated as a minimum air-change rate underpinned by occupancy levels which are room specific, not based on floor area.
- 4.6. Some respondents argued that too great an emphasis is placed on intermittent extract instead of a lower rate of continuous extract, as the former may be insufficient for dealing with moisture generation. The practicality of a visible mould check was questioned by some, while others suggested the mould check on walls should also be applied to windows, doors and rooflights. It was suggested that the references to the World Health Organisation's (WHO) guidance is inadequate and that we should adopt the remaining exposure guidance for carbon monoxide, include particulate matter and re-admit ozone standards. Some stakeholders highlighted that ventilation requirements should align with any future overheating requirements, especially considering the whole house ventilation solutions are based on moisture removal in winter.
- 4.7. Suggestions for additional guidance included adding a summary table to compare system type and airtightness, a note to clarify the compatibility of opening windows with mechanical ventilation, and minimum distances for exhausts, inlets and flues.

Government response to Question 35

- 4.8. In line with the approach set out in the consultation, we will proceed with the use of performance-based ventilation standards, while making some modifications to reflect the variety of responses that we received.
- 4.9. We will retain the infiltration allowance rate of 0.15 air changes per hour in less airtight dwellings. While we recognise that infiltration may not be beneficially situated in some circumstances, removing this allowance would result in extremely large ventilator sizes, which stakeholders have indicated in other areas of this consultation were too large (see response to Question 42). Increasing the ventilator sizes further may contribute to users shutting vents due to draughts or lead to over-ventilation, thereby wasting energy.
- 4.10. Following consultation feedback, we have made some slight amendments in the 2021 draft *Approved Document F, Volume 1: Dwellings*, including:
 - Referencing Public Health England guidance for ventilation standards;

- Adding a long-term testing level for formaldehyde for comparison (a short-term 30-minute limit value of 100 µg/m³ and a long-term annual limit value of 10 µg/m³), as well as a long-term CO exposure limit of 10mg/m³ over eight hours;
- Adding that the mould check should also be used for windows, rooflights and doors; and
- Changing the name of table B.3 from Surface Water Activity to Indoor Air Relative Humidity Water Activity.

Question 36:

Do you agree that using individual volatile organic compounds, informed by Public Health England guidelines, is an appropriate alternative to using a total volatile organic compound limit?

- 4.11. The consultation asked whether designers should have the option to assess ventilation strategies against individual volatile organic compounds informed by empirical evidence from Public Health England, as an alternative to using total volatile organic compounds. It was explained that this could be a better means of determining appropriate control of indoor air pollutants.

Question 36	No. of all responses	% of all responses	% of responses to Q36
(a) Yes	1,268	38%	91%
(b) No – the Public Health England guidelines are not sufficient	34	1%	2%
(c) No – individual volatile organic compounds should not be used	41	1%	3%
(d) No – I disagree for another reason	44	1%	3%
Did not respond	1,923	58%	-

- 4.12. Those that supported this proposal highlighted the advantage of measuring individual compounds as each chemical has a different toxicity. Respondents confirmed that the listed compounds are commonly found and easily measured and noted the benefit this proposal may have on indoor air quality as new homes become more airtight. Some respondents went further and suggested that individual volatile organic compounds (VOC) limits should become the primary metric instead of total VOC.

- 4.13. Respondents that opposed Public Health England guidelines argued that VOCs should not be permitted at all within homes and cited several studies which highlighted the danger of other toxins and pollutants. There was concern that the flexibility to assess against individual VOCs may lead to gaming, whereby individual VOCs could be selected to achieve a better score, ignoring the overall total VOC level.

- 4.14. Respondents that answered c or d to this question highlighted that a holistic, comprehensive or total VOC approach is needed to include all compounds present, with WHO ambient air quality guidelines proposed as a standard. It was suggested that the total VOC approach allows for new compounds to be added when identified as hazardous to health. Some respondents highlighted the cost and technical

challenges associated with measuring individual compounds, such as the significant amount of assumptions required for varying techniques. It was noted that the sum of individual VOCs rarely matches the value of the total VOCs. Some respondents felt that individual VOCs are dependent on both construction standards and internal soft furnishings with an alternate suggestion for total active sampling made using BS EN 16000-6. Some responses reasoned that there is limited research on the interaction between individual VOCs and subsequent impact on health.

- 4.15. We received requests for further guidance on a standardised methodology, test method, sampling approach, report and timing of measurement. It was requested that guidance should be understandable for a non-technical homeowner. Other suggestions for additional guidance included considerations on the source of pollutants, room type, specifying fewer toxic materials and defining 'expert advice'. Some respondents suggested that the values in Table B.1 were not consistent with those in Schedule 2 of the Clean Air (Human Rights) Bill.

Government response to Question 36

- 4.16. 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*¹⁵ 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.

Minimising the ingress of external pollutants

Question 37:

Do you agree with the proposed guidance on minimising the ingress of external pollutants in the draft Approved Document F?

- 4.17. The consultation proposed guidance text in Section 2 of the 2019 draft *Approved Document F, Volume 1: Dwellings*, which states that particular attention should be given to the guidance for minimising the ingress of external pollutants in locations where the Air Quality Standards Regulations 2010 Schedule 2 limit values are exceeded.

Question 37	No. of all responses	% of all responses	% of responses to Q37
(a) Yes	1,395	42%	96%
(b) No	61	2%	4%
Did not respond	1,854	56%	-

¹⁵ 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>

- 4.18. Professionals from across the construction sector were in support of the guidance text and there was recognition that the guidance better addresses health issues and would lead to improved design. Some respondents that supported the text also reasoned against encouraging Mechanical Ventilation with Heat Recovery in every situation due to the cost of maintenance. It was also noted that the guidance should be considered in the context of future air quality, as outdoor air quality from traffic improves due to the potential uptake of electric vehicles. Some, while supportive of the content of the guidance, noted that air quality is already evaluated in the planning process on a case-by-case basis and so it may not need to be included in *Approved Document F, Volume 1: Dwellings*.
- 4.19. The primary concern for those who answered no to this question was that the simplicity of the guidance would result in it being difficult to interpret for non-specialists. We received detailed comments on areas where the guidance could be more prescriptive, including air quality targets, more comprehensive pollutant coverage and external source control.

Government response to Question 37

- 4.20. In line with the consultation proposal, we will include the proposed guidance on minimising the ingress of external pollutants in the 2021 draft *Approved Document F, Volume 1: Dwellings*.
- 4.21. Following consultation feedback, we will make some amendments to make the style consistent with the requirements to be achieved and to improve clarity, including:
- Removing 'where possible' and 'if practicable' to clarify what the minimum standard is;
 - Making 'expert advice' a key term with a demonstrable list of professional qualifications that can demonstrate compliance;
 - Including the limit values for external pollutants in the text; and
 - Referring to CIBSE TM 64 (Emissions Sources and Mitigation Measures) and 40 (Health and Wellbeing in Building Services) for guidance on the location of ventilation intakes near to pollution sources.

Noise

Question 38:

Do you agree with the proposed guidance on noise in the draft Approved Document F?

- 4.22. The consultation considered the issue of noise from mechanical ventilation systems and noted that simple product-testing or type-testing was not considered to be an appropriate mechanism for controlling noise as the noise in-situ is highly dependent on the quality and nature of the installation. The consultation clarified guidance on noise in the 2019 draft *Approved Document F, Volume 1: Dwellings* to make it clear that mechanical ventilation systems should not be unduly noisy.

Question 38	No. of all responses	% of all responses	% of responses to Q38
(a) Yes	220	7%	15%
(b) No – this should not form part of the statutory guidance for ventilation, or the guidance goes too far	59	2%	4%
(c) No – the guidance does not sufficiently address the problem	1,170	35%	79%
(d) No – I disagree for another reason	39	1%	3%
Did not respond	1,822	55%	-

- 4.23. We received suggestions that additional guidance should be provided to reflect whole house ventilation solutions and a reference to Environmental Health legislation. Others argued that this guidance should not form part of the statutory guidance due to concerns that it was unmeasurable and unenforceable. Alternative approaches were suggested which included incorporating testing or verification into guidance, with BS 8233 provided as an example. It was also noted that noise issues related to ventilation are already accounted for in the commissioning sheet that covers poor installation.
- 4.24. Respondents that disagreed with the proposal highlighted findings from MHCLG research that concluded noise is one of the main reasons that occupiers turn off ventilation systems. There was concern that this increases the risk from poor ventilation on health, condensation, mould formation and night-time overheating. Some respondents felt there was a need for prescriptive noise thresholds for either Mechanical Ventilation with Heat Recovery systems in individual rooms and/or for specific fans, and several potential noise limits were suggested. It was also reasoned that there was a need for guidance to address external noise for both mechanical and natural ventilation systems, and some stakeholders requested the inclusion of background noise due to potential transference between rooms.
- 4.25. Some trade bodies and manufacturers reasoned that the guidance presented was insufficient because it was too vague and required further clarification. The *Acoustics Ventilation and Overheating guide* was suggested as an appropriate industry standard.¹⁶ Some respondents argued in favour of performance-based validation in the noise requirement through commissioning and in-situ testing. We also received requests that the good practice advisory noise levels in the current Approved Document F should be retained, with respondents arguing that the delay in enforcing this advice through a future review of Approved Document E was unacceptable.

Government response to Question 38

- 4.26. 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

¹⁶ Acoustics Ventilation and Overheating: Residential Design Guide, Version 1.1, Institute of Acoustics and Acoustics and Noise Consultants, (2020) <https://www.association-of-noise-consultants.co.uk/wp-content/uploads/2020/07/ANC-AVO-Residential-Design-Guide-January-2020-v1.1.pdf>

Regulations (Resistance to the passage of sound), through which we will consider noise from building services.

- 4.27. Consultation feedback suggested that the existing guidance text on noise in the Approved Document is useful for some stakeholders in providing a definition of excessive noise. We have therefore reviewed the noise guidance text and the 2021 draft *Approved Document F, Volume 1: Dwellings* incorporates the noise guidance as a note. The Approved Document is clear that noise testing is not required to demonstrate compliance with the Part F functional requirement. For the full guidance text, please see the 2021 draft *Approved Document F, Volume 1: Dwellings*. We have made it clear that the sound levels in the revised text is for ventilation systems operating under normal conditions, not at boost rates. Providing this text should not limit the scope of a future review of Approved Document E.

Ventilation solutions for Dwellings

Question 39:

Do you agree with the proposal to remove guidance for passive stack ventilation systems from the Approved Document?

- 4.28. The consultation proposed the removal of guidance on Passive Stack Ventilation from *Approved Document F, Volume 1: Dwellings* on the basis that Passive Stack Ventilation is typically installed by specialists carrying out full design and because it accounts for less than 1% of the market share in new homes.

Question 39	No. of all responses	% of all responses	% of responses to Q39
(a) Yes	1,175	36%	86%
(b) No	197	6%	14%
Did not respond	1,938	59%	-

- 4.29. Those in favour of the proposal broadly agreed with the reasoning set out in the consultation regarding infrequency of use and installation by specialists. Respondents noted the beneficial effect this proposal could have in encouraging the adoption of Mechanical Ventilation with Heat Recovery in house building given the energy efficiency advantages of these systems. Some respondents suggested a reference should be provided in *Approved Document F, Volume 1: Dwellings* to enable appropriate guidance to be found or that Passive Stack Ventilation should be included in a list of other example systems along with Positive Input Ventilation (PIV), Single-Room Heat Recovery Ventilation (SRHRV) and combined Passive Stack and Mechanical Ventilation.

- 4.30. Respondents that did not support this proposal highlighted advantages of this system type including sufficient night-time cooling in locations where security might be an issue, the minimal maintenance required and compatibility with solid fuel heating or earth pipe ventilation. The potential for this system type to future-proof homes against overheating risk was also raised. It was also argued that despite its rare use, the guidance is still useful, and removing it could lead to poorer design

and installation. Some stakeholders went further and suggested that Passive Stack Ventilation should be encouraged as a low-energy alternative to Mechanical Extract Ventilation (MEV). There were calls for the Approved Document to be clear that the system type may still be used to comply with the Building Regulations.

- 4.31. We received wider comments on the names of ventilation systems used in the 2019 draft *Approved Document F, Volume 1: Dwellings*. Trade bodies and the manufacturing sector reasoned that the current numbering system should be retained and that Mechanical Ventilation with Heat Recovery should be consistently named as continuous mechanical supply and extract with heat recovery in the Approved Document.

Government response to Question 39

- 4.32. In line with the consultation proposal, we will remove guidance for Passive Stack Ventilation systems (formerly system 2) from *Approved Document F, Volume 1: Dwellings*.
- 4.33. The recently published Manual to the Building Regulations explained that approved documents only provide guidance on how to meet the legal requirements for some common situations.¹⁷ Other less commonly used ventilation systems such as Positive Input Ventilation and Passive Stack Ventilation, which will not be covered in the approved documents, can still be used to achieve regulatory compliance.
- 4.34. Retaining system numbers would likely be confusing in the Approved Document once guidance on Passive Stack Ventilation (formerly System 2) is removed. We will therefore remove the system numbering and rename the installations directly. Based on consultation feedback, we will rename ‘continuous mechanical supply and extract with heat recovery (MVHR)’, which was formerly system 4, as ‘continuous mechanical supply and extract ventilation’ (which encompasses systems both with and without heat recovery).

Question 40:

Do you agree with the proposal to remove guidance for more airtight naturally ventilated homes?

- 4.35. The consultation proposed that guidance for more airtight naturally ventilated homes should be removed. This was considered because the design, sizing and positioning of ventilators to provide effective ventilation is more critical in more airtight homes, and, in more airtight dwellings, reliance on purpose-provided ventilators is more likely.

¹⁷ Manual to the Building Regulations, MHCLG (2020)

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/901517/Manual_to_building_regs_-_July_2020.pdf

Question 40	No. of all responses	% of all responses	% of responses to Q40
(a) Yes	273	8%	20%
(b) No	1,121	34%	80%
Did not respond	1,916	58%	-

- 4.36. Respondents that agreed with this proposal considered that natural ventilation is not appropriate for airtight homes.
- 4.37. Across the responses we received, it was argued that all new build homes should have Mechanical Ventilation with Heat Recovery. Some respondents went further and suggested that we should remove guidance on natural ventilation for all levels of airtightness.
- 4.38. Among some stakeholders there was concern that the distinction between more and less airtight homes in the consultation was not clear. They primarily recommended that the maximum airtightness permeability should be $3\text{m}^3/(\text{h.m}^2)$.
- 4.39. Respondents that objected to the guidance being removed noted that there were benefits to natural ventilation and argued that a lack of guidance may have unintended consequences and that mixed mechanical / natural ventilation methods can be used to increase levels of airtightness permeability. It was also argued that Mechanical Ventilation with Heat Recovery has challenges, such as being more energy intensive than anticipated in practice and requiring regular cleaning and maintenance.

Government response to Question 40

- 4.40. In line with the consultation proposal, we will continue to provide guidance for natural ventilation, but only for less airtight dwellings. This is on the basis that this system type still represents a significant proportion of the UK market, but natural ventilation requires specialist design for implementation in more airtight dwellings. We have clarified the distinction between more and less airtight homes in the 2021 draft *Approved Document F, Volume 1: Dwellings* published alongside this consultation.

Question 41:

Do you agree with the proposal to remove guidance for less airtight homes with mechanical extract ventilation?

- 4.41. The consultation reasoned that there is a general trend towards more airtight homes and that guidance for less airtight homes is therefore less necessary. We proposed to set guidance for continuous mechanical extract ventilation that is only appropriate for more airtight buildings but continue to provide guidance for any level of airtightness for continuous mechanical supply and extract ventilation.

Question 41	No. of all responses	% of all responses	% of responses to Q41
(a) Yes	1,188	36%	87%
(b) No	181	6%	13%
Did not respond	1,941	59%	-

- 4.42. Respondents that agreed with the proposal commented that removing the guidance would reduce complexity and increase clarity.
- 4.43. It was argued by some stakeholders that the guidance should be maintained because it provides useful and compliant solutions to any issues that may arise, citing BRE Digest 398 and EST Good Practice Guide GPG 268. It was also noted that maintaining the guidance would be useful for existing dwellings. Some of the responses we received suggested that guidance for mechanical extract ventilation in less airtight homes should be updated and not removed, on the basis that it is useful for minimising condensation at all levels of airtightness.

Government response to Question 41

- 4.44. Some respondents, including industry experts and manufacturers, argued that there was limited research and evidence to support the approach set out in consultation and that mechanical extract ventilation systems are appropriate for the whole airtightness range. This is a point which has been well supported by recent research seen by MHCLG on the relationship between airtightness and ventilation in new UK dwellings,¹⁸ which suggests it would be unwise to remove guidance for Mechanical Extract Ventilation in less airtight homes.
- 4.45. We therefore intend to provide guidance for mechanical extract ventilation and mechanical supply and extract ventilation (which includes, but is not limited to, Mechanical Ventilation with Heat Recovery) at all levels of airtightness. We will include a note in the Approved Document to remind users that the efficiency of Mechanical Ventilation with Heat Recovery will improve as the dwelling becomes more airtight. In line with our response to Question 39, we will make it clear that the renaming of the former system 4 to continuous mechanical supply and extract ventilation accounts for all supply and extract systems, including those without heat recovery.

Simplification of Design Guidance

Question 42:

Do you agree with the proposed guidance for background ventilators in naturally ventilated dwellings in the draft Approved Document F?

- 4.46. The consultation proposed a simplified method for determining the specification for background ventilators in naturally ventilated dwellings. The revised guidance

¹⁸ The relationship between airtightness and ventilation in new UK dwellings, Crawley, J., Wingfield, J., & Elwell, C., Building Services Engineering Research and Technology, 40(3), (2019), pp. 274–289.

removes the need for a designer to carry out any calculations or make assumptions. Instead a simple table specifies the size of ventilator that should be selected, based upon the room end-use.

Question 42	No. of all responses	% of all responses	% of responses to Q42
(a) Yes	302	9%	23%
(b) No – the ventilator areas are too large	42	1%	3%
(c) No – the ventilator areas are too small	39	1%	3%
(d) No – I disagree for another reason	932	28%	71%
Did not respond	1,995	60%	-

- 4.47. Among the respondents that agreed with this proposal, it was noted that the introduction of a room end-use approach would be less complex than the current guidance and help to improve levels of compliance. We received responses that suggested the sizes proposed would help to mitigate the risk of mould and condensation in new dwellings and that the increase in ventilator sizes would be necessary as homes become more airtight, unless a continuous mechanical ventilation strategy was adopted.
- 4.48. It was noted by some respondents that the proposed ventilator sizes are larger than those commonly available, based upon slot ventilators in windows. Stakeholders from manufacturing and supply chain organisations suggested that significant changes would be required in the manufacture of both ventilator products and window frame profiles and recommended a degree of tolerance around sizes in the 2021 draft *Approved Document F, Volume 1: Dwellings* or slightly smaller ventilator sizes that would be easier to accommodate.
- 4.49. Some stakeholders expressed concern that the increase in ventilator sizes would lead to a higher degree of heat loss and / or energy use, which was contrary to the trajectory of the Future Homes Standard. Noise ingress was also highlighted as a potential risk with larger ventilators unless sound attenuation was included in the guidance.
- 4.50. It was suggested that the proposed ventilator areas were too small. Some respondents commented that background ventilators should not be used in isolation in an airtight dwelling and should only be used either to supplement a continuous mechanical strategy, or as air inlets for mechanical extract ventilation.
- 4.51. Among respondents that disagreed for another reason, it was argued that the ventilation strategy for new dwellings should be based upon the air permeability, assuming these will need to be airtight to meet increasingly demanding energy specifications. Respondents added that continuous mechanical ventilation would be necessary in airtight dwellings, with the majority specifically citing that mechanical ventilation with heat recovery should be the default option.
- 4.52. Recent research related to occupant behaviour was mentioned by some stakeholders, which demonstrated that background ventilators are frequently closed. These respondents suggested that natural ventilation guidance should be removed from *Approved Document F, Volume 1: Dwellings*.

Government response to Question 42

- 4.53. In response to the concerns we received through consultation, we have developed a revised set of equivalent areas. This will balance adequate indoor air quality (modelled using a required air flow rate) with minimising the impact on supply chains and reducing the risk that large ventilators will cause draughts. The provision of guidance on natural ventilation in more airtight homes is addressed in our response to Question 40.
- 4.54. The revised guidance will require dwellings to have the minimum equivalent areas set out in Table 8, and a minimum of 5 ventilators installed in the habitable rooms and kitchen, except for one-bedroom dwellings where this may be reduced to four ventilators.

Table 8 - Consultation and revised proposals for minimum equivalent areas of background ventilators

	Consultation Proposal		Revised Proposal	
Room	for dwellings with multiple floors, mm ²	for single-storey dwellings (e.g. flats), mm ²	for dwellings with multiple floors, mm ²	for single-storey dwellings (e.g. flats), mm ²
Habitable rooms	10,000	12,000	8,000	10,000
Kitchen	5,000	8,000	8,000	10,000
Bathroom	5,000	5,000	4,000	4,000
Sanitary Accommodation	No min	No min	No min	No min
	Notes: <ol style="list-style-type: none"> <i>The use of this table is not appropriate where the dwelling has a single exposed façade. For such situations, expert advice should be sought.</i> <i>The guidance for flats is also applicable to any dwelling which is only one storey, such as a bungalow.</i> <i>In situations where any bathroom has no window or external façade through which a ventilator can be installed, then the minimum equivalent area for the kitchen ventilator should be 12,000mm².</i> <i>In situations where the kitchen has no windows or external façade through which a ventilator can be installed, the use of this table is not appropriate and expert advice should be sought.</i> 		Notes: <ol style="list-style-type: none"> <i>The total number of ventilators installed in a dwelling in habitable rooms and kitchens should be no less than 5, with the exception of one-bedroom properties which should be no less than 4.</i> <i>The use of this table is not appropriate where the dwelling has a single exposed façade and expert advice should be sought.</i> <i>Where a kitchen and living room are not separate rooms (i.e. open plan), no less than 3 ventilators of the same equivalent area as for other habitable rooms should be provided within the open plan space.</i> <i>Where a kitchen has no windows or external façade through which a ventilator can be installed, the use of this table is not appropriate and expert advice should be sought.</i> <i>Where a bathroom has no window or external façade through which a ventilator can be installed, then the minimum equivalent area specified should be added to ventilator sizes specified in other rooms.</i> 	

- 4.55. The revised guidance will still mean that larger ventilators would need to be used in single-storey dwellings because reducing the areas further results in inadequate air flow rates. In these circumstances, careful design would be needed to provide the

required ventilation provision in the window itself or through additional ventilators, such as through an external wall.

Question 43:

Do you agree with the proposed approach in the draft Approved Document for determining minimum whole building ventilation rates in the draft Approved Document F?

- 4.56. The consultation proposed the introduction of a revised method for determining minimum whole building ventilation rates in dwellings based on the number of bedrooms, on the basis that this removes the need for a designer to make any assumptions about dwelling occupancy.

Question 43	No. of all responses	% of all responses	% of responses to Q43
(a) Yes	1,227	37%	93%
(b) No – the ventilation rate is too high	20	1%	2%
(c) No – the ventilation rate is too low	21	1%	2%
(d) No – I disagree for another reason	51	2%	4%
Did not respond	1,991	60%	-

- 4.57. Some respondents expressed concern that the proposed ventilation rates were too high, while others argued it was too low. We received suggestions that any assumptions used for ventilation rates for bedrooms should be based upon full occupancy and maintain CO₂ levels at below 1000ppm. It was argued by some respondents that ventilation rates should be set to mitigate the effect of summer overheating.
- 4.58. Some stakeholders reasoned that ventilation rates, rather than being fixed, should be based upon building or room-demand according to actual occupancy. Others suggested that indoor air pollutants (including using CO₂ as the metric) should be used to control background ventilation rates.

Government response to Question 43

- 4.59. We will introduce the revised method set out in the 2019 draft *Approved Document F, Volume 1: Dwellings* for determining minimum whole building ventilation rates in dwellings based on the number of bedrooms. This revised method should simplify the work for designers or commissioning engineers because they will no longer need to predict the occupancy of a bedroom, and in turn this will ensure a more consistent approach. Concerns about overheating are addressed in the draft *Approved Document for Overheating*, which is released alongside the *Future Buildings Standard consultation*.⁴

Question 44:

Do you agree that background ventilators should be installed for a continuous mechanical extract system, at 5,000mm² per habitable room?

- 4.60. The current Approved Document F recommends that background ventilators sized at 2,500mm² be fitted in dwellings where the designed air permeability is less than or equal to 5m³/(h.m²) @50Pa. The consultation proposed that background ventilators for continuous mechanical extract ventilation systems should be 5,000mm².

Question 44	No. of all responses	% of all responses	% of responses to Q44
(a) Yes	267	8%	21%
(b) No – the minimum background ventilator area is too low	13	<1%	1%
(c) No – the minimum background ventilator area is too high	30	1%	2%
(d) No – I disagree for another reason	971	29%	76%
Did not respond	2,029	61%	-

- 4.61. Respondents who supported this proposal noted that the change would help to improve ventilation in new homes. It was suggested that some smaller window sizes may limit the ability to install the specified ventilator size and that improved guidance in the Approved Document for mechanical extract systems would be beneficial.
- 4.62. Respondents that thought the proposed size of 5,000mm² was too low argued that ventilators should be sized according to room size and a worst-case occupancy scenario.
- 4.63. Those that considered the proposed size of 5,000mm² to be too high included representatives from the supply chain and trade body sectors. While they broadly supported the introduction of a minimum ventilator size, they recommended that the size is lowered to 4,000mm² on the basis that many products are readily available at around 4,000mm² and could be easily accommodated within standard window assemblies and sizes. Some also commented that the proposed ventilator size would result in increased heating energy use and/or be the cause of discomfort due to draughts.
- 4.64. 29% of stakeholders disagreed with the proposal for other reasons. Some proposed that ventilators should be sized according to room size, occupancy and use, as opposed to a standard size. Others respondents commented that ventilators are unnecessary in all habitable rooms and that cross flow using cascade ventilation principles, where the living room supply air is drawn from the bedrooms (assuming the dwelling geometry allows for good air mixing), removes the need for ventilation provision in the living room.

Government response to Question 44

- 4.65. We have assessed the possibility of reducing the background ventilator equivalent area for mechanical extract ventilation to 4,000mm² per habitable room while still achieving the minimum provision for adequate indoor air quality and concluded that this would be acceptable guidance given the availability of products at this size.

4.66. Therefore, the revised guidance will require dwellings with continuous mechanical extract ventilation systems to satisfy both of the following conditions:

- Have at least one 4,000mm² background ventilator in each habitable room; and
- Have a total number of ventilators equalling number of bedrooms, plus two ventilators (i.e. a one-bedroom dwelling would need 3 background ventilators, two bedrooms would require 4 ventilators; and so on).

Question 45:

Do you agree with the external references used in the draft Approved Document F, in Appendices B, D and E?

4.67. In order to reflect the industry development in providing more robust standards, the consultation proposed that the *Approved Document F, Volume 1: Dwellings* includes updated references for British Standards, World Health Organisation guides and CIBSE guides in Appendices B, D and E.

Question 45	No. of all responses	% of all responses	% of responses to Q45
(a) Yes	735	22%	89%
(b) No	93	3%	11%
Did not respond	2,482	75%	-

4.68. Respondents acknowledged that this proposal is useful because the current Chartered Institute of Building Services Engineers (CIBSE) TM21 standard is out of date. We received suggestions that the external references should be used within the draft *Approved Document F, Volume 1: Dwellings*, and not contained exclusively in the appendices.

4.69. Some respondents felt that the 2021 draft *Approved Document F, Volume 1: Dwellings* should only be introduced if the external references are updated, while others asked for additional information to be provided with the external references. Some stakeholders stated that the external references should make a reference to Approved Document B (Fire safety) and the new proposal to lower the height threshold to require high rise buildings of 11m or taller to have sprinklers installed.

Government response to Question 45

4.70. In line with the consultation proposal, we will publish the proposed external references as set out in the appendices of the 2021 draft *Approved Document F, Volume 1: Dwellings*, with modifications to the rest of the text which reflect the feedback we received through consultation.

Question 46:

Do you agree with the proposed commissioning sheet proforma given in Appendix C of the draft Approved Document F, volume 1?

- 4.71. The consultation proposed the integration of the completion checklist and commissioning sheet from the Domestic Ventilation Compliance Guide into Approved Document F. The draft sheet was provided in Appendix C.

Question 46	No. of all responses	% of all responses	% of responses to Q46
(a) Yes	307	9%	25%
(b) No	928	28%	75%
Did not respond	2,075	63%	-

- 4.72. Among those respondents that agreed with the proposal, it was highlighted that the sheet replicates the current template with no obvious omissions.
- 4.73. We received several suggestions for improvements from stakeholders that both agreed and disagreed with the draft completion and commissioning sheet. In particular, recommendations were made for additional checks for noise prevention using mounting or dampers, minimum pressure measurements, and for installation and sealing of heat recovery units and ductwork for both unheated and heated spaces.

Question 47:

Do you agree with the proposal to provide a completed checklist and commissioning sheet to the building owner?

- 4.74. At present, a completion checklist and commissioning sheet are completed by the installer of a ventilation system. To help inform building owners about how their ventilation system performs in practice, the consultation proposed that a copy of the completed checklist and commissioning sheet is provided to them.

Question 47	No. of all responses	% of all responses	% of responses to Q47
(a) Yes	1,501	45%	98%
(b) No	27	1%	2%
Did not respond	1,782	54%	-

- 4.75. Among respondents that agreed with this proposal it was noted that increasing building owners' understanding of a property's ventilation system could improve its performance. There was support around increasing housebuilders' accountability as a way of driving more consistent outcomes and some argued that there should be a requirement for a handover to the building occupier in addition to the owner or construction client. Some stakeholders felt that increasing the understanding of ventilation systems among tenants would help to minimise energy use. It was suggested that simplifying the checklist would suit a non-technical audience.

- 4.76. Those who disagreed with the proposal argued that it was unrealistic and may add an unnecessary burden on housebuilders. We received editorial suggestions to ensure alignment with Approved Document P (Electrical Safety) for certification, inspection and testing, and with parts of the revised BS EN 12599.

Government response to Questions 46 and 47

- 4.77. In line with the consultation proposals, we will proceed with providing the commissioning sheet and checklist in Appendix C of the 2021 draft *Approved Document F, Volume 1: Dwellings*. The checklist has been improved in line with the comments we received, the following has been changed:
- Remove system names and add heat recovery to supply and extract references;
 - Add a check for installation and sealing of heat recovery units and ductwork for both unheated and heated spaces in section 2.3b;
 - Add extra rows for location of fan units; and
 - Renamed part 1.2 from installation details to system details to avoid confusion with part 2a.
- 4.78. Providing these details to the homeowner will be incorporated into *Approved Document F, Volume 1: Dwellings*, as guidance for meeting Regulation 39 of the Building Regulations.

Chapter 5 - Airtightness

5.1. The consultation set out proposed changes to the airtightness requirements of Part L, in order to improve the way this is considered in the Building Regulations. The proposals included:

- Limiting incentives in SAP which encourage very airtight naturally ventilated dwellings;
- Reflecting the uncertainty of air permeability test results in SAP;
- Considering whether developers should test all individual homes on a development, and removing the option of sample-testing;
- Exploring the potential for an alternative testing method for demonstrating compliance with guidance on airtightness; and
- Reviewing the approved airtightness testing scheme methodology.

Encouraging appropriate levels of airtightness

Question 48:

Do you agree that there should be a limit to the credit given in SAP for energy savings from airtightness for naturally ventilated dwellings?

5.2. At present, increased airtightness is rewarded in SAP due to an improvement in energy efficiency. However, for naturally ventilated dwellings, very high levels of airtightness can either result in poor indoor air quality, or the need to provide additional ventilation. The consultation proposed that there should be a limit to the energy/CO₂ credit in SAP for naturally ventilated homes associated with improving airtightness beyond a threshold. The intention of this proposal was to discourage very airtight buildings with insufficient ventilation.

Question 48	No. of all responses	% of all responses	% of responses to Q48
(a) Yes	495	15%	33%
(b) No	1,025	31%	67%
Did not respond	1,790	54%	-

5.3. Some respondents that agreed with this proposal stated that only mechanical ventilation with heat recovery should be used for an airtightness of 3m³/(h.m²) or below, and most proposed that all homes should only be constructed with an airtightness of 3 m³/(h.m²) or below.

5.4. It was noted that the airtightness assessment process should be based on airtightness test results, which may differ from the design intent. It was also suggested that it should be clear what remedial action would be necessary if a naturally ventilated dwelling was found to be below the threshold appropriate for natural ventilation.

- 5.5. Some respondents argued that Part F of the Building Regulations should recommend or require different ventilation strategies for different airtightness levels. On that basis, it was felt that if Part F was clear that natural ventilation is not suitable for the most airtight homes, there would be no need to amend the energy calculations in SAP. It was also suggested that SAP should represent the construction delivered and, if natural ventilation is to be discouraged for more airtight dwellings, it should be actioned in a different way, for example by highlighting the concern that the ventilation system may not be adequate in the standardised compliance report, the Building Regulations England Part L (BREL) report, presented to building control.

Question 49:

Do you agree that the limit should be set at $3\text{m}^3/(\text{h}\cdot\text{m}^2)$?

- 5.6. The consultation proposed that there should be a limit to the energy/ CO_2 credit in SAP for naturally ventilated buildings associated with improving airtightness beyond a threshold of $3\text{m}^3/(\text{h}\cdot\text{m}^2)$.

Question 49	No. of all responses	% of all responses	% of responses to Q49
(a) Yes	372	11%	26%
(b) No – it is too low	965	29%	67%
(c) No – it is too high	102	3%	7%
Did not respond	1,871	57%	-

- 5.7. Among respondents that answered no (b and c), some interpreted this question as asking whether the limit was too easy, while others interpreted it as asking whether the numerical value was too low and thus the limit too stringent.
- 5.8. We received suggestions that a higher threshold value of around $5\text{m}^3/(\text{h}\cdot\text{m}^2)$ would provide a contingency due to concern that natural ventilation does not always achieve the required ventilation rate in practice. There was also concern that the as-built airtightness may be better than the design airtightness and that a higher threshold could avoid potentially costly repercussions if the as-built airtightness was better than $3\text{m}^3/(\text{h}\cdot\text{m}^2)$ such as replacing the ventilation system.
- 5.9. Some respondents felt that there should be no limit and that the ventilation system should be designed such that the ventilation rate is adequate for the airtightness of the property. It was suggested that there should be no limit as the airtightness achieved should be correctly accounted for in SAP.

Government response to Questions 48 and 49

- 5.10. In line with the consultation proposals, we will introduce a credit limit of $3\text{m}^3/(\text{h}\cdot\text{m}^2)$ for both as design and as-built air permeability in SAP for naturally ventilated dwellings. This improves links between *Approved Document L, Volume 1: Dwellings* and *Approved Document F, Volume 1: Dwellings* and ensures that the impacts of airtightness on indoor air quality are recognised. This aligns with guidance for naturally ventilated buildings provided in *Approved Document F*,

Volume 2: Buildings other than dwellings, published alongside the *Future Buildings Standard Consultation*.⁴ A significant proportion of those that disagreed with this proposal expressed concern with the use of natural ventilation rather than the proposed limit.

- 5.11. The 2019 draft *Approved Document L, Volume 1: Dwellings* defines highly airtight dwellings as those with a design air permeability below $5\text{m}^3/(\text{h.m}^2)$ @ 50Pa, or an as-built air permeability of $3\text{m}^3/(\text{h.m}^2)$ @ 50Pa. Guidance will only be provided for naturally ventilated homes where the design air permeability is leakier than $5\text{m}^3/(\text{h.m}^2)$ @ 50 Pa. Mechanical ventilation guidance will be provided for all levels of air permeability. While guidance is not provided, it is still possible to build very airtight, naturally ventilated homes as long as expert advice is sought, which is in line with a technology-neutral approach.
- 5.12. Some stakeholders were unclear about whether the limit was for the design or as-built SAP calculations. For simplicity, a credit limit of $3\text{ m}^3/(\text{h.m}^2)$ for both the design and as-built calculations in SAP was proposed. This will provide certainty to developers on the results of their design stage SAP calculations benefits. We have added guidance in section 1 on possible remedial action if airtightness testing shows the dwelling is too airtight.

Accounting for uncertainty in airtightness test results

Question 50:

Is having a standard level of uncertainty of $0.5\text{m}^3/(\text{h.m}^2).\text{h}$ appropriate for all dwellings undergoing an airtightness test?

- 5.13. In some circumstances, developers may use temporary sealing methods to pass airtightness tests. This is not an adequate or long-term solution for ensuring good airtightness standards in a home and temporary sealing methods may be used within the range of uncertainty of an airtightness test. To better reflect the uncertainty associated with a typical airtightness test, the consultation proposed reducing the precision to which airtightness test results are reported in SAP.

Question 50	No. of all responses	% of all responses	% of responses to Q50
(a) Yes	180	5%	13%
(b) No – a percentage uncertainty would be more appropriate	1,142	35%	80%
(c) No – I agree with having a standard level of uncertainty, but $0.5\text{ m}^3/\text{m}^2.\text{h}$ is not an appropriate figure	45	1%	3%
(d) No – I disagree for another reason	66	2%	5%
Did not respond	1,877	57%	-

- 5.14. Respondents that favoured a percentage uncertainty commented that the proposed value of $0.5\text{m}^3/(\text{h.m}^2)$ would be too punitive for very airtight dwellings and that in such situations, appropriately sized test equipment should be used with smaller

fans more suited to small or airtight structures. We received suggestions for percentage values that ranged from 5% to 12.5%.

- 5.15. Some respondents disagreed with this proposal on the basis that $0.5\text{m}^3/(\text{h.m}^2)$ was too high, particularly for more airtight dwellings. We received suggestions for alternative values that ranged from $0.05\text{m}^3/(\text{h.m}^2)$. to $0.2\text{--}0.25\text{m}^3/(\text{h.m}^2)$.
- 5.16. It was argued by some stakeholders that no level of uncertainty should be added on the basis that the test procedure is already sufficiently accurate and that the level of $0.5\text{m}^3/(\text{h.m}^2)$ would unduly affect the SAP output.

Government response to Question 50

- 5.17. We will not add a percentage or standard level of uncertainty to airtightness test results. Instead we will keep airtightness test reporting, and the way airtightness tests are reflected in SAP, as they work currently.
- 5.18. Based on the feedback we received through consultation and from our technical working group, we believe that reflecting uncertainty in airtightness results will add more complexity than is appropriate and would not adequately address the issue of temporary sealing.

Review of Sampling Approach

Question 51:

Currently only a proportion of new dwellings are required to be airtightness tested. Do you agree with the proposal that all new dwellings should be airtightness tested?

- 5.19. At present, only a portion of the dwellings on a development are required to be airtightness tested, with the option to accept a SAP penalty of $+2\text{m}^3/(\text{h.m}^2)$ at 50Pa for dwellings that are not tested. This may lead to untested dwellings not meeting the required standards and the consultation proposed to require airtightness testing for all new dwellings.

Question 51	No. of all responses	% of all responses	% of responses to Q51
(a) Yes	1,555	47%	97%
(b) No	40	1%	3%
Did not respond	1,715	52%	-

- 5.20. Some respondents highlighted the importance of each dwelling being tested, rather than a random sample, to prove competent construction. It was noted that this proposal would help demonstrate compliance, traceability and have a positive impact on the performance gap.
- 5.21. We received some suggestions that the requirement should be determined on a case-by-case basis, subject to considerations such as the building type. Others argued that testing requirements and / or building control enforcement need to be

more stringent. Some stakeholders questioned the costs and practicality of this proposal.

Question 52:

Currently, small developments are excluded from the requirement to undergo any airtightness tests. Do you agree with including small developments in this requirement?

- 5.22. The consultation proposed that small developments would no longer be exempt from airtightness tests and these dwellings must be airtightness tested alongside all other new dwellings.

Question 52	No. of all responses	% of all responses	% of responses to Q52
(a) Yes	1,517	46%	96%
(b) No	65	2%	4%
Did not respond	1,728	52%	-

- 5.23. Respondents that agreed with the proposal commented that the requirement for airtightness testing should be mandatory regardless of the scale of building project.

- 5.24. Among the stakeholders that disagreed with the proposal, some stated that this would provide small builders with unjustified cost and risk. Some respondents favoured a random sampling process, with triggers in place for testing other homes if a failure occurs.

Government response to Questions 51 and 52

- 5.25. In line with the consultation proposals, we will include requirements that all new dwellings should be airtightness tested, including small developments. This requirement will ensure that all dwellings, regardless of the size of development, meet the standard.

- 5.26. A concern stated was that this will have cost and resource implications, particularly for small projects. Most major housebuilders already currently test all units. We have produced calculations using the total number of tests completed, corrected for failures and multiple tests on the same plot, divided by the number of new build dwellings.^{19, 20} These calculations show that the percentage of new build dwellings that are not currently tested is 14%. As stated in the draft Impact Assessment, we consider that 100% testing could improve the air-permeability of the currently untested dwellings. The benefit of this will be the fuel savings and associated reduced fuel bills.

¹⁹ Table 213 and 214: Permanent dwellings started and completed by tenure England and Wales (quarterly), MHCLG (2019). <https://www.gov.uk/government/statistical-data-sets/live-tables-on-house-building>.

²⁰ Air tightness testing Scheme Statistics: England and Wales, DCLG (2016). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/714057/180605_Air_Tightness_Testing_Master_Stats_April_2016_to_March_2018.pdf

- 5.27. It must also be noted that small developers typically operate in a different segment of the housing market to larger businesses. They will undertake projects that are not well suited to a larger developers' business models, such as smaller sites or those requiring a more bespoke design solution. Their starting cost base is therefore likely to be higher and other elements of their business model will differ. While the impact of new standards, such as all homes having to undergo airtightness tests, on absolute build costs for a smaller developer may be higher than those for a larger business, this does not necessarily mean they will be disproportionately affected. More information on smaller developers can be found in the draft Impact Assessment.²¹

Introducing an alternative to the blower door test

Question 53:

Do you agree that the Pulse test should be introduced into statutory guidance as an alternative airtightness testing method alongside the blower door test?

- 5.28. Currently, the approved method of performing airtightness testing is the blower door method. The consultation sought views on introducing the Pulse test as an alternative approved airtightness testing methodology.

Question 53	No. of all responses	% of all responses	% of responses to Q53
(a) Yes	347	11%	25%
(b) No	1,044	32%	75%
Did not respond	1,919	58%	-

- 5.29. Respondents that agreed with this proposal, including local authorities, competent persons schemes, manufacturers and those in the energy sector, commented that innovative technologies should be encouraged. Respondents from the builder / developer sector noted that Pulse tests are easier to perform, which means that more could be done in one day and to a lower cost.
- 5.30. Many of the responses that we received from designers, engineers, surveyors, architects and researchers disagreed with this proposal on the basis that the blower door test should be the main test for airtightness. Some builders and developers expressed concern that the Pulse test may not provide accurate readings for very airtight buildings or identify where leaks are in the building. There was also some stakeholder concern that having more than one approved method could lead to confusion around the availability of the necessary equipment.
- 5.31. Some respondents suggested that the fact that a Pulse test is undertaken at 4Pa meant it was a better reflection of the real conditions of a home while others expressed concern that tests are performed at 4Pa rather than 50Pa. Specific concerns raised included the robustness of the conversion factor in SAP, that 4Pa

²¹ The Future Homes Standard consultation impact assessment, MHCLG. (2019) <https://www.gov.uk/government/publications/the-future-homes-standard-consultation-impact-assessment>

may not be enough pressure to stress the fabric or test the seal, and that tests at 50Pa may help to understand the long-term saturation of a building.

Question 54:

Do you think that the proposed design airtightness range of between 1.5 m³/m².h and the maximum allowable airtightness value in Approved Document L Volume 1 is appropriate for the introduction of the Pulse test?

- 5.32. As the effectiveness of the Pulse test in very airtight dwellings had yet to be demonstrated at the time of consultation, we proposed a range of design airtightness between 1.5 m³/(h.m²) and the maximum allowable airtightness value (found in the 2019 draft *Approved Document L, Volume 1: Dwellings*) at which a Pulse test could be performed. Airtightness outside of this range would have to be tested using a blower door test.

Question 54	No. of all responses	% of all responses	% of responses to Q54
(a) Yes	231	7%	17%
(b) No	1,101	33%	83%
Did not respond	1,978	60%	-

- 5.33. This proposal received support from local authorities, building control inspectors and competent persons scheme operators. Some respondents suggested that the limit should be reviewed if evidence of the Pulse test's reliability in very airtight buildings is proven. It was also suggested that should the target emission rate be met at an airtightness of 1.5 m³/(h.m²), there may not be a need to commission a further blower door test on a more airtight home.
- 5.34. Respondents that disagreed with this proposal argued that any new technology should be able to test down to at least 0.1 m³/(h.m²) at 50Pa. However, some stakeholders argued that if the Pulse test was to be introduced, there should be no limit set for it. Other respondents questioned the accuracy of Pulse testing in very airtight buildings.
- 5.35. Some stakeholders expressed concern that different parameters and different tests would lead to confusion and mean that comparisons between buildings tested using different methodologies would not be possible.

Government response to Questions 53 and 54

- 5.36. In line with the consultation proposal, we will introduce Pulse testing as an approved airtightness testing method.
- 5.37. After the consultation closed in February 2020, more evidence was submitted to MHCLG by Build Test Solutions, the developer of the Pulse method. This evidence has shown that development to the Pulse method has overcome the issue of over-pressurisation experienced when testing very airtight buildings in the field trials in 2018. The evidence demonstrates that Pulse works in very airtight homes, and we

will therefore introduce the Pulse method with no limits on the airtightness to be measured.

- 5.38. We recognise the challenges associated with measuring airtightness at the extremes of the range and realise there are difficulties with the techniques in very airtight dwellings across both pulse and the door blower test, such as wind conditions. The Government trust that trained and qualified assessors and their associated competent person schemes should ensure valid measurements through the most appropriate test equipment.
- 5.39. We have been working closely with Building Research Establishment (BRE), Build Test Solutions (BTS), the Chartered Institution of Building Services Engineers (CIBSE) and Building Services Research, and Information Association (BRSIA) as well as our technical working group to find an alternative and suitable conversion between the low-pressure pulse (LPP) method and blower door test. The LPP test provides the measured air permeability at 4Pa as opposed to the blower door test, which does so at 50Pa. For this reason, the 'divide by 20' method of conversion to an air change rate at ambient pressures is not applicable, so a different conversion is needed. Build Test Solutions have proposed a conversion formula based on analysing data from field trials and comparison with blower door tests that performs this conversion, which BRE has reviewed and approved. The proposed conversion formula is derived by calculating the ratio of the measured air permeability at 4Pa (AP4) from an LPP test to the measured air permeability at 50Pa (AP50) from a blower door test result over a range of leakage rates. This new method will be included in SAP 10.2.

Revising the approved methodology

Question 55:

Do you agree that we should adopt an independent approved airtightness testing methodology?

- 5.40. To ensure that the approved methodology for airtightness testing is independent of all organisations with an associated competent person scheme, the consultation proposed approving an airtightness testing methodology written by the Chartered Institute of Building Services Engineers (CIBSE), an independent organisation.

Question 55	No. of all responses	% of all responses	% of responses to Q55
(a) Yes	1,436	43%	97%
(b) No	39	1%	3%
Did not respond	1,835	55%	-

- 5.41. Respondents to this question acknowledged that this proposal would allow all developers to adopt a consistent approach to conducting airtightness testing and some commented that approving an independent methodology would avoid any potential commercial bias.

- 5.42. Alternative approaches to the CIBSE methodology were offered by respondents. Some stakeholders recommended that an approved method for performing an airtightness test should look similar to the Air Tightness Testing and Measurement Association's (ATTMA) standards. Others suggested that the Pulse test and a standard level of uncertainty could be introduced as part of an approved methodology.

Question 56:

Do you agree with the content of the CIBSE draft methodology which will be available via the link in the consultation document? Please make any comments here.

- 5.43. Approximately 80% of respondents to this question agreed with the content of the CIBSE draft methodology and made no further comments. Some stakeholders commented that they were pleased to see an independent airtightness testing methodology and that the methodology was rigorous and comprehensive.
- 5.44. Some respondents suggested that the methodology was not comprehensive enough and there was some concern that the guidance needed to make provisions for very low energy buildings. It was noted by some stakeholders that the guidance should acknowledge testing requirements for fully mechanically ventilated buildings.
- 5.45. We received detailed comments from some builders, developers, and research / academic organisations on specific elements that they thought needed refinement.

Government response to Questions 55 and 56

- 5.46. In line with the consultation proposals, we will adopt an independent approved airtightness testing methodology, which will be CIBSE TM23.
- 5.47. While most respondents agreed with the content of the CIBSE draft methodology, we received some helpful suggestions regarding specific elements. A list of these suggestions has been provided to CIBSE, with whom we will collaborate to finalise the TM23 guidance. We will also consider the responses we receive on this subject through *The Future Buildings Standard consultation*, to ensure no further issues are raised.⁴ We anticipate that a final version for adoption will be published in 2021.
- 5.48. Guidance in the 2019 draft *Approved Document L, Volume 1: Dwellings* was inconsistent with what was written in the CIBSE methodology on when the calibration of devices that carry out airtightness testing should take place. We are proposing to clarify this guidance to align with the CIBSE methodology in the *Future Buildings Standard consultation*.⁴

Chapter 6 - Compliance, Performance and Providing Information

- 6.1 The Future Homes Standard consultation explained that studies in the UK, and internationally, have shown there can be a significant difference, or a ‘performance gap’, between the outputs from design calculations and the measured energy performance of new homes. The performance gap in new built homes is particularly affected by three major factors:
- i) Limitations of energy models;
 - ii) Build quality; and
 - iii) Different occupant behaviour of each dwelling.
- 6.2 Poor build quality can lead to a new home requiring more energy for heating than intended and can result in higher energy bills for occupants. The consultation proposed changes to improve the energy performance of homes by addressing compliance with Part L standards; and to improve the accuracy of as-built energy calculations by enhancing the evidence used when producing them.
- 6.3 To deliver this, we proposed to support those involved in the design and construction of buildings to build to the quality expected in the Part L targets and demonstrate this robustly to building control bodies; and to provide clearer information about the as-built specifications of new buildings to both building control bodies and to building owners.

Proposed measures to improve compliance and performance

Question 57:

Do you agree with the introduction of guidance for Build Quality in the Approved Document becoming part of the reasonable provision for compliance with the minimum standards of Part L?

- 6.4 The consultation proposed to introduce guidance to avoid common issues that contribute towards creating a performance gap throughout *Approved Document L, Volume 1: Dwellings* under the title Build Quality.

Question 57	No. of all responses	% of all responses	% of responses to Q57
(a) Yes	1,992	60%	97%
(b) No	55	2%	3%
Did not respond	1,263	38%	-

- 6.5 Respondents that agreed with this proposal, including local authorities, designers, engineers, surveyors, installers and specialist sub-contractors, noted that they felt it

would be effective in reducing the performance gap. We received feedback that the guidance was useful and easy to understand. Some stakeholders acknowledged the importance of a home being built to the agreed specification in order for the heating system to function as designed. They also recognised that the guidance would be helpful for developers by setting expectations around the minimum requirements.

- 6.6 Among respondents that disagreed with this proposal, some argued that guidance would be ineffective unless it was mandatory for house builders to deposit plans and obtain a notice of passing or a plans certificate before commencement. We also received suggestions that the requirements need to go further. It was noted by some respondents that building control need to check sites more thoroughly. Some suggested that there should be checks in place to confirm that the measures have been implemented, potentially through some form of check list.
- 6.7 Some local authorities suggested that the introduction of Build Quality in the *Approved Document L, Volume 1: Dwellings* should be an Appendix to Regulation 7 (which provides guidance on materials and workmanship) or that it should be included in Regulation 7.

Question 58:

Do you have any comments on the Build Quality guidance in Annex C?

- 6.8 Most of the consultation responses we received stated they had no further comments or did not respond to this question. We received detailed suggestions from some stakeholders regarding proposed changes to the Build Quality guidance.

Government response to Questions 57 and 58

- 6.9 We recognise that there is a gap between the design intent and actual built performance. In line with the consultation proposal, we intend to introduce guidance to make it clear how to meet minimum standards by avoiding common issues that contribute towards creating a performance gap.
- 6.10 We have made the following amendments to the Build Quality guidance based on the detailed suggestions we received through consultation:
- The guidance contains all of the core information originally included in the consultation version, but now also includes more specific information;
 - An introduction has been added to outline the scope and purpose of the Build Quality guidance. The introduction includes reference to the LABC construction details library;
 - This library is comprehensive.
 - It is freely accessible and includes many typical details for masonry and timber-frame construction.
 - The details are broadly representative of the level of thermal performance that the Approved Documents specify. They also include psi-values should they be required.

- The LABC library has been included as many respondents stated that 'a' library/repository of details would be needed.
- A photographic evidence section has also been added, making it clear the criteria that is expected for obtaining sufficient photographic evidence.

6.11 The revised Build Quality guidance can be found under Section 4 and Appendix F of the 2021 draft *Approved Document L, Volume 1: Dwellings*.

Question 59:

Do you agree with the introduction of the standardised compliance report, the Building Regulations England Part L (BREL) report, as presented in Annex D?

6.12 The consultation proposed to introduce a new compliance report, which would ensure a more unified approach by providing building control bodies with the same clear information for every home as opposed to the current system, whereby they receive a range of different outputs from SAP software with varying levels of detail.

Question 59	No. of all responses	% of all responses	% of responses to Q59
(a) Yes	1,801	54%	90%
(b) No there is no need for a standardised compliance report	13	<1%	1%
(c) No - I agree there should be a standardised compliance report but do not agree with the draft in Annex D	185	6%	9%
Did not respond	1,311	40%	-

6.13 Respondents that agreed with this proposal noted that the standardised report provided consistency and clarity, and that it would be useful to those working with several companies. Some respondents agreed with a standardised compliance report but argued that any report would have a limited impact if there was no consequence to non-compliance.

6.14 Those who disagreed argued that the report may have a limited impact on the performance gap. There were specific concerns that the report would have limited use as a site inspection check list and that it would be too expensive and overly complicated to produce.

6.15 We received some detailed suggestions from stakeholders regarding proposed changes to the BREL, such as: the compliance report should explain the air-tightness and wind-tightness strategies and clarify the materials used to form the airtightness and wind tightness lines; and that photographic evidence of difficult junctions in, or penetrations through, the air-tightness line should be provided.

Government response to Question 59

6.16 In line with the consultation proposal, we will introduce a new compliance report called the BREL report. This will provide a more unified approach by providing building control bodies with the same clear information for every home. The BREL

report will be a document produced using the information from the SAP calculations and will have to be signed by the energy assessor and the developer to confirm that the as-built calculations are accurate.

6.17 We have made some amendments to the BREL report based on the detailed suggestions we received through consultation. These include:

- Adding a short introductory paragraph to explain that the template is based on a single dwelling and additional information should be added for technologies that are not included in the example. Also, that a BREL is needed both at design and as-built stages;
- Adding a new line in Section 2a for roof windows as these have different performance specifications in the AD to vertical windows;
- Removing hyperlinks to third party certificates (e.g. air permeability) on the basis that respondents commented that their inclusion may not be helpful as hyperlinks may become obsolete over time. Instead, third party certificate reference numbers are requested; and
- Adding proof of commissioning for heating and hot water services, such as Benchmark documentation (note Benchmark commissioning forms do not include a unique reference/certificate number).

6.18 A post-consultation version of SAP 10 will be released for the Part L 2021 changes, and the BRE are currently working on incorporating the compliance report within this software. The final version of the example compliance report, incorporating feedback from the consultation, is attached in Annex C. There may be minor amendments to this as a result of incorporating it into the SAP software.

Question 60:

Do you agree with the introduction of photographic evidence as a requirement for producing the as-built energy assessment for new dwellings?

6.19 The consultation proposed that photographic evidence is required to improve the accuracy of energy calculations and to provide assurance that the SAP as-built energy calculations are a reflection of finished homes.

Question 60	No. of all responses	% of all responses	% of responses to Q60
(a) Yes	1,975	60%	95%
(b) No	107	3%	5%
Did not respond	1,228	37%	-

6.20 Some of the respondents in favour of this proposal expressed support that photographic evidence would be time stamped and geotagged to avoid evidence being fabricated. Others welcomed the idea of introducing photographic evidence as a requirement for producing Energy Performance Certificates but did not think that the requirement was appropriate to produce as-built energy assessments for Building Regulations compliance.

- 6.21 It was argued by some stakeholders that photographic evidence does not provide sufficient evidence to prove compliance and it was suggested that thermal imaging should be included to offer evidence on insulation installation. It was also noted by some that it would not be feasible to implement the proposal due to resources, cost and the administrative burden.

Government response to Question 60

- 6.22 Photographic evidence offers a simple, effective and robust method of improving the quality of as-built energy calculation in new dwellings. We will therefore implement the proposal set out in the consultation.
- 6.23 We have made some amendments to the photographic evidence criteria based on the detailed suggestions we received through consultation. The criteria for photographic evidence has been added as a section in Appendix B: Reporting Evidence of Compliance of the 2021 draft *Approved Document L, Volume 1: Dwellings*. The section outlines what is expected, along with a schedule of details. We have also made clear that trade operatives can take the required photo(s), as many in the consultation sought clarification.

Question 61:

Do you agree with the proposal to require the signed standardised compliance report (BREL) and the supporting photographic evidence to be provided to Building Control?

- 6.24 Approved Document L currently requires the builder to notify the building control body of the output of energy calculations and whether the building was constructed in accordance with the list of specifications submitted to the building control body before work started. The consultation proposed that this evidence is in the form of the new standardised compliance report (BREL) and the photographic evidence is provided to the building control body to confirm that the minimum requirements of the relevant Building Regulations are met.

Question 61	No. of all responses	% of all responses	% of responses to Q61
(a) Yes	1,979	60%	96%
(b) No	82	3%	4%
Did not respond	1,249	38%	-

- 6.25 Some respondents that agreed with this proposal noted that this should not be a substitute for building control visiting a site. Other responses noted a risk that photographic evidence could be falsified and suggested a method of control to ensure that photographs are genuine.
- 6.26 Some stakeholders reasoned that the photographic evidence would need to be provided to building control at an appropriate time in order to demonstrate compliance with the Building Regulations and receive a completion certificate. Stakeholders were concerned that a failure to obtain photographic evidence at the appropriate time would make completion difficult to achieve and result in a difficult and costly route to demonstrate compliance.

- 6.27 Some respondents felt that this proposal would result in an administrative burden. There were some calls for the BREL report to be provided to building control, but not the supporting photographic evidence.

Government response to Question 61

- 6.28 We will implement the proposal set out in the consultation. This change will provide building control bodies with information about how the as-built energy assessment has been produced, in a single clear format. We expect this will simplify the process of checking compliance with the Part L requirements for building control.

Question 62:

Do you agree with the proposal to provide homeowners with the signed standardised compliance report (BREL) and photographic evidence?

- 6.29 The consultation proposed to provide homeowners with the signed standardised compliance report (BREL) and photographic evidence (Question 62), to help them better understand how the as built energy calculation of their home was undertaken.

Question 62	No. of all responses	% of all responses	% of responses to Q62
(a) Yes	1,981	60%	96%
(b) No	77	2%	4%
Did not respond	1,252	38%	-

- 6.30 Respondents that agreed with this proposal reasoned that providing the standardised compliance report (BREL) and photographic evidence will mean a homeowner is made aware of and given assurances about the design and build quality of their home. There was recognition that encouraging a greater awareness around the energy use in a home should generally be encouraged. It was also noted that this information would provide homeowners with additional evidence if there were any issues with their home or if they needed to make any changes in the future. Many respondents argued that the standardised compliance report (BREL) and photographic evidence should be provided to any future occupant of a home, rather than just a 'homeowner'. Others in favour of the proposal suggested that the BREL report should be submitted to the homeowner/occupier of the home, but that it must be easy for them to access and understand.

- 6.31 There was acknowledgement that this proposal would ensure that responsibility is taken by either the developer or assessor. We received some suggestions that we should go further, such as providing information about the structure of a home that is not immediately visible or sharing information with buyers' surveyors, who can advise prospective purchasers about the build quality of their home.

- 6.32 Some respondents that disagreed with this proposal highlighted that homeowners should be provided with evidence of the standard to which the dwelling has been built to (i.e. BREL report), but that photographs are unnecessary and enforcement would be challenging. There were suggestions that the BREL report may not be of

interest to homeowners and that the home user guide would be more useful. A specific concern for some stakeholders was that photographic evidence may be misinterpreted by homeowners due to a lack of technical knowledge.

Government response to Question 62

- 6.33 We will implement the proposal set out in the consultation. This change will provide purchasers with a greater understanding about the technologies and construction details that were used to make the home low carbon and energy efficient. As well as being more transparent, this will assure homeowners that the home they are buying is built in line with the energy efficient design specifications.

Question 63:

Do you agree with the proposal to specify the version of Part L that the home is built to on the EPC?

- 6.34 The consultation proposed to specify the version of Part L that a home is built to on an Energy Performance Certificate in order to provide more information to homebuyers about their homes. The proposal of highlighting which version of Part L the home is being built to adopts recommendations from the BEIS select committee.²²

Question 63	No. of all responses	% of all responses	% of responses to Q63
(a) Yes	2,067	62%	99%
(b) No	18	<1%	1%
Did not respond	1,225	37%	-

- 6.35 Respondents that agreed with this proposal reasoned that it could help drive construction to better standards, improve build quality and describe the performance of the new home in a way that can be easily understood by both professionals and the general public. Stakeholders also noted that it would improve accountability.

- 6.36 It was argued by some stakeholders that specifying the version of Part L that a home is built to on the Energy Performance Certificate was unnecessary. Others argued that Government should go further with the whole compliance report being provided alongside the Energy Performance Certificate.

Government response to Question 63

- 6.37 We will implement the proposal set out in the consultation, which will provide consumers with clarity regarding the energy efficiency standards that their home is built to. We anticipate that the version of Part L that a new home is built to will begin to appear on a home's Energy Performance Certificate in 2021; this will not affect Energy Performance Certificates for existing homes.

²² Conclusions and recommendations: Energy efficiency and net zero, UK Parliament (2019)
<https://publications.parliament.uk/pa/cm201719/cmselect/cmbeis/1730/173012.htm>

Question 64:

Do you agree Approved Document L should provide a set format for a home user guide in order to inform homeowners how to efficiently operate their dwelling?

- 6.38 The consultation proposed that a set format for home user guides should be provided in *Approved Document L, Volume 1: Dwellings*, similar to the standard set out in the National House Building Council and CIBSE TM60 home user guides.

Question 64	No. of all responses	% of all responses	% of responses to Q64
(a) Yes	1,840	56%	98%
(b) No	39	1%	2%
Did not respond	1,431	43%	-

- 6.39 Stakeholders that agreed with this proposal stated this would provide clarity and ensure minimum standards of content in user guides. Others stated that the guide would help homeowners to engage with the energy efficiency in their home and contribute to the effective use of the property. Respondents acknowledged the importance of effective methods of communication such as infographics, and that the home user guides should be short, simple and non-technical to allow widespread understanding.
- 6.40 Some respondents stated that the Building Regulations were not the most appropriate place to put such a requirement and would be difficult to enforce. There was also concern that the guide would not match the diverse range of product types available.
- 6.41 We received a range of suggestions in relation to issues that should be incorporated into the user guide, including:

- Details of equipment, guidance on how to use it and commissioning certificates;
- Information on how to maintain healthy indoor air quality, ventilation standards, airtightness standards, managing overheating and energy efficiency;
- Financial and environmental benefits; and
- Maintenance information.

Government response to Question 64

- 6.42 Home user guides produced by various organisations can vary in quality and we currently have no guidance to require their use. We will therefore implement the proposal set out in the 2019 draft *Approved Document L, Volume 1: Dwellings* to provide a set format for a home user guide in order to inform homeowners how to efficiently operate their dwelling.
- 6.43 We have made some amendments to the home user guide based on the detailed suggestions we received through consultation. These include:

- Guidance on ventilation; and
- Guidance on ‘staying cool in hot weather’.

6.44 The revised Home User Guide is available online through the following website:

<https://www.gov.uk/government/publications/home-user-guide-template>

Chapter 7 - Transitional Arrangements

- 7.1 When changes are made to Building Regulations, transitional arrangements determine which standards a construction site will need to comply with. When changes were last made to Part L in 2013, an entire construction site was permitted to continue under old standards if a developer submitted an initial notice, a building notice or full plans application to the local authority prior to new Regulations coming into effect, providing work then started on site within 12 months of the Regulations coming into effect.
- 7.2 We are aware of cases of housing developments being built out to energy efficiency requirements that have been superseded more than twice with changes to Part L of the Building Regulations. While we appreciate that many housebuilding sites are built out over a number of years, in the context of net zero we must ensure that as many homes as possible are built to the latest energy efficiency standards.

Transitional Arrangements for 2021 Uplift

Question 65:

Do you agree that the transitional arrangements for the energy efficiency changes in 2020 should not apply to individual buildings where work has not started within a reasonable period – resulting in those buildings having to be built to the new energy efficiency standard?

- 7.3 The consultation proposed that for the purposes of the interim uplift, transitional arrangements should only apply to individual buildings on which building work has started within a reasonable period, rather than an entire construction site.
- 7.4 Where work has not commenced on a building covered by the building notice, initial notice, or full plans within the reasonable period, that building would not benefit from transitional provisions and would need to comply with the latest set of energy efficiency standards. The consultation also sought feedback on what would constitute a ‘reasonable period’ for this purpose.

Question 65	No. of all responses	% of all responses	% of responses to Q65
(a) Yes - where building work has commenced on an individual building within a reasonable period, the transitional arrangements should apply to that building, but not to the buildings on which building work has not commenced	2,036	62%	95%
(b) No - the transitional arrangements should continue to apply to all building work on a development, irrespective of whether or not building work has commenced on individual buildings	111	3%	5%

Did not respond	1,163	35%	-
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- 7.5 The responses we received emphasised the importance of clearly defining any transitional arrangements so that terms such as 'commencement', 'reasonable period', 'building work' and 'site' are broadly understood, and any transitional arrangements are as effective as possible.
- 7.6 Some respondents that disagreed with the proposal, including installers, reasoned that changes in specification and processes halfway through a construction site could be detrimental to the quality of work. Others argued against any transitional arrangements at all, on the basis that new standards should be adopted as quickly as possible.
- 7.7 Some alternative suggestions we received included different transitional arrangements for larger and smaller developments; a further transitional period to mandate how quickly construction must be completed on homes that are protected by transitional arrangements; and that large developments containing an energy centre should be allowed additional flexibility if necessary.
- 7.8 The suggestions we received from respondents that agreed with this proposal regarding a potential reasonable period ranged from less than one year to five years.

Question 66:

Do you foresee any issues that may arise from the proposed 2020 transitional arrangements outlined in this consultation?

	No. of all responses	% of all responses	% of responses to Q66
(a) Yes	366	11%	18%
(b) No	1,616	49%	82%
Did not respond	1,328	40%	-

- 7.9 Some respondents noted that if a reasonable, clear period is established and the transitional arrangements have a suitable notification period, there should not be any issues.
- 7.10 Stakeholders, including designers, engineers, surveyors and local authorities, suggested that there may be issues due to availability of resources, expertise, technology, cost and supply chains during a transition period.
- 7.11 Some respondents felt that there needed to be a significant availability of building control officers and other quality assurance professionals to carry out compliance checks and enforcement, while maintaining appropriate records.

Government response to Questions 65 and 66

- 7.12 The pace at which we can transition to higher standards and ultimately deliver homes that are ready for a zero-carbon future has been a key consideration for the Government. Transitional arrangements are important as they provide all

developers with certainty about the standards they are building to, particularly those with larger sites that may be planned well in advance. Our transitional arrangement proposals for the 2021 Part L and Part F uplifts were designed to provide a balance between continuing to offer certainty to developers, while being more stringent in practice to ensure that as many new dwellings as possible are meeting up to date energy efficiency standards.

- 7.13 In this consultation response, we have been clear that as many homes must be built to 2021 standards as quickly possible, not only to increase the number of low carbon, highly energy efficient homes and contribute to our net zero ambitions, but to help grow the supply chains and skills bases that will be necessary in order for industry to be ready to deliver the Future Homes Standard. We will therefore implement the approach set out in consultation, which means that transitional arrangements will apply only to individual buildings, rather than site wide as they have in the past.
- 7.14 We have decided to set a reasonable period of one year, which will allow developers 12 months from when Regulations come in to effect to commence work on each individual building on site. This is in line with the reasonable period that was in place for the 2013 Part L uplift, however, we recognise that applying this to individual buildings is a significant change.
- 7.15 We anticipate that our approach to transition will support successful implementation of the 2021 interim uplift and therefore better support the wider implementation timeline for the Future Homes Standard from 2025.

Transitional arrangements in practice

- For transitional arrangements to apply to an individual building, developers will need to both:
 - i) Submit a building / initial notice or deposited plans by June 2022; and
 - ii) Commence work on each individual building by June 2023.
- Where notices or plans are submitted after June 2022, transitional arrangements will not apply and homes must be built in line with 2021 Part L standards.
- Where notices or plans are submitted before June 2022, but work on any individual building does not commence by June 2023, the uncommenced buildings must build in line with 2021 Part L standards.
- No individual building will need to change once building work has commenced, in line with the definition on commencement below, as long as work commences within the reasonable period. However, developers will need to plan their sites appropriately and if work on a building commences outside of the reasonable period, they will need to ensure that it is compliant with new standards.
- For the purposes of transition, commencement will not change from the existing 2013 definitions:

- Excavation for strip or trench foundations or for pad footings.
- Digging out and preparation of ground for raft foundations.
- Vibrofloatation (stone columns) piling, boring for piles or pile driving.
- Drainage work specific to the building(s) concerned.

Transitional Arrangements for the Future Homes Standard

7.16 The consultation stated that we want to ensure that homes conform to the Future Homes Standard as soon as reasonably possible and sought feedback on three possible changes that might apply for future transitional arrangements.

Question 67:

What is your view on the possible transitional arrangements regarding changes to be made in 2025?

7.17 Some stakeholders wanted to see more ambitious transitional arrangements or none at all when the Future Homes Standard is introduced. Others welcomed an ambitious approach and felt that industry was capable of going further given adequate time and support to prepare, learn and meet the new requirements.

7.18 Many respondents stated that consultation on the Future Homes Standard should begin as early as possible to offer certainty to all stakeholders. There were also calls for more detail on how this will be enacted and enforced along with clear definitions.

7.19 Some respondents felt that it would sensible to see how the market responds to any transitional arrangements in 2021 to better inform final decisions for the Future Homes Standard.

Government response to Question 67

7.20 This consultation response confirms a path towards the Future Homes Standard, as well as the work we will carry out with industry over the next three years to ensure that implementation is a success. Monitoring the impact of the 2021 Part L uplift and the associated transitional arrangements will be a key consideration in that process.

7.21 A full technical consultation on the Future Homes Standard is planned for spring 2023 and as part of this we will consider what transitional arrangements are appropriate.

Chapter 8 - Impact Assessment

- 8.1 The consultation sought feedback on the draft Impact Assessment published alongside the consultation, which considered the costs and benefits of the proposed changes to Part L and Part F of the Building Regulations in 2020.

Question 68:

The Impact Assessment makes a number of assumptions on fabric/services/renewables costs, new build rates, phase-in rates, learning rates, etc. for new homes. Do you think these assumptions are fair and reasonable?

	No. of all responses	% of all responses	% of responses to Q68
(a) Yes	370	11%	50%
(b) No	366	11%	50%
Did not respond	2,574	78%	-

- 8.2 Respondents that disagreed with some of the assumptions provided a range of specific comments regarding the costs that were included in the impact assessment. However, we received contrasting views from some stakeholders on whether the costs for several specific issues were over or under-estimated in the assessment.
- 8.3 We received suggestions that the scope of analysis should be extended to consider whole life carbon, in particular noting the need to capture embodied carbon and waste during the build process.

Question 69:

Overall, do you think the impact assessment is a fair and reasonable assessment of the potential costs and benefits of the proposed options for new homes?

	No. of all responses	% of all responses	% of responses to Q69
(a) Yes	361	11%	50%
(b) No	354	11%	50%
Did not respond	2,595	78%	-

- 8.4 We received a range of detailed suggestions from stakeholders on issues including; supply chains, skills, capacity and consumer perception of low carbon heating; and whole life carbon.

Government response to Questions 68 and 69

- 8.5 The draft Impact Assessment was carried out in line with guidance in HM Treasury's Green Book. We have carefully considered the detailed comments that were provided by consultation respondents. We intend to publish a final Impact Assessment in autumn 2021 alongside a Government response to *The Future Buildings Standard consultation*, the scope of which includes specific proposals in relation to new dwellings, including the level of the Fabric Energy Efficiency

Standard and proposals to introduce a new overheating mitigation requirement in the Building Regulations for new residential buildings.⁴

Annex A - Draft notional building specification for the Future Homes Standard

- A.1 The introduction of the Future Homes Standard will ensure that from 2025, an average home will produce at least 75% lower CO₂ emissions than one built to current energy efficiency requirements. In the short term this represents a considerable improvement in energy efficiency standards for new homes. Homes built under the Future Homes Standard will be ‘zero carbon ready’, which means that in the longer term, these homes will be future-proofed with low carbon heating and world-leading levels of energy efficiency. No further retrofit work will be necessary to enable them to become zero carbon homes as the electricity grid continues to decarbonise.
- A.2 By delivering carbon reductions through the fabric and building services in a home rather than relying on wider carbon offsetting, the Future Homes Standard will ensure new homes have a smaller carbon footprint than any previous Government policy. In addition, this footprint will continue to reduce over time as the electricity grid decarbonises.
- A.3 To illustrate the type of homes we expect to be built under the Future Homes Standard, the October 2019 consultation proposed a draft specification that included the minimum fabric standards we expect these homes might incorporate. Under the Future Homes Standard, we will be pushing building fabric standards further than ever before while ensuring that low carbon heating is integral to the design of all new homes.
- A.4 The table below sets out a draft notional building specification that will form the basis of the Future Homes Standard. While the draft specification for the Future Homes Standard is not final and will be subject to further technical work and full consultation in due course, we are sharing this now so that we can begin to engage with all parts of industry on the indicative technical detail of the Future Homes Standard.

Table A - Draft Future Homes Standard specification	
	Indicative FHS specification ²
Floor U-value (W/m ² .K)	0.11
External wall U-value (W/m ² .K)	0.15
Roof U-value (W/m ² .K)	0.11
Window U-value (W/m ² .K)	0.8
Door U-value (W/m ² .K)	1.0
Air permeability (m ³ /(h.m ²))	5.0
Heating appliance	Low-carbon heating (e.g. Heat pump)
Heat Emitter type	Low temperature heating
Ventilation System type	Natural (with extract fans)
PV	None

Wastewater heat recovery	No
y value (W/m ² .K)	0.05

Annex B - Notional building specification for Part L 2021

Element or System	Reference Value for Target Setting
climate data	<ul style="list-style-type: none"> • UK average
size and shape	<ul style="list-style-type: none"> • Same as actual dwelling
opening areas (windows, roof windows, rooflights and doors)	<ul style="list-style-type: none"> • Same as actual dwelling up to a maximum for total area of openings of 25% of total floor area.¹
external walls including semi-exposed walls	<ul style="list-style-type: none"> • $U = 0.18 \text{ W/m}^2\text{K}$
party walls	<ul style="list-style-type: none"> • $U = 0$
floors	<ul style="list-style-type: none"> • $U = 0.13 \text{ W/m}^2\text{K}$
roofs	<ul style="list-style-type: none"> • $U = 0.11 \text{ W/m}^2\text{K}$
opaque door (<30% glazed area)	<ul style="list-style-type: none"> • $U = 1.0 \text{ W/m}^2\text{K}$
semi-glazed door (30-60% glazed area)	<ul style="list-style-type: none"> • $U = 1.0 \text{ W/m}^2\text{K}$
windows and glazed doors with >60% glazed area	<ul style="list-style-type: none"> • $U = 1.2 \text{ W/m}^2\text{K}$ • Frame factor = 0.7 • Solar energy transmittance = 0.63 • Light transmittance = 0.80 • Orientation same as actual dwelling • Overshading same as for compliance calculation (average if actual dwelling has very little or average overshading; same as actual dwelling if greater overshading)
roof windows	<ul style="list-style-type: none"> • $U = 1.2 \text{ W/m}^2\text{K}$ (adjustment factor of +0.3 $\text{W/m}^2\text{K}$ applied to roof window as described below Table 6e; resultant U value = 1.5 $\text{W/m}^2\text{K}$). • Overshading factor 1.0. Other parameters as for windows.
rooflights	<ul style="list-style-type: none"> • $U = 1.2$ (no correction applied) Overshading factor 1.0. Other parameters as for windows
curtain wall	<ul style="list-style-type: none"> • Curtain walling to be treated as standard glazing and opaque wall with the same areas as the actual dwelling.²
thermal mass	<ul style="list-style-type: none"> • Same as actual dwelling
living area	<ul style="list-style-type: none"> • Same as actual dwelling
number of sheltered sides	<ul style="list-style-type: none"> • Same as actual dwelling
allowance for thermal bridging	<ul style="list-style-type: none"> • Thermal bridging allowance is calculated using the lengths of junctions in the actual dwelling and the 'Option 2' psi values in Table R2.³
ventilation system	<ul style="list-style-type: none"> • Natural ventilation with intermittent extract fans
air permeability	<ul style="list-style-type: none"> • 5 $\text{m}^3/\text{h}\cdot\text{m}^2$ at 50 Pa
chimneys and open flues	<ul style="list-style-type: none"> • None of any type.
extract fans/ passive vents	<ul style="list-style-type: none"> • 2 extract fans for total floor area up to 70 m^2, 3 for total floor area > 70m^2 and up to 100 m^2, 4 for total floor area > 100 m^2
main heating fuel (space and water)	<ul style="list-style-type: none"> • Mains gas

Element or System	Reference Value for Target Setting
heating system	<ul style="list-style-type: none"> • Boiler and radiators • Central heating pump 2013 or later, in heated space • Design flow temperature = 55°C
boiler	<ul style="list-style-type: none"> • If gas or oil combi boiler performing space heating in actual dwelling, instantaneous combi boiler; otherwise regular boiler. • Efficiency, SEDBUK (2009) = 89.5% • Room-sealed, fan-assisted flue; modulating burner control, no hot water test for combi boiler
heating system controls	<ul style="list-style-type: none"> • For a single storey dwelling in which the living area is greater than 70% of total floor area, programmer and room thermostat • For any other dwelling, time and temperature zone control, TRVs • And in all cases: <ul style="list-style-type: none"> • Boiler interlock • ErP Class V
hot water system	<ul style="list-style-type: none"> • Heated by boiler (regular or combi as above). • Separate time control for space and water heating
showers and baths	<ul style="list-style-type: none"> • Number of showers and baths same as actual dwelling. If shower(s) specified, shower flow rate(s) to be 8 l/min. • Shower(s) supplied by main water heating system (not instantaneous electric shower).
wastewater heat recovery	<ul style="list-style-type: none"> • All showers connected to WWHR including showers over baths • Instantaneous WWHR with 36% recovery efficiency utilisation of 0.98, wastewater fraction 0.9.
hot water cylinder	<ul style="list-style-type: none"> • If cylinder specified in actual dwelling: volume of cylinder in actual dwelling • If combi boiler: no cylinder • Otherwise: 150 litres If cylinder, declared loss factor = 0.85 x (0.2 + 0.051 V²/3) kWh/day, where V is the volume of the cylinder in litres
Primary water heating losses	<ul style="list-style-type: none"> • Fully insulated primary pipework. • Cylinder temperature controlled by thermostat cylinder in heated space
water use	<ul style="list-style-type: none"> • Limited to 125 litres per person per day
secondary space heating	<ul style="list-style-type: none"> • None
lighting	<ul style="list-style-type: none"> • Fixed lighting capacity (lm) = 185 x TFA Efficacy of all fixed lighting = 80 lm/W
air conditioning	<ul style="list-style-type: none"> • None
PV system	<ul style="list-style-type: none"> • For houses kW_p = 40% of ground floor area / 6.5 • For flats kW_p = 40% of dwelling floor area / (6.5 * number of storeys in block) • System facing SE/SW • Overshading is 'none' • Connected to dwelling's meter for houses • Not connected to the dwellings meter for flats

Element or System	Reference Value for Target Setting
Notes:	
1. If the total area of openings in the actual dwelling exceeds 25% of the total floor area, reduce to 25% as follows: 1) Include all opaque and semi-glazed doors with the same areas as the actual dwelling (excluding any doors not in exposed elements, e.g. entrance door to a flat from a heated corridor). 2) Reduce area of all windows and roof windows/rooflights by a factor equal to [25% of total floor area less area of doors included in 1)] divided by [total area of windows and roof windows/rooflights in actual dwelling].	
2. When the total opening area exceeds 25% of floor area the glazed area to be reduced to 25% as for opening areas above. U-value of opaque wall = 0.18 W/m ² K U-value of glazing = 1.3 W/m ² K (which includes an allowance of 0.1 for thermal bridging within the curtain wall).	
3. Where the area of openings in the actual dwelling is > 25% of the total floor area the lengths of junctions in the notional dwelling remain the same as the lengths in the actual dwelling, even though window area is reduced as described for 'Opening areas' above. If lengths of thermal bridges are not specified, use a y-value of 0.05 to determine heat losses from thermal bridges.	
For Table R2, please see https://www.bregroup.com/sap/sap10/ (SAP 10.1 specification).	

Annex C - BREL Compliance Report

Building Regulations England Part L (BREL) Compliance Report

Approved Document L1A 20XX Edition, England assessed by xxx SAP 10 program, x.x.x.x

This intention of this template is to identify the level of detail to be included within the BREL at as-designed and as-built stages. It is an example based on a single dwelling. Additional information should be included for technologies not represented in this example.

Project Information			
Assessed By	Text	Building Type	e.g. Semi-detached House
OCDEA Registration	Text		

Dwelling Details				
Assessment Type		Total Floor Area	Value	m ²
Site Reference	Text	Plot Reference	Text	
Address	Text			

Client Details			
Name	Text		
Address	Text		

This report covers items included within the SAP calculations. It is not a complete report of regulations compliance.

1a Target emission rate and dwelling emission rate			
Fuel for main heating system:	e.g. Electricity		
Target carbon dioxide emission rate	Value	kg/m ²	
Dwelling carbon dioxide emission rate	Value	kg/m ²	OK

1b Target primary energy rate and dwelling primary energy			
Target primary energy	Value	kWh/m ²	
Dwelling primary energy	Value	kWh/m ²	OK

2a Fabric U-values				
Element	Average U-Value	Highest U-Value	Key layer elements to achieve U-Value:	
External Wall	x.xx (max. 0.26)	x.xx (max. 0.70)	Layer 1: Description Manufacturer/product ref/thickness	OK
Party wall	x.xx (max 0.20)	-	Description e.g. Cavity Sock Manufacturer/product ref/thickness	OK
Floor	x.xx (max. 0.18)	x.xx (max. 0.70)	Layer 1: Description Manufacturer/product ref/thickness	OK
Roof	x.xx (max. 0.16)	x.xx (max. 0.35)	Roof 1, Layer 1: Description Manufacturer/product ref/thickness Roof 2, Layer 1: Description Manufacturer/product ref/thickness	OK

		Roof 2, Layer 2: <i>Description</i> Manufacturer/product ref/thickness	
Openings (wall)	x.xx (max 1.60) x.xx (max 3.30)	Type 1: <i>Description e.g. Windows</i> Manufacturer/product ref	OK
		Type 2: <i>Description e.g. External Doors</i> Manufacturer/product ref	
Openings (roof)	x.xx (max 2.20) x.xx (max 3.30)	Type 1: <i>Description e.g. Roof Light</i> Manufacturer/product ref	OK

2b Thermal Bridging

Summary of thermal bridging calculated from linear thermal transmittances for each junction				
Main element	Junction detail	Source type	W/m.K	Drawing/reference
External wall	E2 Other lintels	e.g. Independently assessed	x.xx	Text
	E3 Sill	e.g. Table K1	x.xx	Text
	E4 Jamb		x.xx	Text
	E5 Ground floor		x.xx	Text
	E6 Intermediate floor		x.xx	Text
	E10 Eaves (ins. at ceiling)		x.xx	Text
	Etc			
Party wall	P1 Ground floor		x.xx	Text
	P2 Intermediate floor		x.xx	Text
	Etc			
Roof	R5 Ridge		x.xx	Text
	Etc			

3 Air permeability

Air permeability at 50 pascals	xx (measured value)	OK
Maximum	8.0 (limit value)	
Air permeability test certificate ref	e.g. iATS test engineer reference / certificate number	

4 Heating efficiency

Main heating system	e.g. Boiler system with radiators or underfloor heating - mains gas <i>Minimum permitted efficiency xx %</i>	OK
Emitter type	e.g. Radiators	
Flow temperature	xx °C	

	Type Manufacturer Model SEDBUK Efficiency	Technology type <i>Description</i> <i>Description</i> xx %	
Commissioning	Certificate number and installation engineer registration reference		
Secondary heating system	e.g. Closed room heater without back boiler		OK
	Fuel	<i>Description</i>	
	Efficiency	xx %	
Commissioning	Certificate number and installation engineer registration reference		

5 Hot water

Cylinder/store type	Capacity Manufacturer Model Declared daily heat loss	xx litres <i>Description</i> <i>Description</i> xx kWh/day	OK
<i>Maximum permitted loss</i> xx kWh/day			
Commissioning	Certificate number and installation engineer registration reference		
	xx		
Primary pipework insulated Waste water heat recovery	Type Efficiency Manufacturer Model	Horizontal or vertical xx % efficient <i>Description</i> <i>Description</i>	OK

6 Controls

Space heating	e.g. Time and temperature zone control (by plumbing arrangement)	OK
	e.g. ErP Class V Controls	
	Manufacturer Model	<i>Description</i> <i>Description</i>
Hot water	e.g. Cylinderstat and independent timer	OK
	Manufacturer Model	<i>Description</i> <i>Description</i>

7 Lighting

Internal and external	Installed efficacy (average) <i>Minimum efficacy</i> 60 lm/W	OK
External	Automatic controls fitted?	OK

8 Mechanical ventilation

Type of system	e.g. Continuous supply and extract system (MVHR) <i>Maximum specific fan power</i> 1.5 W/(l/s) <i>Minimum efficiency</i> 73%	OK
	Manufacturer Model	<i>Description</i> <i>Description</i>

Ventilation commissioning certificate	Specific fan power xx MVHR efficiency xx % e.g. Part F commissioning certificate reference number	
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9 Local generation

Type of system (Section 9 field to expand to reflect all local generation technologies used in the calculation of the DER)	e.g. Solar PV Manufacturer Description Panel type Description Array size xx m ² Overshading e.g. None/very little Orientation e.g. SE	OK
MCS certificate	MCS certificate reference number(s)	

10 Supporting documentary evidence

Documentary evidence identified in 10.1 and 10.2 is needed to confirm the data values used for any calculations undertaken, manufacturer declarations made, and tests performed as reflected in this As-Built BREL Compliance Report are correct.	OK
10.1 SAP Conventions (v8.01), Appendix 1 (documentary evidence) schedules the minimum documentary evidence required.	
10.2 Photographic evidence of key stages during construction that confirm the products identified in this BREL are used in this dwelling and workmanship is of sufficient quality to support the calculated values claimed in 2a and 2b.	

11 Declarations

a. Assessor Declaration

This declaration by the assessor is confirmation that the contents of this BREL report are a true and accurate reflection based upon the design and construction information submitted for this dwelling for the purpose of carrying out the assessment and that the supporting documentary evidence (identified in 10.1 and 10.2) pursuant to Part L of the Building Regulations 2010 (as amended) has been reviewed in the course of preparing this BREL report.	OK
Signed	Assessor ID
Name	Date

b. Client Declaration

This declaration by the client is confirmation that that the dwelling has been constructed and completed according to the specifications set out in this BREL report, and that photographic evidence of key stages as described in 10.2 have been provided to the Assessor for this dwelling.	OK OR FAIL*
Signed	Organisation
Name	Date

* if not signed