CONCRETE BLOCK ASSOCIATION

Aggregate Block Sustainability

Data Sheet 16
November 2017

Uniclass
L3221 :A4
EPIC
F611 :X221
CI/SfB
Ff2 (Ajv)

Introduction

Aggregate concrete block construction and CBA members provide a valuable contribution to the creation of a sustainable built environment through the development of low carbon construction, efficient use of resources and providing durable, cost-effective construction solutions.

There is a range of assessment methods, standards and regulations available to help gauge the extent to which materials and construction projects are sustainable when considered against the three pillars of sustainability ie environmental, social and economic aspects. It is now widely accepted as being essential for sustainability to be judged using life cycle principles.

Life Cycle Principles

To ensure long-term performance, all buildings and structures should be looked at over their full life cycle from initial concept, through design, construction and in-service use to end of life. Constituent materials and products should be evaluated on the same 'cradle to grave' basis and their contribution to the project optimised over its whole life. Such Life Cycle Analysis (LCA) is the basis of a BS EN 15804[1] that will increasingly govern how product environmental impacts are evaluated and reported.

Manufacture and delivery of aggregate concrete blocks:

- CBA members' production plants are situated in the UK and use locally sourced materials.
- Many aggregate concrete blocks are manufactured using recycled materials. The average recycled content of an aggregate concrete block is 24%[2].
- The average cement content of aggregate concrete blocks is low, at 89kgs/tonne[2].
- The average percentage of alternative cements, e.g. fly ash and ground granulated blast furnace slag, is 19% of all cements used.
- The average energy required to manufacture concrete blocks is only 21 kW/tonne[2].
- This average energy consumption equates to 6 kg/tonne[2] of CO_2 emissions.
- Water consumption in concrete block manufacture averages 39 litres/tonne[2].
- The average waste generated in the manufacture of aggregate concrete blocks and sent to landfill is only 0.36 kg/tonne, packaging is minimal as is on site waste.
- Almost all concrete block manufacturers are certified to EN 14001.
- BRE Standard BES 6001 is the main standard by which construction products can be verified as responsibly sourced. Many aggregate concrete blocks are independently certified to BES 6001[3].
- With over 100 aggregate concrete block plants in the UK most blocks can be locally sourced.

Embodied carbon

The degree to which product groups contain embodied carbon is not yet an exactly defined science and perhaps will always be subject to some interpretation and discussion.

However one of the most respected and freely available sources of information on a wide range of materials is that published by Bath University, entitled University of Bath, Inventory of Carbon and Energy. It is widely known and referred to as the "Bath ICE"[5].

The Bath ICE lists *inter alia* embodied carbon expressed as kgs CO_2/kg of material on a cradle to gate basis.

Version 1.6a – Material Profile : Concrete contains reference to aggregate concrete blocks.

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This table lists aggregate blocks up to 8MPa as having embodied carbon of 0.061 kgs of CO_2/kg of concrete. The majority of concrete blocks are 7.3 MPa and below so this is a fair approximation for aggregate concrete blocks in general.

The embodied carbon level for aggregate concrete blocks is low.

Listed below are some other construction materials for comparison purposes. It can be seen that aggregate concrete blocks compare very favourably with a variety of common construction materials.

Cradle to gate embodied carbon	
Material	kgs CO_2/kg of material
8 MPa aggregate concrete block	0.061
Autoclaved aerated concrete blocks (aircrete)	0.28 – 0.375
Sawn softwood	0.45
Plywood	0.81
Steel - UK typical	1.77
General plastic	2.53
Note that the above products have different densities and that values for timber products exclude the calorific value (CV) of the wood	
Source: University of Bath Inventory of Embodied Energy (2008) Vers 1.6a	

Construction:

- There is a low level of wastage during both delivery to site and in the construction process.
- Aggregate concrete blocks use the minimum amount of packaging consistent with providing safe delivery and handling.

In-Use performance:

- A block built building will last more than 150 years.
- Aggregate blocks do not require repair or maintenance in normal service conditions.
- Thermal mass effects provide more efficient long term energy/carbon performance than lighter weight construction[4].
- Aggregate blocks are durable, fire resistant, not attacked by vermin or insects, do not introduce harmful substances into the internal environment of buildings and require minimal maintenance over the full life of the building. Block construction is resistant to flooding, a potentially increasing risk in the UK due to climate change.
- From the production stage through to the construction stage and during the lifetime of the building aggregate blocks will readily carbonate absorbing atmospheric carbon dioxide.

End of Life:

- Buildings constructed with aggregate concrete blocks can be easily modified to extend their life and to accommodate the developing needs of occupiers or for a change of use.
- Blocks are fully recyclable e.g. as a source of aggregate for future construction.

References/Links:

1. BS EN 15804:2012 "Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products"
2. British Precast Sustainability Charter. Independently audited annual returns representative of 60% plus of UK manufactures aggregate concrete blocks **http://www.britishprecast.org**
3. BRE BES 6001 "Framework standard for the Responsible sourcing of construction products" **http://www.greenbooklive.com/search/scheme.jsp ?id=153**
4. "A whole life CO2 argument for concrete blocks" Tom de Saulles CBA Spring 2012 Newsletter **www.cba-blocks.org.uk**
5. Bath University Inventory of Energy and Carbon **http://www.bath.ac.uk/mech-eng/sert/embodied/**

mpa British Precast

See RDL handbook http://www.robustdetails.com/scotland for full details of these Robust Details including specification of flanking elements and details of filling cavity wall RDs with mineral wool to achieve a notional U-value of 0 W/m²K

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