

# Sustainable steel construction

## Building a sustainable future

### The growing role of steel

The steel construction sector in the UK wholeheartedly embraces the push towards greater sustainability in construction. Steel itself is an inherently sustainable building material and is destined to play a significant role in helping the construction sector achieve its ambitious sustainability objectives.

### Looking to the future

Today, and for the years to come, the steel construction sector is committed to:

- Working with Government to meet the objectives of its sustainable construction strategy
- Providing design guidance and information that allows designers to create buildings with reduced whole-life costs and environmental burdens
- Providing design guidance and information that allows designers to create buildings that can achieve the highest BREEAM ratings and which meet Government aspirations for zero-carbon building operation
- Developing patterns of sustainable procurement consistent with the requirements of emerging standards in this area
- Continuing to invest in research and development to reduce the carbon footprint of its processes and products
- Giving specifiers and procurement agencies the opportunity to identify key supply chain partners that share a commitment to sustainable construction.



# Steel: the ultimate sustainable material

The sustainable qualities of steel are built in to the material. Simply choosing steel as a building material enables specifiers to deliver unrivalled sustainability performance – for life, and for all its subsequent lives.

Manufactured from the most abundant element on earth, iron, steel can be recycled or reused endlessly without detriment to its properties. Its superior strength-to-weight ratio means a little steel goes a long way, giving architects complete flexibility to achieve their most ambitious designs. Manufactured in a controlled factory environment, pre-engineered steel components are delivered to site ready for rapid assembly, with no waste.

## Multicycling

Steel can be re-used repeatedly without ever losing its qualities as a building material. This unique characteristic gives all steel a high value at all stages of its life cycle. The recovery infrastructure for steel recycling is highly developed and highly efficient, and has been in place for decades. Current recycling and re-use rates in the UK are 99 per cent for structural steelwork and 94 per cent for all steel construction products – figures that far exceed those for any other construction material.

## Adaptable

Significant environmental damage can be caused at the end of a building's life when it has to be demolished and its materials scrapped. Steel-framed buildings, however, do not decay, and are easily adaptable if the configuration of the building needs to change. The ability of steel to bridge long spans means that steel buildings contain large open-plan spaces which are easily reconfigured with partition walls. The steel frame itself can be adapted, with parts added or taken away, and its light weight means that extra floors can often be added without overloading existing foundations.



## The thermal mass myth



Bridge Academy, Hackney, Photograph: Martine Hamilton Knight

Research shows that the optimum floor thickness required to achieve an effective thermal mass is readily delivered by steel-framed buildings. There is a common misconception that buildings must be heavyweight to achieve an optimum thermal mass. This myth has probably arisen because buildings such as churches are cool in the summer. However, the main reason that churches stay cool is because they have very few windows, which reduces solar gain.

### Steel delivers optimum floor thickness

In modern buildings, the greatest accessible mass is found in the concrete floor slab. Independent research has shown that the optimum

thickness of concrete floor slab for providing thermal mass is 75-100mm. This thickness of concrete floor slab is routinely available in almost all steel-framed buildings, which are generally the lightest weight form of construction.

### Extra weight unnecessary

The extra weight associated with heavy, bulky concrete frames is not required to improve thermal mass and is surplus to requirements. In fact, the extra mass of heavyweight concrete components may actually increase the energy required to heat and cool the building.

For more information visit [www.corusconstruction.com/thermalmass](http://www.corusconstruction.com/thermalmass)

### Reusable

Because steel frames are essentially a kit of parts, they can easily be dismantled and reused. Bolted connections allow components to be removed in prime condition and easily reused either individually or en masse as entire structures. It means that steel components are perpetually reused in a continuous loop, and never sent to landfill.

### Demountable

Entire steel structures can be fully dismantled and reconstructed in a different location in a matter of days, without creating any dust and dirt, and very little noise. This demountable capability is inherent in a steel building – it doesn't need to be specially designed in and rarely requires any extra provision in the construction process. Constructing a building from a demounted structure is one of the most sustainable ways of creating a 'new' building.

### Fast

The speed of steel construction has made it the framing material of choice for the UK construction sector. A shorter construction programme reduces disruption and disturbance around the site. Steel is relatively clean and quiet to erect, and requires few site deliveries. Speed of construction delivers an economic benefit too, which is fundamental to sustainable development. The shorter on-site period reduces the cost of preliminaries, reduces the period of financing and delivers a building that is operational faster – providing a quicker return from rent or sale.

### Manufactured

All steel components are manufactured in the controlled environment of a fabrication workshop, where consistent structural elements with assured quality can be created to meet the specific requirements of each project. In this environment, steel parts can be easily standardised, tested and certified. Any waste material produced during the fabrication phase can be recycled and used in the steelmaking process.

### Safe

Industry surveys consistently demonstrate that steel is the safest construction material. Components are fabricated offsite in a safe, controlled factory environment. From here they are delivered to site and erected by a small number of skilled personnel. There is minimal requirement for on-site cutting or adjustment, and no need for the time-consuming and potentially hazardous shuttering and handling operations associated with other construction materials.

### Zero waste

When you specify steel for a building, you can rest assured that it is unlikely ever to become waste. Steel always has a value and is only ever sent to landfill as a last resort. Waste generation is one of the least sustainable aspects of construction. Choosing a steel-framed building is the simplest and most effective way to reduce waste. Even during steel manufacture and fabrication, any swarf or offcuts are recovered and recycled in the steelmaking process.

### Stable workforce

The steel industry requires skilled, settled workers. There is little need or desire for an itinerant workforce, and as such it provides more stable employment than in some other sectors.



Hafof Enri, Snowdon. Photograph: Ray Wood Photography

## The CO<sub>2</sub> content of structural steel

To calculate the environmental impacts of steel manufacturing, the World Steel Association adopts the 'system expansion' method of life cycle assessment, which is the preferred approach of the ISO 14040 series of environmental standards. This approach considers all new steel to be part of a single global system of supply and demand. Credits are given for co-products used in the manufacturing process which save energy or emissions, such as process gases being used to generate electricity. An example of the calculation method for the carbon dioxide emissions associated with steel production can be viewed at [www.corusconstruction.com/sustainability](http://www.corusconstruction.com/sustainability)

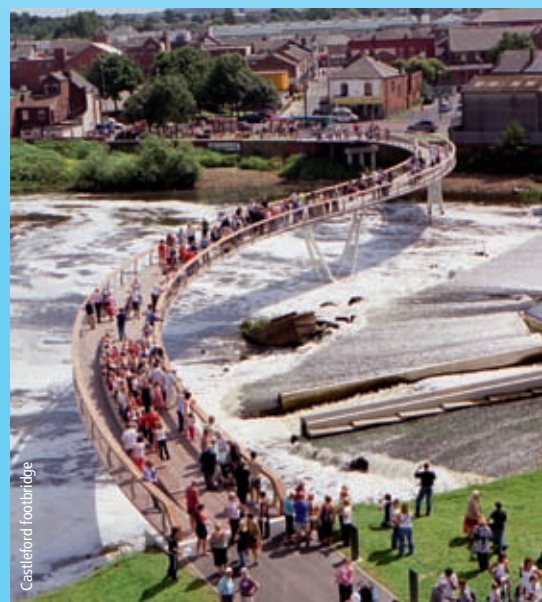
### Carbon and energy impacts of steel products:

It is standard practice to express these figures on a per tonne basis. This may give the impression that steel has higher impacts than other construction products. However, steel has a higher strength-to-weight ratio than most other structural materials meaning that one tonne of steel goes a lot further. As a result, the CO<sub>2</sub> emissions associated with any steel building will be lower.

	Plate	Sections	Tubes	Steel Decking	Purlins & Rails
CO <sub>2</sub> (tonnes per tonne of steel)	0.919	0.762	0.857	1.35	1.1
Energy (GJ per tonne of steel)	17.37	13.12	15.42	21.63	19.38

## The triple bottom line

There are three elements to sustainability: environmental, social and economic – known as the 'triple bottom line'. The environmental element understandably receives the most attention, but to be truly sustainable a structure must also deliver economic and social benefits.



Castleford footbridge

# BCSA's Sustainability Charter

In 2005 the British Constructional Steelwork Association became the first representative organisation in the UK to launch a Sustainability Charter, which sets environmental and other sustainability objectives for its Members and measures their performance against key criteria.

The Charter's objective is: 'To develop steel as a sustainable form of construction in terms of economic viability, social progress and environmental responsibility.'

For further information on the Sustainability Charter visit [www.steelconstruction.org](http://www.steelconstruction.org)



The Corus Kids of Steel programme, where thousands of children across the country participate in a mini triathlon.

## Corporate responsibility

For Corus, corporate responsibility involves the integration of financial and strategic goals with a commitment to the health, safety and well-being of its employees and communities; a focus on improving environmental performance and providing sustainable products; and conducting all aspects of its business with honesty and integrity. To read the Corporate Responsibility Report, please visit [www.corusgroup.com/responsibility](http://www.corusgroup.com/responsibility)

## ULCOS

The ultra-low CO<sub>2</sub> steelmaking project (ULCOS) is a consortium of 48 companies and organisations from 15 European countries, supported by the European Commission, whose target is to reduce emissions per tonne of steel by 50 per cent by 2050. Corus is a major partner in ULCOS. The first phase involves research to evaluate a new generation of steelmaking technologies, while the second phase will operate the most promising of these on a demonstration plant scale.

For more information visit [www.corusgroup.com/climatechange](http://www.corusgroup.com/climatechange)

## Sustainable procurement

Raw materials are responsibly sourced by Corus, and the company champions environmentally responsible practices throughout its supply chains. Corus gives confidence to all of its supply chains that its materials are responsibly sourced, to provide a route for customers to obtain credits under the BREEAM family of certification schemes.



Lakeside Energy from Waste Plant, Colnbrook

## Upstream influence

Corus is committed to minimising the environmental impact of its upstream operations. As a large customer, Corus uses its influence over its global suppliers, encouraging them to adopt responsible practices. To support these efforts, Corus has an online supplier assessment tool which it uses to screen potential suppliers, as well as to promote and monitor the performance of existing suppliers.

## Downstream benefits

Corus also takes responsibility for managing the environmental impacts of its products once they leave its manufacturing facilities. Downstream the properties of its products and the information Corus provides to customers can have a significant impact on the environmental performance of completed buildings and structures throughout their lives.

## Target Zero

The steel construction sector's commitment to supporting the drive towards Zero Carbon buildings includes Target Zero, a three year project to develop fully detailed and costed solutions for building designs that meet the Government's emission reduction targets contained in the Climate Change Act 2008.

Consultants AECOM have been commissioned by the BCSA and Corus to lead the Target Zero project. Guidance for five key building types will be produced over a 15 month period starting with school buildings. See [www.targetzero.info](http://www.targetzero.info)



[www.sustainablesteel.co.uk](http://www.sustainablesteel.co.uk)

