

Sustainability: It's Your Business

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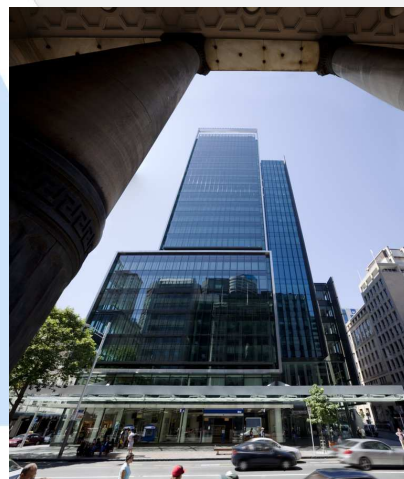


Construction materials in context

- The product isn't the steel beam
- The product is the building
- It is how steel enables sustainable construction and sustainable buildings that is key



First 5 Green Star Education Design



5 Green Star Office Design

Important sustainable construction issues

- Resources and resource efficiency
- Energy and carbon
 - Embodied and operational
- Waste and recycling
- Off-site manufacture
- Flexibility and adaptability
- Steel industry responsibility



Green Star NZ

- Green Star NZ is a rating system developed to evaluate the environmental design, efficiency and performance of New Zealand buildings.
- The Green Star NZ rating System was introduced by the New Zealand Green Building Council (NZGBC) and is derived from the Australian Green Star rating system, LEED rating tool used by the US together with the UK BREEAM rating system.
- For new Office Design projects, the following ratings can be achieved
 - 4 Star Green Star NZ Certified Rating signifies 'Best Practice'
 - 5 Star Green Star NZ Certified Rating signifies 'New Zealand Excellence'
 - 6 Star Green Star NZ Certified Rating signifies 'World Leadership'

Sustainable Steel Council (SSC)

- Steel producers
 - New Zealand Steel
 - OneSteel
 - Pacific Steel
- Manufacturing Industry Associations
 - National Association of Steel-framed Housing (NASH)
 - Steel Construction New Zealand (SCNZ)
 - New Zealand Metal Roofing Manufacturers (NZMRM)
 - New Zealand Stainless Steel Development Association (NZSSDA)
 - Casting Technology New Zealand (CTNZ)
- Research & Development
 - Heavy Engineering Research Association (HERA)
 - University of Auckland
- Australian/NZ Association connections
 - Building Products Innovation Council (BPIC)
- Coatings industry
 - Galvanizing Association of New Zealand (GANZ)
 - Paint Manufacturers
- Supply chain distributors
 - Easysteel
 - Steel & Tube
- Contractors and Builders
 - Mainzeal
 - Hawkins

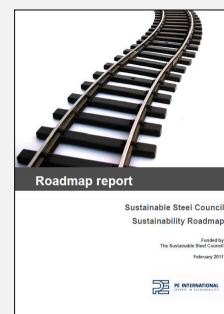
Why form SSC?

- Organizations such as the NZGBC unsure of who represents the interests of the steel industry.
- Specifiers unable to find generic sustainability data when considering steel as a possible structural solution.
- Lack of awareness from some specifiers on steel's positive attributes compared to competitor materials.
- Conflicting advice sometimes given by the industry, thereby creating uncertainty.

Sustainable Steel Council Roadmap

Facilitated workshop by PE International (sustainability experts who supply LCA GaBi software worldwide with clients such as worldsteel, ArcelorMittal, Arup, etc.)

- Connect with Australian and other international sustainable steel initiatives
 - Discussions with worldsteel LCA Manager (generic world LCI data being sourced)
 - Regular meetings with Australian Steel Institute
 - Supporting LCA NZ in development of NZ specific LCI database
- Engage with NZ Green Building Council and participate in Materials Group
- Provide generic sustainability information for users and specifiers



Current Green Star NZ Steel Credit Criteria

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

- One point is awarded where:
 - 60% of all steel, by mass, in the project either has a postconsumer 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 postconsumer 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.

Revised Australian Green Star Steel Credit Criteria

- The revised 'Steel' Credit removes the focus from high percentages of recycled steel content in new steel products, and instead encourages dematerialised efficiencies in the production of steel as a construction material.
- It also recognises innovative and environmentally responsible steel production and fabrication methods.

New Australian Green Star Steel Credit Criteria

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

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

- For the steel maker has a valid ISO 14001 Environmental Management System (EMS) in place
- Steel maker supplying the steel is a member of the worldsteel Association's (WSA) Climate Action Programme (CAP)
- Reinforcing steel used in the project must be sourced from a steel maker using an energy-reducing process in Manufacturing
- Energy reduction arising from energy-reducing processes must equate to at least 40 MJ/tonne. To determine compliance with this benchmark, a lifecycle assessment must be made.
- At least 60% of the fabricated structural steelwork is supplied by a steel fabricator/steel contractor accredited to the Environmental Sustainability Charter (ESC) of the Australian Steel Institute



Minimum strength grades for structural steel products according to Australian Steel Credit Criteria

Category A Products	Minimum Strength Grades
Roof sheeting	550
Wall sheeting	550
Profiled steel decking	550
Purlins	450
Girts	450
Light steel framing	450
Category B Products	
Hot rolled structural steels including plate (e.g. UB's, UC's, etc.)	350
Cold formed sections including hollow sections (e.g. RHS, Channels, etc.)	450
Welded sections (e.g. Welded beams and columns from plate)	400

Environmental Sustainability Charter of ASI

- Companies committed to the ESC are those that run their businesses along sustainable lines, demonstrate environmental responsibility, and share their knowledge of sustainability with others.
- The commitment is audited once yearly by an independent auditor. During the sustainability audit an ASI Environmental Sustainability Charter company must demonstrate that it has a set of environmental procedures in place.

Environmental Sustainability Charter of ASI

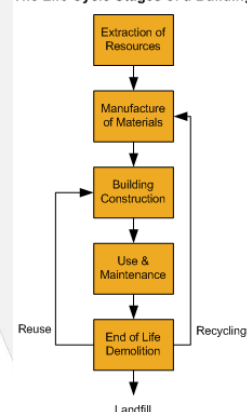
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- Published a sustainability policy signed by the Manager.
- Fully comply with the legislative requirements for environmental laws.
- Be operating an environmental management system (EMS).
- An independent audit to the EMS completed annually.
- Have measured energy, water and fuels use and have plans and targets for reduction.
- Have measured its carbon footprint and have plans for its reduction.
- Established a preferred major sub contractor and supplier list with a selection criterion including good environmental practice.
- Use of environmental impact assessment for process improvement.
- A policy to manage energy and vehicle fuel use in the business.
- A policy to engage with the local community on local environmental issues

What are LCI and LCA?

- Life cycle inventory (LCI) is one of the phases of a life cycle assessment (LCA).
- LCI data quantify the material, energy and emissions associated with a functional system (for example, the manufacture of 1kg of hot rolled coil).
- LCA is a tool to assist with the quantification and evaluation of environmental burdens and impacts associated with product systems and activities, from the extraction of raw materials in the earth to end-of-life and waste disposal.
- Most LCA studies that are currently available consider cradle-to-gate (e.g. NZ wood) as opposed to cradle-to-grave or cradle-to-cradle



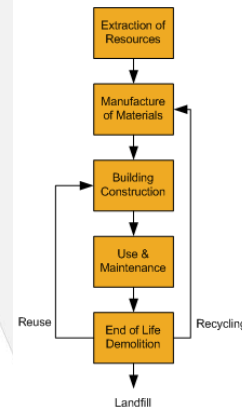
Example LCI data set: Steel hot rolled section; blast furnace and electric arc furnace route (from ELCD)

Unchanged re-publication of: (source data set)		ELCD database 2.0	
Owner of data set (contact data set)		worldsteel	
Access and use restrictions		The data set can be used free of charge by anyone to perform LCA studies, to distribute it to third parties, to convert it to other formats, to develop own data sets etc. as long as it can be accessed via http://ca.jrc.ec.europa.eu . Please note e.g. that reference must be given to the 'Owner of data set' and to the 'ELCD database' plus version number, when the data set is used. The data set is provided 'as is' without any warranty. The use of the data set results in invalidity of any existing 'Official approval of data set by producer/operator', that the impression must be avoided that this would still be a complete ELCD data set and that copyright and license conditions.	
Inputs and Outputs			
Inputs			
Type Of flow	Classification	Flow	Resulting amount
Energy Flow	Resources/ Resources from ground/ Non-renewable material resources from ground	resources from ground	0.09353531 kg (steel)
Energy Flow	Resources/ Resources from ground/ Non-renewable material resources from ground	steel prod. in EU (steel)	1.7696448356 kg (Net carbonic value)
Energy Flow	Resources/ Resources from ground/ Non-renewable material resources from ground	steel prod. in EU (steel)	0.02443787 kg (steel)
Energy Flow	Resources/ Resources from ground/ Non-renewable material resources from ground	steel prod. in EU (steel)	7.402716178 kg (Net carbonic value)
Energy Flow	Resources/ Resources from ground/ Non-renewable material resources from ground	steel prod. in EU (steel)	0.00439972 kg (steel)
Energy Flow	Resources/ Resources from ground/ Non-renewable material resources from ground	steel prod. in EU (steel)	0.00155959 kg (steel)
Energy Flow	Resources/ Resources from ground/ Non-renewable material resources from ground	steel prod. in EU (steel)	2.41117090984 kg (Net carbonic value)
Energy Flow	Resources/ Resources from ground/ Renewable material resources from waste	steel prod. in EU (steel)	3.48375373 kg (steel)
Energy Flow	Resources/ Resources from ground/ Non-renewable material resources from ground	steel prod. in EU (steel)	-0.00233235 kg (steel)
Outputs			
Type Of flow	Classification	Flow	Resulting amount
Product flow	Materials/ production/ Emissions and semiments	steel prod. in EU (steel)	1 kg (steel)
Rate flow	Waste/ Production releases	steel prod. in EU (steel)	0.44897076 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	3.93195112 kg (steel)
Energy Flow	Emissions/ Emissions to water/ Emissions to fresh water	steel prod. in EU (steel)	0.00162339 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	8.0203654 kg (steel)
Energy Flow	Emissions/ Emissions to water/ Emissions to fresh water	steel prod. in EU (steel)	3.052135 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	1.09936802 kg (steel)
Energy Flow	Emissions/ Emissions to water/ Emissions to fresh water	steel prod. in EU (steel)	0.13281458 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	3.9130776 kg (steel)
Energy Flow	Emissions/ Emissions to water/ Emissions to fresh water	steel prod. in EU (steel)	3.2273817 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	4.2470681 kg (steel)
Energy Flow	Emissions/ Emissions to water/ Emissions to fresh water	steel prod. in EU (steel)	3.931668 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	2.2394464 kg (steel)
Energy Flow	Emissions/ Emissions to water/ Emissions to fresh water	steel prod. in EU (steel)	0.00511768 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	2.339684 kg (steel)
Energy Flow	Emissions/ Emissions to water/ Emissions to fresh water	steel prod. in EU (steel)	1.941776 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	1.054987 kg (steel)
Energy Flow	Emissions/ Emissions to water/ Emissions to fresh water	steel prod. in EU (steel)	0.00715662 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	0.0035484 kg (steel)
Energy Flow	Emissions/ Emissions to water/ Emissions to fresh water	steel prod. in EU (steel)	1.646848 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	0.01168581 kg (steel)
Energy Flow	Emissions/ Emissions to water/ Emissions to fresh water	steel prod. in EU (steel)	4.910416 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	0.00212676 kg (steel)
Energy Flow	Emissions/ Emissions to water/ Emissions to fresh water	steel prod. in EU (steel)	6.761426 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	0.00614392 kg (steel)
Energy Flow	Emissions/ Emissions to water/ Emissions to fresh water	steel prod. in EU (steel)	1.62584965 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	0.0024177 kg (steel)
Energy Flow	Emissions/ Emissions to water/ Emissions to fresh water	steel prod. in EU (steel)	1.381168 kg (steel)
Energy Flow	Emissions/ Emissions to air/ Emissions to air, unspecified	steel prod. in EU (steel)	3.041733 kg (steel)

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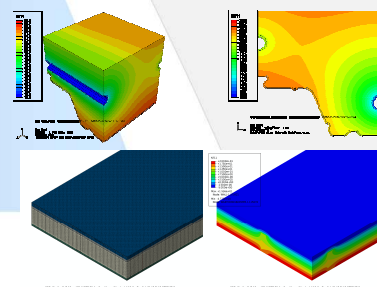
The Life Cycle Stages of a Building



Reducing operational energy through Fabric Energy Storage

Thermal mass is the ability of the fabric of a building to absorb excess heat; it can reduce cooling loads and, in some cases, remove the requirement to provide air conditioning entirely and its associated energy consumption.

- It is shown¹ that sufficient thermal mass may be achieved by providing floors with an effective thickness of only 100 mm, which can be readily achieved in all common forms of composite construction
- Where the diurnal shift is less than 7°C (the daily temperature shift that occurs from daytime to night-time) thermal mass is not so well suited.
- Several steel technologies for enhancing thermal mass are available.



1. Green, R., Hicks, S., Pope, R. & Dowling, J.: Review of conventional applications of Thermal Mass in Buildings (submitted to IPENZ Transactions)

Summary

- Sustainability is here to stay and the New Zealand steel industry needs to be able to provide coherent information to specifiers (the Ministry of Education requires all new schools to meet a 5 Green Star Education 2009 certified rating)
- There is a wealth of international information that has remained untapped to date (worldsteel has been undertaking LCI work since 1996).
- The proposed revision to the Green Star steel credit provides both challenges and opportunities.
- Through a commitment from the industry, the Sustainable Steel Council will provide a one-stop shop for generic sustainability information.
- In the future, the industry may need to provide quantitative NZ-based information such as LCI data.
- There are opportunities for manufacturers and steel producers to develop sustainable construction products (e.g. products that reduce operational energy). [Sustainability Wellington.ppt](#)