



The Building Regulations 2025



Approved Document

Volume 1 – New Builds

Conservation of fuel and power: fabric-first operational energy standard

2026 Edition

For use in Wales*

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What is an Approved Document?

0.1 This Approved Document gives practical guidance on ways of complying with an enhanced fabric-first standard for new dwellings. It is written to support the conservation of fuel and power and the minimisation of greenhouse gas emissions by reducing operational energy demand through improved building fabric.

0.2 Approved Documents provide practical guidance for common building situations. Following the guidance in this document should normally demonstrate reasonable provision for compliance with the proposed fabric-first operational energy standard. Alternative approaches may be used where it can be demonstrated to the building control body that the dwelling achieves an equivalent or better level of performance.

0.3 This Approved Document should be read alongside Approved Document F, Volume 1: Dwellings, relevant net zero frameworks, including the UKGBC Net Zero Carbon Buildings Framework, LETI Climate Emergency Design Guide, Passivhaus, AECB CarbonLite and BREEAM principles. This document focuses on the standard to be achieved, rather than prescribing one fixed construction method.

Section 1: Application and Purpose

Application

1.1 This Approved document applies to the erection of new dwellings in Wales.

1.2 The guidance may also be used for extensions, material changes of use and major renovation work where it is technically, functionally and economically feasible.

1.3 Historic and traditional buildings may require a different approach. Where a dwelling is listed, in a conservation area, of traditional permeable construction, or otherwise subject to special consideration, work should comply with this document so far as reasonably practicable without unacceptably altering the building's character or increasing the risk of long-term fabric deterioration [Welsh Government 2026a].

Purpose

1.4 The purpose of this document is to reduce operational energy demand by improving the permanent performance of the building envelope before reliance is

placed on building services, photovoltaic panels, renewable technologies or offsetting.

1.5 Fabric first design is required because insulation, airtightness, thermal bridge control and high-performance glazing reduce demand for the life of the dwelling. The Passivhaus Trust and AECB warn that weaker fabric standards compensated by additional PV risk poorer fabric efficiency, higher running costs and lower resilience, whereas high-performance fabric measures “bake in” energy efficiency for the lifetime of the building [Passivhaus Trust and AECB 2025].

1.6 This document also recognises that operational carbon cannot be considered in isolation from whole-life carbon. Improvements to the fabric should therefore be durable, proportionate, repairable and designed to avoid unnecessary embodied carbon. The UKGBC framework requires net zero scope, operational energy and construction impact to be clearly defined, while LETI promotes reductions in operational energy alongside embodied carbon reduction [UKGBC, 2019; LETI, 2020].

Section 2: General Principles

Fabric First Hierarchy

2.1 New dwellings should be designed using the following hierarchy in Figure 1.

Figure 1:

Priority	Design Principle
1	Reduce heat loss and heat gain through the building fabric
2	Reduce uncontrolled air leakage
3	Minimise thermal bridging and thermal bypass
4	Provide controlled ventilation with heat recovery or equivalent verified performance
5	Provide efficient low-carbon building services
6	Provide on-site renewable energy only after demand has been reduced
7	Use offsetting only for residual emissions that cannot reasonably be removed

2.2 This hierarchy reflects the principle that the lowest-risk route to net-zero dwellings is to reduce energy demand first. BSRIA describes fabric-first design as high levels of insulation and low level of air leakage, followed by efficient building services, on-site renewable energy and only then offsetting [BSRIA 2025].

2.3 Renewable energy generation should not be used to compensate for poor fabric performance. The purpose of this document is to ensure that all dwellings have a low underlying energy demand before generation is considered [Government Property Agency 2024 & Hopfe and McLeod 2015]

2.4 This approach is consistent with the UKGBC net zero hierarchy, which requires the scope of net zero carbon to be established, operational energy to be measured, and residual emissions to be addressed transparently only after reductions have been made [UKGBC, 2019]. It also reflects LETI guidance, which promotes deep reductions in energy demand through passive design, high-performance fabric and efficient services before offsetting is considered [LETI, 2020].

Operational Energy

2.5 Operational energy means the energy used when the dwelling is occupied, including space heating, hot water, ventilation, lighting, pumps and fixed building services.

2.6 This document focuses mainly on space heating demand because it is directly affected by fabric performance. The Skidmore review states that energy efficiency measures such as insulation reduce overall energy demand, while low-carbon heating and solar work alongside those measures [Skidmore 2023 & Government Property Agency, 2024].

Section 3: Performance Requirements for New Dwellings

Space Heating Demand

3.1 A new dwelling should be designed and constructed so that the calculated annual space heating demand is not greater than:
15kWh/m² treated floor area per year

Or as an alternative route

10W/m² peak heating load.

3.2 This target is based on the Passivhaus Classic Benchmark, which limits space heating demand to 15kWh/m².a or heating load to 10W/m² [Passivhaus Trust n.d].

3.3 The target should be met through the fabric and form of the dwelling, including insulation, airtightness, glazing, orientation, solar control, thermal bridge reduction and ventilation heat recovery. It should not be met by subtracting photovoltaic generation from the energy balance [Passivhaus Trust and AECB 2025].

Minimum Fabric Performance Values

3.4 A new dwelling should achieve fabric performance values of no worse than Figure 2.

Figure 2:

Element	Maximum Value
Roof	0.10 W/m ² K
External Walls	0.15 W/m ² K
Ground Floor	0.10 W/m ² K
Party Wall	0.00 W/m ² K
Window or Roof Window	0.80 W/m ² K Installed whole window value
External Door	1.00 W/m ² K
Air Permeability	0.6 m ³ /(h·m ²) at 50Pa
Thermal Bridging	Calculated junction values; design out avoidable bridges

3.5 These values are intentionally stronger than the previous Welsh Approved Document L 2026 worst acceptable values, which permit roofs at 0.13W/m²K, walls at 0.18–0.21W/m²K, floors at 0.15W/m²K, windows and doors at 1.4W/m²K, rooflights at 2.2W/m²K and air permeability at 8.0m³/(h·m²) at 50Pa [Welsh Government, 2026a]

3.6 These values are consistent with Passivhaus Introductory guidance [Hodgson 2008]

3.7 Area-weighted averaging may be used for opaque elements where the dwelling still meets the space heating demand target in paragraph 3.1. Averaging should not be used to justify poor individual details that create condensation, mould or comfort risks.

Section 4: Airtightness

Requirement

4.1 A new dwelling should achieve an air permeability 0.6 m³/(h·m²) at 50Pa.

4.2 Airtightness should be designed from the start of the project. The design should identify a continuous air barrier around the whole heated envelope. The air barrier should be shown clearly on drawings and should remain continuous at walls, floors, roofs, openings, service penetrations and party wall junctions [BRE N.d].

Reason

4.3 Uncontrolled air leakage increases heat loss and makes the dwelling harder to heat. The BRE Passivhaus Airtightness Guide states that unwanted air leakage significantly increases space heating demand, causes cold draught discomfort, can contribute to interstitial condensation and may reduce indoor air quality [BRE n.d].

4.4 Air leakage is not considered ventilation. BSRIA explains that air leakage is uncontrolled in quantity, timing and location, while a designed ventilation system provides indoor air quality without heat loss [BSRIA 2025].

4.5 The Passivhaus introductory guidance also states that unwanted air leakage can significantly increase the space heating requirement, cause draught discomfort and allow moisture to accumulate within the fabric, reducing the building performance and lifespan.

Testing

4.6 Every new dwelling should be pressure tested before completion

4.7 An interim airtightness test should be carried out before finishes conceal the air barrier. The final test should be carried out when the dwelling is complete.

4.8 The following evidence should be submitted to the building control body:

- Airtightness strategy drawing
- Interim test results
- Final airtightness test certificate
- Photographic evidence of sealed junctions and service penetrations
- Record of remedial works carried out after testing

4.9 The Passivhaus Designer's Manual emphasises that responsibility for maintaining envelope airtightness should be clearly defined and regularly monitored, with key targets and milestones agreed before works commence [Hopfe and Mcleod 2015].

Section 5: Continuity of Insulation and Thermal Bypass

Requirement

5.1 The insulation layer should be continuous around the whole thermal envelope.

5.2 Gaps, voids, missing insulation, poorly fitted boards, unsealed cavities and unintended air paths should be avoided.

5.3 The person carrying out the work should provide evidence that insulation was installed continuously before it was covered.

Reason

5.4 Gaps in insulation can significantly increase heat loss and thermal bypass and create a risk of condensation and mould [Welsh Government 2026a]. This document intends to require inspection and evidence, not just design-stage intent.

5.5 The Scottish Technical Handbook similarly states that incorrect detailing or poor construction can significantly affect building performance and that the insulation envelope should limit heat loss through thermal bridging. It also requires designers to demonstrate continuity of insulation and of the air and vapour control layer [Scottish Government 2026].

5.6 The following locations should receive particular attention:

- Wall-to-roof junctions
- Wall-to-floor junctions
- Window and door reveals
- Cavity closers
- Eaves and verges
- Dormers and rooflights
- Service penetrations
- Balcony and canopy connections
- Party wall edges
- Structural steel or concrete elements passing through insulation

Section 6: Thermal Bridging

Requirement

6.1 Thermal bridges should be designed out where reasonably practicable. Where this is not possible, each significant junction should be calculated and included in the energy model.

6.2 A junction with a Ψ -value greater than $0.01\text{W}/(\text{mK})$ should be treated as a significant thermal bridge and should be included in the energy model. This does not mean that every junction must be below $0.01\text{W}/(\text{mK})$, but it does mean that avoidable thermal bridges must be assessed, justified and reduced.

6.3 Each significant junction should be assessed using one of the following:

- Numerical modelling in accordance with ISO 10211
- A verified thermal bridge catalogue
- Independently certified construction details
- PHPP-certified thermal bridge-free details

Reason

6.4 BS EN ISO 14683 explains that thermal bridges give rise to changes in heat flow rates and surface temperatures compared with unbridged construction [BSI 2017].

6.5 PHPP guidance describes thermal bridges as weak points in the building envelope that increase heat loss, reduce internal surface temperatures and increase condensation and mould risk [Lewis, 2026].

6.6 Thermal bridge calculations should be submitted as a schedule showing:

- Junction reference
- Junction length
- Calculated Ψ -value
- Calculation method
- Drawing reference
- Total heat loss contribution

Section 7: Windows, Doors and Openings

Requirement

7.1 Windows and doors should be specified using installed whole-unit performance, not centre-pane values alone.

7.2 Window and door U-values should include the glazing, frame, spacer, sash, mullions, transoms, sills, thresholds and frame extenders where present.

7.3 Window installation should minimise thermal bridging at the reveal, sill and head.

7.4 The installed whole-window U-value should not exceed $0.80 \text{ W/m}^2\text{K}$.

7.5 Glazing design should balance winter heat loss, useful solar gain, summer overheating risk, daylight and occupant comfort.

Reason

7.6 Window detailing has a significant effect on heat demand. PHPP guidance notes that window performance is highly dependent on installation and that reducing window junction thermal bridges can reduce overall heat demand [Lewis 2026].

7.7 Passivhaus guidance states that triple-glazed windows with U-values around $0.80 \text{ W/m}^2\text{K}$ help reduce heat loss and improve internal surface temperatures, while also reducing external noise transmission [Hodgson 2008].

Section 8: Ventilation in Airtight Dwellings

Requirement

8.1 A dwelling designed to the airtightness standard in Section 5 should be provided with continuous whole-dwelling ventilation. The ventilation system should meet the requirements of Approved Document F and should normally provide a minimum outdoor air supply rate of approximately 30m³/hr per person, unless an alternative rate is justified by the relevant ventilation calculation method.

8.2 The normal route to compliance should be balanced mechanical ventilation with heat recovery, unless an alternative system demonstrates equivalent performance for:

- Indoor air quality
- Moisture removal
- Summer bypass or overheating strategy
- Acoustic comfort
- Energy efficiency
- Commissioning and maintainability

8.3 MVHR should be designed, installed and commissioned by competent persons.

Reason

8.4 Highly airtight homes need reliable purpose-provided ventilation. NHBC Foundation research on MVHR in zero carbon homes explains that, if ventilation provision is insufficient, reduce air infiltration can lead to poor indoor air quality, pollutant build-up, high humidity, condensation, mould growth, house dust mite risks, respiratory issues and damage to the structure [Dengel and Swainson 2013].

8.5 Approved Document F also identifies ventilation as a means of controlling moisture, indoor pollutants and bioeffluents, with performance criteria for moisture and indoor pollutants [Welsh Government 2026b].

8.6 Ventilation must therefore be treated as a health and building fabric protection-measure, not merely as an energy efficiency measure. NHBC research into zero carbon homes found that MVHR performance depends on design, procurement, installation, commissioning, performance, maintenance and occupant perception [Dengel and Swainson 2013].

Specification

8.7 The ventilation specification should include measurable performance criteria.

8.8 The Passivhaus Trust MVHR guide states that specifications should include criteria that can be verified by assessment or measurement through design, installation and commissioning. It warns that a vague requirement to “install MVHR” does not properly define responsibility or allow performance to be verified [Passivhaus Trust, 2018].

8.9 The specification should include the following:

- Whole-dwelling supply and extract rates
- Room-by-room airflows
- Heat recovery efficiency
- Specific fan power
- Sound limits
- Ductwork layout
- Filter grade and access
- Controls
- Commissioning method
- User handover requirements

Commissioning and Maintenance

8.10 Before completion, the ventilation should be commissioned and balanced.

8.11 The commissioning certificate should include measured supply and extract rates, system balance, fan setting, noise checks, controls check and confirmation that filters and access arrangements are installed correctly.

8.12 Where the system cannot be commissioned to the design values, the dwelling should not be treated as compliant until the defect is corrected.

8.13 MVHR filters should be accessible without specialist tools. NHBC monitoring found that difficult filter access made regular checking and replacement unlikely [Dengel and Swainson, 2013].

Section 9: Modelling and Compliance Routes

Standard Route

9.1 Compliance must be demonstrated using an appropriate energy model where the dwelling meets all the following:

- Annual space heating demands no greater than 15 kWh/m².a or peak heating load no greater than 10 W/m²
- All fabric values in figure 2
- Airtightness in section 4

- Calculated thermal bridges in section 6
- Commissioned ventilation in section 8
- As-built evidence in section 9

PHPP Route

9.2 A dwelling may be deemed to satisfy this document where it is certified to Passivhaus Classic, Passivhaus Plus, Passivhaus premium or an equivalent independently verified low-energy standard.

9.3 PHPP may be accepted as a compliance methodology because it is a design and verification tool with a strong evidence base. PHPP Illustrated describes PHPP as one of the most accurate energy-efficiency calculation and design tools [Lewis 2026].

9.4 PHPP should be used from an early design state. Unlike late-stage compliance checks, it allows designers to adjust and optimise the building as the design develops [Lewis 2026].

Deemed to Satisfy Route

9.5 Certified Passivhaus and verified AECB CarbonLite projects should be accepted as deemed-to-satisfy where the certification covers the completed dwelling.

9.6 This is to ensure robust independent quality assurance by preventing duplicated modelling by recognising verified Passivhaus and AECB CarbonLite projects [Passivhaus Trust and AECB 2025].

Comparative Standards

9.7 This document aligns with the wider direction of UK energy policy. Scotland's 2026 Domestic Technical Handbook explains that focus on improved building fabric effectively reduce the space heating demand [Scottish Government 2026].

9.8 Scotland's Domestic Technical Handbook demonstrates that higher fabric standards are already used in UK regulatory development [Scottish Government 2026].

Section 10: Implementation, Limitations and Risk Control

10.1 The enhanced fabric standard is intended to be ambitious but deliverable. However, the following implementation risks should be considered during design and construction:

- Lack of site skills in airtightness detailing
- Poor coordination between fabric and services

- Incorrect MVHR design or commissioning
- Overheating risk from excessive solar gains
- Additional embodied carbon from unnecessary materials
- Performance gaps between design and as-built construction
- Poor occupant understanding of controls and ventilation

10.2 These risks should not be used to weaken the standard. Instead, they should be managed through the early design coordination, competent designers, tested construction details, interim inspections, airtightness testing, MVHR commissioning and clear handover information.

10.3 Whole-life carbon should be considered when selecting materials and systems. The relationship between operational and embodied carbon is central to low-carbon building design, particularly because mechanical systems require maintenance and replacement over a shorter life cycle than passive fabric measures [Sturgis 2017]. The Institution of Structural Engineers also recommends challenging the brief, extending asset life, starting with reuse and avoiding reliance on offsetting [Institution of Structural Engineers, 2021].

10.4 Where the proposed standard is technically difficult to meet, the designer should submit evidence explaining the constraint, the alternative solution and how equivalent operational energy performance will be achieved.

Section 11: Evidence and Quality Assurance

Design-Stage Submission

11.1 Before works start, the person carrying out the work should submit:

- Energy Model
- Space heating demand & heating load result
- U-value Calculations
- Airtightness Strategy
- Thermal Bridge Schedule
- Ventilation Design
- Construction Drawings showing insulation and air barrier continuity
- Specification of windows, doors and MVHR

11.2 This builds on the existing Regulation 27B approach, which already requires target fabric values, designed fabric values and a construction specification before works start [Welsh Government 2026a].

Construction Stage Evidence

11.3 Photographic evidence should be recorded before work is covered.

Photographs should show:

- Insulation Continuity
- Window and door installations
- Air barrier junctions
- Service Penetrations
- Roof, wall and floor junctions
- Thermal bridge details
- MVHR ductwork and insulation
- Remedial works following airtightness testing

11.4 The GPA guide recommends quality monitoring during construction to ensure proper installation of insulation, airtightness and mechanical equipment followed by review of rectification works, airtightness testing and final as-built energy modelling [Government Property Agency 2024].

Completion-Stage Submission

11.5 Within five days of completion, the following should be submitted:

- As built energy model
- Finals U-value schedule
- Final thermal bridge schedule
- Airtightness certificate
- Ventilation commissioning certificate
- Photographic evidence file
- List of variations from the design-stage submission
- Occupier handover pack

11.6 The existing Part L process already requires as-constructed fabric values and confirmation of whether the dwelling was constructed in accordance with the submitted specification [Welsh Government 2026a]. This document makes that process more robust by requiring evidence for the fabric details that most affect operational energy.

Section 12: Handover and Operation

12.1 The occupier should be given clear information explaining:

- How the ventilation system works
- How and when filters should be replaced
- How heating controls should be used

- How overheating should be managed
- Why vents, terminals and air transfer routes should not be blocked
- Where airtightness and ventilation certificates are stored

12.2 The handover information should be written in plain language.

12.3 Where MVHR is installed, the occupier should be shown how to use boost, summer bypass, filter alarms and any maintenance access panels.

12.4 Handover is important because occupants may not fully understand the technologies in high efficiency homes. NHBC research found that occupants in zero carbon homes often didn't fully understand the technologies [Dengel and Swainson 2013].

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