

LIGHT STEEL FRAME
ASSOCIATION

LIGHT STEEL & CIRCULAR CONSTRUCTION

Infinitely Recyclable Immeasurably Sustainable

Introduction

Trusted and specified by the UK construction industry – light steel frame technology is the most technically advanced material in the offsite construction portfolio. The sector has developed panelised and modular systems that deliver high quality buildings renowned for safety, strength and durability but the sustainability benefits are not widely understood.

There is growing pressure on the construction industry to reduce waste and to achieve this we have to move towards resource efficiency. But first we have to address the commercial realities associated with making this practically happen by ensuring information is readily available. In this document we consider the benefits of steel in supporting a circular construction economy.

Mike Fairey

Chair of the Light Steel Frame Association

The Global Challenge of our Time

The circular economy is rising up the political and construction agenda. At its simplest, it prioritises the reuse of materials, preventing the over extraction of natural resources and the amount of usable construction components that end up in landfill.



Back in 2014, the UK Green Building Council warned 120Mt of waste was generated from construction, demolition and excavation – equivalent to 59% of total UK waste and 30% of construction firms' pre-tax profit.

In 2015, the UK economy used 576 Mt of materials and as far back as 1998 construction accounted for roughly half of our national material consumption.

Whilst most construction waste is now diverted from landfill, outside the steel industry – little is being recycled or reused. At the same time the rates of extraction of materials in our fast-developing world are already way beyond planetary capacity.

Sustainability is one of the major global challenges of our time. We all have to play our part in changing the way we design and construct buildings to protect the future of not only the built environment but the impact we have on our planet for generations to come.

The Political Landscape



In early 2018 the UK Government committed to doubling resource productivity and to making the UK a world leader in resource efficiency.

The EU's Circular Economy Package was ratified into law in July 2018 and member states are now working towards putting it into national legislation. Despite Brexit, the UK Government has ratified the proposals and states it will work towards the targets set within.

According to the Mayor of London, the benefits of adopting a circular economy approach in the built environment sector will be significant for our capital city.

The London Waste and Recycling Board estimates that if circular economy principles are successfully adopted it could contribute between £3 billion and £5 billion in growth for London by 2036 and create as many as 12,000 new jobs.

In the Mayor of London's report *Design for a Circular Economy*, it states developers will benefit from material optimisation and waste minimisation through the increase in the productive use of materials and a reduction in disposal costs. By designing lighter structures and reducing embodied carbon through reusing and recycling, together with ensuring buildings are adaptable and designing out waste in the construction process – a circular construction approach will deliver short and long-term value.

But other countries are way ahead of the curve. The Netherlands for example, has set itself a target of having a 50% circular economy by 2030 and to be fully circular by 2050. But most governments have yet to realise the potential of the circular economy and the interrelated benefits to reduce ecological impacts whilst diversifying and improving economic opportunities.

The Ultimate Goal of the Circular Economy

We are at a tipping point. We can keep trying a ‘business-as-usual’ approach and make minor improvements or we can make fundamental changes and create a resilient, collaborative and thriving construction sector fit for the future.

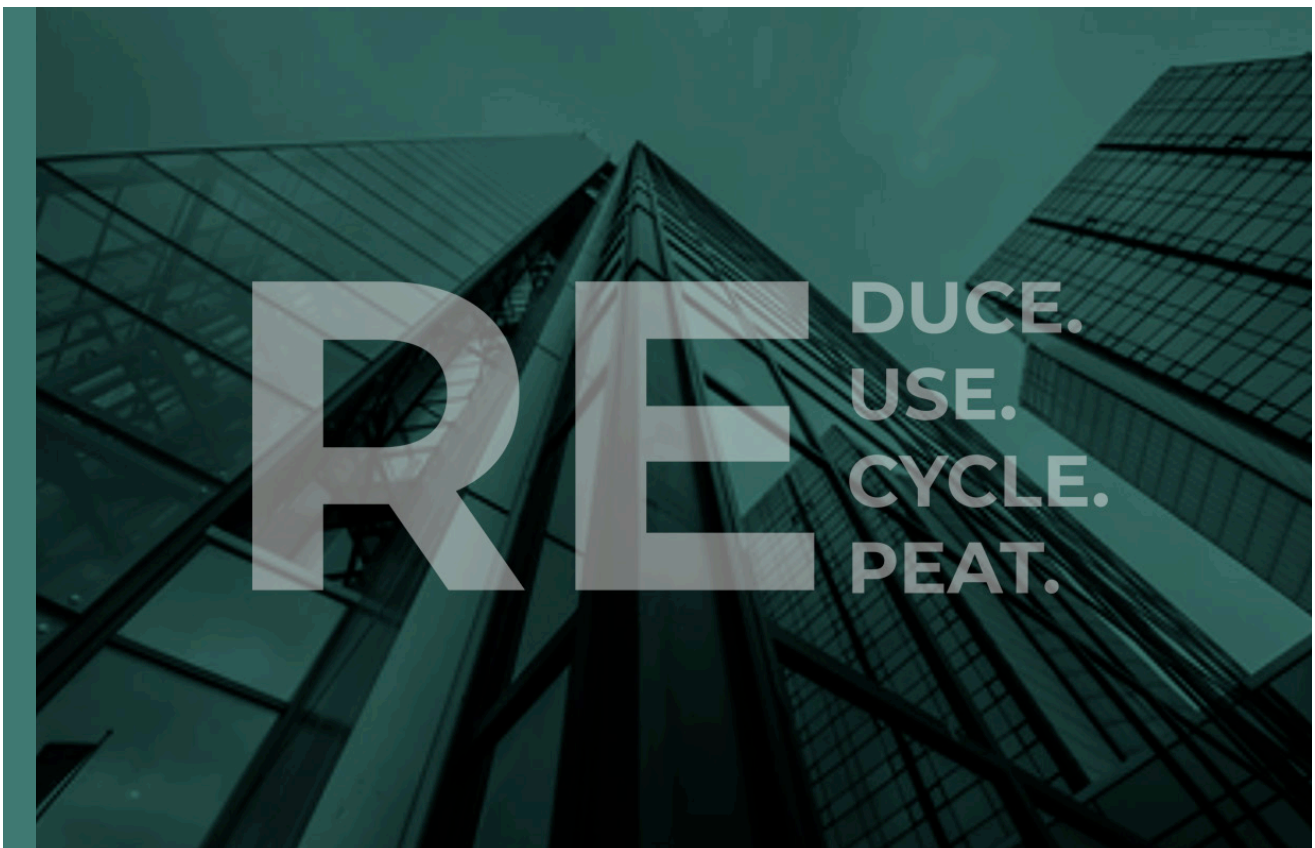
The ultimate goal of the circular economy is to have no negative effects on life or the ecosystem.

It is driven by four guiding principles:

- REDUCE
- REUSE
- RECYCLE
- REPEAT

Recycling is often seen as the ultimate goal although reuse for its original or similar purpose without vastly altering the physical form, is equally if not more important. Reuse offers even greater environmental advantages than recycling since there are limited environmental impacts associated with reprocessing.

Design for Reuse is already prevalent in several manufacturing industries. With all developments targeted to achieve net zero by 2050, the potential reuse of components following the fulfilment of a building's life should be a key consideration in the design process.





Challenges & Opportunities

Steel construction provides the most sustainable and economic buildings, representing the most efficient use of resources. This longevity combined with the inherent value of an asset that can be recycled or reused at end of life means that steel is not a cost, it is an investment.

Light steel sections are protected from corrosion by continuous hot-dip zinc coating, and the natural properties of steel prevents it from shrinking, warping or changing shape. Galvanised steel does not suffer from fungal or biological deterioration and is not susceptible to insect infestation.

Circular construction brings clear benefits in:

- Reducing embodied carbon
- Reducing disposal costs
- Reducing depletion of natural resources
- Supporting planning applications

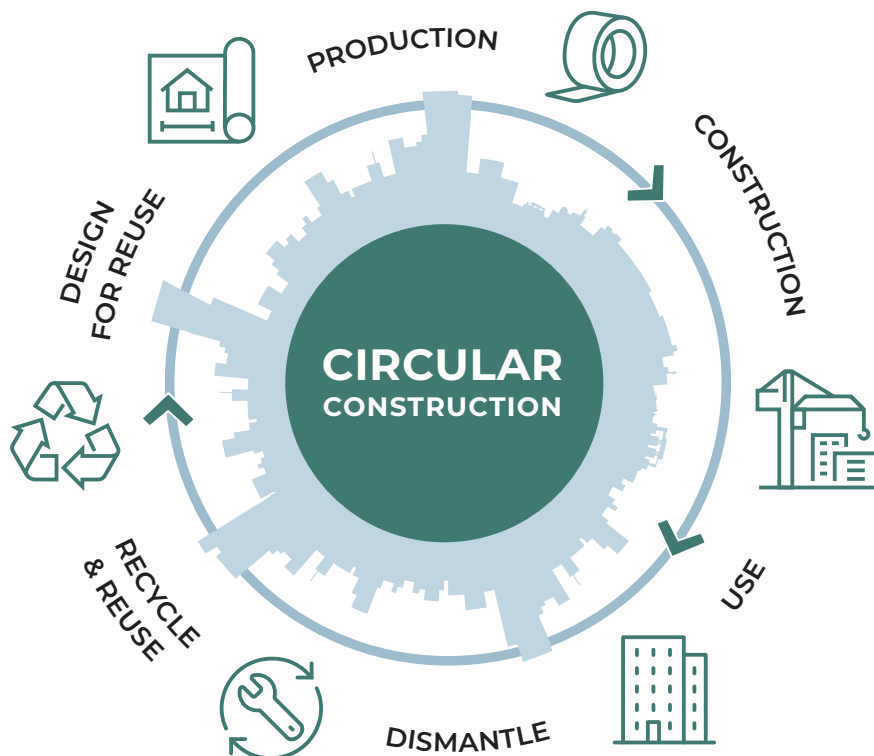
Closing the Circle

We can work together to come closer to a circular process by:

- Using circular construction to inform building design
- Procuring products to improve longevity, recyclability and reuse
- Sharing circular responsibility across design and construction teams
- Considering a building's end-of-life as a new lifetime of components and materials



Transitioning from a linear to a circular construction economy offers significant opportunities reducing the adverse impacts on the environment by re-thinking the way that we design our homes and buildings and consume resources. We need to adopt innovative approaches that design out waste, use resources more efficiently and keep materials and assets in use for as long as possible to retain their value.



Evolving Value Chain

For circular economy principles to successfully work in the built environment, business models need to evolve across the entire value chain. Planners, investors, purchasers and prospective tenants could play a critical role by asking construction clients for details of the proposed longer-term strategy for the building and the risks associated with potential early demolition or change of use.

The built environment needs to move away from the linear economy and embrace circularity. This will reduce waste, carbon emissions and our impact on the natural world. We are now shifting from a short-term linear model – take, make, use and dispose – to a more sustainable circular construction economy – reduce, reuse and recycle.

Design optimisation is crucial in a circular construction approach and a lot of thinking has to be done up front. Once the architectural priority was form and function but now there are a raft of considerations coming to the fore such as design for longevity, adaptability and the offsite mantra of – Design for Manufacture and Assembly (DfMA). Moreover, it is imperative to plan for a building's 'end' right at the beginning of the design stage to enhance the sustainability value chain through Design for Disassembly (DfD), Design for Reuse (DfR) and recoverability protocols.

Circular By Design

So why are we not hearing more people talking about Design for Reuse? Though very similar in concept, Design for Reuse differs from Design for Disassembly. Both look at construction with future dismantling or retrieval of previously used materials in mind. Each offers environmental benefits compared to the production of new materials.



But where Design for Disassembly focuses on the eventual recycling of materials such as steel, Design for Reuse plans for the use of specific building components in similar projects during the design stage and requires comprehensive data capture and recording. The Design for Reuse model specifically pre-empts future use, so designs do not require adapting.

One of the conversations currently gaining traction is how to make information that can lead to growth in reuse rather than recycling more accessible. Developers looking to reuse steel structures need certainty in terms of data. Performance, testing results, loading capabilities and even dimensions are vital to ensure any pre-existing systems fit within the design specifications and requirements of a new build in the future.

The use of QR codes to store information is gathering traction as is recording data for reuse in the BIM model. The bonus of improved traceability for individual components for reuse would be vastly beneficial during the procurement process, particularly when understanding structural capabilities, dimensions, location and availability.



100% Recyclable, Infinitely Reusable

Steel has excellent circular economy credentials both as a material which is strong and durable and as a structural framing system which is lightweight, adaptable, recyclable and reusable. The qualities of strength, longevity, recyclability, availability, versatility and affordability make light steel frame technology unique.

Manufactured from the most abundant component on earth, steel can be recycled or reused endlessly without detriment to its properties. This unique characteristic gives steel a high value at all stages of its lifecycle. The recovery infrastructure for steel recycling is highly developed and extremely efficient and has been in place for decades. Current recovery rates from demolition sites in the UK are 99% for structural steelwork and 96% for all steel construction products – figures that far exceed those for any other construction material.

Research carried out by the Association's technical partner, the Steel Construction Institute (SCI) has estimated that there are around 100 million tonnes of steel in buildings and infrastructure in the UK. This 'stock' of steel is an important and valuable material asset that means we are largely self-sufficient in steel and can virtually produce all the steel we need through recycling or reusing our latent stock to satisfy future market demand.

Offering the best strength to weight ratio of all construction materials, light steel frame is often used for buildings where additional structural integrity is necessary and a lightweight solution is required. Low weight equates to improved efficiencies – you get a lot of structure for relatively little weight which reduces embodied carbon. This is where steel cannot be beaten.

Lighter structures not only reduce material consumption but also concrete in the ground with foundation loads and sizes reduced by over 70% relative to blockwork construction.

Light Steel Frame Circular Credentials

The UK leads the world in steel construction commercially, technically and in terms of quality. The industry has made dramatic improvements in technology, productivity and efficiency. According to research carried out by independent consultants Construction Markets – steel continues to be overwhelmingly the structural framing material of choice with their survey showing that **steel now has a 72.5% share of the multi-storey office market and a 60.9% share in the 'other multi-storey buildings'** which includes retail, education, leisure and healthcare sectors.

Robust, reusable, recyclable and adaptable – steel has excellent circular construction credentials. As a material it is strong and durable, as a structural framing system it is lightweight and cost efficient. Steel's material properties make it the ultimate sustainable construction material both in terms of its longevity, material properties and enhanced safety credentials.

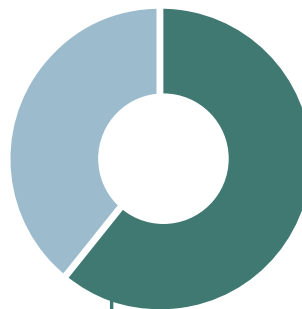
Long Lasting Asset

- ✓ **99% of steelwork** and **96% of steel construction products** are reused or recycled
- ✓ **Steel** can be **recycled** or **reused endlessly** without detriment to its properties
- ✓ **Steel** components can be **reused** with **very little** or **no reprocessing**
- ✓ **Steel** has the **best strength to weight ratio** of all construction materials
- ✓ **Steel** construction is **lightweight** reducing material consumption and concrete foundation requirements by 70% when compared to blockwork construction



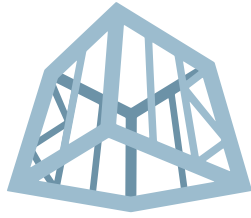
72% SHARE

**MULTI-STOREY
OFFICE MARKET**



60.9% SHARE


**OTHER MULTI-STOREY
BUILDINGS**





LIGHT STEEL FRAME ASSOCIATION


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