



Background and Outcomes– Green Star Steel Credit Review

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1.0 Executive Summary

Since the Green Building Council of Australia (GBCA) introduced Green Star in 2003, the suite of environmental rating tools has contained a 'Steel' credit to encourage the use of recycled steel in structural applications. The Green Star 'Steel' credit was included in the first Green Star rating tool, Green Star – Office Design v1, and has featured in all subsequent tools.

The GBCA's rationale for including a Steel credit that encourages the use of recycled content in steel was based on the well-documented advantages of using recycled steel in place of virgin material. In particular, the use of recycled steel leads to reduced energy demand, reduced emissions (other than energy related emissions) and reduced biodiversity impacts, as well as a reduction in other environmental impacts.

Recognising that Australian steel manufacturers are already recovering scrap steel from the waste stream at world's best practice rates, in 2009 the GBCA commenced an extensive stakeholder engagement process to review the Steel credit.

Through consultation with a Steel Expert Reference Panel (Steel ERP) and review of independent research, the GBCA found that a revised 'Steel' credit was necessary to remove the focus on high percentages of recycled steel content in new steel products, and instead encourage dematerialised efficiencies in the production of steel as a construction material. The new revised 'Steel' credit also recognises innovative and environmentally responsible steel production and fabrication methods.

Future work by the GBCA may involve a life cycle analysis or assessment (LCA) which compares the environmental and health impacts of all building materials. However, the outcomes of this Steel credit review are not based on full LCA comparisons of steel products. Further information about the GBCA's approach to LCA is presented in Appendix 1.

2.0 History of the Green Star 'Steel' Credit

Since 2003, Green Star rating tools have contained a 'Steel' credit that encourages the use of structural steels which contain a high percentage of recycled content. The rationale for incorporating such a credit in Green Star tools is explained below.

The production of steel is an energy-intensive process (Norgate 2004). Strezov and Herbertson (2006) reported a net process energy consumption ranging from 12 to 43GJ/tonnes (based on

worldwide steel production figures for various steel products and various manufacturing technologies). In addition, the extraction of raw materials requires a substantial amount of energy. The NSW Department of Environment and Conservation (2005) states that 32.9GJ are saved for every tonne of steel recycled.

The steel industry acknowledges the reduced impacts associated with recycling of steel, in statements such as:

Recycling of metals has environmental, economic and social value. Consequently, and for many years, metals from end-of-life products are widely recycled at high rates (Eurofer, 2006).

Steel recycling avoids environmental impacts associated with producing steel from virgin material sources. The amount of steel which is recycled / reused at end-of-life is crucial to the sustainability of the steel application (Brimacombe & Buridard, 2001).

OneSteel recognises the benefits of recycling steel in the overall environmental performance of the overall steel production process (OneSteel, 2008).

Recycling prevents the waste of potentially useful materials; reduces consumption of raw materials and energy thereby reducing greenhouse gas (GHG) emissions, compared to virgin production (BlueScope Steel, 2009).

The Australian steel industry and the GBCA agree that there are significant energy reductions associated with the recycling of steel.

Greenhouse gas emissions (GHG) are just one of many environmental impacts associated with steel manufacturing. Other environmental impacts associated with virgin steel manufacturing include, but are not limited to:

- Emissions (other than GHG, such as Sulphur Oxides and Nitrous Oxides) from mining, production and transport;
- Destruction of land, and consequently decreased biodiversity, due to mining;
- Local air pollutants, for example dust and small particles;
- Depletion of raw materials; and
- Water consumption.

3.0 Evaluating the Outcomes of the Steel Credit

According to an independent report (Hyder, 2009) current recycling rates from construction and industrial sources are close to 90%. In total, an estimated 2.8 million tonnes of steel are available for recycling in Australia each year. In the 2007–2008 financial year, 299,681 tonnes of this total was disposed of in landfill, while 2.54 million tonnes was recovered for recycling (Hyder, 2009).

These figures demonstrate that the Australian steel industry is currently recovering scrap steel at world's best practice rates. This is highly likely to remain the case as steel recovery from the waste stream is fuelled primarily by very strong economic drivers (Hyder, 2009).

Based on this research, the Steel ERP concluded that the credit requiring structural steel in Green Star projects to contain high percentages of recycled content was not promoting increased recycling, and in practice was not acting as a driver for change to reduce environmental impact.

4.0 The current 'Steel' Credit Criteria

Aim of Credit

To encourage and recognise the reduction in embodied energy and resource depletion associated with reduced use of virgin steel.

Credit Criteria

Up to two points are awarded as follows:

- One point is awarded where:

60% of all steel, by mass, in the project either has a post-consumer recycled content greater than 50%, or is re-used.

- Two points are awarded where:

90% of all steel, by mass, in the project either has a post-consumer recycled content greater than 50%, or is re-used.

If the material cost of steel represents less than 1% of the project's total contract value, this credit is 'Not Applicable' and is excluded from the points available used to calculate the Materials Category Score.

5.0 The revised Steel Credit Criteria

Note: Full details of the revised Steel credit are provided in the Revised Steel Credit document available from the GBCA website. The aim and credit criteria are as follows:

Aim of Credit

To encourage environmentally responsible production, design and fabrication methods that result in efficient use of steel as a building material.

Credit Criteria

Up to two points are awarded where at least 95% of all steel used in the building's structure complies with the criteria set out below, and is sourced from a responsible steel maker. Points are awarded as follows:

- Where structural steel comprises 60% or more of the total steel used in the structure, one point is awarded for each of the two initiatives met below:
 - At least 95% of all Category A products and at least 25% of Category B products (see Table 1) meet or exceed the nominated steel strength grades and are permanently marked with their strength grade;
 - At least 60% of the fabricated structural steelwork is supplied by a steel fabricator / steel contractor accredited to the Environmental Sustainability Charter of the Australian Steel Institute.
- Where reinforcing steel comprises 60% or more of the total steel used in the structure of the building, one point is awarded for each of the two initiatives met below:
 - At least 95% of all reinforcing bar and mesh meets or exceeds 500MPa strength grade, and at least 60% of all reinforcing steel is produced using energy-reducing processes in its manufacture (measured by average mass by steel maker annually);
 - At least 95% of all reinforcing steel meets or exceeds 500MPa strength grade, and at least 15% (by mass) of all reinforcing steel is assembled using off site optimal fabrication techniques detailed in Table 2.

Where neither structural steel nor reinforcing steel comprises more than 60% of the total steel used in the structure, a combination of any of these criteria as set out above can be used

to achieve the credit for a maximum of two points. See Additional Guidance for more information.

If the material cost of structural and reinforcing steels represents less than 1% of the project's total contract value, or there are no new structural or reinforcing steels used in the project, this credit is 'Not Applicable' and is excluded from the points available used to calculate the Materials Category Score.

6.0 The Steel Credit Review Process

In 2009, the GBCA commenced a stakeholder engagement process to review the Steel credit. This involved gathering feedback from GBCA members and Green Star users, the Australian steel industry and an Expert Reference Panel (ERP).

This section provides details on the background and process of the stakeholder engagement and the Steel ERP.

6.1 STAKEHOLDER ENGAGEMENT

In an effort to better understand the merits for the current credit, as well as recognise opportunities to improve the credit, the GBCA undertook an engagement process involving analysis of feedback from Green Star users, which included challenges, opportunities and relevance of the credit.

The engagement period took place over a 6-month period and involved a variety of initiatives including stakeholder meetings, a review of stakeholder feedback, the establishment of the Steel ERP and site tours of Australian steel mills and recycling centres. The process has provided the GBCA with a sound understanding of the environmental impacts associated with the use of steel, and identified a number of opportunities for reducing the environmental impacts arising from the use of steel in buildings.

6.2 STEEL EXPERT REFERENCE PANEL

Convening the Steel ERP represented an additional commitment to meaningful stakeholder engagement. The Steel ERP comprised an independent chair and eight participants representing a diverse range of expertise relevant to the topics under review.

Nominations for appointment to the panel were sought from GBCA members and Industry Reference Group (IRG) stakeholders.

Participants in the Steel ERP were selected based on their expertise in the following areas:

- Steel manufacturers and suppliers of steel products;
- Steel specifiers (representing building owners: e.g. engineers, architects);
- Structural engineers experienced in the use of steel in building construction;
- Project managers (representing building contractors) experienced in the use of steel in building construction;
- Academics and researchers with expertise in LCA (e.g. building life cycle, building construction and building materials);
- Individuals with an understanding of Australian and international steel supply, use and end of life;
- Experts in steel recycling strategies, construction and demolition waste;
- Australian Standards and BCA experts in relation to steel manufacturing, use and end of life;
- Federal, state and local government department representatives from building, public works, product procurement, environment and climate change, waste management and recycling; and
- Environmental experts with knowledge of the steel lifecycle, including evaluation of biodiversity concerns from impacts of materials extraction.

The panel was appointed in August 2009. A total of six Steel ERP meetings were held between August and December 2009.

The Steel ERP was engaged to:

- o Consider the merit of the current Steel credit; and
- o Recognise opportunities for reduced environmental impacts from steel.

More information on the composition of the Steel ERP can be viewed on the Steel Credit Review webpage, which is accessible from the Materials category section of the GBCA website www.gbca.org.au

6.3 CREDIT REVIEW AIMS AND OBJECTIVES

The Steel credit review project seeks to deliver the following desired outcomes:

- **Appropriateness** - Review the appropriateness of the current credit.
- **Engagement** - Facilitate a Steel Expert Reference Panel to receive technical and factual recommendations that inform the credit review.
- **Benchmarking** - Identify benchmarks for reward, based on reduced

environmental impacts arising from steel use in building structural applications.

- **Guidance** – Provide clear guidance to steel product manufacturers and suppliers of compliance requirements associated with the revised credit criteria.

7.0 Conclusions of the Steel Credit Review

The following is a summary of the conclusions of the Steel credit review:

- Mandatory criteria for Environmental Management Systems (EMS) and Climate Action Program membership eliminate the worst practices from upstream steelmaking (source: WSA).
- In accordance with the sustainability hierarchy of 'Reduce, Reuse, Recycle' the credit should encourage steel production and fabrication methods, as well as design strategies, that aim first to reduce material consumption.
- Encouraging the use of high strength steel in Green Star buildings is the most effective and immediate way to achieve reductions in total steel used in typical structural steel applications.
- Reducing the operational energy use of steel producers should be encouraged in the revised credit and independently verified by using appropriate methods (lifecycle assessment).
- Improvements in the practices of the steel fabrication sectors should be encouraged in the revised credit to drive sustainability improvements in steel production across the supply chain.
- Lifecycle assessment (LCA) based assessment of steel is the preferred future direction for the steel credit.

8.0 References

- Brimacombe & Buridard, 2001 *"Sustainability and Steel Recycling"*, 2001 Environmental Sustainability Conference & Exhibition, November 2001 Graz, ASTRI, Session: Sustainable Materials.
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- Norgate, 2004, *"Metal Recycling: An Assessment Using Life Cycle Energy Consumption as a Sustainability Indicator"*, CSIRO.
- OneSteel, 2008, *"Green Star - TAC review Presentation at Green Building Council of Australia's Technical Assurance Committee"*, Sydney 17th April 2008
- Strezov, L and Herbertson, J, 2006b, *"Life Cycle Perspectives on Steel Building Materials"* The Crucible.

Appendix 1: Life Cycle Assessment

A 'Life Cycle Assessment' or 'Life Cycle Analysis' (LCA) is the investigation and evaluation of the environmental impacts of a given product or service caused or necessitated by its existence.

The GBCA recognises the significant merit in assessing the relative environmental impacts of products and materials by conducting a full LCA of products in various categories (such as I beams, H beams, reinforcement bars). However, the time and resources required to undertake such detailed comparisons, and then applying those findings to specific benchmarks in a revised Steel credit, exceeds those available for this credit review project.

In addition, and especially within the Australian context, there are two fundamental challenges that must be overcome before LCA-based decisions are incorporated into rating tools such as Green Star. These are:

1. Generating sufficient Australian-specific life cycle inventory (LCI) data to support the LCA tools. For example, while many European countries are already undertaking LCA reporting and data collection in accordance with an agreed national methodology, this is not yet common practice in Australia. In order to sustain an Australian LCI, reporting and collection must become common practice for all industries involved in the manufacture of building materials.
2. Collating this data into an Australian LCI database which can be readily and equitably accessed by the developers of LCA tools.

The Australian Life Cycle Inventory (AusLCI) project is currently underway and aims to develop agreed national methodologies and manage a national LCI database to meet the above challenges. The Australia steel industry and the GBCA are both stakeholders in this project.

Any future consideration of LCA tools in Green Star will require assurance that an equitable and consistent methodology is being followed by the LCA tool development stakeholders in Australia. These areas of assurance specifically include tool assessment methodologies, data collection and manipulation requirements, as well as LCI database ownership.

The GBCA encourages the development and use of LCA tools and is currently exploring ways to provide manufacturers and suppliers with incentives to contribute their LCA data to the AusLCI database. Tool development organisations currently undertaking work in this complex field are encouraged to pursue the development of LCA tools that draw on the life cycle data in the AusLCI and, in particular, the data contributed by the

Building Products Innovation Council (BPIC) and Industry Cooperative Innovation Program (ICIP) project.

The BPIC ICIP project is developing:

- An extensive database of LCI data for major Australian building products and construction materials.
- A set of rules on how to conduct LCA and how to use LCI data in LCA tools.
- A rigorous science-based methodology for whole-of-life building assessment.