Passivhaus Trust Responses

Scottish Building Regulations: Proposed changes to energy and environmental standards. Determining the principles for a Scottish equivalent to the Passivhaus standard

14 August 2024

Introduction

This summary document sets out the PHT responses to the July 2024 consultation paper '***Scottish Building Regulations: Proposed changes to energy and environmental standards. Determining the principles for a Scottish equivalent to the Passivhaus standard***'.

Supporting documents available online at: https://www.gov.scot/publications/building-regulations-proposed-changes-energy-environmental-standards/documents/

The deadline for responses is **Wednesday 23 October 2024.**

PHT Position

The Passivhaus Trust believes that, while there are some positive options towards a Scottish Passivhaus equivalent outlined in the consultation proposals, what is being proposed could fall significantly short of the intended aspirations. In our responses to the consultation below, we have put forward suggestions to help the standard deliver a genuine Scottish Passivhaus equivalent.

PHT Consultation Responses

The consultation questions are split into the following sections:

The Passivhaus Trust encourages members to engage with as much of the consultation as they can. If you are very time limited, we would recommend you focus on:

SECTION 2 CONSULTATION PROPOSALS (Q1 – 2)

Consultation Question 1

Do you broadly agree with the statements on what 'equivalent' should not mean, in delivery of amended building standards to address energy and environmental performance?

☐ Yes

☐ No

Please provide information on why you agree or disagree or if you consider other actions need to be considered.

The consultation states (p. 14) [PHT added numbering]:

"In this context, 'equivalent' should not necessarily mean that:

1. *We adopt and implement Passivhaus for all new development;*
2. *Our standards must consistently achieve built outcomes at least as good as Passivhaus; or*
3. *We set a standard which requires a similar level of prescription on key energy-relevant elements of building specification."*

Q1 - Passivhaus Trust (PHT) Response

Answer: **No**

The Passivhaus Trust (PHT) agrees with points (1) and (2) that not all new developments need to meet the full Passivhaus metrics and performance in-use. Instead, a Scottish Passivhaus Equivalent Standard should be established for all projects, with targets met in-use. The level of performance for this standard will be defined in the second consultation.

However, the PHT strongly disagrees with point (3). To achieve a similar level of performance, it is crucial to provide a comparable level of prescription. The Passivhaus Standard relies on absolute energy targets and comfort metrics rather than being prescriptive about specific building specifications (such as U-values etc.), aside from setting limits to avoid inefficient systems or issues such as surface moisture and mould. Including a similar level of detailed guidance for Scottish design teams and clients would be beneficial.

Relaxing any of the established metrics will likely result in unintended consequences and a performance gap. The combination of these metrics has been developed over more than 30 years, with meticulous post-occupancy evaluations showing them as the most effective way to deliver low-energy, healthy homes. The metrics have been honed through a transparent and deliberate process, ensuring that any changes are grounded in sound evidence and aligned with the overall goals of the standard. Introducing a general caveat for flexibility, without this level of scrutiny, risks undermining the very objectives of the new Scottish standard.

Consultation Question 2

Do you broadly agree with the statements on what 'equivalent' should require consideration of, in delivery of amended building standards to address energy and environmental performance?

☐ Yes

☐ No

Please provide information on why you agree or disagree or if you consider other actions need to be considered.

The consultation states (pp. 14-15) [PHT added numbering]:

"However, 'equivalent' should require the following:

1. *We remain aware that the standards we set have to be deliverable for all new buildings at a national level to an agreed timetable, post-2024.*
2. *We base the capacity for change on an understanding of what solutions are currently being delivered to the February 2023 standards, to define a current baseline.*
3. *We have interrogated the practical application of the Passivhaus standard and understand the outcomes it delivers and how these are achieved.*
4. *There is an understanding of differences in outcome due to the application of our respective processes, including chosen calculation methodologies.*
5. *We are able to illustrate how the outcomes of our standards currently compare with those of Passivhaus certified projects.*
6. *We understand and will consider the application of elements which form the Passivhaus approach to target setting where this can be shown to be beneficial and deliverable at scale.*
7. *The manner in which we define and set out targets should support considered and effective low energy design, where practicable.*
8. *Action to increase assurance of outcome should cover both design and construction phases as a single process with emphasis on competence, effective communication, risk management and reporting on activity throughout that process.*
9. *The compliance model we implement should be shown to apply a robust approach to assurance which is defined within a framework that is scalable to the extent of works and able to incorporate future enhancements, be these improved targets or additional assurance elements.*
10. *Any confirmed approach should not result in barriers to use of specific solutions or to the voluntary application of higher standards than those set under our regulations.*
11. *We should recognise valid alternative means of compliance where these are deliverable via our updated regime and where outcomes can be verified simply and effectively by other means.*
12. *The standard we set must align with broader Ministerial Objectives for the built environment, including key strategies such as Heat in Buildings and Housing to 2040.*

The above list sets out the rationale for the proposed approach to delivering change through the building standards system. Both in the defining and setting of performance targets and the means by which evidence of compliance is provided."

Q2 - Passivhaus Trust (PHT) Response

Answer: **No**

The Passivhaus Trust (PHT) broadly agrees with points 1–3 and 6–12.

However, the PHT strongly disagrees with point 4. All methodologies should aim to match performance in-use. Once targets are agreed upon, all approved methodologies should produce the same outcomes, allowing clients and occupants to assess performance in-use against design predictions. This approach is crucial for closing the performance gap.

We question how point 5 will be met, if the proposed standards are not being calculated using accurate methodologies and if the standard does not include the health and comfort metric of the Passivhaus Standard.

Regarding point 10, if this point is aimed at the provision of balanced ventilation through the use of Mechanical Ventilation with Heat Recovery (MVHR), the PHT may consider objecting. It is essential to clarify this point and its implications, as balanced ventilation plays a significant role in achieving energy efficiency and indoor air quality standards. While Passivhaus does not explicitly "require" MVHR, it does mandate that IAQ, heating metrics, and comfort criteria are met. In our climate zone, balanced ventilation through MVHR is typically required to deliver these standards. However, it is important to note that the requirement is not for a specific technology, but for the outcomes: IAQ, comfort (including noise levels) and carbon/peak load reduction.

If the argument is made for achieving IAQ, heating metrics, comfort criteria, and fan power (where fans are used), then the market should be free to develop suitable solutions. The non-negotiable principle remains the maintenance of high standards for IAQ, comfort, and energy efficiency. For a detailed discussion on the evidence supporting balanced ventilation, please refer to the study:

https://www.sciencedirect.com/science/article/pii/S0378778823011131

SECTION 3 PROPOSED COMPONENTS OF THE STANDARD – DESIGN (Q3-14)

Consultation Question 3

On the basis that HEM and SBEM are reviewed and shown to report representative outcomes, do you support the continued use of calculation tools which implement the UK methodologies?

☐ Yes

☐ No

Please provide information on why you agree or disagree or if you consider other actions need to be considered, including your experience of PHPP as a calculation tool.

Q3 - Passivhaus Trust (PHT) Response

Answer: **No**

The Passivhaus Trust (PHT) disagrees with the proposal to continue using HEM and SBEM but agrees with the "consideration of other actions, including the experience of PHPP as a calculation tool".

The Passivhaus Planning Package (PHPP) should be an approved methodology for demonstrating compliance with relevant sections of the Scottish Building Standards, including section 6.1 (Energy) and 3.14 (Ventilation). This affordable, open-source tool is readily available to design and client teams. The Passivhaus Institut has offered it to the Scottish Government for use with the Scottish Passivhaus Equivalent Standard.

Benefits of PHPP:

Proven Effectiveness:

The PHPP has been an effective design tool, refined over 30+ years to match performance in-use. It has been successfully used in Scotland for various projects, ranging from single-family homes to one of the largest educational campuses in the UK at Dunfermline.

Validation, Accuracy, and International Standards Compliance:

PHPP was evaluated in accordance with ANSI/ASHRAE Standard 140, a comparative testing method for building energy programs. This validation involves comparing results from modelling different test cases with reference software. PHPP results agreed very well with those of the reference software, demonstrating its accuracy and reliability as a compliance tool.

Additionally, PHPP complies with ISO 13790, which deals with the calculation of energy use for space heating and cooling in buildings. This compliance further underscores its reliability and international recognition as a robust methodology.

Design Integration:

Unlike other methodologies, PHPP is not only a compliance tool but also a design tool. It aids designers in delivering energy-efficient buildings that meet the new standards. Providing designers with the right tools is essential to achieving the intended outcomes of any new standard.

In-Use Performance:

The focus on matching in-use performance ensures that buildings perform as expected once constructed, addressing the performance gap often seen with other methodologies.

Criticisms of Current Methodologies (HEM and SBEM):

Limitations in Real-World Application:

HEM is an unknown entity as the 'Scottish Wrapper' is yet to be developed. However, a review of the English Wrapper for the Future Homes Standard was disappointing, with results closely aligned to the existing SAP. SAP, along with beta HEM and SBEM, produces outcomes that often fail to accurately reflect real-world performance, leading to significant discrepancies between predicted and actual energy use. Alarmingly, the error percentage in these outcomes increases substantially in lower-energy buildings, making them a very poor choice for Scotland moving forward.

Lack of Design Support:

These tools primarily serve compliance purposes and do not offer the same level of support for the design process as PHPP. This limitation can hinder the ability of designers to create buildings that truly meet high-performance standards.

Performance Gap Issues:

There is a well-documented performance gap in buildings designed using these methodologies, where the energy consumption and comfort levels do not align with the predicted values.

Over-Complexity Concerns:

There is concern that HEM might introduce unnecessary complexity. Experience with energy models like IES shows that increasing the complexity of energy models does not necessarily enhance accuracy. While dynamic models can theoretically offer better predictions for annual heat demand or summer conditions, they often fail to provide practical benefits. In contrast, simpler methods, such as the steady-state calculations used in PHPP, effectively address the fundamental issue of thermal isolation, especially when high levels of insulation are present. PHPP is simpler to use, less prone to errors, and provides immediate feedback to designers, facilitating more effective and reliable building performance outcomes.

Conclusion:

The PHT strongly advocates for the inclusion of PHPP as an approved methodology for demonstrating compliance with Scottish Building Standards, until such time as the Scottish wrapper for HEM can be shown to be as effective as a design tool and produce energy forecasts with the same accuracy as PHPP. PHPP offers a robust, accurate, and practical tool that supports both compliance and design, ensuring that buildings perform as intended. While we are open to a simpler but equally robust calculation method, adopting PHPP from 2026 would provide designers with the necessary tools NOW to meet new standards effectively, thus driving meaningful improvements in building energy performance and occupant comfort.

Consultation Question 4

Do you support retention of the current approach and the setting of relative performance targets for new buildings through an approved calculation methodology?

☐ Yes

☐ No

Please provide information on why you agree or disagree or if you consider other actions need to be considered.

Q4 - Passivhaus Trust (PHT) Response

Answer: **No**

Only absolute targets can deliver on the goals of this review. It is crucial to recognise that these absolute targets are key recommendations from the Low Energy Transformation Initiative (LETI) in their Climate Emergency Design Guide, the Royal Institute of British Architects (RIBA) in their climate work, and will be fundamental to the new UK Net Zero Carbon Building Standard (UKNZCBS). This UKNZCBS standard involves a wide range of industry organisations, including the Building Research Establishment (BRE), the Chartered Institution of Building Services Engineers (CIBSE), the Royal Institution of Chartered Surveyors (RICS), and the UK Green Building Council (UKGBC).

Moreover, the Scottish Low Emission Infrastructure Programme (LEIP) has established an absolute target for schools, which has spurred significant industry transformation. The commitment to these high standards has driven a wave of innovation and adaptation within the sector, as industry stakeholders have embraced new technologies and methods to meet these rigorous benchmarks. The successful application of absolute targets in Scotland highlights their potential to transform the industry and set a model for achieving sustainability goals across all building sectors.

By moving to absolute targets now, this represents a significant opportunity for Scotland to lead the way in sustainable building practices and set a precedent for the rest of the UK.

Absolute targets are more effective than notional (or relative) targets for several reasons:

1. Unambiguous Standards: Absolute targets provide a clear, unambiguous benchmark that does not depend on comparisons to other buildings or changing conditions. This clarity ensures that all new buildings must meet the same high standard, making it easier to enforce and measure compliance.

2. Consistent Performance Benchmarks: By setting a fixed target, absolute standards ensure that performance is consistently evaluated against a set criterion, rather than relative to the performance of other buildings or evolving benchmarks. This consistency is crucial for achieving long-term sustainability goals.

3. Encouraging Innovation: Absolute targets challenge the building industry to innovate and find new, effective solutions to meet the set standards. This drives technological advancements and creative approaches in building design and construction, fostering progress towards more sustainable practices.

4. Future-Proofing: Absolute targets remain relevant over time as they are not influenced by the performance of existing buildings or changing benchmarks. This ensures that the targets stay challenging and effective, driving continuous improvement in building standards.

5. Leadership and Precedent: Adopting absolute targets positions Scotland as a leader in sustainable building practices. This sets a strong precedent for other regions and can influence broader national and international standards, promoting a unified approach to achieving climate goals.

6. Fairness and Predictability: Absolute targets ensure fairness by applying a consistent standard to all new buildings, resulting in energy and operational costs that are reasonably low and predictable per unit of living space. This consistency contributes to equitable access to sustainable and cost-effective building standards.

In contrast, notional (relative) targets can lead to variability in performance expectations, as they are based on comparisons and may not provide the same level of rigour and clarity. Perversely, notional targets can penalise rather than encourage efficiency by design, particularly when it comes to factors like form factor and glazing ratios. Absolute targets ensure that all new buildings adhere to a specific performance level, which is essential for meeting ambitious climate and sustainability objectives.

Under 'Proposal,' the relative target is suggested with flexibility of solution cited as the reason. However, we have seen no evidence that absolute targets, if set at the appropriate level, do not offer the same flexibility of solution.

Consultation Question 5

Do you agree with the proposal to retain delivered energy, covering only regulated energy use, as the main compliance metric for targets set under standard 6.1 (energy demand)?

☐ Yes

☐ No

Please provide information on why you agree or disagree or if you consider other actions need to be considered.

Q5 - Passivhaus Trust (PHT) Response

Answer: **No**

We do not agree with the proposal to retain delivered energy, covering only regulated energy use, as the main compliance metric for targets set under Standard 6.1 (energy demand). Here's why:

1. Effective targets: To drive meaningful change and achieve genuine reductions in energy consumption, it is crucial that the compliance metric reflects the total energy usage of a building. This includes both regulated and unregulated energy. Unregulated energy, which can be a significant portion of total energy use, is particularly important to account for in non-domestic buildings where it often represents a major share of energy consumption. Ignoring unregulated energy undermines efforts to achieve real climate impact and does not align with best practices.

2. Alignment with Industry Recommendations: Key industry bodies and cross-industry groups, such as the Low Energy Transformation Initiative (LETI) and the Royal Institute of British Architects (RIBA), advocate for the inclusion of unregulated energy. These recommendations are reflected in documents such as LETI's Climate Emergency Design Guide and RIBA's climate work. Furthermore, the new UK Net Zero Carbon Building Standard (UKZCBS) emphasises the importance of addressing all energy use to meet climate goals.

3. Importance of an Energy Use Intensity (EUI) Metric: An Energy Use Intensity (EUI) metric is vital for effectively monitoring and driving performance. EUI provides a clear, absolute target that corresponds with actual metre readings, thereby empowering end users with comparable data and helping to close the performance gap. This approach is endorsed by numerous authorities and is increasingly adopted by many Local Plans developed by many local authorities around the UK for setting and achieving energy performance targets. How would users measure their 'regulated' energy only? An EUI makes this simple.

4. Consistency with Best Practices: The statement under 4.2.3 of this consultation highlights the need for an effective process and key actions to deliver robust energy performance. Incorporating EUI as a compliance metric aligns with this need by providing a reliable measure of energy use that reflects real-world conditions. Similarly, the need for greater assurance in the delivery of energy and environmental requirements, as noted in 4.3.1, is supported using EUI, which ensures that design and construction are aligned with performance goals.

In summary, retaining only regulated energy use as the compliance metric does not adequately address the full scope of energy consumption and fails to align with industry best practices and recommendations. Including unregulated energy and utilising EUI metrics would offer a more comprehensive and effective approach to meeting energy demand targets and advancing our climate goals.

Consultation Question 6

Do you support further consideration of the introduction of a prescriptive space heating demand limit for new buildings through building regulations?

☐ Yes

☐ No

If you answered 'Yes', please provide information on what form of prescription you would support and the potential benefits and/or risks this may create.

Q6 - Passivhaus Trust (PHT) Response

Answer: **Yes**

We support the further consideration of introducing a prescriptive space heating demand limit for new buildings through building regulations. Implementing such a limit is crucial for achieving truly energy-efficient buildings. Here's why:

1. Enhanced Energy Efficiency: A prescriptive space heating demand limit, specified either as a heating demand (kWh/m²a) or a peak heat load (W/m²), provides clear and measurable targets that drive higher standards of energy efficiency, while maintaining design flexibility. By setting these limits, building regulations can ensure that new buildings achieve a level of thermal performance that significantly reduces energy consumption for space heating. (If you include peak load in the approved calculation method you will get an indication for sizing the heating system. Which hopefully might address the issue of oversizing, which seems to be an issue).

2. Alignment with Best Practices: Introducing space heating demand limits aligns with best practices in energy efficiency. The Passivhaus standard has demonstrated that setting these limits can result in buildings with exceptional energy performance. Such limits are widely recognised and supported by international standards and energy performance guidelines.

3. Potential Benefits:

- **Reduced Energy Consumption:** Setting limits on space heating demand helps to minimise energy use, leading to lower utility bills for occupants and reduced carbon emissions.
- **Addressing Fuel Poverty:** By reducing energy costs, absolute targets can alleviate some of the financial burdens on vulnerable populations, helping to combat fuel poverty. This, in turn, can improve public health outcomes by addressing issues related to cold and damp living conditions, which are linked to serious health problems such as high blood pressure and asthma.
- **Enhanced Safety:** A very low specific heat load enables a building to maintain a safe temperature even if it is unheated or only heated by internal gains. This safety feature is crucial in preventing extreme temperature drops that could impact occupant health and well-being. [1]
- **Improved Comfort:** Buildings designed to meet strict heating demand limits are typically better insulated and have more efficient heating systems, leading to improved indoor comfort and stability.
- **Market Transformation:** Prescriptive limits can drive innovation and competition in the building industry, encouraging the development of new technologies and solutions that contribute to higher energy performance.

In conclusion, introducing a prescriptive space heating demand limit in building regulations is a crucial step towards achieving high standards of energy efficiency. By setting clear targets for heating demand or peak heat

load, we can drive improvements in building performance, reduce energy consumption, and support the transition to a more sustainable built environment.

References

[1] Kate De Selincourt, 'Healthy Homes: What Passivhaus Offers Scotland', Scottish Housing News https://www.scottishhousingnews.com/articles/kate-de-selincourt-healthy-homes-what-passivhaus-offers-scotland

Consultation Question 7

Do you support the move to application of regional climate data within the approved calculation methodologies and their application within compliance targets?

☐ Yes

☐ No

Please provide information on why you agree or disagree or if you consider other actions need to be considered.

Q7 - Passivhaus Trust (PHT) Response

Answer: **Yes**

We support the move to apply regional climate data within the approved calculation methodologies and their application within compliance targets. Here's why:

1. Importance of Location-Specific Data: Understanding how location-specific climate conditions affect building performance is crucial for designing buildings that are both energy-efficient and comfortable throughout the year. Regional climate data provides insights into local weather patterns, temperature ranges, humidity levels, and solar radiation, which are essential for accurately predicting a building's energy needs and ensuring it performs optimally under local conditions. Without this information, designers are working in a vacuum.

2. Winter Energy Demand: Accurate regional climate data allows for a more precise calculation of heating requirements during the winter months. Buildings in colder regions will have different heating needs compared to those in milder regions. By incorporating local climate data into compliance methodologies, we can ensure that buildings are designed to provide adequate warmth while minimising energy consumption.

3. Summer Comfort: Regional climate data is even more important for assessing summer comfort. In warmer months, managing solar gains and cooling needs becomes critical to prevent overheating and maintain indoor comfort. By using local climate data, building designs can incorporate appropriate window sizes/ orientations, shading, ventilation, and cooling strategies tailored to the specific site conditions, thus enhancing overall comfort and reducing reliance on mechanical cooling systems.

4. Enhanced Accuracy of Compliance Targets: The application of regional climate data within compliance targets ensures that building performance metrics are relevant to the actual climate conditions where the building is located. This improves the accuracy of energy performance predictions and helps in setting realistic and achievable targets for energy efficiency and comfort.

5. Alignment with Heat Load Calculations: Regional and altitude-dependent climate data improves the alignment with heat load calculations, especially for heat pumps. Incorporating local climate data into Scottish regulations for reporting peak heat loads makes sense for heat pump sizing. Our experience indicates that peak heat load is a more consistent outcome of modelling, showing less sensitivity to factors like building orientation, shading, or local insolation. Therefore, a peak heat load certification route is practical and meaningful for Scotland.

6. Encouraging Adaptation and Resilience: Using regional climate data promotes the development of buildings that are resilient to the specific climatic challenges of their location.

In conclusion, incorporating regional climate data into approved calculation methodologies and compliance targets is essential for ensuring that buildings are designed to perform effectively and efficiently in their specific

climatic context. Enhancing the accuracy of energy performance assessments but also contributing to improved comfort throughout the year.

Consultation Question 8

Do you currently deliver new buildings that exceed 'backstop' values for fabric performance set under standard 6.2 or those used to define the notional building in guidance to standard 6.1?

☐ Yes

☐ No

If you answered 'Yes', please provide information on the solutions you apply, any challenges experienced and your views on wider application of such solutions.

Q8 - Passivhaus Trust (PHT) Response

Answer: **Yes**

Passivhaus buildings generally exceed the 'backstop' values for fabric performance set under Standard 6.2 and often the values used to define the notional building in guidance to Standard 6.1. However, this is not universally the case, especially for larger Passivhaus projects such as non-domestic buildings or larger multi-residential blocks, where the U-values required for Passivhaus might not meet SAP backstops. This situation highlights how relative improvement targets can lead to unintended outcomes. Unnecessary insulation increases design complexity and can result in thermal bypass, thermal bridging, and generally poorer performance in use, as well as higher capital costs and overheating risks.

Quality of Design and Construction:

- **Design Principles:** Passivhaus is fundamentally about the effectiveness of an integrated design approach, where every aspect of a building's form, orientation, construction, and buildability is considered. This approach ensures high performance by applying rigorous standards to achieve excellent thermal comfort, airtightness, and overall energy efficiency using practical construction methods under site conditions
- **Fabric Performance:** While many Passivhaus buildings surpass the minimum 'backstop' values and sometimes the notional building values, the core principle is not solely about meeting particularly challenging values. Instead, it's about applying high-quality design principles and construction methods to deliver buildings that perform exceptionally well in real-world conditions, e.g., without thermal bypass.
- **Enhanced Quality and Long-Term Performance:** Passivhaus standards focus on delivering superior building performance through detailed and high-quality design and construction practices. This results in excellent energy efficiency, comfort, and indoor air quality, ensuring outstanding long-term performance and operational efficiency, irrespective of whether the specific values exceed those used to define the notional building.

In conclusion, while Passivhaus buildings typically exceed 'backstop' values and often surpass notional building values, the true emphasis of Passivhaus lies in its comprehensive approach to design and construction. Passivhaus standards include specific backstop values for critical elements such as window U-values to ensure thermal comfort, minimum surface temperatures to prevent mould (including window frames and thermal bridges), and MVHR system heat recovery efficiency and supply air temperature. This approach ensures high performance across various building scales by focusing on rigorous standards and health-related backstops, as well as effective design solutions, rather than solely on meeting specific challenging values.

Consultation Question 9

Do you have any particular views on limiting fabric infiltration through the building standards?

☐ Yes

☐ No

If you answered 'Yes', please provide your views and any supporting information on the benefits and risks arising from greater prescription on this topic.

Q9 - Passivhaus Trust (PHT) Response

Answer: **Yes**

We believe that limiting fabric infiltration through building standards is crucial for enhancing building performance, comfort, and durability. Here's an expanded view on why this is important and the associated benefits:

1. Benefits of Improved Airtightness:

- **Reduced Heat Loss:** Airtightness plays a significant role in reducing heat loss in buildings. Once insulation levels are increased and thermal bridges are addressed, the proportion of heat lost through ventilation and air leakage becomes a major factor (can be half of all heat loss). By improving airtightness, we can substantially reduce this heat loss, resulting in lower energy consumption and heating costs. This is particularly important in cold, windy conditions such as those often experienced in Scotland, where it impacts the accuracy of peak heating load predictions and has significant implications for the sizing of emitters and heat pumps.
- **Enhanced Comfort:** Airtightness helps to improve indoor comfort by minimising drafts and maintaining stable indoor temperatures. Air leakage through building fabric or uncontrolled ventilation can create uncomfortable draft conditions, especially in colder climates like ours. Even low air velocities of 0.1 m/s can be felt as drafts in winter, impacting occupant comfort [1].
- **Protection of Building Fabric:** Airtightness also protects building fabrics from moisture-related issues [2]. Uncontrolled air leakage can carry moisture into the building fabric, potentially causing interstitial condensation and related damage. Properly detailed airtightness layers can prevent such issues. It is important to note that airtightness does not equate to being moisture-closed or vapour impermeable, but it helps manage moisture movement effectively [3].
- **Improved Acoustic Performance:** Airtightness provides enhanced sound protection by reducing noise ingress. Gaps and leaks in the building fabric are the primary pathways for external noise, and a well-sealed building envelope significantly improves acoustic insulation, reducing disturbances from outside noise.

2. Considerations:

- **Effective Ventilation for Air Quality:** Improving airtightness is crucial for reducing heat loss, but it must be complemented by effective ventilation to ensure good indoor air quality. Balanced ventilation systems, such as Mechanical Ventilation with Heat Recovery (MVHR), provide controlled ventilation even when windows are closed. These systems filter incoming fresh air, ensuring a continuous supply of clean air while maintaining indoor comfort.
- **Energy Savings and Comfort:** MVHR systems not only enhance air quality but also contribute to energy savings. By tempering the incoming fresh air and recovering heat from the outgoing air, these

systems minimise heat loss and improve overall energy efficiency. This results in significant energy savings while maintaining a comfortable indoor environment throughout the year.

- **Complexity of Building Details:** Achieving high levels of airtightness benefits from a design approach that emphasises simplicity and straightforward details. By setting stringent airtightness requirements, the focus shifts to developing and implementing simple, effective strategies and details that ensure airtightness by design. This approach reduces the need for complex or intricate solutions and enhances quality assurance throughout both the design process and on-site construction, leading to a smaller performance gap and more consistent outcomes with reduced defects in all areas.

3. Target Value for Limiting Fabric Infiltration:

- **Current Standard:** The Passivhaus standard sets a target of 0.6 air changes per hour (ACH) at 50 Pascals (Pa). This value is often perceived as challenging but has been shown to be a practical and effective threshold for ensuring high performance in building envelopes.
- **Permeability vs. ACH:** While the Passivhaus Institute currently uses ACH at 50 Pa, there is an ongoing discussion about using permeability as a measure. Permeability values, such as 1.0 or 1.5, could serve as a practical backstop with clear energy and peak load benefits when tighter levels are achieved. The target of 0.6 ACH is an arbitrary threshold that, although it may seem stringent, has proven effective in practice. It is not a strict cutoff—performance issues do not suddenly arise at 0.7 ACH or even 1.5 ACH, but lower values provide clearer benefits.
- **Contractor and Regulator Concerns:** The 0.6 ACH target can sometimes be a barrier for contractors and regulators. However, it remains an important benchmark for achieving the desired energy performance and comfort levels. Adjusting to a permeability-based measure could address these concerns while maintaining performance goals.

In conclusion, limiting fabric infiltration through building standards is essential for enhancing building performance and comfort. The benefits of improved airtightness are well-documented, and while the 0.6 ACH target is currently used for Passivhaus certification, considering alternative measures such as permeability could provide additional flexibility while ensuring high performance. Effective implementation and quality assurance strategies are critical to achieving these targets and ensuring consistent, reliable building outcomes.

References:

[1] BRE. (2018). Thermal Comfort and Air Leakage. Building Research Establishment. Retrieved from BRE

[2] Passivhaus Trust. (2023) Thermal Bypass Risks, a technical review
https://www.passivhaustrust.org.uk/guidance_detail.php?gId=55

[3] Fraunhofer UMSICHT. (2021). Hygrothermal Modelling with WUFI. Retrieved from Fraunhofer UMSICHT

[4] ASHRAE. (2019). Ventilation and Indoor Air Quality. American Society of Heating, Refrigerating and Air-Conditioning Engineers. Retrieved from ASHRAE

Consultation Question 10

Do you have any particular views on the means by which effective ventilation of new buildings is best achieved?

☐ Yes

☐ No

If you answered 'Yes', please provide your views and any supporting information on the benefits and risks identified in the delivery of your projects.

Q10 - Passivhaus Trust (PHT) Response

Answer: **Yes**

We believe that effective ventilation in new buildings is best achieved through balanced ventilation. While Passivhaus does not explicitly "require" MVHR, it does mandate that indoor air quality (IAQ), heating metrics, and comfort criteria are met. In our climate zone, balanced ventilation through MVHR is typically required to deliver these standards. However, it is important to note that the requirement is not for a specific technology, but for the outcomes: IAQ, comfort (including noise levels) and carbon/peak load reduction.

If the argument is made for achieving IAQ, heating metrics, comfort criteria, and fan power (where fans are used), then the market should be free to develop suitable solutions. The non-negotiable principle remains the maintenance of high standards for IAQ, comfort, and energy efficiency. For a detailed discussion on the evidence supporting balanced ventilation, please refer to the study:
https://www.sciencedirect.com/science/article/pii/S0378778823011131

The current Scottish standards and traditional ventilation methods often fall short in providing adequate indoor air quality. Here's why MVHR is a superior approach:

1. Limitations of Current Ventilation Standards:

- **Natural Ventilation:** Natural ventilation relies on fabric leakage, trickle vents both affected by wind, and stack effects, supplemented by intermittent extract fans in kitchens and bathrooms. However, this method is inconsistent because it depends on variable wind speeds and the occupants' actions. Evidence shows that relying solely on natural ventilation does not consistently meet adequate ventilation levels [1][2]. For instance, occupants may not regularly open windows in winter or trickle vents, and intermittent fans are insufficient for managing residual moisture.
- **Mechanical Extract Ventilation (MEV):** MEV systems can provide fresh air but draw it through gaps in the building fabric and trickle vents, allowing external pollutants into the building. MEV systems also lack control over where air enters the building, which can result in uneven ventilation and potential issues with stale air in certain rooms.

2. Advantages of MVHR Systems:

- **Consistent Air Quality:** MVHR systems run continuously, ensuring that the required air change rate is consistently achieved. Unlike natural or MEV systems, MVHR systems filter all incoming air through high-efficiency filters, removing a significant portion of outdoor pollutants such as particulates and pollen. This results in superior indoor air quality [3].
- **Improved Acoustic Performance:** MVHR systems significantly enhance acoustic insulation by providing fresh air without the need to open windows or use trickle vents. This allows for both improved indoor air quality and a quieter indoor environment, even in areas with high external noise levels.

- **Improved Performance Across Airtightness Levels:** Research by the Passivhaus Trust indicates that MVHR systems improve ventilation and reduce carbon emissions effectively across various levels of building airtightness [3]. This makes MVHR a compelling option for all buildings.

3. Economic and Market Opportunities:

- **Market Development:** Emphasising MVHR systems in building standards presents an opportunity to develop and expand the market for high-performance ventilation systems in Scotland. This can stimulate economic growth by creating demand for advanced technologies and associated services, such as installation and maintenance, thereby fostering innovation and job creation in the green building sector.
- **Cost-Effectiveness:** Although MVHR systems involve higher upfront costs, they provide long-term savings through reduced energy consumption and improved building performance. Additionally, they contribute to better occupant health and well-being, which can lead to broader economic and health benefits, including reduced strain on the NHS. This aligns with Scotland's broader economic, environmental, and health goals, making MVHR a cost-effective investment over time.

4. Supporting Evidence:

- Scottish Government research highlights the shortcomings of current standards in maintaining indoor CO_2 levels below 1000 ppm, often due to inadequate ventilation provision [1].
- Studies such as this one on IAQ in Passivhaus buildings support the move to MVHR [4].

Conclusion: Incorporating balanced, and particularly MVHR, systems in new buildings offers substantial benefits in terms of indoor air quality, energy efficiency, and overall building performance. MVHR systems address the limitations of natural and mechanical extract ventilation by providing a controlled, filtered, and consistent supply of fresh air, making them the most effective means of achieving optimal ventilation in modern buildings. As the market for MVHR systems matures, there will also be increasing opportunities for their application in retrofits.

References:

[1] Scottish Government. (2023). Research Identifying Changes to Guidance on Standard 3.14 (Ventilation) and 2015 Effective Improving Ventilation and Indoor Air Quality. Retrieved from: https://www.gov.scot/binaries/content/documents/govscot/publications/research-and-analysis/2023/05/research-identify-changes-guidance-standard-3-14-ventilation-2015-effective-improving-ventilation-indoor-air-quality/documents/research-identify-changes-guidance-standard-3-14-ventilation-2015-effective-improving-ventilation-indoor-air-quality/research-identify-changes-guidance-standard-3-14-ventilation-2015-effective-improving-ventilation-indoor-air-quality/govscot%3Adocument/research-identify-changes-guidance-standard-3-14-ventilation-2015-effective-improving-ventilation-indoor-air-quality.pdf

[2] Rosemeier, K. (2008). *Air Tightness and Infiltration: How Predictable is Useful Infiltration?* Energy and Buildings, 40(3), 469-478. DOI: https://doi.org/10.1016/j.enbuild.2007.05.011

[3] Passivhaus Trust. (2020). The Case for MVHR. Retrieved from: https://www.passivhaustrust.org.uk/UserFiles/File/research%20papers/MVHR/2020.04.27-The%20Case%20for%20MVHR-v7%20new%20cover.pdf

[4] A review of the indoor air quality in residential Passive House dwellings https://www.sciencedirect.com/science/article/pii/S0378778823011131

Consultation Question 11

Specifically for new homes should further guidance be given on MVHR, generally, and through the Technical Handbooks?

☐ Yes

☐ No

If you answered 'Yes', please describe what approach to this work you consider would be most appropriate in driving forward informed, good practice on both energy and ventilation performance.

Q11 - Passivhaus Trust (PHT) Response

Answer: **Yes**

The Passivhaus Trust supports providing additional guidance on Mechanical Ventilation with Heat Recovery (MVHR) for new buildings. As the industry evolves and adopts new standards, clear and comprehensive guidance is crucial for ensuring MVHR systems are implemented effectively and consistently.

Approach to Providing Guidance:

1. Comprehensive Technical Guidance:

- **Detailed Design and Installation Standards:** Develop and distribute thorough technical guidance on the design, installation, and maintenance of MVHR systems. This guidance should cover best practices for system sizing, ductwork design, installation procedures, and regular maintenance schedules to ensure systems operate efficiently and effectively.
- **Integration with Building Standards:** Ensure that MVHR guidance is incorporated into the Technical Handbooks to align with existing building regulations and standards. This will promote a cohesive approach to achieving energy performance and indoor air quality in new buildings.

2. Training and Certification:

- **Professional Development:** Provide training programmes and certification for designers, builders, and installers to enhance their understanding of MVHR systems. This will help to standardise practices and improve the quality of MVHR installations across the industry.
- **Best Practice Workshops:** Conduct workshops and seminars focused on MVHR best practices, using real-world examples and case studies from successful projects to illustrate effective implementation.

3. Clear Performance Metrics (these should be performance requirements not just guidance):

- **Benchmarking and Performance Indicators:** Offer clear metrics for evaluating MVHR system performance, including energy efficiency with accurate calculation of duct heat loss (not currently done in SAP), indoor air quality, and noise levels for occupant comfort. Establish benchmarks to guide the assessment of MVHR systems in new buildings and ensure they meet performance expectations.

4. User Guidance and Support:

- **Building Operator Education:** Develop guides for building operators on how to effectively manage and maintain MVHR systems. Educating operators will help ensure that systems perform optimally and contribute to the overall energy efficiency and comfort of the building.

5. Feedback and Continuous Improvement:

- **Industry Feedback:** Create mechanisms for collecting feedback from industry professionals and building operators to refine and improve MVHR guidance. Regular updates based on practical experiences and technological advancements will help maintain the relevance and effectiveness of the guidance.

In conclusion, providing additional guidance on MVHR, in addition to performance requirements, for new buildings is essential for ensuring high standards of energy performance and indoor air quality. While best practices are well established through the Passivhaus Standard, wider industry adoption and understanding needs to be enhanced through targeted guidance, training, and support. This approach will drive consistent and effective implementation of MVHR systems, leading to better-performing and more comfortable new buildings.

Consultation Question 12

Are there areas of newbuild design and specification you would wish to highlight as potential risks to occupant comfort that should be better addressed through the building standards?

☐ Yes

☐ No

If you answered 'Yes', please provide examples of the issues encountered and, where available, the solutions employed to address the problem.

Q12 - Passivhaus Trust (PHT) Response

Answer: **Yes**

There are several areas of new build design and specification that pose potential risks to occupant comfort, which should be more effectively addressed through building standards. Key concerns include managing summer comfort, winter comfort, and indoor air quality (IAQ). Here's a detailed look at these issues and potential solutions:

1. Summer Comfort:

- **Overheating Risks:** One of the most pressing risks is overheating in summer, which can lead to discomfort. To address this, it is crucial to understand and manage key drivers of overheating:
  - **Location:** The local climate significantly affects how buildings perform in terms of heat gain and loss. Accurate climate data should be incorporated into design tools to tailor solutions to specific conditions.
  - **Window Orientation and Size:** The role of windows in managing solar gains is crucial. Optimal window size and shading should be designed to work with the building's given orientation and surrounding context, such as neighbouring buildings and street layout. Effective design ensures that natural light is maximised while controlling unwanted heat gain.
  - **Shading:** Effective shading solutions, such as overhangs, prevent excessive solar heat gain. Shading can be designed to work in tandem with window orientation and size, provided designers have the right tools (such as PHPP) to model these factors effectively.
  - **Internal Heat Gains:** To minimise internal heat gains from sources such as hot water systems, lighting, and electrical appliances, it is essential to use well-designed systems and carefully selected materials and appliances. Effective ventilation, particularly through Mechanical Ventilation with Heat Recovery (MVHR) systems with automatic bypass, is also crucial. These systems help reject unwanted heat while maintaining ventilation when windows are closed, which is especially beneficial in noisy environments. This approach ensures a comfortable indoor climate while controlling internal heat gains.

Designers need effective and accurate tools, such as the Passivhaus Planning Package (PHPP), to model and understand these factors comprehensively. PHPP helps in predicting how various design choices will impact summer comfort and allows for adjustments to achieve optimal results.

2. Winter Comfort:

- **Insulation and Thermal Bridging:** Effective insulation and avoiding thermal bridges are crucial for maintaining winter comfort. Thermal bypass, where heat flows through gaps or poorly insulated areas, can lead to significant heat loss and impact occupant comfort. Ensuring continuous insulation and addressing potential thermal bridges during the design and construction phases is essential. Detailed design practices and thorough construction quality assurance are necessary to avoid these issues.

- **Heating Demand and Peak Load:** Standards should set absolute targets for heating demand and peak heat load to ensure that buildings remain affordable and comfortable in winter. Efficient heating systems, combined with well-insulated structures, should be part of these targets to support manageable heating needs and cost-effective living conditions.

3. Indoor Air Quality (IAQ) and Ventilation:

- **Importance of MVHR:** Mechanical Ventilation with Heat Recovery (MVHR) systems play a crucial role in maintaining good IAQ by providing continuous ventilation while recovering heat from outgoing air. This ensures that the air entering the building is filtered and less contaminated, enhancing overall comfort and health.
- **Balanced ventilation:** Balanced ventilation systems ensure adequate ventilation and maintain good IAQ and are essential to avoid issues such as stale air or inadequate fresh air supply.

In conclusion, addressing these risks through updated building standards and guidance is crucial for ensuring occupant comfort and achieving energy efficiency. By focusing on summer comfort, maintaining winter comfort, and ensuring effective IAQ management with balanced ventilation systems, we can enhance the overall performance of new buildings. Implementing effective and accurate design tools, such as PHPP, and detailed standards will help mitigate these risks and improve the quality of indoor environments.

Consultation Question 13

Do you consider that Passivhaus Certification offers a feasible alternative means of compliance with standard 6.1 (energy demand)?

☐ Yes

☐ No

Please provide information on why you agree, or disagree and on the extents to which this alternative might be usefully applied in practice.

Q13 - Passivhaus Trust (PHT) Response

Answer: **Yes**

We consider that Passivhaus Certification offers a feasible alternative means of compliance with Standard 6.1 (Energy Demand). Here's why:

1. Feasibility and Effectiveness:

- **Rigorous Standards:** Passivhaus Certification requires buildings to meet stringent performance criteria for energy efficiency, including low heating demand, high levels of airtightness, and excellent thermal comfort. These criteria align closely with the objectives of Standard 6.1, making Passivhaus a robust and effective alternative for demonstrating compliance.
- **Comprehensive Approach:** The Passivhaus Standard addresses both energy demand and ventilation comprehensively. By incorporating advanced design principles and rigorous testing, Passivhaus ensures that buildings not only meet but exceed typical energy efficiency requirements.

2. Benefits for the Scottish Government:

- **Scaling Up and Knowledge Building:** A swift announcement by the Scottish Government affirming that full Passivhaus Certification will satisfy relevant sections of the Scottish Building Standards would significantly contribute to the scaling up of Passivhaus in Scotland. This move would provide valuable knowledge-building and dissemination opportunities, helping to prepare the industry for future mandatory standards.
- **Industry Preparation:** As more projects adopt Passivhaus during any transition period, the supply chains and industry professionals will gain experience and expertise, facilitating a smoother implementation of new standards once they are officially introduced.

3. Application to Standards:

- **Section 6.1 (Energy):** Passivhaus Certification ensures that buildings achieve exceptionally low energy demand, directly aligning with the goals of Standard 6.1. Its rigorous performance criteria and testing procedures make it a viable method for meeting and surpassing energy efficiency requirements.
- **Section 3.14 (Ventilation):** Passivhaus Certification also includes comprehensive ventilation requirements through the use of Mechanical Ventilation with Heat Recovery (MVHR). This approach ensures excellent indoor air quality while maintaining energy efficiency, addressing the needs outlined in Section 3.14.

In conclusion, Passivhaus Certification is a feasible and effective alternative for compliance with Standard 6.1 (Energy Demand) and Section 3.14 (Ventilation). Its rigorous standards and comprehensive approach offer a reliable means of achieving high performance in energy efficiency and indoor air quality. Adopting Passivhaus Certification as an alternative can support scaling up, enhance industry readiness, and provide valuable experience for future building standards.

Consultation Question 14

Are there any other comments or observations you wish to make on the proposed components of the review which relate to building design?

☐ Yes
☐ No

If you answered 'Yes', please provide your further comments or observations. Additional supporting information may also be provided by attaching a separate document to your response.

Q14 - Passivhaus Trust (PHT) Response

Answer: **Yes**

In addition to the points already discussed, the Passivhaus Trust would like to highlight several key areas related to building design that are crucial for improving building performance and ensuring compliance with new standards:

1. Enhanced Quality Assurance (QA) Mechanisms:

- **Design Stage QA:** While the review acknowledges the importance of QA during the construction stage, it is even more crucial to implement robust QA mechanisms at the design stage. The Passivhaus Planning Package (PHPP) is a proven tool known for its precision in predicting energy performance and effectively reducing the performance gap. Incorporating PHPP into the design process can significantly enhance the accuracy of performance predictions and support the delivery of high-quality buildings.
- **Integration into Design:** By focusing on QA at the design stage, we can address potential issues before they manifest during construction, ensuring that the final building performance aligns with design expectations. This proactive approach is essential for achieving optimal energy efficiency and compliance with new standards.

2. Training for Assessors:

- **Section 6 certifiers and LABSS verifiers:** The training of Section 6 and LABSS assessors is crucial for the effective implementation of new standards. Assessors should receive appropriate training to incorporate tools like PHPP into their skills. This training will ensure that they are proficient in evaluating energy performance accurately and can effectively verify and certify building designs in line with updated standards.

3. Support for the Transition:

- **Qualified Workforce:** Ensuring that assessors and designers are adequately trained and equipped with the right tools will facilitate a smoother transition to new standards. This approach will contribute to a more consistent and effective implementation of building regulations, ultimately leading to better-performing buildings and improved energy efficiency.

In conclusion, to achieve optimal building performance and compliance with new standards, it is imperative to enhance QA mechanisms not only at the construction stage but also at the design stage. By leveraging tools like PHPP and ensuring that assessors and verifiers receive appropriate training, we can support the successful implementation of updated building regulations and drive improvements in building design and performance.

SECTION 4 PROPOSED COMPONENTS OF THE STANDARD – COMPLIANCE (Q15 – 25)

Consultation Question 15

Do you currently apply an in-house or third party compliance management process to your projects which specifically addresses energy and environmental project elements?

☐ Yes
☐ No

If you answered 'Yes', please provide information summarising your approach and the key benefits you derive from its application in practice.

Q15 - Passivhaus Trust (PHT) Response

Answer: **Yes**

The Passivhaus Trust supports the use of Passivhaus Certification for managing energy and environmental project elements. Passivhaus Certification exemplifies effective compliance management through rigorous third-party verification of both design and construction stages.

Passivhaus Certification

- **Thorough Reviews:** Passivhaus certification involves independent verification by accredited certifiers, including comprehensive reviews of design documentation, site quality inspections (which can be conducted remotely), and performance testing. This ensures compliance with stringent energy efficiency, comfort, and environmental criteria.
- **Proven Performance:** Certified Passivhaus buildings consistently meet their expected energy savings and comfort levels, demonstrating the effectiveness of the certification process in real-world conditions.

Encouraging In-House Systems

While the focus here is on Passivhaus Certification, we also encourage members to provide insights into their in-house compliance management systems. These systems can complement Passivhaus Certification by offering additional quality control and oversight.

In conclusion, the Passivhaus Trust welcomes the consideration of Passivhaus Certification as a means of compliance with sections of the building standards. This approach is beneficial for ensuring high-quality energy and environmental performance in new buildings. Passivhaus Certification is crucial for achieving consistent and effective outcomes, and we support its inclusion in the review of building standards.

Consultation Question 16

From your experience of delivering very low energy buildings, what are the most common risks identified at an early design stage and how are they managed most effectively?

Q16 - Passivhaus Trust (PHT) Response

From our experience in delivering very low energy buildings, several common risks can be identified at an early design stage. These risks primarily relate to the complexity of design, targets, modelling, and construction systems. Effective management of these complexities is crucial for successful project outcomes.

Common Risks and Management Strategies

1. Unnecessary Design Complexity:

- **Risk:** Designers may introduce unnecessary complexity into the design, either due to a lack of understanding of the implications or by adding features that do not effectively contribute to the building's performance. This can lead to increased costs, longer design times, and potential performance issues.
- **Management:** Using the Passivhaus Planning Package (PHPP) from the earliest design stage helps simplify the design process by providing clear insights into how different design choices impact energy performance. By focusing on proven, robust, rules of thumb and effective design principles and avoiding unnecessary complexity, designers can streamline the process and ensure that every element contributes to the building's overall performance. Training and experience with PHPP further help designers avoid pitfalls and ensure that all design choices are both practical and effective. The Passivhaus Trust have many good resources [1]

2. Overheating Risks:

- **Risk:** One of the most pressing risks is overheating in summer, which can lead to discomfort.
- **Management:** To address this, it is crucial to understand and manage key drivers of overheating:
  - **Location:** The local climate significantly affects how buildings perform in terms of heat gain and loss. Accurate climate data should be incorporated into design tools to tailor solutions to specific conditions.
  - **Window Orientation and Size:** The role of windows in managing solar gains is crucial. Optimal window size and shading should be designed to work with the building's given orientation and surrounding context, such as neighbouring buildings and street layout. Effective design ensures that natural light is maximised while controlling unwanted heat gain.
  - **Shading:** Effective shading solutions, such as overhangs, prevent excessive solar heat gain. Shading can be designed to work in tandem with window orientation and size, provided designers have the right tools (such as PHPP) to model these factors effectively.
  - **Internal Heat Gains:** To minimise internal heat gains from sources such as hot water systems, lighting, and electrical appliances, it is essential to use well-designed systems and carefully selected materials and appliances. Effective ventilation, particularly through Mechanical Ventilation with Heat Recovery (MVHR) systems with automatic bypass, is also crucial. These systems help reject unwanted heat while maintaining ventilation when windows are closed, which is especially beneficial in noisy environments. This approach ensures a comfortable indoor climate while controlling internal heat gains.
  - Designers need effective and accurate tools, such as the Passivhaus Planning Package (PHPP), to model and understand these factors comprehensively. PHPP helps in predicting how various design choices will impact summer comfort and allows for adjustments to achieve optimal results.

3. Complexity of Targets:

- **Risk:** Many ambitious policies (including zero-carbon targets) can be complex and challenging for designers to understand and implement effectively. This complexity can hinder uptake and create barriers to achieving performance goals. The Scottish Futures Trust introduced a new standard for schools that included a straightforward Energy Use Intensity (EUI) metric. This simplified approach allowed designers to quickly understand and meet design requirements, demonstrating that clear and manageable targets facilitate better outcomes.
- **Management:** The Passivhaus Standard excels in this area by providing clear and consistent performance targets reported through the PHPP. This simplicity and clarity help designers easily grasp what is required and focus on driving performance rather than navigating complex requirements. Ensuring that targets are straightforward and directly tied to performance outcomes, rather than becoming burdensome or merely box-ticking exercises, is crucial for effective implementation.

4. Complexity of Modelling:

- **Risk:** Accurate modelling is essential for predicting energy performance, but complex models can be challenging to manage and interpret, potentially leading to inaccuracies.
- **Management:** Using the PHPP allows for detailed and reliable energy performance modelling. Professionals can effectively interpret the modelling results, ensuring that the building's energy performance is on track and making necessary adjustments as required.

5. Complexity of Construction Systems:

- **Risk:** Implementing advanced construction systems required for very low energy buildings introduces challenges related to coordination, quality control, and construction techniques.
- **Management:** Engaging experienced contractors and specialists familiar with low-energy construction methods or providing up-skilling opportunities is essential. Robust third-party certification further ensures that construction practices adhere to the required standards, providing an additional layer of quality assurance.

In conclusion, managing the complexities associated with very low energy buildings involves streamlining design processes, using effective tools like the PHPP, and ensuring robust quality assurance through third-party certification. Addressing these risks proactively helps enhance the likelihood of successful project outcomes and ensures that performance targets are clear and effective, rather than becoming a burdensome process.

References:

[1] Passivhaus Trust (2023) *How to Build a Passivhaus: Good Practice Guide*
https://www.passivhaustrust.org.uk/guidance_detail.php?gId=29

Consultation Question 17

Do you consider there are practical limits to effective risk management at design stage alone and can you give examples of where management of risk is more effective at a later (construction) stage?

Q17 - Passivhaus Trust (PHT) Response

While the design stage is crucial for planning and mitigating many risks, some challenges inevitably arise during the construction phase. Unforeseen conditions, quality control issues, coordination between trades, and system testing are critical aspects that require attention during construction to ensure the project meets its performance and quality goals. A comprehensive risk management approach integrates strategies from both the design and construction phases to achieve the best outcomes.

Key Areas Where Construction-Stage Risk Management is Crucial:

- **Material and Component Substitutions:** During construction, specified materials or components may become unavailable or impractical to use. Managing these substitutions on-site is essential to ensure that any changes do not compromise the building's performance.
- **Quality Control and On-Site Adjustments:** Despite thorough design efforts, quality control issues often arise during construction. It is crucial to ensure that the construction matches the design specifications, as deviations can lead to significant performance gaps. The Passivhaus Quality Assurance (QA) process includes documenting as-built conditions and, where necessary, remodelling to maintain compliance with Passivhaus standards.
- **Coordination and Trade Interactions:** The interaction between different trades can introduce risks that were not apparent during the design stage. For instance, conflicts between the design and other regulatory standards, or the practicality of installing specific details (such as airtightness measures), may only become evident during construction. These risks require close coordination, effective communication, and the flexibility to address on-site challenges.
- **Airtightness Testing and System Commissioning:** Certain critical aspects, such as airtightness and mechanical ventilation system commissioning, can only be fully addressed and verified during the construction phase. These tests and adjustments are essential to ensure that the building meets its energy performance targets and indoor air quality standards.

In conclusion, while effective design-stage risk management is essential, a comprehensive approach must also encompass construction-stage strategies. By proactively addressing unforeseen conditions, ensuring quality control, and managing on-site risks, we can achieve the high performance and quality goals set during the design phase. Crucially, in Passivhaus projects, it is vital to keep the PHPP model up to date with any changes, such as material substitutions or updated thermal bridge values, to ensure that the building continues to meet its energy performance targets. Passivhaus processes are well-equipped to handle these challenges, ensuring alignment between both design and construction phases to deliver buildings that perform as intended.

Consultation Question 18

Do you currently apply a particular approach to the recording of project information during construction that can demonstrate, to a third party, that work complies with energy-related aspects of building regulations?

☐ Yes

☐ No

If you answered 'Yes', please provide information summarising your approach and the key benefits you derive from its application in practice.

Q18 - Passivhaus Trust (PHT) Response

Answer: **Yes**

The Passivhaus Trust advocates for the following approach, aligned with the Passivhaus Institute's (PHI) requirements:

Approach to Recording Project Information for Passivhaus Certification:

1. Detailed Documentation and Data Recording:

- **Description:** Throughout construction, comprehensive records are maintained to document compliance with Passivhaus standards. This includes detailed logs of insulation installation, window and door installations, and airtightness measures. Documentation also covers site inspections and performance tests.
- **Benefits:** Ensures that every element of the building's construction is aligned with Passivhaus requirements, providing a clear and thorough audit trail for certification purposes.

2. Use of the Passivhaus Planning Package (PHPP):

- **Description:** The PHPP is used to model and predict energy performance throughout the design and construction stages. Although PHPP itself is not updated with real-time performance data, it is continually updated during construction to reflect design changes and ensure that the predicted performance aligns with the expected results.
- **Benefits:** Facilitates ongoing verification of design assumptions versus actual construction changes, helping to ensure that the building meets Passivhaus energy criteria as intended.

3. International Certification Platform:

- **Description:** Passivhaus Certification is managed through an international certification platform, which requires the submission of detailed construction records, performance data, and compliance checks. This platform allows for the systematic recording and review of all relevant documentation.
- **Benefits:** Provides a standardised process for certification, making it easier for PHI to review and verify compliance. Ensures that all documentation aligns with international Passivhaus standards.

4. Airtightness Testing and System Commissioning:

- **Description:** Conducting airtightness tests and system commissioning during construction is essential for Passivhaus Certification. Results are documented and submitted to PHI as part of the certification process.

- **Benefits:** Validates that the building meets stringent airtightness and performance criteria, ensuring compliance with Passivhaus standards and contributing to the overall quality of the certification process.

In conclusion, for Passivhaus Certification, accurate and comprehensive recording of project information during construction is essential. By maintaining detailed documentation, using the PHPP to reflect design changes and predict performance, leveraging the international certification platform, and conducting rigorous performance tests, compliance with Passivhaus standards can be effectively demonstrated. This approach ensures that the building meets the high standards required for certification and supports the overall integrity of the Passivhaus certification process

Consultation Question 19

Do you currently compile and report summary information on the completed building as part of a handover record of project information that goes beyond what is currently required by building regulations?

☐ Yes

☐ No

If you answered 'Yes', please provide information summarising your approach and the key benefits you derive from its application in practice.

Q19 - Passivhaus Trust (PHT) Response

Answer: **Yes**

For Passivhaus Certification, compiling and reporting summary information on the completed building involves several key elements that go beyond what is currently required by Scottish Building Standards. These additional requirements from the Passivhaus Institute (PHI) ensure comprehensive documentation and verification of the building's performance. Here's a summary of the minimum requirements for Passivhaus Certification that exceed the standard Scottish Building Standards:

Additional Requirements Beyond Scottish Building Standards:

1. Updated Passivhaus Planning Package (PHPP) Model:

- **Description:** An updated PHPP model reflecting all changes made during construction must be submitted. This model includes finalised values for insulation, window specifications, and ventilation systems.
- **Benefits:** Provides an accurate representation of the building's performance, ensuring consistency between design expectations and actual outcomes.

2. Detailed Construction Documentation and Photographic Records:

- **Description:** Comprehensive records including construction details, materials used, installation methods, and deviations from the design, complemented by photographic evidence of key stages and materials on site.
- **Benefits:** Offers a complete and verifiable record of construction, supporting the certification process and confirming compliance with Passivhaus standards.

3. Airtightness Testing Results:

- **Description:** Results from airtightness testing, showing the building's airtightness level compared to Passivhaus standards, must be provided.
- **Benefits:** Validates that the building meets the stringent airtightness requirements, crucial for achieving Passivhaus certification.

4. Ventilation Commissioning;

- **Description:** The ventilation system must undergo thorough commissioning to ensure it operates according to the design specifications. This includes balancing airflow rates, verifying heat recovery efficiency, and ensuring that all components are functioning correctly.

- **Benefits:** Proper commissioning ensures optimal indoor air quality, energy efficiency, and occupant comfort. It also helps prevent common issues like insufficient airflow, noise, and imbalances in the ventilation system, contributing to the overall performance of the building.

5. Operational and Maintenance Manual:

- **Description:** A manual detailing the operation and maintenance of building systems, including heating, cooling, ventilation, and renewable energy systems, with occupant instructions.
- **Benefits:** Ensures that building operators and occupants have the necessary information to maintain optimal performance and efficiency.

6. Certification Documentation:

- **Description:** Official Passivhaus Certification documents, including certificates and reports from the certification process.
- **Benefits:** Provides formal proof of compliance with Passivhaus standards, enhancing the building's credibility and performance assurance.

7. Signed Contractor Declaration:

- **Description:** A declaration from the contractor confirming that the construction was completed in accordance with the Passivhaus design and standards.
- **Benefits:** Adds an extra layer of verification and accountability to ensure adherence to the specified standards.

In conclusion, these additional requirements for Passivhaus Certification provide a more detailed and comprehensive record than what is currently mandated by Scottish Building Standards. They support enhanced performance verification, quality assurance, and operational efficiency of Passivhaus-certified buildings, ensuring that they meet the high standards of energy efficiency and comfort set by the Passivhaus Institute.

Consultation Question 20

Do you have experience of implementing methods to effectively de-risk the very low energy building aspects of design and construction and provide assurance that the compliant solutions are properly considered and delivered as intended?

☐ Yes
☐ No

If you answered 'Yes', please provide information summarising your experience.

Q20 - Passivhaus Trust (PHT) Response

Answer: **Yes**

The Passivhaus Trust has substantial experience in supporting members to implement methods to effectively de-risk the design and construction of very low energy buildings and ensuring that compliant solutions are properly considered and delivered as intended. Here's a summary of our approach:

1. **Reducing Complexity:**
   - **Approach:** We advocate for simplifying the design process to avoid unnecessary complexity. This includes using clear, achievable targets and straightforward design principles to reduce the risk of misunderstandings and errors.
   - **Benefits:** Simplification helps ensure that all stakeholders understand and can effectively manage the design and construction requirements.
2. **First-Principles Heat Loss Calculations:**
   - **Approach:** Passivhaus requires heat loss calculations to be derived from first principles, rather than relying on typical manufacturer values. This includes determining fabric U-values based on specific construction details, accurately estimating repeating thermal bridges, and calculating window U-values based on the exact frame and glazing specifications. MVHR ductwork heat loss is also calculated according to the design, not generic "in-use" factors.
   - **Benefits:** This rigorous, detail-oriented approach ensures that all performance aspects are accurately modelled and predicted, reducing the risk of performance gaps and ensuring that the building performs as intended in real-world conditions.
3. **Engaging Experienced Practitioners and Upskilling Teams:**
   - **Approach:** Engaging experienced professionals who are familiar with Passivhaus principles is beneficial. We also support the upskilling of teams through various training programmes.
   - **Benefits:** Experienced practitioners and well-trained teams contribute to better decision-making and problem-solving, ensuring that projects can cost-effectively adhere to Passivhaus standards.
4. **Training and Professional Development:**
   - **Approach:** Passivhaus offers a range of training opportunities, from informal courses to formal qualifications. These are available through a robust network in the UK, both online and in-person at centres like BE-ST.
   - **Benefits:** Continuous professional development ensures that all involved in the construction industry are knowledgeable about the latest best practices and standards, which mitigates risks associated with low energy building projects.

5. **Proven Track Record of Passivhaus Standard:**

- **Approach:** The Passivhaus standard has been tested and refined over more than 30 years, providing a reliable framework for designing and delivering low energy buildings.
- **Benefits:** The long history of success with Passivhaus helps to ensure that the standards are practical and effective, providing confidence in their application.

6. **Third-Party Certification:**

- **Approach:** Passivhaus projects undergo rigorous third-party certification, which includes independent verification of design and construction. This process ensures that all aspects of the project meet the stringent Passivhaus standards.
- **Benefits:** Third-party certification provides an additional layer of quality assurance and accountability, helping to confirm that the building meets all energy performance and comfort requirements.

In conclusion, by focusing on reducing complexity, engaging experienced practitioners, providing comprehensive training, leveraging the proven Passivhaus standard, and utilising third-party certification, we effectively manage and de-risk the delivery of very low energy buildings. These methods contribute to successful project outcomes and ensure that solutions are delivered as intended.

Consultation Question 21

Do you consider the proposals set out present a reasonable summary of why there is a need for improvement in compliance processes to deliver very low energy buildings?

☐ Yes

☐ No

Please provide information on why you agree or disagree and on any drivers for improvement you consider particularly important.

Q21 - Passivhaus Trust (PHT) Response

Answer: **Yes**

The proposals outlined present a reasonable summary of why there is a need for improvement in compliance processes to deliver very low energy buildings. They effectively highlight the challenges faced in current compliance and the need for enhanced processes to ensure that buildings meet very low energy standards.

Consultation Question 22

Do you consider the proposed scope of application and recommended actions are appropriate to address the effective delivery of very low energy buildings?

☐ Yes
☐ No

Please provide information on why you agree, or disagree and on what other actions may be useful in driving compliance

Q22 - Passivhaus Trust (PHT) Response

Answer: **Yes**

The proposed scope of application and recommended actions are appropriate for addressing the effective delivery of very low energy buildings. They cover essential aspects such as design quality, construction practices, and compliance monitoring. To further enhance the effectiveness of these proposals, the following additional actions are recommended:

Additional Actions:

1. **Enhanced Training:**
   - Implement further training programs for design and construction professionals to ensure they are well-versed in very low energy building requirements. Continuous professional development (CPD) opportunities focusing on the latest advancements in low-energy building design and construction should be developed e.g in MVHR.
2. **Regular Reviews:**
   - Conduct periodic reviews of compliance processes to ensure they remain effective. Establish a framework for regular updates to the compliance guidance to incorporate new research findings and technological advancements.
3. **Leveraging Passivhaus Certification:**
   - Allow third-party Passivhaus Certification to demonstrate compliance with the new QA requirements. Passivhaus Certification, with its rigorous procedures, can streamline the compliance process and ensure adherence to high standards.
   - Promote the use of the Passivhaus Planning Package (PHPP) as a design and compliance tool. Its accuracy and ease of use make it valuable for all design teams, whether or not they are aiming for certification.

In conclusion, these additional actions will support achieving high-performance outcomes and drive better compliance with the new standards. By providing comprehensive guidance that addresses training, regular reviews, and leveraging established certification systems like Passivhaus, we can ensure the effective delivery of very low energy buildings.

Consultation Question 23

Do you support the application of provisions from an early (pre-warrant) design stage through to completion and handover of the building?

☐ Yes
☐ No

Please provide information on points in the process you consider there may be a need for particular emphasis on action to manage the risk of failures in compliance.

Q23 - Passivhaus Trust (PHT) Response

Answer: **Yes**

We strongly support the application of provisions from the early (pre-warrant) design stage through to completion and handover of the building. This approach aligns well with the Passivhaus methodology, which is proven to deliver high-quality, low-energy buildings, as set out in the Passivhaus overlay to the RIBA plan of work.

Points for Emphasis:

- **Early Design Stage Reviews:** Conducting thorough design reviews at the pre-warrant stage to identify potential compliance issues early on, as set out in the Passivhaus overlay to the RIBA plan of work.
- **Continuous QA Integration:** Ensuring that quality assurance processes are integrated throughout the design, construction, and handover phases. This helps manage risks and ensures that compliance is maintained from start to finish.
- **Alignment with Standards:** Aligning these QA practices with any new requirements in building standards to streamline compliance and improve overall building performance.

The Scottish Government's ambitious goals—fully supported by the Passivhaus Trust—aim to achieve significant improvements in building quality, energy efficiency, and sustainability. These goals will only be met if there is a consistent and rigorous application of provisions throughout the entire process, from early design to final handover.

Incorporating these practices will help mitigate the risk of compliance failures and ensure high standards are maintained throughout the building process. Passivhaus Certification can be an excellent way to demonstrate compliance with any new QA requirements.

Consultation Question 24

Do you have any views on the key areas where the verification process should focus, to be effective in responding to an enhanced compliance reporting regime?

☐ Yes
☐ No

If you answered 'Yes', please provide your views.

Q24 - Passivhaus Trust (PHT) Response

Answer: **Yes**

To enhance the effectiveness of the compliance verification process under an enhanced reporting regime, key areas of focus should include:

1. **Clear Documentation of Assumptions:**
   - **Documentation of Performance Assumptions:** It is critical to clearly document all assumptions made during the design phase that are used to achieve the projected building performance. This includes assumptions related to material properties, thermal bridges, airtightness, and system efficiencies.
   - **Benefits:** Clear documentation allows for the verification of these assumptions during construction and provides a reliable reference for future checks, ensuring transparency and accountability throughout the process.
2. **Design and Documentation Review:**
   - **Accuracy and Completeness:** Ensure that all design documentation, including energy models and performance predictions, is thoroughly reviewed for accuracy and completeness. This is crucial for identifying potential discrepancies early.
   - **Passivhaus Standards:** Adopting Passivhaus Certification provides a rigorous framework for verifying design documentation and performance predictions, ensuring they meet high energy efficiency and comfort standards.
3. **Construction Quality Assurance:**
   - **Verification of Construction Practices:** Implement robust QA procedures to verify that construction practices align with design specifications. This includes regular site inspections and checks on material quality and workmanship.
   - **Third-Party Certification:** Leveraging Passivhaus Certification, which involves detailed site inspections and quality checks by accredited certifiers, can provide an additional layer of assurance.
4. **Performance Testing:**
   - **Post-Construction Performance Testing:** Conduct thorough performance testing after construction to validate that the building meets the expected energy and comfort standards. This includes airtightness testing and robust commissioning.
   - **PHPP Verification:** Use the Passivhaus Planning Package (PHPP) to model and verify performance throughout the construction phase, ensuring that any deviations from the predicted performance are addressed.
5. **Handover and Occupancy:**
   - **Training and Handover Procedures:** Ensure that building occupants and facilities managers are well-informed about the building's energy systems and maintenance requirements. Proper handover procedures can help in maintaining performance over time.

By focusing on these areas, the verification process can be more effective in ensuring compliance with enhanced building standards and delivering very low energy buildings that meet their performance targets. Passivhaus Certification offers a proven approach to achieving these goals, providing a comprehensive and reliable verification process.

Consultation Question 25

Do the recommendations presented adequately describe action to affect the key roles and responsibilities of those who contribute to building compliance?

☐ Yes
☐ No

Please provide information on anything else you consider to be relevant to the actions of such parties.

Q25 - Passivhaus Trust (PHT) Response

Answer: **Yes**

Response from a Passivhaus Perspective:

The recommendations presented in the consultation document largely address the key roles and responsibilities of those involved in building compliance. However, there are specific considerations from the Passivhaus perspective that could enhance these recommendations further.

1. **Comprehensive and Integrated Approach:** The document outlines roles and responsibilities but could benefit from a more integrated approach that considers the unique aspects of Passivhaus certification. This includes ensuring that energy performance and indoor environmental quality are given equal importance. Passivhaus standards emphasise rigorous energy performance and occupant comfort, which should be reflected in compliance processes.
2. **Training and Upskilling:** The emphasis on upskilling and training for key roles (Applicants, Designers, Main Contractors, Verifiers) is crucial. For Passivhaus, specific training programmes tailored to understanding and implementing Passivhaus principles would be beneficial. This should include understanding the Passivhaus Planning Package (PHPP), which is essential for accurate energy performance calculations.
3. **Use of PHPP as a Compliance Tool:** PHPP is a robust and precise tool widely used in Passivhaus projects around the world. Integrating PHPP as an accepted compliance tool, either alongside or in place of SAP/SBEM, could significantly streamline processes and reduce the burden on project teams. This integration would encourage more projects to benefit from the accuracy and predictive power that PHPP offers during the design process, ensuring more reliable energy performance outcomes and supporting the delivery of very low energy buildings.
4. **Coordination and Verification:** The recommendations for enhancing verification processes can be strengthened by adopting best practices from the Passivhaus Institute's Building Certification Guide. This includes rigorous documentation and verification at key stages of design and construction to ensure compliance with very low energy standards.
5. **Defining Roles and Competence:** Clearer definitions of roles and responsibilities, with an emphasis on competence in Passivhaus standards, would support better compliance. This includes not just general competencies but specific skills related to achieving and verifying the stringent requirements of Passivhaus.

Additional Recommendations:

- **Enhanced Collaboration:** Encouraging a collaborative approach between different stakeholders (designers, contractors, verifiers) early in the project to ensure that Passivhaus principles are embedded from the outset.
- **Holistic Building Design:** Emphasising a holistic design approach is crucial, particularly when addressing factors like thermal bridging, airtightness, and ventilation strategies, which are central to Passivhaus. This method can lead to substantial reductions in both operational and upfront carbon emissions, often achieved at very little or even negative cost. By incorporating these considerations early in the design process,

buildings can attain high energy efficiency and comfort levels while supporting broader sustainability objectives.

- **Monitoring and Feedback:** Implementing a system for monitoring building performance post-occupancy to ensure that the buildings complying with the Scottish Passivhaus Equivalent Standard perform as designed and provide feedback for continuous improvement.
- **Passivhaus Certification:** Passivhaus Certification can be an excellent way to show compliance with the new QA requirements, ensuring a high standard of performance and quality throughout the building process.

In conclusion, while the recommendations in the consultation document are comprehensive, incorporating the specific requirements and best practices of the Passivhaus standard will provide a more robust framework for achieving high-performance, low-energy and healthy buildings in Scotland.

SECTION 5 – CALL FOR INFORMATION ON CURRENT STANDARDS (Q26-29)

Consultation Question 26

Are you currently designing buildings to the February 2023 standards and have confirmed specifications which are at a stage that have been or will be used in a building warrant application, that you would be happy to share with us?

☐ Yes
☐ No

If you answered 'Yes', please send calculation output sheets which detail your building specification(s) to buildingstandards@gov.scot with the subject title 'Call for evidence – February 2023 design specification'.

We encourage members to submit projects

Consultation Question 27

With regards to the current approach to target setting and overheating risk, do you have experience related to either of these two issues you consider useful to inform review of the current published guidance or this review of current energy and environmental standards?

☐ Yes
☐ No

If you answered 'Yes', please provide information summarising your experience.

Q27 - Passivhaus Trust (PHT) Response

Answer: **Yes**

The Passivhaus Trust has substantial experience in managing overheating risks and ensuring summer comfort in very low energy buildings. Effective management of overheating requires advanced tools for prediction and assessment, as well as careful consideration of building design and ventilation strategies.

Experience and Insights:

Overheating Risk:

We assume the focus on this question is on managing overheating risks. The Passivhaus Planning Package (PHPP) is a vital tool for this purpose, offering simple and reliable methods for assessing and mitigating overheating risks, and importantly clearly documenting assumptions.

A key feature of PHPP is its capability for stress testing:

Stress Testing with PHPP:

- **Future warmer climate:** PHPP allows for basic stress testing by assessing the impact of increased temperatures to simulate future warmer climates. This helps in understanding how buildings might perform under higher temperature conditions.
- **Internal Heat Gains (IHGs):** PHPP allows stress testing of higher than expected internal heat gains, such as those from lighting, appliances, and other sources, to ensure that these do not exacerbate overheating issues. Even before stress testing the PHPP uses a higher IHG figure for estimating overheating than for modelling energy and peak heating.
- **Occupancy Patterns:** The tool considers varying occupancy patterns to model how different usage levels affect indoor temperatures.
- **User Behaviour:** PHPP models user behaviour, including window opening and shading practices, which are critical for managing indoor climate and comfort.

Alongside appropriate targets it is critical to review the assumptions for building use and occupant behaviour that are used to achieve the performance. For example it may not be appropriate to assume windows are open 24/7 during summer, due to security, noise, insects etc. PHPP provides documented assumptions for quality checks or reviewing in the case of a building issue.

Documentation and Certification: Passivhaus certifiers require a signed document outlining the summer comfort strategy. This document must confirm that the strategy has been discussed with and understood by the clients or building occupants. This requirement ensures that all parties are aware of and agree to the measures in place to manage overheating risks.

Use in Part O: PHPP has been recognised for its effectiveness in managing overheating risks and has been deemed to satisfy Part O of the Building Regulations (England & Wales) by several Building Control services. The Passivhaus Trust's position paper on this topic [1] outlines why PHPP should be accepted as an alternative means of compliance to both the 'simplified method' and the 'dynamic method' for single-family dwellings and simple building forms. This endorsement underscores PHPP's capability in addressing overheating effectively.

Dynamic Method Consideration: There will be some instances when the dynamic method is more appropriate, for example, in complex buildings or multi-residential buildings. For project teams pursuing Passivhaus certification in these scenarios, the UK Passivhaus Certifiers' Circle has developed guidance to establish a common approach to modelling, reporting, and user handover. This guidance is freely available to download at UK Certifiers' Circle Guidance [2].

Conflicting Approaches and Practical Experience: Experience shows that there can be conflicts between the requirements of Part O, which may mandate larger outward-opening windows for maximum ventilation, and a best practice approach, which optimises window design for daylight while allowing for external shading, insect mesh, and secure night ventilation. In some cases, natural ventilation alone may not suffice, and efficient low-level cooling solutions may be more appropriate. This highlights the importance of balancing different approaches to achieve effective summer comfort and energy efficiency.

General Target Setting: While this question focuses on overheating risks, it is also important to address general target setting for energy performance in buildings. The Passivhaus Trust advocates for clear, simple, and achievable targets. The Energy Use Intensity (EUI) metric, for example, provides a straightforward measure for designers to understand and meet energy performance requirements. Alongside clear fabric performance targets in the form of absolute space heating demand (kWh/m²a) and Peak Heat Load (W/m²). The clarity and consistency of targets in the Passivhaus standard ensure that they drive genuine performance improvements rather than becoming a burdensome box-ticking exercise.

In conclusion, incorporating tools like PHPP into the design and assessment process is crucial for effectively managing overheating risks and ensuring summer comfort. The requirement for a signed summer comfort strategy document further reinforces the importance of client and occupant engagement in managing overheating risks. We recommend that the review considers the use of PHPP as a standard tool for assessing and addressing overheating in single family homes and simple new buildings, given its comprehensive stress testing options and accurate modelling capabilities.

References:

[1] Passivhaus Trust (2023) *Overheating, Part O, and PHPP*
https://www.passivhaustrust.org.uk/guidance_detail.php?gId=62

[2] Passivhaus Trust (2023) *Dynamic Thermal Modelling for Summer Comfort*
https://www.passivhaustrust.org.uk/guidance_detail.php?gId=61

Consultation Question 28

Have you undertaken any projects under the post-2023 energy standards which considered connection to a new or existing heat network, both district heat networks and communal heating systems?

☐ Yes

☐ No

If you answered 'Yes', please share any information you consider influenced the outcome of those projects, with reference to the type of system (district or communal) and the impact of current energy targets in particular. If you answered 'No', please confirm the reason for not considering a heat network solution.

We encourage members to submit projects

Consultation Question 29

Do you have experience of issues affecting development which you consider have arisen from application of current energy and environmental standards set under building regulations?

☐ Yes
☐ No

If you answered 'Yes', please provide information summarising your experience.

Q29 - Passivhaus Trust (PHT) Response

Answer: **Yes**

The Passivhaus Trust has experience with various issues arising from current energy and environmental standards set under building regulations. These issues can impact development quality, energy performance, and occupant comfort. Key areas of concern include:

% reduction reported by Section 6 is not understandable by consumers
There is no feedback loop between existing standards and resident experience of paying bills and energy consumption. It has therefore not been possible to spot quality issues or failures, and therefore no continual improvement of development delivery. Metric should align with what consumer pays for, i.e. kWh delivered energy (EUI), but also with metric to ensure energy efficiency, such as space heating demand or heat load.

Performance Gaps
Broader performance issues, such as missing insulation, inadequate sealing, and ill-specified ventilation systems, highlight limitations in current standards, leading to performance deficiencies and occupant discomfort.

Energy efficiency impact of ventilation and infiltration is not properly accounted for.
The impact of improved ventilation with heat recovery (MVHR) and reducing airtightness is not accounted for correctly within SAP calculations, meaning developers are not sufficiently rewarded for deploying these technologies.

Conflicts Between Passivhaus and Building Standards:
Although there is now less conflict between Section 3 and Passivhaus standards, potential conflicts still exist. For example, Passivhaus mandates specific ventilation requirements to maximise energy efficiency and indoor air quality, which go beyond existing standards. Such conflicts can lead to design and compliance complications, affecting overall project execution and performance.

Additional Compliance Requirements:
Another challenge is the necessity for project teams to complete both the Passivhaus Planning Package (PHPP) and other compliance tools such as SAP (Standard Assessment Procedure) or SBEM (Simplified Building Energy Model). This duplication of effort not only incurs additional costs but also creates unnecessary complexities for many projects. Streamlining the compliance process by integrating Passivhaus certification as a means of satisfying both energy (Section 6.1) and ventilation (Section 3.14) standards would significantly benefit the industry.

In conclusion, the Passivhaus Trust strongly supports the use of the Passivhaus Planning Package (PHPP) as an alternative compliance tool due to its accuracy and ease of use. By adopting PHPP, design teams can effectively manage energy performance and compliance with minimal duplication of effort. Recognising Passivhaus certification as a valid means of compliance and promoting the use of PHPP would streamline processes, reduce costs, and enhance the effectiveness of energy and environmental standards. This approach not only addresses current issues but also contributes to more efficient and sustainable building practices, benefiting the industry as a whole.

SECTION 6 – PROPOSED DELIVERY PROGRAMME (Q30)

Consultation Question 30

Do you agree with the proposal to mandate the standard in 2028, introducing changes initially as a voluntary standard from 2026?

☐ Yes
☐ No
☐ Not sure

Please provide information on why you agree or disagree or if you consider other actions need to be considered.

Q30 - Passivhaus Trust (PHT) Response

Answer: **Yes**

The Passivhaus Trust supports the proposal to implement the Scottish Passivhaus equivalent standard with a phased approach, becoming voluntary in 2026 and mandatory from 2028. This phased transition is beneficial as it provides the industry with adequate time to upskill and train, ensuring preparedness for the mandatory requirements.

Implementing the standard initially on a voluntary basis will offer valuable insights and allow industry stakeholders to adapt to the new standards effectively. To further encourage early adoption, we recommend considering incentives for projects that choose to implement the standard ahead of the mandatory date. These incentives could include benefits such as financial support, expedited approvals, or technical support/ consultancy services.

This approach would not only accelerate the adoption of higher standards but also help gather practical insights to refine and enhance the final mandatory requirements. It is essential that this voluntary period is used to support industry transformation, ensuring that by 2028, the Passivhaus Equivalent standard is fully integrated and delivers meaningful improvements in energy efficiency and sustainability.