Further Reading

Sustainability Matters

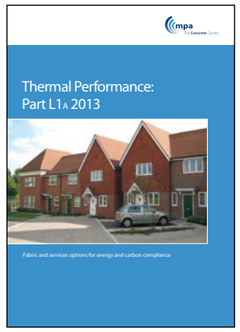
Factory made concrete including concrete masonry is the scope for British Precast's annual sustainability report covering production impacts and improvements for these locally manufactured products.

Download from
www.britishprecast.org

BDA Sustainability Report

The Brick Development Association's annual sustainability report reflects the activities of its members, which account for 95% of brick manufacturing capacity in the UK. Detailed information on objectives, targets and current performance are all covered in the report.

Download from
www.brick.org.uk

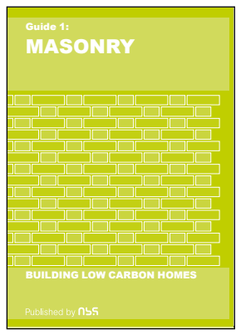


Thermal Performance Part L1A 2013

Published by:
MPA The Concrete Centre, 2014

This guide focuses on concrete and masonry housing, and presents a range of solutions for meeting current and anticipated requirements for Part L1A of the Building regulations.

Download from
www.concretecentre.com



Masonry

Published by:
NBS, 2010

The guide will help designers and builders to detail well-insulated and airtight solutions in masonry. The guide was commissioned by Zero Carbon Hub, written by Richard Partington Architects in association with MPA – The Concrete Centre.

Download from
www.concretecentre.com

References

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11. *Climate: Observations, projections and impacts*, The Met Office, 2011
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modern masonry ALLIANCE

The Modern Masonry Alliance (MMA) is a body that seeks to ensure developers and designers, customers and occupants understand the benefits of masonry solutions. It provides guidance on design of masonry and furnishes government and influencing organisations with the evidence of how masonry can contribute to a sustainable built environment.

Founding association funders of MMA are Aircrete Product Association, Brick Development Association, Concrete Block Association and Mortar Industry Alliance.

For more information visit

www.modernmasonry.co.uk

Follow us on @masonrymodern

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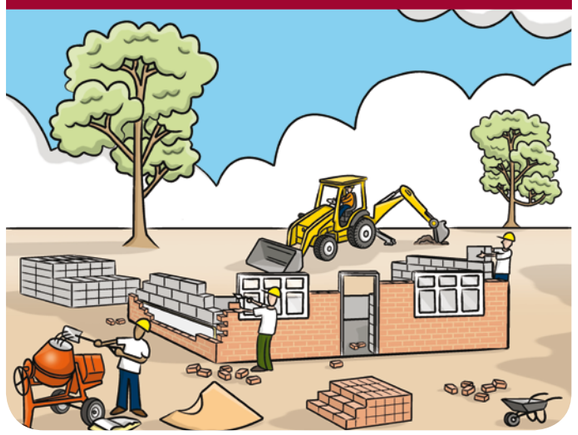
British Precast is affiliated to the Mineral Products Association (MPA) the trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and silica sand industries.
www.mineralproducts.org

modern masonry ALLIANCE

Fabric for the Future

Whole-life performance of masonry

DESIGN AND CONSTRUCTION



Locally sourced

Wherever houses are built in the UK, masonry products won't have travelled far to reach site. In fact, the average distance is only about 66 miles for concrete blocks [1]. Also, being a local material, the manufacturing impact is accounted for in the UK and not exported to other parts of the world.

Responsibly sourced

For a material to be considered responsibly sourced, its life cycle must be properly managed from mining or harvesting through to manufacturing, processing and finally reuse, recycling and disposal as waste with no further value. The masonry sector has worked hard to ensure its products achieve these requirements. Recent figures show that 89% of UK concrete, masonry and brick production has achieved compliance with BES 6001 [2, 3], which is the standard for responsible sourcing of construction products published by the Building Research Establishment (BRE).

Use of waste materials

Concrete blocks can contain high levels of recycled materials; often around 80% or more, including aggregates made from fly ash, furnace bottom ash, industrial slag and recycled concrete products. The cement used to make concrete products also includes a lot of recycled/secondary products. In addition, approximately 44% of the energy used to make cement comes from waste-derived fuels [3]. Overall, the UK concrete and masonry industry uses around 107 times more waste than it produces [3].

Embodied CO_2

It's a common misconception that the average masonry house contains a lot more embodied CO_2 than an equivalent timber frame house. Actually, the difference is quite small at around 4-5% [4, 5]. This is because, with the exception of the timber frame and the inner leaf of blockwork in the masonry house, all the other materials used are largely the same for both houses e.g. the brick outer leaf, roof, floors, windows etc.

It is possible to offset this 4-5 % difference in around 11 years as a result of the thermal mass in a masonry house, which can be used to enhance its fabric energy efficiency. Following the offset period, masonry homes can go on to have the lowest whole life CO_2 footprint [4].

Low fire risk

Masonry materials do not burn, which reduces the risk of fire during a building's life and also during construction. Government statistics [6] show this can be an issue for timber structures. Improved fire safety measures during the construction of timber framed buildings are required whereas no special measures are required for masonry structures. *"All those making design and procurement decisions that significantly affect fire risk should consider and reduce the risk and consequences of fire during the construction phase through **DESIGN**."* (HSE emphasis) [7]. Designers can comply with this by choosing masonry.

IN-USE

Safe and secure environment

Arguably the most basic requirement for a home is to provide a safe and secure living environment. In terms of safety, masonry benefits from being an inert, non-flammable material. From a security standpoint, the robust nature of masonry ensures that separating walls cannot be easily breached by intruders attempting access.

Summertime comfort

While the high level of insulation and airtightness in new homes helps save energy during the winter – and this is clearly a good thing - it can also increase the risk of overheating during the summer due to a greater ability to trap heat. The thermal mass provided in masonry housing can help reduce this problem by absorbing and later releasing excess heat, with the aid of night-time ventilation [8]. This is an increasingly useful benefit of construction materials with thermal mass which, alongside other measures such as shading and ventilation, can help tackle the growing problem of overheating.

Passive solar benefits

During the heating season (particularly spring and autumn), the thermal mass in masonry housing can help take full advantage of solar gain. This heat is absorbed during the day and released at night. In well-insulated homes, this can lower the demand on the heating system and reduce CO_2 emissions.

Long-term airtightness

The inner leaf of blockwork in masonry homes can help deliver long-term airtightness by providing a robust and durable air barrier. Masonry provides a rigid structure avoiding building movement which, over time, can lead to a reduction of airtightness in lightweight frame construction. Furthermore, masonry avoids the need for more fragile forms of air barrier and is not overly reliant on the use of tape and sealant. Evidence highlighting the long-term airtightness merits of masonry homes can be found in the NHBC publication 'Aging and Airtightness' published by the NHBC Foundation.

Acoustic performance

Masonry homes can provide high levels of sound insulation across a wide range of frequencies, reducing noise levels in homes. Quieter homes can make a valuable contribution to the health and wellbeing of occupants. This is helped by the inherent mass, stiffness and damping properties of concrete. In fact, masonry has among the best acoustic properties of any structural material [9].

IN-USE: LONG-TERM BENEFITS

Flexibility

If occupants need to make changes, masonry housing is easily altered or extended thanks to its straightforward method of construction, which is typically devoid of vapour barriers, breather membranes and structural frames.

Durability

Masonry is among the most durable of all construction materials, with numerous old buildings providing testament to this fact. In addition to being a tough material, masonry helps ensure resistance to:

- Weathering
- Abrasion and impact damage
- Insects, rodent and chemical attack
- Mould/rot
- Sunlight
- Water damage

History provides much evidence of masonry's durability but perhaps of more importance is how concrete and other building materials will perform over the next century, when climate change is likely to result in more severe environmental conditions.

Adaptation to climate change

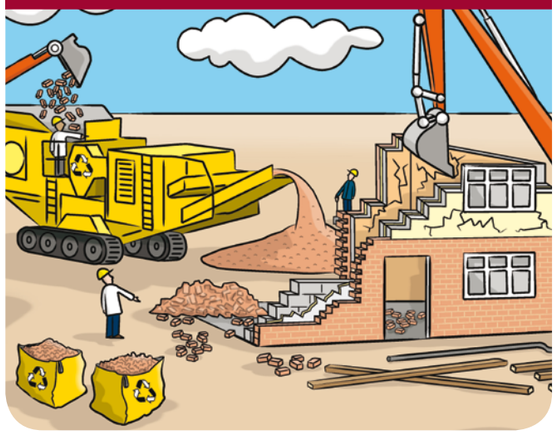
Flooding - Many parts of the UK face increased risk of flooding as a consequence of climate change. For example, the latest predictions from the UK Climate Impacts Programme (UKCIP) suggest a 16% rise in average winter rainfall for the North West, and an increase in the volume of rain on the wettest days leading to greater risk of flooding. Weather patterns over recent years provide demonstrable evidence for this change, with December 2015 being the wettest on record, leading to extensive flooding in the north of England [10].

Masonry is a flood-resilient construction solution, i.e. it absorbs very little water, remains structurally stable (no warping/twisting) and will not rot. Its use therefore, in buildings at risk of flooding, provides a measure of adaptation to climate change and helps maximise their whole life performance.

Extreme weather events - In addition to flooding, climate change is likely to result in greater storm damage. Housing may need to cope with higher wind loadings and more driving rain; issues which masonry construction can deal with.

Overheating - During the 21st century the UK is projected to experience a temperature increase of around 3°C in the south and 2.5°C further north, resulting in a greater risk of overheating [11]. Masonry's thermal mass offers a useful adaptation measure, which can be used in conjunction with ventilation and shading to help reduce the problem.

END OF LIFE



Reuse of masonry buildings

Perhaps the most significant way in which the whole-life performance of a building can be maximised is by extending its life through refurbishment and reuse, avoiding in turn the impacts arising from demolition and new build. In particular, extending a building's life makes its embodied CO_2 even lower, relative to its operational CO_2 emissions.

Masonry buildings have often proved eminently suitable for reuse and extension of use, helped by:

- Longevity of the basic structure
- Ability to adapt/extend
- Availability of skills and know-how for working with brick and block construction

Recycling

At end-of-life, masonry can be fully recycled to create new construction materials. When mixed with other demolition waste it forms hardcore or, if separated out, concrete blocks can be crushed for use as a recycled aggregate in new concrete. There is little evidence that any hard demolition and construction waste is sent to landfill in the UK [12].

Clay bricks can offer the potential for reuse, providing they are technically appropriate for new work. Help on using reclaimed bricks is available from the Brick Development Association [13].

Recarbonation

It is a little known fact that during the life cycle of concrete it undergoes a natural process called carbonation, resulting in the absorption of CO_2, which can ultimately reach a level equivalent to around a third of the concrete's initial embodied CO_2. In other words, by the time concrete reaches the end-of-life stage, its CO_2 footprint is reduced by around a third with no detriment to performance [14].