PAS 2035:2023

Retrofitting dwellings for improved energy efficiency – Specification and guidance






Department for Energy Security & Net Zero

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Foreword

Publishing information

This PAS was sponsored by the Department for Energy Security and Net Zero (DESNZ). Its development was facilitated by BSI Standards Limited and it was published under licence from The British Standards Institution. It will come into effect on 30 March 2025.

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- Solid Wall Insulation Guarantee Agency (SWIGA)
- The Installation Assurance Authority
- TrustMark
- Welsh Government

Acknowledgement is also given to the members of a wider review panel who were consulted in the development of this PAS.

This PAS is not to be regarded as a British Standard. It will be withdrawn in the event it is superseded by a British Standard.

The PAS process enables a standard to be rapidly developed in order to fulfil an immediate stakeholder need. A PAS can be considered for further development as a British Standard, or constitute part of the UK input into the development of a European or international standard.

Supersession

PAS 2035:2023 supersedes PAS 2035:2019+A1:2022 which remains current and will be withdrawn on 30 March 2025.

Information about this document

This is a full revision of the document and introduces the following principal changes.

- PAS 2035 guidance clauses have been updated to:
  a) reflect national policy; and
  b) emphasize the role of PAS 2035 in protecting the consumer.
- Clauses have been included to facilitate scale retrofit by allowing retrofit design to commence based on assessments of archetypes.
- The BEIS retrofit technical guides have been included as references.
- The risk assessment process has been simplified to avoid unintended complexities.
- Change of emphasis from measures-based retrofit to whole dwelling retrofit by including more reference to a Main Contractor.
- Clarification of the role of the Retrofit Coordinator, including site visits and recording of non-compliance.
- Contents of a Medium-Term Improvement Plan is now a requirement rather than guidance.
- Requirements to produce an airtightness strategy for projects, which can include setting of an airtightness target and air leakage testing.

- Clarification of what happens in the PAS 2035 process if historic significance is identified. A new Annex E is included.
- Annex C has been simplified where possible and brought in line with the new Approved Document F
- Further Monitoring and Evaluation references the new BS 40101 Building Performance Evaluation, and Monitoring and Evaluation is now considered from inception through to completion.
- A process has been included whereby distressed replacement of heating appliances can retrospectively comply with PAS 2035.
- The guidance and requirements for climate resilience and adaptation in retrofit has been strengthened.
- The requirements and qualifications for independent inspection of the pre-installation building inspection (PIBI) in some PAS 2030 annexes have been strengthened.
- Requirements and guidance around moisture in buildings has been brought in line with language in BS 5250.

This publication can be withdrawn, revised, partially superseded or superseded. Information regarding the status of this publication can be found in the Standards Catalogue on the BSI website at bsigroup.com/standards, or by contacting the Customer Services team.

PAS 2035:2023 is published with the expectation that users intending to claim compliance with it, will commence adoption of its provisions immediately following publication with a view to fully meeting its requirements and claiming compliance with PAS 2030:2023 and therefore also PAS 2035:2023, by 30 March 2025. During this period, PAS 2035:2019+A1:2022 will remain available for use where required but will be withdrawn on 30 March 2025.

Where websites and webpages have been cited, they are provided for ease of reference and are correct at the time of publication. The location of a webpage or website, or its contents, cannot be guaranteed.

Relationship with other publications

PAS 2035:2023 is intended to be read and used in conjunction with PAS 2030:2023.

Presentational conventions

The provisions of this document are presented in roman (i.e. upright) type. Its requirements are expressed in sentences in which the principal auxiliary verb is "shall".

Commentary, explanation and general informative material is presented in smaller italic type, and does not constitute a normative element.

Where words have alternative spellings, the preferred spelling of the *Shorter Oxford English Dictionary* is used (e.g. "organization" rather than "organisation").

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0 Introduction

Statutory national targets for the reduction of greenhouse gas emissions in response to the threat of climate change imply that very significant improvements need to be made in the energy efficiency of the UK's building stock, including nearly all its 27 million domestic buildings. The Climate Change Committee sets "carbon budgets" under the Climate Change Act 2008 [1], and the Government's Net Zero Strategy [2] includes a commitment to improvements in Energy Performance Certificate (EPC) scores in existing dwellings.

This PAS supports work towards those objectives by promoting and defining technically robust and responsible "whole-dwelling" domestic retrofit work, i.e. high-quality work that supports:

a) improved functionality, usability and durability of buildings;
b) improved comfort, health and wellbeing of building occupants and visitors;
c) improved energy efficiency, leading to reduced fuel use, fuel costs and pollution (especially greenhouse gas emissions associated with energy use);
d) reduced environmental impacts of buildings;
e) protection and enhancement of the architectural and cultural heritage as represented by the building stock;
f) avoidance of unintended consequences related to any of the above;
g) minimization of the "performance gap" that occurs when reductions in fuel use, fuel cost and carbon dioxide emissions are not as large as intended or predicted; and
h) protection of the general public and the client in relation to retrofit work.

The requirements and guidance presented in this PAS are intended to apply to improvement measures in the context of a whole dwelling approach to retrofit that takes the points listed above into account. The whole dwelling approach considers the building as a system of elements, interfaces and occupants that interact, and not as a set of elements that are independent of each other or of occupants' practices and lifestyle.

This PAS is intended to support both the one-off installation of improvement measures and a staged approach in which improvement measures are implemented over time. It is compatible with current national and EU schemes, including the Building Performance Institute Europe scheme[1)] and *Building Renovation Passports* [3].This PAS has a role in protecting the client by reducing the risk of unintended consequences and through effective communication and advice via the individuals involved in a retrofit project that are defined in this PAS. A key role in the PAS is the Retrofit Coordinator, who is both client facing and responsible for retrofit works being compliant with PAS 2035.

Health and safety in construction projects, which include retrofit projects following this PAS, is particularly important because the industry is prone to hazardous situations and can be dangerous at times. Good health and safety processes help protect both the construction workers and the general public, which in retrofit situations often includes the occupants of the dwelling.

NOTE 1 *The Construction (Design & Management) Regulations (CDM 2015) are the main set of regulations for managing the health, safety and welfare of construction projects. CDM applies to all building and construction work and includes new build, demolition, refurbishment, extensions, conversions, repair and maintenance. Following these regulations, as well as the Building Regulations of England, Scotland, Ireland and Wales is implicit for the majority of the projects that follow this PAS.*

In 2015, the UK Government commissioned the *Each Home Counts* review [4] (originally known as the "Bonfield Review") to determine ways of improving the confidence of both Government and clients in the domestic retrofit industry and improving the quality and effectiveness of retrofit work. The report of the review published in December 2016 contains 27 recommendations, including the establishment of a quality mark for domestic retrofit supported by an industry Code of Conduct, a Consumer Charter and a framework of technical standards for retrofit. The quality mark has subsequently been established as the TrustMark quality scheme.

PAS 2035 is the overarching document in the retrofit standards framework. All the other standards referred to in this PAS are part of the retrofit standards framework (see Clause **15**). This PAS and the retrofit standards framework can be applied to all domestic retrofit activity.

[1)] Available at see https://www.bpie.eu/.

Designs for the installation of retrofit measures in domestic buildings that are prepared in accordance with PAS 2035 are required to be installed, commissioned and handed over in accordance with PAS 2030, or in some cases in accordance with the Microgeneration Certification Scheme (MCS) standards ([N1], [N2]).

Requirements for the installation, commissioning and handover of retrofit measures are provided in PAS 2030, or in some cases in the MCS standards ([N1], [N2]).

Users of PAS 2030 are required to work to designs that conform to this PAS.

For domestic retrofit projects, PAS 2035 and PAS 2030 are effectively intended to be used in conjunction with each other, because one standard cannot be used without the other. The only exception is installation of some measures in accordance with the MCS standards ([N1], [N2]), rather than PAS 2030, where specified.

Figure 1 illustrates the overall process that users of PAS 2035 are expected to follow in order to comply with the requirements.

Figure 1 – *The domestic retrofit process required by PAS 2035 and PAS 2030*

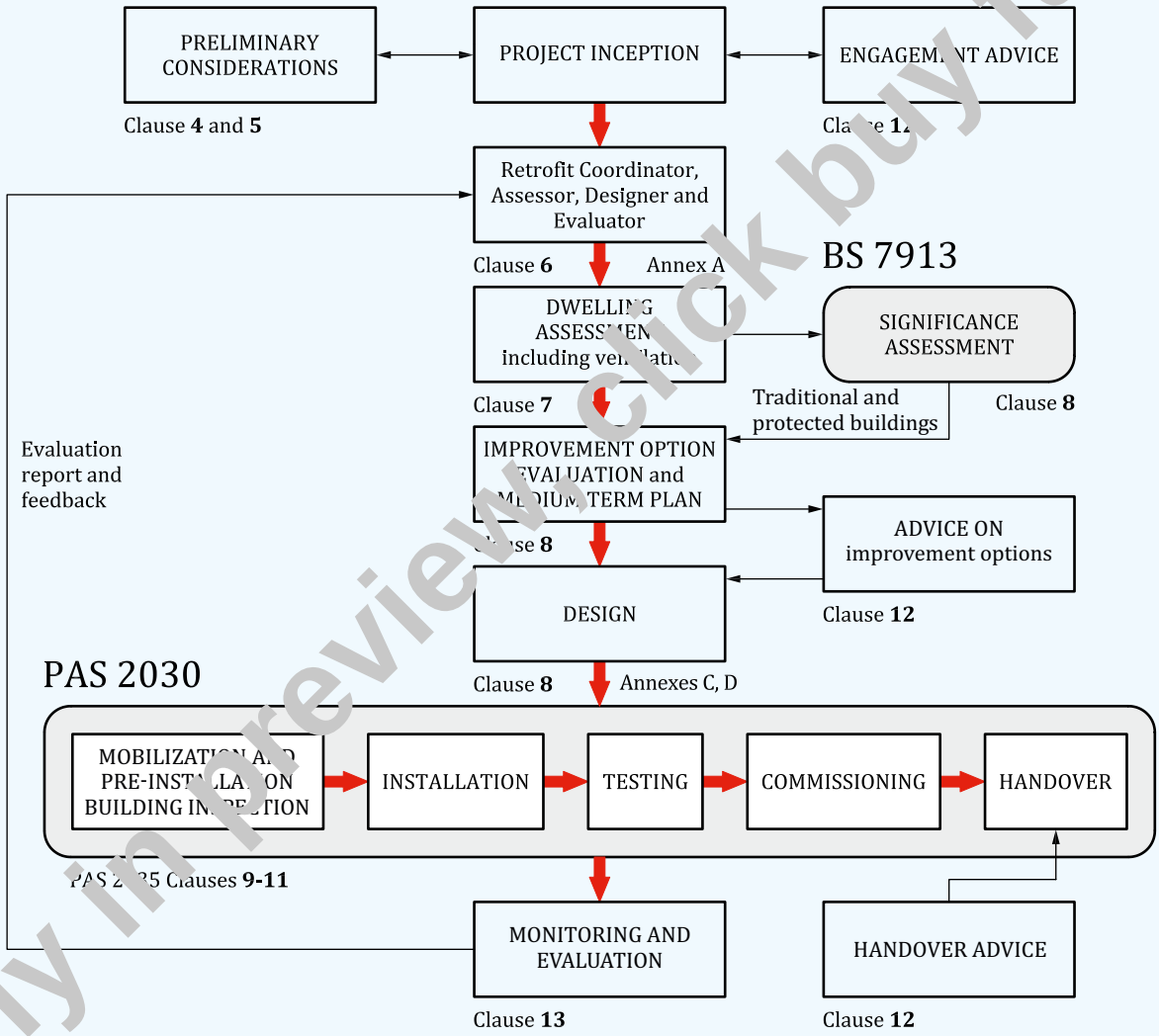
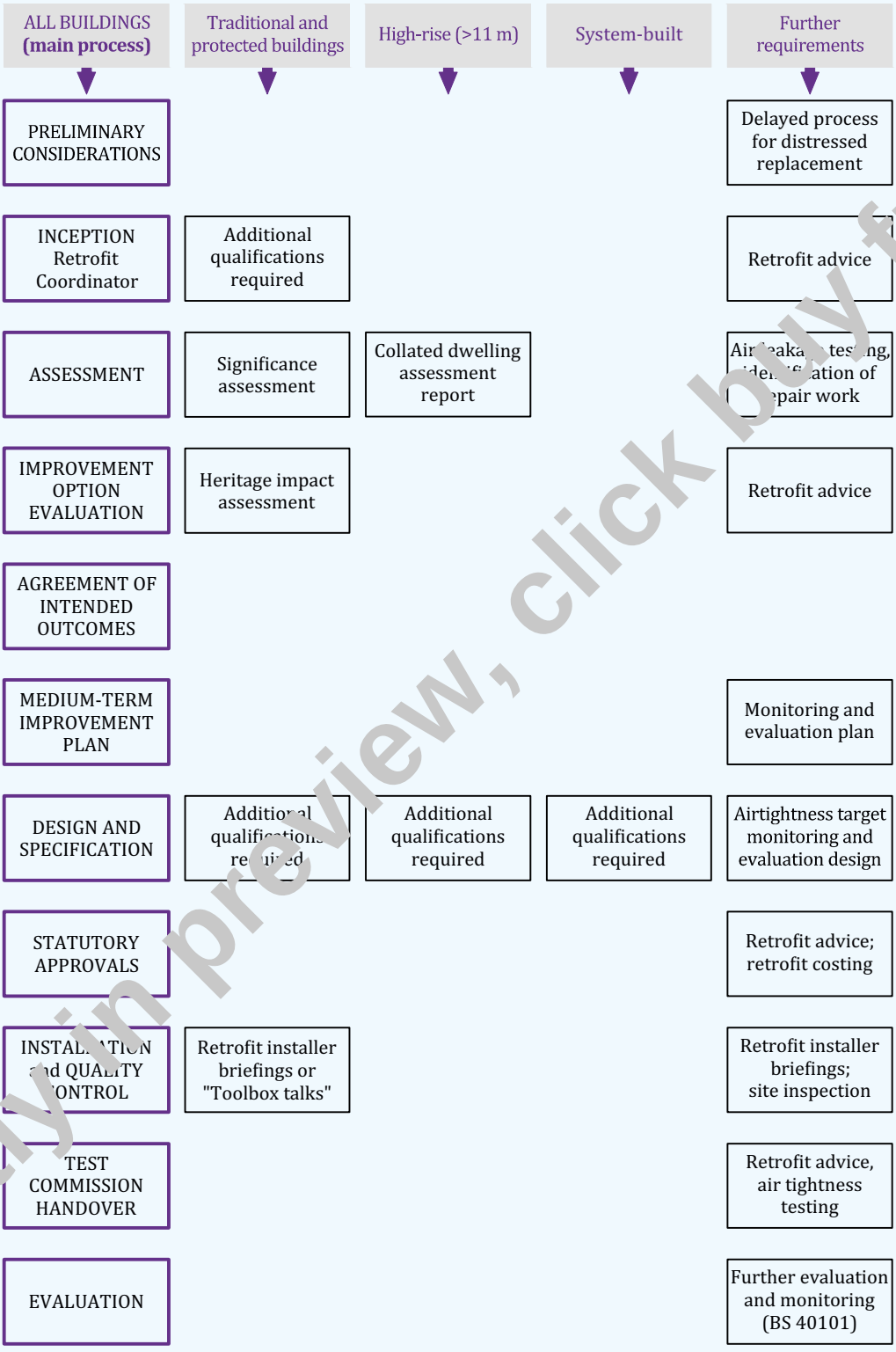


Figure 2 illustrates in more detail the process for different types of projects that users of PAS 2035 are expected to follow in order to comply with its requirements.

Figure 2 – *Domestic retrofit process that users are expected to follow in order to meet the requirements of PAS 2035*



NOTE 2 *Figure 2 reflects only the requirements of PAS 2035. Other requirements might be part of the retrofit process as defined by UK building regulations or other statutory obligations.*

1 Scope

This PAS specifies requirements for retrofit of dwellings, including:

a) assessment of dwellings for retrofit;

b) identification and evaluation of improvement options (energy efficiency measures, or EEMs);

c) design and specification of EEMs (whether individual measures or packages of multiple measures); and

d) monitoring and evaluation of retrofit projects.

This PAS covers EEMs that are intended to:

1) improve the insulation of the elements of the building fabric (external walls, roofs, floors, windows and doors) and reduce thermal bridging;

2) improve the airtightness of the building envelope;

3) establish a safe dynamic moisture equilibrium through each element of the building fabric;

4) improve the resilience of the building envelope in order to maintain the thermal properties of the building fabric and the capability of the building envelope to manage moisture in a manner suited to its construction;

5) reduce heat loss from ventilation with the use of high efficiency heat exchangers in a fully ducted ventilation system;

6) minimize the risks associated with vapours or other products, for example volatile organic compounds (VOCs), released within buildings subsequent to their airtightness being improved;

7) minimize the risks associated with overheating;

8) provide efficient heating and cooling systems with responsive, intelligent or "smart" controls, including systems that use low or zero carbon (LZC) technologies;

9) provide efficient water heating systems with responsive controls, including systems that use LZC technologies;

10) provide efficient fixed lighting, appliances and equipment with appropriate controls;

11) reduce electricity use and minimize internal heat gains, including systems that use LZC technologies;

12) provide on-site energy storage to improve the usefulness of energy generated by LZC technologies; and

13) reduce the impact of climate change on the building and the occupant.

Alongside the installation of EEMs to achieve some of the intended outcomes above, this PAS also covers the installation of:

- ventilation to achieve good internal air quality and minimize the risk of condensation;
- metering and monitoring systems to promote the efficient use of energy; and
- climate change adaptations needed to improve the resilience of the building to existing and/or future risk from climate change.

In addition to setting out requirements for the commissioning and handover of all of the above, this PAS specifies requirements for advising building occupants about improvement options appropriate to their homes, and the efficient and appropriate use and maintenance of their retrofitted homes, as well as for monitoring and evaluating retrofit projects when appropriate, and feeding back lessons learned to all parts of the supply chain, including the building occupants.

While the PAS 2035 process includes maintenance and repair, works that consist exclusively of maintenance and repair do not necessarily need to follow the full PAS 2035 process. This PAS does not apply to maintenance or repair of any element of an existing dwelling, or system installed in it, which does not involve improvement of the energy performance or ventilation of the dwelling, or a reduction of the carbon dioxide emissions associated with energy use in the dwelling. Nor does this PAS apply to "like for like" replacement of damaged or worn-out elements or systems that do not involve improvement of the energy performance or ventilation of the dwelling, or a reduction of the carbon dioxide emissions associated with energy use in the dwelling. This PAS does, however, apply to the distressed replacement of heating appliances, for which a specific process is outlined throughout.

NOTE *Appropriate repair and maintenance of the building fabric can improve energy efficiency and is always the first step in energy efficiency improvements, even though it is not covered in this PAS. Otherwise, an unacceptable level of risk to the future condition of the building might be introduced.*