

Key facts

1 Low carbon and carbon neutral concrete is available today

Innovations in concrete and cement to use lower emission constituents are an important lever in the decarbonisation of the UK concrete and cement industry. The industry is building on the extensive early action which has seen the sector deliver a 53 per cent reduction in absolute carbon dioxide emissions (CO₂) since 1990.

Cement is the binding ingredient in concrete. In the UK there are many cements, with a range of embodied carbon, that can be specified in construction projects and concrete products. Ingredients such as clinker,

2 Concrete is used in a wide range of applications but not all lower carbon cements can be used for all applications

alkali activators and supplementary cementitious materials (SCMs) are blended or inter-ground to form a fine powder called cement.

Cements can be categorised into two groups: 'general purpose' (i.e. those with generic suitability established in the UK concrete standard BS 8500) and 'niche' (i.e. those with suitability not yet established in BS 8500).

Carbon emissions will be reduced by accelerating the use of the lower carbon concretes available now and the research and development into

3 UK standards and practices are evolving to make it easier to specify and use lower carbon concretes

clinker content, alternative binders and cement formulations to increase the range of lower carbon concretes available.



Lower carbon multi-component cements

An opportunity to reduce direct CO₂ emissions by up to four million tonnes a year

A Government-backed Mineral Products Association (MPA) research programme has successfully developed and trialled new low-carbon cements which have up to 60 per cent lower embodied CO₂ emissions than CEM I (the current market leader).

Research supported by the Department for Business, Energy and Industrial Strategy (BEIS) led by the MPA revealed that if the new cements are fully adopted

in the UK, up to four million tonnes of direct CO₂ could be saved every year.

During the two-year Carbon Trust-managed Industrial Energy Efficiency Accelerator programme, concretes containing 22 low-carbon multi-component cements were extensively tested for their durability and performance.

The research, supported by **Hanson, the Building Research Establishment and Forterra Building Products**, demonstrated that the new multi-component cements can be lower

CO₂ while meeting the performance requirements for general purpose in BS 8500.

The MPA are in the process of presenting the findings of this research to the British Standards Institution (BSI) committee responsible for BS 8500. Inclusion of these multi-component cements in BS 8500 will increase the range of lower carbon concretes available to designers, specifiers, contractors and the wider construction sector and can reduce carbon emissions of the built environment.

Accelerating the use of low carbon cements and concretes

1. Use lower carbon cements and concretes:

The UK has a good track record of using low-carbon cements in construction. Early engagement with concrete manufacturers is recommended to understand the lowest carbon concrete available for your project now.

2. Benchmark low carbon based on performance:

Current UK standards (BS 8500) and guidance (PAS 8820) enable the use of lower carbon cements and concretes. It is important that the cement specified will provide the concrete performance required and the definition of "low carbon" should relate to this performance benchmark.

3. Use Supplementary Cementitious Materials (SCMs):

Whilst the embodied carbon of SCMs is lower than standard clinker, the use of SCMs such as fly ash, GGBS, limestone powder or calcined clay will lower the embodied carbon of concrete.

4. Development of new industry standards:

Standards are being developed to help increase the adoption of low carbon

cements and concretes. For example: MPA has demonstrated that new cements with 60 per cent reduction in embodied CO₂ (ECO₂) vs CEM I can be specified in all concrete applications. National standards should be quickly, safely and efficiently modified to increase access to lower carbon concretes.

5. Support innovation programmes:

Government, clients and designers can support low carbon cement innovation. Early engagement with cement and concrete manufacturers could create an opportunity to support trials of new materials and formulations. Results from innovation trials can inform the development of standards.

6. Collaboration and knowledge sharing:

Collaboration with other organisations such as ICE, IStructE, RIBA, LETI, GCB and others is fundamental for accelerating the specification of low carbon cements and concrete (as well as material efficient concrete design). MPA The Concrete Centre is active in generating and sharing guidance to enable designers to accelerate the use of low carbon cements and concretes. Visit www.concretecentre.com

Innovation in Action

A ground-breaking project trialling the use of calcined clay in cement and concrete manufacture could lead to carbon savings of up to 40 per cent if implemented across the UK. The research led by the MPA will demonstrate how calcined clay can utilise a valuable by-product from other industries and create low carbon cements.

Funded by UK Research and Innovation (UKRI), the two-year project, will use calcined clay from brick manufacturing and reclaimed clay from other mineral extraction to assess the potential to reduce waste by 1.4 million tonnes and cut the embodied CO₂ of cement by around 20-40 per cent compared to the market leading CEM I cement.

Clay is a naturally abundant material in the UK, which can offer an alternative to other widely used industrial by-products including ground granulated blast-furnace slag (GGBS) and fly-ash that are already being successfully used to lower embodied carbon within cement.

Key policy enablers:

1 Establish government funding programmes that aim to widen and accelerate the number of lower carbon general purpose cements in the UK concrete standard.

2 Provide Government investment to support the continued decarbonisation of UK clinker production to help deploy lower carbon cements at industrial and national scale.

3 Provide policy measures that encourage or incentivise clients and specifiers to use low carbon cement and concrete in construction projects, based on a whole life carbon and performance assessment.

4 Ensure Government and its agencies take the lead in public projects by specifying UK produced low carbon cements and concrete while taking into account the whole life CO₂ performance of projects.

UK Concrete is part of the Mineral Products Association, the trade association for the aggregates, asphalt, cement, concrete, dimension stone, lime, mortar and silica sand industries.

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