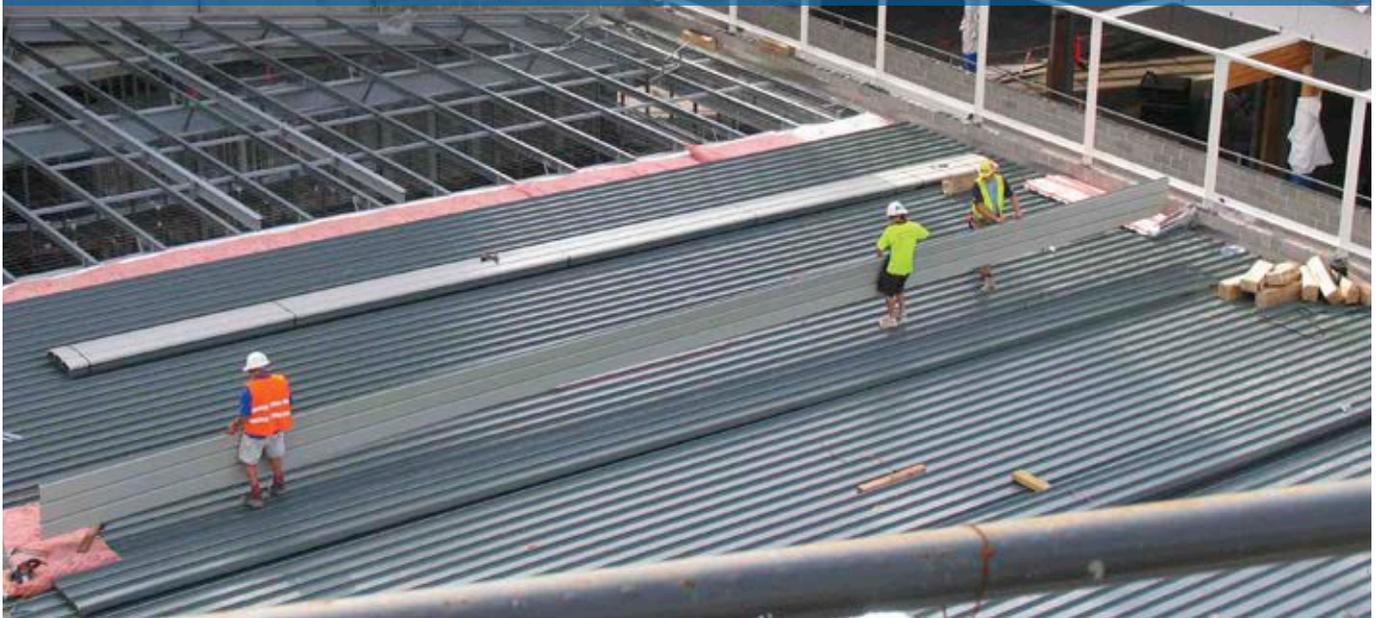


Sustainability



Voluntary Green Building Ratings Tools in Australia



BlueScope Steel Ltd. (BlueScope Steel) has made a commitment to continually improve the company's environmental footprint and the sustainability of its products and services.

This is the third in a series of technical bulletins relating to sustainability issues that directly or indirectly impact the steel value chain. In writing these bulletins BlueScope Steel wishes to inform and educate the market, based on the latest available and verifiable information.

This technical bulletin briefly outlines the voluntary systems for rating building design and operation according to sustainability criteria that are most commonly used in Australia.

BlueScope Steel products can be utilised in greener building designs to improve energy efficiency and thermal comfort—as well as to reduce energy and water demand—thus helping designers meet many of the voluntary green building standards that are becoming benchmarks in Australia.

BlueScope Steel products can help accrue points both directly and indirectly in many of the categories that are commonly included in green building ratings tools, including:

- *Indoor Environment Quality;*
- *Water;*
- *Energy;* and
- *Materials.*

Other technical bulletins in this series related to voluntary green building ratings systems include:

1. Zero-Carbon and Carbon Neutral Developments;
4. Recycling;
5. Mandatory Sustainability Requirements for Residential Buildings in Australia;
7. Sustainable Building Solutions: Thermal Mass; and
8. Steel in Sustainable Buildings.

1. Introduction to Green Buildings Ratings Tools

As awareness and concern regarding environmental and sustainability issues – such as the consequences of resource depletion, loss of biodiversity and climate change – have increased, so has the demand for property developments that result in fewer environmental impacts, while allowing living standards to be maintained. Architects, developers and materials suppliers have responded to this demand by developing techniques and technologies that reduce energy, water and primary material consumption, reduce greenhouse gas (GHG) emissions and maintain or improve local ecological systems and services. Numerous government and nongovernmental organisations have also attempted to influence the sustainability of the property sector by creating a range of voluntary *green ratings tools*, which can be used to quantify the environmental performance of new and existing buildings.

In contrast to the mandatory standards set out in the Australian Building Code,

Table 1: Key features of the voluntary Green Ratings Tools in use across Australia.

GREEN RATINGS TOOLS	KEY FEATURES							
	Applicable	New Buildings	Existing Buildings	Full Life Cycle	Commercial / Multi Unit Residential	Detached Residential	Communities	Infrastructure
Green Star™	Nationally	✓	✓	✓	✓		✓	
City of Sydney Multi Unit Residential	City of Sydney	✓		✓	✓			
AGIC – IS Rating Scheme	Nationally	✓		✓				✓
NABERS (incorporating ABGR)	Nationally		✓		✓	✓		
STEPS	Port Phillip & Moreland (Vic)	✓		✓		✓		
SDS	Port Phillip & Moreland (Vic)	✓		✓	✓			
EnviroDevelopment™	QLD, NSW, VIC, SA, WA	✓		✓	✓	✓		
eTool	Nationally	✓		✓	✓	✓		
Living Building Challenge	International	✓		✓	✓		✓	✓

BASIX (NSW) and 5 Star Homes (Victoria), which have been introduced to encourage sustainable building practices, voluntary green ratings tools are generally highly *prescriptive* and *holistic*. That is, they attempt to consider the whole life cycle of a building and occupant behaviour – rather than focusing on gaining efficiencies in the use-phase of a building from changes to initial design elements. They also look at a range of environmental effects, and ways to reduce negative impacts, whereas the mandatory standards focus primarily on reducing GHG emissions by increasing energy efficiency. The table above (Table 1) summarises some of the key features of each of the green ratings tools currently in use, and the developments to which they can be applied.

2. Green Star™

Green Star™ is based on the Leadership in Energy and Environmental Design (LEED) Green Building Rating System™ – developed by the US Green Building Council – and the UK Building Research Establishment Environmental Assessment Method (BREEAM).

BREEAM covers new and retrofitted buildings, and includes assessment tools for offices, homes (including multi-unit residential complexes), communities, courts, industrial developments, prisons, retail buildings, healthcare facilities and schools. There is also a BREEAM bespoke assessment that can be applied to any building that falls outside the range of tailored BREEAM tools, such as leisure complexes, laboratories and hotels. BREEAM International is also a bespoke tool, which can be used to assess a single development outside the UK. Buildings are rated on a scale from *pass* to *good*, *very good* and *excellent*.

There are LEED® assessment tools for the construction and major renovation of commercial and institutional buildings, the operation and maintenance of existing buildings, commercial interiors, new core and shell, school developments, retail design and construction, healthcare buildings, new homes and neighbourhood development. There are four levels of LEED® achievement; *certified*, *silver*, *gold* and *platinum*.

2.1 Green Star™ Rating Tool

Launched in 2002, and endorsed by the World Green Building Council, the Green Building Council of Australia (GBCA) is a national, not-for-profit organisation that aims to develop a sustainable property industry in Australia by encouraging the adoption of green building practices. To this end, the GBCA developed Green Star™ as a national rating scheme to evaluate the environmental design and achievements of buildings. The scheme covers a number of categories that assess the environmental impact that is a direct consequence of site selection, design, construction, occupancy and maintenance. There are nine categories within Green Star™ rating tools, which are divided into credits. Each credit addresses an initiative that improves – or has the potential to improve – environmental performance. Points are awarded under each credit for actions that demonstrate that the project has met the overall objectives of Green Star™. The current Green Star™ Buildings categories are:

- *Management*: covers the overall management of the construction phase of the building. Points are awarded for the implementation of, for example, a formal Environmental Management System (EMS) and for limiting the amount of waste sent to landfill;

- *Indoor Environmental Quality*: covers design features which improve occupant health and well-being, such as creating good fresh air ventilation rates, low ambient noise levels, natural daylight and no (low) solar glare;
- *Energy*: aims to minimise operational energy use and carbon dioxide (CO2) emissions through, for example, the utilisation of low energy lighting, energy sub-metering and reduced peak demand;
- *Transport*: assesses transport-related CO2 reduction strategies and location factors such as access to public transport networks and the provision of cycle storage facilities;
- *Water*: assesses water consumption rates and efficiencies. Points can be accrued for the installation of low water-use fittings, rain and/or grey water systems, water meters, leak detection systems and proximity detection shut-offs;
- *Materials*: assesses the environmental implications of building materials over their life cycle e.g. responsible sourcing, potential to re-use the building façade and primary structure, and provision for on-site recycling;
- *Land Use and Ecology*: points are awarded for using previously developed land or remediating contaminated land. Points are also accrued if the site is one of low ecological value, has been ecologically enhanced or ecological impact is kept to a minimum;
- *Emissions*: covers air and water pollution issues such as the use of insulants and refrigerants with low/no global warming potential (GWP) or ozone depleting potential (ODP), the inclusion of sustainable urban drainage with low flood risk and no contribution to night time light pollution; and

- **Innovation:** points are awarded in recognition of pioneering initiatives in sustainable design, process or advocacy, or where a project achieves environmental benefits in excess or beyond the scope of the current Green Star™ benchmarks.

Once all credits in each category are claimed and verified, a percentage score is calculated, and Green Star™ environmental weighting factors applied. Weighting factors vary according to State and Territory, to reflect the diversity of environmental concerns across Australia. The result is a weighted score out of 100, which is translated into a Green Star™ rating:

- 4 Star Green Star™ Certified Rating (score 45-59) signifying *Best Practice*;
- 5 Star Green Star™ Certified Rating (score 60-74) signifying *Australian Excellence*; and
- 6 Star Green Star™ Certified Rating (score 75-100) signifying *World Leadership*.

Green Star™ certification is a formal process certified by the GBCA, although any developer can use the Green Star™ tools as a guide to track and improve the environmental performance of their project.

Green Star™ Rating Tools are available for Offices (Office Design and Office As Built), Office Interiors, Multi Unit Residential, Education buildings, Healthcare facilities, Retail centres and Industrial buildings. Pilot Green Star™ Ratings Tools are available for Office Existing Building and Convention Centre Design, Communities and Public Buildings. Tools for Performance and Custom Buildings are under development.

2.2 Green Star™ Communities

Launched in 2012, Green Star™ Communities supports the planning, design and delivery of communities, precincts and neighbourhoods that prioritise environmental sustainability alongside broader issues such as economic prosperity, liveability and community health and wellbeing

The Green Star™ Communities tool defines 38 best practice benchmarks across 5 sustainability categories, plus Innovation, for planning, design and delivery of sustainable communities:

1. Governance
2. Design
3. Liveability

4. Economic Prosperity
 5. Environment
- + Innovation

An independent assessment panel awards points to the project based on each category and the Green Star™ rating is determined. (Out of a possible 100 + an additional 10 points for innovation)

Score	Rating	Category
45–59	4 Star	Best Practice
60–74	5 Star	Australian Excellence
75+	6 Star	World Leadership

In addition to the Green Star™ buildings tools rating there are minimum point scores per category ensuring any star rating achieved has addressed every category resulting in a more holistic outcome.

The Communities tool has been developed with a view that it can be applied to a variety of community development types.

All credits are intended to be applicable to projects that contain 100% single use buildings (residential or commercial & industrial) or developments that contain a mix of uses.

2.3 Based on Green Star™: City of Sydney Multi Unit Residential Rating Tool

The City of Sydney has developed a rating tool – in co-operation with the GBCA – to measure the environmental performance of proposed new

multi unit residential developments comprising more than six units. The tool is based on Green Star™ and integrates additional BASIX (legislative) requirements for energy and water efficiency. Subsequently, there are over 50 performance criteria through which building designers can accrue points towards the benchmark of 45/100 points, or 4 stars (Green Star™ -equivalent). This affords designers flexibility as to how to meet the targets, and allows the most to be made of site-specific opportunities. The criteria fall into eight categories with the same emphasis as Green Star™:

- *Management*;
- *Indoor Environmental Quality*;
- *Energy*;
- *Water*;
- *Materials*;
- *Land Use and Ecology*; and
- *Emissions*.

As under Green Star™, an environmental weighting factor is applied to each category score to reach a single score.

3. Australian Green Infrastructure Council (AGIC)

The Australian Green Infrastructure Council (AGIC) was launched in February 2008 with the aim of catalysing the delivery and operation of more sustainable infrastructure in Australia. AGIC launched the Infrastructure Sustainability (IS) rating scheme in 2012.





- 50 to <75 points achieve an 'Excellent' rating.
- 75 to 100 points achieve a 'Leading' rating.

How can BlueScope Steel help you earn credits?

The IS rating scheme differs significantly from other rating tools such as Green Star™ and LEED in that it is less prescriptive and allows more options for evidence to prove compliance. This evidence will have to pass the assessment of an appointed AGIC assessor.

4. National Australian Built Environment Rating System (NABERS) – incorporating the Australian Building Greenhouse Rating (ABGR)

NABERS is a national initiative managed by the NSW Government (Office of Environment and Heritage). It is a performance-based rating system incorporating:

- NABERS Energy (formally ABGR);
- NABERS Water;
- NABERS Waste; and
- NABERS Indoor Environment.

The tools aim to measure the sustainability of existing residential, office (for landlords and tenants), retail and hotel buildings. The assessment does not take the construction, maintenance or end-of-life phases of properties into account. NABERS measures environmental performance against a set of key impact categories, which are weighted depending on what sort of building is being assessed. The key impact categories are:

- *Energy Use and Greenhouse Emissions:* assesses operational energy efficiency with the premise that reducing energy demand reduces GHG – specifically CO₂ – emissions;
- *Water Use:* assesses the adoption of practices to harvest water and reduce water demand;
- *Waste:* assesses waste-to-landfill minimisation strategies; and
- *Indoor Environment:* assesses the impact on health, satisfaction and productivity of building occupants, including thermal comfort, air flow and natural light.

Any building owner or occupier can complete a self-assessment using online calculation tools based on 12-months of

There are six key themes: Management and Governance, Using Resources, Emissions, Ecology and People and Place plus the bonus Innovation theme. These themes are divided into 15 categories under which you can earn credits towards a rating score out of a total of 100.

A project certification can be obtained for Design, As Built or Operation. The initial planning process is not covered by the IS tool. The Design certification is an interim rating and must be converted into an As Built certification once the project is completed or it becomes invalid. To obtain the Operational rating the infrastructure must have been operating for a minimum of 2 years. Existing infrastructure can be rated via the Operations certification. Operations ratings must be renewed every 5 years.

The rating tool applies to the following classes of infrastructure:

Transport:

- Roads & bridges
- Bus & cycle ways
- Footpaths
- Ports & harbours
- Airports
- Railways

Communication:

- Communication transmission & distribution

Water:

- Water storage & supply
- Sewerage & drainage

Energy:

- Electricity transmission & distribution

Credit layout

Each credit has the same format:

Aim – explains the aim of the credit

Criteria – A table with 1 to 3 benchmark levels all above business-as-usual

Evidence – description of suggested evidence to demonstrate compliance – other evidence can be included.

Additional Guidance – advice to help achieve the credit.

The IS rating tool uses a 100 point scale to measure performance and this score determines the rating level achieved as follows:

- <25 points are not eligible to apply for a certified rating.
- 25 to <50 points achieve a 'Good' rating.

energy- and water-use data, and basic measurements of indoor environment quality and waste management practices, but to be quotable, a NABERS assessor must verify the assessment. NABERS operates on a 0-5 star rating scale: 5 stars represents a highly efficient building; 2.5 stars is average; and a 1 star rating means there are many opportunities to improve efficiency and efficacy.

5. Sustainable Design Assessment in the Planning Process: STEPS and SDS

Moreland City Council, along with others in Victoria, has implemented Sustainable Design Assessment in the Planning Process (SDAPP). The SDAPP program recognises that many decisions affecting the sustainability of new buildings are made early in the design process. Therefore, sustainability should be considered from the outset, rather than just at the building permit stage.

STEPS and SDS were developed by Moreland City Council and The City of Port Phillip to set clear environmental performance targets for developments. Whilst voluntary, these are the preferred assessment tools in Moreland and Port Phillip (Victoria). Both tools can be accessed online by developers and property owners to assess the impacts of the construction, use (including fixtures and fittings) and end-of-life phases of their developments.

5.1 Sustainable Tools for Environmental Performance Strategy (STEPS)

STEPS is used to assess residential planning applications for individual dwellings, town houses, multi unit developments and the residential component of mixed use buildings. Points are awarded for what are considered to be the five most critical elements in constructing environmentally sustainable dwellings:

- GHG emissions from operating energy;
- peak energy use;
- mains potable water use;
- stormwater quality impacts; and
- building materials impacts.

The STEPS assessment attempts to account for consumer behaviour, as well as static features such as design elements. For example STEPS assesses the energy use per resident, not the energy used per square metre, and takes the likely energy that will be used

to operate appliances and lighting into account.

The expected environmental impacts for each element are converted into a score by comparing the impact of the proposal against a conventional development and a perfect development. Dwellings are scored from 1 to 100: 100 equals a *perfect development* i.e. there are no adverse off-site impacts for a particular element, for example, no GHG emissions from energy use or no mains water consumption. A score of 0 equals the estimated *average* performance of a conventional design. A highly inefficient building can therefore receive a negative score, and a building that makes a positive contribution to the environment by, for example, generating more solar energy than it uses, can score more than 100. To encourage the continual improvement of the housing stock, there are also reductions from *current average* targets associated with each element: the GHG emissions target is a reduction of 15%; mains water consumption target is a reduction of 25%; and peak energy demand is a reduction of 10%.

The STEPS report also specifies the areas needed for bicycle storage and waste recycling facilities, and includes information to help developers and owners increase the sustainability performance of the proposed dwelling.

Data inputs into STEPS are the output from a FirstRate5 thermal modelling assessment, as well as additional design and fixtures and fittings information. Moreland City Council has also published the *Moreland Greenlist*, which specifies the building materials that are considered *environmentally suitable* by STEPS.

5.1.1 The Greenlist

The Greenlist considers:

- *Fate of Material*: rewards products and construction practices that are highly reusable or recyclable;
- *Embodied Energy*: scores are based on both the embodied energy of the material and the associated fixing materials;
- *Biodiversity*: considers the effects on biodiversity from the creation of building materials, taking into account recycled content and the source of the materials;
- *Human Health*: this criteria considers whether a product emits, or is likely to emit, carcinogens or persistent organic pollutants (POPs); and

- *Environmental Toxicity*: points are awarded to products that do not, at any stage of their life cycle, emit environmental toxins or POPs.

5.2 Sustainable Design Scorecard (SDS)

SDS is a universal scorecard for all non-residential buildings with a floor area of less than 2500m², including commercial, industrial and retail developments. The Scorecard assesses potential environmental impacts in seven categories. Developments must achieve a minimum score in each category i.e. a high score in one category cannot be used to offset a low score in another category. Some of the strategies listed in the scorecard are mandatory to meet the minimum score:

- *Energy Efficiency*: minimum score 30/60. Points are accrued by, for example, minimising building air leakage and achieving high operational energy efficiency;
- *Transport*: minimum score 10/10. Building design must include the provision for undercover bicycle storage;
- *Water*: minimum score 20/24. Includes a specific target for a 25% reduction in potable water demand;
- *Waste*: minimum score 12/16. Encourages designs that allow for disassembly, re-use and easy retrofit; designs that preserve heritage; and practices that minimise construction waste and off-cuts;
- *Materials*: minimum score 12/28. Points are accrued by, for example, using cladding which is durable and materials on the Greenlist (see Section 5.1.1);
- *Indoor Environment Quality*: minimum score 8/14. Points are accrued by, for example, designing to create natural ventilation and using materials that do not emit volatile organic compounds (VOCs); and
- *Innovation*: minimum score 8/45. Points are awarded for innovative sustainability solutions, such as the use of efficient vertical transport systems, sub-metering and creating window area equal to 30% of the floor area.

Points for each category are weighted according to Moreland City Council and The City of Port Phillip sustainability priorities. For example, the energy category requires 30 points to achieve the standard because of concerns about the consequences of unchecked global warming. The SDS model incorporates a separate *Stormwater Calculator* (developed by Melbourne Water), and a construction *waste minimisation plan* (EcoRecycle) must be completed.

6. EnviroDevelopment™

EnviroDevelopment™ (an initiative of the Urban Development Institute of Australia: Queensland – UDIA) is a branding system that aims to make it easier for purchasers to recognise, and thereby select, more environmentally sustainable developments and lifestyles. Any building i.e. residential, commercial or industrial can be evaluated and certified in any (or all) of six categories:

- *Water*: awarded for the use of water efficiency mechanisms and/or source substitution, such as rainwater and stormwater harvesting;
- *Energy*: awarded for energy efficiency strategies and the use of renewable and non-polluting energy sources;
- *Ecosystems*: awarded for the protection and enhancement of the health and sustainability of natural systems, encouraging native biodiversity, and the rehabilitation of degraded sites;
- *Community*: awarded for the provision of community facilities and networks, safe, accessible housing and mechanisms to reduce private motor vehicle use;
- *Materials*: awarded for, as an example, the reuse of materials, the use of recycled materials and consideration of life cycle costs; and
- *Waste*: awarded for management procedures and practices that reduce the amount of waste sent to landfill.

The criteria for certification under each element are more prescriptive than those used in the other voluntary ratings systems, although in some sections there are a number of options available to designers to meet the standard. Further, certification is binary: there is no accrual of points (or stars) reflecting

different levels of sustainable practice under each element.

Developers can apply for EnviroDevelopment™ certification as soon as they are able to demonstrate that the development will meet the criteria. EnviroDevelopment™ recommends that submission for certification occur at the Development Approval or Building Approval stage.

7. eTool

eTool was formed for the purpose of realising a sustainable modern culture via low carbon buildings. Going further than the triple bottom line approach, the Company Charter further details how they operate as an organisation. Their goals are:

- Provide eTool LCA software free of charge to maximise availability to all and thus enable dramatic reduction to Australian and Global CO2 emissions;
- Propagate the use of eTool LCA software as quickly and effectively as possible through education, training and marketing;
- Utilise profits to further fund other actions enhancing the quality of life for humanity in a sustainable fashion; and
- Practice business in a financially sustainable and ethical manner while providing a high quality work environment for all employees and sub-contractors.

There are two components to eTool:

1. *eTool LCA* – software designed specifically for Life Cycle Assessment of the built form; and
2. *eTool Services* – utilising eTool LCA to provide sustainable design services.

eTool is designed to be applicable to residential and commercial developments with future development into infrastructure.

8. The Living Futures Institute Australia – Living Building Challenge

The Living Futures Institute Australia (LFIA) is a regional organization, partnered with the International Living Future Institute (ILFI). The purpose of the Living Future Institute Australia, however, is as a visionary hub, which supports restorative design specifically in alternative environmental and built environment (buildings and communities) tools and strategies.

The Living Building Challenge goes beyond the usual rating tool and pushes the boundaries of sustainable design.

The Living Building Challenge is described as a philosophy, advocacy tool and certification program that addresses development at all scales.

Rather than a checklist of best practices the Challenge leads teams to embrace regional solutions and respond to a number of variables, including climate factors and cultural characteristics.

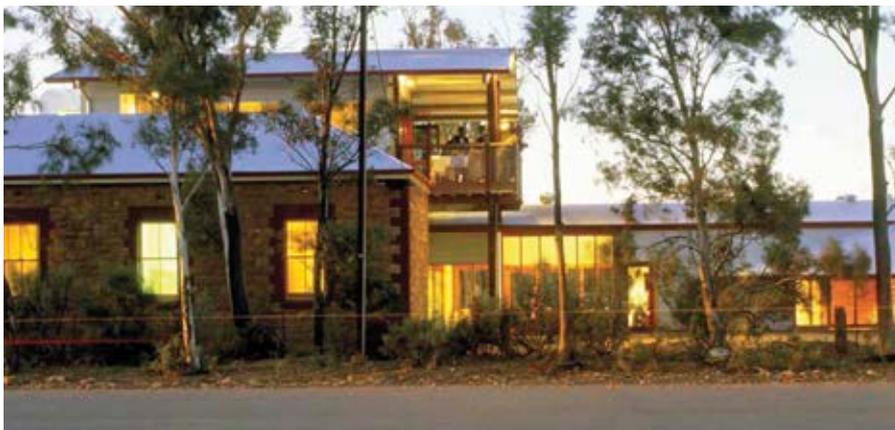
The Living Building Challenge is considered by many as the world's most stringent and progressive green building certification program. It is applicable to both new and existing projects that seek to reach much further than any existing green building program in terms of water, energy, materials and a host of other factors. Projects that successfully complete the program can be seen as the world's greenest buildings.

With a goal to increase awareness, the program tackles critical environmental, social and economic problems including the rise of toxic chemicals, climate change, habitat loss, and urban sprawl. It comprises seven performance areas – site, water, energy, health, materials, equity and beauty.

The Living Building Challenge is not prescriptive in suggesting particular solutions but a holistic framework driving building designers to set new benchmarks.

9. Greener Buildings with BlueScope Steel Products

The key to greener buildings is efficient and effective sustainable design. BlueScope Steel products can be utilised in greener building design to improve energy efficiency and thermal comfort, and reduce energy and water demand, and thus help designers meet many of the voluntary green building standards.



Above: Prairie Hotel, Parachilna, South Australia.

9.1 Indoor Environmental Quality and Energy

Because of the high strength to weight ratio of steel, buildings can be designed to incorporate large internal volumes. This facilitates several aspects of green design, which accrue points in *Indoor Environmental Quality and Energy* assessments. Large volumes allow for *one-room-thick* designs – with doors and windows on both sides of the room – which have good natural ventilation rates, allow for cross ventilation and help maintain thermal comfort throughout the year. Thermal comfort and natural ventilation are assessed elements in all the green rating tools.

Because steel building components are produced with consistency, and tight tolerances that are maintained over the life of the building, they can be used to create extremely airtight building envelopes. A steel envelope can therefore help limit air loss and reduce energy demand. Building envelope air loss is specifically assessed in the SDS tool.

More glazing can also be incorporated into a high-volume room, which increases daylight penetration rates, allows for external views and can be important in passive solar design to manage thermal comfort. Green Star™ and the City of Sydney Multi Unit Residential tool both have points available for daylight penetration rate and external views: all tools indirectly award points for good daylight penetration rates via lighting energy efficiency criteria. Increasing natural light levels and controlling thermal comfort via design – rather than air-conditioning – also contributes to reduced overall- and peak-energy demand. The refurbishment and extension of the Prairie Hotel in Parachilna – which won the Royal Australian Institute of Architects (SA Chapter) Award of Merit for Energy and Environmentally Sustainable Design (ESD) – is a good example of how energy demand can be reduced by combining green design elements with steel products¹. Architect John Maitland reported that he chose to use ZINCALUME® steel to create the low-lying, curved roof because it is lightweight, durable, recyclable, easy to transport, produces minimal on-site waste and has high thermal efficiency¹. When combined with design elements such as roof overhangs that shade the building during the summer, and building

orientation to allow winter sun into northern rooms, energy demand for both heating and cooling was minimised¹.

The range of colour finishes produced in steel can also aid the management of thermal comfort and the reduction of peak energy demand. In warmer climates light coloured and/or reflective roofs and walls can be used to deflect energy away from the building, which in turn can reduce energy demand for internal cooling. For example, the use of light coloured COLORBOND® steel, light coloured COLORBOND® Metallic steel, COLORBOND® Coolmax® steel or ZINCALUME® steel for external walls and roofing will result in less of the sun's energy being absorbed into the building because of the colour – light colours absorb less energy than dark colours. However, with the addition of Thermatech® solar reflectance technology, darker coloured standard COLORBOND® steel products also absorb less energy, creating the same advantages of a cooler roof and a cooler building. Further the high thermal emittance of painted steel products means that any heat that is absorbed into the building is quickly re-radiated at night. This is particularly important for residential buildings, where peak electricity use often occurs during the summer when occupants cool their homes after being away for the day. Reducing peak-demand can often be the key to not requiring additional power generation stations and infrastructure to be commissioned. BlueScope Steel cladding can also be used in the coldest Australian climate zones to make buildings more energy efficient: dark roofs and walls are effective at absorbing solar energy, and can result in warmer buildings, that require less energy to heat.

Lightweight steel construction also responds quickly to changes in thermal conditions which, in particular, can help reduce energy demand in the residential sector. Homes can be heated or cooled quickly at the end of the day, without expending a lot of energy on heating or cooling the structure.

9.2 Materials

From a resource sustainability perspective, the proportion of steel that is recovered for recycling at the end of each use phase is one of the most important criteria, however this is both difficult to measure and enforce (given that the steel entering the built

environment is anticipated to have a long service life before becoming available for recycling).

In an attempt to establish a metric which is broadly applicable and easy to measure, some of the first established green building ratings tools assessed steel sustainability based on recycled content alone. However, as tools mature, some governing bodies are recognising that no good or service should be evaluated by a single metric – and that the full life cycle of the product should be taken into account, including all positive and negative effects on the environment, society and economy, from cradle to grave. For example, the GBCA has adopted a multi-metric approach to the assessment of steel within the Materials section of Green Star™ building tools. The credit (Mat-6) now focuses on encouraging 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 the steel used in the building's structure complies with the criteria set out below, and is sourced from a responsible steel maker (defined as steelmakers with ISO 14001 certification and worldsteel Climate Action Program membership).

Where structural steel comprises 60% or more of the total steel used in the structure, up to two points can be awarded for the use of:

- High strength steels (1 point); and
- Steelwork supplied by a steel fabricator/contractor accredited to the Environmental Sustainability Charter of the Australian Steel Institute (1 point).

Where *reinforcing steel* comprises 60% or more of the total steel used in the structure of the building, up to two points can be awarded for the use of:

- High strength steel, of which at least 60% is produced using energy-reducing processes (1 point); and
- High strength steel, of which at least 15% (by mass) is assembled using off-site optimal fabrication techniques (1 point).

Where neither structural 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.

BlueScope Steel is a responsible steel maker, therefore BlueScope Steel



products meet the mandatory requirements of the credit. BlueScope Steel also produces high strength steels which can help accrue points (see page 7).

Steel products can also help accrue points indirectly in materials assessments: high strength, lightweight steel framing can also be utilised to add volume to existing buildings, particularly heritage buildings that are weight sensitive e.g. the completion of the Scots Presbyterian Church Assembly Building in downtown Sydney, where the original building façade was preserved, and additional residential and commercial space added using steel products². This type of project falls in line with Green Star™, SDS and EnviroDevelopment™ aims for *building reuse*. Further, the

large internal volumes that can be created cost effectively, and with high material efficiency, using high strength, lightweight steel can be easily redefined over the life of the building. This reduces retrofit costs, which specifically accrues points under the SDS and Green Star™ assessments.

It is also possible to incorporate steel into *designs for disassembly*. High-grade, durable materials work best in designs for disassembly, where entire components of the building are removed and reused: steel products are ideal for this purpose.

Over many years BlueScope Steel has improved processes and developed technologies to improve the material efficiency of steel products to assist in *dematerialisation*. The dematerialisation™ that has been achieved means that the

same function can now be performed using less material. For example, due to the development of high strength steel a dematerialisation of 24% has been achieved for COLORBOND® steel used for residential roofing without any sacrifice in functionality. Residential roofing that was once manufactured at a base metal thickness of 0.55 mm can today be produced at 0.42 mm (0.13 mm thinner). Steel framing is another example of innovation that allows the same functionality with less material use: house framing that used be 1.20–1.60 mm thick is today usually only 0.60–0.75 mm thick – a saving of 50%. Dematerialisation of structural steel helps accrue points in the Dematerialisation credit (Mat-10) of Green Star™ Office v3.

In the Green Star™ Communities tool Urban Heat Islands are addressed by Credit ENV-3 Heat Island Effect, one point is awarded if at least 50 per cent of the site area (in plan view) comprises one, or a combination of, the following:

- vegetation
- roof materials with a minimum solar reflective index (SRI) greater than 78
- unshaded hardscape with an SRI greater than 29
- water bodies and water courses.

COLORBOND® steel colours Classic Cream™, Surfmist® and COLORBOND® Coolmax® in Whitehaven® all meet the GBCA benchmark for roofing material with a Solar Reflective Index greater than 78, earning one point in this category. In addition if a ‘green roof’ is proposed for part of the development steel is a good choice for the supporting structure.

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2. **Harding, L. (2006)** Tonkin Zulaikha Greer’s addition to the Scots Church Assembly Building constructs a lively encounter between old and new, offering an articulate challenge to current conservation orthodoxy. *Architecture Australia*.

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