



## The Passivhaus Handbook

### A practical guide to constructing and retrofitting buildings for ultra-low energy performance

By Janet Cotterell, By Adam Dadeby

#### Description

An essential guide for anyone wanting to realize a supremely comfortable, healthy, and durable home with exceptionally low energy costs, this book brings together current thinking and best practice in Passivhaus design. This type of design focuses on getting the building fabric right, to achieve ultralow energy consumption in the most cost-effective manner. The approach is relevant to a wide range of building types and climates.

Whether you are building an extension, retrofitting your house or starting from scratch, and whether you are new to low-energy design or already have some experience, this book will help you navigate around the potential pitfalls and misconceptions. The book includes a clear explanation of the underlying building physics and terminology; detailed information on key elements of Passivhaus: avoiding air leakage, designing out thermal (cold) bridges, moisture management, and ventilation strategy.

It offers practical advice on setting up a project, including developing a motivated project team, and a discussion of economic considerations. As pressure on global resources increases and energy prices continue to rise, the Passivhaus approach, proven over 20 years, meets the challenge of ultralow-energy building for the future.

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Foreword by Wolfgang Feist

Introduction

How to use this book

#### Part One: The how and why of Passivhaus

Chapter 1: What is a Passivhaus?

The Passivhaus energy standard, the Passivhaus concept, common misconceptions, retrofitting and the EnerPHit energy standard

Chapter 2: The economics of a Passivhaus

Economic culture, energy costs and supplies, factors affecting property prices, factors affecting Passivhaus costs, methods of determining cost-effectiveness

Chapter 3: Passivhaus Certification

Certification of buildings, building components, designers and contractors; the process and information required for building certification

Chapter 4: Challenges of meeting the Passivhaus standard

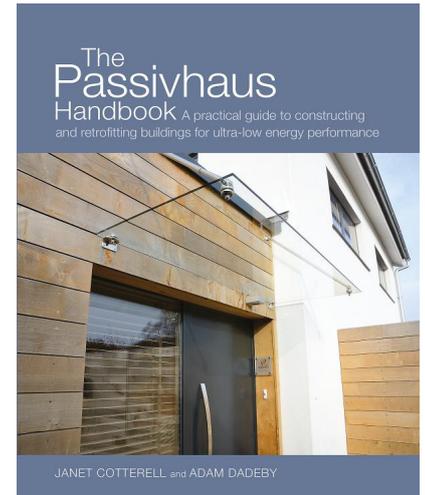
UK building culture, education and employment in construction, professional expertise, risk-aversity, the planning system, vernacular styles, the team approach, the disadvantages of a Passivhaus, Passivhaus and other low-energy standards

Chapter 5: Natural materials, zero carbon and resilience

Natural and low-embodied-energy building materials, zero carbon and the Code for Sustainable Homes (CSH), on-site low- or zero-carbon energy, post-peak energy, energy returned on energy invested (EROEI)

Chapter 6: Setting up a Passivhaus project

Choosing a plot, planning considerations, retrofit considerations, phased retrofitting and extensions, selecting an architect and builder, the role of the client



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## Part Two: Passivhaus projects: a practical guide

### Chapter 7: Using the Passivhaus Planning Package (PHPP)

History of the PHPP, PHPP worksheets: Verification, U-Values, Ground, WinType, Windows, Shading, Ventilation, Annual Heating Demand, Summer, Shading-S, DHW + Distribution, SolarDHW, Climate

### Chapter 8: Thermal bridges

Constructional and geometrical thermal bridges, linear and point thermal bridges, thermal bypass, internal and external psi-values, dealing with thermal bridges, thermal bridge calculation

### Chapter 9: Airtightness and sequencing

Air leakage and Passivhaus, internal air quality (IAQ), airtightness standards, wind-tightness, breathable materials, airtight materials, air leakage at the design stage and construction stage, sequencing, on-site communication and training, airtightness testing, typical airtight construction details

### Chapter 10: Moisture

Liquid moisture and water vapour, relative humidity (RH) and indoor air quality (IAQ), capillarity, hygroscopicity, vapour permeability, moisture management in construction, breathability, example constructions (new build and retrofit)

### Chapter 11: Windows

High-performance windows, U-values (frame, pane, spacer and installation factors), solar gain, window installation, window sills, doors, roof lights, avoiding summer overheating, the construction phase, future developments and costs

### Chapter 12: Ventilation

Ventilation in UK housing and in Passivhaus, indoor air quality (IAQ), humidity, mechanical ventilation with heat recovery (MVHR) (components, heating, efficiency, noise levels, possible objections to MVHR, installation skills)

### Chapter 13: Living in a Passivhaus

Noise, energy bills, kitchen and bathroom, drying clothes, the MVHR, entering and leaving the house, case studies (Totnes Passivhaus, Denby Dale, Grove Cottage, Passivhaus apartment buildings)

### Chapter 14: Policy change in the UK

Planning, a building-fabric-based energy standard, floor measurement conventions, VAT, Energy Performance Certificates, property tax, change in the construction sector, self-build, home-grown Passivhaus products, culture and policy-making

### Appendix A: Space heating and hot water

### Appendix B: Thermal conductivity values

### Appendix C: US units - metric conversions

### Appendix D: Certified Passivhaus projects in the UK

### Glossary of terms

### Glossary of units

### Notes

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## The Author

**Adam Dadeby** and **Janet Cotterell** are directors of Passivhaus Homes Ltd., which in 2011 completed one of the very few fully Certified Passivhaus retrofits in the UK – featured in their book *The Passivhaus Handbook*, published in 2012.

## Review Quotes

"As we move towards the 2016 zero carbon target in house building, Passivhaus construction looks like becoming not just popular in the UK, but commonplace. This is a no-nonsense and engaging introduction on how to do it."

**Kevin McCloud**

"This book gives a wonderful overview of Passivhaus in the UK today, not only enabling interested parties to understand the principles and pitfalls for their own projects, but also for policy makers and planning officers to understand how to avoid some of their 'own goals' in

attempting to encourage conservation."

**Peter Warm, Passivhaus Consultant, Trainer and Certifier**

"The Passivhaus Handbook really is the 'bible' for developing passivhaus housing, particularly if you are thinking of a self-build passivhaus."

**Elrond Burrell - Passivhaus in Plain English**

"I'm delighted to see everything about Passivhaus and its application in the UK collated for the first time, in *The Passivhaus Handbook*. The first-hand experience of the authors provides an excellent grounding for the book."

**Jon Bootland, Chief Executive, Passivhaus Trust**

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