A custom Green Star Antarctic Tool: A sustainable design standard

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**Information Paper submitted by New Zealand**

Summary

The Green Star Antarctic Tool is a custom Antarctic sustainable design standard developed in collaboration with the New Zealand and Australian Green Building Councils as part of the proposed Scott Base Redevelopment project (WP XX1). Parties could consider using the Tool to minimise carbon emissions when undertaking modernisation or infrastructure projects in Antarctica (WP XX2).

Trends in Sustainable Design Standards

The goal of the sustainable building movement led by the World Green Building Council (WGBC) is to facilitate the sustainable transformation of the built environment by addressing both the ambitions of the Paris Agreement and the United Nations’ Sustainable Development Goals. This goal is divided into three impact areas; (i) to decarbonise the built environment, (ii) to deliver healthy, equitable and resilient buildings, and (iii) to support regeneration of resources and natural systems.

Tools for addressing these impact areas include research, advocacy, education, and sustainable design standards. Two well-known standards administered under the WGBC umbrella are Leadership in Energy and Environmental Design (LEED) via the United States Green Building Council, and Green Star via the New Zealand and Australian Green Building Councils (NZGBC and GBCA).

The WGBC, who administers 69 member countries Green Building Councils (GBCs), has provided trends in ‘Green Building’ in the 2020 annual report (WGBC, 2020). Between 2010 and 2020, the number of GBCs worldwide has increased from 41 to 69, the number of organisations registered with GBCs has increased from 21,000 to 36,000, and the amount of building floor area certified by a GBC (under a sustainable design standard) has increased from 300 million square meters to 3.5 billion square meters.

New Zealand Green Building Council’s Green Star

Established in 2006 as a not-for-profit organisation, the NZGBC administers New Zealand’s only sustainable design standard, Green Star (NZGBC, 2021). Green Star’s mission reflects that of the WGBC, “Lead the sustainable transformation of the built environment”.

Green Star aims to achieve this mission by encouraging practices that:

* Reduce the impact of climate change;
* Enhance the health and quality of life of inhabitants and the sustainability of the built environment;
* Restore and protect the planet’s biodiversity and ecosystems;
* Ensure ongoing optimum operations performance of buildings; and
* Contribute to market transformation and a sustainable economy.

The NZGBC developed four sustainability design standards relevant to distinct areas of the built environment:

* Design and As Built – for commercial builds;
* Interiors – for retrofitted existing buildings;
* Performance – for operation of buildings, can apply for any building; and
* Communities – for large scale developments.

The “Green Star – Design and As Built” tool is focussed around new commercial buildings, and is the tool that the “Green Star Antarctic Tool” sustainable design standard was based.

Scope of the Green Star Antarctic Tool

Sustainable design standards are designed for the majority of new buildings based in towns and cities. These standards are linked to the function of the building within the city context. As a means of independently verifying sustainability goals and outcomes, Antarctica New Zealand (New Zealand’s Antarctic Program) worked with the NZGBC and GBCA in 2018 to identify a tool for application in the Scott Base Redevelopment project. Given the isolated location, extreme climate, and the mixed-use functionality of the building, it was identified that a custom Green Star Antarctic Tool needed to be created.

The Tool was developed to be used as a sustainable design standard for the Scott Base Redevelopment, and for application by any building development project in Antarctica. Some of the key changes for the custom Green Star Antarctic Tool include:

1. A shift in the focus from environmental restoration to environmental protection, and aligning the scope to the provisions outlined in the Protocol on Environmental Protection to the Antarctic Treaty.
2. The Antarctic context require strong policies relating to operations, biosecurity, waste, procurement, emergency preparedness, and health and wellbeing so an enhanced focus was placed on operational policy and plan development.
3. Excluding categories specific to cities, such as transport and occupant commuting, which are not relevant in an Antarctic context.
4. A focus on the health and wellbeing of occupants, in addition to the indoor environmental quality, to reflect the extended length of time occupants spend in the building and the mixed functionality of the buildings.

Implementation and Benefits

The implementation of Green Star starts in the design phase and finishes after commissioning in the final building. The Tool is structured around credits which are based on aspects of the building design, construction, and operation (Appendix A). Individual credits are achieved by adhering to the aim of the credit, and achieving the desired outcome. Every credit has a number of possible points which can be awarded (Appendix A). Evidence to support a claim of credit points is then provided to the NZGBC in a submission for certification. The structure and form of evidence required is detailed in the Green Star submission guideline.

Credits can be implemented by adhering to the performance standards or criteria detailed in the Green Star submission guidelines. By way of an example, for the credit concerning greenhouse gas emissions (20 points), a project must demonstrate that the proposed building meets standards relating to thermal performance, and reductions in greenhouse gas emissions. The submission guidelines require computer modelling of the design, with points awarded based on improvements in thermal performance and reduction of greenhouse gas emissions compared to a standard reference building (ASHRAE[[1]](#footnote-1)). This process drives continual improvements in the design of the building by modification to cladding systems, heating and cooling systems, electrical systems, and operational procedures. The resulting benefit is realised as a reduction in emissions and savings in energy production.

A Green Star rating is determined by adding the total number of points achieved against each credit for the project and comparing to the total available points in the tool. In Green Star, there are 100 base points and 10 innovation points. The proportion of points required to achieve different levels of certification are presented in Table 1. Under Green Star, a project must meet at a minimum of 45 points, the threshold for Four Stars.

Table 1 - The Green Star rating scale. Zero to three stars are not certified, four stars and above are certified.

|  |  |  |
| --- | --- | --- |
| **% of available points** | **Rating** | **Outcome** |
| Less than 10 | Zero Star | Assessed |
| 10 - 19 | One Star | Minimum Practice |
| 20 - 29 | Two Star | Average Practice |
| 30 - 44 | Three Star | Good Practice |
| 45 - 59 | Four Star | Best Practice |
| 60 - 74 | Five Star | Excellence |
| 75 + | Six Star | World Leadership |

The proposed Scott Base Redevelopment project is aiming for five-star accreditation. At this level, the project has seen benefits in the design resulting from:

* Significant weighting to environmental protection introduced into design decisions.
* Focus on reducing emissions by modelling and continuous improvement.
* Designing for operational efficiency in mechanical plant, and ease of maintenance of all plant.
* Setting of performance targets for environmental and operational outcomes. These targets are then considered at every stage of design. Targets include, energy use, greenhouse gas emissions, water use, waste generation, and wastewater treatment.
* Consideration of the long-term health of occupants through the elimination of pollutants in materials and consideration of wellbeing through design of spaces.
* Introduction of prescriptive standards to standardise and drive improvement of building elements.

References

NZGBC, 2021. New Zealand Green Building Council. https://www.nzgbc.org.nz/ Accessed 10/03/2021

WGBC, 2020. World Green Building Council Annual Report 2020. <https://www.worldgbc.org/news-media/annual-report-2020>

Appendix A: Table of credits included in the custom Antarctic Green Star tool.

|  |  |  |
| --- | --- | --- |
| Credit | Aim | Points |
| **Management** | | |
| Green Star Accredited Professional | To recognise the appointment and active involvement of a Green Star Accredited Professional in order to ensure that the rating tool is applied effectively and as intended. | 1 |
| Commissioning and Tuning | To encourage and recognise commissioning, handover and tuning initiatives that ensure all building services operate to their full potential. | 5 |
| Adaptation and Resilience | To encourage and recognise projects that are resilient to the impacts of a changing climate and natural disasters. | 2 |
| Building Information | To recognise the development and provision of building information that facilitates understanding of a building's systems, operation and maintenance requirements, and environmental targets to enable the optimised performance. | 1 |
| Commitment to Performance | To recognise practices that encourage building owners, building occupants and facilities management teams to set targets and monitor environmental performance in a collaborative way. | 6 |
| Metering and Monitoring | To recognise the implementation of effective energy and water metering and monitoring systems. | 2 |
| Responsible Construction Practices | To reward projects that use best practice formal environmental management procedures during construction. | 2 |
| Operational Waste | To recognise projects that implement waste management plans that facilitate the re-use, upcycling, or conversion of waste into energy, and stewardship of items to reduce the quantity of outgoing waste. | 1 |
| Site Planning and Layout | To recognise projects in which the activity of planning and detailed design for land use takes into consideration pedestrian safety, environmental protection, and ongoing snow management. | 2 |
| **Occupant Health and Wellbeing** | | |
| Quality of Amenities | To encourage and recognise projects that promote healthy and active living through the provision of high-quality amenities for occupants' use and a Health and Wellbeing Policy or Plan is in place to support the successful operation of these amenities. | 2 |
| Emergency Preparedness | To encourage projects to provide safe facilities and procedures to prevent emergency situations and to ensure life safety during and following emergency events. | 2 |
| Indoor Air Quality | To recognise projects that provide high air quality to occupants. | 3 |
| Acoustic Comfort | To reward projects that provide appropriate and comfortable acoustic conditions for occupants. | 3 |
| Lighting Control | To encourage and recognise well-lit spaces that provide a high degree of comfort to users. | 3 |
| Visual Comfort | To recognise the delivery of well-lit spaces that provide high levels of visual comfort to, and that support the natural circadian rhythm of, building occupants. | 5 |
| Sensory Environment | To recognise the delivery of projects that consider all the senses to provide high levels of sensory comfort to building occupants. | 1 |
| Indoor Pollutants | To recognise projects that safeguard occupant health through the reduction in internal air pollutant levels. | 2 |
| Thermal Comfort | To encourage and recognise projects that achieve high levels of thermal comfort. | 3 |
| Universal Design | To encourage projects to provide safe, equitable and dignified access for persons with disabilities. | 1 |
| **Energy** | | |
| Greenhouse Gas Emissions | To encourage energy efficient buildings and the reduction of greenhouse gas (GHG) emissions associated with the use of energy in building operations. | 20 |
| Peak Electricity Demand Reduction | To encourage the reduction of peak demand load on the electricity network infrastructure. | 2 |
| **Water** | | |
| Potable Water | To encourage building design that minimises potable water consumption in operations. | 8 |
| **Materials** | | |
| Life Cycle Impacts | To reward project that undertake a whole-of-building, whole-of-life, life cycle assessment and where outputs of the LCA are translated into reductions in environmental impacts through meaningful changes in design. | 8 |
| Responsible Building Materials | To reward projects that include materials that are responsibly sourced or have a sustainable supply chain. | 3 |
| Sustainable Products | To encourage sustainability and transparency in product specification. | 3 |
| Construction and Demolition Waste | To reward projects that reduce construction waste going to landfill by reusing or recycling building materials. | 1 |
| **Environment and Wildlife Protection** | | |
| Environmental Protection | To ensure projects are delivered in accordance with requirements of the Protocol on Environmental Protection to the Antarctic Treaty. | 0 |
| Biosecurity | To reward projects that protect the environment through biosecurity measures which address potential risks of construction and building operations. | 2 |
| Site Remediation | To reward projects that choose to reuse previously developed land, and that remediate contaminated land. | 2 |
| Light Pollution | To reward projects that minimise light pollution. | 1 |
| Water Pollution | To reward projects that reduce pollutants entering water bodies. | 2 |
| Refrigerant Impacts | To encourage operational practices that minimise the environmental impacts of refrigeration equipment. | 1 |
| **Innovation** | | |
| Innovation | To recognise and encourage pioneering initiatives in sustainable design, process or advocacy. | 10 |

1. American Society of Heating, Refrigerating and Air-Conditioning standards are used in comparison. [↑](#footnote-ref-1)