The British Constructional Steelwork Association Limited

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For the attention of:			
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ALL MEMBERS MEMORANDUM No 233-10

THE RECYCLED CONTENT OF STEEL PRODUCTS

BCSA members are frequently asked questions about the sustainability of steel as a construction product, in particular, its recycled content. Below are three bullet points on the recycled content of steel which may be used by members to support pre-qualification questions on the use of steel in sustainable construction. The remainder of this AMM describes the background to these recommendations.

- Most new steel is manufactured from a mixture of iron ore and steel scrap, but specifying steel based on the percentage of scrap is not a good measure of environmental performance.
- If asked about the scrap content of structural sections in the UK, members are advised to use the figures from the Waste & Resources Action Programme (WRAP), who recommend a value of 60%.
- The carbon emissions of steel construction products are calculated by the World Steel Association in accordance with ISO 14044. For structural sections, the figure is 0.76 tonnes of CO_2 per tonne of steel.

Background to the above recommendations

Most of the world's steel is manufactured either by the Basic Oxygen Steelmaking (BOS) process, which uses a mixture of iron ore and steel scrap as raw materials, or in Electric Arc Furnaces (EAF), which typically utilise 100% steel scrap. Due to its high value, the vast majority of the steel scrap that becomes available worldwide is collected and recycled. Studies in the UK indicate that the recovery rate at end-of-life for structural sections is as high as 99%. International studies indicate that around 90% of all steel is eventually recovered for recycling[1].

The production of all new steel, whether it is manufactured via the BOS or EAF route, can be considered as part of a single global system. All steel begins life in a BOS furnace. When it is recycled it becomes the raw material for new steel production in both process routes. This interdependent continuous process of manufacture and recycling, or multicycling, takes place without any loss of quality, and is what makes steel one of the most sustainable of all materials.

However, because the two principal routes for steel manufacture use different levels of scrap steel as a raw material, it can appear attractive to some decision makers to select steel on the basis of its recycled content. Recycled content can be a useful measure of the sustainability of materials that may otherwise be sent to landfill or incinerated, such as glass, plasterboard and plastics. Importantly, this is not the case with steel, which already has a mature and economical global recycling infrastructure. Indeed, the application of a recycled content measure for steel may actually create inefficiencies. Even at the current very high recovery rates, there is a limited supply of scrap steel for new steel production. If a designer specifies a high recycled content in a well-meaning effort to reduce environmental impacts, this may stimulate the market to direct the limited supplies of scrap steel towards particular product groups and away from other products where the use of high levels of scrap steel may be more effective or economical. Market stimulation is therefore ineffective and may result in inefficient processing and unnecessary transportation[2].

The international metals industry strongly advocates that the sustainability assessment of steel should include the benefits of end-of-life recycling. Using this approach, the origin of the raw materials, i.e. whether iron ore or steel scrap, is not relevant because it is considered to be the net conservation of the material (i.e. how much of the material is captured at end of life and recycled back into new products) that determines the environmental impacts. This approach is consistent with ISO 14044, which acknowledges that if a product is recycled at the end of its life, this will displace the need to manufacture new products from primary raw materials (such as iron ore). The end-of-life recycling approach encourages high levels of recycling by focusing on avoiding the loss of the material, for example to landfill, at the end of a product's life.

The table below shows the CO_2 emitted in the production of some of the most common steel construction products using an end-of-life approach in which credit is given for recycling which displaced production from virgin materials. These values are derived from data collected by the World Steel Association (2002) and are independent of the process of manufacture. The differences on a product-by-product basis are entirely due to the specific product manufacturing emissions and the measured recovery rates of the individual products at the end-of-life.

Product	**Structural Sections**	**Tubes**	**Plate**	**Hot-Dip Galvanized**	**Purlins & Rails**
CO_2/tonne	0.76	0.86	0.92	1.25	1.1

The Waste and Resource Action Program (WRAP), a body set up by the UK government to promote waste reduction, recycling and the use of recycled materials, has calculated that the structural steel used in the UK contains an average of around 60% recycled content. On that basis a recycled content of 60% should be assumed for structural steel used in the UK[3].

Further information on this topic can be found using the following links:

1. Life Cycle Assessment Methodologies for Quantifying the Benefits of Steel Reuse and Recycling
2. Declaration by the metals industry on recycling principles
3. Wrap Reference Guide: Choosing Construction Products – Guide to the recycled content of mainstream construction products

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