Ministry of Housing, Communities & Local Government consultation

Future Buildings Standard

Submission from CIBSE

13.04.2021

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THE RESPONDENT

The Chartered Institution of Building Services Engineers (CIBSE)

- CIBSE is the primary professional body and learned society for those who design, install, operate and maintain the energy using systems, both mechanical and electrical, which are used in buildings. Our members therefore have a pervasive involvement in the use of energy in buildings in the UK with a key contribution to sustainable development. Our focus is on adopting a co-ordinated approach at all stages of the life cycle of buildings, including conception, briefing, design, procurement, construction, operation, maintenance and ultimate disposal.

- CIBSE is one of the leading global professional organisations for building performance related knowledge. The Institution and its members are the primary source of professional guidance for the building services sector on the design, installation and maintenance of energy efficient building services systems to deliver healthy, comfortable and effective building performance.

CONSULTATION RESPONSE

EXECUTIVE SUMMARY

We welcome a number of aspects in the Future Homes Standard (FHS) response and the Future Buildings Standard (FBS) consultation, which we had called for in our response to the 2019-20 FHS consultation and other policy positions**:**

- **The overall stated intention that from 2025, buildings should not need to be retrofitted to be net zero carbon in 2050.** This is an essential first step towards delivering new housing that can achieve net zero standards without significant further cost to the homeowner or landlord and without significant use of additional financial, time and embodied carbon resources.
- **Retaining the right for Local Authorities** to set energy and carbon standards beyond regulatory minima, allowing more carbon savings earlier and ultimately developing the rest of the market
- **Accelerated development of the FHS**, with a draft now due in 2023. This will allow early adoption by market leaders and local authorities and support the development of supply chains.

- **Retaining fabric energy efficiency standards** (FEES) whose removal created serious risks of fuel poverty and poor fabric performance.
- For non-domestic buildings, clear statements acknowledging the **performance gap**, with a strengthening of **commissioning** requirements, some **changes to the NCM** to "better account for energy uses and incentivise appropriate design solutions", and the new requirement for **energy performance modelling (**e.g. CIBSE TM54) for buildings over 1,000 m2.
- For non-domestic buildings, clear statements about the **importance of heat decarbonisation**, anticipating a central role for heat pumps and no role for hydrogen in the timescale considered.

However, there are a number of proposed measures which cause concern and may cause unintended consequences, and some measures which CIBSE considers necessary that are omitted. These concerns and omissions are set out below along with our recommendations for inclusion in the 2021 and 2025 revisions:

Key points to address	**CIBSE recommendations for 2021 revision**	**CIBSE recommendations for 2025 revision (i.e. Future Buildings / Homes Standard, but also including existing buildings / homes)**
1 - Target setting and like-for-like-comparisons, to drive real reductions in energy use and heat decarbonisation	For non-domestic buildings the 2021 uplift currently proposes to vary the heating fuel in the notional building e.g. district heating or gas if this is in the actual building. This provides artificial support factors for particular systems e.g. district heating networks would be allowed several times the emissions from heating than heat pumps, and significantly more than even from gas boilers: this is not enough incentive to heat decarbonisation now and to build supply chains. Buildings and heat options must be evaluated on a like-for-like basis: • All on-site options must be compared against the same baseline. This would provide a clear assessment of low-carbon heat options, and send a strong signal that the move away from gas is serious. • While we accept there may be a transition period for district heating networks, 1) new networks must be evaluated on a like-for-like basis with on-site solutions; 2) existing networks must be assessed on a more	The approach based on a notional building may have been appropriate when regulations sought relative improvements, but all opportunities need to be captured towards the net zero carbon target and there must be a clear way to assess and track progress. The notional building prevents like-for-like comparisons and does not drive optimisation of building form and orientation. New buildings of the same type should be compared to the same target level of performance, an absolute target. In addition, the outline FBS should from now on set a clear end data for new fossil fuel installations, as the outline FHS does. This will give a clear direction and incentive for supply chains to develop.

Key points to address	CIBSE recommendations for 2021 revision	CIBSE recommendations for 2025 revision (i.e. Future Buildings / Homes Standard, but also including existing buildings / homes)
	ambitious basis than currently, which is with average plant and 100% fossil fuelled, and they must be required to produce a plan for decarbonisation.	
2 – Metrics that support energy efficiency and heat decarbonisation	The consultation proposes a dual metric system, introducing primary energy alongside carbon. Both these metrics mean little to consumers, especially primary energy. They rely on conversion factors which change over time, which does not facilitate tracking of progress over time, comparing buildings, nor creating a closer link with actual performance. In addition, the consultation states that the benefit of using primary energy would be to drive reductions in electricity demand. However, our analysis shows that this is a flawed argument, as the primary energy factors for electricity completely follow its carbon factors: primary energy as a metric does not add any value. Finally, and importantly, primary energy favours gas and other fossil fuels over electricity and therefore goes against heat decarbonisation. We understand primary energy was introduced because the EPBD uses it, but Brexit provides an opportunity not to. Instead of primary energy, energy use as metric alongside carbon emissions and fabric performance would better address the key goals of energy efficiency, carbon reduction, and consumer engagement.	Retain energy use as a metric alongside carbon emissions, and fabric performance. Review the need to introduce a metric or criteria to address demand management (e.g. peak demand and proportion that can be shifted).

Key points to address	CIBSE recommendations for 2021 revision	CIBSE recommendations for 2025 revision (i.e. Future Buildings / Homes Standard, but also including existing buildings / homes)
3 - A commitment to actual performance, starting with disclosure	Actual in-use performance beyond Practical Completion must be addressed, for example as part of the wider regulatory regime created in response to the Hackitt Review. As a very minimum, this should start with disclosure of actual energy use (broken down into fuels where applicable). In addition to this, we recommend reviewing the possibility to introduce further in-use evaluation, monitoring and evaluation to match performance criteria in Building Regulations and the Approved Documents e.g. ventilation rates. We expect this should be possible within the existing framework of the Building Act (Section 2 – Continuing Requirements) and Building Regulations; however, we are aware that the clause on Continuing Requirements is difficult to interpret, and we also recommend that this lack of clarity needs addressing. We have commented in detail on the proposed new overheating risk "simplified method", including the request for more information on the rationale and testing carried out. Regardless of the final method implemented, as it is a new regulatory requirement and a new un-tested method, we strongly recommend that MHCLG should put together a programme of monitoring to test its implementation and gather lessons for the next revision. We would also recommend that Building Control reserve the right to request in-use monitoring of temperature and possibly feedback from occupants. However good the new method ends up being, there will be lessons to gather and incorporate, and this must be factored in right now.	The data collected from the 2021 disclosure requirement should inform the FHS and FBS and the setting of absolute rather than relative targets (see point 1). The overheating methodology should be modified in line with lessons gathered from the first phase of implementation, including in-use monitoring and feedback. In-use monitoring and evaluation requirements should be in place to match Building Regulations performance requirements.
4 – Commissioning	New buildings will not be net zero carbon buildings unless they are commissioned. There needs to be greater focus on compliance with the commissioning requirements. It must become accepted that building control will expect to see and may make some checks on commissioning evidence then we will not achieve net zero. This may imply some training requirements	Continue as per 2021, and incorporate any lessons learnt. Look to introduce digital returns of key information throughout the build process to simplify the cost of existing requirements and reduce the impact of additional information requirements. Such a system should be centralised and accessible to the Building

Key points to address	CIBSE recommendations for 2021 revision	CIBSE recommendations for 2025 revision (i.e. Future Buildings / Homes Standard, but also including existing buildings / homes)
	for building control professionals, and it may require some procedures to support the greater focus, but without action it is not possible to claim that the changes to the regulations will achieve the intended carbon impacts. Commissioning should very clearly include performance testing, and this could for example be linked to a penalty in as-built Part L calculations unless satisfactory results are provided to Building Control. This would benefit both energy efficiency and, for ventilation systems, air quality.	Safety Regulator, allowing them to see easily where projects are not producing required information and therefore to target their compliance and enforcement efforts on topics where compliance is low, or on those parties not delivering, which in turn incentivises better compliance.
5 - Airtightness and ventilation	For dwellings, the notional building specification of 5 m3/hr/m2 at 50Pa together with natural ventilation does not set the right direction to prepare supply chains for airtight buildings and highly efficient ventilation (even if other systems remain allowed). For non-domestic buildings, a limiting value of 8 m3/hr/m2 at 50Pa is too high. Testing requirements and limit airtightness values must be introduced on existing buildings and existing dwellings, at least where substantial works are carried out. This will improve performance and build quality, and support better informed decisions on both energy efficiency and ventilation. See also point 7 on whole-building approach	The draft FHS specification proposes an airtightness of 5 m3/hr/m2 at 50Pa, and natural ventilation. This is quite far from the "world class" levels of energy efficiency intended for the FHS and is a remaining important opportunity for energy savings. The FHS specification should show best practice airtightness and MVHR (even if other systems remain allowed). This would encourage the development of supply chains now so that MVHR is well designed and installed, and delivers energy savings and good indoor air quality**.**
6 – A trajectory for the existing stock	For existing domestic and non-domestic buildings the consultation package only includes a 2021 revision, and it is a relatively modest one. However, given the scale and performance of the existing building stock, it is clearly by far the biggest challenge to achieve net zero carbon buildings. Whilst this cannot be solved by Building Regulations alone, they are a key policy to drive some of the changes needed. It is therefore essential that work is done urgently to consider the role of Building Regulations in the decarbonisation of the existing building	Implement 2025 Future Homes & Buildings standard proposals for the existing stock

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	stock and to co-ordinate the various policies that influence the energy use of our building stock. The recent coronavirus response has highlighted the need to co-ordinate health requirements and energy requirements more closely, for example. It would be very helpful to see a clear and early indication that the challenge of existing buildings is a cross departmental policy issue and a cross disciplinary technical issue. Government must commit to a 2025 upgrade and set out a programme of works to introduce upgraded requirements informed by evidence and supported by clear guidance on complex technical issues, such as dealing with traditional construction buildings, thermal bridging and moisture movement. This should incorporate lessons from recent exemplar retrofit projects, PAS 2035, past programmes such as Retrofit for the Future, and additional research if required. It should be on the same timescale as the development of the FHS/FBS.	
7 – A plan and a whole building approach for the existing stock	Two serious limitations in the current requirements for existing buildings are that they do not provide an end goal compatible with net zero, and they rely heavily on an elemental approach. This doesn't sufficiently make the links between energy, overheating, air quality, and fabric, and it doesn't prevent carbon lock-ins and unintended consequences. All works covered by Building Regulations must contribute to the huge challenge of putting buildings on track to net zero, while being healthy and comfortable. The Part F requirement that ventilation should be "no worse" than before the works is highly inadequate, as many homes are not well ventilated. The works should be "net zero ready", and a longer-term plan should be produced for the building, to reduce operational, embodied, and financial expenditure now and in the future. It is the approach promoted in PAS 2035, which regulations should build on.	Continue as per 2021, and incorporate any lessons learnt. Start a programme gradually phasing out fossil fuel replacement plant in existing buildings/dwellings.

Key points to address	CIBSE recommendations for 2021 revision	CIBSE recommendations for 2025 revision (i.e. Future Buildings / Homes Standard, but also including existing buildings / homes)
8 - Calculation methodologies that are fit to Net Zero	There is little evidence that NCM drives improvements on non-domestic buildings. Space heating is known to be routinely under-estimated, clearly an issue for heat decarbonisation and the appraisal of options. Changes to NCM in 2021 should be more substantial changes than currently proposed, in particular on the calculation of energy use for heating. MHCLG should also commit to a fundamental review of NCM to accompany the FBS, similar to that commissioned by BEIS for SAP/RdSAP 11.	Implement the conclusions of the fundamental review of SAP and NCM.

Competence, skills, and supply chains

Many of the topics and proposals detailed above will require **significant skills updates and upgrades across the whole of the supply chain**. They are not optional extras, they are essential to achieving the necessary successful outcomes from the measures detailed. Without a serious and sustained focus on skills over many years then significant aspects of the programme are in jeopardy from the outset. There are 2 particular areas where this is the case:

- Airtightness and ventilation, to improve energy efficiency and protect the health of occupants
- Low-carbon heat: Moving from a predominantly gas fuelled domestic sector to a predominantly electric fuelled one requires significant (re)training to deliver performance and protect consumers.

The outline Future Homes / Buildings Standard must clearly show what supply chains will be expected to deliver, so they can start preparing now, and the 2021 revision must represent a clear step towards 2025 requirements, to provide further incentives for supply chain development.

In addition, and recognising that this cannot be addressed by Building Regulations alone, MHCLG should work closely with BEIS to develop a buildings policy which covers safety, sustainability and skills. For a more detailed analysis please see the Royal Academy of Engineering paper “Beyond COVID-19: laying the foundations for a net zero recovery[1].

General comments on the consultation package

We acknowledge that a consultation seeking to tackle new and existing buildings, domestic and non-domestic, 2021 and 2025, and Parts L, F and overheating, was a significant challenge to produce, and we appreciate all the work which went into it. However, following

[1] https://www.raeng.org.uk/publications/reports /beyond-covid-19-laying-the-foundations-for-a-net-z

our own analysis as well as the feedback we have received from several parties, we would like to raise concerns about some of the information provided which, together with the breadth of the consultation, may prevent MHCLG from gathering truly well-informed and thorough responses. The following items are of particular concern as they are significant topics for building performance, carbon emissions, and the health of occupants, and we are concerned about the quality of responses as a result. There may be others which we have not been able to spot:

- **Question 17 – connection to existing district heating networks**: erroneous carbon factor of the notional district heating network (0.19kgCO2/kWh stated in the draft NCM). We are grateful for MHCLG's response to our query on this topic, and we have communicated this it to members who had raised it with us, to the LETI network, and via social media, but given the short timescale we are wary that a number of respondents will respond on the basis of "carbon factor of 0.19".
- **Question 110 - FEES**: Unclear wording ("high" or "low"), which was clarified to the LETI network and passed on to CIBSE, as we raised our concerns to them. This is a significant topic under consultation, and we are concerned about the ease of interpreting responses as a result.
- **New overheating standard and simplified method**: as detailed in our response, we very much support the introduction of a regulatory standard on this issue, and support the principle of a simplified method. However, these are clearly significant changes, which could have long-term consequences on thousands of buildings and residents, and the proposals are currently difficult to assess thoroughly given the lack of explanatory material i.e. how the method was arrived at, and what testing was carried out on its robustness.
- **Changes and omissions e.g. Removal of reference to summer comfort appraisals for non-domestic buildings**: the current draft ADL2 omits an important statement highlighting the limits of considering only summer gains, and recommending an assessment of thermal comfort in non-domestic buildings – see details in Question 53. Not only is this a change CIBSE strongly advise against, it is also a significant change which has not been highlighted in the consultation document and draft AD, nor covered by a consultation question. This is of specific concern for this topic, but also raises the question of whether other important changes are proposed, which have not been highlighted and are not covered by consultation questions. Faced with such a wide ranging and important consultation, industry cannot be expected to spot every single change or omission, and we are concerned that important ones may not have been raised and will consequently not receive the scrutiny and feedback they deserve.

Section A: Non-Domestic Buildings

The Future Buildings Standard

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

~~a) Yes~~ b) No

Please explain your reasoning and provide supporting evidence or alternative suggestions.

The intention and outline are welcome, but we have some strong concerns about the proposals. We have detailed them throughout our response, but key points include:

- §2.3.18 "*The energy efficiency requirements of the Building Regulations will continue to be set using performance-based standards rather than mandating or banning the use of any technologies. However, to make sure that new buildings are zero carbon ready, it is highly unlikely a new building will be able to meet the Future Buildings Standard without low carbon heating and very high levels of energy efficiency.* " Why not take the same approach as for the FHS, i.e. new gas-fuelled and other fossil fuel installations banned from a certain date? We appreciate this may be on a different timescale for some non-domestic building types, but there must be a clear direction and end date for new fossil fuel installations. Unless there is a clear target date by which new natural gas installations will not be compliant then there will be a lack of focus in the supply chain and also a lack of investment in new skills to deliver the carbon neutral technologies that are needed. A clear signal is needed now.
- Heat decarbonisation requires reductions in demand. If we do not further reduce energy demand in buildings then the cost of new infrastructure will be prohibitive. The current specifications of the notional building and, more importantly, the reliance on a notional building AND the fact that its fuel will change with the actual building, mean that there is not enough incentive to reduce demand, buildings and heating solutions are not compared on a like-for-like basis, and it is difficult to assess and track progress over time. Moving to an Energy Use Intensity (EUI) approach would provide a clear target and allow progress to be tracked, and to judge all buildings on a like-for-like basis – see details in Questions 9 and 14.
- "as heat networks decarbonise": there is not enough incentive for this to happen – see details in question 17.
- The consultation does not include a stated goal in terms of reductions in energy use and carbon emissions to be delivered by the FBS. This should be provided, as a clear

target that allows progress to be tracked and which places emphasis on the importance of energy demand reduction (e.g. kWh/sqm/yr), not a relative fictitious one using a notional building – see response to question 9.

- As the consultation itself states in §2.3.3 "*In order to decarbonise new non-domestic buildings, all heat and hot water needs should be met through low-carbon sources*". However, many uses of heat and hot water are currently unregulated and therefore remain a risk of going counter to heat decarbonisation objectives e.g. catering in commercial kitchens, swimming pools, spas and similar facilities in hotels and leisure buildings (hot water in changing facilities is regulated, heating of the pool water itself isn't). Some of these are large and arguably reasonably fixed; they need to be addressed, whether by extending the scope of building regulations or through other regulatory means. (See comments in the Executive Summary about the relationship between building regulations and other energy related policy measures).
- 2.3.19 "*We will also consider whether minimum fabric standards also need to be reviewed for the Future Buildings Standard*." They absolutely **do** need to be reviewed, possibly with an approach to fabric performance such as a combined metric for heating & cooling demand. It is not possible to argue that the aim in Q1 will be met without reviewing fabric standards.

Question 2): We believe that developers will typically deploy heat pumps and heat networks to deliver the low carbon heating requirement of the Future Buildings Standard where practical. What are your views on this and in what circumstances should other low carbon technologies, such as direct electric heating or hydrogen, be used?

We agree that **heat pumps** are likely to be the most appropriate option in the majority of cases.

Heat networks may have a role to play but at the moment there is not enough incentive for them (new and, especially, existing networks) to decarbonise. This must be addressed to avoid locking schemes into high-carbon solutions – see details in question 17. In addition, such networks must be supported by reduced demand from buildings. It is therefore essential that new build standards are framed in such a way as to minimise energy demand. Reducing demand aids future resilience as well as present decarbonisation.

To limit pressure on the grid, **direct electric heating** should be limited to buildings which can demonstrate very high levels of fabric efficiency (i.e. similar to Passivhaus). In the FBS this could be addressed through an optional higher fabric performance standard or, possibly, a criterion applying to peak demand (as exists in Passivhaus, in W/m2 for cooling and heating). Direct electric heating would only be allowed if the higher or additional standard is met. We recommend this should be one aspect to investigate in the preparation of the FBS.

Hydrogen: CIBSE agree with the assessment in the consultation document that hydrogen should not be relied upon in the timescale of the FHS and FBS. In addition to significant

uncertainty, hydrogen will be (if it does become available) costly, energy intensive and possibly carbon intensive to produce; it should then be retained for other uses which have fewer options than buildings, which require low-grade heat.

Other systems should also have a place on a case-by-case basis, such as solar thermal and biomass systems. To provide flexibility and allow project teams to determine the most suitable outcome to each situation, the criteria for compliance should be as transparent and fair as possible; this is NOT the case with a notional building which changes fuel depending on the fuel in the actual building – see details in question 14.

Question 3) Do you agree that some non-domestic building types are more suitable for low carbon heating and hot water, and that some non- domestic building types are more challenging?

a) Yes ~~b) No~~

If you answered no, please explain your reasoning.

Yes but it is not so much the buildings themselves being suitable or not for low-carbon heat, but whether technical solutions are readily available NOW. This will change, and it will change faster the more incentives and the clearer direction are available.

Question 4): Do you agree with the allocation of building types to space and water heating demand types, as presented in Table 2.1 of this consultation document?

~~a) Yes~~ b) No

If you answered no, please explain your reasoning, including how different building types should be allocated.

We agree with the broad categorisation per types of space heating and hot water demands, but are uncertain about how this would work in practice, given:

- the wide variety of building uses in practice, which are not represented in the current categorisation
- the fact that many buildings are mixed-use or served by central plant which serves multiple uses
- the fact that several buildings have both a heating and cooling load, which influences the suitability of heat pumps.

In addition, we do not necessarily agree with the conclusions on suitability of heating and hot water solutions for each of these types e.g. the statement that ““*we do not typically see heat pumps being installed for buildings which need a reliable supply of large volumes of domestic hot water, such as in hospitals or hotels*”. For example, some new hotels and hospitals do already have heat pumps for hot water, typically installed together with storage (means e.g. a

recent small acute healthcare project at Guys and St Thomas's Trust). The efficiencies won't be as high as for lower temperature systems but they will be reasonable.

In particular, we have received advice from healthcare specialists, including from the CIBSE Healthcare Group and advisors for the NHS Net Zero Standard, and they have the following comment on the statement made in the consultation:

- "*While heat pumps are capable of providing domestic hot water, they may ~~not always be suitable~~* ***need to be supplemented by other means of heating*** *where higher temperatures are required, and therefore we do not typically see them being installed as* ***the sole means of hot water provision*** *for buildings which need a reliable supply of large volumes of domestic hot water, such as in hospitals or hotels*".
- "*Such applications may require more time for commercial-scale domestic hot water heat pumps to become established – of particular interest are those which use CO2 refrigerant systems which can supply heat at higher temperatures. There are only a small number of manufacturers that currently offer these types of products*." There are a few heat pumps on the market with alternative refrigerants in addition to CO2 as suggested, such as Ammonia and R1234ze, which offer good efficiencies at higher temperatures and are therefore suitable for DHW. This is particularly relevant for larger projects, where there are already significant manufacturers and typically more operational and maintenance resources available.

We recommend MHCLG contact specialists in those sectors (including those involved in the leading-edge NHS Net Zero Standard), to seek advice on the latest thinking and ensure that proposals for 2021 and 2025 do really drive the adoption of low-carbon heating as far as reasonably practical.

Question 5): We would like to introduce the Future Buildings Standard for all buildings as quickly as possible. When do you think the Future Buildings Standard should introduce low carbon space heating for buildings with Type 1 or Type 2 demand (buildings that have space heating demand more suitable for heat pumps)?

a) 2025–our proposed date
~~b) Another date (please specify)~~

Please explain your reasoning.

As the consultation describes, these building types are suitable for either heat pumps. Those which have a very efficient fabric may also find other low-carbon options are more suitable, such as direct electric heating. Implementation by 2025 is therefore possible.

Requirements which are based on a like-for-like basis without changing the fuel in the notional building, as we recommend (see details in question 14), would also introduce further flexibility for teams to choose the most appropriate low-carbon option.

Question 6): We would like to introduce the Future Buildings Standard for all buildings as quickly as possible. When do you think the Future Buildings Standard should introduce low carbon space heating for buildings with Type 3 demand (buildings that have space heating demand less suitable for heat pumps)?

a) 2025
~~b) Another date (please specify)~~

Please explain your reasoning.

Question 7): We would like to introduce the Future Buildings Standard for all buildings as quickly as possible. When do you think the Future Buildings Standard should introduce low carbon water heating for buildings with Type 1 or Type 3 demand (buildings that have water heating demand more suitable for point-of-use heaters or heat pumps)?

a) 2025–our proposed date
~~b) Another date (please specify)~~

Please explain your reasoning.

As the consultation describes, these building types are suitable for either heat pumps or point of use electric heating, both of which non-fossil fuel low-carbon solutions. Implementation by 2025 is therefore possible. Requirements which are based on a like-for-like basis without changing the fuel in the notional building, as we recommend (see details in question 14), would also introduce further flexibility for teams to choose the most appropriate low-carbon option.

Question 8): We would like to introduce the Future Buildings Standard for all buildings as quickly as possible. When do you think the Future Buildings Standard should introduce low carbon water heating for buildings with Type 2 demand (buildings that have water heating demand less suitable for point-of-use heaters or heat pumps)?

a) 2025
~~b) Another date (please specify)~~

Please explain your reasoning.

Interim uplift to Part L standards for non-domestic buildings

Question 9): We would welcome any further suggestions, beyond those provided in this consultation, for improving the modelling process; Part L and Part F compliance; and the actual energy performance of non-domestic buildings. Please provide related evidence.

Modelling process

In terms of the modelling methodology, the NCM needs to be fit to Net Zero. There is little evidence that NCM drives improvements in the performance of non-domestic buildings. CIBSE understand that research carried out by UCL, including the London stock model, across a range of non-domestic sectors shows no correlation between actual energy use and EPC ratings. In the housing sector that correlation is weak, but it does at least exist. We strongly recommend that MHCLG should actively engage with UCL and these research findings.

A fundamental review of the NCM is pressing. BEIS recently commissioned a study on how to turn SAP/RdSAP 11[2] into a tool for net zero. MHCLG should commission a similar exercise on the NCM.

The first step is the treatment of space heating, since demand is known to be routinely under-estimated, clearly an issue for heat decarbonisation and the appraisal of options – some of this should already be implemented in the 2021 update, as detailed in Question 19, but a more fundamental review needs to be carried out on time for the FBS.

In terms of the modelling process, we recommend that as-built inputs on plant efficiencies should be reliant on evidence of satisfactory commissioning and performance tests – see Question 34. Since the EPC would also be so reliant, then the Energy Assessor would require the evidence of commissioning and would be unable to provide an EPC without it – this would reduce the burden on the building control officer.

L and F compliance

A key recommendation is to improve compliance with **commissioning** requirements, including linking it to penalties in Part L calculations and, where applicable, the production of EPCs – see response to Question 34

Target setting for energy performance: the notional building approach may have been appropriate when regulations sought relative improvements, but all opportunities need to be captured towards the net zero carbon target. The notional building prevents like-for-like comparisons and does not drive optimisation of building form and orientation. New buildings of the same type should be compared to the same target level of performance; this performance should be evaluated in energy use intensity, (rather than primary energy), alongside carbon emissions and fabric performance (see details in question 11). This should be implemented from 2025, informed by data disclosure starting from 2021.

Target setting for heat decarbonisation: In addition, for non-domestic buildings the 2021 uplift proposes to vary the heating fuel in the notional building e.g. district heating or gas if this

[2] Led by Etude, with CIBSE, Elementa, Levitt Bernstein, WSP, Clarion Housing Group and UCL.

is in the actual building. This provides artificial support factors for particular systems, rather than a like-for-like evaluation of low-carbon heat options – see details in question 14.

The **definitions of ventilation types** are somewhat confusing. CIBSE propose an amended set of definitions, provided in Supporting Evidence – Item G. This would add clarity and build on existing definitions widely used in the industry, including BB101. Given the very significant levels of current interest in ventilation in schools there are significant advantages in aligning with BB101.

Actual energy performance of non-domestic buildings

There must be a commitment to move to regulating for actual performance, starting with disclosure: Actual in-use performance beyond Practical Completion must be addressed, for example as part of the wider regulatory regime created in response to the Hackitt Review.

At the very minimum:

- Commissioning performance tests linked to as-built Part L calculations: see comments above.
- Airtightness testing and limiting values must be introduced for the existing stock where works are carried out, to help inform a whole building approach according to PAS2035 and PAS2038. This will improve energy performance, probably improve air quality as ventilation strategies will be based on better-informed decisions, and improve overall build quality.
- The move to in-use performance should start in 2021 with a requirement for monitoring and disclosure of energy use (broken down into fuels where applicable). The collected data could then inform future revisions of Building Regulations in 2025 and the setting of absolute rather than relative targets (as per point above).

However, we think there is scope even within the existing framework of the Building Act and the Building Regulations to put together a **more comprehensive set of monitoring and post-occupancy evaluation** requirements to accompany all existing performance requirements, as detailed below.

Section 2 of the Building Act makes provision for continuing requirements and it should be used to start to develop ongoing requirements in relation to energy use, and to upgrade the existing stock through building regulations (addressing performance overall, beyond just imposing standards on works being carried out). Whilst CIBSE understands that there are considered to be difficulties around Section 2, including how difficult it is to understand, these difficulties need to be resolved as the difficulties posed by the absence of in-use performance feedback and by inappropriate or insufficient works on existing buildings are far more significant and undermine the objectives of national policy.

As a starting recommendation, we think this should apply to non-domestic buildings over 1,000 m^2 (to align with the proposed threshold in the current BEIS consultation on operational energy ratings), and for residential schemes above 5 homes (to align with, for example, the new "Be Seen" requirement in the London Plan) – possibly on a sample basis.

Monitoring and reporting should be carried out within the first year defects period: while this is not "ideal" post-occupancy evaluation period, it is easier then to tie results to contractual obligations, and to request remediation.

The recommended parameters to be monitored and reported on are listed below; Supporting Evidence – Item E provides more detail on how they tie to current building regulations and approved documents, and how they could be implemented in 2021 and 2025.

- **Energy Use**: Energy Use Intensity (kWh/m2/pa) - Total building energy use as a minimum. For non-domestic buildings there are upcoming requirements on operational energy ratings which could help to enable and support this requirement, provided coordination between BEIS and MHCLG and assuming a compatible system of performance metrics.
- **Water Use**: Litres Per person Per Day Per Year, at least for residences where the building regulations requirement already exists
- **Adequate ventilation as required by building regulations, and air quality spot checks or monitoring** against the pollutants already covered by performance criteria in Approved Document F. For non-domestic buildings that are used as a workplace there are already ongoing requirements for ventilation in the workplace regulations which would help to enable and support this requirement.
- **Acoustics:** in addition to current testing requirements for fabric and airborne impact, noise measurements should be carried out during commissioning checks, particularly for ventilation systems as this is known otherwise to lead occupants to switch ventilation off (particularly in residential settings).
- **Overheating:** we strongly recommend that MHCLG should put together a programme of monitoring at random to check the consequences of using the new simplified method, gather lessons, and use them to inform further revisions where required
- **Thermal bridging check and thermography:** A thermographic survey should be carried out to check for any thermal bridging that may lead to excessive moisture and mould issues.
- **Heat Transfer Coefficient:** Measurement of the heat transfer coefficient (e.g. via smart meters, subject to SMETER trial conclusions). Note the FEES is not directly verifiable, as it is a notional artificial metric. However, the HTC together with the airtightness test would more or less verify the as-built FEES. In addition, we recommend in 2025 to move to a better, more meaningful metric than FEES – see response to question 110.

Other comments: the existing stock needs addressing

The existing stock represents, by far, the biggest pie of energy use and carbon emissions, and it is barely addressed in the current proposals, with only small changes proposed for 2021 and no proposals for 2025. This must be addressed, with the following:

- **A trajectory for the existing stock:** for existing domestic and non-domestic buildings the consultation package only includes a 2021 revision, and it is a relatively modest one. Government must commit in 2021 to a 2025 upgrade and set out a programme of works to introduce upgraded requirements informed by evidence and supported by clear guidance on complex technical issues. This should incorporate lessons from recent exemplar retrofit projects, past programmes such as Retrofit for the Future, and additional research if required e.g. on dealing with thermal bridges and moisture.
- **A plan and a whole building approach for existing buildings:** Two serious limitations in the current requirements for existing buildings are that they do not provide an end goal compatible with net zero, and they rely heavily on an elemental approach. This doesn't sufficiently make the links between energy, overheating, air quality, and fabric, and it doesn't prevent carbon lock-ins and unintended consequences. All works covered by Building Regulations must contribute to the huge challenge of putting buildings on track to net zero, while being healthy and comfortable. The Part F requirement that ventilation should be "no worse" than before the works is highly inadequate, as many homes are not well ventilated. The works should be "net zero ready", and a longer-term plan should be produced for the building, to reduce operational, embodied, and financial expenditure now and in the future. It is the approach promoted in PAS 2035, which regulations should build on, starting in 2021.

See our further comments on the existing stock and wider policy considerations in the Executive Summary.

Embodied carbon

As we have previously stated, embodied carbon will become more important as operational carbon reduces, and it does need to be addressed to reach Net Zero. We note the high-level comment on this in the FHS response from government, but stress that a timetable and a programme of works should be put in place to introduce requirements.

Question 10): What level of uplift to the energy efficiency standards for non- domestic buildings in the Building Regulations should be introduced in 2021?

~~**a) Option 1 – average 22% CO_2 reduction**~~

~~**b) Option 2 – average 27% CO_2 reduction (this is the Government's preferred option)**~~

~~**c) No change**~~

d) Other level of uplift (please specify)

Please explain your reasoning and provide supporting evidence or alternative suggestions where applicable.

It is impossible to meaningfully comment on the current figures, since:

- they are based on comparisons with a notional building i.e. a shifting target.
- neither the consultation document nor the impact assessment include details of the modelled energy use from the buildings used to develop the proposed options. Without this, it is difficult to know whether or not these represent true best practice, or whether further improvements could be obtained in the upcoming uplift.

In addition, we think the main goal should be to reduce energy use, alongside heat decarbonisation. The target for the 2021 uplift should be expressed as reduction in energy use compared to a real, measurable baseline i.e. actual energy use in new non-domestic buildings. Alternatively, this could be translated into an average energy use intensity in the sector. This would allow progress to be tracked, and would ensure that it is real progress rather than dependent on system changes too.

Note – it is not entirely clear whether the proposed carbon reduction includes the benefits of grid decarbonisation, as well as those from reductions in energy use from buildings: the wording referring reductions "over the current Part L 2013 standard" is ambiguous. Our interpretation is that these reductions do NOT include the benefits of grid decarbonisation, they are achieved by the buildings alone i.e. comparing a Part L 2021 compliant building with a Part L 2013 compliant building, both with 2021 carbon factors, which is how they should be assessed (" *Modified carbon emission and primary energy factors were used to rebase the Part L 2013 standard and used to calculate the proposed 2021 standards*", §4.16 of the impact assessment). If instead, the stated 27% CO2 reduction benefits from grid decarbonisation (i.e. it compares Part L 2021 compliant buildings with 2021 carbon factors, against Part L 2013 compliant buildings with 2013 carbon factors), it is wholly inadequate and insufficient.

Question 11): Do you agree with the way that we are proposing to apply primary energy as the principal performance metric?

~~a) Yes~~ b) No

If you answered no, please explain your reasoning.

CIBSE disagree that primary energy should be introduced as new metric for Building Regulations compliance, for a number of important reasons:

- Primary energy relies on conversion factors related to the wider energy system, which change over time. As illustrated in our response to question 10, this makes it very difficult to track progress in actual building performance. This is all the more a problem since the 2nd metric, carbon, is also a system metric.
- Primary energy is not familiar to the public and to many individuals operating and managing buildings. This limits opportunities to engage them in understanding and managing energy use, a fundamental step to improve performance.
- Primary energy favours gas and other fossil fuels over electricity – see graph in Supporting Evidence – Item B: by using primary energy as main metric, gas-heated buildings would be assessed as 15% to 35% better, at similar thermal energy use. This goes fundamentally counter to heat decarbonisation objectives and sends badly mixed messages to the wider market.

There are clearly many metrics possible when assessing building performance, and a number of desirable objectives. No single metric meets them all. Based on our analysis (see Supporting Evidence – Item C), **a combination of energy use (rather than primary energy) together with carbon emissions would address these 3 points, and is therefore much preferable. It is our strong recommendation.**

We would like to point to strong industry support for this, **as evidenced by a large industry survey** (over 200 respondents) carried out as part of the SAP11 scoping project for BEIS, which was led by Etude and which CIBSE took part in: this found that energy use was the preferred metric (85% of respondents), with primary energy only the 4th choice as proposed key metric (behind energy use, carbon emissions, and space heating demand). MHCLG have been provided with the full report on the SAP 11 scoping study, including details of the survey, but we would be very happy to discuss it with them.

The arguments put forward in the consultation for primary energy are flawed, or insufficient on their own:

- "*reducing electrical infrastructure needs*": this is flawed. Our analysis shows that the proposed primary energy factors for electricity are almost exactly correlated with its carbon factors – see graph in Supporting Evidence – Item B. This means that any incentive provided by primary energy as a metric to reduce electricity use at times of high demand is already provided by carbon emissions as a metric: primary energy as a metric, for this purpose, does not add anything that carbon does not already do. Our recommendation: Instead, energy use as a metric would, combined with carbon emissions, provide an added focus on the efficiency of the building itself. It would also, at a given heat demand, encourage heat pumps over direct electric heating, i.e. further reduce demand on the grid.
- "*set an energy performance target which prioritises the energy efficiency of the*

- *Building (…) and the energy efficiency of the building fabric regardless of the heat source'*: this is clearly flawed, since primary energy is NOT independent of the heat source, and at a given heat demand, it favours fossil fuel heat sources to meet that demand. In addition, the proposed PEF attribute a value of "zero" to energy produced on site by renewables (Table C.3 of the impact assessment). This means that a building would be able to have poorer fabric performance, if it meets its demand by on-site renewables. This goes against the stated objectives of the consultation. Our recommendation: energy use by the building is the metric which encourages efficiency regardless of the heat source. This can be complemented by fabric performance standards and/or metrics, as already proposed.

Question 12): Do you agree with using CO_2 as the secondary performance metric?

a) Yes ~~b) No~~

If you answered no, please explain your reasoning.

We agree that carbon emissions are an important metric but not the most important one. The main metric should be energy use. The most significant objective should be to reduce energy demand, and after that to minimise the emissions from meeting that demand.

Question 13): Do you agree with the approach to calculating CO_2 and primary energy factors, referred to in paragraph 3.5.7 of this consultation document?

~~a) Yes~~ b) No

If you answered no, please explain your reasoning and provide supporting evidence or alternative suggestions.

No

Primary energy:

As explained in Question 11, primary energy is not an appropriate or helpful metric to introduce, for the stated objectives of energy efficiency and heat decarbonisation, and to provide simple and fair information to consumers. In addition:

- also as explained in Question 11, the settings of the Primary Energy Factors (PEF), by (rightly) wanting to differentiate between renewable and non-renewable energy sources into the grid, mean that when looking at electricity, primary energy factors do

not add anything to carbon emissions: they are directly correlated – see Supporting Evidence – Item B.

- the proposed PEF attribute a value of “zero” to energy produced on site by renewables (Table C.3 of the impact assessment). This means that a building would be able to have poorer fabric performance, if it meets its demand by on-site renewables. This goes against the stated objectives of the consultation, and against the recognised need to reduce demand first, before expanding financial and embodied carbon resources on complex systems, be they zero carbon.

CO2 factors:

The current factors for grid electricity are expected to be out of date very soon, and will not reflect the impact of a building and its services over its first cycle; they may not even be representative of the impact for the next few years that the 2021 Part L update is in force.

Electricity grid carbon factors should instead become longer-term averages, to e.g. 15 years as a minimum, ideally 25-30 years, as recommended by the Climate Change Committee. The reasons are:

- This is more reflective of the impact of a building and especially its services
- There is now relatively good consensus on grid decarbonisation trends to 2050, in particular from reference sources such as the CCC and National Grid, which means that such an average can be calculated
- By reflecting the trend in grid decarbonisation, it will provide more incentive for selecting low-carbon heat solutions.

We appreciate there may be unintended consequences, but think there are ways to address this:

- Longer-term carbon factors for electricity will be lower, which will provide less incentive for on-site renewables (since they will be seen to add smaller benefits, relatively speaking). This could possibly be addressed through other means, such as specific incentives for on-site generation. In addition, while the displaced carbon emissions “per installation” will be smaller, if those of the building overall are also smaller than the installation could still make an important contribution.
- The trajectory may change: having longer-term averages doesn’t mean that the values do not get reviewed and updated as required, for example on a 5-year basis. This should still happen to reflect actual rates of decarbonisation, but it is likely that the updates will be smaller, and therefore with fewer cut-off effects at each update. It should also be noted that even if the calculated long-term average is wrong due to a

different decarbonisation in practice, in most cases it will still be closer to reality than using a short-term average.

Note that long-term averages for the gas grid should NOT be used, since at the moment there is considerable uncertainty about its future. This is also in line with advice from the CCC.

Question 14): Do you agree with the proposals for natural gas being assigned as the heating fuel for any fuels with a worse CO_2 emission factor than natural gas?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide supporting evidence or alternative suggestions.

This prevents a like-for-like assessment between buildings and between heating options, and it goes against the consultation's stated goal that "*targets will continue to be performance based*" (§3.4.5). Put simply, a building that uses LPG or heating oil will be allowed carbon emissions around 0.226kgCO2/kWh heat, while those that use a heat pump will be allowed emissions around 0.055-0.06 kgCO2/kWh heat i.e. broadly 4 times higher. This is clearly not "performance-based", and does not reward low-carbon heat options. If government are serious about getting off gas (and we strongly think they should be), then every policy needs to go in that direction.

In addition:

- those buildings that may use a fuel of worse carbon factor than gas, i.e. LPG or heating oil, are almost certainly buildings off the gas grid. They are precisely the buildings where high carbon emissions savings are available, and which could act as early drivers to develop supply chains in low-carbon solutions.
- LPG and heating oil are also high sources of air polluting emissions, so there would be additional benefits in them switching to electricity.

Heat options should be compared on a like-for-like basis, against a low-carbon heat baseline. This would set a fair basis, and would provide an incentive for low-carbon heat supply chains to develop before 2025, when high-carbon options are phased out.

Question 15): Do you agree with our proposal of using a hybrid electric/heat pump heating system in the notional building when electricity is specified as a heating fuel?

~~**a) Yes**~~ **b) No**

If you answered no, please explain your reasoning and provide supporting evidence or alternative suggestions.

No.

We agree there needs to be an incentive to avoid direct electric heating systems being installed without attention to peak demand, demand management, and fabric efficiency, as this could otherwise lead to high running costs and pressure on the grid. However, for reasons explained in our response to Question 14, we do not think the current approach is right because it does not provide a like-for-like comparison nor real "performance based targets", which the consultation claims to aim for.

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

a) Yes

b) No

If you answered no, please explain your reasoning and provide alternative suggestions.

We strongly caution against arbitrary thresholds where requirements change, such as proposed here: this could drive design decisions that are inadequate and can end up causing poor energy efficiency in practice, or create problems for users, and possibly being rectified later on, in the existing building, at poor efficiency and outside of building regulations.

This, again, illustrates the constraints of the notional building, instead of a simple energy performance target which buildings would determine how best to meet.

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

~~**a) Yes**~~
b) No, they give too much of an advantage to heat networks
~~**c) No, they do not give enough of an advantage to heat networks**~~
~~**d) No, I disagree for another reason**~~

If you answered no (b, c or d), please explain your reasoning and provide supporting evidence or alternative suggestions.

We welcome the revision to the 2013 approach, which will at least start to incentivise the worst performing existing networks to decarbonise. **However, it would still leave many existing heat networks with no incentive to move away from fossil fuels, and would still**

provide an allowance for carbon emissions from heat much higher than for buildings not connected to networks:

- **Comparing networks with one with gas CHP and a gas boiler, i.e. completely fossil fuelled, is NOT a low-carbon comparison and does not set the right signal for the importance of heat decarbonisation** e.g. buildings connecting to an existing network would be allowed 0.37 kgCO2/kWh heat, **several times higher** than buildings with a heat pump (around 0.05-0.6kgCO2/kWh, depending on the grid factors assumed at an SCOP of 2.5), and **even significantly higher (over 50%)** than those connected to an on-site gas boiler (0.23kgCO2/kWh, at 93% boiler efficiency). This really is difficult to justify, given the need for heat decarbonisation.
- Even if we accepted the broad principle of the comparison, using a gas boiler of 80% efficiency is far from best practice. As the consultation itself states, the network is "typical though not exceptional". This is wrong, when buildings clearly must be better than "typical" to get on track for net zero. Existing networks must have incentives, leading to requirements, to become more energy efficient and to switch to low-carbon supplies.
- Connection to existing heat networks will, directly or not, incentivise their continued use and potentially their expansion, in addition to affect the emissions of the building itself. This must only be allowed **subject to a clear and committed plan to decarbonise.**

The emphasis needs to be on setting the correct framework for addressing the assessment of the appropriateness of a heat network. **While we understand the need for a transition period for existing networks, we need to move to the point where heat networks are assessed on their actual performance, not just their *potential* to decarbonise in a hypothetical future.** The Building Regulations must clearly show the direction in this e.g.:

- State that in the FBS and FHS, networks and on-site solutions will be assessed for their actual absolute performance (= on an equal basis), in kgCO2/kWh heat delivered. For example this could use criteria similar to those proposed in the recent BEIS consultation for the Green Heat Networks Fund; this would provide consistency between different government policies and would offer a useful transition from a few years of financial incentives, before regulation is in place.
- Compare existing networks with a lower carbon one e.g. one where a proportion of the heat is provided by a low-carbon source. The comparison should not be with an entirely fossil fuelled one.
- From 2021, introduce a test on whether "there is potential for decarbonising": this is not addressed currently and should be introduced as requirement in the 2021 interim uplift.

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

~~**a) Yes**~~
b) No, they give too much of an advantage to heat networks

~~**c) No, they do not give enough of an advantage to heat networks**~~
~~**d) No, I disagree for another reason**~~

If you answered no (b, c or d), please explain your reasoning and provide supporting evidence or alternative suggestions.

We cannot continue to build new heat networks which do not already offer carbon benefits, and which lock large numbers of buildings to high carbon solutions for a long period. New heat networks should already be low-carbon, not just have the *potential* to decarbonise in a hypothetical future. The Building Regulations must clearly show the direction in this by setting a real case for performance and outcome-based requirements:

- MHCLG should state that in the FBS and FHS, networks and on-site solutions will be assessed for their actual absolute performance (= on an equal basis), in kgCO2/kWh heat delivered. For example this could use criteria similar to those proposed in the recent BEIS consultation for the Green Heat Networks Fund, where networks would only receive funding if they can deliver carbon savings compared to on-site air source heat pumps; this would provide consistency between different government policies and would offer a useful transition with a few years of financial incentives, before regulation is in place in the FBS / FHS.
- Require that new heat networks do not use fossil fuels, from 2021 (or possibly only for a small minority of the load, to be checked through plant capacity and in-use records).
- Set clear low-carbon requirements from 2021, with a baseline network having a heat pump for all of the majority of its heat, not just 20% of its heat delivered by a heat pump.

Question 19): Do you agree with the proposed changes to the National Calculation Methodology Modelling Guide and activity database?

~~**a) Yes**~~
b) Yes, but additional changes should be made

~~**c) No**~~

If you answered b or c, please explain your reasoning and provide alternative suggestions.

An additional change which MUST happen is a review of how heating and cooling loads are assessed. NCM heating loads are well-known to be under-estimated – see evidence provided

by LETI as part of their responses to this consultation. This has been raised by CIBSE with BRE and MCHLG before. One of the reasons is understood to be the fact that heating loads are calculated “in the space”, taking account of the benefits of internal gains; in fact, many non-domestic buildings have pre-heating at the air handling units, which results in much higher loads in practice.

Another reason may be, at least in some building types, that unregulated loads are over-estimated, which further reduces the estimated regulated heating load.

In addition to the above and beyond the 2021 revision, and as explained in Question 9 we strongly recommend a more fundamental review of NCM, in preparation of the FBS and in a similar spirit to the SAP/RdSAP11 review commissioned by BEIS recently.

Question 20): We would welcome any further suggestions for revising the outputs from SBEM, which would enable easier checking by building control on building completion. Please provide related evidence.

We strongly recommend that the plant efficiencies used in Part L calculations should be attributed a default penalty until it is confirmed that commissioning tests have been satisfactorily conducted. This could be clearly indicated on the outputs. would help both energy efficiency and wider building performance issues, such as noise and air quality from ventilation systems.

We would also recommend examining the possibility of having the Heat Transfer Coefficient as output, if an independent review confirming that it could easily be measured at the as-built stage (similarly to the SMETER trials, but for non-domestic buildings). This could help improve compliance and reduce the performance gap.

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

~~**a) Yes**~~
~~**b) No, they go too far**~~
~~**c) No, they do not go far enough**~~
d) No, I disagree for another reason

If you answered no (b, c or d), please explain your reasoning and provide alternative suggestions.

While cooling is clearly more common than in the residential sector, many non-domestic buildings do have a high heating load. We therefore recommend examining the potential for introducing a metric that would look at fabric performance for both heating and cooling, rather than the current limit which addresses summer heat gains only. This could be 2 separate limits, or a combined one. This would provide an equivalent to the fabric performance approach in the residential sector.

Question 22): Do you agree with the proposed minimum standards for fabric performance in new non-domestic buildings as presented in Table 3.2 of this consultation document?

~~**a) Yes**~~
~~**b) No, the standards go too far**~~
c) No, the standards do not go far enough

~~**d) No, I disagree for another reason**~~

If you answered no (b, c or d), please explain your reasoning and provide supporting evidence or alternative suggestions.

No, the standards do not go far enough. A limiting air permeability of 8 m3/ (h.m2) @50Pa is too high. Improving this would represent little additional cost, would have benefits for overall building quality, and would reduce air pollution ingress as well as unwanted heat losses.

While some limiting U-values could be improved, for example by looking at the notional building specifications Option 2, because of the use profile of many non-domestic buildings we recommend looking, in parallel, at a fabric performance metric (or 2 separate metrics) which would look at both heating and cooling demand overall.

In addition, we would highlight that looking at individual elements only misses fundamental opportunities for reducing energy use i.e. building shape, orientation, and layout of uses across the building. Using a notional building misses these incentives, which in turns places more pressure on the performance of individual elements. This is another argument in support of moving to an EUI approach, as detailed in question 9.

Question 23): Do you agree with the proposed minimum standards for fabric performance of new thermal elements in existing non-domestic buildings as presented in Table 3.3 of this consultation document?

~~**a) Yes**~~
~~**b) No, the standards go too far**~~
c) No, the standards do not go far enough

~~**d) No, I disagree for another reason**~~

If you answered no (b, c or d), please explain your reasoning and provide supporting evidence or alternative suggestions.

Retrofitting of the existing stock is a huge challenge, so every opportunity must be taken to improve them as far as possible when works are carried out.

The standards do not go far enough as they should include minimum standards for air permeability, at least where works are substantial enough (e.g. of the type that currently trigger consequential improvements) – see response to question 24.

Question 24): Do you agree with the draft guidance in paragraph 4.15 of the draft Approved Document L, volume 2: buildings other than dwellings on reducing unwanted air infiltration when carrying out work to existing non-domestic buildings?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning.

Retrofitting of the existing stock is a huge challenge, so every opportunity must be taken to improve them as far as possible when works are carried out. The proposals are insufficient in several ways:

- It is only guidance in the approved document, not a requirement in itself
- It doesn't set a minimum standard as such – this should be required, at least when substantial works are carried out (e.g. of the type which currently trigger consequential improvements)
- It doesn't take opportunities from less intrusive low-pressure testing, as recently approved by MHCLG and which, with the incentive of a set target, could become more commonplace pre-works to inform the energy efficiency and ventilation strategy, and post-works to check quality and building regulations compliance.
- It only applies to the elements being installed or renovated, not the whole building. This misses many opportunities to improve airtightness while other works are carried out.

As stated in response to question 22, improving airtightness could achieve high energy savings at little additional cost, would have benefits for overall building quality, and would reduce air pollution ingress as well as unwanted heat losses.

Question 25): Do you agree that the limiting U-value for rooflights in new and existing non-domestic buildings should be based on a rooflight in a horizontal position, as detailed in paragraph 4.4 of draft *Approved Document L, volume 2: buildings other than dwellings*?

a) Yes b) No

If you answered no, please explain your reasoning.

Question 26): Do you agree that we should adopt the latest version of BR 443 for calculating U-values in new and existing non-domestic buildings, as detailed in paragraph 4.1 of draft *Approved Document L, volume 2: buildings other than dwellings*?

a) Yes b) No

If you answered no, please explain your reasoning.

Question 27): Do you agree with the newly proposed minimum efficiencies for natural gas, oil and LPG boiler and domestic hot water system installations in new non-domestic buildings in Section 6 of draft Approved Document L, volume 2: buildings other than dwellings?

a) Yes
b) No, the standards go too far
c) No, the standards do not go far enough

If you answered no (b or c), please explain your reasoning.

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

a) Yes
b) No, the standards go too far
c) No, the standards do not go far enough

If you answered no (b or c), please explain your reasoning.

Question 29): Do you agree with the proposals for self-regulating devices for new non-domestic buildings, as set out in Sections 5 and 6 of draft Approved Document L, volume 2: buildings other than dwellings?

a) Yes b) No

If you answered no, please explain your reasoning.

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

~~**a) Yes**~~
b) No, the standards go too far
~~**c) No, the standards do not go far enough**~~

If you answered no (b or c), please explain your reasoning.

We are received concerns from our specialist society, the SLL, at the proposal (S6.59) that lighting should have an average luminaire efficacy of 95 luminaire lumens per circuit-watt in all spaces. While this could be workable in offices, it will lead to problems in some places

- e.g. those that need more domestic type light fittings, such as in care homes, hotels and pubs where lamps will be in shades. In those settings light fittings would not be photometered and 95 lm/c-w would not be possible. In more domestic type spaces it would be more appropriate to retain a lamp lumen approach; this could still be set at 95 lm/c-w.
- e.g. healthcare.

Noting the statement at Section 6.58 that, "Spaces should be within the recommended illuminance range and should not be over-illuminated," and the calculation methodology at Appendix B, we are concerned that this obliges designers to carry out a full lighting calculation for every space, even for small spaces like a hotel bedroom or a toilet. We question whether an illuminance level has to be in the building regulations.

It would be better to have an overriding watts/m2 rather than requiring a full lighting design for every space, or some alternative lumen output type criteria for lights that are not ‘technical’ and have photometric data associated with them. Most general lights in historic buildings, most decorative lights in hotels, restaurants, etc. For wall and pendant lights with changeable shades, you can only have lumen efficiency of the lamps as a criteria. The output and distribution will change drastically as you change the shape and material of any shade put on these lights. Although it’s good to have designers at least think about lighting levels in toilets, cleaners’ cupboards and small store rooms, etc. They should never have to produce calculations for every small space in a building, and the potential energy savings are questionable.

Question 31): Do you agree with the proposals for cooling in new non-domestic buildings in Section 6 of draft Approved Document L, volume 2: buildings other than dwellings?

~~**a) Yes**~~
b) No, the standards go too far
~~**c) No, the standards do not go far enough**~~

If you answered no (b or c), please explain your reasoning.

An important thing that minimum efficiencies of plant items miss are the opportunities for synergies between plant items and different areas of a building, when considering buildings as a system e.g. recovering heat from one area to serve another, water-to-water heat pumps. Again, this may not be possible to implement as requirements in the AD as long as the current approach of a notional building with minimum elemental requirements is retained, but again, this is an argument in support of an EUI approach, which would really encourage

teams to look at all opportunities, as these would be truly rewarded under a single target. We have put this comment under this question on cooling, but it equally applies to heating plant.

Question 32): Do you agree with the proposals to require building automation and control systems in new non-domestic buildings, when such buildings have a heating or air-conditioning system over 290kW?

~~**a) Yes**~~
~~**b) No, a different trigger point should be used**~~
c) No, I do not agree that building automation and control systems should be required in new buildings

d) No, I disagree for another reason

If you answered no (b, c or d), please explain your reasoning and provide alternative suggestions. Please also highlight any unintended consequences that may result from setting this standard.

There may be a real challenge here as the developer (or owner) may not know whether a BACS is required until well into the building design process. For larger buildings it may be obvious, but for those at around the margin it will not be clear. However, it is recognised that the 290kW is set in the revised EPBD.

We would also like to point out that these requirements were originally (in the EPBD) intended for BACS operating heating and cooling systems, and are not applicable or achievable to BACS operating other building services. This distinction needs to be made clear, to avoid confusion and problems at building control stage.

We do however support requiring lighting controls in the FBS and propose the following recommended alternative text for lighting controls systems:

Requirements should be laid down to ensure that, where technically and economically feasible, non-residential buildings of over 400 m2 (or other threshold, tbc) are equipped with automatic lighting control systems capable of:

1. *occupancy control for indoor lighting with automatic detection; and*
2. *automatic dimming of the lighting power based on daylight levels (when daylight is present); and*
3. *enabling continuous monitoring, logging and fault detection; and*
4. *allowing end-user control; and*
5. *allowing communication with relevant connected technical building systems inside the building.*

Question 33): Do you agree with the technical specification for new building automation and control systems as EN 15232, Class A?

~~**a) Yes**~~
~~**b) No, the requirements go too far**~~
c) No, the requirements do not go far enough

If you answered no (b or c), please explain your reasoning.

The type of BACS selected should reflect the complexity of control required, nature of occupants, type of maintenance arrangements available and many other project specific influences. It is not clear that mandating the nominally best, i.e. Class A, in EN 15232 maps across well to the out-turn energy efficiency. Many other aspects have a significant impact on outcomes. And whatever BACS is installed it MUST be commissioned if it is to work and deliver benefits.

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

~~**a) Yes**~~
~~**b) No, the standards go too far**~~
c) No, the standards do not go far enough

~~**d) No, I disagree for another reason**~~

If you answered no (b, c, or d), please explain your reasoning and provide alternative suggestions.

CIBSE welcomes the intent set out in section 8. Without competent commissioning buildings will not achieve the efficiencies expected of them. Clients and consumers lose out through increased energy use and bills and emissions targets will not be met. The challenge is in gaining sufficient traction for commissioning to be taken more seriously by contractors and more assiduously checked by building control bodies.

Some simple steps could be taken to increase awareness of the importance of the requirements for effective commissioning. For example, in 8.2 there is no reference to when the schedule is to be submitted. If it is not submitted early then it is a fait accompli. If CIBSE Code M is being followed, then it requires early development of the Commissioning Plan. Whilst it may be unrealistic to expect a full commissioning plan at Gateway 2, the headlines of a plan should be in place at that point and should be subject to checking as part of Gateway 2.

We agree with specifically mentioning building automation and control systems within the requirements for commissioning.

8.3 causes some concern. An “on-off” switch is not necessarily an automated control system. If the on-off switch is automated then the effective and appropriate operation in response to the trigger needs to be checked and commissioned. This wording needs further attention.

Sections 8.6 and 8.7 are fine, as far as they go. But unless building control are active in seeking commissioning notices and have the knowledge and expertise to take an informed view of what is submitted and to challenge where they consider that commissioning has not been effective then they are easily manipulated. There will need to be a step change in the approach of building control to commissioning as well as a cultural change in the industry if systems are to be effectively commissioned to deliver the expected energy performance.

8.1, 8.2, 8.3, 8.6, 8.7: references to on-site generation should be to any on-site generation, not just electricity generation as currently written (e.g. to cover solar thermal and biomass boiler systems).

8.2 “b. the tests to complete”: for the avoidance of doubt, we recommend adding “and the performance to be achieved under these tests”. CIBSE receive regular feedback that the interpretation of commissioning is somewhat variable, with some individuals including performance testing but others more focused on whether systems operate, not how well they operate. The guidance should also be clear that the tests should include essential performance parameters such as ventilation rates, and all plant efficiencies used in Part L calculations. These inputs should also be provided to building control, alongside the commissioning plan and building’s design stage emissions rate and (as we advocate – see question 11) energy use intensity rate. As mentioned in Question 9, we also strongly recommended to more closely link commissioning with Part L, by requiring that **relevant inputs in as-built Part L and EPC calculations be applied a penalty until evidence of satisfactory commissioning (performance) test.**

Links to the EPC regime: it would be relatively simple and very low cost for MHCLG to set out in guidance to EPC assessors and their registration schemes, as well as in guidance to building control bodies, that closer attention to commissioning is expected. These changes would place additional requirements on EPC assessors, but this could be covered in the training of EPC assessors required anyway due to changes to Parts L and F. In addition, their work is audited regularly. All parties should be made aware that EPC assessors will be required to check commissioning records when producing new as-built EPCs and that this will be checked in audits. This would help to focus minds where needed by raising the spectre of getting a lower banding on the EPC if commissioning is not carried out more effectively and properly reported.

Question 35): Do you agree with the proposals for requirements relating to the assessment of overall energy performance of building services installations and providing information to building owners for new non-domestic buildings given in sections 8 and 9 of Approved Document L, volume 2: buildings other than dwellings?

a) Yes

~~**b) No**~~

If you answered no, please explain your reasoning.

We welcome the change requiring the provision of energy forecasting to the building owner, particularly until such time that 1) NCM becomes a better modelling tool (see comments under question 9 and question 19), and 2) requirements to monitor and disclose actual performance are introduced, which would place more onus on design teams to achieve low-energy design.

See more comments Clearly, the value provided by this new requirement will depend on the quality of the energy performance modelling and how it is enforced – see response to question 60.

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

a) Yes
b) No, I do not agree with providing guidance on this

c) No, the guidance should be improved

If you answered no (b or c), please explain your reasoning.

Question 37): Do you agree with the proposal that wet space heating systems in new buildings should be designed to operate with a flow temperature of 55°C or lower?

a) Yes, through a minimum standard set in paragraph 5.9 of the *Approved Document L, volume 2: buildings other than dwellings*

~~**b) Yes, through carbon and primary energy credit in SBEM**~~

~~**c) Yes, by another means**~~

~~**d) No, the temperature should be below 55°C**~~

~~**e) No, this standard should not be applied to all new buildings**~~

~~**f) No, I disagree for another reason**~~

Please explain your reasoning.

This should depend on the heating system installed, to maximise efficiency and carbon savings from heat pumps, and reduce demand on the grid at times of cold weather (as air source heat pumps in particular would otherwise operate on very low efficiencies). We would recommend:

- 55^{o}C may be appropriate for homes connected to low carbon heating networks

- 45^{O}C for dwellings with ground or water source heat pumps
- 40^{O}C for the other cases, including dwellings with air source heat pumps.

If this is not considered feasible now, then we would suggest the temperature should be 45°C as this is suitable for low temperature radiators and would allow conversion to heat pumps in the future. This would also be consistent with emerging industry thinking that supports reducing instantaneous domestic hot water temperatures of 50^{O}C or lower.

Of course the capacity to operate at these flow temperatures should not compromise essential issues such as the ability to deal with legionella risk, especially when storage is present or may be in the future (as will often be desirable with heat pumps).

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Question 38): Do you agree with the proposals to clarify, rationalise and simplify the guidance for building services in new non-domestic buildings, and to incorporate the standards of the Non-Domestic Building Services guidance into the main body of the Approved Document L, volume 2: buildings other than dwellings?

a) Yes b) No

If you answered no, please explain your reasoning.

In principle yes, however:

- in places having guidance on new and existing buildings in the same document makes the new reorganised AD is more confusing to navigate.
- there is a risk that, now the AD only includes guidance related to minimum standards (i.e. backstop, not notional required for compliance), design teams will get confused, design to this by default, and at a late stage realise they do not meet compliance.
- Section 6 should be reorganised to avoid having first a long list of fossil-fuel systems, as if they were the default. It could also be clearly reorganised into either applications (cooling, heating etc) OR systems (heat pumps, boilers etc), rather than a mix of both as currently.
- We are very concerned that some changes have been made, particularly omissions, which have not been highlighted in the consultation and may result in valuable guidance being lost. We have commented on this with regards to the omission of guidance on thermal comfort – see Question 53 - , but we are concerned there may be others which have slipped un-noticed as they were not highlighted in the consultation or draft AD, and as the consultation package is so large as to make thorough analysis of every change quite difficult.

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

a) Yes

~~b) No~~

If you answered no, please explain your reasoning.

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

a) Yes b) No

If you answered no, please explain your reasoning.

Question 41): Do you agree with the newly proposed minimum efficiencies for natural gas, oil and LPG boiler and domestic hot water system installations in existing non-domestic buildings in Section 6 of draft Approved Document L, volume 2: buildings other than dwellings?

a) Yes
b) No, the standards go too far
c) No, the standards do not go far enough

If you answered no (b or c), please explain your reasoning.

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

a) Yes, boiler installations should continue to benefit from heating efficiency credits

b) No, boiler installations should no longer benefit from heating efficiency credits (the Government's proposal)

If you answered yes, please explain your reasoning.

Question 43): Do you agree with the proposed set of standards for air distribution systems for existing non-domestic buildings in Section 6 of draft Approved Document L, volume 2: buildings other than dwellings?

a) Yes
b) No, the standards go too far
c) No, the standards do not go far enough

If you answered no (b or c), please explain your reasoning.

Question 44): Do you agree with our proposed approach and guidance to mandating self-regulating controls in existing non-domestic buildings, including technical and functional feasibility, as detailed in Sections 5 and 6 of draft Approved Document L, volume 2: buildings other than dwellings?

a) Yes b) No

If you answered no, please explain your reasoning.

Question 45): Do you agree with the minimum efficacy proposals for lighting in existing non-domestic buildings in Section 6 of draft Approved Document L, volume 2: buildings other than dwellings?

~~**a) Yes**~~
b) No, the standards go too far
~~**c) No, the standards do not go far enough**~~

If you answered no (b or c), please explain your reasoning.

See our response to question 30. The concerns about luminaire efficacy and required illuminance apply particularly to existing buildings.

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

a) Yes
b) No, the standards go too far
c) No, the standards do not go far enough

If you answered no (b or c), please explain your reasoning.

Question 47): Do you agree with the proposals that when Building Automation and Control System is installed in an existing non-domestic building with a heating or air-conditioning system over 290 kW, it should meet the same minimum standards as new non-domestic buildings?

a) Yes
~~**b) No, a different trigger point should be used c) No, a different standard should be used**~~
~~**d) No, for another reason**~~

If you answered no (b, c or d), please explain your reasoning and provide alternative suggestions.

Question 48): Do you agree with the proposals for requirements relating to the assessment of overall energy performance of building services installations and providing information to building owners for existing non-domestic buildings?

~~**a) Yes**~~
~~**b) No, I do not agree with providing this guidance**~~

c) No, the guidance should be improved

If you answered no (b or c), please explain your reasoning, including any further suggestions.

Same comments as for new domestic buildings provided in question 34 PLUS the commissioning and information requirements should also apply whenever regulated works have been done to the building which could affect its energy use profile (e.g. fabric efficiency, changes of use, extension) – whether or not there have been works to fixed building services, automation and control systems: the services and their controls may need to operate at different settings.

This should also include information and designed/ commissioned data on lighting installations for accuracy and completeness, to benefit the building owner.

Question 49): Do you agree with the guidance proposals for adequate sizing and controls of building services systems in existing non-domestic buildings, as detailed in Sections 5 and 6 of draft Approved Document L, volume 2: buildings other than dwellings?

a) Yes
b) No, do not agree with providing this guidance c) No, the guidance should be improved

If you answered no (b or c), please explain your reasoning.

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

a) Yes, through a minimum standard set in paragraph 5.9 of *Approved Document L, volume 2: buildings other than dwellings*

~~**b) Yes, through carbon and primary energy credit in SBEM**~~

~~**c) Yes, by another means**~~

~~**d) No, the temperature should be below 55°C**~~

~~**e) No, this standard should not be applied to all existing buildings**~~

~~**f) No, I disagree for another reason**~~

Please explain your reasoning.

As per response to Question 37, with even more constraints on existing buildings.

Question 51): Do you agree with the proposals to restructure the guidance for building services in existing non-domestic buildings, and to incorporate the standards of the Non-Domestic Building Services guidance into the main body of the Approved Document L, volume 2: buildings other than dwellings?

a) Yes

b) No

If you answered no, please explain your reasoning.

See response to question 38.

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

a) Yes
b) No, the Ecodesign regulations are sufficient

c) No

If you answered no (b or c), please explain your reasoning.

Question 53): Do you agree with the changes made to simplify, rationalise and clarify the guidance, and the updates to external references in Appendix E and Appendix F, in Approved Document L, volume 2: buildings other than dwellings, as outlined in paragraph 3.12.1 of the consultation document?

~~**a) Yes**~~

~~**b) Yes, but not with the changes to the supplementary guidance**~~

~~**c) Yes, but not with the external references**~~

d) No

If you answered no, please explain your reasoning. Please do not repeat comments on the changes made to simplify, rationalise and clarify the guidance for Building Services which you have already provided under Questions 38, 51 and 52.

We could in theory agree, however we noted a significant omission in the draft AD, compared to current ADL2A, which is not mentioned in the list of changes provided in §3.12.1:

The current ADL2A, alongside Criterion 3, includes this statement:

> *"§2.52 Therefore the developer should work with the design team to specify what constitutes an acceptable indoor environment in the particular case, and carry out the necessary design assessments to develop solutions that meet the agreed brief. Some ways of assessing overheating risk are given in CIBSE TM 37 Design for improved solar shading control and, for education buildings, in Building Bulletin 101 Ventilation of school buildings. "*

This is really important to highlight to teams the limitations of looking at solar gains only, and the importance of considering summer comfort, and therefore 1) protect the health, comfort, and productivity / learning of occupants; 2) reduce the risk of occupants installing cooling at a later date due to high summer temperatures, leading to increases in energy use and carbon emissions. Even as it is, it is not always sufficient to prevent overheating, for example we are aware that ventilation is schools may be planned without a proper overheating risk assessment, with ventilation designed to meet winter ventilation and insufficient consideration of summer ventilation and few or no opening windows, with winter ventilation and heat recovery sometimes even compounding overheating risk.

This statement seems to have been omitted, with nothing else to replace it. **We strongly urge MHCLG to re-instate a statement on summer comfort,** with suggested text as follows:

> *" Therefore the developer should work with the design team to specify what constitutes an acceptable indoor environment in the particular case, and carry out the necessary design assessments to develop solutions that meet the agreed brief. Some ways of assessing overheating risk are given in* ***CIBSE TM 52*** *and, for education buildings, in Building Bulletin 101 Ventilation of school buildings* ***and/or the latest DfE Output Specification****".*

See also communication from DfE to MHCLG on this topic, which CIBSE were party to. In addition, **we recommend considering extending the new overheating standard to other uses than residential, for example schools**.

This important omission, not highlighted in the draft AD nor the consultation document, raises the concern that other important changes are being implemented without being consulted upon. We strongly recommend MHCLG to clarify whether this is the case, and give a proper opportunity to industry to thoroughly consider all changes.

Question 54): Do you agree that the measures in Tables D.1 and D.2 of Appendix D of Approved Document L, volume 2: buildings other than dwellings are likely to be technically, functionally and economically feasible under normal circumstances?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning.

No. These measures are likely to be feasible, however:

- The requirement for new plant should take decarbonisation into account, not just the replacement of existing systems for newer one
- Consequential improvements are NOT the right approach to put the existing building stock on track to net zero carbon. By their very nature, they promote an elemental instead of a whole-building approach. Measures may be installed on the basis of their capital costs rather than appropriateness and effectiveness, and without consideration of their interaction with other building elements. It is far from what is required to improve our existing stock.

This must be changed. When substantial works are carried out, of the type that currently trigger consequential improvements, the building should be subject to a whole building approach, including whole building model and whole building target (this may be informed by constraints on the existing buildings, but would nonetheless promote whole building considerations). This should apply from 2021. In addition, a plan should be produced for the building to reach Net Zero, whether or not this is done as part of this first iteration of works. This would provide valuable information to the building owner, and ensure the works carried out in the first iteration do not “lock the building” into high-carbon solutions.

Question 55): Do you agree with the proposals for relaxation factors for modular and portable buildings, as detailed in Tables 2.2 and 2.3 of draft *Approved Document L, volume 2: buildings other than dwellings*?

a) Yes
b) No, the requirements go too far
c) No, the requirements do not go far enough

If you answered no (b or c), please explain your reasoning and provide supporting evidence or alternative suggestions.

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

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide supporting evidence.

On the basis of the information available to CIBSE, we do not think that there is enough evidence and experience to put Pulse on the same basis as the blower door test for new non-domestic buildings at this stage. More data is needed on its use for non domestic purposes before it is given equal status.

Question 57): Do you agree that we should adopt an independent approved airtightness testing methodology such as the CIBSE draft methodology for non-domestic buildings?

a) Yes, and the CIBSE methodology is appropriate
~~**b) Yes, but with a methodology other than CIBSE**~~
~~**c) No, an independent approved airtightness methodology shouldn't be adopted.**~~
~~**If you answered no, please explain your reasoning.**~~

See response to Question 57: we agree with the principle of an independent testing methodology, but do not think Pulse is at this stage ready for application to non-domestic buildings.

Question 58): Do you agree with the proposal for guidance on the calibration of devices that carry out airtightness testing in new and existing non- domestic buildings?

a) Yes b) No

If you answered no, please explain your reasoning and provide alternative suggestions.

Question 59): Do you agree with the proposed approach to energy sub-metering, as detailed in Section 5 of draft Approved Document L, volume 2: buildings other than dwellings?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide alternative suggestions.

We would recommend the following **changes** to the current draft wording of the AD §5.18:

The additional reference to TM63 is recommended to assist with cases where operating conditions are significantly different than the design assumptions and TM54 scenarios, in which case the comparison with TM54 modelling would have limited use.

5.18 Energy submetering systems should be installed and meet all of the following requirements.

a. The various end-use categories, such as heating, **domestic hot water**, lighting, and cooling, **pumps, fans, small power and other equipment** are sub-metered in such a way that at least 90 per cent of the annual energy consumption of each fuel can be assigned to an end-use. Detailed guidance on how to achieve this is given in CIBSE's *TM39.*

b. Metering enables the comparison of forecast energy use and in-performance energy, and facilitates energy reporting. This can be demonstrated by basing the sub-metering strategy on either:

i. an estimate of respective energy end-uses, using a representative building archetype.
ii. a design-stage energy forecast for the building, for example CIBSE's *TM54,* **or operational baseline, such as CIBSE's TM63.**

c. Metering allows for the energy use of different tenants within the building to be separately monitored. **Implementation and commissioning of the metering strategy of a building, including all main meters and sub-meters, should be carried out in accordance with the industry guidelines such as the detailed guidance provided in CIBSE's TM39.**
d. The output of any renewable systems are separately monitored.

e. In buildings with a total useful floor area greater than 1000 m2, an automatic meter reading and data collection facilities are installed.

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

a) Yes

~~**b) No, I do not agree with the proposed approach**~~

~~**c) No, energy forecasting should not form part of the Building Regulations**~~

If you answered no (b or c), please explain your reasoning and provide alternative suggestions.

Yes, energy forecasting has a place at least until such time when buildings are subject to in-use performance requirements: see details in response to Question 9. Clearly, the value provided by energy performance modelling will depend on how it is enforced and the quality of the modelling (including the model itself, and the scenarios developed by project teams). **CIBSE would be very happy to work with MCHLG on how more guidance and support could be provided to project teams and building owners on the application and interpretation of this requirement.**

In addition to a "high" and "low" scenario, a "likely" scenario should also be provided, as per TM54. CIBSE are looking to revise their guidance on these scenarios, as an improvement

over the current “management factors” approach e.g. providing clearer “off axis” scenarios such as part load, extended occupancy hours, equipment/sensor failure etc.

We also have the following comments on the text in §9.4:

- The energy forecast information should not only be provided broken down by fuel type, but in line with the metering strategy (e.g. by end use) – see comments to question 59.

For commercial offices, particularly tenanted ones where it is useful to differentiate landlord and tenant energy uses, we recommend the guidance should refer to NABERS UK Design for Performance as alternative to TM54.

Question 61): Do you agree with the proposals for transitional arrangements for buildings other than dwellings?

a) Yes

~~**b) No**~~

If you answered no, please explain your reasoning and provide alternative suggestions.

Yes. In particular we welcome the proposals that transitional arrangements would apply to the specific buildings or works, rather than site wide as they have in the past.

INTERIM UPLIFT TO PART F STANDARDS FOR NON-DOMESTIC BUILDINGS

Question 62): Do you agree with the proposed guidance in Section 1 and Section 2 of Approved Document F, volume 2: buildings other than dwellings on minimising the ingress of external pollutants and on the proper installation of ventilation systems in non-domestic buildings?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide alternative suggestions.

Minimising the ingress of external pollutants

Section 0, Intention e) We welcome the clear reference to minimising the ingress of external pollutants, but this should be more explicit and stronger as a requirement rather than guidance: the regulations themselves should refer to air quality, not ventilation.

§1.10 should make reference to measures to prevent the ingress of external pollutants.

§2.2 to 2.6: these clauses deal with the location of air inlets. This is the right first step but on many sites it will not be sufficient and the air taken into the building will still be polluted.

- In theory, one option could be to require (or at least guide) all buildings that meet the criteria of §2.1 to require mechanical ventilation, and for filters to be installed. We do not think this would be appropriate, for reasons including the unintended detrimental consequences that installing mechanical ventilation systems could have, if the users do not have the resources to operate them properly.
- However, we do think that in such situations where the criteria of §2.1 are met and mechanical ventilation is proposed, then filters should be installed, at least fine particulate ones if PM levels exceed the limit values of Table 2.1: these are relatively common and would not add substantial maintenance requirements, where ventilation systems are installed anyway. In that case the maintenance implications of the filters should be included to the information provided to the building owner. Requiring gas filters is more complex, expensive, and has higher maintenance implications, so again on balance we do not think this should be required.

The proper installation of ventilation systems in non-domestic buildings

See response to question 64.

Question 63): Do you agree with the proposed guidance for reducing noise nuisance for ventilation systems in non-domestic buildings?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide alternative suggestions.

§1.5 should include commissioning as a key measure to minimise noise from mechanical ventilation systems e.g. new bullet point d).

§1.7 taking account of noise when considering the suitability of opening windows for purge ventilation: in theory this is less relevant to purge situation, when purge ventilation is transient

/ temporary to remove the build up of a pollutant. However, noise does need to be considered if what is meant here is ventilative cooling, which is not transient (see definitions in Supporting Item G).

§1.8 we recommend that noise testing is required for ventilation systems, as part of commissioning requirements. This will have benefits in itself, and may also help spot a poor design or installation.

In addition to proper sizing of ducts, which can help with both noise and energy efficiency (covered in §1.12), selection of fans for medium/low speed should also be considered.

Question 64) Do you agree with the additional guidance provided in paragraphs 1.18 to 1.26 of the draft Approved Document F, volume 2: buildings other than dwellings on the installation of ventilation systems?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning.

§1.26 Commissioning:

- See also our recommendations in question 34 on commissioning, including setting clear performance tests and linking results to Part L compliance checks. This should overall improve compliance and enforcement.
- See also our response to question 63, to include noise testing in commissioning tests.

Flexible duct lengths are extremely long and will result in lazy duct installers and high pressure drops which will have an impact on fan power. Best practice is a maximum of half the figures stated in all scenarios.

§1.23 will lead to substantially larger grilles.

§1.25 is slightly superfluous. Who is going to check that the installer has done it? An alternative would be to that the installer must be member of a trade body that trains people to install ductwork properly.

There should also be a limit on maximum axial misalignment on flexible ducts to avoid excessive pressure drops.

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

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning.

W**e strongly recommend clarifying the status of the performance criteria, both in Appendix B and in Section 1** §1.14-1.15. Awareness of these criteria within the industry is low, and it is very unclear whether the criteria have to be met in all cases, or whether (as the wording seems to imply) they are mostly there in case ventilation rates are lower than stated in the guidance. This really is important as there is evidence that many buildings do not meet the performance criteria.

Comments on Table B.1:

- We agree with aligning recommended indoor levels with WHO and PHE recommendations.
- The selection of pollutants to focus on (Table B.1) seems appropriate with the important exception that we question why particulate matters are not included, when they present known risks to health and levels outdoors often exceed levels recommended by the WHO. As per our response to Question 62, we recommend this should at least be examined where the building is mechanically ventilated, and the installation of filters would bring significant benefits to air quality at relatively small costs and maintenance implications.
- We agree with the inclusion of formaldehyde as a specific pollutants, and the note on the appropriateness or not of TVOC as metric. Public Health England's 'Indoor Air Quality Guidelines for selected Volatile Organic Compounds (VOCs)' is the best source of specific evidence-based limits for VOCs for occupant health in the UK and should be used in place of the relatively meaningless 'TVOC' metric. For example, 300ug/m^3 of Benzene (**a** VOC) is not safe.
- The 'surface water activity' metric shown in B.4 is completely alien and will not be recognised by many in the industry. We recommend the inclusion of humidity ranges, as they are for dwellings. We acknowledge that in many situations this will be less relevant than in dwellings, but it would be similarly relevant at least in places such as student accommodation, care homes, hotels etc.
- The primary problem is that there is no mechanism in the approved document for verifying that these standards are met. The assumption is firstly that the outdoor air is free from pollutants and secondly that providing 10l/s·person outdoor air is sufficient to dilute indoor sources to these levels, yet that is entirely dependent on the emission intensity of the source.
- The guidance needs to require a pre-occupancy test of the building (once the building has been pressure tested and the ventilation system commissioned) to verify that

these pollutant levels are met. For example, BREEAM and WELL both provide methods which could be adapted and refined for UK non-domestic buildings.

There should be clearer links between the levels of outdoor pollution at which additional guidance is provided (i.e. Table 2.1 of the draft AD) and the recommended indoor levels: with the current draft, building control and project teams would often be in the situation where they know levels are unacceptable, but do not know what to aim for.

As recommended in our response to Question 76, recommended CO2 levels should be provided, to complement the new guidance on monitoring. Currently project teams and building control are faced with the generation of data without something to gauge it against, and without the need to act on it.

Question 66): Do you agree with the list of industry guidance presented in Section 1 of draft Approved Document F, volume 2: buildings other than dwellings?

~~**a) Yes**~~
~~**b) Yes, but additional guidance should be provided**~~

c) No

Please explain your reasoning and where relevant provide alternative suggestions for guidance.

Table 1.1 refers to Guide B, 2016, but this is a very large piece of guidance. We recommend recommending referring to Table 1.5 of Guide A instead, which summarises recommended ventilation rates; Guide B could be referred to for further guidance beyond recommended rates. In addition, to enable a responsive approach that is evidence based and can be updated as knowledge emerges CIBSE would be willing to develop an online resource that offered more detailed guidance – but this would really need both MHCLG and HSE to support the principle to start with.

§1.12: We suggest rewording as follows: “Additional guidance on the design of natural ventilation systems can be found in CIBSE's AM10. Additional guidance on the design of mixed mode ventilation systems can be found in CIBSE's AM13”.

Question 67): Do you agree with the list of references to industry guidance presented in Appendix C and Appendix D in the draft Approved Document F, volume 2: buildings other than dwellings?

~~**a) Yes**~~
b) No, the Government should amend the list of references

~~**c) No, for another reason**~~

If you answered no (b or c), please explain your reasoning and provide alternative suggestions.

TM40 is referenced in the draft AD and should therefore be included in Appendix D.

The reference to BB101 needs updating, it still shows the 2006 version rather than the latest 2019 one.

Question 68): Do you agree with the proposals to simplify, rationalise and clarify the Approved Document guidance in Approved Document F, volume 2: buildings other than dwellings as outlined in paragraph 4.3.7 of the consultation document?

a) Yes

b) No

If you answered no, please explain your reasoning and provide alternative suggestions

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

a) Yes
~~b) No, this standard goes too far~~
~~c) No, this standard does not go far enough~~

If you answered no (b or c), please explain your reasoning and provide alternative suggestions.

As noted previously, it is important to ensure that the reader of the AD understands the difference between purge, ventilative cooling, night (purge) ventilative cooling. Using current purge definition, this is transient to remove a pollutant and 4ach will remove 90% of pollutant (on the basis of the pollutant no longer being emitted) within about 35min.

With the current state of knowledge, and without knowing the pollutant or concentration of pollutant it is hard to specify a rule of thumb. The guidance of 4ach may be appropriate in some cases, but for larger spaces (e.g. supermarkets, offices with limited natural openings) 4ach may well be unachievable and could have significant commercial ramifications for plant, risers etc, and often would not be practical to deliver on large scale buildings with central plant. An alternative approach such as minimum ventilation volume that needs to be passed through the space before occupancy, or a volume flux flow rate to reduce the concentration of a pollutant to % within, say, 30 minutes may be more appropriate.

If this is taken forward, guidance must clarify that the Part L SFP requirements do not apply to purge ventilation otherwise the spatial penalty would be enormous.

MHCLG may also wish to given consideration to the fact that the appropriateness of reducing to 90% of the original concentration also of course depends on the starting point:

- Say 10m3 of pollutant released in 100m3 space, concentration of pollutant is 0.1m3 per m3, after 4ach for 35 min concentration of pollutant is 0.01m3 per m3
- Say 10m3 of pollutant released in 1000m3 space, concentration of pollutant is 0.01m3 per m3, after 4ach for 35 min concentration of pollutant is 0.001m3 per m3

In the larger space the pollutant concentration is the same at the start as the 100m3 after 4ach for 35 min. Although in both examples the pollutant is reduced by 90% the concentration of pollutant in each space is very different – which the 4ach purge ventilation doesn't convey.

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

a) Yes
b) Yes, but some improvements can be made
c) No, the guidance should be significantly changed

If you answered b or c, please explain your reasoning and provide alternative suggestions. Please note that the appropriate questions on measures to prevent the spread of infection are detailed in section 4.4 of this consultation document.

Question 71): Do you agree with the proposals in Section 3 of draft Approved Document F, volume 2: buildings other than dwellings, when replacing an existing window with no background ventilators?

~~**a) Yes**~~
b) No, the standards do not go far enough

~~**c) No, the standards go too far**~~

If you answered no, please explain your reasoning and provide alternative suggestions.

The current proposal risks introducing unnecessary energy use and carbon lock-ins, without necessarily guaranteeing good ventilation either:

- In some cases, if the air permeability of a building is high or if the building already benefits from mechanical ventilation, new trickle vents will introduce unnecessary air leakage, ingress of external pollutants, and heat loss.

- In other cases, additional ventilation may indeed be required but would be better provided through mechanical ventilation.

The ventilation strategy should be informed by an overall assessment of the building, with consideration of energy efficiency alongside. As detailed in question 24, at least in the case of substantial works this should include an airtightness test pre-works, and a target post-works, as part of a whole building assessment.

Question 72): Do you agree with the proposal to provide a completed commissioning sheet to the building owner and associated guidance in Section 4 of draft Approved Document F, volume 2: buildings other than dwellings?

a) Yes

~~**b) No**~~

If you answered no, please explain your reasoning.

Commissioning sheets need to be understandable – in many cases they may mean little to building owners and even maintenance teams. In addition to information of operation and maintenance proposed in the consultation, we recommend the inclusion of clear information about the performance expected from the systems, and the test results against these expectations – see details in question 34.

Question 73): Do you agree with requiring increased capacity of 50% within new ventilation systems in offices shown in paragraph 1.38 of the draft Approved Document F, volume 2: buildings other than dwellings?

~~**a) Yes**~~
~~**b) Yes, but with qualifications**~~
~~**c) No, the standard is too high**~~
~~**d) No, the standard is too low**~~
e) No, I disagree for another reason

If you answered b, c, d or e, please explain your reasoning.

We welcome the fact that this topic is addressed in detail in the consultation in response to the recommendations of the SAGE Environment and Modelling Group, and we understand that this has had to be assembled in a very short timeframe and without widespread discussion with relevant experts.

We must stress that all buildings really do need to achieve the standards already set. This should apply to offices, but other environments too – we are not sure why the question focuses on offices, and do not think this is right. Other workplaces as well as residential accommodation (e.g. care homes, students halls), for example, would clearly also benefit from it.

Before even considering additional rates that may be needed under exceptional circumstances, the priority must be on compliance with and enforcement of current requirements. The past few years, and the pandemic, have shown that many buildings are sub-standard and non-compliant with either the existing building regulations or the workplace regulations or indeed with both – see for example the 2020 Royal Society Proceedings, quoted at the end of the response to this question.

This may mean that Building Control have to get more competent and assertive about ventilation. It also further supports our points on the importance of commissioning, including that it should be seen as a safety issue and a cross regulations requirement – see Executive Summary and question 34.

Beyond this minimum provision, we agree that it is useful to consider the need for additional ventilation, but we are not convinced that a blanket requirement for 50% additional capacity is the right approach:

- This seems somewhat arbitrary and without an obvious evidence base (or otherwise, that evidence base should be provided). In offices it may suggest that 15l/s/p is sufficient to reduce risk of transmitting infectious agents to acceptable levels – this is unknown, and may be dependant on the infectious agent.
- This could lead to plant operating highly inefficiently a lot of the time, unless additional plant is installed specifically for the potential of being needed one day.
- there is usually capacity for greater ventilation flow in buildings for ventilative cooling.

We have proposed some rewording of §1.27 and 1.28 as follows:

1.27 Ventilation systems in non-domestic environments may be required to disperse airborne contaminants, for example infectious agents being transmitted as aerosols. Ventilation systems, including natural ventilation, should be designed **taking account of the possible need to increase the supply of** outdoor air in the following types of occupiable rooms.

a. Rooms where singing, loud speech or aerobic exercise or other aerosol generating activities are likely to take place. These may include rooms, for example, in gymnasiums, indoor sports venues, dance studios, ~~theatres, concert halls,~~ public houses, nightclubs, ~~assembly halls,~~ as well as in other types of building.

a1. Spaces where performers or participants in cultural or sporting activities may generate aerosols and where there may be a significant number of spectators or audience members in part of the space, such as theatres, concert halls, places of assembly and indoor sporting facilities.

b. Rooms where members of the public are likely to gather in large numbers. These may include rooms, for example, in public buildings, hotels, shopping malls, ~~gymnasiums, indoor sports venues, dance studios, theatres, concert halls, public houses, nightclubs or assembly halls~~ **as well as in other types of buildings where large numbers of people may assemble indoors.**

c. Rooms which are maintained at both low temperatures and low levels of humidity. These may include rooms used for chilled food processing and occupied cold stores.

1.28 Buildings containing rooms outlined in paragraph 1.27 should also meet the ventilation guidance relevant to the building type set out in paragraphs 1.29 to 1.50. If the ventilation guidance set out in 1.29 to 1.50 requires outdoor air rates greater than ~~**15**~~ **10** litres per second per person in these rooms, the higher rate should be provided as a minimum.

In addition, we recommend the inclusion of a **note on infectious agents** (preferably before paragraph §1.27) as follows:

To minimise the risks of airborne aerosol transmission of infectious material the general advice is to increase the air supply and exhaust ventilation, supplying as much outside air as is reasonably possible. The underlying principle is to dilute and remove airborne pathogens as much as possible, exhausting them to the outside and reducing the chance that they can become deposited on surfaces or inhaled by room users. Recirculation or transfer of air from one room to another should be avoided unless this is the only way of providing adequate ventilation rates to all occupied rooms. The application of these principles will vary from one type of building or space to another and will depend on the activity or activities undertaken in the various spaces within a building. Consideration should always be given to the rate of air supply and to the ventilation pathways within a building to reduce the risks of airborne transmission of infectious material.

In addition, MHCLG may want to consider defining “increased” supply through the use of **recommended CO2 levels**, as indicator of ventilation effectiveness. For example, by the addition of a note as follows:
Spaces with low occupancy or where enhanced aerosol generation is likely (e.g. through singing, loud speech, aerobic activity) should aim to ensure ventilation is sufficient to maintain CO_2 concentrations below 800-900ppm, and should also include additional mitigations such as reduced exposure (occupancy) times, face coverings for audiences and restricting the size of groups and duration of activities. The latest Government advice should be sought with respect to undertaking high aerosol generating activities indoors
See also our response to Question 66 on the possible development of an online CIBSE resource on ventilation rates.

The 2020 Royal Society Proceedings include this section:

“*Most documented cases of transmission which are believed to have arisen from the airborne route have been in environments where the outdoor air supply would not have complied with current UK design guidance. It is inferred from this, and the documented modelling, that*

provision of outdoor air in-line with existing design guidance will help reduce the risk of transmission by the airborne route.

The rate of provision of outdoor air can be inferred by monitoring CO2 levels in occupied spaces, maintaining these below about 1000ppm being indicative of adequate ventilation in many indoor environments, including offices (with design guidance for some indoor spaces permitting 1500ppm see [2] and §3b for a fuller discussion). However, higher ventilation rates may be needed wherever activity levels increase beyond desk-based work."

Question 74): Do you agree with the proposed standards for provision of outdoor air for offices, shown in paragraphs 1.35 to 1.36 of draft Approved Document F, volume 2: buildings other than dwellings?

~~**a) Yes**~~
b) Yes, but with qualifications

~~**c) No**~~

If you answered b or c, please explain your reasoning.

The guidance of 10l/s/p or 1L/s/m2, whichever is the higher, is in line with industry guidance. The issue is whether these rates are achieved in practice, hence our insistence on commissioning and guidance to building owners (see questions 34 and 73).

§1.36 - mechanical ventilation of common spaces may be difficult to achieve as corridors are generally already congested with services. Ventilating them as well will exacerbate this. If this is retained, we recommend considering reducing the volume requirement or providing more flexibility to make a judgement based on specific project context.

- The standard needs to specify whether this minimum fresh air rate applies only when CO_2 sensors are not satisfied or if this is the minimum permissible ventilation rate at all times. The latter would introduce significant energy penalties.
- See also our comments in other questions on introducing recommended CO2 levels.

Question 75): Do you agree that extract ventilation in bathrooms, WCs, and other sanitary accommodation should be capable of operating in a continuous mode if necessary?

a) Yes

~~**b) No**~~

If you answered no, please explain your reasoning.

The question is then how to define “necessary” – recommended humidity ranges should be included in performance criteria, as per our response to question 65.

Needless to say, toilets and sanity accommodation should also avoid venting into occupied spaces.

Question 76): Do you agree with the proposal for indoor air quality monitoring in offices as outlined in paragraphs 1.39 to 1.41 of draft Approved Document F, volume 2: buildings other than dwellings?

~~**a) Yes**~~
b) Yes, but with qualifications

~~**c) No**~~

If you answered b or c, please explain your reasoning and provide any suggestions for guidance if applicable.

We welcome the introduction of guidance on monitoring indoor air quality, however;

- This should be applicable to other workplaces than offices. Some of the references in Table 1.1 may cover this, for example the latest BB101 in schools, but not all. Good ventilation is important in all workplaces; in places such as warehouses or industrial areas with moving equipment or vehicles, drowsiness caused by high CO2 levels may actually be a hazard. We think that, if monitoring is required for offices and, through BB101, in schools, then it should also be applicable in other workplaces such as factories and workshops~~.~~
- **Important comment:** The guidance focuses on CO2 as indicator of performance of the ventilation system. This is appropriate when the main pollutants from indoor sources are people, e.g. offices, schools with no special activities. However, it may not be appropriate in other areas such as those that generate fumes from indoor activities (painting, printing, manufacturing …). While all cases cannot be covered in the Approved Document guidance, this must be made clear. While high CO2 levels indicate poor ventilation, lower levels do not on their own confirm good levels of ventilation or indeed good indoor air quality overall, as highlighted in CIBSE TM40 and the recent SAGE guidance.
- There should also be guidance on the fact that high CO2 levels may not indicate a failure to achieve the original, intended, Part F compliant ventilation rates, but may be linked to occupancy density which is higher than initially intended. This also means that, ideally, occupancy should be assessed, particularly if high levels are recorded (since the AD guidance is the higher of 10l/s/p OR 1l/m2).

- **Important comment**: We question the value of having CO2 monitors, without 1) guidance on acceptable levels (e.g. in the performance criteria), and 2) the possibility to act on the monitored data i.e. link it to ventilation rates, such as in demand control ventilation (increase them when CO2 levels are poor, reduce them and save energy when CO2 levels are low). This should be considered, at least on large buildings (e.g. over 1000m2). It would introduce a closer link between Parts L & F, and help energy savings as well as air quality.
- There is no specification of the accuracy of the air quality monitors, only the range (which is arguably too high for office use and hence will provide less sensitivity). 0-2500ppm is more suitable.
- §1.40: requirement to be capable of storing data for 24 hours: it does not seem realistic to expect someone to manually download the stored data every 24 hours, so this creates a high risk of data being lost: the storing period should be expanded, or there should be capability for data to be automatically downloaded.
- §1.41: sensors should be located where possible in representative areas of exposure e.g. within or close enough to the breathing zone. In large spaces, they may otherwise give unrepresentative readings. The current proposals mean they could be located anywhere from 150mm off the floor to 3m up in the air, in the same room.
- Some guidance should be provided on the rooms where monitoring is most likely to be beneficial, i.e. those likely to be of high density, such as meeting rooms (especially small ones), and on the number of sensors within a given floor area.

Question 77): If applicable, please provide any suggestions for guidance for indoor air quality monitoring (e.g. CO2 monitoring) in non- domestic buildings.

See detailed comments in response to Question 76. In addition, we have the following recommendations on CO_2 Sensors:

Measurements of elevated CO_2 levels in indoor air are an effective method of identifying poor ventilation in multi-occupant spaces. However, in low occupancy or large volume spaces a low level of CO_2 cannot necessarily be used as an indicator that ventilation is sufficient to mitigate transmission risks. Multi-occupant spaces that are used regularly and are poorly ventilated (below 5 l/s/person or above 1500ppm CO_2 for prolonged periods) should be identified and prioritised for improved ventilation rates.

If CO_2 sensors are to be deployed they should be Non-dispersive Infra-red (NDIR) CO_2 sensors, which actually detect CO_2 in the space, rather than the type of sensors that do not detect CO_2 and infer a CO_2 concentration by measuring room volatile organic compound (VOC) concentrations instead.

Question 78): Do you agree with the proposals for systems that recirculate air as outlined in paragraph 1.46 of draft Approved Document F, volume 2: buildings other than dwellings?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning.

The explicit reference to HEPA filters is a concern. They introduce much higher resistance into the system and will require an increase in fan power and energy use. There is also a relatively limited supply chain, and they require regular and possibly additional maintenance. These filters may also become biological hazards needing special treatment and disposal.

HEPA filters may well be excessive, except in special applications such as healthcare facilities or places where occupancy is consistently high, such as prisons, care homes, some hotels. In Europe the European Federation of Heating and Ventilation (REHVA) guidance (to which CIBSE contributed) recommends using ePM1 80% filters. ASHRAE recommend MERV 13 which is the nearest US equivalent to the European grade. It is also important that the system is designed and sized to take the filters that are specified and also to meet Part L requirements.

Again, UV is known to deactivate the virus and appropriately and safely deployed it may be appropriate. However, there are currently no robust standards on comparing efficacy of UV in duct technology. The issue here is how far government should go in naming specific technologies in guidance to the regulations.

We suggest revising 1.46 as follows:

1.46 Office buildings should have the ability to provide adequate outdoor air to all occupied spaces. If recirculating air within spaces or between different spaces, rooms or zones, the ventilation system should be designed to incorporate and be installed with filtration using at least ePM1 80% grade filters or other clearly demonstrated and evidenced means of deactivating infectious material and meet the energy efficiency requirements of Part L. Any such filtration of alternative provision should be regularly cleaned and maintained in line with the manufacturer's requirements.

NOTE: For some system types some recirculation may be necessary or desirable in normal operation. Such systems should comply with paragraph 1.46 by either meeting the standards for filtration or other means of deactivation or by having the ability to switch to a full fresh air mode.

It should also be made clear whether "recirculation" applies to fan coil units, in which case the guidance could be impractical or have a high energy penalty. We assume here it applies to centralised systems.

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

~~**a) Yes**~~
b) Yes, with qualifications

~~**c) No**~~

If you answered b or c, please explain your reasoning and provide any suggestions for guidance if applicable.

See answer to Q73. The current standards clearly need to be met in full. Beyond this, it is difficult to say due to the limited amount of data yet available; the guidance will depend on the community infection rate, probability of an infector etc. For example singing can increase emission by 15-30X, so does that mean ventilation needs increasing 15-30 fold? We think it is too early to be confident of a balance between ventilation flow, transmission risk and energy use. Evidence may emerge to show that higher values are needed in certain settings and we need a rapid and responsive means to do that – CIBSE would be happy to work on an online tool if supported and acceptable to MHCLG and HSE.

Question 80) Do you think the mitigating measures to protect against infection via aerosols would be suitable for any non-domestic buildings other than those stated in the Approved Document guidance?

~~**a) Yes**~~

b) No

If you answered yes, please explain your reasoning and provide evidence to support this.

SECTION B: DOMESTIC BUILDINGS

Standards for overheating in new residential buildings in 2021

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

a) Through a new requirement in the Building Regulations and an Approved Document, as proposed in this consultation

~~**b) Through Parts L and F of the Building Regulations**~~

~~**c) Through government guidance**~~

~~**d) I have an alternative approach**~~

~~**e) It isn't an issue that needs addressing**~~

Please explain your reasoning and provide alternative suggestions where applicable.

Overheating in new homes is a serious issue and the introduction of a requirement within building regulations is welcomed.

Longer term, a more holistic design approach where energy, thermal comfort, air quality etc. are considered together will need to be introduced in order to optimise design and avoid unintended consequences. We appreciated there are attempts in the current drafts to point to the links between AD L, AD F, and the new Overheating AD , but all look at aspects of building performance which are closely interlinked and influence each other , and we think the links could be closer. We have highlighted some instances throughout our response.

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

~~**a) Yes**~~
b) Yes, but they should be expanded to include more building types and/or existing buildings
~~**c) No, they should be reduced to only include flats and houses**~~

~~**d) No, I disagree for another reason**~~

Please explain your reasoning.

We welcome the inclusion of care homes, residential schools and student accommodation within this AD.

We would like to see an intent to extend the guidance to include:

- Existing homes (where building regulations apply), as a lot of existing stock, (the CCC's Housing Fit for the Future report states that 20% of homes in England are overheating under current climate) is already experiencing serious risk of overheating.
- Building conversions into residential, e.g. office buildings, into flats; the change in use will require careful consideration of potential overheating risk.

- All building types (new and existing), as overheating is not limited to homes, and limiting overheating risk in all buildings will make buildings more resilient to climate change, and reduce cooling loads where mechanical cooling solutions are traditionally used. In addition, with permitted development, the future use of any building is uncertain and could include conversion to homes. See also our comment in question 53 on the omission of the previous reference to summer comfort in non-domestic buildings, which is a backward step and which we strongly recommend against.

Question 83): Do you agree that the division of England based on overheating risk detailed in paragraph 5.6.3 of this consultation document is correct?

a) Yes
~~**b) No, there should be one area**~~
~~**c) No, there should be more areas**~~

If you answered no (b or c), please explain your reasoning and provide supporting evidence.

Current evidence supports the treatment of London as a higher risk as it combines multiple risk factors for overheating including the local climate, UHI, smaller unit sizes and more flats, and security, noise and pollution being a barrier to opening windows, so it is appropriate that these homes are assessed more carefully, when they fall under a simplified method.

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

~~**a) Yes**~~

b) No

If you answered no, please explain how buildings should be re- categorised.

No – we broadly agree that flats and smaller units, like student residences, which do not have cross ventilation, are generally at higher risk than houses and those properties with cross ventilation, however we do not agree with the treatment of the two separate Groups.

It is counter-intuitive that single aspect flats be allowed a higher glazing percentage than triple aspect flats (or top floor dual aspects) which generally have a lower overheating risk.
As it is written, a top floor dual aspect unit would be Group A while the identical unit on the floor below would be Group B (without the exposed roof element), leading to different criteria for almost identical units while in fact the top floor, receiving gains from the roofs without probably any opening on the roof, will typically be at higher risk.

In addition, orientation is not considered as part of the group distinction and will have a significant role in the amount of solar gains entering the windows. This is a significant omission in the simplified method.

Question 85): Do you agree with the simplified method as a means of compliance with the proposed new requirement to reduce overheating risk?

~~**a) Yes**~~
~~**b) No, the method should be more sophisticated**~~

~~**c) No, the method is too easy to pass**~~
d) No, for another reason

If you answered no (b, c or d), please explain your reasoning and provide supporting evidence.

While we are very supportive of having a simplified method of compliance with this regulation, we do not agree with the simplified method as proposed in the AD.

We strongly recommend that MHCLG should publish the evidence that supports the design criteria in the simplified method, and any testing carried out to develop it and check its robustness, in order to allow the industry professionals to review them and provide feedback.

Our main concerns are:

- The glazing areas are excessive as a backstop and will not prevent overheating in many flats and over-glazed rooms. See for example the supporting evidence provided by LETI in their submission to this consultation.
- The free areas look to be unachievable. See for example the supporting evidence provided by LETI in their submission to this consultation.

The simplified method needs to set sensible limits on glazing, encourage generous free areas of openings, consider surrounding permanent features and require suitable mitigations. For example, see the Good Homes Alliance tool; the GHA would be happy to provide details of the calculations and evidence behind it (it is provided on request to anyone who asks, as it should be for the AD simplified method).

The current proposals are not as simple to apply in practice as they first appear, for example similar units will fall into Group A and B altering their glazing requirements, and it is time-consuming calculating glazing areas, frame areas and opening areas, and evaluating whether the glazing is sufficiently evenly distributed across facades. At the very least this strongly points to the fact that the simplified method should be integrated within SAP software to reduce input time requirements (as is the current Appendix P test) – see also response to question 102, but other inputs will also be required to complemented the inputs required for Part L.

We are concerned that there will be unintended consequences such as encouraging higher glazing areas (meeting the limit) in order to meet the free area requirements.

One major concern is that the concentration of glazing is not factored into the simplified method, so that one room could be very highly glazed while other rooms have much more

modest windows, triggering risk of overheating in the over-glazed room, or requiring unnecessary shading to the smaller windows in other rooms.

An alternative simplified method could be based on a glazing limit for all new homes of (approximately 20% of floor area - for sufficient daylight) with an additional requirement that if the glazing area to external wall ratio exceeds approximately 50% for any one room (that isn't north facing), then the glazing in that room should be shaded and more openable. This would require mitigations for any room with more concentrated levels of glazing whilst allowing other rooms/units with more modest glazing not to be penalised. More evidence would be needed to set these percentages, but based on collective design experience this is a more robust approach with fewer unintended consequences.

There should be clear guidance on when the simplified method is not appropriate and TM59 should be used instead. These should include:

- Where communal heating systems are proposed
- Where noise or pollution levels exceed thresholds preventing windows from being freely opened
- Where occupants will be more vulnerable to heat - e.g. care homes or special schools.

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

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide supporting evidence.

The **glazed areas** are too generous for some contexts and could lead to increased overheating risk.

What is difficult is that larger homes, especially detached houses, can include higher glazing areas without increased overheating risk as this will be spread over more facades and receive sun at different times of day, and benefit from cross-ventilation. For these homes 20% glazing to floor area might be reasonable, but in homes with glazing on only 1 or 2 facades, glazing will be more concentrated and 20% of floor area could mean full height, full width glazing with consequently high overheating risk – See for example the supporting evidence provided by LETI in their submission to this consultation.

For this reason we suggest a simplified method requirement looking at the proportion of glazing on exposed facades, and shading measures targeted to where the glazing proportion exceeds approximately 50% of the exposed facade area for any one room (see Q85).

In section 1.8 more clarification is required around the definition of 'evenly distributed' - it would be unusual for a semi-detached home to have the same amount of glazing on the

sidewall as on the front and back, due to the lack of view and daylight to the side (often facing the house next door).

See also the difficulties of achieving these glazing areas whilst complying with the sill height and reach requirements - Q97

Where the simplified method can't demonstrate compliance, then TM59 provides a more flexible approach.

The **shading options** proposed make sense, but need to be better targeted to where glazing is more concentrated, rather than applying to the whole unit.

The advice on overhangs is not sufficiently robust to prevent high solar gains. 'Due south-facing' is unclear; shading needs to be east to west and the cut-off angle of 50° would only work in high summer. Overheating can occur across at least 6 months of the year.

In addition, a glazing g-value of 0.4 on its own (without other solar control options) with the proposed glazing area would result in high solar gains and inevitable overheating. Without high-specification glazing, it could also result in poor light transmittance, with a risk of "gloomy" rooms and increased risk of artificial lighting.

Modelling/analysis of homes would be needed to evidence whether the shading options proposed are sufficient to mitigate overheating risk when the glazing areas are at the maximum allowable levels in all contexts and orientations.

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

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide supporting evidence.

The free areas proposed are unfeasibly high - See for example the supporting evidence provided by LETI in their submission to this consultation, where we understand that a review of past projects did not identify a single scheme where this criteria would have been met; in that sample, the free area to floor area for the homes ranged from 3-12%).

Whilst very supportive of encouraging generous and flexible window openings, the proposals set out seem impractical and excessive. If the maximum glazing areas are reduced then the need for summer ventilation will also be reduced to more realistic levels.

The guidance as written would preclude some forms of openings including sash windows and sliding doors as these can only achieve a maximum of 50% openable area.

Crucially, the simplified method as stated requires openings of at least 12% of the floor area. This could require glazing areas to be significantly increased in order to generate sufficient openable area. NB the free area requirement gets closer to being achievable if frame

thicknesses are increased, decreasing the glazing area whilst still contributing to the openable area – this could encourage chunkier frames.

Combined with the protection from falling guidance on maximum reach, the width of openable windows would be reduced to around 300mm in homes with thicker walls (e.g. passivhaus) - - See for example the supporting evidence provided by LETI in their submission to this consultation.

The term 'designed to open' could be misinterpreted to include windows that are capable of opening wide, but have restrictors applied to prevent this.

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

a) Yes

~~**b) No**~~

Please explain your reasoning.

We cannot be confident that they ***will*** be provided, since they are not regulated, but they ***can*** under the proposed glazed area limits. Daylight levels are as much a function of glazed area location and good window design as the amount of glazing itself. Constraining the glazing area should encourage better design in how glazing is utilised. For example, considerations such as placement of windows higher in walls and limiting low level glazing, which does little for daylight, but still contributes to overheating, could be a balanced approach of achieving good daylight while reducing the solar gains.

Please note however that surrounding buildings are not considered as shading in the simplified method, but in urban environments, especially in blocks of flats, the lower level properties might require higher levels of glazing due to their exposure to daylight being compromised by surrounding buildings. We understand that designers choosing to use higher glazing proportions, for example for daylight, will have the option to use a TM59 assessment to show how risk is mitigated, but this could particularly affect a certain type of developments e.g. as vulnerable populations and those with reduced mobility often occupy the lower levels. We do not know whether this has been factored into the impact and equalities assessments.

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

~~**a) Yes, as described in the draft *Overheating Approved Document***~~

b) Yes, but not as described in the draft *Overheating Approved Document*

TM59 provides a more flexible approach which is widely recognised, and already required by

some planning authorities.

It is not clear why there are minor variations to TM59 proposed around window openings. This runs the risk of confusion with modellers who follow the TM59 guidance potentially not complying with the AD. We recommend that these changes should be discussed and agreed with CIBSE and the TM59 authors and an update published by CIBSE to work with this AD.

These variations, particularly around window opening, are hard to follow and to apply accurately to a model, and are unlikely to make significant difference to TM59 results. It is not clear for example how the occupants would know that the temperature had fallen below 26°C and start to slowly close the windows accordingly - this seems unlikely to be a consistent human behaviour - and TM59 is intended as a stress test of the design not a depiction of how occupants will always behave.

2.6 b suggests that all ground floor windows should be modelled as closed at night regardless of whether there are security measures in place. We recommend, as per TM59, that provided security measures are in place, ground floor windows should be allowed to stay open at night.

Question 90): Please detail any information you have about the likelihood of occupants opening doors and windows at night in unoccupied rooms.

This is a hard one to evidence as everyone is different. TM59 takes a stance that homes should be designed to achieve good comfort levels with occupants taking reasonable actions, i.e. opening them when both internal temperature exceeds 22^{o}C and the room is occupied, but there will always be some people with unpredicted reasons for not wanting to open windows.

There is not one "realistic" way of people opening windows, every occupant will open their windows differently and this will very much vary on context (e.g. noise outside) and their personal preferences and perceptions (air movement, noise, temperature, feeling of safety etc), so the importance should be placed in a consistent way of applying window opening profiles in the dynamic method. The TM59 methodology should apply as it offers such a consistent approach.

Security is a key issue. Designing windows that people will feel secure opening (both from burglars and from the toddlers escaping) is a challenge that window manufacturers need to step up to. There is resistance to the ‘prison bar’ aesthetic, but solutions on the continent are widespread and generally considered visually acceptable.

Noise is another major issue - see Q94

Question 91): Do you agree with the proposed acceptable strategies for shading and the removal of excess heat, when following the dynamic thermal analysis method, as found in Section 2 of the draft Overheating Approved Document?

~~**a) Yes, I agree with both sets of acceptable strategies**~~

~~**b) Yes, but with amendments to the acceptable shading strategies**~~

c) Yes, but with amendments to the acceptable strategies to remove excess heat

~~**d) Yes, but with amendments to both sets of acceptable strategies**~~

~~**e) No, I do not agree with the acceptable strategies**~~

Please explain your reasoning and provide any suggested amendments where applicable.

The shading solutions set out in 2.7 are reasonable; see also more comments on assumptions for internal blinds, trees & plants in our response to question 92.

Clarification is needed in 2.10 re using **mechanical ventilation systems** for removing excess heat. It should be made clear that this cannot be the boost function from a standard MVHR unit as these are not designed to operate continuously and tend to be noisy. There should also be requirements around summer bypass to ensure that heat recovery is minimised during summer operation.

Where a site is too noisy to open the windows, a mechanical ventilation solution is not always viable. A fundamental principle of the adaptive comfort method promoted in TM59 is the ability to control one's environment, including in this case opening windows; as stated in TM59, where a home is not 'predominantly naturally ventilated' the adaptive thermal comfort criteria no longer apply, and a fixed criteria of all occupied rooms not exceeding 26°C operative temperature for more than 3% of occupied hours is recommended. In some locations (e.g. London), the outside air temperature itself does not meet this criterion, which makes it almost impossible to achieve the desired operative temperature without some form of mechanical comfort cooling. The AD precludes the use of comfort cooling, so the logical conclusion is that there will be sites that are too noisy to build homes on, this should align with planning guidance on noise – see also Q29.

In reality, in many cases, a hybrid solution of natural and mechanical ventilation might be the best option. Clarification on acceptable/appropriate hybrid solutions would be welcomed.

Ceiling fans is another potential aid to keeping cool - particularly when natural breezes are compromised such as in single aspect units or when acoustic vents are used. Ceiling fans are currently not included in TM59 as there is no consensus yet on how to model their impact, but once this is evidenced it could (and should) be included in dynamic models.

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

a) Yes, curtains, blinds and tree cover should be excluded

~~**b) Yes, but only curtains and blinds should be excluded**~~
~~**c) Yes, but only tree cover should be excluded**~~
~~**d) No, none of these should be excluded**~~

If you answered b, c or d, please explain your reasoning.

c) No Please explain your reasoning and provide alternative suggestions where applicable.

The requirement to exclude **internal blinds** from the assessment is supported.

While **shading from trees/plants** can be beneficial, it is not possible to model this effect accurately or rely on it long-term and for this reason the exclusion of these effects is supported, in general. However, we do acknowledge that some trees are protected or that local authorities may wish to protect them, and that one way to ensure their protection and maintenance is to formally value their benefits. There may be occasions, such as tree protection orders (TPOs), where this could be allowed. This is another example of the need for local authorities to be involved, and the importance of the planning process when considering overheating risk.

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

a) Yes

~~**b) No**~~

If you answered no, please explain your reasoning.

This will mean that cooling is not a requirement to maintain reasonable comfort.

It will also ensure that cooling loads (if mechanical cooling is subsequently installed) do not include excessive solar gains, that occupants will not suffer coolth poverty maintaining reasonable comfort levels, and that if this cooling equipment fails for any reason, the homes will be more resilient.

Question 94): Do you agree with limiting noise in new residential buildings when the overheating strategy is in use, and the proposed guidance in Section 3 of the draft *Overheating Approved* Document?

~~**a) Yes**~~

b) Yes, but with amendments to the guidance

~~**c) No, I do not agree with limiting noise when the overheating strategy is in use**~~

If you answered b or c, please explain your reasoning and provide alternative suggestions.

It is essential that noise is considered in this AD, but a number of issues require addressing.

For example, bedrooms should be better defined so that the AD can't be evaded by claiming a flat has 2 home offices and one bedroom.

Noise limits (generated internally, from HVAC equipment, and due to external noise) should be stated more explicitly and align with other ADs and, where not covered in ADs, best acoustic advice. We also recommend the involvement of health specialists, ideally Public

Health England, in generating the advice: noise thresholds for health are a developing area, and when combining this with the effects of heat and the impacts on sleep, the potential effects on health are significant and the technical advice is currently unclear and very complex. This really needs the involvement of independent public health experts, and some investment in research.

Given there is a limit to the amount of noise that can be attenuated passively, sites that are so noisy that openable windows cannot be relied on for ventilative cooling present a significant overheating risk. Mechanical ventilation solutions are not ideal as achieving sufficient air changes per hour quietly is technically challenging, and even if this is achieved, the TM59 criteria for 'predominantly mechanically ventilated' homes use a fixed temperature threshold of 26°C. The external weather files for some London locations do not meet this criteria making a TM59 pass virtually impossible. This leaves mechanical cooling as a compliance option, which the proposed AD (rightly) specifically rules out of compliance checks. The implication is that some sites are too noisy and cannot be used for residential development - if this is the intention it should be stated more clearly, and it should align with planning guidance on noise.

Question 95): Do you agree with minimising the ingress of external pollutants when the overheating strategy is in use, and that the external pollutants guidance in Approved Document F, volume 1: dwellings should be followed where practicable?

~~**a) Yes**~~

b) Yes, but with amendments to the guidance

~~**c) No, I do not agree with minimising the ingress of external pollutants when the overheating strategy is in use**~~

If you answered b or c, please explain your reasoning and provide alternative suggestions.

See our comments in Question 62 on the ADF guidance on ingress of pollutants.

Question 96): Do you agree with the proposals on security in Section 3 of the draft Overheating Approved Document in new residential buildings?

a) Yes

~~**b) No**~~

Yes - but solutions including grilles or bars must also comply with other ADs including means of escape.

Question 97): Do you agree with the protection from falling guidance proposed in Section 3 of the draft Overheating Approved Document?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide alternative suggestions.

This AD should focus on overheating risk, and reference other ADs to ensure proposed solutions meet all other building regulation requirements, and not introduce confusing or conflicting requirements. MHCLG should carry internal checks at final publication to ensure the guidance from all ADs can be met simultaneously e.g. that it is possible to design dwellings with openable windows that meet 1) the glazed area limits of the simplified method and 2) the free area minima of the simplified method and 3) the protection from falling guidance of ADK .

We would refer to the LETI submission to this consultation for details of clashes between the current draft AD with Parts B, K, and M, and their associated ADs.

Question 98): Do you agree with the guidance on protection from entrapment proposed in Section 3 of the draft Overheating Approved Document?

a) Yes

~~**b) No**~~

If you answered no, please explain your reasoning and provide alternative suggestions.

Yes, but this AD should focus on overheating risk, and reference other ADs to ensure proposed solutions meet all other building regulation requirements, as explained in our response to Question 97.

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

a) Yes

~~**b) No**~~

Please explain your reasoning and provide supporting evidence.

We know that local microclimate has a significant bearing on overheating risk. Dynamic models are not currently able to take this much into account, but as more evidence and guidance becomes available this might be better included in assessments. See GHA guidance https://goodhomes.org.uk/overheating-in-new-homes

In addition, the use of thermal mass with adequate ventilation is considered as potential low energy/passive method of reducing risk of overheating. There is currently considerable debate on where and how to apply thermal mass, for example it might be beneficial in rural settings but not in urban settings where the outside temperature is hotter, especially during the night. Further studies will be required to support this as a viable mitigation solution.

Overheating is a result of a combination of risk factors that could be addressed with a combination of mitigation options. An approach where the weighting of all risks and mitigation factors will be considered, as per the GHA tool, would introduce more nuance and flexibility, without more complexity. The GHA tool authors would be happy to meet and explain the method, or provide the background assumptions and calculations.

Question 100): Do you agree with the proposed requirement to provide information on the overheating strategy to the building owner?

a) Yes, I agree with the requirement, the list provided and that this should be within a Home User Guide

~~**b) Yes, I agree with the requirement, but think that the list provided should be changed or that this should not be provided within a Home User Guide**~~

~~**c) No, I do not agree with providing information**~~

Please explain your reasoning and provide alternative suggestions where applicable.

Diagrams explaining the overheating mitigations could also be provided and when and how they should be used. This should include external shading systems (particularly when they are adjustable), cross ventilation, ceiling fans, summer bypass modes on MVHR etc.

Guidance should also be provided to explain the role of thermal mass (when applicable e.g. if used in a TM59 modelled, or if relied upon even if not accounted for in the simplified method), the role it can play on hot days, and how it is best managed including the importance of night-time ventilation to realise its benefits, as this is notoriously unfamiliar to many UK residents.

Question 101): How do you see this new Building Regulation interacting with policies in local plans?

All LAs should have the authority to require the TM59 route in certain circumstances or locations, i.e. UHI, nature of residential buildings, nature of occupants etc.

If communal heating systems are proposed on a scheme then the TM59 route must always be used.

Question 102): Do you agree that this guidance on limiting the effects of heat gains in summer, in both Approved Document L guidance for new dwellings and SAP Appendix P, can be removed?

a) Yes

~~b) No~~

If you answered no, please explain your reasoning.

Provided the simplified method is improved to a more robust standard.
It is important that Part L and the new AD are fully integrated. If mechanical cooling is proposed based on the overheating AD analysis, then Part L should evaluate the probable cooling load and fan power and include the energy consumption within the assessment.
This AD should focus on ensuring that homes do not suffer excess overheating when mechanical cooling is not installed or not functioning. This should drive down any cooling loads quantified within Part L.

It is also really important to **ensure that the assessments under ADL and this new AD are consistent.** Separating the methods introduces the very real possibility that they will be carried out by 2 different individuals, possibly even 2 organisations. The assumptions may end up inconsistent. At the very least, the inputs and outputs of both should be shown together to Building Control, but we encourage more thinking by MHCLG about how to avoid any inconsistency. For example, it should be possible for the inputs of the simplified method to be largely derived from the SAP inputs i.e. for the simplified method to be integrated within approved software, with only a few additional inputs if required. This would greatly reduce the risk of inconsistent inputs, reduce the time required for the assessment, and encourage consideration of energy & carbon together with overheating, for a balanced solution.

There is no obvious answer to how to encourage this with TM59 assessments, although in practice it is likely that firms will, at least in the case of large flatted developments, produce a 3-D model which then 1) is used for the dynamic TM59 assessment and 2) provides the geometry which is exported into the approved SAP software. This should at least provide a minimum of consistency in the inputs, if not complete.

Question 103): Should the transitional arrangements that apply to the overheating requirements align with the proposed transitional arrangements for Part L and F 2021 for new dwellings, as described in paragraph 5.10.2 of this consultation document?

a) Yes

~~b) No~~

Please explain your reasoning and provide alternative suggestions where applicable. If you answered no, please also propose an alternative reasonable period that could apply.

Question 104): Do you agree with the proposed minimum fabric standards for existing domestic buildings set out in Table 6.1 of this consultation document?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide supporting evidence.

The **standards for individual elements** seem broadly acceptable, however we note that the recent consultation on standards for existing dwellings in Wales proposed more ambitious standards for the following:

- Roofs: limiting value of 0.13 proposed in Wales, rather than 0.15 currently proposed in England
- Floors: limiting value of 0.15 proposed in Wales, rather than 0.18 currently proposed in England

We recommend reviewing the analysis carried out in support on the consultation proposals in Wales, as this could show opportunities to improve standards in England and help consistency between the nations, which generally helps supply chains and cost efficiency.

In addition, a significant limitation of the proposed standards is that they do not address **airtightness – see our response to Question 105**.

Question 105): Do you agree with the draft guidance in section 4 of the draft Approved Document L, volume 1: dwellings on reducing unwanted air infiltration when carrying out work to existing homes?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning.

The guidance in §4.19 is insufficient in several ways:

- It is only guidance in the approved document, not a requirement in itself
- It doesn't set a minimum standard – this should be required, at least when substantial works are carried out (e.g. of the type which currently trigger consequential improvements)

- It does not capitalise on opportunities from less intrusive low-pressure testing, as recently approved by MHCLG . Such tests, with the incentive of a set target, could become more commonplace pre-works to inform the energy efficiency and ventilation strategy, and post-works to check quality and building regulations compliance. It would mean that decisions on the most cost-effective and technically appropriate measures are well-informed.
- It only applies to the elements being installed or renovated, not the whole building. This misses many opportunities to improve airtightness while other works are carried out.

Overall, this means **the current proposals miss significant opportunities for energy and air quality improvements**. Improving airtightness could achieve high energy savings at little additional cost, would have benefits for overall building quality, and would reduce air pollution ingress. Evidence of energy use in existing dwellings shows that space heating demand is very closely related to airtightness, particularly for buildings with poorer airtightness which is the case for many existing buildings – see Supporting Evidence – Item D.

Airtightness testing and targets must be introduced on existing dwellings, at least where significant works are carried out.

Question 106): Do you agree that we should control the primary energy and fabric energy efficiency of new extensions to existing homes when using the SAP method of compliance?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning.

Primary energy is not the right metric to support heat decarbonisation, promote energy efficiency, track progress in home performance, and provide clear information to consumers to engage them with the energy performance of their home. See details in our response to question 11 and Supporting Evidence – Item B. The metrics should be, as for new dwellings: energy use intensity, carbon emissions, and fabric performance.

Question 107): Do you agree that the limiting U-value for rooflights in existing domestic buildings should be based on a rooflight in a horizontal position, as detailed in Section 4 of draft Approved Document L, volume 1: dwellings?

a) Yes

b) No

If you answered no, please explain your reasoning.

Question 108): Do you agree that we should adopt the latest version of BR 443 for calculating U-values in existing domestic buildings, as detailed in Section 4 of draft Approved Document L, volume 1: dwellings?

a) Yes b) No

If you answered no, please explain your reasoning.

Question 109): Do you agree with the proposed minimum fabric standards set out in Table 6.2 of this consultation document, and Sections 4 and 11 of draft Approved Document L, volume 1: dwellings?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning provide supporting evidence.

As explained in Question 105, fabric standards must include airtightness.

In addition, Section 4 must refer to assessment and management of moisture risk when improving thermal elements, at the very least by referring to Appendix C in the guidance notes accompanying Table 4.3, but preferably more prominently. The recent consultation Approved Document in Wales provides an example of how simple guidance notes could be provided alongside the values in Section 4, even if more extensive guidance is also provided in Appendix. In particular, it refers to PAS 2035, which is not mentioned in this AD and which we recommend.

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

~~**a) Option 1, full fabric specification**~~

~~**b) Option 2, fabric specification x1.15**~~

c) Neither, it should be higher
~~**d) Neither, it should be lower**~~

Please explain your reasoning and provide supporting evidence, including whether you think a higher level of FEES will make it more or less likely for a home to be built with low carbon heat.

We understand MHCLG have clarified in correspondence that “lower” and “higher” in options c and d relate to the level of ambition i.e. c) “higher” = higher ambition, i.e. more stringent FEES i.e. lower FEES. For the avoidance of doubt, we think ambition and fabric performance should be higher, i.e. the FEES should and can be lower:

- Buildings should have future-proofed fabric which will require no retrofit to net zero, reduce running costs for consumers, and reduce demand on the system. This means the higher specification, Option 1, is more suitable.
- It is possible: while the more onerous, Option 1 does include a lot of flexibility in how to achieve it, in particular because its airtightness of 5 m3/hr/m2 at 50Pa can easily be improved upon.
- As the consultation itself states, a heat pump route should still cost less than gas boilers and solar panels, so there should still be an incentive for heat decarbonisation.

Beyond 2021, we also think that a fabric performance metric should be retained, but that it should **evolve to something better than FEES**, which are based on a notional dwelling, mean little in reality, and cannot be measured. Other metrics are much preferable – see comparison in Supporting Evidence – Item E. The most viable alternatives which we strongly recommend exploring are:

- Space heating demand: this has the disadvantage of not being directly measurable, but it is a clear reflection of overall space heating performance, allows comparisons between buildings, and has a track record through Passivhaus and similar schemes.
- Heat transfer coefficient: this has the disadvantage of varying with climate (i.e. the same HTC in Scotland and Cornwall would result in different heating needs), but it is directly measurable.
- Our recommendation: A combination of both i.e. space heating demand as compliance metric, which would be evidenced at the as-built stage by calculations using tested as-built airtightness and HTC.

Question 111): Do you agree that we have adequately covered matters which are currently in the Domestic Building Services Compliance Guide in draft Approved Document L, volume 1: dwellings for existing homes?

a) Yes b) No

If you answered no, please explain which matters are not adequately covered.

Question 112): Do you agree with the proposed minimum standards for building services in existing homes, as detailed in Sections 5 and 6 of draft Approved Document L, volume 1: dwellings?

~~**a) Yes**~~
b) No, the standards go too far
~~**c) No, the standards do not go far enough**~~

If you answered no (b or c), please explain your reasoning.

At §6.53 it is stated that "spaces should be within an illuminance range recommended in design guidance and should not be over-illuminated." We think this is unrealistic: complying with this statement would require a full lighting design but, in practice, this is very rarely carried out in a dwelling.

We also note the recommendation that, "If the lamp efficacy is 75 lamp lumens or less, external light fittings should have automatic controls which switch luminaires off in response to occupancy. Otherwise manual control is acceptable." Aside from the fact that this is probably meant to say "75 lamp lumens per circuit-watt" we suggest that all external lighting should have this efficacy anyway. This sentence could be redrafted as 'In infrequently accessed areas where it is safe to do so, external light fittings should have automatic controls which switch luminaires off in response to occupancy.'

Question 113): Do you agree with the proposals for replacement fixed building services in existing homes, as detailed in Section 5 of draft Approved Document L, volume 1: dwellings?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning.

§5.4: We do not agree with the requirement that a replacement fixed building service should not produce more primary energy per kWh of heat. This would prevent gas boilers from being replaced by direct electric systems; while this is right in many situations, there will be retrofits where the energy efficiency and demand of a home has improved so much that the remaining space heating load could be met with direct electric heating, with no adverse effects on the grid and on running costs. This, again, relates with the limitations of using primary energy as a metric – see our response to Question 11.

§5.8: "*the system should be sized (…) in a manner which meets the heating needs of the dwelling, at a flow temperature of 55°C or lower*": see question 120.

Question 114): Do you agree with our proposed approach to mandating self- regulating controls in existing domestic buildings, including technical and economic feasibility, as detailed in Sections 5 and 6 of draft Approved Document L, volume 1: dwellings?

a) Yes

~~**b) No**~~

If you answered no, please explain your reasoning.

This is the most suitable option for the majority of homes.

Question 115): Do you agree with the proposed specifications for building automation and control systems installed in a new or existing home, as detailed in Section 6 of draft Approved Document L, volume 1: dwellings?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning.

The Standard is difficult to understand and interpret. On a quick read through, it is very easy to interpret the proposed specification for BACS in a new or existing home, as a requirement to do so. Such an interpretation could incur substantial costs for homeowners with little certainty of benefit as a result.
The BACS industry is already short of the necessary skills to provide effective BACS for larger non-residential buildings and such buildings often fail to deliver on energy performance for many reasons.
“Keep it simple stupid” (KISS) is a good principle to apply here. It should be made very clear that simple automatic controls, such as TRVs, room thermostats and time clocks, can give perfectly adequate and energy efficient control in homes, when properly installed and operated. This is also true of BACS but with additional initial expense and potential ongoing cost (licenses, periodic technical/digital obsolescence and upgrade etc.) as well as introducing the potential for cyber security issues within the home. These have already become an issue, even with the more tech savvy early adopters of Smart Home technology.
The simple automatic controls are currently disguised as “self-regulating devices” in the Standard in contrast to a focus on specification of “Building Automation and Controls Systems”. That only the former is mandated should be made much clearer in the final draft.

Question 116): Do you agree with the proposals for extending commissioning requirements to Building Automation and Control Systems and on-site electricity generation systems, as detailed in Sections 8 and 9 of draft Approved Document L, volume 1: dwellings?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning.

We have the same comments as in question 34, including:

- Linking commissioning results to Part L inputs at the as-built stage, to provide a further incentive for good commissioning to be carried out properly
- Being clear on the performance to be achieved under performance tests, not just the tests to be carried out.

In addition, there must be system specific guidance on commissioning of ventilation systems, including noise, to avoid impacts on air quality, energy efficiency, and comfort.

Question 117): Do you agree with the proposals for requirements relating to the assessment of overall energy performance of building services installations and providing information to homeowners, as detailed in Sections 8 and 9 of draft Approved Document L, volume 1: dwellings?

~~**a) Yes**~~
~~**b) No, I do not agree with providing this guidance**~~

c) No, the guidance should be improved

If you answered no (b or c), please explain your reasoning.

We very much agree with the provision of such information, but the information provided to the owner should:

- cover the building and all its systems, not just “building services” and “technical building systems”, which are ambiguous. For example, the operation of shading devices and the use of thermal mass should be covered.
- cover any on-site generation, not just electricity generation.
- Be easily understood; in particular, commissioning sheets are unlikely to mean anything to most home occupiers, unless they come with explanations including how the results compare with what they should be – see comments under question 116.

We also think that, in existing dwellings, owners should be provided with:

- A prediction of energy performance under a range of scenarios (similar to the proposals for TM54 modelling of non-domestic buildings). This could be carried out for

example with an “unconstrained” SAP with inputs such as occupancy patterns and heating set points modified from the set compliance inputs to represent the actual home. Details on this are provided in the SAP/RdSAP11 scoping report issued to BEIS in January 2021, which has also been provided to MHCLG. CIBSE and the rest of the team would be very happy to discuss the recommendations with MHCLG.

- a whole-house retrofit plan to net zero, or as close to net zero as technically possible - see details in question 9.

Question 118): Do you agree that water softening and water treatment guidance should be removed from formal guidance?

a) Yes

b) No

If you answered no, please explain your reasoning.

Question 119): Do you agree with the guidance proposals for adequate sizing and controls of building services systems in domestic buildings, as detailed in Sections 5 and 6 of draft Approved Document L, volume 1: dwellings?

a) Yes
b) No, I do not agree with providing this guidance

c) No, the guidance should be improved

If you answered no (b or c), please explain your reasoning.

Question 120): Do you agree with the guidance proposals on sizing a system to run at 55°C when a whole heating system is replaced, as detailed in Section 5 of draft Approved Document L, volume 1: dwellings?

~~**a) Yes**~~
~~**b) No, I do not agree with providing this guidance**~~

c) No, the guidance should be improved

If you answered no (b or c), please explain your reasoning.

This should be 55oC or lower.

Question 121): Do you agree with the proposed changes to the supplementary guidance and the external references in Appendix D and Appendix E, in the draft Approved Document L, volume 1: dwellings as outlined in paragraph 6.8.2.?

a) Yes
b) Yes, but not with the changes to the supplementary guidance
c) Yes, but not with the external references d) No

If you answered b, c or d, please explain your reasoning.

Question 122): Do you agree with the proposal for guidance on the calibration of devices that carry out airtightness testing in new and existing domestic buildings?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide alternative suggestions.

The main comment CIBSE received on this topic as part of the TM23 consultation was that annual calibration was a burden and some commentators felt it unjustified. It may be that the calibration rate should be reviewed, however there are clearly some vested interests, so we recommend that the right balance in calibration rate requirements should be discussed by MHCLG with relevant independent technical experts.

Part F standards for existing domestic buildings in 2021

Question 123): Do you agree that we have adequately covered matters for existing dwellings which are currently in the Domestic Ventilation Compliance Guide in draft Approved Document F, volume 1: dwellings?

a) Yes

b) No

If you answered no, please explain your reasoning and provide alternative suggestions.

Question 124): Do you agree with the proposed changes to supplementary guidance and the external references used in Appendix E and Appendix F, for existing domestic buildings from the draft Approved Document F, volume 1: dwellings?

a) Yes
b) Yes, but not with the changes to the supplementary guidance
c) Yes, but not with the external references d) No

If you answered b, c or d, please explain your reasoning.

Question 125): Do you agree with the proposal to align the guidance and standards for work to existing homes to that outlined in Chapter 4 of the Government Response to the Future Homes Standard consultation?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide

Our main objection is the principle in §3.1 that "*the provision of ventilation should not be made less satisfactory than before the work was carried out*". Many existing dwellings are currently NOT appropriately ventilated; as is the case for other parts of the Building Regulations, such as fire, works to a home should be the opportunity to bring the home to a satisfactory standard. At least for substantial works (e.g. beyond the simple replacement of, say, a defective boiler), adequate ventilation should be provided, whether or not it was before.

Given what we have learned in the past year about the importance of domestic ventilation **it is absolutely essential that when significant works are undertaken then the ventilation provision must be brought up to standard, and this standard must be enforced**. Non worsening is wholly inappropriate.

Supporting reference 1: Trustmark, who manage the data generated from retrofit projects following PAS 2030/5, have highlighted evidence of poor compliance with ventilation requirements. "*There seems, in some quarters, a lethargy to engage with the ventilation requirements of domestic retrofit – whilst we know that PAS 2035 is expected drive change as it is a core principle*." These requirements are closely related to those of Part F, which points to serious issues of regulatory compliance, let alone PAS compliance. We strongly urge MHCLG to approach Trustmark on this issue, and incorporate lessons in their requirements, design guidance, commissioning requirements, and enforcement regime.

Supporting reference 2: Last year (1st October) SAGE published a paper on Housing impacts related to the pandemic. On page 2 of this paper it concludes that poor ventilation is a contributory factor:

"Poor ventilation. *Occupants spend long periods of time in the home, so risks of aerosol transmission may be greater. There is evidence that ventilation rates in many homes can be poor, due to inadequate and defective provision, and also environmental barriers (external noise, pollution, security, heat loss) and behavioural barriers (lack of knowledge, thermal comfort) to the effective use of ventilation. Ventilation rates are difficult to measure in use, and poor indoor air quality is not generally perceived by occupants. Occupants' ventilation use is driven predominantly by thermal comfort and energy use and is likely to be lower in winter. Ventilation provision is not necessarily related to the age of the home."*

The paper goes on to consider what environmental measures may be effective to mitigate household transmission, and these include improving ventilation:

"Improving ventilation. *Improving ventilation rates can be achieved by ensuring that homes have satisfactory provision for extract and background ventilation, and that this is used effectively. For dwellings with mechanical ventilation systems, flow rates may be increased. Enhanced ventilation is required in homes with high levels of occupancy. There should be better advice and guidance to owners, landlords and occupants on the requirements and use of ventilation provision. This should be specific to the types of housing, occupancy profiles, ventilation provision and risk.*

Whilst some short term measures may be implemented through better guidance, improving ventilation performance is a longer-term challenge. Current proposed regulatory change to Part F should develop improved ventilation standards and mechanisms to ensure compliance with these in use, whilst meeting other demands such as energy reduction, for example demand controlled ventilation and heat recovery ventilation. Improved standards for ventilation and enforcement of these, are required for existing buildings."

As at least one part of the response to this we believe that in the interests of public health provision in the future when work is carried out on an existing dwelling, then there should be a requirement for measures to bring the ventilation up to an acceptable standard.

Question 126): Do you agree with the proposed guidance for installing energy efficiency measures in existing homes, as detailed in Section 3 of draft Approved Document F, volume 1: dwellings.

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide alternative suggestions.

We have concerns about the simplified method:

This is stated to apply to a dwelling which is "*assumed to have adequate means of ventilation through a combination of purpose provided ventilation and advantageous infiltration*":

We very much challenge the appropriateness of "assuming" significant things when designing works on an existing home. It is not good enough to undertake retrofit works based on assumptions, particularly when they can put the health of occupants at risk. It should be clear that the method only applies if teams and building control are indeed satisfied that the means of ventilation are adequate, and some guidance should be provided on how to determine this: as a minimum, this should require the use of the Appendix D checklist, which is currently not referred to in §3.1-3.8 (please see also our comments on this checklist in question 127).

Our assessment is that the simplified method comprises significant uncertainty on:

- The starting airtightness
- The starting ventilation
- The effect of measures.

This could result in energy efficiency opportunities being missed, or carbon lock-ins being introduced (e.g. additional trickle vents or ventilators where not required), or poor air quality (if the starting point was poorer than assumed, and/or the impact of measures greater than estimated). **We recommend that where "major" measures are proposed, buildings should be required to follow the more elaborate route.** "Major" works would include any significant upgrade of the insulation or thermal performance of an element – including installation of insulation in walls or roofs.

See also our response to Q125, on providing appropriate ventilation.

Other comments on the simplified method:

- Works to the roofs only include renewing insulation or changing it from cold to a warm loft, both classified minor. Works that include the installation of new roof insulation are not listed. The guidance states that teams may choose "the most similar category", but in fact the insulation of a previously uninsulated roof could have a major impact on airtightness.
- Why is draught-proofing of openings excluded from table 3.1?

<u>Recommendations on the "expert advice" route:</u>

We recommend an airtightness test before and after works – see also response to question 105.

The definition of “expert advice” causes some concern. As stated in the Appendix A to ADF 1, an expert for ventilation is “a suitably qualified competent person”. The examples are then of engineers and ventilation specialists, or “professional trade bodies” (this is unclear – which trade body would not call itself professional?). This may lead to competent persons who have a qualification meeting the “expert” definition when they are not expert on ventilation (e.g. they may be competent in installing windows or insulation). This needs further definition to limit it to those who genuinely do have the expertise to provide the advice that is needed.

Question 127): Do you agree with the content of the proposed checklist for ventilation provision detailed in Appendix D of draft Approved Document F, volume 1: dwellings?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide alternative suggestions.

We do not think Appendix D as it is currently drafted covers all the key issues – we suggest that it needs more work and will also need to take account of changes to the drafting in response to other elements of the consultation.

Question 128): Do you agree with the guidance in Section 3 of draft Approved Document F, volume 1: dwellings when replacing an existing window with no background ventilators?

~~**a) Yes**~~
~~**b) No, the standards go too far**~~
c) No, the standards do not go far enough.

If you answered no (b or c), please explain your reasoning.

In a similar vein as our comments to Question 127, the proposed approach defaults to the provision additional ventilators without this being informed by an assessment of the building’s airtightness, its current ventilation provision, and the most suited ventilation and energy efficiency strategy. A whole building approach should be followed, similarly to that proposed under question 127.

Question 129): Do you agree with the proposals in paragraphs 3.29 to 3.31 of draft Approved Document F, volume 1: dwellings in 7.4.11 of this consultation document on work to existing kitchens or bathrooms?

~~**a) Yes**~~
~~**b) No, the standards go too far**~~
c) No, the standards do not go far enough

If you answered no (b or c), please explain your reasoning and provide alternative suggestions.

As per our comments to questions 125 and 127:

- Not worsening ventilation provision is not sufficient, since it may previously be inadequate
- Ventilation provision must be part of an overall building approach, as described in our response to question 127.

In addition, there should be reference to how ventilation in kitchens and bathrooms is controlled. In bathrooms, we recommend controls on humidity levels.

Question 130): Do you agree with the proposal to provide a completed commissioning sheet to the homeowner, as detailed in Section 4 of draft Approved Document F volume 1: dwellings?

~~**a) Yes**~~

b) No

If you answered no, please explain your reasoning and provide alternative suggestions.

See our response to questions 34 and 116.

Noise testing should be carried out on ventilation systems, particularly those that are continuous. There is evidence that otherwise residents are likely to switch he systems off, with detrimental effects on air quality. This must go beyond the guidance that “There are no abnormal noises” in §4.7: there should be performance criteria, and these should be tested.

The importance of controls must be emphasised e.g. humidistats linked to intermittent extract fans or to boost rates in wet rooms.

Comments on Appendix C checklist:

- Bearing in mind the information is meant for non-specialists: it would be useful to add explanatory notes on what is “good”. For example, in sections 2.3a and 2.3b, responding “yes” would be good. In section 2.3c, responding “No” would be good. It may be useful to change the wording so that for all questions, “yes” is good, or to colour code (red/green) the responses, although this would not help visually impaired individuals). In Part 3, a note could be added to explain that measured rates should NOT be under the design ones. etc

Impact and Equalities Assessment

Question 131): Please provide any feedback you have on the impact assessment here, including the assumptions made and the assessment of the potential costs and benefits of the proposed options we have made.

Question 132): Please provide any feedback you have on the potential impact of the proposals outlined in this consultation document on persons who have a protected characteristic. Please provide evidence to support your comments.

Please see our comments to Question 88 on the need to protect daylight levels in lower level homes, such as flats in urban areas.

SUPPORTING EVIDENCE

SUPPORTING EVIDENCE – ITEM B: PRIMARY ENERGY FOLLOWS CARBON FOR ELECTRICITY, AND ENCOURAGES FOSSIL FUELS AGAINST ELECTRICITY

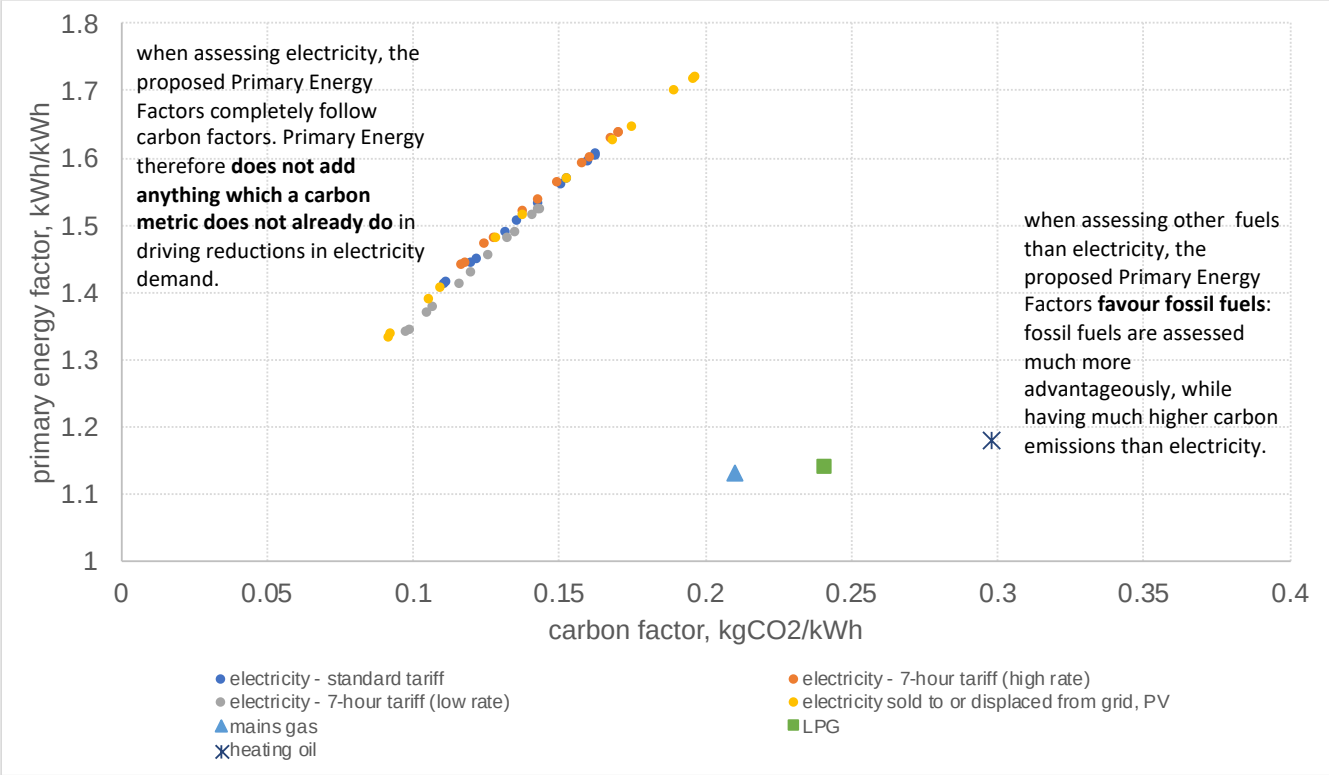


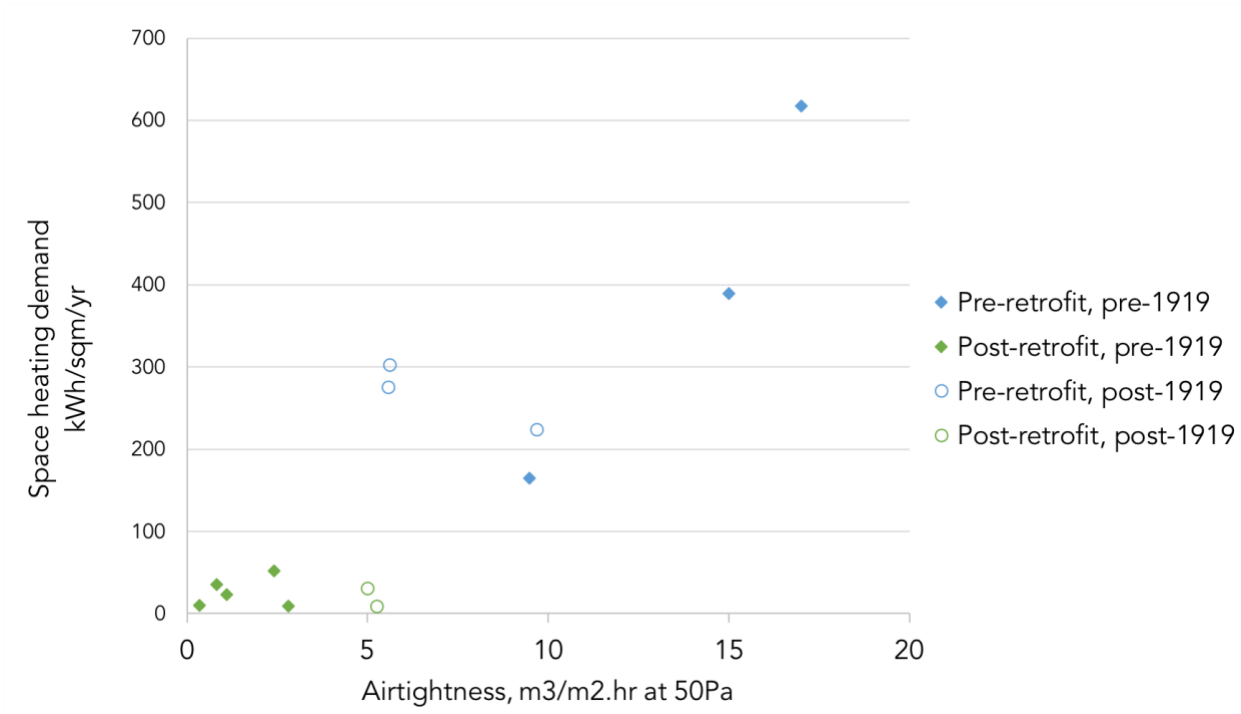
Illustration of proposed carbon and primary energy factors (using those of Table xx in the Impact Assessment)

SUPPORTING EVIDENCE – ITEM C: COMPARISON OF METRICS AND WHAT THEY CONTRIBUTE TO POLICY OBJECTIVES

	Would the metric incentivise…				
Metric ↓	reduction of carbon emissions?	reduction of energy use?	low-carbon heat?	demand reduction / management ?	engagement with consumers?
Carbon [$kgCO_2/m^2/yr$]	✓	~	✓	✗	~
Energy use (at the meter) [$kWh/m^2/yr$]	~	✓	✗	~	✓
Primary energy use [$kWh_{prim}/m^2/yr$]	✗	~	✗	~	✗
Peak demand [kW/m^2]	✗	~	✗	✓	~

SUPPORTING EVIDENCE – ITEM D: SPACE HEATING DEMAND VS AIRTIGHTNESS IN EXISTING DWELLINGS

Measured airtightness and space heating demand across 20 case studies from Retrofit for the Future (graph produced by CIBSE, data from Marion Baeli, *Residential Retrofit – 20 Case Studies*, 2013)



SUPPORTING EVIDENCE – ITEM E: FOR HOMES, OTHER FABRIC PERFORMANCE METRICS HAVE STRONG BENEFITS COMPARED TO FEES

The following comparison was produced as part of the SAP / RdSAP11 scoping report for BEIS, January 2021 (work led by Etude, as part of consortium team including CIBSE, Elementa, Levitt Bernstein, WSP, Clarion Housing Group and UCL).

	Heat Transfer Coefficient	Space heating demand	Fabric Energy Efficiency (FEE)
Accounts for purpose ventilation	No – in typical co-heating tests. Yes - in SMETER HTC in use	Yes	Yes, but assumes set natural ventilation system
Accounts for internal gains	No	Yes; mix of actual and set assumptions	Yes, but assumes set internal gains
Accounts for solar gains	No	Yes	Yes, but assumes set location, not actual
Accounts for heating system	No	No, but set 20ºC heating set point	Mix: system responsiveness, set heating setpoint
Verifiable as built or in-use	Yes - co-heating test, disruptive. Alternatives tbc with SMETER, currently only for individual homes	No (or only approximately)	No, as calculated under theoretical assumptions
Calculated by SAP 10	Yes, incl. ventilation. Box 39, not an output	No	Yes **
Comments	In W/K (or W/m^2/K) so performance outcome varies with climate	Set performance outcome (kWh/yr/m^2). Used in Passivhaus	Includes cooling, if provided

SUPPORTING EVIDENCE – ITEM F: PROPOSED MONITORING AND DISCLOSURE AGAINST BUILDING REGULATIONS REQUIREMENTS AND APPROVED DOCUMENTS PERFORMANCE CRITERIA

	Current regulations	**Draft 2021 Approved Documents**	**Recommendations for 2021 update**	**Recommendation for 2025 FBS / FHS**
Air quality	Part F: "adequate means of ventilation"	NEW buildings - Performance criteria: All buildings: NO2, CO, no visible mould Non-domestic:, TVOC, ozone, formaldehyde Dwellings: RH + formaldehyde & TVOC On existing dwellings / buildings " The works themselves should comply with the requirements, and "the provision of ventilation should not be made less satisfactory than before the work was carried out"	All buildings: see commissioning of ventilation systems. Non-domestic buildings above 1000sqm and sample homes in large developments : **Monitoring of humidity and pollutants covered by Approved Document performance requirements** + Ability for building control to request monitoring data at random / if concerns are raised. + CO2, as per question 76 Existing homes & non-domestic buildings: Upgrade the Approved Documents to make it clear that appropriate ventilation is required; many existing homes and buildings are not suitably ventilated currently, so the Approved Documents perpetuates potentially unhealthy conditions. This should be treated in a similar way to, for example, fire, where upgrade works are required to bring the building up to standard when other works are carried out.	Upgrade Part F requirement to cover indoor air quality, not just ventilation, and introduce monitoring & disclosure accordingly . A key pollutant type NOT currently covered in the AD but a prominent health concern is particulate matters. At the very least, where mechanical ventilation is provided and outdoor air is polluted, filters should be required . User surveys
Acoustics	Part E: Dwellings / rooms for residential purposes: sound	AD F: guidance on noise levels from ventilation systems	Homes: - **Sound insulation testing** (i.e. building envelope): as currently	Introduce noise requirements from systems in occupied spaces e.g. ventilation User surveys

	from other parts of the building and adjoining buildings, and within dwelling/room + reverberation Schools: acoustic conditions and insulation against disturbance		- Noise from services: **noise testing of ventilation systems** to check that guidance levels are achieved, to be tested as part of commissioning - see below Schools: testing of overall acoustic conditions, to check they meet regs	
Thermal comfort	None currently, but draft new requirement to limit overheating risk	Draft AD to limit overheating risk - no temperature requirement as such, especially under the simplified method	**MHCLG monitoring programme** to feed back into the new requirement and incorporate lessons at the next iteration (= part of good policy making) Ability for Building Control to require temperature monitoring and/or user surveys, if concerns are raised and at random.	Modified AD using lessons from MHCLG monitoring programme Temperature monitoring against the AD requirements - using the criteria from the detailed method User surveys
Thermal bridging	Part C: interstitial and surface condensation Part L (indirectly): thermal bridging values used in calculations		Ability for building control to require **thermography surveys** to be submitted in all sample cases.	
Airtightness	Regulation 42: pressure testing on erection of a building	•	New build: as currently proposed i.e. every building / home tested. **Existing homes and non-domestic buildings where works are carried out: Introduce requirement for airtightness testing,** to inform whole-house approach to energy & ventilation. Update calculation methodologies to require input of airtightness, not default value.	

Energy	"Fuel and power", carbon emissions	Annual carbon emissions	For all non-dom buildings above 1000sqm, and as aggregate for all developments of 5 homes and more ? **Annual energy use**, into fuels if relevant. Initial monitoring of 9 months period, so info is provided before end of defects period.	Energy use information to be submitted annually User surveys (e.g. affordability)
		FEES	Dwellings: Measurement of the **heat transfer coefficient** (e.g. via smart meters, subject to SMETER trial conclusions). Note the FEES is not directly verifiable, as it is a notional artificial metric. However, the HTC together with the airtightness test would more or less verify the as-built FEES.	As-built HTC AND change fabric metric to one that is verifiable e.g. HTC, or one that is all-encompassing e.g. space heating demand in homes, space heating & cooling demand in non-domestic
Water use	Part G - dwellings newly built or through change of use: reasonable provision for fittings and fixed appliances that use water efficiently for the prevention of undue consumption of water	New dwellings: Annual water use per person per day	Dwellings: **Annual water use** per person per day	Non-domestic buildings: annual water use performance requirement in regs + associated disclosure requirement in use
All systems	Regulation 44: Commissioning of all fixed building services (except where they cannot be tested / adjusted)	•	Better enforcement by Building Control. **More incentives e.g. penalty in Part L calcs for all systems until commissioning** (performance tests) results are provided (note: this would follow a similar approach to airtightness results in Part L when only sample testing was carried out)	Ability for Building Control to request random commissioning checks in use, and re-commissioning if required

SUPPORTING EVIDENCE – ITEM G: COMMENTS AND PROPOSED AMENDED DEFINITIONS OF VENTILATION TYPES AND RELATED ITEMS

For clarity CIBSE suggest the following definitions, developed with advice from our specialist Natural Ventilation group:

Background ventilation
Currently this seems to be defined as *whole building ventilation*, which is confusing as one would assume this term refers to all the ventilation in a building, both purpose provided and adventitious.

Purge ventilation is manually controlled **transient** ventilation of rooms or spaces at a relatively high rate to rapidly dilute pollutants and/or water vapour. Purge ventilation may be provided by natural means (e.g. an openable window) or mechanical means (e.g. a fan).[From ADF with insertion in **bold**]

Ventilative cooling is the application of the cooling capacity of the outside air flow by ventilation to reduce or eliminate the cooling loads and / or the energy use by mechanical cooling in buildings. Ventilative cooling utilises the cooling and thermal perception potential of outside air and the driving force can be natural, mechanical, or a combination of the two. [paraphrasing of EBC Annex 62 https://www.iea-ebc.org/Data/publications/EBC_SR_Annex62.pdf]

Night time ventilative cooling is the application of ventilative cooling during the night to pre-cool the air and thermal mass of the building.

Natural ventilation is ventilation provided by thermal, wind or diffusion effects through doors, windows or other intentional openings without the use of mechanically driven equipment. ~~For the purposes of this approved document, natural ventilation refers to a ventilation strategy using background ventilators and intermittent extract ventilation.~~

Mechanical ventilation is where the driving force for the supply of fresh air and/or extract of stale air is provided by a fan. [BB101]

Mixed mode and **hybrid ventilation** are ventilation systems that combine or switch between natural and mechanical ventilation and/or cooling systems. [BB101]

Free areas: see **"** A review of ventilation opening area terminology", B.M.Jones, M.J.Cook, S.D.Fitzgerald, C.R.Iddon, Energy and Buildings 118 (2016) 249-258, 2016

END OF RESPONSE

Please do not hesitate to contact us for more information on this response.