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PAS 2035:2019, incorporating Corrigendum No.1 2020

Retrofitting dwellings for improved energy efficiency – Specification and guidance

PAS 2030:2019, incorporating Corrigendum No.1 2020

Specification for the installation of energy efficiency measures in existing dwellings and insulation in residential park homes

BSI Group
389 Chiswick High Road
London, W4 4AL
United Kingdom

T: +44 20 845 086 9001
F: +44 20 8996 7400
cservices@bsigroup.com
bsigroup.com

British Standards Limited
Registered in England no: 07864997
Registered address: 389 Chiswick High Road
London, W4 4AL, United Kingdom

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Retrofitting dwellings for improved energy efficiency – Specification and guidance

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Contents

Foreword

This PAS was sponsored by the Department for Business, Energy and Industrial Strategy (BEIS). Its development was facilitated by BSI Standards Limited and it was published under licence from The British Standards Institution. It comes into effect on 30 June 2019.

Acknowledgement is given to Dr. Peter Rickaby, BSI Retrofit Standards Task Group, as the technical author, and the following organizations that were involved in the development of this PAS as members of the steering group:

- Association for Environment Conscious Building (AECB)
- British Board of Agrément (BBA)
- British Electrotechnical and Allied Manufacturers' Association (BEAMA)
- BSI Retrofit Standards Task Group
- Building Research Establishment (BRE)
- Building Services Research and Information Association (BSRIA)
- Build Test Solutions (BTS)
- Cavity Insulation Guarantee Agency (CIGA)
- Chartered Institute of Building (CIOB)
- Chartered Institution of Building Services Engineers (CIBSE)
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- Department for Business, Energy and Industrial Strategy (BEIS)
- Each Home Counts (EHC)
- Edwards Hart Ltd
- Electrical Contractors' Association (ECA)
- Elmhurst Energy
- Energy UK
- Environmental Change Institute (ECI), University of Oxford
- Fortem
- Historic Environment Scotland (HES)
- Institution of Engineering and Technology (IET)
- Mineral Wool Insulation Manufacturers Association (MIMA)
- Ministry of Housing, Communities and Local Government (MHCLG)
- National Inspection Council for Electrical Installation Contracting (NICEIC)
- National Insulation Association (NIA)
- Office of Gas and Electricity Markets (Ofgem)
- Oil Firing Technical Association (Oftec)
- Prewett Bizley Architects
- Rockwool
- Solid Wall Insulation Guarantee Agency (SWIGA)
- Sustainable Traditional Buildings Alliance (STBA)
- THS Inspection Services Ltd
- TrustMark
- United Kingdom Accreditation Service (UKAS)

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

The PAS process enables a Specification to be rapidly developed in order to fulfil an immediate need in industry. 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

[C1] PAS 2035:2019, incorporating Corrigendum No.1 2020 supersedes PAS 2035:2019 which will be withdrawn. Together with PAS 2030:2019, incorporating Corrigendum No.1 2020, PAS 2035:2019, incorporating Corrigendum No.1 2020 also supersedes PAS 2030:2017. This will be withdrawn on 30 June 2021. [C1]

Relationship with other publications

PAS 2035 is intended to be read, and used, in conjunction with the current version of PAS 2030.

Information about this document

The PAS provides a specification for the energy retrofit of domestic buildings and best practice guidance about domestic retrofit projects. It is intended not only to support the Each Home Counts quality mark (now known as the TrustMark Government endorsed quality scheme) for domestic retrofit (see Clause **1**) but also to be applied to any domestic retrofit work carried out in the UK.

C1 PAS 2035:2019, incorporating Corrigendum No.1 2020 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 2035:2019, incorporating Corrigendum No.1 2020 and therefore also PAS 2030:2019, incorporating Corrigendum No.1 2020, by 30 June 2021. During this period PAS 2030:2017 remains available for use where required but will be withdrawn on 30 June 2021. C1

Use of this document

It has been assumed in the preparation of this PAS that the execution of its provisions will be entrusted to a competent person or persons for whose use it has been produced.

This PAS is not to be regarded as a British Standard, European Standard or International Standard. In the event that this PAS is used to form the basis of a full British Standard, European Standard or International Standard, it will be withdrawn.

BSI permits the reproduction of PAS 2035:2019, Figure **D.1**. This reproduction is only permitted where it is necessary for the user during the decision-making process for retrofit designs during each application of the PAS. A larger version of Figure **D.1** is available.

Presentational conventions

This PAS combines requirements for retrofit of domestic buildings with guidance about best practice in undertaking domestic retrofit projects.

Both requirements and guidance are presented in roman (i.e. upright) type, but they are distinguished in Clause and annex titles. Requirements are expressed in sentences in which the principal auxiliary verb is "shall". Recommendations and guidance are expressed in sentences in which the principal auxiliary verb is "should".

Commentary, explanation and general informative material, e.g. notes, are presented in italic type, and do not constitute a normative element.

Contractual and legal considerations

This publication does not purport to include all the necessary provisions of a contract. Users are responsible for its correct application.

Compliance with this PAS does not confer immunity from legal obligations.

0 Introduction

0.1 Context

0.1.1 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 EU objective is to achieve Near Zero Energy Buildings throughout the EU. This PAS supports work towards those objectives by promoting and defining technically robust and responsible "whole-building" domestic retrofit work, i.e. high-quality work, that supports:

- improved functionality, usability and durability of buildings;
- improved comfort, health and well-being of building occupants and visitors;
- improved energy efficiency, leading to reduced fuel use, fuel costs and pollution (especially greenhouse gas emissions associated with energy use);
- reduced environmental impacts of buildings;
- protection and enhancement of the architectural and cultural heritage as represented by the building stock;
- avoidance of unintended consequences related to any of the above;
- 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.

0.1.2 The requirements and guidance presented in this PAS are intended to apply to improvement measures in the context of a holistic approach to retrofit that takes the points listed above into account. The holistic 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.

0.1.3 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 and Building Renovation Passports.

0.2 Each Home Counts

0.2.1 In 2015 the Government commissioned the Each Home Counts review [8] (originally known as the Bonfield Review) to determine ways of improving the confidence of both Government and consumers in the domestic retrofit industry and improving the quality 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 Government endorsed quality scheme.

0.3 The retrofit standards framework

0.3.1 PAS 2035 is the over-arching document in the retrofit standards framework, with which users of the TrustMark Government endorsed quality scheme are required to comply when carrying out domestic retrofit work. All the other standards referred to in this PAS are part of the retrofit standards framework (see Clause **16**); users of the TrustMark Government endorsed quality scheme should also comply with those standards, as appropriate. PAS 2035 may also be applied to retrofit projects outside the TrustMark quality assurance framework.

0.4 The relationship with PAS 2030

0.4.1 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 2030:2019, or in some cases in accordance with the Microgeneration Certification Scheme (MCS) standards [N7], [N8].

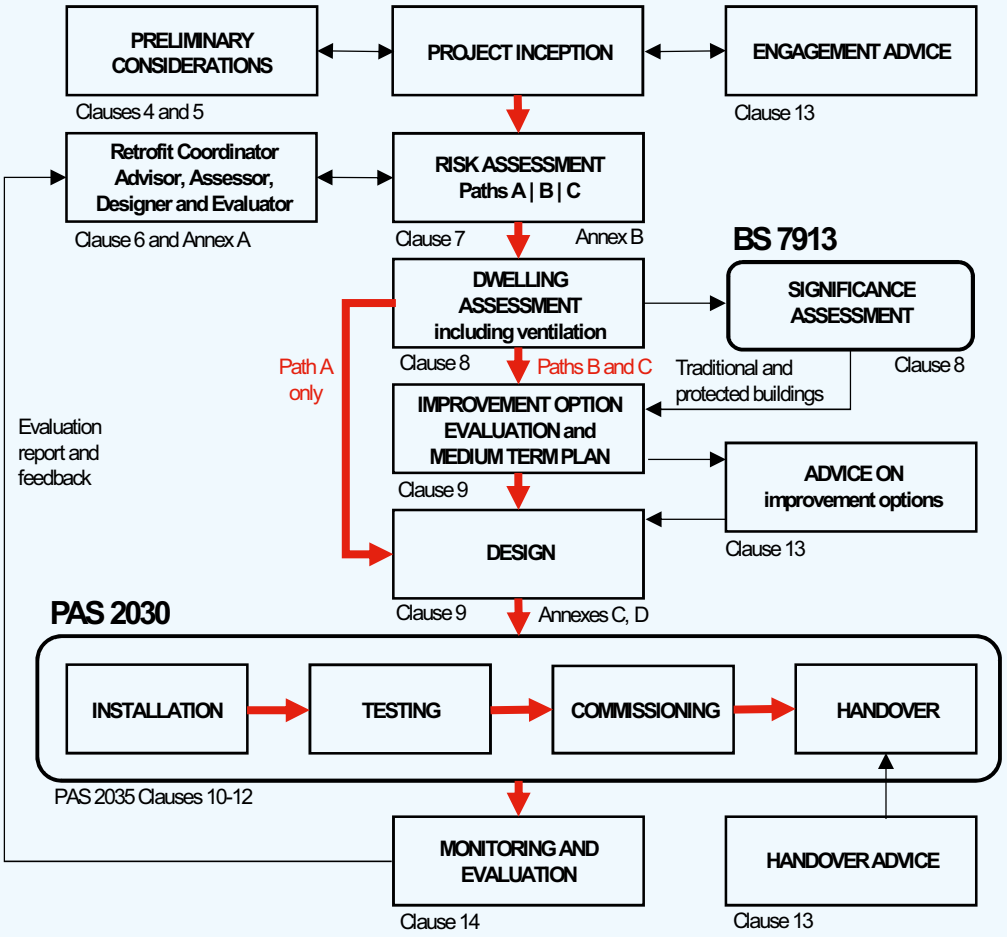
0.4.2 Requirements for the installation, commissioning and handover of retrofit measures are provided in PAS 2030, or in some cases in the MCS standards. Users of PAS 2030:2019 are required to work to designs that comply with this PAS.

0.4.3 Thus, for domestic retrofit projects, PAS 2035 and PAS 2030:2019 are effectively "locked together", because one standard may not be used without the other. The only exception is installation of some measures in accordance with the MCS standards, rather than PAS 2030, where specified.

0.5 The PAS 2035 process

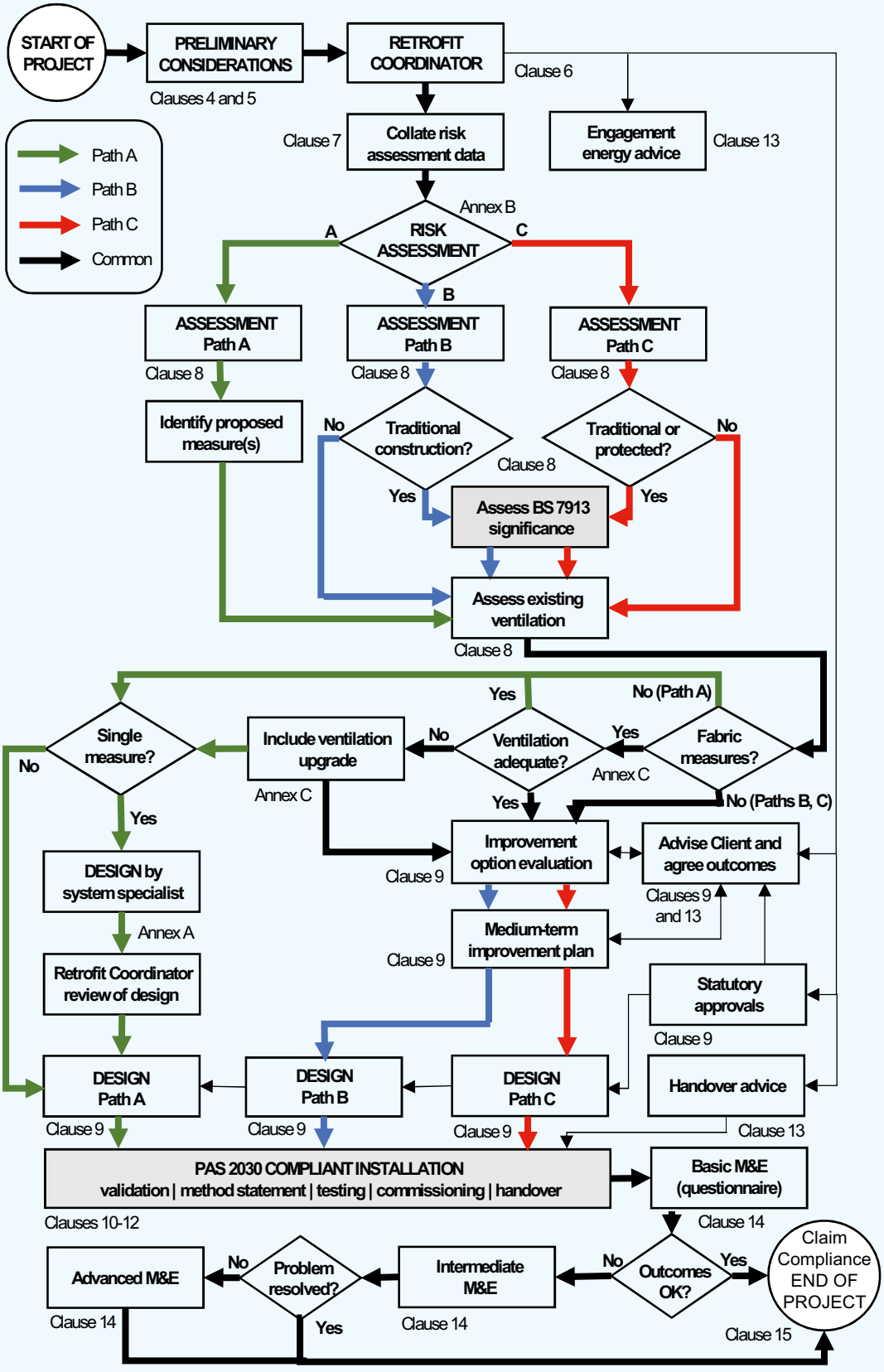
0.5.1 Figure **0.1** illustrates the broad overall process that users of PAS 2035 are expected to follow in order to comply with its requirements.

Figure 0.1 – A diagrammatic overview of the domestic retrofit process required by PAS 2035 and PAS 2030



0.5.2 Figure **0.2** illustrates in more detail the process that users of PAS 2035 are expected to follow in order to comply with its requirements.

Figure 0.2 – A flow-chart illustrating the domestic retrofit process that users are expected to follow in order to meet the requirements of PAS 2035



1 Scope

This PAS specifies requirements for retrofit of dwellings, including:

- assessment of dwellings for retrofit;
- identification and evaluation of improvement options (energy efficiency measures, or EEMs);
- design and specification of EEMs (whether individual measures or packages of multiple measures); and
- monitoring and evaluation of retrofit projects.

This PAS covers EEMs that are intended to:

- improve the insulation of the elements of the building fabric (exposed floors, walls, roofs, windows and external doors) and reduce thermal bridging;
- improve the air-tightness of the building envelope;
- establish a safe dynamic moisture equilibrium through each element of the building fabric;
- improve the resistance of the building envelope to water penetration 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;
- provide or upgrade ventilation to ensure good internal air quality and minimize the risk of condensation;
- minimize the risks associated with vapour or other products, for example volatile organic compounds (VOCs), released within buildings subsequent to their air-tightness being improved;
- minimize the risks associated with overheating;
- provide efficient heating and cooling systems with responsive, intelligent or "smart" controls, including systems that use low or zero carbon (LZC) technologies;
- provide efficient water heating systems with responsive controls, including systems that use LZC technologies;
- provide efficient fixed lighting with appropriate controls;
- provide efficient appliances and equipment to reduce electricity use and minimize internal heat gains;
- provide locally generated renewable electric power systems that use LZC technologies;
- provide on-site energy storage to improve the usefulness of energy generated by LZC technologies; and
- provide metering and monitoring systems to promote the efficient use of energy.

In addition to setting out requirements for the commissioning and handover of all of the above, this PAS also 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.

Many aspects of domestic retrofit are covered by existing standards. Where appropriate, those standards are referred to in this PAS, and compliance with the standards referred to is thereby a requirement of this PAS.

This PAS and the retrofit standards framework may be applied to all domestic retrofit activity and embrace work that is initiated, procured, funded and delivered in a wide variety of ways including:

- programmes of retrofit promoted and/or funded by national or local government schemes;
- programmes of retrofit initiated and/or funded by landlords, including social housing organizations, private landlords in the domestic sector and commercial property portfolio holders;
- retrofit of individual buildings by their owners and/or occupants, including both domestic and commercial owner-occupiers;
- retrofit that is integrated with and forms part of broader repairs, maintenance and improvement (RMI) activity related to individual buildings or building stocks.

This PAS and the retrofit standards framework may also be applied not only to retrofit work carried out by commercial building contractors and specialist installers of retrofit measures but also to work carried out by local SME builders and independent trades people working alone or in small teams.