TECHNICAL MANUAL
GREEN STAR SA
EXISTING BUILDING PERFORMANCE PILOT

Rev.1
March 2014

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Green Building Council of South Africa
Green Star SA – Existing Building Performance PILOT
Technical Manual
First Edition October 2013

Table of Contents

CONTENTS

Authorisation & Disclaimer

The Green Star SA Rating System and the rating tools have been developed with the assistance and participation of representatives from many organisations. The rating tools are subject to further development in the future. The views and opinions expressed in this Technical Manual have been determined by the GBCSA and its Committees.

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You are only authorised to proceed to use this Technical Manual on this basis.

Acknowledgements

GREEN STAR SA – EXISTING BUILDING PERFORMANCE PILOT RATING TOOL

The Green Star SA – Existing Building Performance PILOT rating tool has been adapted from the Australian Green Star – Performance Tool, under license from the Green Building Council of Australia. The tool has established individual environmental measurement criteria with particular reference to the South African marketplace and environmental context.

The Green Building Council of South Africa (GBCSA) would like to acknowledge all the parties who have worked on and supported the development of the Green Star SA – Existing Building Performance PILOT rating tool.

SPONSORSHIP

Green Star SA - Existing Building Performance PILOT tool sponsor, Nedbank has provided much-needed financial support to develop the rating tool.

SUPPORT

The Green Building Council of South Africa acknowledges the support of the Green Building Council of Australia in providing their Green Star intellectual property and assisting the GBCSA in adapting it for the South African market.

ADDITIONAL EXPERTISE

The GBCSA also thanks all the individuals and organisations who provided feedback and expertise to the technical development of the Green Star SA – Existing Building Performance PILOT rating tool and Technical Manual. Their advice and guidance is greatly appreciated.

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Technical Working Group Members

Amanda Colling		
Giel Faber	-	Vodacom
Hope Mashele	-	VIKINDUKU Engineering & Projects
Jenni Lombard	-	Metropolitain Health
Kobus van Wyk	-	GAPP
Menno Sulsters	-	SEM
Michael Vice	-	Jeffares & Green
Paul da Silva	-	IDC
Paul Kollenberg	-	Growthpoint
Rudd van Deventer	-	SpaceWorx
Sally-Jeanne Misplon		
Sibusiso Dlamini	-	Microsoft
Simon Penso	-	Spire
Willem Bosman	-	Arup
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Green Star SA Technical Advisory Group Members

Whilst not mentioned individually, the GBCSA would like to thank all Technical Advisory Group members who continuously contribute to the technical refinement of Green Star SA rating tools.

2013 GBCSA TECHNICAL STEERING COMMITTEE

Brent Wiltshire (TSC Chair)

Mike Munnik

Eric Noir

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green building council australia

Green Star SA Certification

The property industry is well-placed to deliver significant long-term environmental improvements using a broad range of measures. More importantly, it is unique in that it can directly influence and create behavioural changes at all stages of the supply chain. However, there are inherent barriers within the industry that often act to ensure that efficiency measures are not adopted, despite the fact that a strong business case can be made for their implementation. Most significantly, these barriers relate to the developer/contractor/owner divisions or split incentives that often result in the benefits of efficiency or improved performance measures not accruing to the party that initiated them.

The Green Building Council of South Africa (GBCSA) was created in order to address some of these barriers. The GBCSA's objective is to promote sustainable development and the transition of the property industry towards sustainability by promoting green building programs, technologies and design practices. A key priority for the GBCSA has been the development of a comprehensive environmental rating system for buildings, known as Green Star SA.

Green Star SA separately evaluates the environmental initiatives of designs, projects and/or buildings based on a number of criteria, including energy and water efficiency, indoor environment quality and resource conservation.

Green Star SA was created to:

- Establish a common language and standard of measurement for green buildings;
- Promote integrated, whole-building design;
- Identify building lifecycle impacts;
- Raise awareness of green building benefits;
- Recognise environmental leadership; and
- Transform the built environment to reduce the environmental impact.

Green Star SA will have rating tools for different phases of the building lifecycle (design, construction, operations, refurbishment or fitout) and for different building classes (office, retail, healthcare, education, residential, industrial, public buildings etc.).

Green Star SA has built on existing systems and tools in overseas markets, most notably the Green Star system developed by the Green Building Council of Australia (GBCA), by adapting and establishing individual environmental measurement criteria relevant to the South African marketplace and environmental context.

Green Star SA rating tools use the best regulatory standards to encourage the property industry to improve the environmental impact of development. The rating tools embrace local standards and guidelines, where applicable, to benchmark this improvement.

The GBCSA has developed Green Star SA to provide industry with an objective measurement for green buildings. In assessing those elements that should be rated and to drive change in the market, the GBCSA has been diligent in focusing on areas of environmental impact that are a direct consequence of a building's briefing, design, construction and maintenance – that is, those outcomes that can be directly influenced by stakeholders within the property industry.

Green Star SA Certification

Green Star SA establishes a number of categories under which specific key criteria are grouped and assessed. This framework is used by each and every Green Star SA rating tool. The basic Green Star SA structure is shown below.

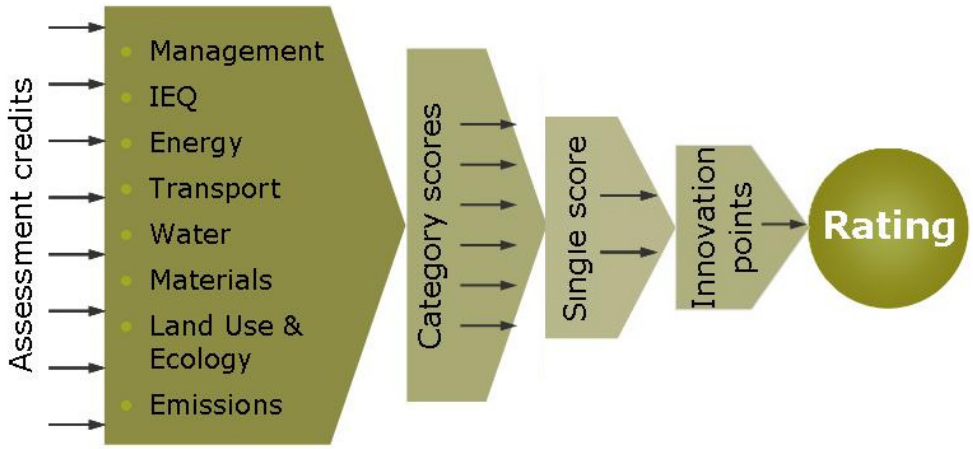


***Figure 1**: Structure of the Green Star SA rating system*

Green Star SA rating tools include nine separate environmental impact categories:

- Management;
- Indoor Environment Quality;
- Energy;
- Transport;
- Water;
- Materials;
- Land Use and Ecology;
- Emissions; and
- Innovation.

The categories are divided into credits, each of which addresses an initiative that improves or has the potential to improve a design, project or building's environmental performance. Points are awarded in each credit for actions that demonstrate that the project has met the overall objectives of Green Star SA and the specific aims of the Green Star SA rating tool.

To encourage the development and spread of innovative technologies, designs and processes that could improve buildings' environmental performance, an 'Innovation' category is included in each Green Star SA rating tool. The Innovation category is not subject to an environmental weighting factor as the innovation could fall under any number of Green Star SA categories.

Green Star SA Certification

Category Score

The Category Score is determined for each category based on the percentage of credits achieved, as follows:

$$\text{Category Score} = \frac{\text{Number of points achieved}}{\text{Number of points available}}$$

For example, if 10 Energy points are achieved out of a total available of 26 then the Category Score is 38.5%.

Single Score

The single (i.e. overall) score is determined by adding together all the Category Scores plus the Innovation points. The maximum possible score for the categories is 100, with an additional ten points available for Innovation, making the maximum attainable score in Green Star SA – Existing Building Performance 110.

The Green Star SA rating is determined by comparing the overall score with the rating scale shown below.

Overall Score	Rating	Outcome
10-19	One Star	Eligible for 'Committed to Performance'* Acknowledgement
20-29	Two Star	Eligible for 'Committed to Performance'* Acknowledgement
30-44	Three Star	Eligible for 'Committed to Performance'* Acknowledgement
45-59	Four Star	Eligible for Four Star Certified Rating that recognises/rewards 'Best Practice'
60-74	Five Star	Eligible for Five Star Certified Rating that recognises/rewards 'South Africa Excellence'
75+	Six Star	Eligible for Six Star Certified Rating that recognises/rewards 'World Leadership'

***Table 1**: Green Star SA rating tool scores*

**Exact wording and branding to be confirmed*

As indicated above, the minimum Green Star SA rating is One Star and the maximum is Six Stars. Whilst in Design or As Built ratings, Green Star SA only recognises and rewards market leaders (only certifies 4 or above), in the Existing Building Performance tool, the GBCSA recognises that the move to becoming a 4-6 star rated building may be a lengthy journey for some, and those who are doing significant work in reaching this point should be acknowledged along this journey.

Green Star SA Certification

GREEN STAR SA ACCREDITED PROFESSIONALS

To encourage the adoption of environmental initiatives from the earliest project stages throughout design, construction and operation of a building, all Green Star SA rating tools award points in the Management category to projects that have a Green Star SA Accredited Professional as a member of their team. In the case of Green Star SA – Existing Building Performance, a separate Existing Building Performance AP accreditation will exist, distinct from that of the Design / As Built tools.

Green Star SA Accredited Professionals are experienced building industry representatives who have demonstrated their understanding of the Green Star SA rating system and the benefits of high environmental performance. To become a Green Star SA Accredited Professional, candidates must attend a GBCSA Green Star SA Accredited Professional course and pass the associated exam. Refer to the GBCSA website (http://www.gbcsa.org.za) for further details. The GBCSA has developed an on-line directory of Green Star SA Accredited Professionals (see http://www.gbcsa.org.za) to enable easy identification and provide the contact details of these qualified service providers.

ASSESSMENT CREDITS

The Green Star SA – Existing Building Performance rating tool is divided into nine environmental categories, each of which has a number of credits.

For each credit the following topics are described in this Technical Manual:

- Aim of Credit;
- Credit Criteria;
- Compliance Requirements;
- Documentation Requirements;
- Additional Guidance/Background; and
- References.

Points are awarded within credits for achieving performance-based objectives and for adopting policies and procedures to improve a project's environmental impact.

In some instances credits (or points within credits) may not be applicable. This situation usually depends on the nature of the building and the inclusion or otherwise of a variety of typical building features. These specific instances are clearly defined in this Technical Manual. Whenever a credit is deemed 'Not Applicable', points are not awarded, and instead are excluded from the Points Available, used to calculate the Category Score. This modification prevents distortion of the Category Score (up or down) for issues that cannot be addressed and are not applicable to the project.

Green Star SA Certification

CONDITIONAL REQUIREMENTS

Green Star SA – Existing Building Performance PILOT has two criteria that must be achieved (known as 'Conditional Requirements') in order to obtain a Green Star SA – Existing Building Performance PILOT certified rating of 4 stars or above. The Conditional Requirements fall within the Energy and Water categories. Please refer to the 'Eligibility' section below, as well as the Energy and Water sections of the Technical Manual for further details.

ELIGIBILITY*

Note that the Eligibility Criteria below are a proposed draft to be tested before v1 release. Eligibility of Pilot Projects will be determined on an individual basis.

To be eligible for Green Star SA Existing Building Performance Rating assessment, buildings must meet each of the following four Eligibility Criteria.

1. **Building Characteristics**
2. **Building Use**
3. **Conditional Requirements**
4. **Timing of Certification**

ELIGIBILITY CRITERION 1: BUILDING CHARACTERISTICS

An Existing Building:

It is defined as a building that is in a state of typical physical occupancy and all building services operational for this purpose for at the least 12 months after final completion*.

(* final completion- as defined in JBCC building contracts)

To meet the requirements of building characteristics, it must be:

1. **Occupied at min 70% occupancy throughout performance period (vacancy rate below 30%)**

   Examples:

a) For a commercial office building or retail centre, this would mean that 70% of the Gross Lettable Area is to be let out over the 12 month performance period.

b) [Note that for transient occupancy buildings such as convention centres, it is proposed at this stage that as long as 70% of the building is operational (available for use as a

convention centre) through the performance period, the building is eligible. This approach will be reviewed during the Pilot period however]

2. **Be an existing building in its entirety.**

Green Star SA Certification

ELIGIBILITY CRITERION 2: BUILDING USE

The following Existing Building Types can be considered eligible for certification:

Building Type	SANS 10400- NBR Classification of Occupation
Office Buildings	G1- Offices
Retail Developments	F1- Large Shop
Public Assembly	A1- Entertainment
	A4- Worship
	Convention Centres
	C1- Exhibition Hall
	C2- Libraries
	C2- Museum
	Community Centres
Educational	A3- Places of Instruction (Tertiary)
	A3- Places of Instruction (Basic Education)
Multi-Unit Residential *	H3-Housing
Industrial Warehouse *	J2- Moderate Risk Storage
Light Industrial Manufacture *	D3- Low-risk Industrial
Laboratories*	Laboratories
Hospitality: Hotels	H1-Hotel
Health Care *	E2- Hospital
Indoor Sports Facilities	A2- Theatrical & Indoor Sport
Gymnasiums	Gymnasiums
Data/ Equipment Centers*	Data centres
Multi-use Buildings	Multi-use buildings

Table 2: *Eligible Building Types*

** In developing the rating tool, the spaces within the building types listed above were analysed for applicability. Based on this analysis, the building types marked with an asterisk have been flagged as being possibly problematic (mostly due to specialised IEQ related issues or limited occupancy). These problematic building types in particular will require further review during the Pilot period to ensure their applicability to the rating tool before being classed as eligible.*

ELIGIBILITY CRITERION 3: CONDITIONAL REQUIREMENTS

For certifications of 4 Star or above, the following conditional requirements are in place:

- **Improvement on 'national good practice' energy performance** *(this is defined in the Green Star SA – Energy & Water benchmarking tool as the average performance of investment grade properties, or as code compliance levels for new buildings)*

- **Improvement on 'national good practice' water performance** *(this is defined in the Green Star SA – Energy & Water benchmarking tool as the average performance of investment grade properties, or as calculated using the Potable Water Calculator good practice benchmarks.*

- **Projects are required to submit annual Energy & Water consumption data**

It should be noted that the benchmarks for 'national good practice' require significant testing in the Pilot period and as such, for Pilot projects, flexibility is given for demonstrating alignment with this 'national good practice' through alternative benchmarking approaches. Especially for specialised building types.

ELIGIBILITY CRITERION 4: TIMING OF CERTIFICATION

The following requirements are proposed to apply in terms of timing of certification.

- **Must be operational for min 12 months after final completion**
  [It is noted that this period will be examined in the PILOT Period and may be increased, but as the required performance period is 12 months, it is proposed that all buildings with min 12 months performance data be considered eligible]
- **The building's performance period (period under which the building's performance is measured) is to be 12 consecutive months.** *[Note that this does not mean that the project must have decided to apply for certification 12 months prior to submission. Much of the performance data may already be collected (such as energy performance data)]*
- **All credit specific performance periods must end within a finite period of each other (Exact period to be tested and confirmed in PILOT).** *[Note that specific credits may have shorter performance periods than 12 months (e.g. lighting comfort may only be required to be monitored once in the 12 month period).]*
- **The project must submit for certification within 90 days of the end of the building's 12 month performance period.**
- **Certification is valid for 3 years from the end of the certified performance period. Thereafter re-certification will need to be undertaken.**
- **Re-certification can take place at any time within the 3 year period, but not thereafter. This would essentially involve:**
  - Re-submission of all relevant documentation in order to either maintain or improve on the previous rating.
  - Re-certification is expected to require significantly less documentation than initial certification as only changes in policies, plans or performance will need to be compiled. Information that has not changed will only require minor confirmations.
- **Annual submission during the 3 year period will be required for:**
  - Energy consumption data
  - Water consumption data
  - Confirmation that no major refurbishment or operational changes have taken place which may significantly decrease the performance of the building as certified.

Green Star SA Certification

CERTIFICATION PROCESS

Up to date information on the Green Star SA certification process is outlined in detail on the GBCSA website (www.gbcsa.org.za). Templates, forms and checklists will be made available on this website to guide projects through the process.

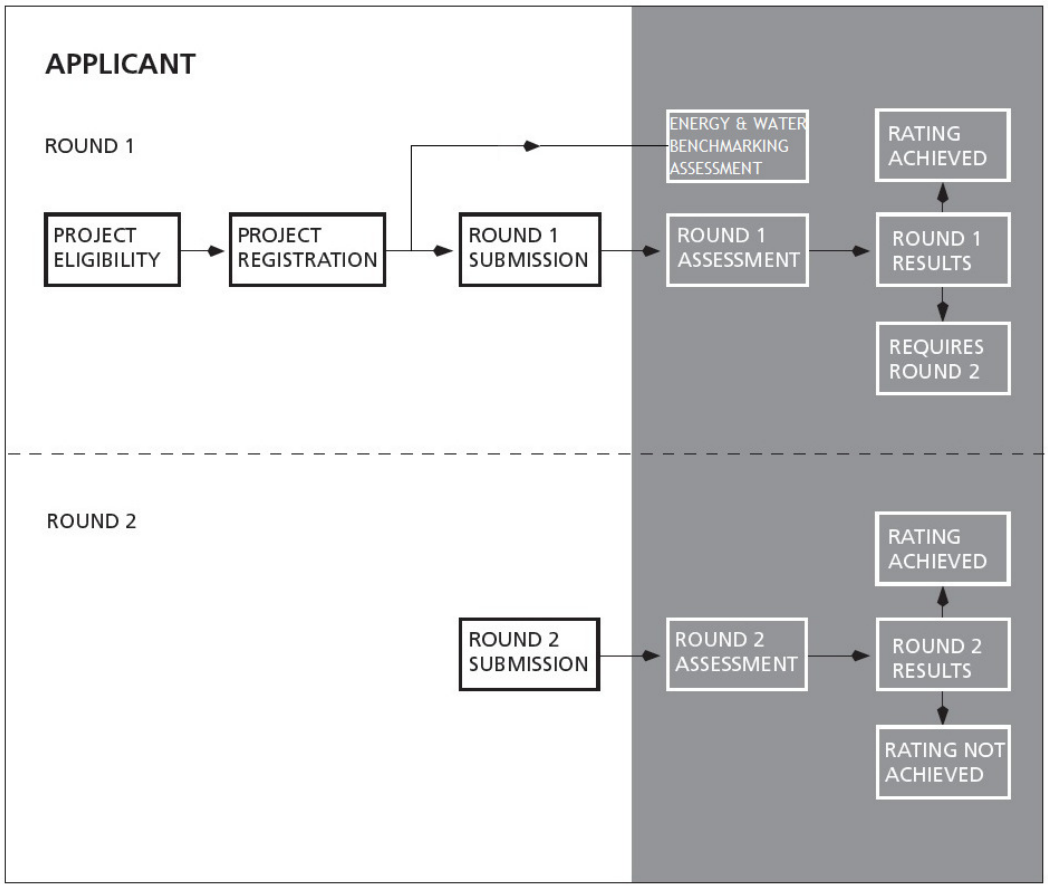


Figure 2: *Overview of certification process.*

Preparing the Submission(s)

Once your project is registered, the project team should prepare documentation to satisfy the Green Star SA credit documentation requirements and submission templates. The Green Star SA Accredited Professional (whether externally appointed or part of the internal building management team) should take responsibility for the quality of submission.

Green Star SA Certification

It is important to ensure that documentation for all claimed credits adheres to the Documentation Requirements outlined in the Green Star SA – Existing Building Performance PILOT Technical Manual as well as the Submission Template provided for each credit.

Assessors will not award the point(s) unless it is demonstrated that all the requirements have been met exactly as detailed in the Technical Manual. And requested in the Submission Templates.

ENERGY & WATER BENCHMARKING

For Office buildings, projects will have the option of submitting the Energy Consumption and Water Consumption credits (Ene-1 and Wat-1) for assessment prior to submission of all other credits for assessment. The Energy & Water performance will be assessed and a formal Energy & Water Benchmarking Certificate issued to the project by the GBCSA.

The following information is required to be submitted for Energy & Water Benchmarking:

- Completed Submission Templates for Ene-1 and Wat-1 credits with all supporting documents as called for in the templates.

From submission of the Energy & Water benchmarking info to the GBCSA, results will be provided within 4 weeks. The Assessors reserve the right to request additional information or revised information to substantiate the project's claims.

SUBMISSION (Round 1)

From the date of receipt of the project's submission of all targeted credits (Round 1), the GBCSA provide the assessment results in 7 weeks.

The full balance of the Certification Fee (less registration payment) will be invoiced at this point and results will be issued upon payment.

Projects must submit the following for assessment:

- Completed pre-submission checklist
- Completed 'Rating Tool' showing points targeted
- Completed Submission Templates for each credit with all supporting documents as called for in the templates

The GBCSA will conduct a pre-assessment submission quality review of a project submission prior to the commissioning of a review by the Assessors. A project may be required to resubmit the submission prior to assessment if the submission quality review suggests that the quality of the submission would result in an erroneous or extended assessment. There is no fee associated with the pre-assessment completed by the GBCSA.

ASSESSMENT (Round 1)

The Assessor(s), will review the submission. Recommendations will then be made to the GBCSA on the rating which should be awarded. The GBCSA reserves the right to question the findings of the Assessor(s).

Green Star SA Certification

The GBCSA will forward the results of the Assessment to the project contact and the applicant. At this point a rating could be achieved and the certification process completed.

However, the Assessors may request additional information from the applicant supporting their claims, or may request corrections to certain credits not achieved. In such a case, the project team must submit the required documentation for credits 'to be confirmed' in a Round 2 submission.

Round 2 Submission

Upon receipt of the results of the Round 1 Assessment, the project may be required to submit documentation for credits 'to be confirmed'. The project will be required to provide the Round 2 submission within 1 month of Round 1 Assessment results being issued. Each project has only one opportunity for resubmission (Round 2), which may include:

- Additional/revised documentation to demonstrate fulfilment of Credit Criteria;
- New credits not targeted in Round 1. Note however that there will not be the opportunity for two rounds of assessment on these credits.

From the date of receipt of the Round 2 submission at the GBCSA offices, the GBCSA provide the Round 2 assessment results in 5 weeks.

Round 2 Assessment

Assessment of the Round 2 submission will follow the procedures outlined above for Round 1 assessment.

CERTIFIED RATING AWARDED

If the assessment validated the project's achievement of the required score, the GBCSA will award a Certified Rating and notify the Applicant.

Certified Rating not Awarded

If a desired Certified Rating is not achieved, the project may in certain circumstances be eligible to Appeal select credits for a fee to re-asses. Please contact the GBCSA for further details.

APPENDIX A – Weightings

Updating the Green Star SA – Existing Building Performance rating tool

Green Star SA – Existing Building Performance PILOT was developed on the basis of information available at the time of its development. Some issues have not been addressed in Green Star SA – Existing Building Performance PILOT due to the following:

- Cost of undertaking assessment and concerns of the reliability and accuracy of data relevant to South Africa (e.g. embodied energy, Life Cycle Assessment etc.);
- Lack of clear benchmarks or guidelines relating to buildings; and
- Lack of standards of measurement in South Africa and availability of suppliers' data (e.g. material toxicity).

As more research is undertaken in the green building area, Green Star SA rating tools are updated to reflect new information, practices, tools and references.

Green Star SA rating tools may also be updated as a result of credit interpretations from the certification process. In these cases, the GBCSA reviews the credit and, if the new credit interpretation is adopted, the relevant Green Star SA rating tool and the associated Technical Manual is updated to reflect the change. All Green Star SA tools have an allocated version number to reflect these changes.

Green Star SA rating tools may also be revised on the basis of stakeholder feedback.

Within the PILOT Programme, there may be up to four updates of this Technical Manual issued. Project team's may choose whether to incorporate such updates into their submission or not.

Feedback on Green Star SA – Existing Building Performance PILOT

The GBCSA encourages feedback on all Green Star SA rating tools, including Green Star SA – Existing Building Performance PILOT.

Feedback is to be sent to existingbuilding@gbcsa.org.za for consideration by the GBCSA.

Glossary

Accredited Professional
A building professional who has attended the Green Star SA Accredited Professional- Existing Building training course, has passed the associated examination and is registered with the Green Building Council of South Africa as an Accredited Professional for Existing Buildings.
Active Cooling/Heating
A heating or cooling process or system which consumes a form of primary energy to store, collect and distribute thermal energy in order to provide space heating or cooling within a building.
Active Solar Strategies
Roof mounted mechanisms that are utilized to actively collect the energy of sunlight for example photo-voltaic.
AFFL: Above Finished Floor Level.
Air Handling Unit (AHU)
Equipment that includes a fan or blower, heating and/or cooling coils, regulator controls, and condensate drain pans, and air filters.
Alternative Energy
Is energy from a source other than the conventional fossil-fuel sources of oil, natural gas and coal.
American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASHRAE)
See http://www.ashrae.org.
Asbestos
A naturally occurring soft fibrous mineral commonly used in fireproofing materials and considered to be highly carcinogenic in particulate form.
Assessor
A person or persons, independent of the GBCSA, independent of the existing building owner and facilities managers, nominated by the GBCSA, knowledgeable and with experience in the green building industry, or who has such other appropriate assessment qualifications as the GBCSA may from time to time determine.
Baseline
A line serving as a basis, as for measurement, calculation of performance of an existing building in relation to a resource for example energy or water consumption.
Benchmarking
Is the process of comparing one's performance metrics to industry bests (the benchmark) or best practices from other similar buildings with relation to a resource for example energy or water consumption.
Biodiversity
Or Biological Diversity is the entirety of all living organisms which is the variety of life in all forms, levels and combinations in a region from all sources including, terrestrial, marine and other aquatic ecosystems and the ecological complexes of which they are part. The term also includes diversity within species, between species, and of ecosystems.
Biomass
Plant matter for example trees, grasses, agricultural crops or other biological material; and comprising of all other materials of recent plant or animal origin.
Building Envelope
The exterior surface of a building's construction: the walls, windows, roof and floor; also referred to as 'building shell'.
Building Maintenance Guide (BMG)
A detailed guide compiled for the use of the building owner or facilities manager on assessing and maintaining the building's services and external building fabric.
Building Management System (BMS)
The BMS automatically controls the building services systems to maintain temperature, humidity, ventilation rates and lighting levels to pre-determined load requirements and to provide safe, efficient operation of equipment.
Building Research Establishment Environmental Assessment Method (BREEAM)
The UK-based BREEAM green building rating system assesses the environmental performance of both new and existing buildings. See http://www.breeam.org.
Building Users' Guide (BUG)

Glossary

A simple and easy to use guide for the non technical building user which, through practical recommendations, encourages the use of the green building features of the design.

Carbon Dioxide (CO2)
Odourless gas commonly sourced by respiration, and is the result of the oxidation (including active combustion and respiration) of carbon based substances; it has been widely used as a measure of the ventilation adequacy of a space; (a principal greenhouse gas)

Carbon Monoxide (CO)
This is an odourless gas that is given off during the process of incomplete combustion, to be found in parking basements for example. Breathing in of CO gas reduces the ability of the blood to absorb oxygen and can be fatal.

Chartered Institute of Building Services Engineers (CIBSE)
See http://www.cibse.org.

Chlorofluorocarbons (CFCs)
CFCs are refrigerants or blowing agents which cause ozone depletion when released in the atmosphere.

CIR
See Credit Interpretation Request.

Climate Change
The change expected to occur to the world's climate due to human activities that emit greenhouse gases, such as burning fossil fuel (cars and electricity generation) and deforestation.

CLO Constant
The CLO Constant refers to the clothing variable used to assess the Predicted Mean Vote (P.M.V.) It recognises that people are warmer if they are wearing more clothes. See Thermal Comfort.

Cogeneration
Is the simultaneous production of electrical or mechanical energy (power) and useful thermal energy from the same fuel/energy source.

Commissioning
Is the advancement of an installation from the state of static completion to full working order to the specified requirements. It includes the setting to work of an installation, the regulation of the system and the fine tuning of the system.

Constructed Wetland
It constitutes a human-made habitat for waterfowl and other forms of wildlife, often using grey-water or rainwater catchments' overflow.

Contaminant
A substance that is not naturally present in the environment or that is present in unnatural concentrations or amounts, and which can (in sufficient concentration) adversely alter an environment.

Contractor
The contractor or builder engaged to complete the scope of works for churn and alterations.

CSIR
Council for Scientific & Industrial Research – See http://www.csir.co.za.

Credit Interpretation Request
Credit Interpretation Requests are submitted prior to assessment by a project that clearly meets the Aim of Credit but does not adhere to the stated Credit Criteria of the relevant Technical Manual. CIRs are considered by the GBCSA with the consultation from the Technical Working Group and other independent consultants, and the resulting rulings may set precedent and be used to update Green Star SA rating tools.

Cross Ventilation
Is when air flows naturally along one or more breeze paths, between ventilation openings on opposing or adjacent walls of a space or via a combination of wall and roof openings.

Current Public Transport Record
Is a survey of public transport undertaken regularly by Local and District Municipalities as mandated by National Government.

Daylight Factor (DF)

Glossary

Is the proportion of internal luminance (light level) compared to the external luminance, expressed as a percentage. Daylight Factor represents the proportion of external light which illuminates a given internal surface.

Daylight Luminance (DI)
It is the luminance (light level) achieved from daylight.

Deemed to Satisfy
It is prescriptive provisions which satisfy performance requirements, or stated level of performance.

Department of Environmental Affairs and Tourism (South Africa)
See http://www.deat.gov.za.

Department of Health (South Africa)
See http://www.doh.gov.za.

Department of Transport (South Africa)
See http://www.dot.gov.za.

Department of Water Affairs (South Africa)
See http://www.dwa.gov.za.

DTS
See Deemed to Satisfy.

Ecology
Is a branch of science concerned with the interrelationship of organisms and their environment.

Ecosystem services
Are the beneficial functions provided by ecosystems, such as water quality regulation, nutrient cycling, soil fertility maintenance, regulation of the concentration of atmospheric gases, climate regulation through reduction of heat islands, flood retention, and cultural and recreational opportunities.

Ecological infrastructure
Is the nature based equivalent of built or hard infrastructure, and is just as important for providing services and underpinning socio-economic development. Ecological infrastructure includes, for instance, healthy mountain catchments, rivers, wetlands, coastal dunes, and nodes and corridors of natural habitat, which together form a network of interconnected structural elements in the landscape.

Ecosystem
It is an interconnected and symbiotic grouping of animals, plants, fungi and micro-organisms which sustains life through biological, geological and chemical activity.

Eligible Project
An existing building that complies with the requirements contained in the Green Star SA Eligibility section of this Technical Manual.

Emission Controls
Is any measure that reduces emissions into air, water or soil. The most effective emission controls involve the redesign of the process so less waste is produced at the source.

Emissions
The release of gases, liquids and/or solids from any process or industry; liquid emissions are commonly referred to as effluents.

Environmental Impact
Any change to the environment, whether adverse or beneficial, wholly or partially resulting from human activity, industry or natural disaster.

Existing Building
The building seeking Green Star SA performance rating certification has to be occupied and operational for at least 12 months after practical completion.

EPA
Environment Protection Agency – See http://www.epa.gov.

GBCSA
See also Green Building Council of South Africa.

Gross Floor Area
See 'List of Areas', 'Technical Manual & Submission Guidance' Section.

GHG
See Greenhouse Gas.

Global Warming Potential (GWP)

Glossary

Global Warming Potential provides a measure of the potential for damage that a chemical has relative to one unit of carbon dioxide, the primary greenhouse gas.

Greenbelt Zones
Are zones or areas in or around a city where the removal of native vegetation is prohibited and/or parks and other open, undeveloped, and vegetated space is protected.

Green Building
A Building that incorporates as built or operational practices that significantly reduce or eliminate its negative impact on the environment and its occupants; an opportunity to use resources efficiently while creating healthier environments for people to live and work in.

Green Building Council of South Africa (GBCSA)
A national, not-for-profit organisation that is committed to developing an environmentally sustainable property industry for South Africa by encouraging the adoption of green building practices. See http://www.gbcsa.org.za.

Greenhouse Effect
(1) The warming of the earth's surface and lower atmosphere as a result of carbon dioxide and water vapour, which absorb and reradiate infrared radiation, in the atmosphere; (2) An intensification of this warming effect from human-induced increase in carbon dioxide and other greenhouse gases in the atmosphere from the burning of fossil fuels.

Greenhouse Gases (GHGs)
Trace gases such as carbon dioxide, water vapour, methane, and CFCs that are relatively transparent to the higher-energy sunlight, but trap the lower-energy infrared radiation.

Grey water
Waste water recovered from basins, showers, washing machines and other water sources that do not contain food or human waste.

Grid
A term used to describe the network of wires and cables which transport electricity from a power plant.

Ground Water
Is a general term which is used to describe the water beneath the Earth's surface.

GWP
See Global Warming Potential.

Habitat
Is the natural home of an animal or plant; (2) or the sum of the environmental conditions that determine the existence of a community in a specific place.

Habitat Fragmentation
Is Habitat disruption where natural habitat is broken into small, relatively isolated sections.

Hardscape
Pavers, sidewalks, raised planters, retaining walls, site furnishings and other non-living design elements used to enhance landscaped areas.

Hazardous Waste
Waste that is particularly dangerous or destructive; specifically characterised by one or more of the following properties: ignitable, corrosive, reactive or toxic.

Heating, Ventilation and Air Conditioning (HVAC)
It is the Mechanical systems that provide heating, ventilation and air conditioning in buildings.

Heat Recovery Ventilation
Is a system that reclaims the heat from warm exhaust air exiting a building and uses it to pre-heat entering fresh air.

HCFCs (Hydrochlorofluorocarbons)
HCFCs are found in refrigerants and blowing agents that cause ozone depletion when released in the atmosphere.

HFCs (Hydrofluorocarbons)
HFCs are commonly used to replace HCFC refrigerants and blowing agents to reduce the ozone depletion potential (ODP); however, HFC products have a high Global Warming Potential (GWP).

IEQ
See Indoor Environment Quality.

Luminance

Glossary

Is the luminous flux incident on a unit area of a surface. The unit is the lux which is one lumen per square meter.

Independent Chair

A person independent of the GBCSA, nominated by the GBCSA, knowledgeable and with experience in the green building industry, who has such appropriate assessment qualifications as the GBCSA may from time to time determine who is responsible for reviewing the report of the Assessors prior to the Assessors making a recommendation to the GBCSA in respect of the existing building performance.

Independent Commissioning Agent

Is an experienced and qualified commissioning agent who carries out commissioning on behalf of the building owner or the tenant.

Indicators

(1) A measurement or reporting tool used to gauge how well a society is achieving its economic environmental and societal goals; (2) A species of plant or animal, or a community, whose occurrence serves as evidence that certain environmental conditions exist.*

Indoor Environment Quality (IEQ)

It covers issues such as indoor air quality, thermal comfort, illumination, daylight, views, acoustics and occupant control of building systems.

Intergovernmental Panel on Climate Change (IPCC)

UN agency set up to provide the decision-makers and others interested in climate change with an objective source of information about climate change. Its role is to assess on a comprehensive, objective, open and transparent basis the latest scientific, technical and socioeconomic literature produced worldwide relevant to the understanding of the risk of human-induced climate change, its observed and projected impacts and options for adaptation and mitigation.

Interdependent Projects

Projects that share services and amenities.

JBCC Contract

The JBCC- Joint Building Contracts Committee's Principal Building Agreement for the South African Construction industry

Justify

Where project teams are requested to provide justification for certain claims within the Green Star SA submission, the actual quantitative or qualitative impact of the specific claim must be clearly demonstrated in relation to the Green Star SA Technical Manual requirements in order to prove compliance. Quantitative demonstration should be via referenced calculations or simulations, whereas qualitative demonstration should be referenced by supporting documentation or evidence such as recognised standards, guidelines or research papers.

Landfill

Is an area where solid waste is deposited. In a suitable area, a hole in the ground is lined so that materials will not escape, and is filled with layers of rubble/waste as the waste is progressively deposited. When completely filled, it is typically capped and sealed.

Leadership in Energy and Environmental Design (LEED)

The US-based LEED Green Building Rating System® is a voluntary, consensus-based national standard for developing high-performance, sustainable buildings. See http://www.usgbc.org/leed.

Life Cycle

All phases associated with the life of a product (i.e. creation, distribution, sale, installation, use, care and disposal/reuse/recycle).

Life Cycle Assessment (LCA)

An evaluation of the environmental effects of a product or activity holistically, by analysing the entire life cycle of a particular material, process, product, technology, service or activity. The LCA consists of three complimentary components: inventory analysis, impact analysis, and improvement analysis, together with an integrative procedure known as scoping.

Maintained illuminance

The average illuminance over the reference surface at the time maintenance has to be carried out by replacing laps and/or cleaning the equipment and room surfaces (if applicable).

Mechanical Ventilation

Glossary

It is Ventilation systems which use fans or other electrically operated air movement devices to provide ventilation to a building. Wind driven turbine ventilators and mechanically operated windows are not classified as 'mechanical ventilation'.

Mechanically Assisted Natural Ventilation

It is Systems that rely, partially or fully, on fans to move non-conditioned air through a space.

MET Values

MET refers to human metabolic rate and corresponds to the amount of heat (sensible and latent) released from the human body. It is used to size air conditioning equipment and to assess the Predicted Mean Vote (PMV) when calculating thermal comfort.

Mixed-Mode Ventilation

A ventilation strategy that combines natural ventilation and mechanical ventilation, allowing the building to be ventilated either naturally or mechanically according to the season or ambient temperatures.

Mixed-Use Development

Is the use of a single building for different purposes simultaneously.

Mould

Mould is a fungus that typically grows in a filamentous cobweb-like mass under damp conditions and is capable of producing staggering numbers of reproductive spores in as little as a few days. Moulds are non-chlorophyll containing entities, which require organic matter, living or dead, for survival. Moulds are extraordinarily diverse in character and their relationship with humans span the positive (e.g. food, antibiotics) to the negative (e.g. pathogens, antigens, toxins).

Natural Ventilation

The process of supplying and removing air in building spaces by natural means, by using openings in the façade (e.g. windows), non-powered ventilators, solar chimneys and infiltration processes. A building can still be termed 'naturally ventilated' if it contains propeller type ceiling fans provided they only cause recirculation of air.

O&M Manual

Operations and Maintenance Manual

Occupied Space

Areas that are predominantly: Work spaces (e.g. cellular offices, open plan offices, meeting rooms, food preparation areas, laboratories, consulting rooms, workshops - small scale and high density it work spaces); Large event spaces (e.g. dry sports halls, swimming pool areas, halls, arts theatres, libraries, assembly areas, sales areas – general, performance areas (stage), check in areas, fitness suites, gyms, fitness studios); and Learning spaces (e.g. classrooms and lecture rooms) are all expected to form part of the Occupied Space.

Common areas and corridors are to be excluded from the calculation of Occupied Space unless they are designed to include permanent occupation such as workspaces. Occupied Space also excludes enclosed fire stairs, storage areas, toilets, tea kitchens, changing facilities, bathrooms, display areas, IT equipment rooms and plant-rooms.

ODP

See Ozone Depleting Potential.

OHS

Occupational Health & Safety.

Organisation for Economic Co-operation and Development (OECD)

See www.oecd.org.

Ozone (O3)

A naturally occurring, highly reactive, irritating trace gas comprising of tri-atomic oxygen formed by recombination of oxygen in the presence of ultraviolet radiation.

Ozone Depletion

Destruction of the Earth's ozone layer, which can be caused by the photolytic breakdown of certain chlorine and/or bromine-containing compounds (e.g. chlorofluorocarbons), which catalytically decompose ozone molecules.

Ozone Depleting Potential

ODP provides a measure of the potential damage that a chemical has relative to that of refrigerant type CFC11. CFC11 has an ODP of one and is the most damaging of CFCs.

Ozone Hole

Glossary

Is a thinning break in the ozone layer. Designation of the amount of such depletion as an 'ozone hole' is made when the detected amount of depletion exceeds 50%. Seasonal ozone holes have been observed over the Antarctic and Arctic regions, part of Canada, and the extreme northeast United States.

Ozone Layer
Is the protective layer in the stratosphere layer of the atmosphere, about 24 kilometres above the ground that absorbs some of the sun's ultraviolet rays, thereby reducing the amount of potentially harmful radiation that reaches the earth's surface.

Passive Cooling/Heating
A process of cooling/heating a building in which no power or fuel is consumed. This is distinct from natural ventilation, which relates only to air supply and extract, although natural ventilation may provide passive cooling in some weather conditions. Other examples of passive cooling include cooling from thermal mass, while passive heating strategies include heating using solar gains through windows and reducing infiltration to prevent heat escaping.

Passive Design
Interventions implemented that reduces the energy consumption of a building by taking advantage of natural heating, cooling and lighting.

Passive Solar Design
Interventions implemented that uses the inherent characteristics of a building rather than mechanical systems to capture heat and light from the sun.

Performance Period
The Existing Building Performance certification application includes performance data for the building and site over the performance period—the continuous, unbroken time during which sustainable operations performance is being measured. The performance period may not have any gaps, defined as any period of time longer than 1 full week.

Photovoltaics
Is the introduction of semiconductor technology to generate electricity directly from the sunlight.

Pollution
Generally, the presence in the environment of a substance that, because of its chemical composition or quantity, prevents the functioning of natural processes and produces undesirable environmental and health effects; can be seen as the human-induced alteration of the physical, biological, chemical and radiological integrity of water and other media.

Potable Water
It is water that is drinkable therefore safe to be consumed.

Practical Completion
The stage of completion where the works or a section thereof, as certified by the principle agent, is substantially complete and can effectively be used for the purpose intended (JBCC Series 2000).

Recyclable
Commonly referred to as the ability of a product or material to be recovered from, or otherwise diverted from, the solid waste stream for the purposes of recycling.

Recycled Content
Materials that have been recovered or otherwise diverted from the solid waste stream, either during the manufacturing process (pre-consumer) or after consumer use (post-consumer). Pre-consumer material does not include materials normally reused by industry within the original manufacturing process, and is also termed 'post-industrial'.

Recycling
A process, by which materials that would otherwise become waste are collected, separated or processed and returned to the economic mainstream to be reused in the form of raw materials or finished goods.

Regularly Occupied Spaces
See 'Occupied Space'

Relative Humidity RH)
The ratio of the amount of water vapour in air at a specific temperature to the maximum capacity of the air to hold moisture at that temperature.

Relevant Existing Building Team Member

Glossary

A member of the Existing Building Performance Team; no specific profession or skills are required for the purpose of 'Documentation Requirements'.

Remediation
Efforts to counteract some or all of the effects of pollution after it has been released into an environment.

Renewable Energy
Is an energy source that, from an earth perspective, is continually being replenished.

Renewable Resources
Resources that can be replenished at a rate equal to or greater than its rate of depletion (for example solar, wind, geothermal and biomass resources).

RH
See Relative Humidity.

South African Bureau of Standards (SABS)
See http://www.sabs.co.za

South African National Standard (SANS)
Standards written by SABS which are normally not mandatory unless referenced by legislation, such as SAN 10400 National Building Regulations

South African Institute of Architects (SAIA)
See http://www.saia.org.za

South African Property Owners Association (SAPOA)
See http://www.sapoa.org.za

Suitably Qualified Professional
A person suitably experienced by profession, training, or demonstrable experience, to calculate, confirm, commit or provide comment on, the field, subject or topic as required for the purpose of 'Documentation Requirements/Evidence' as necessary.

Sustainable Development
An approach to progress that meets the needs of the present without compromising the ability of future generations to meet their needs.*

Supporting Documentation
With reference to 'Documentation Requirements'; other documentation submitted within the same credit of a submission.

Technical Working Group (TWG)
An advisory panel convened by the GBCSA and designated as the 'Technical Working Group'.

Tenancy Fit-out Guide (TFG)
A detailed guide for the design team responsible for the fit-out containing information on the green building features of the base building and recommendations on how to achieve the green building potential of the tenancy.

Thermal Comfort
Is a method of describing occupant comfort which takes into account air temperature, radiant temperature, humidity, draught, clothing value and activity rates.

Thermostatic Control
A device which measures the room temperature and automatically switches the heating/cooling system on and off according to the set point temperature which can be adjusted by the occupant(s).

Time-clock Control
A device which allows the occupant(s) to set times at which a specific system (e.g. geyser or HVAC system) is switched on and off. Both one day (24 hour) and 7 day time-clock controls are available, the latter allowing different settings to be used at weekends.

Ventilation
The process of supplying and removing air in building spaces by natural or mechanical means.

Visual Light Transmittance (VLT)
Refers to the amount of visual light a material allows to be transferred through itself.

VOC
See Volatile Organic Compounds.

Volatile Organic Compounds (VOCs)
VOCs are organic compounds that produce vapours readily at room temperature and normal atmospheric pressure.

Glossary

Waste Management Plan (WMP)
Is a document which outlines how solid waste can be collected for recycling and recycled, and how the recycling of that waste has to be recorded.

WC
Water closet (toilet).

WHB
Wash Hand Basin.

Work Setting
Is a table or workstation with a chair. Tables which have more than one chair provided are considered to be equivalent to one work setting for each two chairs provided.

Xeriscape
Is a water-conserving landscape or landscape installation requiring no additional watering. For Green Star SA purposes, it is acceptable to irrigate a xeriscape garden during the first year, but once established the landscape must not be irrigated.

MAN-1 Certified Buildings

POINTS AVAILABLE **1**

AIM OF CREDIT

To reward buildings that has shown previous environmental achievement through Design/As Built Green Star SA ratings and has maintained this performance in operation.

CREDIT CRITERIA

Certified Buildings	1 point is awarded if the building has a Green Star SA Design/As Built certification.

DOCUMENTATION REQUIREMENTS

Complete online submission template-
Provide required documentation as requested with template.

ADDITIONAL GUIDANCE / RESOURCES

Potential Green Star Certification strategies: it would be possible for an existing building owner to firstly pursue a Refurbishment Green Star SA Design Rating or As Built rating if a substantial Green Building refurbishment is done prior to the performance period. The following Green Star Rating Tools are available for new buildings and refurbishments:

Green Star SA-Office V1

Green Star SA-Retail Centre V1

Green Star SA- Multi-Unit Residential V1

Green Star SA- Public & Educational Building V1

The GBCSA is in favour of all Green Star tools linking with one another. Certain information approved in previous certifications will be deemed acceptable as documentation requirements for this performance rating assessment. Such documentation should be motivated by the project team via Credit Interpretation Request.

BACKGROUND

Green Star SA certification during building design and construction indicates that building owners have already taken significant steps to protect the environment and conserve valuable resources, in addition to making available healthy indoor environments for building occupants. Green Star-certified buildings deliver many economic benefits, such as reduced operating costs, enhanced asset value, improved productivity of building occupants, and optimized life-cycle economic performance. On average, Green Star certified buildings should use 25- 50% less energy than conventional buildings, which should result in a significant decrease in operational costs. Rebates, incentives, and long-term savings based on life-cycle cost assessments help discharge the initial investments in pursuing Green Star certification. Recent market studies including operational analysis of certified buildings in the USA (LEED) and Australia (Green Star- Australia) have however shown that not all buildings have

performed according to design/ as built predictions. The actual reduced costs of operating the building and improved economic performance by reduction of water and energy consumption will therefore be confirmed in terms of conserving resources and reducing Greenhouse Gas Emissions if the building does perform as predicted.

REFERENCES

Web-Sites:
Green Building Council of South Africa
http://www.gbcsa.org.za
The GBCSA web-site provides case-study information of buildings that certified with Green Star ratings

Printed Media:
LEED Reference Guide for Green Building Operations and Maintenance for the Operations and Maintenance of Commercial and Institutional Buildings 2009 Edition (Updated April 2010)
LEED Canada for Existing Buildings: Operations and Maintenance 2009

MAN-2 Accredited Professional

POINTS AVAILABLE **1**

AIM OF CREDIT

To encourage and recognise the involvement of qualified individuals who can assist the owner/ facilities management team with the integration of Green Star SA aims and processes throughout the assessment of baselines, targeted improvements and interventions before and during the performance period to application, submission and certification.

CREDIT CRITERIA

Green Star SA AP (Existing Building Performance)	1 point is awarded if a principal participant in the existing building team is a Green Star SA Existing Buildings Accredited Professional AND Has been employed or engaged by the building owner to provide support and encourage the operations, maintenance, and upgrade team integration required for Performance Rating implementation. Also, to streamline the application and certification process.

This credit can be claimed as 'Not Applicable' for PILOT projects.

DOCUMENTATION REQUIREMENTS / EVIDENCE

Complete the Submission Template for this credit and provide all required documentation.

Proof of accreditation must take the form of either:
• A copy of the nominated Green Star SA Existing Buildings Accredited Professional's accreditation certificate;
OR
• A printout of the relevant page of the online Green Star SA Existing Building Accredited Professional Directory, to be found on the GBCSA website.

Statement of confirmation from the Building Owner in the form of signed correspondence, confirming the engagement of a Green Star SA Existing Building Accredited Professional as an employee or by appointment:
• Detailing the date of engagement/appointment (i.e. dates from/to); and
• Describing their scope of works and confirming that they have provided guidance to the existing building's performance rating team regarding, or were responsible for, the Green Star SA submission compilation.

To be deemed 'engaged', in line with the Aim of Credit, the Green Star SA Accredited Professional must contribute substantially to the rating of performance of the existing building and the submission compilation. Where the Green Star SA Existing Building Accredited Professional's scope of works is outlined in a job description or fee proposal provided to the Building Owner, upon which they are engaged, the fee proposal may be submitted to demonstrate the 'scope of works' aspect of the 'Statement of Confirmation', provided the fee proposal is referenced in the signed 'Statement of Confirmation', or the fee proposal itself is signed by the Building Owner.
Should the role of the Green Star SA Accredited Professional be fulfilled by different individuals throughout the performance period, the evidence listed under Documentation Requirements must be submitted for each Accredited Professional. Where the 'Statement of Confirmation' makes reference to the company

appointed for Accredited Professional services, and not the individual Accredited Professionals, a signed letter from the appointed company must be provided listing all individuals fulfilling the role of Accredited Professional on the specific existing building's performance rating.

ADDITIONAL GUIDANCE / RESOURCES

[To be future enabled]

Green Star SA Accredited Professional Existing Buildings Database
Green Star SA Accredited Professional Existing Buildings Courses

http://www.gbcsa.org.za

BACKGROUND

Training will be offered by the GBCSA for Green Star SA Existing Building Performance and these qualified Green Star SA – Existing Building Accredited Professionals will be of assistance in informing and advising building owners and facilities managers on environmentally sustainable solutions, promote integrated auditing and reviewing of interventions and performance approach, and thereby generally leading existing buildings to better environmental outcomes.

REFERENCES

Green Building Council of South Africa
http://www.gbcsa.org.za

MAN-3 Building Management

POINTS AVAILABLE 5

AIM OF CREDIT

To recognize management and operating processes and procedures used to optimize building environmental performance.

CREDIT CRITERIA

Building Operations Manual	**1 point** is awarded where a Building Operations Manual has been implemented and is actively used as a guide for operating building systems efficiently and managing resources effectively. **Note – for PILOT Projects, the Building Operations Manual need not be implemented throughout the performance period, but the manual must have been produced.*
Building Users' Guide	**1 point** is awarded where a simple and easy-to-use Building Users' Guide is available and is used as part of building management, for the purpose of providing relevant building information to users, occupants and tenants. If the requirement for a Building Users' Guide has been satisfied under the Green Star SA Design / As-Built certification, this point will be automatically be awarded.
Maintenance Management	**1 point** is awarded where there is evidence of operational maintenance planning and scheduling for Building assets and equipment. **1 additional point** will be awarded where the building owner demonstrates that 75% of the planned maintenance activities have been executed and that the corresponding budget expenditure has been met during the performance period. A total of two points can be awarded here, the second point being dependent on achieving the first point.
Life Cycle Maintenance	**1 point** will be awarded where there is a programme of life cycle maintenance or replacement of key building components, which is actively used in optimising the building's environmental performance.

These credit requirements shall apply to the base building only.

MAN-3 Building Management

POINTS AVAILABLE 5

COMPLIANCE REQUIREMENTS

A. Building Operations Manual

The Building Operations Manual shall include but not be limited to the following items:

- Asset registers (Information presented up to system level and not component level. For example, for a centralised air-conditioning system, only the Air Handling Unit (AHU) will be indicated on the asset register and not the AHU Fan Motor (which may be described as a component or subsystem of an AHU system).
- Schedule of up to date As-Built drawings (Note: This is including all building systems/services)
- Commissioning data (for building not older than 5 years)
- Building material and finishes schedules
- Operating procedures (operating times, security, service request management, help desk etc.)

B. Building Users' Guide

The Building Users' Guide must be a concise and user-friendly document, suitable for a layperson. It is not intended as a supplementary document to the Operations & Maintenance Manual for maintenance staff, and as such must not include detailed information on maintenance and spare parts, etc. The Building User Guide is aimed at tenant staff members within the building.

Simplified diagrams are aimed, and intended, for the use of the building occupants and need to communicate the depicted service/system in a very basic and clear way that can be readily understood by the general public. Any drawing/diagram that contains technical detail generally is not considered to be "simplified".

For basic function and operation, it is not necessary to describe the function of simple amenity taps, or lighting systems without automatic control features. The intent of providing information on basic function and operation is only intended for those systems whose use and operation may not be immediately intuitive to building occupants. For example, the basic functions of a lighting system that includes daylight sensors or occupancy sensors would need to be described, however a lighting system with only simple manual controls (i.e. on/off switches) would not.

The Building Users' Guide must include links to online information such as websites, publications, and organisations relating to energy and water conservation, efficient building operation, indoor air quality or sick building syndrome, and environmental design features.

MAN-3 Building Management

POINTS AVAILABLE 5

The provision of a building Operation and Maintenance (O&M) manual does not meet the Building Users' Guide requirement. The O&M manual typically only provides detailed specialist information required by building manager and staff/contractors, not information intended for occupants.

The Building Users' Guide, at a minimum, must include the following sections and information:

Energy & Environmental Strategy:

- Descriptions of the initiatives intended to enhance energy efficiency (and associated greenhouse gas emissions), water efficiency and indoor environment quality;
- Descriptions of initiatives which have been incorporated into the building for the purposes of Green Star SA certification; and,
- Quantification of the potential water, energy and greenhouse gas emissions, and financial (i.e. operational) savings.

Monitoring and Targeting:

- Outline of the energy and water targets or benchmarks for the building;
- Descriptions of the automated energy and water metering strategy for the building (if applicable);

In compiling the Building Users' Guide and noting Monitoring and Targeting initiatives for Indoor Environmental Quality, project teams may address (but are not limited to) the following where applicable:

An explanation of the importance of good Indoor Environmental Quality and the related benefits:

- Benchmarks and monitoring initiatives for Ventilation Rates;
- Benchmarks and monitoring initiatives for Carbon Dioxide Monitoring;
- Benchmarks and monitoring initiatives for Thermal Comfort;
- Benchmarks and monitoring initiatives for Day-lighting Measures;
- Any other relevant data that may be extracted from and/or controlled by, that building's Building Management System and;
- Any other relevant information, aligned with the Green Star SA Indoor Environmental Quality initiatives the project has employed and/or is targeting.

Building Services:

Descriptions of the basic function and operation, and simplified system diagrams, of the building services including, at a minimum:

- Ventilation system;
- Heating system;
- Cooling system;

- Electrical system;
- Lighting system; and,
- Domestic hot water system.

Transport Facilities:

- Descriptions of the car parking requirements and provision of cyclist facilities, conditions of access, and appropriate use;
- Overview of local public transport information, maps and links to timetables; and,
- Details on alternative methods of transport to the workplace, such as car-sharing and carpooling, bicycle paths etc.

Materials & Waste & Recycling:

- Information on recycling, including what can be recycled, where the waste storage areas are, and the schedules for waste and recycling removal;
- Information on any other waste management processes present such as composting or worm farm facilities (where applicable), as well as schedules for waste and recycling removal.

Community Facilities:

- Where the project has included community facilities (community recycling depots, playgrounds, etc.), descriptions of on-site community facilities providing their location and instructions for use.

Landscape Management and Biodiversity Features

- Descriptions of the site landscape and biodiversity features;

Expansion/Re-fit Considerations and Preferred Materials

- Descriptions of the materials or products which have been incorporated into the building to improve indoor environment quality such as:
    - Construction materials with zero or low VOC emissions
- Descriptions of the materials or products which have been incorporated into the building because of their improved sustainability performance (e.g. recycled content material, FSC certified timber, etc.). Include a list of environmental recommendations for consideration, highlighting in particular the areas covered in the Building Users' Guide. Consider examples such as use of environmentally friendly materials, reuse of other materials, or exhausts for printing and photocopying rooms.

C. Maintenance Management

Maintenance in this context refers to both operational and capital expenditure items. The types of maintenance activities can include (but not limited to):

- Planned preventative

- Upgrades, refurbishments etc.
- Building fabric and equipment life cycle replacements

Maintenance plans must indicate the building equipment, asset, material affected and the corresponding maintenance task or activities planned (including date scheduled) during the performance period.

Only tasks with frequencies of one month or more need be shown in the maintenance plans.

Maintenance Plans should also include information such as:

- Maintenance schedules
- Maintenance best practice standards
- Maintenance procedures

The maintenance plans / schedules required for this submission must be limited to main equipment and subsystems. Below are some examples of equipment types and subsystems applicable, mapped to different maintenance tasks / activities.

Electrical and Electronic Equipment Maintenance Plan (Example)

Equipment / Subsystem	Maintenance Activity / Task1	Frequency of Maintenance Activity / Task	Date Scheduled
MV Switchgear (2 units)	Major equipment service	2 yearly	xx Sept 2013
Standby Diesel Generator xxx kVA	Engine major service	Annually	xx July 2013
Standby Diesel Generator xxx kVA	Alternator and auxiliaries service	Annually	xx July 2013
Standby Diesel Generator xxxkVA	Generator on-load test and inspection	3 monthly	xx July 2013 [1] xx Nov 2013 [2]

Other examples of electrical and electronic equipment:

- Transformer
- Uninterruptible Power Supply (UPS)

Mechanical Equipment Maintenance Plan (Example)

Equipment / Subsystem	Maintenance Activity / Task1	Frequency of Maintenance Activity / Task	Date(s) Scheduled
Air conditioning – Ducted Split Units (xx units)	Minor equipment service	Monthly	xx Jul 2013 xx Aug 2013 xx Sep 2013
Water Treatment Plant	Water testing, chemical dosing	Monthly	xx Jul 2013 xx Aug 2013

	and system inspection		xx Sep 2013

Other mechanical equipment examples:

- Domestic water tanks and pumps
- Chillers

Civil and Structural

- Painting
- Roof repairs

Fire Protection Systems

- Sprinkler suppression
- Smoke detection
- Fire fighting equipment (extinguishers, water hose reels)

D. Life Cycle Maintenance

The submission as evidence of compliance must contain analysis to prove that the building's maintenance operations incorporate life cycle maintenance activities. A short report describing the life cycle programme must be submitted, clearly indicating:

- Life cycle planned maintenance replacements, upgrades and major maintenance of building fabric and equipment
- Environmental performance benefits derived from these life cycle activities
- Demonstrating that a product / equipment life cycle assessment (LCA) has been conducted during the process of planning and executing maintenance
- Confirming that the life cycle maintenance programme has been formulated in accordance with ISO 14040:2006 Life Cycle Assessment – Principles and Framework or ISO 14044:2006 Life Cycle Assessment – Requirements and Guidelines

DOCUMENTATION REQUIREMENTS

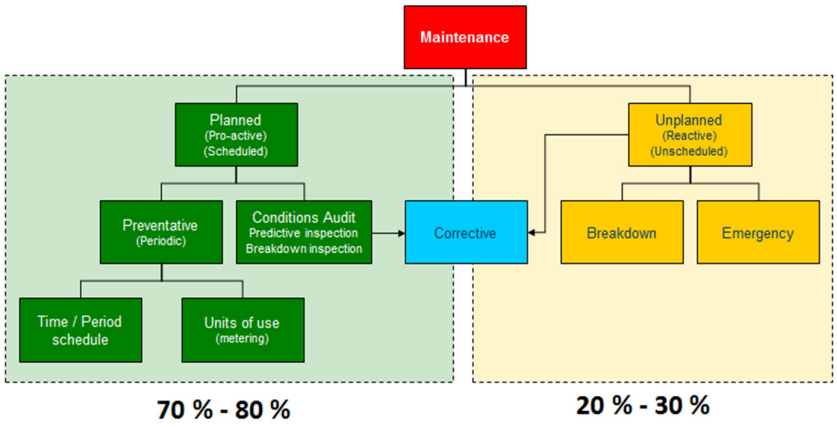
Submit all evidence and ensure it readily confirms to the above compliance; also complete online submission template/check list.

1. **Building Operations Manual**
2. **Building Users' Guide** document
3. **Programme of Maintenance**
4. **Short Report:** Programme of **Life Cycle** Maintenance

5. **Schedule of Completed Maintenance** within the Performance period, signed off by the Facilities Manager or person responsible for maintenance activities.

ADDITIONAL GUIDANCE / RESOURCES

Building Maintenance Processes



Different types of maintenance strategies and planning techniques

Life Cycle Assessment (LCA)

Lifecycle assessment, or LCA, estimates the environment impact of processes and products in terms of greenhouse gas emissions, wastes, toxins, and particulate matter.

LCA is a technique to assess the environmental aspects and potential impacts associated with a product, process, or service, by:

- Compiling an inventory of relevant energy and material inputs and environmental releases
- Evaluating the potential environmental impacts associated with identified inputs and releases
- Interpreting the results to help you make a more informed decision

BACKGROUND

Environmental performance of existing buildings relies on effective operations and management of buildings systems. For many buildings in South Africa the responsibility to operate, maintain and improve performance of building systems is given to a Facility or Facilities Manager.

MAN-3 Building Management

POINTS AVAILABLE 5

Basic facilities management practices have been outlined in this credit. By complying with them, the building can realise environment and economic performance envisaged.

REFERENCES

ISO 14040:2006 Life Cycle Assessment – Principles and framework

ISO 14044:2006 Life Cycle Assessment – Requirements and guidelines

Green Seal - Green Building Operations & Maintenance
http://www.greenseal.org/GreenBusiness/InstitutionalGreeningPrograms/GreenBuildingOperationsMaintenance.aspx

MAN-4 Green Cleaning Performance

POINTS AVAILABLE 3.5

AIM OF CREDIT

To encourage high performance cleaning practices, which reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemicals, biological and particulate contaminants that compromise indoor environmental quality, human health, building fabric and the natural environment.

CREDIT CRITERIA

Green Cleaning Policy and High Performance Green Cleaning Programme	1 point is awarded where: • The applicant develops and implements* a compliant Green Cleaning Policy during the performance period. This Green Cleaning Policy must be in line with the Green Star SA Policy Model (available from the GBCSA on request). • A high performance Green Cleaning Programme is in place and actively and measurably implemented during the performance period*. **Note – For PILOT projects only, implementation of the Green Cleaning Policy and Green Cleaning Programme may be waivered, however the Policy and Programme must have been developed.*
Purchase of Green Cleaning Consumables	Up to 1 Point is awarded as follows: 0.5 points are awarded where 20% by cost of total cleaning consumables purchased during the performance period* meet the sustainability criteria for their product category. 0.5 additional points are awarded where 40% by cost of total cleaning consumables purchased during the performance period* meet the sustainability criteria for their product category.
Purchase of Green Cleaning Equipment	0.5 points are awarded where 60% of all new purchases of cleaning equipment during the performance period* meet the sustainability criteria outlined under the Compliance Requirements below. A phase-out plan for existing equipment that is non-compliant must also be submitted.
Cleaning Audit	0.5 points are awarded where a cleaning audit is carried out in accordance with the stipulated guidelines and a score of 3 or less is obtained.

Note - During the pilot period only, the **performance period will be three months.*

For Multi-tenanted Buildings, the following applies:

Where the landlord-occupied areas (landlord-tenanted space and common areas) comprise more than 10% of the GLA, **50% of the points available can be achieved** for landlord compliance only.

The remaining 50% of the points are awarded where tenants have committed to specific Tenant Criteria clauses set out below. The number of tenants who have committed to these agreements (green lease or special lease clauses) must be such that a minimum of 75% of the building GLA is compliant with the credit criteria (either through landlord or tenant commitment).

The following specific Tenant criteria are required to demonstrate compliance:

- Agreemet to aligning with the objectives of the Green Cleaning Policy of the landlord,
- Tenant to participate in the landlord's high performance green cleaning programme and allow access to regularly occupied spaces in premises by landlord technical staff or engaged persons to periodically measure and monitor the cleaning performance,
- Allow access to premises for a Cleaning audit and achieve a score of 3 or less.

COMPLIANCE REQUIREMENTS

PERFORMANCE PERIOD
The performance period for all components of this credit is six months (three months during pilot period only).

Green Cleaning Policy

NB. Although it is not necessary for organizations seeking certification to develop separate policies, projects are required to highlight - and where not present in existing policies, amend these to include - all elements of the Green Star SA Policy Model as well as the requirements outlined below.

A Green Cleaning Policy must be in place for the building(s) and site, which must be in line with the Green Star Policy Model and to cover, at a minimum, the following requirements:

- Standards and Performance Measurements and Metrics:
  - Stipulate that the purchase and use of green cleaning chemicals has to meet the credit requirements: Purchase of Green Cleaning Consumables
  - Stipulate that the purchase and use of cleaning equipment has to meet the credit requirements: Purchase of Green Cleaning Equipment
  - Stipulate the environmental performance measurements, metrics and goals relating to green cleaning products and equipment

- Implementation Procedures and Strategies
  - Clearly set out the Standard Operating Procedures which outline the implementation of cleaning practices at the project building(s)

- Quality Assurance Control Processes
  - Stipulate the quality assurance control system that must be in place to ensure the implementation of the green cleaning policy, to include at a minimum a regular facility and process inspection by means of a structured cleaning audit.
  - Include green cleaning performance specific wording in tender documentation and/or service level agreements that clearly identifies the responsibility

The Green Cleaning Policy can be an existing, company-wide policy that covers, at a minimum, the above requirements and is implemented on an individual building level. Although the policy does not have to be developed specifically for the purpose of Green Star SA Performance certification, adherence to the Green Star Policy model is required.

MAN-4 Green Cleaning Performance

POINTS AVAILABLE 3.5

High Performance Green Cleaning Programme

On the basis of the green cleaning policy develop a high performance green cleaning programme that expands on the green cleaning policy and specifically includes the following:

- Stipulate how the following are implemented and maintained
    - Hard floor and carpet maintenance
    - Handling and storing of cleaning chemicals
    - Protection of vulnerable populations
    - Promotion of hand hygiene
    - Training of cleaning staff

- Develop of an appropriate staffing plan
- Occupant feedback collection

Purchase of Green Cleaning Consumables

The use of common cleaning chemicals poses a potentially potent threat to indoor air quality and the health and wellbeing of building occupants and cleaning and maintenance personnel.

This credit component rewards projects that during the performance period procure cleaning chemicals, which meet sustainability criteria as outlined below.

Points	Compliance criteria
0.5 points	20% of total cleaning product purchases by cost meet at least one or more of the standards as outlined below
0.5 points	40% of total cleaning product purchases by cost meet at least one or more of the standards as outlined below

Cleaning products are required to meet the 'Product Sustainability Criteria' outlined in Table MAN-4.1, 2, 3, 4 & 5 below:

Purchase of Green Cleaning Equipment

- In the first instance, create an inventory of all existing indoor and outdoor cleaning equipment that is used on site, including that which is brought to site by cleaning contractors. Use the inventory template provided on request from the GBCSA.
- In order to meet credit requirements ensure that at a minimum 60% of all new purchases by cost of cleaning equipment procured during the performance period (if any) meet the sustainability criteria as per the criteria outlined in Table MAN-4,6 Cleaning Equipment. A phase-out plan for existing equipment that is non-compliant must also be submitted.
- During the performance period compile a repair and maintenance log of all powered cleaning equipment, which must be, at a minimum, in line with manufacturer requirements.

Cleaning Audit

In order to assess the effectiveness of a cleaning programme, conduct regular cleaning audits of the entire facility that assess, at a minimum, the appearance level of the facility.

An appearance level assessment must be done in accordance with the assessment guidelines issued by APPA (APPA Leadership in Educational Facilities' Custodial Staffing Guidelines) and as modified and issued for the purposes of Green Star SA Existing Building Performance certification.

The audit can be carried out by in-house facility staff members.

A score will be assigned according to the audit outcome and an average score of 3 or less has to be obtained.

PRODUCT SUSTAINABILITY CRITERIA:

Table MAN-4.1: Cleaning Products

Cleaning products must meet one or more of the following standards:

Product category	Specific Standards	Other Standards
General-purpose, bathroom, glass and carpet cleaners used for industrial and institutional purposes	Green Seal GS-37	Any Type 1 eco-labeling program as defined by ISO 14024: 1999 developed by a member of the Global Eco labeling Network *OR* Any Certification Scheme classified as Level A,B or C under the GBCSA's 'Assessment Framework for Certification Schemes'. *OR* EPA Design for the Environment Program's Standard for Safer Cleaning Products *OR* Cleaning devices that use only ionized water or electrolyzed water
Cleaning and degreasing compounds	Environmental Choice CCD-110	
Hard-surface cleaners	Environmental Choice CCD-146	
Carpet and upholstery care	Environmental Choice CCD-148	
Industrial and institutional floor care products	Green Seal GS-40	
Hard-floor care	Environmental Choice CCD-147	

Table MAN-4.2: Disinfectants, metal polish, or other products not addressed by Table MAN-4.1

Disinfectants, metal polish, or other products not addressed by Table MAN-4.1 must meet one or more of the following standards:

Product category	Specific Standards	Other Standards
Digestion additives for cleaning and odour control	Environmental Choice CCD-112	California Code of Regulations maximum allowable VOC levels for the specific product category *OR* EPA Design for the Environment Program's Standard for Safer Cleaning Products *OR* Cleaning devices that use only ionized water or electrolyzed water and have third-party-verified performance data equivalent to the other standards mentioned in this table[2] *OR* Any Type 1 eco-labeling program as defined by ISO 14024: 1999 developed by a member
Drain or grease trap additives	Environmental Choice CCD-113	
Odour control additives	Environmental Choice CCD-115	
Specialty cleaning products	Green Seal GS-52/53	

[2] if the device is marketed for antimicrobial cleaning, performance data must demonstrate antimicrobial performance comparable to EPA Office of Pollution Prevention and Toxics and Design for the Environment requirements, as appropriate for use patterns and marketing claims

		of the Global Eco labeling Network *OR* Any Certification Scheme classified as Level A, B or C under the GBCSA's 'Assessment Framework for Certification Schemes'.

Table MAN-4.3 Disposable cleaning paper products and rubbish bags

Disposable cleaning paper products and rubbish bags meet the minimum requirements of one or more of the following programmes for the applicable product category:

Product category	Specific Standards	Other Standards
Tissue paper, paper towels and napkins	Green Seal GS-01	Maintenance/cleaning paper products derived from rapidly renewable resources or made from tree-free fibres *OR* FSC certification, for fibre procurement *OR* Paper products, such as bathroom tissue, facial tissues and paper towels have recovered and post-consumer recycled content recommendations as per Table MAN-4,4 *OR* Any Type 1 eco-labeling program as defined by ISO 14024: 1999 developed by a member of the Global Eco labeling Network *OR* Any Certification Scheme classified as Level A,B or C under the GBCSA's 'Assessment Framework for Certification Schemes'.
Toilet tissue	Environmental Choice CCD-082	
Hand towels	Environmental Choice CCD-086	
Specialty cleaning products	Green Seal GS-52/53	

Table MAN-4.4 Recommended recovered fibre content levels for maintenance/cleaning and hygiene paper products

Item	Recovered Fibre (%)		Post-consumer Fibre (%)
Toilet tissue	20-100	of which	20-60
Paper towels	40-100		40-60
Facial tissue	10-100		10-15
Paper napkins	30-100		30-60
General purpose industrial wipes	40-100		40

Table MAN-4.5 Hand Soaps

Hand soaps should not contain any anti-microbial agents (other than as a preservative) except where required by health and other regulations (e.g. food industry, health care requirements).

Product category	Standards	
Industrial and institutional hand cleaners	Green Seal GS-41	Any Type 1 eco-labeling program as defined by ISO 14024: 1999 developed by a member of the Global Eco labeling Network *OR*
Hand cleaners and hand soaps	Environmental Choice CCD-104	
Hand sanitizers	Environmental	

	Choice CCD-170	Any Certification Scheme classified as Level A,B or C under the GBCSA's 'Assessment Framework for Certification Schemes'.

Table MAN-4.6: Cleaning Equipment Sustainability Criteria

Equipment Type	Sustainability Criteria
Powered equipment	To be equipped with safeguards, such as rollers or rubber bumpers, to avoid damage to building surfaces, AND Feature ergonomic design to minimize vibration, noise, and user fatigue, as reported in the user manual in accordance with ISO 5349-1 for arm vibrations, ISO 2631–1 for vibration to the whole body, and ISO 11201 for sound pressure at the operator's ear; AND as applicable, use environmentally preferable batteries (e.g., gel, absorbent glass mat, lithium-ion) except in applications requiring deep discharge and heavy loads where performance or battery life is reduced by the use of sealed batteries
Vacuum cleaners	To be certified by the Carpet and Rug Institute Seal of Approval/Green Label Vacuum Program AND operate with a maximum sound level of 70 dBA or less in accordance with ISO 11201.
Carpet extraction equipment, for restorative deep cleaning	certified by the Carpet and Rug Institute's Seal of Approval Deep Cleaning Extractors and Seal of Approval Deep Cleaning Systems program.
Powered floor maintenance equipment	Vacuum cleaners, guards, or other devices for capturing fine particulates, must operate with a maximum sound level of 70 dBA, in accordance with ISO 11201.
Propane-powered floor equipment	Must have high-efficiency, low-emissions engines with catalytic converters and mufflers that meet the following: California Air Resources Board standards OR EPA standards for the specific engine size OR a locally applicable standard, whichever is more stringent AND operate with a sound level of 90 dBA or less, in accordance with ISO 11201
Automated scrubbing machines	Must be equipped with variable-speed feed pumps AND on-board chemical metering to optimise the use of cleaning fluids OR

	dilution control systems for chemical refilling. OR Alternatively, scrubbing machines may use tap water only, with no added cleaning products

MAN-4 Green Cleaning Performance

POINTS AVAILABLE 3.5

DOCUMENTATION REQUIREMENTS

Credit	Documentation Requirements
Green Cleaning Policy	• Upload a copy of the green cleaning policy. • Complete the submission checklist.
High Performance Green Cleaning Programme	• Upload a copy of the high-performance green cleaning programme. • Complete the submission checklist.
Purchase of Green Cleaning Consumables	• Track cost of all purchases of cleaning materials made during the performance period. • Provide evidence confirming percentage by cost of purchases meeting the stipulated sustainability criteria. • Technical data sheets confirming sustainability claims have to be uploaded for all compliant cleaning products procured.
Purchase of Green Cleaning Equipment	• Provide an inventory of all cleaning equipment used on site during the performance period. • Track cost of all purchases of cleaning equipment made during the performance period. • Provide evidence confirming percentage by cost of purchases meeting the stipulated sustainability criteria. • Technical data sheets confirming sustainability claims have to be uploaded for all compliant cleaning products procured. • Repair and maintenance log for all powered cleaning equipment. Use the sample log provided (available from the GBCSA on request).
Cleaning Audit	• Use the audit calculator provided (available from the GBCSA on request), confirming scores for each audited space type • Upload a copy of the completed spread-sheet above as evidence

ADDITIONAL GUIDANCE & BACKGROUND

The commercial contract cleaning industry in South Africa has low-level entry requirements while being a highly competitive industry sector. An industry characterised by an often low-skilled labour force with low levels of education carrying out highly labour intensive cleaning practices, often with little protection, makes cleaning staff in particular vulnerable to high levels of harmful chemicals that are commonly found in many cleaning chemicals. Chemical use in the cleaning industry in the US annually amounts to close to 3m tons and ongoing exposure to such chemicals, by cleaning staff and building users/occupants, either through inhalation or skin absorption, can increase adverse health risks, such as reproductive problems and eye, skin and respiratory irrigation. If not disposed off properly, cleaning products can also have negative environmental impacts including air and water pollution, accumulation of toxic substances in plants and animals, endocrine disruption in wildlife, and ozone depletion. Used correctly, green cleaning products and green cleaning practices can help to reduce many of these health and environmental hazards.

Green Cleaning Chemicals

Green cleaning products can make a contribution to both improving the indoor environment in buildings and lowering the impact on air, water and ecosystems. Many cleaning chemicals are derived from non-renewable resources and often pose significant threats to human and environmental health. Using certification standards to vet and approve what constitutes green cleaning chemicals approved for use in buildings reduces the risk of 'green-washing' and ensures that chemicals are thoroughly tested - according to internationally established standards - for toxicity to aquatic life, bio-degradability, contribution to eutrophication, air quality degradation and other factors related to human and environmental health.

Green Cleaning Equipment

Negative impacts often generated by the use of conventional powered cleaning equipment on building occupants, maintenance and cleaning staff and the building itself include waste production, emissions, noise pollution, damage to indoor surfaces and the degradation of indoor air quality (IAQ). By making careful and well-considered choices when procuring powered cleaning equipment this can have a positive impact on the life-cycle of indoor finishes (carpets, floors, other surfaces), reducing energy use, resource extraction, transportation and waste involved in maintenance, repair and replacement. Green cleaning equipment can save energy and can avoid emissions of microscopic particulates, reducing stress on building systems, electronic equipment, building occupants and equipment users/operators.

Building Audits and Building Cleanliness

Building Cleanliness is often associated with the health and well-being of occupants. In well-cleaned and well-maintained facilities, occupants report fewer health problems and through cleaning audits, facility managers can identify weaknesses in the cleaning programme and improve the indoor environment.

REFERENCES

WEB-SITES

EPA Design for the Environment Program's Standard for Safer Cleaning Products:
http://www.epa.gov/dfe/pubs/projects/formulat/saferproductlabeling.htm

Environmental Choice Certified Products
www.ecologo.org
Green Seal Certified
www.greenseal.org

Global Eco labelling Network
www.globalecolabelling.net

Carpet and Rug Institute
www.carpet-rug.org

APPA: Leadership in Educational Facilities
www.appa.org

PRINTED MEDIA

USGBC, Leadership in Energy and Environmental Design (LEED) – Existing Buildings: Operations and Maintenance Reference Guide, 2009.

MAN-5 Green Leasing

POINTS AVAILABLE 6

AIM OF CREDIT

To recognise and encourage collaboration between the building owner and tenants in order to manage and operate the building along environmentally sustainable principles whilst realising mutual benefit.

CREDIT CRITERIA

Building owner / tenancy fit-out and alterations

A maximum of **2 points** can be awarded where a signed agreement is in place between building owner and tenant during the performance period, in order to ensure that fit-out design and construction for the occupied rentable space meets the intended sustainability objectives. Points are achieved as shown in the table below:

Type of agreement signed	*Total tenanted Gross Lettable Area (GLA) covered by signed agreement(s)*	
	30%	**60%**
Performance agreement	1.5 points	2 points
Mutual disclosure agreement	1 point	1.5 points
Memorandum of agreement	0.5 points	1 point

Management and operations

A maximum of **4 points** can be awarded where the building owner has a signed agreement with the tenant during the performance period, in order to ensure that occupied rentable space is operated and managed in compliance with the intended sustainability objectives. Points are achieved as shown in the table below:

Type of agreement signed	*Total tenanted Gross Lettable Area (GLA) covered by signed agreement(s)*	
	30%	**60%**
Performance agreement	3 points	4 points
Mutual disclosure agreement	2 points	3 points
Memorandum of agreement	1 point	2 points

Where no leasing arrangement exists for the building (e.g. owner-occupied buildings), or where areas under a lease agreement make up less than 30% of the building GLA, this credit can be claimed as '**Not Applicable**'.

Alternatively, for Pilot projects where a lease agreement is not in place, an owner commitment or inter-departmental agreement could be motivated to substitute the Green Lease.

Fit-Out Requirements:

Points are awarded where the tenant is committed to the following environmental considerations for any fit-out work in the building:

- Specification of energy efficient lighting and appliances, and agreement on a targeted energy consumption level for the space. Reporting* on how these areas are achieved within the fit-out must be provided to the landlord;
- Specification of water efficient fixtures and fittings (where applicable), and agreement on a targeted consumption level for the space. Reporting* on how these areas are achieved within the fit-out must be provided to the landlord;
- Waste reduction/recycling requirements during fit-out construction, a waste management plan to be provided to the landlord including recycling targets and reporting* on these targets to the landlord;
- Sustainability considerations for materials specified. Reporting* on how these areas are achieved within the fit-out must be provided to the landlord;

**Note – For a Memorandum of Agreement, formal reporting need not yet be in place.*

For a Performance Agreement, there must be specific performance commitments for each item above.

Management & Operations Requirements:

Points are awarded where the owner/landlord demonstrates that the tenant is committed to ongoing performance that requires the tenant to participate in the following environmental initiatives while occupying the space:

- Electrical energy monitoring & reporting* (minimum quarterly) and have submitted an energy management plan at the beginning of each year to the landlord;
- Water monitoring & reporting* (minimum quarterly) and have submitted a water management plan at the beginning of each year;
- Waste reduction/recycling monitoring & reporting* (minimum quarterly) and have submitted a waste management plan at the beginning of each year;
- The preparation of a procurement policy at the beginning of each year regarding the use of environmentally friendly consumables (cleaning products, toiletry products, paper and plastic consumable products).

AND

The building owner is required to report back to the tenants on the buildings performance relating to energy, water, waste and procurement policies on an annual basis.

**Note – For a Memorandum of Agreement, formal reporting need not yet be in place. However there must be commitment from tenant and landlord to monitor and strive for improved energy, water and waste performance, and to negotiate further requirements as above going forward.*

For a Performance Agreement, there must be specific performance commitments for each item above.

COMPLIANCE REQUIREMENTS

Signed Agreement

The 'signed agreement' document mentioned above must take the form either of the following:

- A memorandum of agreement (MOA)
- A mutual disclosure agreement
- A performance agreement

MEMORANDUM OF AGREEMENT

The memorandum of agreement (MOA) is the first level of formalising the move towards green building performance. With an existing lease, where it is not appropriate to renegotiate all the material terms, an MOA is the simplest way to bring sustainability into the contractual discussion.

An MOA is a document written between parties to cooperate on an agreed upon project or meet an agreed objective, in this case sustainability objectives. The purpose of an MOA is to have a written understanding of the agreement between parties.

An MOA serves as a legal document and describes the terms and details of the agreement. A contractually-binding MOA appended to an existing lease could include the provision of new sustainability clauses upon renewal of the lease. The MOA should include a timeframe for moving towards a formal green leasing agreement.

The content of the MOA and the content of the already existing lease agreement should not be in conflict.

MUTUAL DISCLOSURE AGREEMENT

The most accessible formal green leasing schedule is a mutual disclosure of environmental performance between the tenant and the landlord. This should build on the contents of the MOA but also require the tenants and landlord to participate in the monitoring and reporting of environmental initiatives. The MDA requires the tenant and landlord to disclose on all areas which are required by both parties.

PERFORMANCE AGREEMENT

A performance agreement is a method of establishing expectations, accountability and consequences for not meeting a set standard of expected performance levels. Parties agree on the actions required and the expected results from the actions.

Where improvements in operational performance are of specific importance to either party, the mutual disclosure lease can be augmented with targets for improvement for both the tenants and the landlord. It sets standards to which each party must perform.

Targets should be set using the baseline established through the monitoring and reporting of building performance. Where no building performance information exists, targets should be framed using specific improvement benchmarks.

In instances where there is an existing standard lease agreement, the documents listed above can be incorporated as an addendum / annexure, in order to constitute a green lease.

DOCUMENTATION REQUIREMENTS

Submit all evidence and ensure it readily confirms compliance; also complete online submission template/check list. The following documents are required:

- **A schedule of signed agreements** between building owner and tenant(s), confirmed as correct by the building owner.
- **A schedule listing all rentable spaces**, sizes (m^2), current tenants and green leases(whether MOA, Mutual Disclosure or Performance Agreement) in place, tallying the total percentage of the GLA covered by these leases.
- **Extracts from the signed agreements** that address the credit criteria.

ADDITIONAL GUIDANCE

Please refer to GBCSA Green Lease Toolkit for further information regarding benefits, formation and specific application of a green lease. (http://www.gbcsa.org.za/knowledge/publications/?cat=98)

BACKGROUND

What is the Goal of a Green Lease?

The fundamental concept that underpins a green lease is that of mutual understanding. While the details may vary from one agreement to another, the primary purpose of a green lease is:

- To improve the operational performance of green buildings; and
- To deliver to landlords and tenants an equitable share of the incremental value provided by green buildings.

A green lease seeks to achieve these goals by securing long-term operational performance through a transparent, mutually beneficial agreement between tenants and landlords that governs:

- The base building and fit-out quality in buildings;
- The contractual requirements of facilities managers;
- The behaviour of tenants from an environmental perspective; and
- Regulation of governing bodies (through continuing education).

What is a Green Lease?

'Green Lease' is a general term that describes a document for negotiating green building attributes between the owner and the tenant of a building. It does not necessarily refer only to a lease agreement but could also represent:

- A Service Level Agreement (SLA)
- Memorandum of Agreement (MOA)
- Lease annexures
- Special lease terms and conditions
- Building/property/facility management guidelines or rules

A green lease is an adaptation of a traditional lease. It is primarily a set of legally binding rights and obligations - a contract. The parties both agree that the landlord will provide the temporary use and enjoyment of the premises in return for the payment of rent by the tenant. It must contain the essential terms of a contract and, in particular:

- There must be consensus on the essential elements of the contract;
- Both parties must have the capacity to enter into the contract;
- Performance of the contract must be physically possible; and
- It must include any legal formalities such as the length of the lease and lease termination requirements.

The key difference with a green lease is the assignment of responsibilities and financial obligations related to occupying and owning a green building. The responsibilities to do, and to pay, are often split. Typically, the tenant carries the responsibility to pay and the landlord the responsibility to do. Please refer to GBCSA Green Lease Toolkit for any other information regarding benefits, formation and application of a green lease.

REFERENCES

GBCSA Green Lease Toolkit, South Africa 2012

The Green Lease Handbook, Council of Australian Governments (COAG), 2012
http://www.gbca.org.au/gbc_scripts/js/tiny_mce/plugins/filemanager/Green-Lease-Handbook-20120907-PDF.pdf

Tenants Guide to Green Leases, Council of Australian Governments (COAG), 2012
http://www.gbca.org.au/gbc_scripts/js/tiny_mce/plugins/filemanager/Tenants-Guide-to-Green-Leases-20120907-PDF.pdf

The Real Property Association of Canada
http://www.realpac.ca

Jones Lang LaSalle, Perspectives in sustainable tenants strategies, 2013
http://www.joneslanglasalle.co.za/GSP/en-gb/Documents/GSP/GreenLeases-10reasonswhyyoushouldhaveone.pdf

Green Lease – Commercial Lease Arrangement s for Sustainable Buildings
http://www.ogierproperty.com/commercialproperty/commercialguides/greenleasescommercialleasearrangementsforsustainablebuildings/

Pinsent Masons, The Pinset Masons Sustainability and Energy Toolkit, 2012
http://www.pinsentmasons.com/PDF/DevelopmentofGreenLeasees.pdf

MAN-6 Ongoing Monitoring and Metering

POINTS AVAILABLE **2**

AIM OF CREDIT

To recognize operational practices which facilitate effective ongoing monitoring and metering of water and energy consumption.

CREDIT CRITERIA

Basic Monitoring Strategy	0.5 points are awarded where metering is provided for major energy consumption of the building for the performance period AND There is an effective mechanism for monitoring the consumption data. 0.5 points are awarded where metering is provided for major water consumption of the building for the performance period AND There is an effective mechanism for monitoring the consumption data.
Advanced Monitoring Strategy	0.5 points for water and 0.5 points for energy are awarded where: • The point above is achieved, AND • Installed meters are online and live monitoring is implemented, AND • There is an effective automated mechanism for monitoring the consumption data (trending, logging, etc.)

COMPLIANCE REQUIREMENTS

Basic monitoring strategy
A basic monitoring strategy, developed specifically for the premises under investigation must be in place during the performance period to be eligible for points in this credit. This strategy can make use of manual meter reading, monitoring and reporting.

The monitoring strategy must identify:

- which meters are in place and operational (existing and planned)
- how meters should be read
- by whom meters should be read
- how often meters should be read
- how this process is managed and verified

The monitoring strategy must also include a metering schedule. This schedule must address the loads for energy and water consumption. It must outline:

- The incoming inputs (electricity, gas, water, etc.)
- The end-uses (lighting, HVAC, fans)
- The consumption for the end-uses
- Which meter(s) provide the required information

- The individual end consumption.

The monitoring strategy, once implemented and operational, must easily allow at least the top 3 energy consumers and the top 3 water consumers to be easily identified by facilities management teams. Top consumers could include tenants and/or plants and must be identified as such. In multi-tenanted buildings the top 3 tenants as well as the top 3 plants (if applicable) should be highlighted.

Where renewable energy and water reuse or harvesting is taking place, these must be measured and indicated separately.

Advanced monitoring strategy
An advanced monitoring system is regarded as an automated monitoring system that records both consumption and demand of either energy or water via live, on-line meters. These systems are capable of processing the information to produce reports for definable periods (hourly, daily, monthly, etc.) for individual as well as groups of meters. Advanced monitoring system meters are characterised as being capable of recording values and producing an output that can be transmitted to a central location (onsite or offsite) that can provide data retrieval and reporting mechanisms.

The system must be capable of:
- Collecting data from all meters;
- Alerting to missing data due to failures
- Processing data on energy use or water consumption at user adjustable intervals
- Raising an alarm when the energy or water use increases beyond certain parameters and automatically notify the facilities manager
- Providing a breakdown of the information by building system (mechanical, electric, etc.), or by space (or by tenanted floor)
- Including the consumption of water, or the consumption of energy, the load versus time (load profile), and the power factor (in the case of energy)
- Producing, as a minimum, a quarterly report for the facilities manager responsible for the building

The requirements described in the following sections apply to both credit criteria, regardless of the monitoring practices that have been implemented, either manual or automated

Meter Accuracy and Accessibility
Meters can either be read manually (for basic) or automatically (for advanced), via a remote meter reading system such as a Building Management System. Facilities management teams must be able to identify existing utility meters, as well as any other utility meters being installed prior to the end of the performance period.

Energy and water consumption data must be verified against 12 months of utility meter data and include service records to verify a check of sub-metering equipment by the manufactures or accredited person to ensure the equipment is operating within the prescribed parameters. An annual meter audit report to confirm that all meter readings are accurate and reliable is required for the purposes of this credit.

The audit report should include, as a minimum:
- Confirmation of meter accuracy
- Confirmation and verification of CT ratios
- Calibration certificates validity

MAN-6 Ongoing Monitoring and Metering

POINTS AVAILABLE **2**

Meters must be located in an area that allows regular monitoring and maintenance by facilities managers

Monitoring Distinct Uses
The monitoring strategy must cover relevant areas or functions of a building. In most cases floor by floor metering will suffice if the entirety of the floor is a single use.

Where a landlord and tenant relationship exists, it would be acceptable for the monitoring strategy developed by the building owner to take into account each individual tenanted space.

Major energy uses
Major electrical loads that warrant sensible and beneficial sub-metering to achieve energy savings that must be sub-metered include:

- Car park ventilation and lights
- Chiller-HVAC plants
- Hot water plants for space heating
- Air handling fans
- Lifts / escalators
- Domestic hot water plants with a combined storage of 1000 litres or more

As a general guideline all loads greater than 20kVA should be independently monitored and metered. The consumption of all major energy uses combined must equate to at least 95% of the building's overall energy consumption, for the purposes of this credit

Major water uses
Major water uses are defined as items or spaces that individually account for at least 10% of the building's total water use. The consumption of all major water uses combined must equate to **at least 95%** of the overall building water consumption, for the purposes of this credit.

Examples of major water uses include, but are not limited to:

- Evaporative heat rejection systems, such as cooling towers
- Landscape irrigation systems
- Wash down systems
- Humidifiers
- Food preparation areas

DOCUMENTATION REQUIREMENTS

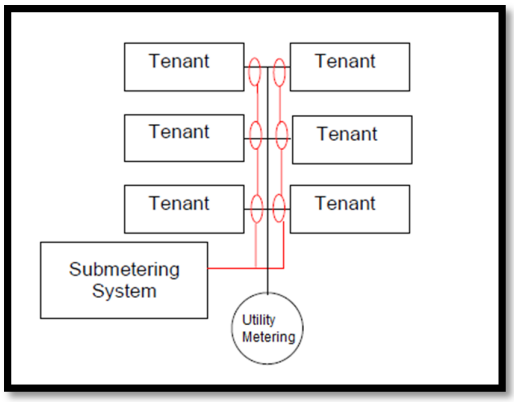
The following documentation/evidence is required for this credit; submit all evidence and ensure it readily confirms compliance; also complete online submission template/check list

- Verification that at least 95% of the building's overall energy and water consumption is measured for the duration of the performance period by means of submitting utility bills
- Annual Meter Audit report to confirm meter readings accuracy/reliability including, verifying CT ratios, calibration certificates validity etc.
- Provide copy of basic/advanced metering strategy document referenced to Electrical system line diagrams or meter schedule indicating metering types and positions, attach herewith example monthly metering data (trending, logging indicated)

ADDITIONAL GUIDANCE / RESOURCES

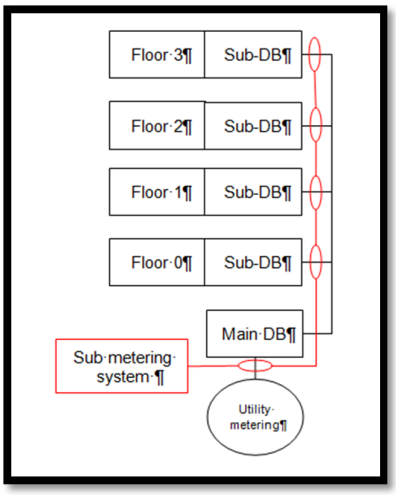
The following examples of metering are provided for guidance:

The figure below illustrates a typical tenant sub-metering system with a single utility meter. Each tenant area is sub-metered for billing prepossess.



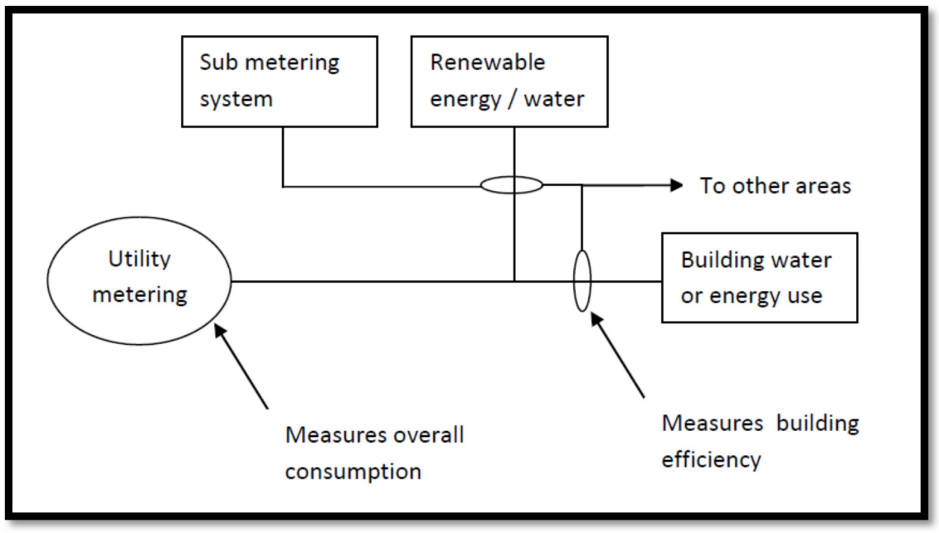
Example1-Subsystem metering

The diagram below illustrates a typical high-rise building environment with different tenants on each floor. Sub-metering is provided on each sub-DB as well as on the main DB. The latter can be used as a verification tool for the main utility meter. A similar layout will be employed if more than one tenant occupies a particular floor, i.e. each tenant area will be equipped with a meter.



Example 2- Subsystem metering with central verification meter

The figure below illustrates how renewable energy and water must be separately measured along with any sub-metering systems.



Example 3 – Measure for building efficiency

Additional guidance on energy sub-metering in non-domestic buildings can be found in the CIBSE TM39 Building Energy Metering guide to issued by Chartered Institution of Building Services Engineers (CIBSE).

BACKGROUND

Electricity tariffs and charges – financial incentive to monitor

Building electricity bills are normally made up of three components:

- Max demand (kVA)
- Actual usage (kWh)
- Connection size levy

Accurate monitoring and metering of utilities will enable building owners to make informed decisions regarding tariff plans (e.g. reduced rates after peak hours, awareness of max demand penalties, etc). Historical data analysis can also lead to the realisation that legacy electrical connection sizes are excessive and savings can be realised by reducing the connection size and thus the connection levy.

Meter accuracy and accessibility

The accuracy of existing utility meters and sub-meters must be verified prior to the performance period. Meters should be capable of measuring kVA as well as kWh to reap maximum benefit from

the information. In addition to the SANS 50001, the Eskom M&V protocol document can also be used as a guideline.

Benefits of sub-metering

The old adage “you can't manage what you don't measure” applies to sub-metering and the effective control of energy and water usage in buildings.

The information contained in Utility bills is retrospective by nature and aggregated over the entire billing period obscuring patterns of use and usage areas. Sub-metering addresses this information gap by providing real-time, granular visibility of energy and water use. The main advantages of sub-metering include:

- Identification of unnecessarily running loads (e.g. over weekends, at night)
- Real-time feedback on implemented strategies
- Comparison and benchmarking of usage
- Detection of utility bill errors and wastage
- Better management of energy and water usage to limit Utility imposed penalties (e.g. notified maximum demand)

REFERENCES

1. **SOUTH AFRICAN NATIONAL STANDARD.** *SANS 50001:2011 Energy managment systems - requirements with guidance for use.* Pretoria : SABS Standards Division , 2011.
2. —. *SANS 50010:2011 Measurement and verification of energy savings .* Pretoria : SABS Standards Division , 2011.
3. **Green Star SA .** GREEN-STAR-SA-PUBLIC-EDUCATION-BUILDING-RATING-TOOL. Cape Town : s.n., 2013.
4. **Green Star Australia.** Green Star - Performance . Sydney : s.n., 2013.

IEQ-1 Indoor Air Quality

POINTS AVAILABLE **3**

AIM OF CREDIT

To recognize air management system attributes that provide occupants with high quality indoor air.

CREDIT CRITERIA

Fresh Air Volumes	Up to 2 points are awarded where it is demonstrated that for 95% of the Nominated Area, outside air is provided at rates greater than the l/s per person requirements of SANS 10400-O:2011, or naturally ventilated • 10% improvement for one point; • 33% improvement for two points;
System performance	1 point is awarded where it is demonstrated that the • Appropriate filters are installed in all duct systems to avoid any dust infiltration through the air inlets. • A positive pressure is maintained in the occupied spaces to ensure no dust infiltration takes place through the building envelope • Fresh air intakes are positioned in locations in order to avoid the intake of outdoor pollutants. • The air distribution system is sufficiently circulating outdoor air to all occupied spaces.

Compliance with this credit requires a walk-through audit and calculations conducted by an HVAC engineer / technician in order to demonstrate compliance. In-house or external expertise can be used for this purpose.

COMPLIANCE REQUIREMENTS

Fresh Air Volumes

- Naturally ventilated spaces
    - Two points are awarded where it is demonstrated that 95% of the Nominated Area is sufficiently naturally ventilated in accordance with SANS 10400-O:2011;

- Mechanically ventilated spaces

  Up to two points are awarded where it is demonstrated that for 95% of the Nominated Area, outside air is provided at rates greater than the l/s per person requirements of SANS 10400-O:2011, awarded as follows:
    - 10% improvement for one point;
    - 33% improvement for two points;

An audit is required by a person with a technical diploma or engineering degree from a recognised institution and experienced in HVAC systems. This person shall confirm through the submission template that 95% of the nominated area is either;

1. Sufficiently Naturally ventilated in accordance with SANS 10400-O:2011, OR
2. Sufficiently Mechanically ventilated through either
    a. System calculations.

        System calculations shall include the capturing of the fresh air fan operation capacities through the audit and calculating the fresh air rates for the areas served within the submission template. Confirmation that fresh air rates are provided to each space in accordance with the required benchmarks given above shall be provided.

        OR

    b. Air measurements according to good engineering practice commissioning protocols for air flow measurements and confirm within the submission template that fresh air rates are provided to each space in accordance with the required benchmarks given above.

For the purposes of this credit, the 'Nominated Area' is Regularly Occupied Space.

System Performance (Mechanical Ventilation systems only)
In order to comply with the criteria under system performance, an audit is required by a person with a technical diploma or engineering degree from a recognised institution and experienced in HVAC systems. This person shall confirm through the submission template the following:

- Fresh air system overall filter types and efficiency. To be more than 85% efficient
- Fresh air intake position and distance to closest pollutant source (exhaust fumes, smoke stacks, kitchen extract ducts, etc.). Fresh air intakes are to be more than 10m from pollutant sources.
- The occupied space is maintained at a positive pressure. This shall be done by measuring/calculating and comparing the total amount of air supplied, with the exhaust and return air from the occupied space. The supply air shall be at least 10% more than the return and exhaust air.
- The duct system supplying the fresh air to the occupied spaces shall be sufficiently sized and leak free with diffuser positions suitably positioned to ensure good distribution of fresh air.

Performance period
- The assessment of fresh air rates and system performance shall be determined during the last three months before submission.

Regularly occupied Spaces
Regularly occupied spaces shall be defined for the purpose of this credit as all spaces where a person is expected to work, or remain for an extended period of time, including, but not limited to:
- Offices, either open plan or individual;
- Classrooms, lecture halls, theatres, auditoriums and court rooms;
- Computer labs;
- Commercial kitchens and preparation areas where food is sold;
- Retail / sales floor, exhibition halls, multi-purpose rooms;

- Industrial spaces, warehouse areas, shop floors, workstations;
- Hospital wards, procedure rooms, waiting areas

Typical areas that are not regularly occupied are

- Store rooms
- Laundry
- Cloak room
- Display area
- Plant room
- Ablutions
- Tea kitchen

DOCUMENTATION REQUIREMENTS

Submit all evidence and ensure it readily confirms compliance; also complete online submission template/check list:

- Proof of **Qualification** of person completing the audit
- **Area schedule** and confirmation of spaces in compliance with SANS 10400:O
- **Audit Report containing:**
    - For naturally ventilated spaces, confirming the requirements of SANS 10400-O, and confirming for each space that these requirements are met.
    - For mechanically ventilated spaces, whether compliance was determined through measurement or system calculations.
    - Where measurements were taken, a description of the measurement methodology followed, and based on this what percentage improvement was achieved on SANS 10400-O:2011 requirements.
    - Where system calculations were undertaken, a summary of how system characteristics were determined (register of fan specifications of actual inspection). Calculations based on these specifications on what percentage improvement was achieved on SANS 10400-O:2011 requirements for each space.
    - Where the 'system performance' point is targeted:
        - Confirming whether filters are installed on all inlets and confirming the efficiency of these filters.
        - Calculations of total supply air for each space versus total return air for each space, confirming that all occupied spaces are maintained at a positive pressure.
        - Confirmation that all supply air intakes are positioned at least 10m from pollutant sources.
        - Confirmation that diffuser layouts allow for sufficient air distribution.

  Note that assessors may request additional proof such as photographs of the installed system and fan capacities to justify the claims made within the report.

IEQ-1 Indoor Air Quality

POINTS AVAILABLE **3**

ADDITIONAL GUIDANCE / RESOURCES

- The aspects that affect indoor air quality are:
  - Building design
  - Physical layout
  - Mechanical systems (HVAC)
    - How does air get in?
    - Is it filtered?
    - How does it circulate?
  - Equipment and space usage
- Various outdoor pollutant sources to consider when assessing the position of the fresh air inlets are
  - building stack exhaust
  - vehicle emissions
  - industrial processes
  - construction activity
  - many others
- In order to manage indoor air quality it is important to look at both the source of the pollutant and the pathway to the occupied space. Therefore the following solutions can be considered.
  - Barriers between source and occupied space or pressure differentials
  - Dilution through extra ventilation
  - Increased filtration
  - IAQ Management plan
- Calculate fresh air rates per person and compare to standards (ASHRAE 62, or SANS10400-O) or recommendations.
- Actions that positively affects the level of particulates
  - Good housekeeping
  - Upgrade filters
  - Maintain positive pressure relative to outdoor areas
  - Have proper exhaust design

Also refer to the following websites and documents for guidelines:

- CIBSE AM10 Application manual: natural ventilation.
- http://www.epa.gov/iaq/
- http://www.who.int/indoorair/en/
- http://www.iaqa.org/

BACKGROUND

Since people working in buildings spend a significant amount of time indoors, it is essential that the quality of the indoor air is sufficient to maintain a healthy and productive environment. With more and

more technological advances, new pollutant sources arise all the time and these needs to be addressed by ensuring that the indoor air quality is maintained. This credit focus on the ventilation systems in a building to ensure that the system allow a sufficient quantity of fresh air as well as avoids any unnecessary ingress of pollutants.

REFERENCES

- SANS 10400-O:2011
- ASHRAE 62-2001, Ventilation of acceptable indoor air quality
- Green Star South Africa, Public 7 Education Building v1
- LEED EBOM, 2009 Edition
- Green Star Australia , Draft Performance tool (submitted for board approval)
- CIBSE AM10, Natural ventilation in non-domestic buildings

IEQ-2 Lighting Comfort

POINTS AVAILABLE **2**

AIM OF CREDIT

To recognize operational practices that provides occupants with a high degree of lighting comfort.

CREDIT CRITERIA

Luminaire ballasts	1 point is awarded where high frequency electronic ballasts are employed in 95% of all fluorescent luminaires in regular occupied spaces. OR a Magnetic ballast replacement program is in place and being implemented within a 12 month period.
Lighting comfort	1 point is awarded where there is a process in place to monitor and measure lighting lux levels and achieve a maximum maintained illuminance level of no more than 80% of the illuminance levels prescribed in SANS 10114-1:2005 in regularly occupied spaces during the performance period, ensuring that lighting lux levels are appropriate to the tasks performed in each space. At least 80% of the readings taken must comply with the criteria above. **This point applies to workstation areas only. For Retail Centres, this point may be claimed as 'not applicable' where 'back of house' workstation areas and office areas account for less than 10% of the GLA.** Other building types may also motivate to claim this point as 'not applicable' if motivated as such to the GBCSA and approved prior to submission for assessment.

For Multi-tenanted Buildings, the following applies:

Where the landlord-occupied areas (landlord-tenanted space and common areas) comprise more than 10% of the GLA, **50% of the points available can be achieved for landlord compliance with the above criteria.**

The remaining 50% of the points are awarded where tenants have committed to specific Tenant Criteria clauses as detailed below. The number of tenants who have committed to these criteria or agreements (green lease or special lease clauses) must be such that a minimum of 75% of the building GLA is compliant with the credit criteria (either through landlord or tenant commitment).

The following specific Tenant criteria are required to demonstrate compliance.

Tenant Criteria for first point:

- Any new lighting installed is to have high frequency electronic ballast
- Confirm that at least 95% of current light fittings have high frequency electronic ballasts, or that where magnetic ballasts exist, these will be replaced within the next 12 months with high frequency electronic ballasts.

Tenant Criteria for second point:

- Commitment to participation in Occupant Survey to determine lighting comfort problem issues
- Allow access to premises by landlord technical staff or engaged persons to measure and monitor lighting lux levels.

COMPLIANCE REQUIREMENTS

Luminaire ballasts

One of the leading causes of lamp flicker is magnetic ballasts. To reduce the occurrences of lamp flicker, the use of modern ballasts is rewarded under this credit.

1 point is awarded if high frequency electronic ballasts are employed in 95% of all fluorescent luminiares in regular occupied spaces.

This credit recognises that not all existing buildings are equipped with modern ballasts, thus buildings not complying with the above requirement can still be eligible for points if a magnetic ballast replacement program is in place and being implemented during the performance period.

Flourescent Ballast Audit

In confirming that high frequency electronic ballasts are employed in 95% of all fluorescent luminiares in regular occupied spaces, a visual audit must be undertaken by a suitably qualified lighting technician. This person can be part of the in-house facilities team or an external party. The audit must confirm the following:

- Number of fluorescent light fittings
- Percentage of fluorescent fittings that make use of Magnetic Ballasts

Magnetic ballast replacement program

A magnetic ballast replacement program must be in place during the performance period to replace all the magnetic ballasts in the building. The start to finish duration of the replacement program must not exceed 1 year to qualify for points in this credit. Ideally the replacement program should fall within the performance period.

Details of the program must include replacement product details, milestone dates and commissioning procedures.

Signed by both the Landlord and person responsible for implementing the project.

Details must include whether the program intends to replace ballast within Tenants premises as this will determine the amount of points available as per the multi-tenanted description above.

Lighting comfort

1 point is awarded if a process to periodically monitor and verify luminiare performance and general luminance within regularly occupied primary spaces in the building is in place during the performance period.

Regularly occupied areas where employees are expected to work or remain for an extended period of time may include, but not be limited to:

- Offices, either open plan or private;
- Classrooms, staff offices, computer labs;
-
- Areas containing workstations.

A space or area may be excluded from the requirements of this credit, if the use of the space justifies specific lighting conditions that may not be covered by a recognised standard.

Lux levels

For a comprehensive list of minimum maintained illuminance values the reader is directed to Table 1 in SANS 10114-1:2005

The lighting installation shall achieve no more than 80% of the illuminance levels prescribed in SANS 10114-1:2005 in order to achieve the performance parameters.

Where an OHS Act minimum level is in excess of 80% of the illuminance levels prescribed in SANS 10114-1:2005, the OHS Act minimum levels may be used to show compliance.

Example.

Table 1 *(continued)*

1	2	3	4	5	6
Type of interior, area, task, or activity	E_m, min. lx	UGR, max.	R_a, min.	Remarks	SA legislation min. lx
Offices (concluded)					
Conference rooms, general offices, typing and filing	500	19	80		300

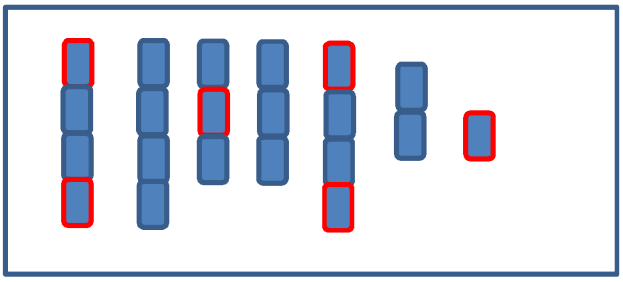
Table 1. Example - Minimum maintained illuminance, table courtesy of (1)

From the table above the minimum lux levels in general office areas must be equal to 500 lux or minimum 300 lux as required by the OHS Act. Thus to achieve the performance parameters, the illumination level at any point may be no more than 400 lux (80%) but cannot be lower than 300 lux (OHS Act lux level)

Measuring procedure

Lux levels shall be recorded at work surface height (700mm above finished floor level) and the corresponding measurements indicated on floor plans or measurement tables.

For office areas, conference rooms, classrooms or any area with workstations, measurements shall be taken at 25% (rounded up) of the work stations evenly distributed throughout the area. The measurement shall be taken with the lux meter pointing vertically on the workstation. For example if you had a classroom with 23 desks you would need to take six measurements at six evenly distributed desks representing every area of the room:
23 x 25% = 5.75, therefore rounded up to 6 sample readings needed. The example below shows red blocks as readings.



IEQ-2 Lighting Comfort

POINTS AVAILABLE **2**

Example: Sample lux measurements on workstations

For areas where there are no workstations, a 10m x 10m grid approach could be used.

Measurements need to be performed with the blinds / any sunlight shading closed.

All readings to be indicated on a floor plan showing workstation layouts or tabulated and accompanied by a confirmation from the auditor that the above methodology has been employed.

The measurement data shall be counter signed by the building owners' Health and Safety Representative or suitable owner representative based on a representative verified sample to ensure the validity of the data.

DOCUMENTATION REQUIREMENTS / EVIDENCE

Submit all evidence and ensure it readily confirms compliance; also complete online submission template/check list. The following documentation/ evidence are required for this credit:

1. **Flourescent Ballast Audit Report**.

   A brief report is required signed off by the lighting technician and Facilities Manager confirming the amount of fluorescent light fittings within the building and the percentage of these which have magnetic ballasts.

2. **Short report** showing lighting measurements table, detailing:
   - Space name and/or use
   - All reading values and confirmation if each reading complies with the credit criteria (80% of SANS 10114-1:2005 levels).
   - Summing the number of compliant and non-compliant readings and indicating the percentage compliance (80% of readings required to comply)
   - Description of measuring equipment usedDate and time measurements were taken
   - Party responsible for taking the measurements, including position & role, and sign-off from this party
3. **Specifications of equipment** used to measure light levels
4. Magnetic ballast **replacement program** particulars (if applicable) signed off by the Facilities Manager or Owner representative.

ADDITIONAL GUIDANCE / RESOURCES

Lighting comfort parameters

The focus of this credit is on measuring and maintaining appropriate lux levels in regularly occupied areas of the building.

Although not formally recognised by this credit the following parameters play a key role in lighting comfort:

- Colour Rendering Index (CRI)
- Colour temperature
- Glare

Additional guidance with regards to CRI, colour temperature and glare control can be found in SANS 10114-1. The specification also provides minimum maintained illuminance values, including lux levels, CRI and colour temperature for standard interior spaces. In addition to the SANS recommended levels, the Occupational Health and Safety Act lux level requirements are also provided. It should be noted that the OHS Act levels are legislative and must be achieved to comply with local law.

The table below is an extract from SANS-10114-1 which provides guidance on lux levels for general building areas. For a comprehensive list of interior, area, task and activities, the reader is directed to the SANS document.

1	2	3	4	5	6
Type of interior, area, task, or activity	**E_m, min.** lx	**UGR, max.**	**R_a, min.**	**Remarks**	**SA legislation min.** lx
General building areas					
Entrance halls	100	22	60		
Lounges	200	22	80		
Circulation areas and corridors	100	28	40		100
Stairs, escalators and travelators	150	25	40		
Loading ramps/bays	150	25	40		
Canteens	200	22	80		
Rest rooms	100	22	80		
Rooms for physical exercise	300	22	80		
Cloakrooms, washrooms, bathrooms, toilets	200	25	80		
Sick bays	500	19	80		
Rooms for medical attention	500	16	90		
Plant rooms, switch-gear rooms	200	25	60		
Post rooms, switchboards	500	19	80		
Stores, stockrooms, cold stores	100	25	60	200 lx if continuously occupied	100
Dispatch packing and handling areas	300	25	60		
Control stations	150	22	60	200 lx if continuously occupied	

Table 2. General Building Area lux levels (1)

Additional guidance on the remaining lighting comfort parameters identified in the section above is provided in the section below. For optimal lighting comfort in the working environment, these parameters should also be aligned with the standards and recommendations. Note that measurement or compliance with these parameters are not required within this credit however.

Colour rending index (CRI)

The following table shall be used to determine colour rendering index of luminaires:

1	2
Type of lamp	**Colour-rendering index/range**
Incandescent	Very good = 100
Tungsten halogen	Very good = 100
Fluorescent	Standard = ± 60 Triphosphor = 80 to 98
Blended	Fair = 60
Metal halide	Good = 80 to 90
Mercury vapour	Standard = ± 46
High-pressure sodium	Standard = 20 (Poor) Deluxe = 65
Low-pressure sodium	Bad = 0
NOTE This information is provided for guidance only. Specific details should be specified by the manufacturer.	

Table 3. Typical lamp colour rendering index (1)

Measuring procedure

To measure the CRI in an area the above table shall be used to select the appropriate CRI range depending on the type of lamp used. For example, if an area is lit by tri-phosphor fluorescent lamps, the CRI will be 80-98.

Colour temperature

The following table shall be used to determine the colour temperature of luminaires:

Colour appearance	Correlated colour temperature (K)
Warm	< 3 300
Intermediate	3 300 to 5 300
Cold	> 5 300

Table 4. Lamp colour temperature (1)
The table below provides a guide for fluorescent lamps.

Kelvin	Lamp name[1]
3000 K	Warm white
3500 K	White
4000 K	Cool white
5400 K	Daylight

[1] Lamp names may vary from manufacture to manufacturer.

6500 K	Cool daylight

Table 5. Fluorescent lamp colour temperature guide

The following table shall be used as a guide to determine colour temperature and CRI suitability:

1	2	3	4	5
Colour-rendering group	**Colour-rendering index range**	**Colour appearance**	**Examples of use**	
			Preferred	**Acceptable**
1A	$R_a \geq 90$	Warm Intermediate Cold	Colour matching Clinical examinations Picture galleries	—
1B	$90 > R_a \geq 80$	Warm Intermediate	Houses, hostels, restaurants, shops, offices, schools, hospitals	
		Intermediate Cold	Printing, paint and textile industries, demanding industrial work	
2	$80 > R_a \geq 60$	Warm Intermediate Cold	Industrial work	Offices, schools
3	$60 > R_a \geq 40$	Cold	Rough industries	Industrial work
4	$40 > R_a \geq 20$	Warm	—	Rough industries, industrial work with low-order colour - rendering requirements
NOTE If so desired, colour-rendering group 2 can be subdivided into groups 2A and 2B in a way that corresponds to the subdivision of group 1.				

Table 6. Lamp colour-rendering suitability chart (1)

Measuring procedure

To determine the colour temperature of lamps, the installed lamps' datasheet or product packages must be studied. The colour temperatures of the lamps must be noted in the measurement table.

Example:
The colour temperature of an OSRAM L 36W/840 fluorescent tube that is used in an office environment is 4000K

Discomfort glare

Eliminating glare from regularly occupied areas during the performance period can be achieved as described below:

- All *bare lamps* directing light onto task areas are fitted with baffles, louvers, translucent diffusers, or other means that directly obscure the lamp from view when space is under typical operating conditions.
- Daylight glare control measures are in place (fixed shading, occupant controlled/automated blinds/screens

IEQ-2 Lighting Comfort

POINTS AVAILABLE **2**

BACKGROUND

There are four key issues addressed by this credit, the potential health impacts from light flickering, and the comfort impacts from poor reproduction of colours, electric lighting levels and glare control.

Flickering in lights can lead to headaches, eye strain and general eye discomfort. Solutions include removing the causes of flickering by utilizing electronic instead of magnetic ballasts, or installing solid state lights.

Poor colour rendering usually results in badly lit spaces. Using the right colour rendering for the right activity will result in improved lighting comfort.

Electric lighting levels, especially the SANS lighting levels are often excessive in comparison to international best practice, especially in computer based work areas. The corresponding lighting levels provided in the OHS Act can be used as these are generally lower than the levels stated in SANS.

This document recognises that modern building occupants use computers with modern screens making lower levels comfortable. Lighting levels of 300 lux for purely screen based work is acceptable

REFERENCES

1. **South African National Standard.** *Interior lighting Part 1: Artificial lighting of interiors.* Pretoria : SABS Standards Division, 2005. SANS 10114-1:2005.
2. **RSA Department of Labour.** *Occupational Health and Safety Act.* Pretoria : Government, 1993. Act No. 85 of 1993 (OHS Act).
3. **Green Star Australia.** Green Star - Performance . Sydney : s.n., 2013.

IEQ-3 Thermal Comfort

POINTS AVAILABLE **3**

AIM OF CREDIT

To recognize operational practices that monitor and maintain a high level of thermal comfort for building occupants.

CREDIT CRITERIA

Mechanically Ventilated spaces	1 point is awarded where there is a process in place to • Periodically measure temperature in occupied spaces. 1 point is awarded where there is a process in place to • Periodically measure humidity in occupied spaces. • Periodically assess problems caused by high air speed and radiant heat in occupied spaces through a high-level audit. • Gather occupant feedback through a thermal comfort survey feedback form. 1 additional point is awarded when the above is achieved and the predicted mean vote (PMV) levels, calculated in accordance with ISO7730 tables E.1 to E.9 using standard clothing and metabolic rates values, are within the following limits for at least 98% of occupied hours: • PMV levels between -1.0 and + 1.0 (inclusive)
Naturally Ventilated spaces	1 point is awarded where there is a process in place to • Periodically measure temperature in occupied spaces. 1 point is awarded where there is a process in place to • Gather occupant feedback through a thermal comfort survey feedback form. 1 point is awarded when the above is achieved and the internal operative temperatures are within the ASHRAE Standard 55-2004 80% Acceptability Limits:

For Multi-tenanted Buildings, the following applies:

Where the landlord-occupied areas (landlord-tenanted space and common areas) comprise more than 10% of the GLA, **50% of the points available can be achieved** for landlord compliance only.

The remaining 50% of the points are awarded where tenants have committed to specific Tenant Criteria clauses as set out below. The number of tenants who have committed to these criteria or in agreements (green lease / special lease clauses) must be such that a minimum of 75% of the building GLA is compliant with the credit criteria (either through landlord or tenant commitment).

The following specific Tenant criteria are required to demonstrate compliance.

Tenant Criteria for first point:

- Tenant to allow access to regularly occupied spaces in premises by landlord technical staff or engaged persons to periodically measure and monitor the above comfort levels,
- Participation in Occupant Survey to determine thermal comfort issues,

Tenant Criteria for second and third point:

- As above for first point,
- Allow access to premises to correct the thermal comfort levels of regular occupied spaces.

COMPLIANCE REQUIREMENTS

A process must be in place to monitor and measure relevant indoor comfort parameters such as temperature, relative humidity and air speed in regularly occupied spaces during the performance period. The data captured must be used to calculate comfort conditions based on ISO 7730 for mechanically ventilated spaces and ASHRAE 55-2004 for naturally ventilated spaces.

Performance Period
Performance period relates to the continuous time period during which a credit is measured or data is collected. For the Thermal Comfort credit, the performance period is the most recent 9 month period* of operations preceding the submission for certification that includes at least one summer month and one winter month.

**Note – For Pilot projects, periods shorter than 9 months may be motivated.*

Minimum Frequency of Measurements/Verification

Parameters	**Mechanically Ventilated spaces**	**Naturally Ventilated Spaces**
Temperature	At least once when the ambient temperature is below the average minimum expected temperature for the region (see table of average min and max temperatures below) and once when the ambient temperature is higher than the maximum average temperature for the region (see table below).	
RH%	At the same time as the Temperature readings above	NA
Air speed	Twice during the performance period through an audit (at the same time as the Temperature and RH readings above)	NA

Average temperatures (°C) in South Africa

City	Summer (Jan) Max	Summer (Jan) Min	Winter (July) Max	Winter (July) Min
Bloemfontein	31	15	17	-2
Cape Town	26	16	18	7
Durban	28	21	23	11
East London	26	18	21	10
George	25	15	19	7
Johannesburg	26	15	17	4
Kimberley	33	18	19	3
Mthatha	27	16	21	4
Musina	34	21	25	7
Nelspruit	29	19	23	6
Pietermaritzburg	28	18	23	3
Polokwane	28	17	20	4
Port Elizabeth	25	18	20	9
Pretoria	29	18	20	5
Richards Bay	29	21	23	12
Skukuza	33	21	26	6
Thohoyandou	31	20	24	10
Upington	36	20	21	4

Average Min & Max temperatures for major towns. (*Source: South African Weather Service*)

For unlisted towns, the nearest town within the same climate zone (see Fig A.1 in SANS 10400-XA:2011) should be used.

Location and method of Measurement

Parameters	Mechanically Ventilated spaces	Naturally Ventilated Spaces
Temperature	At least one sensor/measurement in each HVAC zone at a height of between 1m to 1.8m off the ground in a location that represents the average temperature of the space. Additional sensors/measurements may be required within a zone if the zone is likely to have temperature variations within the zone. This would for example include open plan office spaces that include an external sun facing wall and an internal shaded wall.	At least one measurement in each occupied space at a height of between 1m to 1.8m off the ground in a location that represents the average temperature of the space.
RH%	At least one sensor/measurement in each humidity zone. A humidity zone is typically a zone served by one dehumidifying HVAC system such as an air-handling unit or fan coil unit.	NA
Air speed	Through a system audit, a suitably qualified HVAC	NA

	technician or engineer shall inspect the Ventilation system and determine if the system is operating sufficiently in terms of air supply rates and distribution within the space for the air flow rates in the occupied spaces to be within the acceptable limits. Any significant draft issues are also to be noted. High-level review of radiant heat problem areas such as facades with direct sunlight will also be assessed.	

Period of Measurements

- Time of day:
  - During occupied hours typical for the specific building.
- Time of year:
  - Temperature and RH%: As per tables above
  - Air speed: Verified through at least two audits during the performance period (typically at same time as temp & humidity).

Occupant Thermal Environment Survey

- All occupants shall be requested to complete a thermal environment survey as per example in ASHRAE 55-2004 Appendix E or similar.
- A minimum response rate shall be required as detailed within the IEQ-4 Occupant Survey credit.
- A minimum of one occupant survey shall be done during the performance period and it may be included as part of the general occupant survey performed under IEQ-4.

Regularly occupied Spaces

Regularly occupied spaces shall be defined for the purpose of this credit as all spaces where a person is expected to work, or remain for an extended period of time, including, but not limited to:

- Offices, either open plan or individual;
- Classrooms, lecture halls, theatres, auditoriums and court rooms;
- Computer labs;

- Retail / sales floor, exhibition halls, multi-purpose rooms;
- Industrial spaces, warehouse areas, workstations;
- Hospital wards, procedure rooms, waiting areas

Extent of occupied space measurement

- In order to achieve full points, 80% of the regularly occupied primary space is monitored, measured and controlled in order to maintain the respective comfort conditions..

Naturally ventilated spaces

- No humidity or air speed reference ranges are required to be established when this option is used. However, it must be verified that occupants have access to open-able windows and that they function properly.

IEQ-3 Thermal Comfort

POINTS AVAILABLE **3**

DOCUMENTATION REQUIREMENTS

Submit all evidence and ensure it readily confirms compliance; also complete online submission template/check list:

Measuring and verifying comfort

1. **Sample data logging sheet** indicating temperature and humidity in occupied spaces
2. **Summary report** indicating outcome of air speed assessment and radiant heat in occupied spaces.
3. **Sample of occupant feedback** form from most recent survey.

PMV or Acceptability Limits

Sign confirmation from the Thermal Comfort auditor of the following:

1. **HVAC system** description
2. Rationale description of **air speed determined** and used in calculations
3. **PMV Calculations** according to ISO 7730 for mechanically ventilated space
4. **ASHRAE standard 55 assessments for acceptability limits** in the event of naturally ventilated spaces.

ADDITIONAL GUIDANCE / RESOURCES

Mechanically Ventilated spaces

Example PMV values using ISO 7730 Tables E.1 to E.9 with 90% satisfaction rates highlighted for typical office activity levels and standard winter and summer clothing.

(PMV Values between -0.5 and +0,5)

Table E.3 — Activity level: 69,6 W/m² (1,2 met)

Clothing		Operative temperature	Relative air velocity							
			m/s							
clo	m² · K/W	°C	< 0,10	0,10	0,15	0,20	0,30	0,40	0,50	1,00
0	0	25	−1,33	−1,33	−1,59	−1,92				
		26	−0,83	−0,83	−1,11	−1,40				
		27	−0,33	−0,33	−0,63	−0,88				
		28	0,15	0,12	−0,14	−0,36				
		29	0,63	0,56	0,35	0,17				
		30	1,10	1,01	0,84	0,69				
		31	1,57	1,47	1,34	1,24				
		32	2,03	1,93	1,85	1,78				
0,25	0,039	23	−1,18	−1,18	−1,39	−1,61	−1,97	−2,25		
		24	−0,79	−0,79	−1,02	−1,22	−1,54	−1,80	−2,01	
		25	−0,42	−0,42	−0,64	−0,83	−1,11	−1,34	−1,54	−2,21
		26	−0,04	−0,07	−0,27	−0,43	−0,68	−0,89	−1,06	−1,65
		27	0,33	0,29	0,11	−0,03	−0,25	−0,43	−0,58	−1,09
		28	0,71	0,64	0,49	0,37	0,18	0,03	−0,10	−0,54
		29	1,07	0,99	0,87	0,77	0,61	0,49	0,39	0,03
		30	1,43	1,35	1,25	1,17	1,05	0,95	0,87	0,58
0,50	0,078	18	−2,01	−2,01	−2,17	−2,38	−2,70			
		20	−1,41	−1,41	−1,58	−1,76	−2,04	−2,25	−2,42	
		22	−0,79	−0,79	−0,97	−1,13	−1,36	−1,54	−1,69	−2,17
		24	−0,17	−0,20	−0,36	−0,48	−0,68	−0,83	−0,95	−1,35
		26	0,44	0,39	0,26	0,16	−0,01	−0,11	−0,21	−0,52
		28	1,05	0,98	0,88	0,81	0,70	0,61	0,54	−0,31
		30	1,64	1,57	1,51	1,46	1,39	1,33	1,29	1,14
		32	2,25	2,20	2,17	2,15	2,11	2,09	2,07	1,99
0,75	0,116	16	−1,77	−1,77	−1,91	−2,07	−2,31	−2,49		
		18	−1,27	−1,27	−1,42	−1,56	−1,77	−1,93	−2,05	−2,45
		20	−0,77	−0,77	−0,92	−1,04	−1,23	−1,36	−1,47	−1,82
		22	−0,25	−0,27	−0,40	−0,51	−0,66	−0,78	−0,87	−1,17
		24	0,27	0,23	0,12	0,03	−0,10	−0,19	−0,27	−0,51
		26	0,78	0,73	0,64	0,57	0,47	0,40	0,34	0,14
		28	1,29	1,23	1,17	1,12	1,04	0,99	0,94	0,80
		30	1,80	1,74	1,70	1,67	1,62	1,58	1,55	1,46
1,00	0,155	16	−1,18	−1,18	−1,31	−1,43	−1,59	−1,72	−1,82	−2,12
		18	−0,75	−0,75	−0,88	−0,98	−1,13	−1,24	−1,33	−1,59
		20	−0,32	−0,33	−0,45	−0,54	−0,67	−0,76	−0,83	−1,07
		22	0,13	0,10	0,00	−0,07	−0,18	−0,26	−0,32	−0,52
		24	0,58	0,54	0,46	0,40	0,31	0,24	0,19	0,02
		26	1,03	0,98	0,91	0,86	0,79	0,74	0,70	0,58
		28	1,47	1,42	1,37	1,34	1,28	1,24	1,21	1,12
		30	1,91	1,86	1,83	1,81	1,78	1,75	1,73	1,67

ISO 7730 Example thermal comfort design criteria

Table A.5 — Example design criteria for spaces in various types of building

Type of building/space	Activity W/m²	Category	Operative temperature °C		Maximum mean air velocity [a] m/s	
			Summer (cooling season)	Winter (heating season)	Summer (cooling season)	Winter (heating season)
Single office Landscape office Conference room Auditorium Cafeteria/restaurant Classroom	70	A	24,5 ± 1,0	22,0 ± 1,0	0,12	0,10
		B	24,5 ± 1,5	22,0 ± 2,0	0,19	0,16
		C	24,5 ± 2,5	22,0 ± 3,0	0,24	0,21 [b]
Kindergarten	81	A	23,5 ± 1,0	20,0 ± 1,0	0,11	0,10 [b]
		B	23,5 ± 2,0	22,0 ± 2,5	0,18	0,15 [b]
		C	23,5 ± 2,5	22,0 ± 3,5	0,23	0,19 [b]
Department store	93	A	23,0 ± 1,0	19,0 ± 1,5	0,16	0,13 [b]
		B	23,0 ± 2,0	19,0 ± 3,0	0,20	0,15 [b]
		C	23,0 ± 3,0	19,0 ± 4,0	0,23	0,18 [b]

[a] The maximum mean air velocity is based on a turbulence intensity of 40 % and air temperature equal to the operative temperature according to 6.2 and Figure A.2. A relative humidity of 60 % and 40 % is used for summer and winter, respectively. For both summer and winter a lower temperature in the range is used to determine the maximum mean air velocity.

[b] Below 20 °C limit (see Figure A.2).

Naturally Ventilated spaces

Acceptability Criteria (ASHRAE 55-2004 figure 5.3)

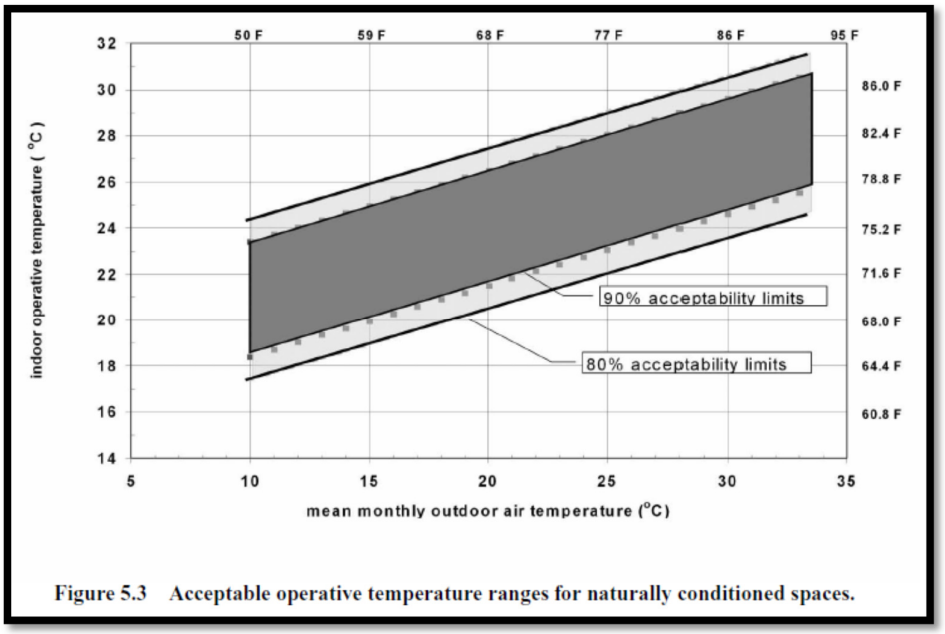


Figure 5.3 Acceptable operative temperature ranges for naturally conditioned spaces.

ASHRAE 55-2004 Adaptive Comfort Temperatures

ASHRAE 55-2004 Adaptive Comfort Temperatures

The ASHRAE guide defines a range of temperatures which are deemed comfortable for a naturally ventilated space, where occupants have control over openings. These depend on the mean monthly outside air temperature, based on the fact that people living in warmer areas can tolerate higher internal temperatures than those living in cold areas. An approximate summary of the data is as follows:

Mean monthly outdoor temp °C	Min internal temp (80% acceptability) °C	Min internal temp (90% acceptability) °C	Max internal temp (90% acceptability) °C	Max internal temp (80% acceptability) °C
10	17.5	18.5	23.5	24.5
15	19	20	25	26
20	20.5	21.5	26.5	27.5
25	22	23	28	29
30	23.5	24.5	29.5	30.5

Table IEQ-9.1: *Adaptive Comfort Temperatures as defined in ASHRAE 55-2004*

These internal temperatures are 'operative' internal temperatures, defined in ASHRAE Fundamentals 2001. For occupants not sitting in direct sunlight, this can be approximated as the mean of the air temperature and the mean radiant temperature.

ASHRAE 55 Table B1 Example clothing insulation for typical ensembles

TABLE B1
Clothing Insulation Values for Typical Ensembles[a]

Clothing Description	Garments Included[b]	I_{cl} (clo)
Trousers	1) Trousers, short-sleeve shirt	0.57
	2) Trousers, long-sleeve shirt	0.61
	3) #2 plus suit jacket	0.96
	4) #2 plus suit jacket, vest, T-shirt	1.14
	5) #2 plus long-sleeve sweater, T-shirt	1.01
	6) #5 plus suit jacket, long underwear bottoms	1.30
Skirts/Dresses	7) Knee-length skirt, short-sleeve shirt (sandals)	0.54
	8) Knee-length skirt, long-sleeve shirt, full slip	0.67
	9) Knee-length skirt, long-sleeve shirt, half slip, long-sleeve sweater	1.10
	10) Knee-length skirt, long-sleeve shirt, half slip, suit jacket	1.04
	11) Ankle-length skirt, long-sleeve shirt, suit jacket	1.10
Shorts	12) Walking shorts, short-sleeve shirt	0.36
Overalls/Coveralls	13) Long-sleeve coveralls, T-shirt	0.72
	14) Overalls, long-sleeve shirt, T-shirt	0.89
	15) Insulated coveralls, long-sleeve thermal underwear tops and bottoms	1.37
Athletic	16) Sweat pants, long-sleeve sweatshirt	0.74
Sleepwear	17) Long-sleeve pajama tops, long pajama trousers, short 3/4 length robe (slippers, no socks)	0.96

a Data are from Chapter 8 in the *2001 ASHRAE Handbook—Fundamentals*.
b All clothing ensembles, except where otherwise indicated in parentheses, include shoes, socks, and briefs or panties. All skirt/dress clothing ensembles include pantyhose and no additional socks.

Thermal Environment Occupant Survey

INFORMATIVE APPENDIX E— THERMAL ENVIRONMENT SURVEY

THERMAL ENVIRONMENT SURVEY	Survey Number:
WHITE SECTIONS TO BE FILLED IN BY OCCUPANT	Surveyor's Name:
1. Occupant's Name:	**11. Occupant Location in Area** (Place an "X" in the approximate place where you most often work.) 
2. Date:	
3. Time:	
4. Approx. Outside Air Temperature (°F or °C):	
5. Sky: ❑ Clear ❑ Mixed (Sun & Clouds) ❑ Overcast	
6. Seasonal Conditions ❑ Winter ❑ Spring ❑ Summer ❑ Fall	
7. Occupant's Clothing Please refer to the attached Table 1. Place a check mark next to the articles of clothing that you are currently wearing as you fill out this sheet. If you are wearing articles of clothing not listed in the table, please enter them into the space provided below. Article:	**SURVEYOR'S USE ONLY** Clothing Insulation Summary: Total I_{cl} = _____ clo
Article:	
8. Occupant Activity Level (Check the one that is most appropriate) 1. ❑ Reclining 2. ❑ Seated Quite 3. ❑ Office, school 4. ❑ Standing Relaxed 5. ❑ Light Activity Standing 6. ❑ Medium Activity, Standing 7. ❑ High Activity	**Metabolic Rates (met)** 1. 0.8 met 2. 1.0 met 3. 1.2 met 4. 1.2 met 5. 1.6 met 6. 2.0 met 7. 3.0 met
9. Equipment (Equipment adding or taking away from the heat load.)	
Item (computers, copiers, lighting, fans, etc.) / **Quantity**	**Total Heat Added/ Subtracted**
10. General Thermal Comfort (Check the one that is most appropriate) 1. ❑ Hot 2. ❑ Warm 3. ❑ Slightly Warm 4. ❑ Neutral 5. ❑ Slightly Cool 6. ❑ Cool 7. ❑ Cold	Thermal Sensation Scale 1. +3 2. +2 3. +1 4. 0 5. –1 6. –2 7. –3
General Environment Comments:	**Area Summary:**
	Room/Building Type:
	Outside Relative Humidity: %
	Thermostat Setting: °F or °C
	Humidity setpoint: %
	Total Number of Occupants:

…

IEQ-3 Thermal Comfort

POINTS AVAILABLE **3**

BACKGROUND

Thermal comfort is important for the occupants of a building to remain productive if they spend a significant amount of time in the space. The perception of thermal comfort is influenced through a variety of factors such as clothing, activity level, air and radiant temperature, relative humidity and air speed.

The first step in maintaining thermal comfort conditions are to have a process in place to monitor the major factors that influence thermal comfort such a temperature humidity and air speed.

In order to ultimately determine if thermal comfort levels are achieved these measured values together with the activity and clothing levels are required to be used in a predicted mean vote (PMV) calculation in order to determine if the majority of the occupants will experience comfort levels.

This credit aims at using occupant surveys and a simplified calculation methodology to determine if the thermal comfort is achieved in the building.

REFERENCES

- ISO7730 – PMV Levels (Predicted Mean Vote)
- ASHRAE 55-2004 (and 2010)
- Green Star South Africa, Public & Education Building v1Rating tool
- LEED EBO&M, 2009 Edition
- Green Star Australia , Draft Performance tool (submitted for board approval)

Average temperatures (°C) in South Africa

City	Summer (Jan) Max	Summer (Jan) Min	Winter (July) Max	Winter (July) Min
Bloemfontein	31	15	17	-2
Cape Town	26	16	18	7
Durban	28	21	23	11
East London	26	18	21	10
George	25	15	19	7
Johannesburg	26	15	17	4
Kimberley	33	18	19	3
Mthatha	27	16	21	4
Musina	34	21	25	7
Nelspruit	29	19	23	6
Pietermaritzburg	28	18	23	3
Polokwane	28	17	20	4
Port Elizabeth	25	18	20	9
Pretoria	29	18	20	5
Richards Bay	29	21	23	12
Skukuza	33	21	26	6
Thohoyandou	31	20	24	10
Upington	36	20	21	4

Average temperatures (°C) in South Africa

CITY	SUMMER		WINTER	
	MAX	MIN	MAX	MIN
Bloemfontein	31	15	17	-2
Cape Town	26	16	18	7
Durban	28	21	23	11
East London	26	18	21	10
George	25	15	19	7
Johannesburg	26	15	17	4
Kimberley	33	18	19	3
Mthatha	27	16	21	4
Musina	34	21	25	7
Nelspruit	29	19	23	6
Pietermaritzburg	28	18	23	3
Polokwane	28	17	20	4
Port Elizabeth	25	18	20	9
Pretoria	29	18	20	5
Richards Bay	29	21	23	12
Skukuza	33	21	26	6
Thohoyandou	31	20	24	10
Upington	36	20	21	4

(Averages for January (mid-summer) and July (mid-winter). Data source: South African Weather Service)

IEQ-4 Occupant Comfort Survey

POINTS AVAILABLE 2

AIM OF CREDIT

To encourage the assessment of building occupants' satisfaction as it relates to comfort

CREDIT CRITERIA

Occupant Survey	1 point is awarded where at least one occupant survey is conducted during the performance period.
Occupant Satisfaction Levels	Points will be awarded for a survey conducted during the performance period, according to the table below:

Survey Outcome	Points to be awarded
At least 80% of respondents indicate they are 'Satisfied' (+1 on 7 point scale)	1
At least 60% of respondents indicate they are 'Satisfied' (+1 on 7 point scale)	0.5

OR

0.5 points are awarded where performance improvement of 5% or more is achieved from the previous survey.

0.5 points are awarded where a corrective action plan is in place to improve performance.

COMPLIANCE REQUIREMENTS

At least one survey must be undertaken during the measurement period, in order to obtain points under this credit.

A. Occupant Survey

Survey Compliance Checklist

Question	Yes	No
Is the survey rating scale based on a 7-point system's 'Satisfaction' dimension?	□	□
Is the survey configured such that all 'Environmental Sustainability Categories' are represented?	□	□
If a corrective action plan has been submitted, does it comply with the 'Corrective Action Plan Criteria'?	□	□

IEQ-4 Occupant Comfort Survey

POINTS AVAILABLE 2

Survey Categories

In order for an occupant survey to be deemed compliant, the following survey categories need to be included:

- Acoustic comfort
- Thermal comfort
- Lighting
- Indoor air quality and ventilation
- Building management (cleanliness, odours, etc.)

Population

For all population calculations, the number of regular occupants should be the maximum number of occupants that will regularly work at the premises* (Full Time Equivalent (FTE) employees) during the performance period. Population sizes can be estimated where there is no access to more precise figures, by using typical occupancy per meter square.

**Note – For Pilot Retail Centres and Public Assembly buildings, should visitor surveys wish to be included, this may be motivated to the GBCSA.*

Survey Sample Size Determination

Table 2 below summarizes the number of responses needed to create a representative sample size, depending on the number of people in the building. Responses for 5% Margin of Error are given for information, but for the purposes of compliance with this credit, a 10% Margin of Error is acceptable.

Table 2: Determining survey sample size

Survey Responses needed for 95% Confidence		
Population Size	Responses Needed for 5% Margin of Error(Sample Size)	**Responses Needed for 10% Margin of Error(Sample Size)**
>100	75%	**75%**
100	81	**51**
150	110	**61**
200	134	**67**
250	154	**72**
300	172	**76**
350	187	**78**
400	201	**81**
450	212	**82**
500	222	**83**
700	255	**88**
900	277	**90**
1000	286	**91**

2000	333	**95**
5000	370	**98**
10000	385	**99**
20000	392	**100**

Source: Determining Sample Size. http://edis.ifas.ufl.edu/pd006

B. Occupant Satisfaction Levels

Survey Rating Scale Questions

Surveys must utilise a 7-point scale, as shown in the example below.

Table 1: Seven point scale example

Question	**7**	**6**	**5**	**4**	**3**	**2**	**1**
"How satisfied are you with...?"	Very satisfied	Mostly satisfied	Satisfied	Neutral	Dissatisfied	Mostly dissatisfied	Very dissatisfied

Corrective Action Plan

For the additional point to be awarded for the corrective action plan, the following is required:

- A clear list describing problematic or focus areas and services
- Show action tasks required to address problematic areas
- Allocate responsible resources to each action task
- Set action task start and completion dates

SUBMISSION REQUIREMENTS

Submit all evidence and ensure it readily confirms compliance; also complete submission template/check list:

1. **Sample of completed survey** document
2. **Short Report:** containing results analysis and corrective action plan if applicable
3. **Calculation:** of survey performance improvement where applicable

ADDITIONAL GUIDANCE / RESOURCES

Survey Questions – Examples

Thermal Comfort

In winter months, how satisfied are you with the temperature in your office?

- Very Satisfied
- Mostly Satisfied
- Satisfied
- Neutral
- Dissatisfied
- Mostly Dissatisfied
- Very Dissatisfied

Acoustic Comfort

How satisfied are you with the noise level in your workspace?

- Very Satisfied
- Mostly Satisfied
- Somewhat Satisfied
- Neutral
- Somewhat Dissatisfied
- Mostly Dissatisfied
- Very Dissatisfied

Lighting

How satisfied are you with the visual comfort of the lighting (e.g., glare, reflections, contrast)?

- Very Satisfied
- Mostly Satisfied
- Somewhat Satisfied
- Neutral
- Somewhat Dissatisfied
- Mostly Dissatisfied
- Very Dissatisfied

Air Quality

How satisfied are you with the air quality in your workspace (i.e. dusty, stuffy/stale air, cleanliness, odors)

- Very Satisfied
- Mostly Satisfied
- Somewhat Satisfied
- Neutral
- Somewhat Dissatisfied
- Mostly Dissatisfied
- Very Dissatisfied

Guidelines for Writing Effective Survey Questions

1) Questions should be linked to research aims and objectives

- Ensure the question provides the information needed to fulfill the research objectives

2) Questions should be kept short and simple so the respondents have the best chance to understand them

- The question should only ask one question.
- The question must be worded appropriately for the target population.
- The question must be clear, precise, and unambiguous.
- The question must be simple to understand.
- Avoid unnecessary adjectives and adverbs.
- Avoid negatives and double negatives.

3) Put the Question in Context

- The wording of the question should not make unwarranted assumptions.
- The wording should follow a natural order from the previous question.

Source: Snap Surveys (Website: www.snapsurveys.com)

BACKGROUND

The occupant satisfaction surveys have been used extensively by building owners and managers to gauge overall building comfort levels and performance of specific building services. Popular subjects to consider when structuring surveys include issues relating to comfort, building user-friendliness, general up-keep, availability and performance of critical building services and systems.

The occupant comfort survey in this document takes into account all occupant comfort elements developed as part of the Green Star SA Existing Building Performance framework.

REFERENCES

Snap Surveys, Website: www.snapsurveys.com

BOSSA – Building Occupants Survey System Australia Version 2 September 2012

IEQ-5 Acoustic Quality

POINTS AVAILABLE **3**

AIM OF CREDIT

To encourage operational practices that monitor and maintain indoor ambient noise levels from building services and all outside sources at an appropriate and comfortable level, mitigate problems created by transference of sound to adjacent spaces, and to control the noise impact from the operations of the existing building on the immediate surrounding environment.

CREDIT CRITERIA

Internal Noise Levels – from Internal and External sources	**Testing** 0.5 points are awarded where there is a process in place to monitor and measure noise from building services and other interior and exterior sources during the performance period. **Performance:** 0.5 points are rewarded for maintaining acoustic comfort at acceptable levels for its particular space type and/or activity as defined inSANS10103:2008. Where noise levels are not in accordance with SANS10103:2008, the 0.5 points (for performance) are not achieved and a corrective action plan must be in place to achieve the required noise levels.
Reverberation	1 Point is awarded as follows; **Testing** Where there is a process in place to monitor and measure the reverberation times in the nominated area during the performance period. **Performance** Projects are required to meet the specified criteria described below (AS/NZS 2107), or where the specified criteria are not achieved, a corrective action plan must be in place to achieve the required performance.
Transference of Noise to adjacent space	0.5 points are awarded as follows; **Testing** Where there is a process in place to monitor, measure and mitigate problems caused by transference of noise and speech between nominated areas during the performance period, for its particular space type and/or activity, such as described below. (EN ISO 3382-3 and SANS10218:2012 Part 1). **Performance** Where the required performance as per these standards are not achieved, a corrective action plan must be in place to align with required performance levels.
Noise from the existing building	0.5 points are awarded as follows;

operations	**Testing** Where there is a process in place to monitor, measure and maintain acceptable levels of noise caused by the building's operations to the surrounding environment during the performance period. (Local Noise Control Regulations). Compliance with Local Noise Control regulations must be achieved to receive points under this criteria (no points rewarded for having corrective action plan in place).

For Multi-tenanted Buildings, the following applies:

Where the landlord-occupied areas (landlord-tenanted space and common areas) comprise more than 10% of the GLA, **50% of the points available can be achieved** for landlord compliance with the criteria above.

The remaining 50% of the points are awarded where tenants have committed to specific Tenant Criteria clauses as set out below. The number of tenants who have committed to these criteria or agreements (green lease or special lease clauses) must be such that a minimum of 75% of the building GLA is compliant with the credit criteria (either through landlord or tenant commitment).

The following specific Tenant criteria are required to demonstrate compliance:

- Participation in Occupant Survey to determine acoustic comfort problem issues,
- Tenant to allow access to regularly occupied spaces in premises by landlord technical staff or engaged persons to measure the indoor noise levels, reverberation levels and identify transference issues,
- If any fixed equipment is to be installed, these are to have noise levels that conform to SANS10103:2008, for space type/ activity.

Credit Specifics related to Space or Building Type:

The criteria set out in this credit applies to all 'Regularly Occupied Spaces' in the building (which does not include areas such as circulation areas, storage areas, etc. See definition in Glossary).

Nominated areas for the 'Transference of Noise' and 'Reverberation' portions of this credit only apply to the specific spaces below.
Offices (whether in office buildings or offices in other building types): Meeting rooms and adjacent space, enclosed offices and adjacent space, open plan offices.
Educational Buildings: Classroom Spaces,
Conference/Meeting Space: boardrooms/ auditoriums and adjacent overflow space,
Health Care: Consulting Rooms and adjacent spaces
Hospitality Spaces: Kitchen and Dining space,
Public Buildings: Court Room spaces, Library Reading Rooms and respective adjacent spaces.
Industrial buildings: Office areas, Meeting rooms, Boardrooms and their adjacent spaces

IEQ-5 Acoustic Quality

POINTS AVAILABLE **3**

COMPLIANCE REQUIREMENTS

Testing of representative (worst-case) occupied areas:

The acoustic specialist is to provide a baseline document that categorizes the areas involved under consideration and to table the relevant acoustic properties associated with each area. This is to be based on the recommended specifications as listed in SANS10103:2008, SANS10218:2012 Part 1, AS/NZS 2107 and EN ISO 3382-3.

The acoustic consultant is to select one example of each category under consideration, usually the "worst case" area. The acoustic consultant must confirm that the example area is "worst case" and if not, why the chosen area can be used as a representative sample for that category.

Measurements:

All noise measurements for the building under evaluation should be taken under normal operation conditions.

Internal noise levels:

Sound level meters and measurement methodologies to comply with SANS 656 and SANS 658. The measurements must be taken according to acceptable procedures. The acceptable procedures are described in SANS 10103:2008, SANS10218:2012 Part 1; this relates to the equipment, calibration thereof, and acoustic sensitivity and positions of microphones for outdoor and indoor measurements.

Reverberation measurements
Reverberation measurements to comply with AS/NZS 2107 for the spaces defined.

Transference of Noise to adjacent space
Measurement of transference of noise to adjacent spaces: comply with EN ISO 3382-3 and the 'Standard Grade' rating in SANS 10218:2012 Part 1.

Noise from the existing building operations
Noise from the existing building operations to comply with SANS10103:2008

SUBMISSION REQUIREMENTS

Complete Submission Template for the credit providing the following:

- **Operational plan / Service Level Agreement** which requires such measurement / monitoring to take place in accordance with the relevant requirements
- **Acoustic Report** showing:
  - Measurement methodology (confirming compliance with requirements set out in Technical Manual)
  - Measurement Results
  - Confirming compliance with levels set out in relevant standards

- **Corrective Action Plan** showing interventions required to achieve performance levels.

BACKGROUND

Internal noise is a significant factor in terms of occupant satisfaction and wellbeing. It can have a major influence on productivity in the workplace and is recognised as a health hazard by the World Health Organisation. Sound is measured in terms of pressure levels to which the human ear is extremely sensitive.

The measure used is the decibel (dB). On this scale 0dB corresponds to the lowest possible audible sound and 140dB to the level at which pain will occur. The scale is not linear and an increase of 3dB corresponds to a doubling of the sound intensity whilst an increase of 10dB is perceived as an approximate doubling of the loudness of the sound.

The level of ambient sound may affect speech communication or, in extreme conditions, the effectiveness of a public address system. Control of the ambient sound level and limiting reverberation times are required to achieve good communications. On the other hand, spaces such as offices and restaurants may benefit from some continuous ambient sound, which may assist in providing privacy between adjacent groups of people or in reducing distraction where people are concentrating on some particular task.

The building owner should provide an acoustic environment measurably superior to that commonly found in conventional buildings to reduce occupants' stress and improve their comfort and productivity. Strategies might include significantly reducing maximum unoccupied background noise based on measured decibel levels or achieving compliance with an acoustic performance standard.

Ambient noise level is a measure of 'background sound' that tends to be of low intensity and is present for most of the time. In a building, it can be defined as the noise level in a space caused by a composite of sounds from HVAC, equipment, lighting systems, computers, activity noises and the like, but excluding specific sources of interest, such as a person talking in an adjacent space. Excessive amounts of ambient sound can cause stress, which can impede an individual's ability to work well or to be comfortable.

In terms of the existing building's performance to the exterior region: noise pollution is normally a statutory requirement but not well regulated in South Africa. The intention is that buildings that achieve best practice and higher certified should also provide services and utilities such as HVAC plants and emergency power generators that do not cause unacceptable levels of noise to the immediate neighbourhood directly adjacent to the building.

REFERENCES

AS/NZS 2107: 2000 – Acoustics: recommended design sound levels and reverberation times for building interiors.

SANS 10103:2008 – The measurement and rating of environmental noise with respect to annoyance and to speech communication.

IEQ-5 Acoustic Quality

POINTS AVAILABLE **3**

SANS 10083:2012 – The measurement and assessment of occupational noise for hearing conservation purposes

SANS 11690-2:1996 – Acoustics – Recommended practice for the design of low noise workplaces containing machinery.

SANS 656 - Sound level meters.

SANS 658 - Integrating-averaging sound level meters

EN ISO 3382-3

SANS 10218:2012

IEQ-6 Daylight and Views

POINTS AVAILABLE 2

AIM OF CREDIT

To recognize the introduction of naturally lit spaces which provide occupants in regular occupied spaces with access to appropriate daylight and quality views for the activities being performed during the performance period.

CREDIT CRITERIA

Daylight Access and Glare Control	1 point is awarded where occupants in 60% of regularly occupied spaces have access to appropriate amounts of daylight, as measured or as calculated for the regularly occupied space during the performance period.
	A further 0.5 points are awarded where occupants in regularly occupied spaces have installed operational features that reduce the discomfort of glare from direct sunlight
Views and Lines of Sight	0.5 points are awarded where occupants in 60% of regularly occupied spaces have a clear line of sight to high quality internal (day-lit atrium) or external views, providing a connection between indoor space and the outdoors, as measured on plan.

'**Nominated area**: is defined as **Occupied Space** with the exception of:

- Theatres
- Cinemas
- Performance area- stages
- Archives

And other spaces that for functional reasons do not allow daylight/views

COMPLIANCE REQUIREMENTS

Access to daylight and views have positive impacts or the occupants of existing buildings and can provide positive stimulation and a connection to the outdoors environment to them. It also assists to lessen visual fatigue from computer workstation operational requirements.

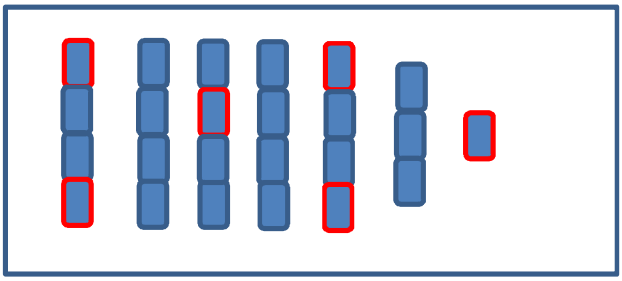
Regular occupied spaces are defined as spaces where people work, study or remain for an extended period of time, including:

- Offices, either open plan or enclosed space;
- Classrooms, staff offices, computer labs;
- Commercial kitchens and preparation areas where food is sold;
- Retail / sales floor, exhibition halls, multi-purpose rooms;
- Libraries, reading rooms, study halls,
- Industrial spaces: specifically break-out areas,
- Warehouse areas: specifically break-out areas,

Option1- Daylight Measurement

Lux levels shall be recorded at work surface height (700mm above finished floor level) and the corresponding measurements indicated on floor plans or measurement tables.

For office areas, conference rooms, classrooms or any area with workstations, measurements shall be taken at 25% (rounded up) of the work stations evenly distributed throughout the area. The measurement shall be taken with the lux meter pointing vertically on the workstation. For example if you had a classroom with 24 desks you would need to take six measurements at six evenly distributed desks representing every area of the room:
23 x 25% = 5.75, therefore rounded up to 6 sample readings needed. The example below shows red blocks as readings.



Example: Sample lux measurements on workstations

For areas where there are no workstations, measurements should be taken on a 10m x 10m grid.

The measurements taken for each room / space can then be averaged to give the average daylight level for the room. The areas with an average daylight level of 200lux or more should make up 60% of all regularly occupied spaces.

Measurements need to be performed with all artificial lighting off.

All readings to be indicated on a floor plan showing workstation layouts or tabulated and accompanied by a confirmation from the auditor that the above methodology has been employed.

The measurement data shall be counter signed by the building owners' Health and Safety Representative or suitable owner representative based on a representative verified sample to ensure the validity of the data.

It is recommended that these measurements are taken at the same time as the IEQ-2 Lighting Comfort audit.

Option 2 Criteria of Building Characteristics for Daylight (deemed-to-satisfy)

It is also acceptable to display the following in the building's characteristics and the following minimum criteria will be:

- To indicate that 40% of the external building façade is transparent or translucent glazing
- To show that the footprint depth of the building floor plan or separate wings of the floor plan is no more than 11,5m deep from external to external façade
- To indicate that in terms of space planning- internal partitions over 60% of the floor area of the existing building is no more than 1,5m in height.

Glare-control:

For all buildings pursuing this path, provide daylight redirection and/or glare control devices as follows to avoid high-contrast situations that could impede visual tasks:

- Northern, Western and Eastern Facades: External Shading Devices or Adjustable Blinds

View and Line of Sight Measurement

Demonstrate to achieve direct line of sight to the outdoor environment or an atrium of at least 8m wide by means of transparent perimeter vision glazing in a zone between 1,2 to 1,5m above the finished floor for building occupants in [60%] of all regularly occupied areas. Determine the area with direct line of sight by totalling the regularly occupied square meters that meets the criteria below.

The following are conditions to be considered and addressed in the calculations:

- In plan view, the area is within sight lines drawn from perimeter vision glazing; unblocked by solid structures- there must not be another building within 8 m of the perimeter
- The area behind any solid portion of the external wall or atrium must be excluded from the calculations and
- The sightline is to be measured by extended an perpendicular line from the atrium or window, a 45 degree line can be used at the corners of the window see diagram:

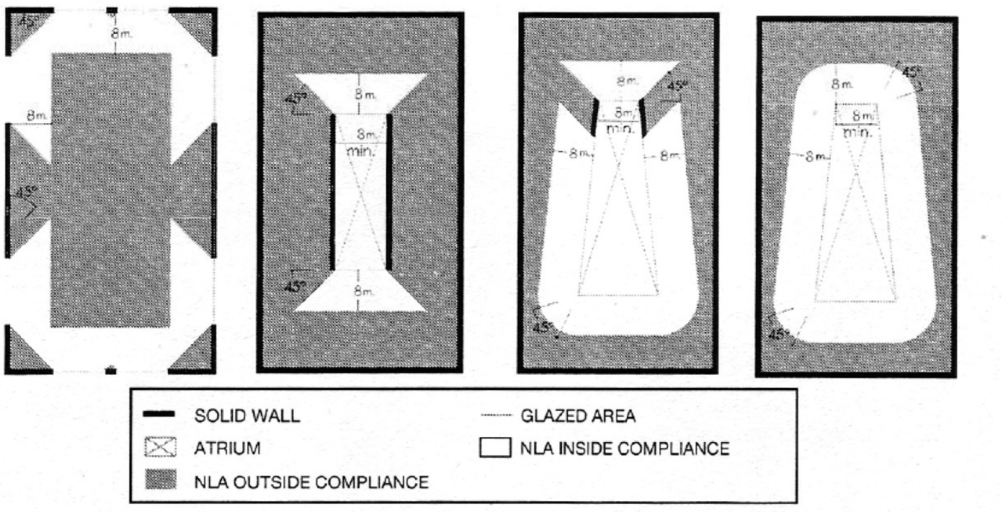


Diagram- 8m width of external view areas in external façade and for different atrium shapes.

- Line of sight may be drawn through interior glazing.
- For private offices, the entire square meters of the office can be counted if 75% or more of the area has direct line of sight to perimeter vision glazing.
- For multi-occupant spaces, the actual square meters of the areas with direct line of sight to perimeter vision glazing is counted as above.
- Compliance with the requirement within this credit can also be demonstrated through compliance of a representative floor if floors are typical.

IEQ-6 Daylight and Views

POINTS AVAILABLE 2

DOCUMENTATION REQUIREMENTS

Submit all evidence and ensure it readily confirms compliance; also complete online submission template/check list.		
Short Report: Daylight & Glare Control	Tables of measurement results or summary of deemed to satisfy calculations.	Total m2 of adequately daylit areas divided by total m2 of regularly occupied spaces
Drawings: Floor Plans (existing 'As built')	Showing regularly occupied spaces, including latest space planning.	Indicate areas that achieved 200 lux, areas where Glare Control devices are installed and areas where external views are achieved.
Short Report: External Views	Tables of results/calculations	Total m2 of external view areas divided by total m2 regularly occupied spaces
Referenced to Drawings/Photographs Floor Plans, Elevations, Sections or Photographs (existing 'As built')	Showing regularly occupied spaces, including latest space planning	Indicate areas that achieved 200 lux daylight

Short reports (limit 5 pages) with referenced drawings:

- Option 1: Daylight access measurement: Referenced to 'As built' drawings showing regularly occupied spaces which were scrutinized to meet requirements. A calculation table showing results from measuring daylight and a summary of compliance. Statement and sign-off by Facilities Manager.
- Option 2: Daylight access deemed to satisfy: Referenced 'As Built' drawings of floor plans, elevations sections/ photographs showing façade percentage glazing, floor plan depth and internal partitioning height compliance
- Glare Control: Referenced 'As Built' drawings and photographs with summary of compliance.
- View and line of sight: Referenced 'As Built' drawings with indication of compliance showing results of areas with views by line of sight achieved and acceptable calculation table with a summary of compliance

ADDITIONAL GUIDANCE / RESOURCES

Opportunities, possible interventions and solutions:

- Use a combination of side-lighting and/or top-lighting to achieve a total Day lighting Zone (that floor area meeting the following requirements) that is at least [60%] of all the regularly occupied spaces.
- Windows or skylights can be inserted in the facade or roof or added to existing buildings; if these are added to the building envelope:
    - Glare control and solar heat gain however must also be controlled so that the interventions do not cause other environmental problems.
    - Sunlight re-direction can also be applied such as screening or introduction of light shelves.

- Space planning: layouts of space planning can be changed to allow more views and daylight access, open plan areas can be created by modifying layouts regarding enclosed office space with corridors.
- In some instance atriums can possibly be inserted into very deep space with suitable directed day lighting from skylights

Day lighting Zone:
In certain buildings such as high-rise buildings with a typical floor plate, the floor may be representative of the typical daylight access found throughout the entire premises.

Daylight Glare control:

The glare control devices must be provided by the Building Owner within the Existing Building to meet the Credit Criteria. Projects can use a combination of fixed external shading devices and internal blinds, with different systems on each orientation, to achieve this credit. For fixed shading, the typical glazing system on the façade must be analysed, demonstrating that it shades the stipulated proportion of the Occupied Space for at least 80% of standard working hours throughout the year.

BACKGROUND

It is commonly understood that access to daylight and views result in positive impacts for building occupants. One of the reasons for these positive impacts is that access to daylight in regularly occupied areas, may give building occupants a circadian stimulus and a connection to the outdoors.

The impact of circadian rhythms on human productivity and health is well documented. These rhythms are based on the body's understanding of the time of day, which is driven by access to daylight. The natural changes in light that occur over the course of the day drive the circadian rhythms and remind the body that it is not evening.

Additionally, access to daylight and views in regularly occupied spaces, can contribute to diminished 'visual fatigue'. Simply put, visual fatigue is a feeling of weariness resulting from visual tasks in an indoor space. Access to views also connects the indoor space to the outdoors.

While daylight is generally accepted as beneficial by improving the internal environment and saving on artificial lighting energy, it can also cause significant glare problems. Direct sunlight or patches of sunlight on internal surfaces, including reflections of windows on computer screens, can cause discomfort due to glare. The provision of shading devices and blinds can overcome this problem and the latter offering the occupant control to deal with local glare.

REFERENCES

Web-Sites:
http://www.cibse.org
CIBSE (Chartered Institution of Building Services Engineers, UK (1999) Publications: Day-lighting & Window design

Printed Media:

Australian Green Star Draft Performance tool (for Board Approval)

IEQ-6 Daylight and Views

POINTS AVAILABLE 2

LEED Reference Guide for Green Building Operations and Maintenance for the Operations and Maintenance of Commercial and Institutional Buildings 2009 Edition (Updated April 2010)
LEED Canada for Existing Buildings: Operations and Maintenance 2009
These publications provides information of credit intent and requirements for a similar credit 'Day-lighting and Views'

IEQ-7 Indoor Pollutant Management

POINTS AVAILABLE **2**

AIM OF CREDIT

To prevent build up of indoor pollutants such as volatile organic compounds, carbon monoxide, carbon dioxide and other indoor pollutants by managing and controlling pollutant sources and thus help sustain the comfort and well-being of building occupants.

CREDIT CRITERIA

IAQ Manager	**1 point** is awarded where an IAQ manager is appointed who supervises and manages the optimisation of practices that prevent and minimise the build-up of indoor pollutants in buildings.
Regular Indoor Air Quality testing	**1 point** is awarded where annual testing of indoor air quality is carried out in regularly occupied spaces and parking areas for the following: ▪ carbon monoxide (CO) levels must not exceed 700ppm and ▪ carbon dioxide (CO_2) levels must not exceed 26ppm. Where the specified limits are exceeded, a corrective action programme has to be implemented and documented.

COMPLIANCE REQUIREMENTS

N.B. Although it is not necessary for organizations seeking certification to develop separate policies and programmes, projects are required to highlight - and where not present in existing policies and programmes, amend these to include - all elements of the Green Star SA Policy Model as well as the requirements outlined below.

IAQ Manager

Prior to the start of the performance period, appoint an individual as the IAQ manager for the project. The role of the IAQ manager can be fulfilled by the Facilities Manager or another member of the building management team, whether in-house or contracted-in.

The IAQ manager has to develop an IAQ management programme in line with the requirements of the EPA Indoor Air Quality Building Education and Assessment Model (I-BEAM) IAQ management programme[1] for surveying and evaluating the building systems to identify potential IAQ problems. The IAQ manager is responsible for implementing an IAQ management programme, including preventative strategies, manage and maintain the relevant IAQ contracts for the project building and communicate about issues relating to IAQ with building occupants.

[1] EPA Indoor Air Quality Building Education and Assessment Model (I-BEAM), EPA Reference Number 402-C-01-001, December 2002. http://www.epa.gov/iaq/largebldgs/i-beam/overview.html.

1. Review I-BEAM programme

   http://www.epa.gov/iaq/largebldgs/i-beam/text/index.html

2. Conduct a baseline IAQ building audit, using the I-BEAM forms at the links below, focusing on the following areas:

   INDOOR SPACES
   http://www.epa.gov/iaq/largebldgs/i-beam/forms/baseline_iaq_audits/indoor_spaces.pdf

   HVAC SYSTEMS
   http://www.epa.gov/iaq/largebldgs/i-beam/forms/baseline_iaq_audits/hvac_system.pdf

   EXTERIOR
   http://www.epa.gov/iaq/largebldgs/i-beam/forms/baseline_iaq_audits/exterior.pdf

3. Identify and implement no-cost improvements

4. Compile an IAQ audit report

   Review sample Table of Contents under “Additional Guidance and Resources”.

5. Develop source control strategies and protocols

6. Conduct periodic inspections

   http://www.epa.gov/iaq/largebldgs/i-beam/forms/iaq_operation_maintenance/om_periodic_inspections.pdf

7. Develop and implement an IAQ communication programme.

   Review sample Table of Contents under “Additional Guidance and Resources”.

Regular IAQ testing

Regular IAQ testing must be done at least annually and has to occur during normal operating hours during the performance period.

1. CO (carbon monoxide) concentrations must not exceed 26 ppm according to ISO 4224 [Government Gazette 24 December 2009] in regularly occupied spaces and indoor parking areas, AND

2. CO_2 (carbon dioxide) concentrations must not exceed 700ppm according to ISO 16000-26 in regularly occupied spaces

If the above limits are exceeded, corrective action is required and a programme and log is to be developed and maintained.

Testing Methodology:

CO_2

CO_2 levels must be tested in all regularly occupied spaces capable of accommodating 25 people or more. Testing must be undertaken during normal operation of the building with occupants present. Within each space, one reading can either be taken at the furthest point from the supply-air or at the return-air point for the space.

CO

CO levels must be tested in covered car park areas. One reading should be taken per 1000m^2, and each level of the car park or each enclosed areas of the car park must have at least one reading taken.

In addition to car parks, any occupied spaces adjacent to the car park should be tested in the expected 'worst-case' locations.

Note – the GBCSA invites feedback on the testing methodologies for CO and CO2 above.

Regularly occupied Spaces
Regularly occupied spaces shall be defined for the purpose of this credit, as all spaces where a person is expected to work, or remain for an extended period of time, including, but not limited to:

- Offices, either open plan or individual;
- Classrooms, lecture halls, theatres, auditoriums and court rooms;
- Computer labs;
- Commercial kitchens and preparation areas where food is sold;
- Retail / sales floor, exhibition halls, multi-purpose rooms;
- Industrial spaces, warehouse areas, shop floors, workstations;
- Hospital wards, procedure rooms, waiting areas

DOCUMENTATION REQUIREMENTS

IAQ Manager

- A letter of appointment of the IAQ Manager, signed by the project owner
- A copy of the IAQ management programme audit report, signed by the project owner, which includes:
    - Summary of the audit procedures and the results
    - Representative copies of the completed I-Beam audit forms
    - Detailed source control strategies and protocols
    - Representative copies of periodic inspection forms
- A copy of the IAQ communication plan, signed off by the project owner

Regular Indoor Air Quality testing

Provide proof of indoor air quality tests conducted during the performance period or proof of installed permanent CO_2 and CO monitoring systems.

- Sign-off from the testing contractor confirming:
    - Specifications of equipment and time schedule used to measure
    - Copy of results of the CO and CO_2 measurements results

- Copy of plans that identify all regularly occupied spaces

- Corrective action plan and its implementation, where applicable.

Exhaust risers

- Floor plans/system drawings marked-up to clearly show the location of the dedicated exhaust riser(s)/air conditioning duct and the exhaust system provided to each printing/photocopy room/area
- Description of how the dedicated exhaust riser/air conditioning duct is controlled and operated
- Description of how the riser/duct has the capacity to serve the printing/photocopy rooms/areas as required by the submission requirements
- In the case where the exhaust risers are claimed 'Non-applicable', a clarification with reference to the floor plans is required that no printing or photocopy equipment is installed in the project building.

ADDITIONAL GUIDANCE / RESOURCES

Dedicated Exhaust Risers

Where no dedicated print/photocopy area(s) (whether separate rooms or not) are provided in the building, the Exhaust Riser point is 'Not Applicable' and is excluded from the points available in this credit.

The credit cannot be claimed as 'Not Applicable' if the project building consists of 1000 m^2 or more of the following spaces:

- Offices
- Reception
- IT workspace
- It equipment
- Laboratory
- Consulting room

Sample Table of Contents of an IAQ communication programme

1. Introduction
2. Purpose
3. Responsibilities
4. Procedure for Responding to IAQ Complaints
5. Content of the Complaint Response Programme
    a. IAQ complaint collection and log
    b. Problem Solving Steps

   c. Assignment of Responsibilities
   d. Record keeping and resolutions
6. Communicating with Building Occupants
   a. intranet
   b. E-Mail bulletins
   c. Major incidents
7. Annual Occupant Comfort Survey

Appendix 1: IAQ forms for occupant feedback and logs

BACKGROUND

Occupants' health and well-being depends largely on the quality of air they breathe. While the building might be mechanically or naturally supplied with fresh air, local sources of air pollutants can make the indoor air toxic. This credit awards the management tasks that guard the indoor environment of buildings for sources of toxic pollutants of the air.

REFERENCES

EPA Indoor Air Quality Building Education and Assessment Model (I-BEAM), EPA Reference Number 402-C-01-001, December 2002. http://www.epa.gov/iaq/largebldgs/i-beam/overview.html.

GBCSA, Technical Manual Green Star SA, Public & Education Building v1

www.iso.org – international standards for measuring and reporting greenhouse gas emissions and validating and verifying greenhouse gas assertions (ISO 14064-1,2,3 and ISO 14065) – International Standards Organization

www.greenhouse.gov.au – information, tools and emissions factors for measuring and reporting greenhouse gas emissions – Australian Department of Climate Change, formerly the Australian Greenhouse Office

Green Star Australia, Draft Performance tool (submitted for board approval)

ENE-1 Energy Consumption (GHGE)

POINTS AVAILABLE **25**

AIM OF CREDIT

To encourage the reduction of greenhouse gas emissions associated with the use of energy in building operations.

CREDIT CRITERIA

Minimum Requirements	To be eligible for any points in this credit, 12 months* of historic energy consumption data for the building must be available. **Note – for PILOT projects, periods shorter than 12 months may also be motivated. Please contact the GBCSA for further details.*
Energy Performance	A total of 25 points may be awarded where percentage reductions in energy consumption associated with operations are achieved during the performance period. Points are awarded based on the level of the building's actual energy efficiency performance against industry benchmarks. In addition to points achieved above, where the full 25 points are not achieved: 1 point is awarded where there is a proven energy saving for the performance period compared to the previous 12 months. 1 additional point is awarded where there is a proven energy saving of 10% or more for the performance period compared to a 12 month period within the last 3 years.

COMPLIANCE REQUIREMENTS

Performance period
Performance period relates to the continuous time period during which a credit is measured or data is collected. For Green Star SA – Existing Building Performance certification, the performance period is the most recent 12-month period of operations preceding the submission for certification.

Minimum requirement – Collect metered energy consumption data for the last 12 months* of the building's operation.
Energy consumption data for the past 12 months must have been collected in order for the minimum requirement criteria in this credit to be met. This data will be used to measure against industry benchmarks and quantify improvements in energy consumption during the performance period, for which points will be awarded.

**Note – for PILOT projects, periods shorter than 12 months may also be motivated. Please contact the GBCSA for further details.*

ENE-1 Energy Consumption (GHGE)

POINTS AVAILABLE **25**

Sources of acceptable data
Energy consumption data collected for the building must be verifiable with sources such as Municipal or Eskom accounts for correctness. Alternatively, verification from an independent utility metering contractor may be presented.

Collected energy data must cover the energy use associated with the whole building, including source information. Buildings producing their own energy on site must indicate the alternative/renewable energy component separately from the traditional energy sources. If there are any missing accounts or data points, the missing data point may be interpolated for completeness, except when the missing data point is the first one or the last one of a series. A maximum of 3 months in the 12 month period may be interpolated.

Energy use must include all building energy consumption; this could include but not be limited to:

- all common areas,
- air-conditioning and plant
- lifts
- tenant sub-metered areas
- external lighting

'Energy' encompasses all the energy types used in powering the building, including electricity, gas, oil or diesel.

Where the energy use is clearly separate and sub-metered between building owner and building occupants, this separation must be clearly outlined. Where this separation does not exist (or it is not clearly outlined) the total energy use for the whole building must be gathered and presented together.

The energy data must cover at least 3 consecutive years* for Compliance Path 3 (see below for further details on compliance paths).

**Note – for PILOT projects, periods shorter than 3 years may also be motivated. Please contact the GBCSA for further details.*

Municipal/Eskom Accounts
Data from utility accounts (as opposed to metered data) will only be accepted if no more than 3 months of data in the 12 month period is estimated.

Compliance Paths
For the purposes of this credit, there are four options for establishing an energy consumption benchmark for the building as outlined in the figure below.

Note that only one compliance path may be followed.

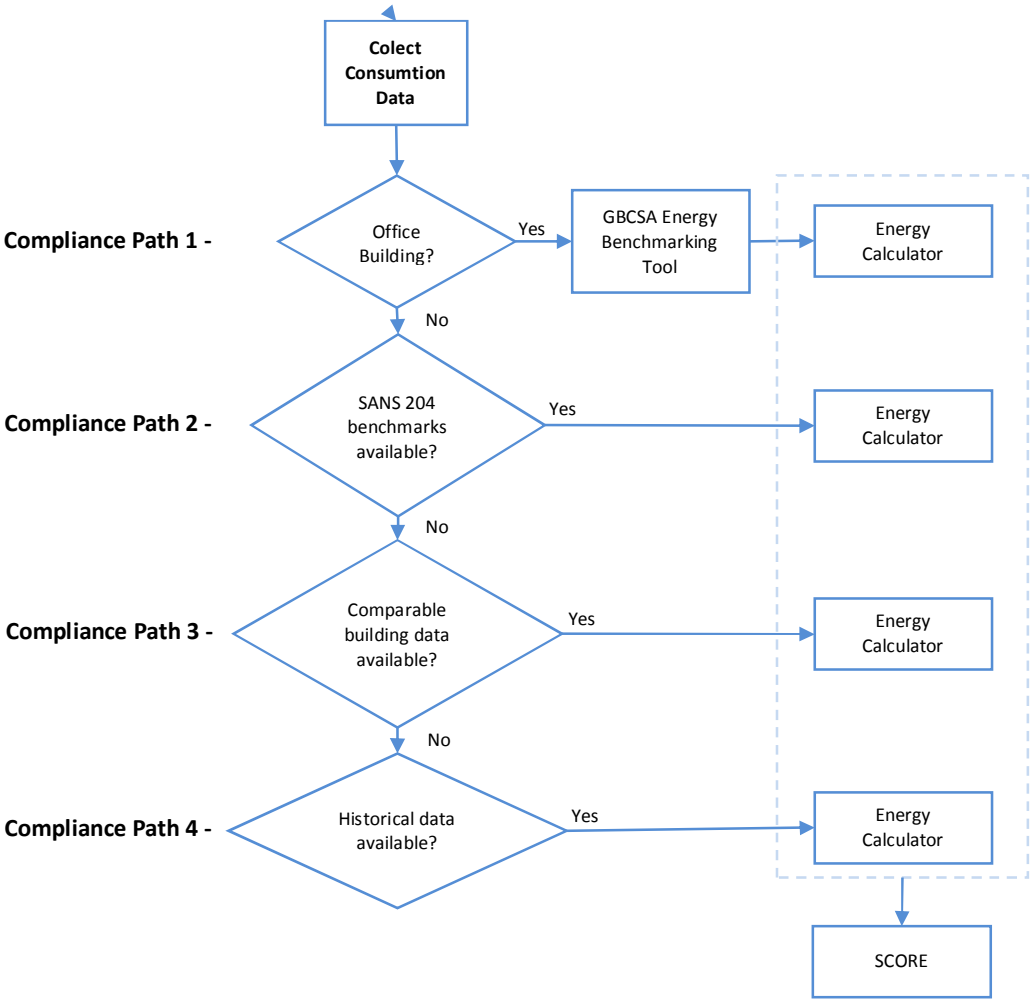


Figure 1. Compliance path flow diagram

ENE-1 Energy Consumption (GHGE)

POINTS AVAILABLE **25**

COMPLIANCE PATH 1: GBCSA Energy Benchmarking Tool (office buildings)

If the GBCSA's Energy Benchmarking Tool caters for your building type (currently caters for office buildings), this tool must be used to benchmark your building's performance.

The GBCSA's Energy Benchmarking Tool is an operational performance measurement tool which rates the performance of a whole building, by comparing the energy usage figures against a national "average" benchmark that is adjusted for the following factors:

- Climate;
- The number of computers;
- The number of occupants;
- The annual vacancies;
- Operating hours.

The building is positioned on a 10 level scale based on its performance relative to the benchmark. The level achieved in the benchmarking tool is then translated into the number of points scored under this credit as per the table below. Points are converted by using the Green Star SA – Energy Calculator available from the GBCSA website (see resource links below).

Table 1. Scoring Table - GBSA Benchmarking calculator

GBSA Energy Benchmarking Tool rating	1	2	3	4	5	6	7	8	9	10
Points Allocated for this credit	0	0	0	0	2	5	10	15	20	25

To summarise, for Compliance Path 1, the following procedure must be followed:

1. Collect 12 months of energy consumption data
2. Benchmark office building using GBCSA Energy Benchmarking Tool
3. Enter results into Green Star SA – Energy Calculator to obtain final score

Compliance Path 1 Resources:

Resource	Description	Location
Energy Benchmarking Tool	Use to benchmark building performance	http://www.gbcsa.org.za/other-tools/energy-water-benchmark/
Energy Benchmarking Guidelines	Provide details on how to use benchmarking tool	http://www.gbcsa.org.za/other-tools/energy-water-benchmark/
Existing Building Performance Energy Calculator	Use to determine final score for this credit	http://www.gbcsa.org.za/green-star-rating-tools/existing-buildings-performance-pilot/
Existing Building Performance Energy	Provides detailed guidance for each compliance path	http://www.gbcsa.org.za/green-star-rating-tools/existing-

Calculator Guide		buildings-performance-pilot/

COMPLIANCE PATH 2: SANS Benchmarks

Where the GBCSA's Energy Benchmarking Tool does not cater for your building type and comparable benchmarking figures exist in SANS 10400-XA or SANS 204, the listed figures in the SANS documents shall be used as benchmarks with respect to the building type and climatic zone. The Green Star SA – Existing Building Performance Energy Calculator (see resource links below) must be used to conduct this benchmarking exercise.

Note that for the purposes of this credit, Compliance Path 1 shall take preference when evaluating office buildings.

The energy consumption benchmarks determined in the SANS document will present the "minimum performer" for this particular building. Percentage differences will then be calculated in 5% increments to allow improvements to be measured over time. Points scored under this credit shall be allocated within the Energy Calculator as per the table below. Due to the fact that the SANS 10400 XA only became compulsory in November 2011, buildings built prior to this date will be scored slightly higher for initial improvements over this benchmark. The SANS benchmark tables are included under the 'Additional Guidance' section below for reference.

Table 2. Scoring Table – Compliance path 2: SANS Benchmarks

Percentage improvement over SANS Benchmark	Points achieved	
	Buildings constructed before November 2011	Buildings constructed after November 2011
0%	2	0
5%	3	2
10%	5	3
15%	7	4
20%	8	5
25%	9	6
30%	11	8
35%	12	9
40%	13	10
45%	14	11
50%	15	13
55%	16	14
60%	17	15
65%	18	16
70%	19	18
75%	20	19
80%	21	20
85%	22	21
90%	23	23
95%	24	24
100%	25	25

Applicability of Using SANS Benchmarks
Note that not all building types within a specific SANS classification would be able to apply the SANS 10400-XA benchmarks equitably. As such, the guidance below seeks to further define the type of buildings that may use the benchmarks, as well as the approach to be taken in terms of normalising for occupancy.

In order to make use of the kWh/m2 benchmarks indicated above, the following characteristics must be met for the various building classifications.

Building Classification	Type of buildings that can use these benchmarks	Occupancy
A1	Entertainment & Public Assembly Buildings >2000m2 with commercial kitchen facilities. These buildings would typically be air conditioned. E.g. convention centres, auditoria, restaurants, etc.	Occupancy shall be normalised as shown below. The standard occupancy for this building type is assumed to be full occupancy 18 hours a day, 7 days a week.
A2	Theatrical and indoor sport venues >1000m2. These venues would typically be air conditioned.	Occupancy shall be normalised as shown below. The standard occupancy for this building type is assumed to be full occupancy 18 hours a day, 7 days a week.
A3	Applies to tertiary education buildings that would typically be air conditioned.	Occupancy shall be normalised as shown below. The standard occupancy for this building type is assumed to be full occupancy 12 hours a day, 5 days a week.
A4	Places of Worship (typically not air conditioned)	Occupancy shall be normalised as shown below. The standard occupancy for this building type is assumed to be full occupancy 6 hours a day, 4 days a week.
F1	Retail Centre / store >2000m2	Occupancy shall be normalised as shown below. The standard occupancy for this building type is assumed to be full occupancy 12 hours a day, 7 days a week.
G1	Use GBCSA Energy Benchmarking Tool	
H1	Hotels larger than 50 rooms. Includes commercial kitchen facilities typically air conditioned.	Occupancy shall be normalised as shown below. The standard occupancy for this building type is assumed to be full occupancy 24 hours a day, 7 days a week.

<u>Normalising Occupancy:</u>

Normalisation shall be undertaken to correct for occupancy, as follows:

Effective energy consumption (kWh/m^2/a) = measured net energy consumption (kWh/a) / occupied nett floor area (m^2)

where

occupied nett floor area = (nett floor area – unoccupied floor area)

The unoccupied floor area must be prorated to the measurement period, for example:

Area A is unoccupied for 30% of the year, area B is unoccupied for 60% of the year, area C is always occupied (100% occupied). A, B, and C make up the net floor area. Therefore, occupied net floor area = (A + B + C) – [(0.3 x A) + (0.6 x B)]

Example:

A convention Centre (A1) has characteristics as follows:

- Measured net energy consumption = 1000 000 kWh/a
- Net floor area = 5000 m2
- Area A is 100% occupied for 9 hours of the day, all year
- Area B is 50% occupied for 18 hours of the day, all year
- Area C is 100% occupied for 18 hours of the day, 50% of the year

Usable net floor area = (A+B+C) – [(A x 0.5) + (B x 0.5) + (C x 0.5)]

As such the Effective Energy Consumption = 1000 000 / (5000 x 0.5) = 400kWh/m2/a

The Green Star SA – Existing Building Performance Energy Calculator will take into account the occupancy normalising above. Applicant need simply fill in the occupancy fields.

Energy Performance Certificates
The SABS is currently developing a standard for Energy Performance Certificates in buildings and the intention is for these EPC's to take preference over the SANS 204 / SANS 10400-XA method employed in Compliance Route 2. Once EPCs are released and available to be issued by SANAS accredited organizations, an EPC would need to be submitted for this compliance route.

To summarise, for Compliance Path 2, the following procedure must be followed:

1. Collect 12 months of energy consumption data
2. Benchmark building against SANS benchmarks using Green Star SA – Existing Building Performance Energy Calculator

Compliance Path 2 resources:

Resource	Description	Location
Existing Building	Use to benchmark energy	http://www.gbcsa.org.za/green-

Performance Energy Calculator	consumption against SANS benchmarks and to determine final score for this credit	star-rating-tools/existing-buildings-performance-pilot/
Existing Building Performance Energy Calculator Guide	Provides detailed guidance for each compliance path	http://www.gbcsa.org.za/green-star-rating-tools/existing-buildings-performance-pilot/

COMPLIANCE PATH 3: Comparable Buildings (for building types NOT covered by GBCSA Energy Benchmarking tool or SANS benchmarks)

As not all of building-types are covered by the GBCSA benchmarking tool or SANS benchmarks, non-listed premises can still be eligible for points under this credit by following the point scoring path as described below.

Energy consumption baseline from energy data from comparable buildings
An energy consumption baseline must be determined from historical data of at least three (3) other comparable buildings in the same climatic zone. 'Energy' encompasses all the energy types used in powering these buildings, including electricity, gas, oil or diesel. Historical data from at least two (2) recent year periods shall be used for the calculations.

The energy performance baseline determined using this option, will represent the 'average performer' against which the premises seeking Green Star certification will be compared. Percentage differences will then be calculated in 5% increments as per Table 4 to allow for improvements to be measured over time.

The following process must be followed for each of the 3 comparable buildings:

I. Determine if the building being used to create the baseline is of 'comparable use' to the premises seeking Green Star certification as per guidelines provided here and in Energy Calculator & Guide;
II. Collect historical monthly energy data, from at least 2 consecutive years* covering the major energy sources used by the comparable buildings as well as 12 months of data for the building being rated;
III. Collect Gross Lettable Area information in square metres for all buildings;
IV. Collect hours of operation information in 'hours per week' for all buildings;
V. Collect postcode of all buildings;
VI. Determine and collect other operational characteristics that may be specific to that building type or space use that are aligned with the energy data. These may be factors such as the number of regular occupants, number of refrigeration units, or whether a 'forklift charge room' exists.

The data collected as part of this process will be used to determine a simplified average energy consumption performance baseline. In addition to that, the data collected will be used in anonymous format to create normalisation factors and more accurate average energy performance baselines over time.

**Note – for PILOT projects, periods shorter than 2 years may also be motivated. Please contact the GBCSA for further details.*

Determining comparable buildings
Comparable buildings are defined as buildings in the same climatic zone that have the same primary use and that have similar operating characteristics.

This means that if the primary use of the building under investigation is defined as a "Restaurant", the primary use of the buildings used in the comparison must also be "Restaurant". Primary use is defined as at least 80% of the Gross Lettable Area (GLA) of a building having the same use. Where buildings are characterised by mixed-use if no single primary use covers 80% of the GLA an area weighted approach may be used (see 'Mixed Use Buildings' after Compliance Path 4).

Comparable buildings shall be defined in terms of the following variables*:

1. Type of building (same)
2. Use of building (same)
3. Climatic zone (same)
4. Hours of operation (within 10%)
5. Size of building (within 20%)
6. Construction (Masonry, steel-frame, concrete etc.?)
7. Occupation rate (person / m2) (within 10%)
8. HVAC systems (Chilled water/ DX etc.) (same)
9. Age of building (within 5 years)

**Note – for PILOT projects, the GBCSA is seeking feedback from project teams on the appropriateness of these variables. Motivation of alternative metrics or variables will be considered.*

Collecting area information
Gross Lettable Area (GLA) data must be collected from comparable buildings to allow for the establishment of the baseline. This data must be presented in square metres and be verifiable from floor plans or measurements obtained from site.

The GLA will be required to "normalise" the collected energy data to an energy per square metre unit. For building types where GLA may not be the most sensible means of comparing energy performance, applicants may motivate alternative comparison approaches for approval.

Collecting hours of operation
The 'hours of operation' of a building is an important variable in determining the baseline that can be used for comparisons. 'Hours of operation' means the total number of hours a week a building is fully capable of being used for its main purpose.

The building under investigation is to be used as the point of reference for this comparison. This means that if the building under investigation typically operates Monday to Friday from 8am to 6pm (50 hours a week), the hours of operation of the comparable buildings in comparison group should also ideally operate around 50 hours a week.

It is understood that comparison buildings may not have the same exact 'hours of operation' as one another, however this variable is used to normalise the baseline for more comparable results.

Climate zones
To mitigate against the influence of different climate and weather conditions that may influence a building's energy use, only comparable buildings from the same climate zone as defined by SANS 204 and 10400-XA shall be used for comparison.

It is envisioned that future updates to this credit may include the use of Cooling Degree Days (CDD) and Heating Degree Days (HDD to normalise baseline data for more comparable results and allow buildings from different climate zones to be compared against each other.

Location information
To grow the national energy consumption database, generic building location data will be required to allow future comparisons. To preserve participant's confidentiality, non specific geographical information in the form of the buildings postal codes must be provided.

Other operational characteristics
Variables that could explain how energy is consumed by building operations must also be collected for all buildings and shown to be comparable (as detailed above).

Variables that should be considered include:

- The number of computers
- The number of occupants
- The annual vacancies
- Operating hours
- Size of building
- Construction (Brick, steel, concrete etc.)
- Occupation rate (person / m2)
- HVAC systems (Chilled water/ DX etc.)
- Age of building

Where the specific building type may have an operational characteristic not listed above which is likely to affect energy performance significantly, this should be collected and shown to be comparable between the four buildings.

To summarise, for Compliance Path 3, the following procedure must be followed:

1. Identify 3 'comparable buildings' (as per guidelines provided here and in Energy Calculator & Guide)
2. Collect energy consumption and other required data for 3 buildings as well as the building being certified
3. Use the Green Star SA – Existing Building Performance Energy Calculator to benchmark the building seeking certification against the 3 comparable buildings.

Compliance Path 3 Resources:

Resource	Description	Location
Existing Building	Use to benchmark building	http://www.gbcsa.org.za/green-

Performance Energy Calculator	seeking certification against 3 comparable buildings and to determine final score for this credit	star-rating-tools/existing-buildings-performance-pilot/
Existing Building Performance Energy Calculator Guide	Provides detailed guidance for each compliance path	http://www.gbcsa.org.za/green-star-rating-tools/existing-buildings-performance-pilot/

COMPLIANCE PATH 4: Historical Data (for premises NOT covered by GBCSA Energy Benchmarking tool or SANS benchmarks, and where no comparable building data is available)

Historical data from at least three (3) recent year periods* shall be used for the baseline calculations. The energy consumption baseline determined using this option will represent an 'average performance' for the particular premises. Percentage differences will then be calculated in 5% increments to allow for improvements to be measured over time.

**Note – for PILOT projects, periods shorter than 2 years may also be motivated. Please contact the GBCSA for further details.*

The process as described in Compliance Route 3 above to collect data shall also be followed for Compliance Path 4.

To summarise, for Compliance Path 4, the following procedure must be followed:

1. Collect historical energy consumption data for the building
2. Use the Green Star SA – Existing Building Performance Energy Calculator to benchmark the building against its own historical performance.

Compliance Path 4 Resources:

Resource	Description	Location
Existing Building Performance Energy Calculator	Use to benchmark building seeking certification against its own historical baseline and to determine final score for this credit	http://www.gbcsa.org.za/green-star-rating-tools/existing-buildings-performance-pilot/
Existing Building Performance Energy Calculator Guide	Provides detailed guidance for each compliance path	http://www.gbcsa.org.za/green-star-rating-tools/existing-buildings-performance-pilot/

Mixed-use buildings
The following methodology for mixed-use buildings shall apply:

- If 80% or more of a building's GLA comprises a single space type, the building's space use shall be defined by this type. If the building consist of more than one space type and no single space type is more than 80% of the GLA, then the relevant compliance path shall be used to rate each space type seperately. The final score shall be a pro rata averaged based on the respective scores and floor areas.

  If a space type makes up less than 10% of the building's GLA, it can be excluded (both consumption and GLA) from the benchmarking calculation provided the sum of all excluded areas do not exceed 10% of the building GLA.

- Example 1: If the building comprises 90% Retail and 10% Office space, the primary use of the building shall be Retail. Thus Compliance path 2 shall be followed to rate the building.

- Example 2: If the building under investigation consists of 60% Office, 35% Retail and 5% residential, Compliance path 1 shall be followed for the Office section and Compliance Path 2 for the Retail section. The residential energy consumption and floor area can be excluded from benchmarking exercise. The final score shall be calculated by adding the final scores for each space type averaged based on floor area of each space type.

Greenhouse gas emission factor data
The ultimate goal of this credit is to reduce the amount of greenhouse gasses produced through the use of energy. To this end the collected energy usage data is converted to their respective CO_2 emissions for the final comparison.

The table below provides the kg CO_2 / unit fuel and kg CO_2 / GJ factors used in the calculator.

Table 3 CO2 emission of energy sources

Energy sources	**kg CO_2 / unit fuel**	**kg CO_2 / GJ***
Electricity	0.77 kg CO_2/kWh (Eskom) 0.89 kg CO_2/kWh (EIA)	213.89 kg/GJ (Eskom) 247.22 kg/GJ (EIA)
Distillate Fuel (No.1,2,4 fuel oil and diesel)	2.68 kg CO_2/litre 3.14 kg CO_2/kg fuel	69.38 kg/GJ
Residual Fuel Oil (No. 5 and 6 fuel oil)	3.12 kg CO_2/litre 3.12 kg CO_2/kg fuel	74.77 kg/GJ
LPG	1.54 kg CO_2/litre	59.78 kg/GJ
Propane	1.52 kg CO_2/litre	59.84 kg/GJ
Natural Gas	1.93 kg $CO_2/m^3{}_n$	50.34 kg/GJ
Bituminous Coal	2465.61 kg CO_2/ton fuel	88.27 kg/GJ
Sub-Bituminous Coal	1857.91 kg CO_2/ton fuel	91.45 kg/GJ

* GJ values are based upon Higher Heating Values

The table was compiled using the following sources:
- GHG Protocol, Eskom environmental report, 2000 figures, Agama
- CO_2 calculation tool from www.ghgprotocol.org (Energy Information Agency EIA)

Renewable energy sources (excluding biomass) will be regarded as completely emission free for the purposes of this credit.

ENE-1 Energy Consumption (GHGE)

POINTS AVAILABLE **25**

Energy consumption performance
For compliance route 3 and 4, points are awarded based on improvement upon the average energy consumption baseline created using the methodologies described in the sections above. The better the energy consumption performance of the premises seeking Green Star certification when compared to the average energy consumption baseline, the more points are awarded.

Because the accuracy of the baseline benchmarks in representing industry average may not be as good as those for compliance routes 1 & 2, points for compliance route 3 & 4 are limited.

Energy consumption performance – Compliance Routes 3 & 4

Table 4. Compliance path 3 & 4point allocation

Percentage better than 'average performer'	Compliance Path 3	Compliance Path 4
0%	0	0
5%	1	1
10%	2	2
15%	3	3
20%	4	4
25%	6	5
30%	7	6
35%	8	7
40%	9	8
45%	10	9
50%	11	10
55%	12	11
60%	13	12
65%	14	13
70%	15	14
75%	17	15
80%	18	16
85%	19	17
90%	20	18
95%	21	19
100%	22	20

DOCUMENTATION REQUIREMENTS / EVIDENCE

Submit all evidence and ensure it readily confirms compliance; also complete online submission template/check list. Applicants must provide all documentation that supports their claims and calculations.

Required Documentation (as requested in submission template):

- 12 consecutive months (or more) of electricity consumption data.
- Completed Energy Benchmarking Calculator (Offices)Completed Green Star SA – Existing Building Performance Energy Calculator

Further Evidence* that may be Requested by Assessors:

- Proof of building area (GLA)
- Proof of number of occupants
- Proof of occupancy hours
- Proof of building address
- Proof of age of building
- Proof of material used in construction of building

**Note that for Compliance Path 3, the above information may be requested not only for the building seeking certification, but for comparable buildings as well.*

ADDITIONAL GUIDANCE / RESOURCES

Energy audit
Whilst not a specific requirement within the credit, it is recommended that an energy audit is conducted to establish where energy savings could be realized.

An ASHRAE level 1 energy audit would typically cover the following:

1. Summary
2. Systems narrative
    a. Air distribution and ventilation systems
    b. Cooling systems
    c. Heating systems
    d. Building HVAC controls
    e. Domestic hot water system
    f. Lighting systems and controls
    g. Electrical distribution system
    h. Building envelope system
3. Energy usage analysis
    a. Benchmark implications
    b. Irregularities in energy use
    c. Current occupancy rates
4. Energy audit procedure and results
5. Recommended energy efficiency measures

NATIONAL CONTEXT: To meet the conditional requirement the building must demonstrate energy performance equal to or better that the national building regulation benchmarks indicated in SANS 10400 XA.

In light of the increased demand on South Africa's electrical supply, Demand-side Management (DSM) and energy efficiency projects are currently being implemented by Energy Service Companies (ESCos) to achieve electrical savings and obtain rebate payments from Eskom.

The metering installation forms a critical part of the measurement and verification process to quantify for rebates and determine the effectiveness of the DSM project. To this end, compliance with Eskom's PM/M&V/STD001 (currently under review) metering standard should be considered when selecting the metering standard and methodology for the building(s).

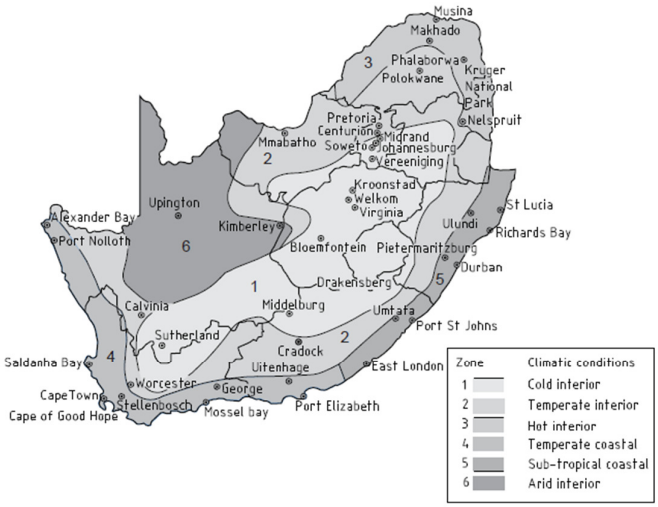
Additional resources are shown below.

http://www.gbcsa.org.za/other-tools/energy-water-benchmark/

The application of the National Buildings Regulations standard, SANS 10400-XA-2011 provides the following performance levels based on the different climatic zones in South Africa.

Table 5. SANS 10400-XA Maximum Energy consumption table (1)

1	2	3	4	5	6	7	8
Classification of occupancy of building	**Description of building**	**Maximum energy consumption** kWh/m^2					
		Climatic zone					
		1	**2**	**3**	**4**	**5**	**6**
A1	Entertainment and public assembly	420	400	440	390	400	420
A2	Theatrical and indoor sport	420	400	440	390	400	420
A3	Places of instruction	420	400	440	390	400	420
A4	Worship	120	115	125	110	115	120
F1	Large shop	240	245	260	240	260	255
G1	Offices	200	190	210	185	190	200
H1	Hotel	650	600	585	600	620	630
NOTE 1 The annual consumption per square metre shall be based on the sum of the monthly consumption of 12 consecutive months. NOTE 2 Non-electrical consumption, such as fossil fuels, shall be accounted for on a non-renewable primary energy thermal equivalence basis by converting megajoules to kilowatt hours.							



Zone	Description	Major centre
1	Cold interior	Johannesburg, Bloemfontein
2	Temperate interior	Pretoria, Polokwane
3	Hot interior	Makhado, Nelspruit
4	Temperate coastal	Cape Town, Port Elizabeth
5	Sub-tropical coastal	East London, Durban, Richards Bay
6	Arid interior	Upington, Kimberley

Table 6. Climate Zone table(1)

ENE-1 Energy Consumption (GHGE)

POINTS AVAILABLE **25**

BACKGROUND

The per capita greenhouse gas emissions of South Africa are on average greater than our economic counterparts in the region. This can largely be attributed to our over reliance on coal for power generation. Balancing economic growth and the ever growing energy demand can only be achieved through the reduction in energy demands of new and existing buildings.

Reducing the energy demand has the added benefit of alleviating the current shortfall in electrical generation capacity in South Africa and reducing the strain on the generation and distribution infrastructure, minimising the future need for load shedding.

The South African Government has set a reduction in energy demand target of 15% by 2015 for the commercial and public building sector.

For additional resources and technical information please see the following:

GBSA Benchmarking tool
The GBCSA's Energy & Water Benchmarking Tool for office buildings (currently in PILOT) for the building type. See http://www.gbcsa.org.za/other-tools/energy-water-benchmark/

http://gbcsa.codo-dragon.com/wp-content/uploads/2013/05/Guidelines-on-How-to-Use-the-Tool.pdf

ASHRAE Audits
http://www.energyadvantage.com/blog/2011/05/the-difference-between-ahsrae-level-1-2-3-energy-audits/

Additional information with regards to energy metering can be found under:

- MAN-6 Ongoing Monitoring and Metering

REFERENCES

1. **SOUTH AFRICAN NATIONAL STANDARD.** *SANS 10400-XA:2011 The application of the National Building Regulations, Part X: Environmental sustainability, Part XA: Energy usage in buildings.* Pretoria : SABS Standards Division, 2011.
2. —. *SANS 204:2011 Energy efficiency in buildings.* Pretoria : SABS Standards Devision , 2011.
3. —. *SANS 50001:2011 Energy managment systems - requirements with guidance for use.* Pretoria : SABS Standards Division , 2011.
4. —. *SANS 50010:2011 Measurement and verification of energy savings .* Pretoria : SABS Standards Division , 2011.
5. **Green Star SA .** GREEN-STAR-SA-PUBLIC-EDUCATION-BUILDING-RATING-TOOL. Cape Town : s.n., 2013.
6. **Green Star Australia.** Green Star - Performance . Sydney : s.n., 2013.

ENE-2 Peak Electricity Demand

POINTS AVAILABLE **2**

AIM OF CREDIT

To recognize operational practices that reduces peak demand on electricity supply infrastructure.

CREDIT CRITERIA

Minimum Requirement **Historical Peak Electricity Demand Data**	To be eligible for any points in this credit,historical peak demand data must be collected.
Peak Electricity Demand performance	A total of 2 points may be awarded where it is demonstrated that the building's Peak Demand Performance meets the required benchmarks set out in the credit (improvement on SANS 10400-XA where applicable, or improvement on a historical baseline where not).

COMPLIANCE REQUIREMENTS

Peak demand is a primary issue of concern for electricity supply networks, as it is a direct driver of network capacity requirements. In contrast to the variable nature of electricity demand, network capacity cannot be increased in the short-run to accommodate excessive periods of demand.

Compliance Paths
For the purposes of this credit, there are two options for establishing a Peak Deamnd benchmark for the building as outlined in the figure overleaf.

Note that only one compliance path may be followed.

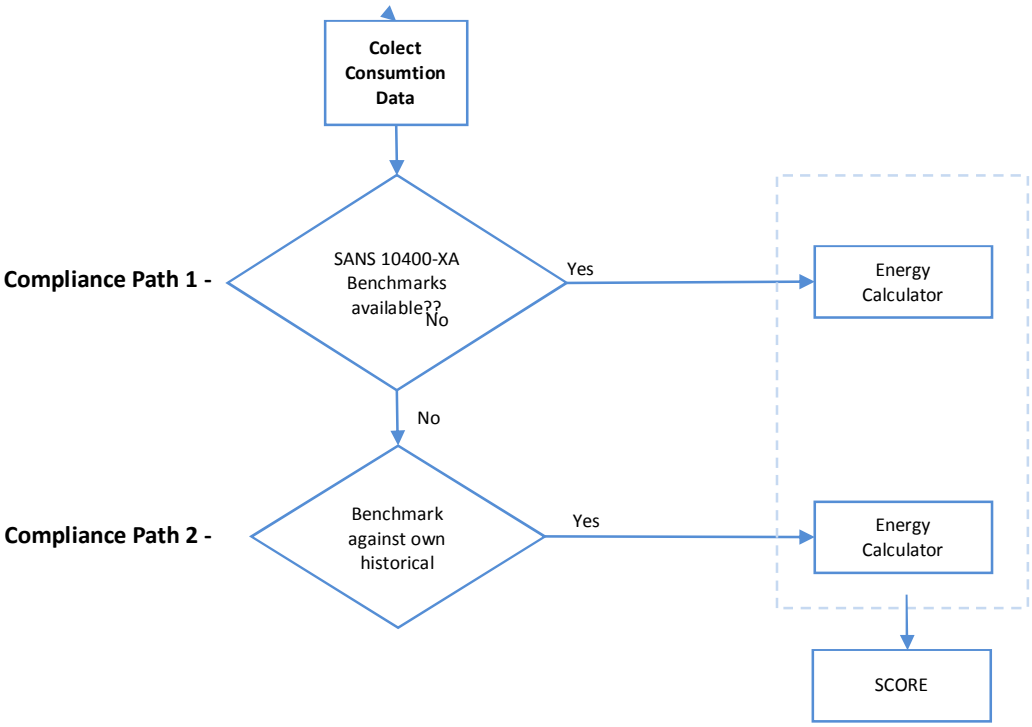


Figure 1. Compliance path flow diagram

COMPLIANCE PATH 1: SANS 10400-XA Peak Demand Benchmarks

SANS Benchmarks

Where comparable benchmarking figures exist in SANS 10400-XA for the building type, the listed figures in the SANS document shall be used within the ENE-2 calculator as a benchmark to compare your building's peak demand performance to. The corresponding SANS reference table is provided under the additional guidance section.

Points shall be scored as per the table overleaf.

Table 1. Scoring Table - SANS Benchmarks

Building	Improvement on benchmark	0 to 5%	5 to 10%	10 to 20%	Above 20%
built before November 2011	Points Allocated for this credit	0.5	1	1.5	2
built after November 2011		0	0.5	1	2

To summarise, for Compliance Path 1, the following procedure must be followed:

1. Collect 1,2 or 3 yearss of Peak Demand data for your building
2. Enter data into Green Star SA – Ene-2 Peak Demand Calculator to obtain final score. Data must be entered for each full year. Months in a year may not be left blank.

COMPLIANCE PATH 2: Building Types not covered by SANS 10400-XA Benchmarks

Where no comparable benchmark figure exists in SANS 10400-XA or SANS 204, points shall be allocated as follows within the Ene-2 Peak Demand Calculator

	1 point	2 points
Criteria	1 point for peak electrical demand actively reduced by 15% over the baseline during the performance period	1 point is awarded if the difference between peak and average demand does not exceed 20%

For Compliance Path 2, at least 2 years of monthly Peak Demand Data is needed to prove compliance. Three years of data is recommended.

To summarise, for Compliance Path 1, the following procedure must be followed:

1. Collect 2 or 3 years of Peak Demand data for your building
2. Enter data into Green Star SA – Ene-2 Peak Demand Calculator to obtain final score. Data must be entered for each full year. Months in a year may not be left blank.

ENE-2 Peak Electricity Demand

POINTS AVAILABLE **2**

Standards for acceptable data
Standards for acceptable source data are provided below, in order of preference:

1. Utility accounts
    a. Utility accounts from the Municipality/Eskom showing consumption and demand figures for the performance period, including meter reading times/dates and meter identification. Note data from utility accounts will only be accepted if no more than 3 months of data per year is estimated.
    b. Electricity peak demand data must be recorded in the same units (either kVA or kW).

2. Non-Utility meters
    a. Electronic records including spread sheets which show consumption and demand figures for the performance period, including reading times/dates and meter identification.
    b. Readings obtained from non-utility meters must be signed off by the utility contractor
    c. Non-utility meters must have an accuracy of at least Class 1 quality
    d. Interval data must be measured in 15 or 30 min intervals to be acceptable.

Non-utility meter validation
Non-utility meters are open to a wide source of variability due to incorrect wiring, incorrect meter multipliers and programming errors in meter reading software. Due to this potential variance in the meter readings, all non-utility meters are required to be validated.

Multiple electricity meters
Where a building has multiple electricity meters all electricity meters must be accounted for in the peak demand calculation. Evidence in the form of an electrical single line diagram or meter schedule which shows all meters in the building must be provided such that all meters can be reconciled against the source data.

Mixed use buildings
The following methodology for mixed use buildings shall apply:

- If 80% or more of a building's GLA comprises a single space type, the building's space use shall be defined by this type. If the building consist of more than one space type and no single space type is more than 80% of the GLA, then the relevant compliance path shall be used to rate each space type. The final score shall be a pro rata averaged based on the respective scores and floor areas.

DOCUMENTATION REQUIREMENTS / EVIDENCE

Submit all evidence and ensure it readily confirms compliance; also complete online submission template/check list:

- 12-36 consecutive months (or more) of electricity consumption, peak demand data
- An electrical single line diagram or meter schedule indicating metering locations and types
- Completed Ene-2 Peak Demand Calculator

ENE-2 Peak Electricity Demand

POINTS AVAILABLE **2**

ADDITIONAL GUIDANCE / RESOURCES

Electricity accounts are generally made up of charges for the quantity of energy used (measured on kWh) and charges for peak demand (measured in kVA). Tariff charges very widely depending on user size, location and other factors. The reader is directed to the Eskom Tariff booklet for additional information.

Typically energy consumption is either charged at a flat rate or according to a "time-of-use" charge which vary the rate based on the time of day/year the energy is consumed. Whilst peak demand (or maximum demand) is typically charged a flat or variable rate for each unit of apparent power consumed based on the highest apparent power demand in the billing period. Note that demand is monitored over defined intervals (integrating period) of typically 30 minutes to calculate the maximum demand billed amount.

Generally three basic strategies can be employed to reduce the peak demand of a facility:

- Load shifting
- Power factor correction
- Energy efficiency initiatives

Load shifting
Load shifting involves scheduling high demand processes not to operate at the same time thus reducing the overall peak demand of the site. Processes can also be shifted to operate during periods in which peak demand charges do not apply, however factors such as overtime costs must be kept in mind.

Power factor correction
Power factor is the relationship between real and apparent power. It is a measure of the efficiency of an electrical system in converting electrical power to useful forms of work. The larger the difference between the apparent power (measure in kVA) and the real power (measured on kW), the lower the site's power factor at any instant in time will be, resulting in higher peak demand charges. Note that the power factor at peak demand is of concern, as a low power factor at low demand will not have an impact on demand charges.

Power factor correction is a widely accepted technology that can be used to reduce the peak demand of a site. Typically a large bank of capacitors is used to reduce the difference between the real and apparent power used.

Energy efficiency initiatives
Energy efficiency improvement initiative can have a significant impact on peak demand. However it is possible to reduce the amount of energy consumed without impacting on peak demand. This can be attributed to the fact that peak demand is calculated over an integration period and should be kempt in mind when considering energy saving initiatives.

Additional guidance on how excess network access charges are calculated the reader is directed to Eskom tariff booklet:
http://www.eskom.co.za/content/2012_13%20Draft%20Tariff%20Book%2011%20April%202012%20ver%203.pdf

Additional guidance and information can be found at the following links.
http://www.eskom.co.za/c/article/78/conserving-electricity/
http://www.eskomidm.co.za/wp-content/themes/eskom/pdfs/Commercial/2011_12_20_ESKD_Trimming_10percent_Brochure.pdf

The effects of peak demand shifting, or load shifting, is illustrated in the figures below.

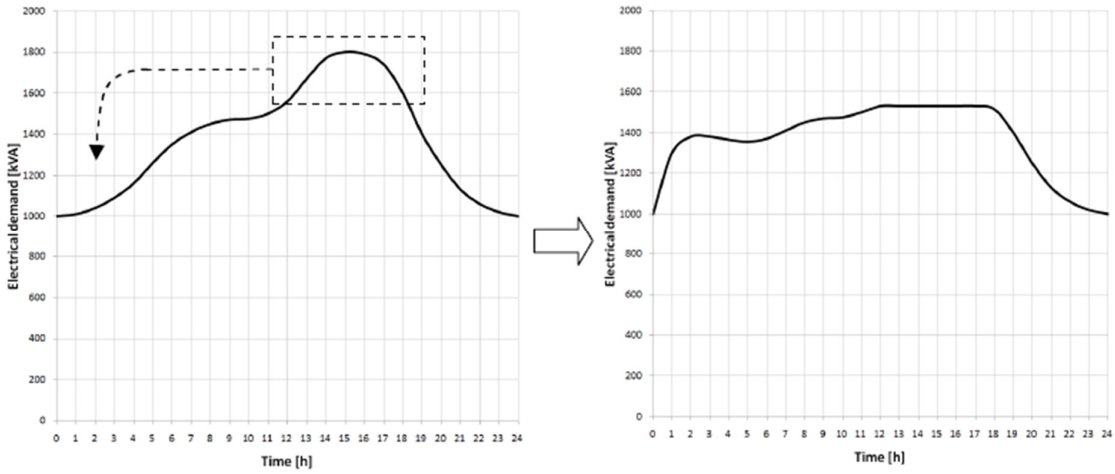


Figure 2. Graphs indicating how the peak demand can be shifted into another period of the day to result in a deduced overall peak.

The figure below illustrates the difference in average peak demand and maximum peak demand. The difference between these two parameters should be as small as possible.

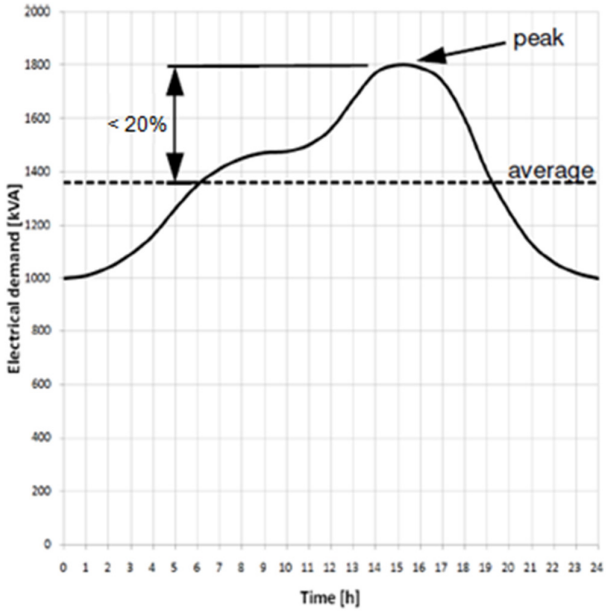


Figure 3. Graph indicating the percentage difference between the peak and the average of the annual demand curve

SANS Benchmarks

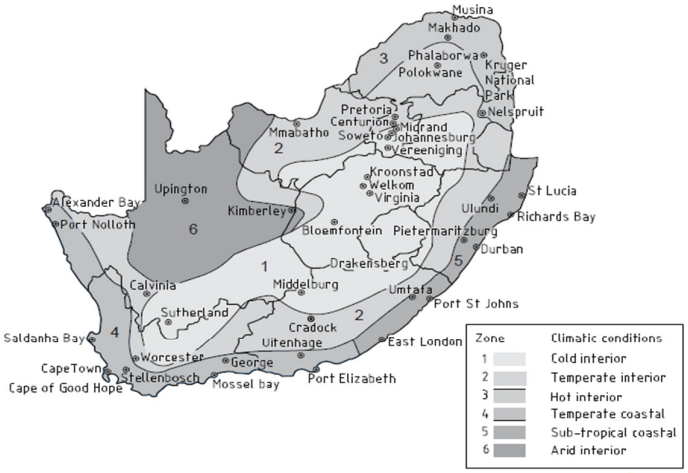
The following benchmark maximum energy demand values are specified by the SANS 10400-XA: 2011 document.

Table 2. Maximum energy demand per building classification for each climatic zone (1)

1	2	3	4	5	6	7	8
Classification of occupancy of building	**Description of building**	**Maximum energy demand[a] VA/m²**					
		Climatic zone					
		1	**2**	**3**	**4**	**5**	**6**
A1	Entertainment and public assembly	85	80	90	80	80	85
A2	Theatrical and indoor sport	85	80	90	80	80	85
A3	Places of instruction	80	75	85	75	75	80
A4	Worship	80	75	85	75	75	80
F1	Large shop	90	85	95	85	85	90
G1	Offices	80	75	85	75	75	80
H1	Hotel	90	85	95	85	85	90

[a] The maximum demand shall be based on the sum of 12 consecutive monthly maximum demand values per area divided by 12/m², which refers to the nett floor area.

The climatic zones for South Africa are shown in the figure below.



Zone	Description	Major centre
1	Cold interior	Johannesburg, Bloemfontein
2	Temperate interior	Pretoria, Polokwane
3	Hot interior	Makhado, Nelspruit
4	Temperate coastal	Cape Town, Port Elizabeth
5	Sub-tropical coastal	East London, Durban, Richards Bay
6	Arid interior	Upington, Kimberley

Figure 4. Climatic Zone reference chart (1)

ENE-2 Peak Electricity Demand

POINTS AVAILABLE **2**

BACKGROUND

Peak demand is a primary issue of concern for electricity supply networks, as it is a direct driver of network capacity requirements. In contrast to the variable nature of electricity demand, network capacity cannot be increased in the short-run to accommodate excessive periods of demand.

Generally there are two types of peak periods that exist – wholesale network peak demand and localised distribution network peak demand. Wholesale network peaks generally occur towards the mid-afternoon, driven by aggregate commercial activity; whereas local distribution network peaks (generally in residential areas) are often later in the afternoon or evening as people return home from school and work (Productivity Commission). At present Eskom experiences peak demand between 5pm and 9pm. The bonus point will only be awarded if a minimum of 1 point is achieved in either compliance paths.

Electricity tariffs and charges – financial incentive to monitor

Building electricity accounts are normally made up of three components:

- Max demand (kVA) (Peak electricity demand)
- Actual usage (kWh)
- Connection size levy

Accurate monitoring and metering of utilities will enable building owners to make informed decisions regarding tariff plans (e.g. reduced rates after peak hours, awareness of max demand penalties, etc). Historical data analysis can also lead to the realisation that legacy electrical connection sizes are excessive and savings can be achieved by deducing the connection size.

Impact of Credit SA market:
In light of the increased demand on South Africa's electrical supply, Demand-side Management (DSM) and energy efficiency projects are currently being implemented by Energy Service Companies (ESCOS) to achieve electrical savings and obtain rebate payments from Eskom.

The metering installation forms a critical part of the measurement and verification process to quantify for rebates and determine the effectiveness of the DSM project. To this end, compliance with Eskom's PM/M&V/STD001 (currently under review) metering standard should be considered when selecting the metering standard and methodology for the building(s).

REFERENCES

1. **SOUTH AFRICAN NATIONAL STANDARD.** *SANS 10400-XA:2011 The application of the National Building Regulations, Part X: Environmental sustainability, Part XA: Energy usage in buildings.* Pretoria : SABS Standards Division, 2011.
2. *SANS 204:2011 Energy efficiency in buildings.* Pretoria : SABS Standards Devision , 2011.
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TRA-1 Alternative Transportation

POINTS AVAILABLE **4**

AIM OF CREDIT

To measure and assess transportation modes of regular building occupants and promote/encourage green travel plans for commuting and as a result reduce pollution and land development impacts from automobile use.

CREDIT CRITERIA

Transportation Modes Survey	1 point is awarded where a Transportation Modes Survey, aimed at the regular occupants of the building(s), is delivered during the performance period. Transient occupants/visitors must be surveyed if either the typical peak or daily average is greater than the number of regular building occupants.
Green Travel Plans (GTP) – Regular Occupants and Visitors **and** **Improved Transportation Modes Performance: Improvements on Baseline**	2 points are awarded where a Green Travel Plan (GTP) that addresses regular occupants of the project building(s), is in place and operational during the performance period. Transient occupants/visitors must be included in the plan if either the typical peak or daily average is greater than the number of regular building occupants. 1 additional point is awarded where there has been a follow-up Transportation Modes Survey Conducted which shows at least 10% reduction in single occupant car drivers. For Pilot projects or projects undertaking Existing Building Performance Certification for the first time, the additional point can be claimed as Not Applicable. Type 'na' in the 'points achieved' column of the rating tool.

COMPLIANCE REQUIREMENTS

TRANSPORTATION MODES SURVEY

Develop and carry out a transportation modes survey of all regular building occupants and, if applicable, all transient occupants/visitors to the project building(s). This transportation modes survey must be carried out during the performance period, and should be carried out early on in the certification process, preferably at the beginning of the performance period.

The survey must be carried out over a **typical** one-week period within the performance period. Where applicable to the building use, this one-week period cannot include holidays or other days/times of the year, which may not represent a typical occupancy period for the particular building type. Furthermore, the survey must be structured in a way that respondents can provide detail of their commute pattern over the full week period and must provide the opportunity for qualitative answers to allow respondents to provide input into a site-appropriate Green Travel Plan.

A sample questionnaire is provided below, and projects are encouraged to use it. However, where an organization has carried out a survey meeting these requirements at some point over two years immediately preceding the submission for Green Star SA certification, the results may be submitted as evidence to comply with the requirements of this credit. Where a project building is located on a campus or within an office park and a campus-wide/business park survey is carried out, this may be used as proxy for the response results for a specific building on that campus.

Population

The population size for number of regular occupants should be the maximum number of occupants that will regularly work at the premises (Full Time Equivalent (FTE) employees) during the performance period. Population sizes can be estimated where there is no access to more precise figures, by using typical occupancy per meter square.

The population size for visitors shall be the typical number of visitors for the day being surveyed.

Sample Size

The surveyed sample size must be such that it provides 95% confidence with a 10% margin of error. The table below shows acceptable sample sizes in this regard.

If the required sample size for 10% margin of error is not achieved, the number of additional respondents required to reach the correct sample size should be aassumed to make use of single occupancy cars, and be added to the actual surveyed respondents.

Table TRA-1.1: Sample Size determination

Survey Responses needed for 95% Confidence	
Population Size	**Responses Needed for 10% Margin of Error(Sample Size)**
>100	**75%**
100	**51**
150	**61**
200	**67**
250	**72**
300	**76**
350	**78**
400	**81**
450	**82**
500	**83**
700	**88**
900	**90**
1000	**91**
2000	**95**
5000	**98**
10000	**99**
20000	**100**

Table TRA-1.2: Sample Survey Results Template

TRA-1 Alternative Transportation

POINTS AVAILABLE **4**

Transport Mode	Monday		Tuesday		Wednesday		Thursday		Friday		Total
	am	pm	am	pm	am	pm	am	pm	am	pm	
Single occupancy vehicle											
2 person carpool											
3 person carpool											
4 person carpool											
Walking											
Cycling											
Bus											
Minibus Taxi											
Train											
Dropped off/collected by partner/neighbor											
Sick day											
Work from home day (telecommuting)											
Teleconferencing											
Other											
Total											

GREEN TRAVEL PLAN FOR REGULAR OCCUPANTS & / OR VISITORS

N.B. Although it is not necessary for organizations seeking certification to develop separate plans and programmes, projects are required to highlight - and where not present in existing plans and programmes, amend these to include - all elements of the Green Star SA Policy and Programme/Plan Model as well as the recommended elements to be included, outlined below.

Develop and implement a Green Travel Plan (GTP) that is specifically tailored to the project building(s) and its/their location.

'Green Transport', for the purposes of this credit, relates to transport modes that assist in reducing the environmental impacts from conventional single-occupant vehicles used for commuting. More specifically and typically, 'conventional single-occupant vehicles' are petrol or diesel powered vehicles that are used by one single individual for commuting. For the purposes of this credit, a programme that facilitates, promotes and encourages the use of alternative transport as defined above is known as an 'Green Travel Plan.

Although there are no 'standard' Green Travel Plans or programmes in South Africa, since the design and implementation of such a programme depends largely on the nature, location and size of the project building(s) and the outcomes that project buildings are looking to achieve, there are numerous references in the literature that provide examples of leading practice for alternative transportation options and schemes. (see References). A **Menu of Options** for addressing and/or encouraging alternative green transportation modes is included under Additional Guidance/Resources.

Specifically, the GTP must include the following

- **Describe current status**

  Describe the status quo of commuter transport to and from the project building(s) and review any existing and planned public transport options available to commuters as well as their current usage (survey results)

- **Define Strategy for at least 3 Alternative Transport Options**

  Formulate a clear outline of the strategies and performance metrics that actively support at a minimum three "Transport Options" from the menu of options of the Alternative Transportation Programmes below.

- **Target GTP at regular occupants & / or visitors**

  Ensure that the GTP is targeted at regular building occupants. Where the typical peak or daily average of transient occupants/visitors is greater than the number of regular building occupants, the GTP must also target transient occupants/visitors.

- **Communications strategy to regular occupants & / or visitors**

  Outline the communications strategy to be employed to ensure that the GTP is adequately communicated to regular building occupants and visitors/transient occupants to ensure that the GTP remains effective.

- **Set timelines for Implementation**

  Set clear time-lines for the implementation of the GTP and communication strategies

Improved Transportation Modes Performance: Improvements on Baseline

Once a GTP has been developed and implemented, repeat transport surveys, following the same methodology as outlined under Transportation Modes Survey above, can be carried out to assess the efficiency and effectiveness of the GTP. Projects, which can demonstrate a 10% 10% reduction in single occupant car drivers.are rewarded with an additional point.

DOCUMENTATION REQUIREMENTS / EVIDENCE

Submit all evidence and ensure it readily confirms compliance; also complete submission template/check list.

Credit	Documentation Requirements/Evidence
Transportation Modes Survey and Improved Transportation Modes Performance	• Submit a copy of the survey questionnaire. • Use and complete the checklist provided. • Provide summary of Survey Results
Green Travel Programme – Regular Occupants and Visitors And Improved Transportation Modes Performance: Improvements on Baseline	• Upload a copy of the GTP • Complete the Submission Checklist • Submit the results of the repeat survey as per the Survey Results Template demonstrating the required percentage improvements.

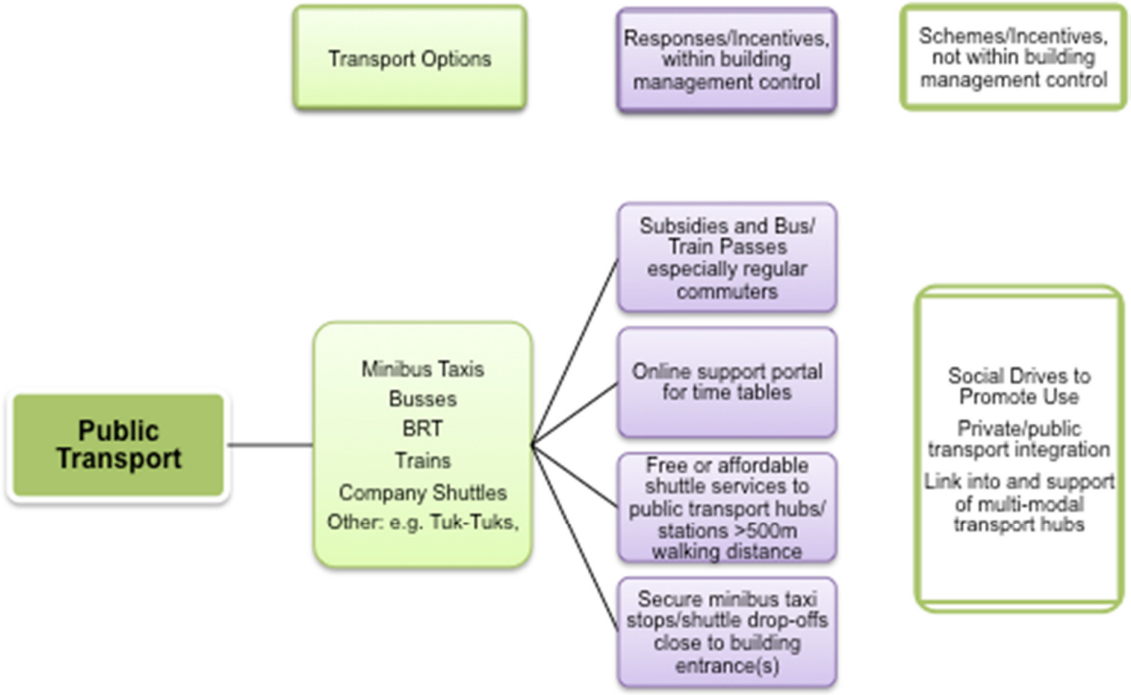
ADDITIONAL GUIDANCE / RESOURCES

TRA-1 Alternative Transportation

POINTS AVAILABLE **4**

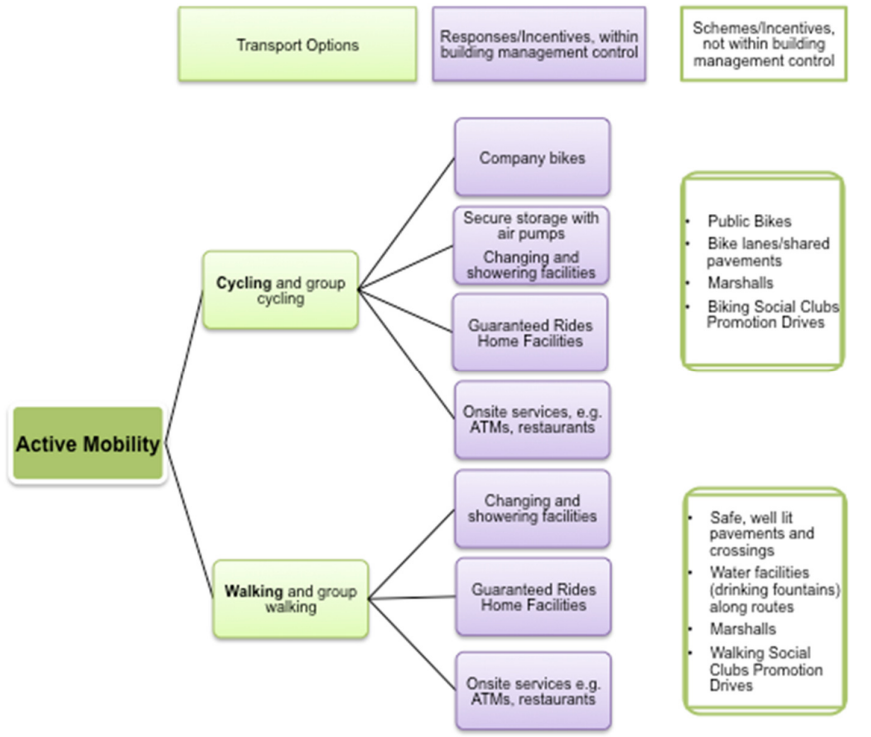
Alternative Modes of Transportation

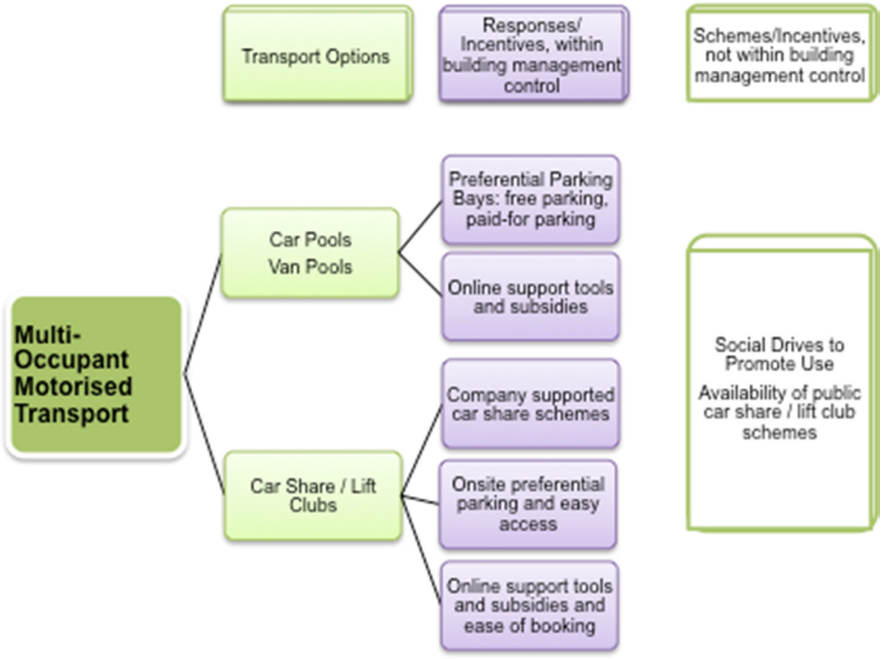
Providing the most appropriate systems and incentives to building users that will encourage the use of alternative transportation modes is paramount to reducing overall environmental, social and economic impacts of transporting users to and from buildings. The following sections provide a menu of options that projects must choose from when developing an Alternative Transportation Programme.



TRA-1 Alternative Transportation

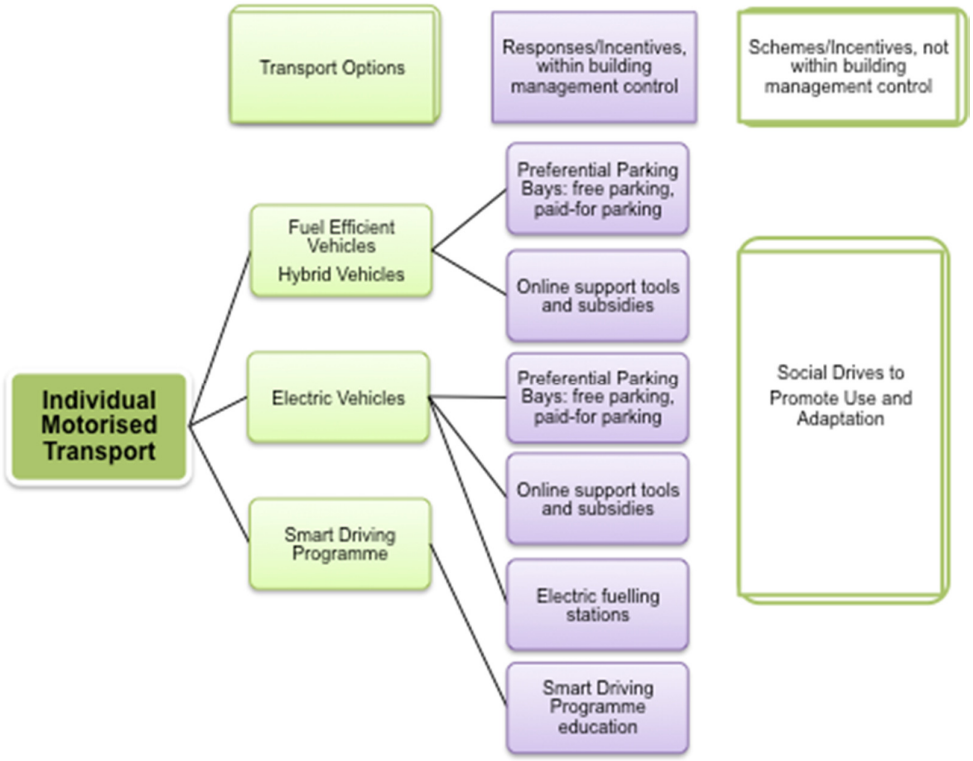
POINTS AVAILABLE **4**





TRA-1 Alternative Transportation

POINTS AVAILABLE **4**



BACKGROUND

Environmental Impacts of Transportation

In 2007, transport fuels in South Africa made up 30% of energy consumption (by energy content) and 70% by value (Biofuels Industrial Strategy, DME, 2007). Direct emissions from motor vehicles contribute to smog and other forms of air pollution: in 2000, global emissions as a result of transport-related activities were estimated to account for around 20% of all greenhouse gas (GHG) emissions caused by human activities (WBCSD, 2004). Other studies suggest that by 2006, worldwide CO2 emissions from fuel combustion generated by the transport sector, including light duty vehicles amounted to 33% (AC-WEC, 2009), with predictions, however, that the transport sector would rise about 40% between 2006 and 2030 (OECD 2008), with greenhouse gas emissions from transport increasing at a faster rate than any other energy using sector (Kahn et al 2007).

Research dating back to 2003 suggests that the shift from private to public modes of transportation can have significant impacts on reducing overall emissions levels associated with transport: measured in 'passenger mile travelled' a 95% reduction in carbon monoxide, 92% reduction in Volatile Organic Compounds and an almost 50% reduction in carbon dioxide and nitrogen oxides can be achieved. (APTA 2003).

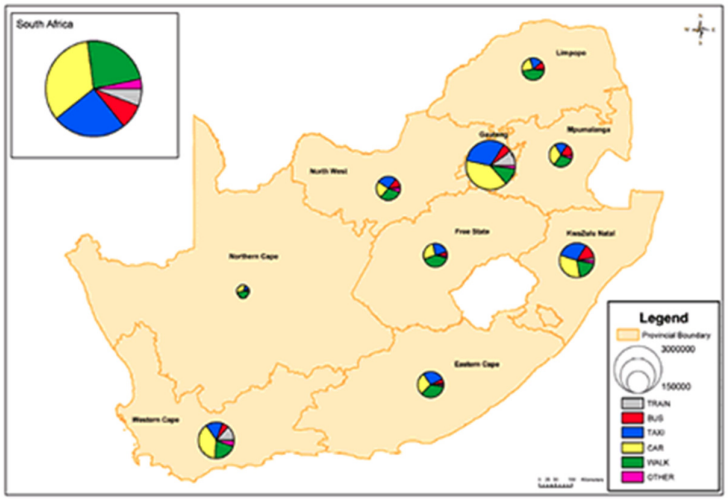
State of Public Transport in South Africa

The 2003 National Household Travel Survey (released 2005) showed that almost two-thirds of households in South Africa did not have access to public transport. Figures show that at the time there were approximately 3.9m public transport commuters: 2.5m taxi commuters (63%), 0.86m bus

commuters (22%) and the remainder (0.6m – 15%) using train services. More than 300 000 commuters also used taxis as a feeder mode to other public transport services. On aggregate, taxis provided close to 70% of all public transport trips in South Africa. While the statistics will have shifted since the 2003 survey, the figures regardless provide a good indication on the prevailing complexities and challenges of public transport provisions in South Africa.

The social and economic strains that an underdeveloped, while at the same time expensive public transport system, poses also express themselves in the fact that in 2003 30% of households spent more than 10% of household income on public transport. The average travel time (per trip) by commuters (all modes) was 43 minutes, increasing to 59 minutes for public transport, where around 1.3m commuters using public transport spent more than an hour per trip to work. Walking distances to public transport services in urban and rural areas alike also indicate serious challenges, by far exceeding targets of 15 min walking distance (urban areas) and 30 min walking distances (rural areas) to bus, train and taxi services.

Crucially, the public transport share of all motorised trips is 52%, which is high by world standards (ca. 53%). Maintaining or further increasing this share is a challenge, especially when coupled with rapid growth in car ownership. For a country with a relatively low average household income, South Africa has a high rate of car ownership: in 2003, for every 1000 people, there were 109 cars owned (Lagos: 15/1000, Nairobi: 50/1000 and New York: 500/1000). (Satawu 2006).



The above figure (DoT 2005) shows transport modes used for travel to work in each province based on the 2003 National Household Travel Survey. More recent figures, once available, can be used to establish provincial benchmarks for modes of transport to and from work to allow national and provincial benchmarking for building projects.

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WAT-1 Potable Water

POINTS AVAILABLE **12**

AIM OF CREDIT

To recognise efficient potable water use associated with building operations thus reducing the burden on potable water supply and wastewater systems.

CREDIT CRITERIA

Potable Water Performance	A total of 12 points may be awarded for percentage improvements in water efficiency compared to benchmarks. Benchmarks for Office buildings are based on the GBCSA's Water Benchmarking Tool (industry averages). For other building types, a notional benchmark is calculated using the Potable Water Calculator. In addition to points achieved above, where the full 12 points are not achieved: 1 point is awarded where there is proven water saving during 6 consecutive months of the performance period compared to same period in the previous year. A further 1 point is rewarded where this water saving exceeds 10%.

COMPLIANCE REQUIREMENTS

Performance period
Performance period relates to the continuous time period during which a credit is measured or data is collected. For Green Star SA – Existing Building Performance certification, the performance period is the most recent 12-month period of operations preceding the submission for certification.

Collect metered water consumption data for the last 12 months* of the building's operation.
Water consumption data for the past 12 months must have been collected in order to demonstrate compliance with the credit criteria. This data will be used to measure against benchmarks and quantify improvements in water consumption efficiency, for which points will be awarded.

**Note – for PILOT projects, periods shorter than 12 months may also be motivated. Please contact the GBCSA for further details.*

Sources of acceptable data
Water consumption data collected for the building must be verifiable with sources such as Municipal accounts for correctness. Alternatively, verification from an independent utility metering contractor may be presented.

Collected water data must cover the water use associated with the whole building. If there are any missing accounts or data points, the missing data point may be interpolated for completeness, except when the missing data point is the first one or the last one of a series. A maximum of 3 months in the 12 month period may be interpolated.

WAT-1 Potable Water

POINTS AVAILABLE **12**

Water use must include all building water consumption; this could include but not be limited to:

- Occupant amenity water (toilets, kitchenettes, etc.)
- Heat rejection water (cooling towers / evaporative cooling)
- Outdoor taps, wash-down areas, etc.
- Tenant consumption (restaurant kitchens etc.)
- Irrigation of landscaping serving the building being certified
- Pools, water features, etc. servicing the building
- Sports field irrigation only if the building being certified services the said sportsfield

'Water' refers to potable water servicing the building from municipal sources. Recycled / reused water and rainwater must not be included in the metered water consumption for this credit. Borehole Water* used for anything other than irrigation is not considered to be a sustainable water source for the purposes of this credit and as such it must be included in the metered water consumption.

**Note – the GBCSA invites feedback on whether Borehole water should be included or excluded from the metered water consumption for this credit.*

Municipal Accounts
Data from utility accounts (as opposed to metered data) will only be accepted if no more than 3 months of data in the 12 month period is estimated.

Compliance Paths
For the purposes of this credit, there are two options for establishing a water consumption benchmark for the building as outlined below.

Note that only one compliance path may be followed.

COMPLIANCE PATH 1: GBCSA Water Benchmarking Tool (office buildings)

If the GBCSA's Water Benchmarking Tool caters for your building type (currently caters for office buildings), this tool must be used to benchmark your building's performance.

The building is positioned on a 10 level scale based on its performance relative to the benchmark. The level achieved in the benchmarking tool is then translated into the number of points scored under this credit as per the table below.

Points Conversion from GBCSA Water Benchmarking Tool

Outcome from Benchmarking Tool	points
5	1
6	2
7	4
8	7
9	11
10	12

To summarise, for Compliance Path 1, the following procedure must be followed:

1. Collect 12 months of water consumption data
2. Benchmark office building using GBCSA Water Benchmarking Tool
3. Convert benchmarking score into points out of 12 as per table above

Compliance Path 1 Resources:

Resource	Description	Location
Water Benchmarking Tool	Use to benchmark building performance	http://www.gbcsa.org.za/other-tools/energy-water-benchmark/
Water Benchmarking Guidelines	Provide details on how to use benchmarking tool	http://www.gbcsa.org.za/other-tools/energy-water-benchmark/

COMPLIANCE PATH 2: Notional Benchmark Using Potable Water Calculator

For building types other than offices, use the Potable Water Calculator (see link in resources below) to establish a baseline for the building from which by comparison can be derived the efficiency of water consumption in percentages over this baseline.

In order to be inputted into the calculator, details such as the building occupancy, landscaping areas, etc. will be required. See Potable Water Calculator Guide (in resources list below) for further information.

The building's actual water consumption performance is compared to the benchmark calculated and points are awarded as follows:

Points awarded

Improvement on Notional Benchmark	points
0%	0
5%	1
15%	2
25%	3
35%	4
45%	5
55%	6
65%	7
75%	8
80%	9
85%	10
90%	11
95%	12

To summarise, for Compliance Path 2, the following procedure must be followed:

4. Collect 12 months of water consumption data
5. Calculate Notional Benchmark using Potable Water Calculator
6. Calculate points score for improvement on benchmark using Potable Water Calculator

Compliance Path 2 Resources:

Resource	Description	Location
Potable Water Calculator	Use to calculate notional benchmark	http://www.gbcsa.org.za/green-star-rating-tools/existing-buildings-performance-pilot/
Potable Water Calculator Guide	Provide details on how to use calculator	http://www.gbcsa.org.za/green-star-rating-tools/existing-buildings-performance-pilot/

ADDITIONAL POINTS - Water saving over performance period

1 point is awarded where there is proven water savings for a 6 month period during the performance period compared to same period in previous year by municipal water bills if the total potential points are not fully targeted in water efficiency.

A further 1 point is rewarded where this improvement exceeds 10%.

DOCUMENTATION REQUIREMENTS/EVIDENCE

Potable Water Performance

Compliance Path 1:

- Completed Submission Template
- A completed GBCSA Water Benchmarking Tool
- 12 months of municipal water bills or metering data verified and signed off by metering contractor

Assessors may request proof on calculator inputs such as GLA, occupancy, etc. after assessment.

Compliance Path 2:

- Completed Submission Template
- A completed Potable water calculator
- 12 months of municipal water bills or metering data verified and signed off by metering contractor
- Signed confirmation from the building manager confirming calculator inputs
  Where any of the following is inputted, the signed confirmation must justify how these values were derived.
  - Occupancy numbers
  - Heat rejection values
  - Landscaping square meterage
  - Swimming pool volume and surface area
  - Loads processed by laundry facilities
  - No. of meals processed by large kitchens
  - Justification of values inputted for 'Other Major Water Uses'

Assessors may request further proof of these values after assessment.

AND

When targeting the additional points:

- 6 months of municipal water bills or metering data verified and signed off by metering contractor from previous year.

ADDITIONAL GUIDANCE / RESOURCES

-

Water consumption reduction
To ensure optimum water use efficiency the following aspects can be considered.

a. Analyze water consumption
   - Water account structuring
   - Staff encouragement and possible incentive programme to ensure responsible water use behavior
   - Water leak detection
   - Water meter / sub meter installations
   - Load investigation / record keeping
   - Low pressure regulators

b. Reduce water consumption by installing:
   - Low flow shower heads and taps
   - Low flush or waterless toilets
   - Moisture sensor irrigation
   - Water saving appliances
   - Dual water systems

c. Re-use by installing:
   - Irrigation integration
   - Grey water collection
   - Rain water collection
   - Mechanical water use
   - Fire system water use

d. Recycle by installing
   - Black water recycling
   - Grey water recycling
   - Irrigation water recycling
   - Condensation recovery
   - Non-potable water use

e. Monitor by implementing:
   - Education programmes
   - Water reduction strategies
   - Development of strategies

- On site specific water balance
- Assess local authorities

BACKGROUND

Water is essential for life. In a lot of cases this water is used unconsciously and unnecessarily. In a water scarce country this is going to weight heavy on the future. The saving and conservation of water is therefore essential.

Rainwater, Grey water & Blackwater

Collecting rainwater from roofs and other impervious surfaces can add to the amount of sustainable water available for use in buildings. Retail centres with large roof areas are particularly well suited for rainwater collection.

Grey water can be recovered from sinks and showers, washing machines, cooling towers and other water sources that do not contain food or human waste. This water can be stored for irrigation and toilet flushing but needs to be used within a short period following collection to avoid having extensive treatment requirements. In locations where on-site black water treatment is generally not permitted, projects should consider contacting local authorities to discuss the benefits of on-site water treatment for the project and local infrastructure.

Water Efficiency Labelling Scheme

The South African Government, through the Department of Water Affairs (DWA), is currently working with the South African National Standards to introduce the Water Efficiency Labelling and Standards (WELS) Scheme that involves the introduction of national mandatory water efficiency labelling and minimum performance standards for domestic water-using devices.

Landscaping Water Efficiency

Potable water demand can be reduced through the installation of water-efficient irrigation systems (such as sub-soil or drip irrigation) or through the use of sustainable water for landscape irrigation. A ‘xeriscape garden’ is defined as a water-conserving garden, or garden requiring no additional watering. Where a ‘xeriscape garden’ has been installed, provisions must be made to remove any irrigation system within twelve months and ensure that the landscape will not receive watering after that time. Evidence will include, but will not be limited to, a report from the landscape architect confirming why the design can be classified as ‘xeriscape’.

Heat Rejection

The use of water based heat rejection systems that consume huge amounts of water through cooling towers is wide spread because of the high energy efficiency of such systems.

Minimising or eliminating the use of potable water in heat rejection systems or completely eliminating the need for mechanical cooling in buildings can achieve significant savings in both energy and water. The use of non-chemical dosing (such as ionisation, UV treatment, etc.) can save water by avoiding more frequent flushing of cooling tower water systems.

Laundry Equipment

The typical laundry utilises a washer technology called washer-extractors. This type of machine ranges in size from about 16 kg up to 1 766 kg in the largest laundries. The name washer-extractor is used because after each portion of the wash cycle (soak, suds, pre-wash, wash, rinse, or finish) an

extraction imparting centrifugal force removes the water and detergent contents from the wash wheel to the drain.
Other equipment found in large industrial laundries are tunnel washers (or continuous batch washers), which is an industrial laundry machine designed for heavy loads. Tunnel washers are inherently water-efficient; water is used several times before being sent to the drain. Average water consumption of this type of equipment is 16 litres per kilogram of laundry, which is 2/3 of the typical washer extractor.
Water recycling in laundry processes can be done quite easily. The last rinse water used in an industrial washer can be reused as a pre-wash for the next wash cycle. Larger commercial and industrial laundries have been utilising this technology for decades. For smaller laundries it is not common practice due to the high upfront cost. However in recent year, washing machine manufacturers have been designing systems that are less expensive and require less space.
Most commercial washer-extractors can be retrofitted with a tank to save the final rinse water, which can then be reused as pre-wash in the next load. It is possible to cut the potable water consumption by 30% by reusing water from the final rinse cycle for the next load.

Large Kitchens
Inefficient use of water in kitchen operations is usually a result of equipment design and/or behavioural patterns. The main types of water using equipment found in kitchens are dishwashers, sinks, woks, steamers, pre-wash spray rinse units, ice-making machines and garbage disposal units.

Dishwashers
Substantial savings can be made with a new dishwasher; newer models use less water, also different type of dishwashers has different flow rates. Below are the most common ones with their average water consumption.

Type	Description	Litres per rack
Under counter	A machine with an overall height of 1 meter or less, in which a rack of dishes remains stationary within the machine while being subjected to sequential wash and rinse sprays, and is designed to be installed under food preparation workspaces.	13 ltr/rack
Single Tank Door	A machine in which a rack of dishes remains stationary within the machine while subjected to sequential wash and rinse sprays. This definition also applies to machines in which the rack revolves on an axis during the wash and rinse cycles.	8.4 ltr/rack

Tank conveyor	A washing machine that employs a conveyor or Similar mechanism to carry dishes through a series of wash and rinse sprays within the machine. Specifically, a single tank conveyor machine has a tank for wash water followed by a final sanitizing rinse and does not have a pumped rinse tank.	6.0 ltr/rack
Multiple Tank conveyor	A conveyor type machine that has one or more tanks for wash water and one or more tanks for pumped rinse water, followed by a final sanitizing rinse.	4.1 litre/rack

Source:
http://www.energystar.gov/index.cfm?c=comm_dishwashers.pr_crit_comm_dishwashers
(See Table: WAT-1.1: Description of types of dishwashers.)

Commercial Car Wash Facility
Commercial Car Wash Facilities use large amounts of water. The amount of potable water to wash cars varies depending on the method used from bucket and hand wash to open hose spray and industrial high pressure conveyor carwash system.
One of the largest car rental companies of South Africa has invested in reducing and recycling the water used to wash the vehicles. They procured a conveyor bay type of wash system which washes a car within 45 seconds. It further included the construction of underground water filtration and recycling facilities that filters the waste water and reuses it in the wash cycle. Rainwater is also collected and used for car washing. Potable water is only used for the final rise, minimising potable water use to the bare minimum. All interventions saved the company approximately 100 million litres of water annually.

Laboratories
In meeting their large cooling and process water demands, most laboratories use significantly more water per square metre than standard commercial buildings (US EPA, 2005). As an example, the Australian National University has estimated that 45% of the 750 million litres of water used annually are consumed in its laboratories, compared to 25% used in accommodation and 15% in irrigation (ANU, 2008). This demand arises from space cooling requirements, water used in the activity of the laboratory and equipment cooling (the focus of this credit).
Single-pass or once-through systems are commonly used to cool a broad range of scientific and medical equipment from CAT scanners to mass spectrometers. These systems circulate water, typically directly from the public water supply, once through the piece of equipment and then discharges directly to the sewer. These systems are the most water intensive cooling methods used in laboratories; consuming approximately 40 times the water required by cooling towers to remove the same heat load (US

Source: GREEN STAR SA – PUBLIC & EDUCATION BUILDING v1 2013 TECHNICAL MANUAL

REFERENCES

GBSA benchmarking tool
The GBCSA's Energy & Water Benchmarking Tool for office buildings (currently in PILOT) for the building type. See **http://www.gbcsa.org.za/other-tools/energy-water-benchmark/**

Water Efficiency Guide: office and public buildings, Australian Government, Department of The Environment and Heritage, 2006, ISBN 06425 52878

Best Practice – How to achieve the most efficient use of water in commercial food service facilities. **www.energystar.com**

South African Weather Service. www.weathersa.co.za

South Africa Department of Water Affairs. www.dwa.gov.za

Water Efficiency South Africa. www.waterefficiency.co.za

MAT-1 Procurement and Purchasing

POINTS AVAILABLE 6

AIM OF CREDIT

To recognise procurement and purchasing practices which encourage use of products that are environmentally preferable.

CREDIT CRITERIA

Sustainable Procurement Policy

1 point will be awarded where there is evidence of a sustainable procurement policy that has been put in place during the performance period.

Sustainable Procurement of Operational Consumables

Points will be awarded where total operational consumables purchased during the performance period, by cost meet the sustainability criteria stipulated under the Compliance Requirements section of this credit..

Portion of operational consumables	Points allocation
20 - 39%	0.5
40 - 59%	1
> 60%	1.5

Sustainable Procurement of construction materials, building refurbishment, alteration and extension

(if applicable)

Points will be awarded where total construction materials purchased during the performance period by cost meet sustainability criteria stipulated under the Compliance Requirements section of this credit.

Portion of construction materials	Points allocation
20 - 39%	0.5
40 - 59%	1
> 60%	1.5

Sustainable Procurement of Furniture and Movable Equipment

(if applicable)

Points will be awarded under this credit where total furniture and movable equipment purchases by cost, during the performance period, meet the sustainability criteria stipulated under the Compliance Requirements section of this credit.

Portion of furniture and movable equipment	Points allocation
50 - 69%	0.5
> 75%	1

Life Cycle Assessment

1 point can be awarded where there is evidence that at least half of all procurement decisions made for furniture and movable equipment incorporate life cycle analysis.

MAT-1 Procurement and Purchasing

POINTS AVAILABLE 6

For Multi-tenanted Buildings, the following applies:

Where the landlord-occupied areas (landlord-tenanted space and common areas) comprise more than 10% of the GLA, **50% of the points available can be achieved** for landlord compliance only.

The remaining 50% of the points are awarded where tenants have committed to specific Tenant Criteria clauses as set out below. The number of tenants who have committed to these criteria agreements (green lease or special lease clauses) must be such that a minimum of 75% of the building GLA is compliant with the credit criteria (either through landlord or tenant commitment).

The following specific Tenant criteria are required to demonstrate compliance:

- Agreement to aligning with the objectives of the landlord's sustainable procurement policy,
- Install and utilize a paperless faxing operating system,
- Purchase only Energy Star or equivalent new electronic equipment during the performance period: computers, copiers, scanners, audio-visual equipment,
- Purchase recycled/refilled cartridges for printers and copiers during the performance period,
- Purchase and apply only paints that are low-VOC or VOC-free during churn, alterations or maintenance during the performance period.

COMPLIANCE REQUIREMENTS / EVIDENCE

Definitions

Operational Consumables	Assessment done on five products ranked according to highest procurement spend that are used for building operations and management and that require replenishing or replacement at any point during the performance period**.** NB: Operational consumables referred to in this credit exclude cleaning, hygiene and pest control consumables. Operational consumables include products and materials commonly used in day-to-day building management and minor building maintenance activities. Examples: reprographic consumables, paper products, office stationery, maintenance consumables such as light bulbs, filters, etc.
Construction Materials	All materials purchased during the performance period, used exclusively for refurbishment, alteration and upgrade. Examples: bricks, cement, concrete, floor covering, wall coverings, ceiling tiles, floor tiles, paint, lighting equipment, air-conditioning equipment, balustrades, cladding, pipes and any other fixed features or equipment.
Furniture and Movable	Items purchased during the performance period (other than operational consumables and construction materials) that have

Equipment	significant value and are used for building management and operations. These items typically have replacement cycles of longer than one (1) year. Examples: desks, tables, chairs, movable electrical appliances, computers and any other ICT equipment etc.
Performance period	Performance period relates to the continuous time period during which a credit is measured or data is collected. For initial Green Star SA – Existing Building Performance certification, the 'performance period' is the most recent period of operations preceding the submission for certification (at least 12 months in most cases).

Sustainable Procurement Policy

A sustainable Procurement Policy must be in place during the performance period. The Policy must align with the Green Star SA – Policy & Programme Model.

N.B. Although it is not necessary for organizations seeking certification to develop new policies for Green Star SA ratings, projects are required to highlight - and where not present in existing policies, amend these to include - all elements of the Green Star SA Policy and Programme Model.

Product Sustainability Criteria

The selection of environmentally friendly products must follow the criteria described in the credit in the order (options) presented below.

Option 1 : Third Party Product Certification Programs

Products that carry a certification (eco-label) from any independent certification body which achieves a Level A, B or C categorisation in the GBCSA's 'Assessment Framework for Certification Schemes'.

A list of certification schemes that achieve Level A, B and C status, as well as criteria for assessing certification schemes will be made available on the GBCSA's website (www.gbcsa.org.za).

Note – The GBCSA is currently in the process of developing an 'Assessment Framework for Certification Schemes', which will be launched during 2014.

Option 2 : Product Selection Criteria Deemed-to-Comply

Products that do not subscribe to any of the certification programs mentioned above can also be deemed to meet the requirements of this credit as follows:

For each product claimed as compliant, the building's procurement officer must submit a signed statement of confirmation stating that

- environmentally preferable products available in the specific product criteria were thoroughly researched, and environmentally preferable product alternative s were considered in procurement

- procurement selection of the product was based on comparing a number of environmentally preferable alternatives (min 3) according to the selection criteria shown overleaf in Table Mat-1.1.
- that the product with the most preferable environmental performance when compared to the criteria in Table Mat-1.1 was procured.

Table MAT-1.1 Checklist of Generic Product Selection Criteria

Manufacturing Phase	
1. Have virgin materials been used in the product?	Y / N
2. Have recycled materials been used in the product? If the proportion of content made up by recycled materials is known, capture this information.	Y / N (% content of product)
3. Has the manufacturer taken steps to avoid and minimise the generation of waste in the production of the goods?	List actions taken
4. Has the manufacturer taken steps to minimise the use of energy in the production of the goods?	List actions taken
5. Has the manufacturer taken steps to minimise the emissions of air pollutants in the production of the goods?	List actions taken
6. Has the manufacturer used any hazardous substances in the product?	Y / N If Y, list hazardous substances used
7. Does the supplier have any form of environmental certification (e.g. ISO 14001)?	Y / N If Y, list
Use Phase	
8. Can the product be reused (e.g. able to accept refills of ink)?	Y / N Detail how it could be reused.
9. Does the product have an Energy Star® rating? 10. Is the product energy efficient?	Y / N Supplier to compare energy efficiency with other similar products.
11. Does the product come with a supplier guarantee of quality? 12. Does the product come with a maintenance plan?	Y / N Y / N
Disposal Phase	
13. Can the product be recycled?	Y / N
14. Has the supplier provided information on how he plans to dispose of the product? 15. Has he considered environmentally friendly options?	Y / N List disposal options
16. Where hazardous substances are used, has the supplier detailed how he plans to dispose of the product?	Y / N List disposal options

Source: Green Paper on Greening the Procurement of Goods and Services in the Provincial Government of the Western Cape, Gazette 6733

MAT-1 Procurement and Purchasing

POINTS AVAILABLE 6

Life Cycle Assessment (Furniture and Movable Equipment)

A Life Cycle Based Procurement Strategy for furniture and movable equipment should be developed and clearly demonstrate how products are assessed based on:

- Environmental footprint (carbon footprint, energy) and methodology for reducing impact to the environment.
- Supplier's environmental performance plan.
- Total life cycle costs examination throughout life cycle.

The consideration for products should result in some of the following outcomes:

- The lowest building energy consumption over the operational life span of the building
- A reduction in maintenance requirement/frequency
- Prolonged replacement intervals of services infrastructure/systems or building fabric
- Dismantling and recycling or re-use of building components

SUBMISSION REQUIREMENTS

The following documents should be submitted as evidence of compliance with the credit criteria:

- **Completed Submission Template**
- **Sustainable Procurement Policy** accompanied by completed Green Star SA – Policy/Programme model checklist.
- **Product certificate** / **proof of accreditation** by qualifying Certification Scheme.
- **Signed statement of product selection criteria** (for option 2 under 'sustainable procurement criteria') for each product accompanied by completed Mat-1.1 checklist for product.
- **Cost reports** or any other records indicating quantum of environmentally preferable products purchased.
- **Life Cycle Based Procurement Strategy** for furniture and movable equipment clearly demonstrating how products are assessed based on total life cycle costs examination throughout life cycle.

ADDITIONAL GUIDANCE / RESOURCES

Sustainable Procurement Objectives

MAT-1 Procurement and Purchasing

POINTS AVAILABLE 6

The building blocks of sustainable procurement and purchasing practices are based on the following fundamental objectives:

1. Avoiding unnecessary consumption and managing demand.
2. Minimising environmental impact.
3. Seeking value for money.
4. Enforcing suppliers social and ethical responsibility.

BACKGROUND

What is Sustainable Procurement?

Sustainable procurement is the process whereby economic development, social development and environmental protection are balanced against business needs, taking into account the:

- entire life cycle cost of the product
- quality required by the specification
- availability of the product.
- functionality of the product in the environment to which it is to be applied
- effect the product will have on the environment when in service
- labour conditions of the producer and the human rights of the workforce
- use of sustainable or recycled materials and/or products.
- reduction of waste

The Benefits of Sustainable Procurement

- Control of costs by adopting a wider approach to whole life costing.
- Improvement of internal and external standards through Performance Assessments.
- Compliance with environmental and social legislation.
- Effective management of risk and reputation.
- Build a sustainable supply chain for the future.

REFERENCES

International Institute for Sustainable Development

http://www.iisd.org/

Constitution of the Republic of South Africa, Act 108 of 1996, Section 24

MAT-1 Procurement and Purchasing

POINTS AVAILABLE 6

National Environmental Management Act, 107 of 1998 (NEMA), Section 2

Hazardous Substances Act, 15 of 1973

Province of Western Cape: Provincial Gazette 6733 – Green Paper on Greening the Procurement of Goods and Services in the Provincial Government of the Western Cape

MAT-2 Solid Waste Management

POINTS AVAILABLE 6

AIM OF CREDIT

To reward operational practices which reduce the amount of solid waste going to landfill. Such waste may be from typical building operations, including ongoing and durable goods, and from refurbishments, construction or demolition works.

CREDIT CRITERIA

Solid Waste and Materials Management Policy	1 Point is awarded where a compliant Solid Waste and Materials Management Policy is in place during the performance period* that covers a building's entire waste stream, including, at a minimum the following: • Ongoing Consumables, • Hazardous Materials, • Movable and Electronic Goods and • Construction Waste from Churn and Alterations **Note – for PILOT projects only, the Waste and Materials Management Policy need not be implemented in the performance period, but must have been produced.*
Waste Stream Audit of Ongoing Consumables and development of an Operational Waste and Materials Management Plan	**1 point** are awarded where a building carries out a waste stream audit of the building's entire ongoing consumable waste stream to establish a baseline that identifies the types and amounts of waste making up the waste stream, thereby identifying opportunities for increased waste minimisation, recycling and waste diversion. An operational waste and materials management plan (OWMMP) must be developed on the basis of this audit and to outline clearly opportunities for waste minimisation.
Waste to Landfill Diversion: Operational waste and materials	**Up to 3 points** are awarded where the following percentages (by mass or volume) of operational waste and materials are diverted from landfill during the performance period*: 25% = 1 point 50% = 1.5 points 75% = 2 points and where no hazardous waste (e.g. CFL lamps) and batteries enter the operational waste and materials stream and are collected through a separate and documented process. **1 point** is awarded where overall operational waste and materials generated (tonnage or volume) has been reduced by at least 10% over the performance period* when compared to the baseline month at the beginning of the performance period. **Note – For PILOT Projects only, the performance period for this credit is 3 months.*
Waste to Landfill Diversion: Movable and/or	**0.5 points** are awarded where 75% of all movable goods waste is diverted from landfill during the performance period* and where no

Electronic Goods	electronic goods enter the movable goods waste stream and are collected and responsibly managed through a separate and documented collection process. **Note – For PILOT Projects only, the performance period for this credit is 3 months.*
Waste to Landfill Diversion: Construction Waste – Churn and Alterations	**0.5 points** are awarded where 50% of total construction waste from churn and alterations generated during the performance period* is diverted from landfill during the performance period. This portion of the credit is N/A if no churn or alterations took place during the performance period. **Note – For PILOT Projects only, the performance period for this credit is 3 months.*

COMPLIANCE REQUIREMENTS

Solid Waste and Materials Management Policy

N.B. Although it is not necessary for organizations seeking certification to develop separate policies, projects are required to highlight - and where not present in existing policies, amend these to include - all elements of the Green Star SA Policy Model (available from the GBCSA on request) as well as the requirements outlined below.

A Solid Waste and Materials Management Policy, which is a minimum requirement, must be developed and adopted prior to the start of the performance period and must be in place for the building(s) and site throughout the performance period (except for the case of PILOT Projects). The Policy must be in line with the Green Star Policy and Programme/Plan Model and cover, at a minimum, the following requirements:

- Standards and Performance Measurements and Metrics:
  - Clearly stipulate the waste minimisation goals for particular waste categories
  - Clearly stipulate the targeted diversion rates from landfill relating to the following:
    - Ongoing operational waste and materials.
    - Food waste
    - Landscape waste
    - Batteries
    - Hazardous Waste (e.g. CFL lamps)
    - Electronic Waste
    - Movable goods
    - Waste from Construction Activities as a result of Churn and Alterations

- Implementation Procedures and Strategies
  - Clearly set out the Standard Operating Procedures which outline the implementation of the waste diversion practices at the project building(s), including onsite waste and materials practices and staff and contractor education
  - Include in the procedures and strategies means to ensure resource use reduction through, for instance, targeted reduction in unnecessary packaging in the building consumables supply chain

- Quality Assurance Control Processes

- Stipulate the quality assurance control system that must be in place to ensure the implementation of the solid waste and materials policy
- Include solid waste and materials performance specific wording in tender documentation and/or service level agreements that clearly identifies responsibilities and targets
- Put processes in place that ensure that the appointed waste contractor(s) comply with all relevant legislation, including being registered on the SAWIS (South African Waste Information System)

The Solid Waste and Materials Management Policy can be an existing, company-wide policy that covers, at a minimum, the above requirements and is implemented on an individual building level. Although the policy does not have to be developed specifically for the purpose of Green Star SA Performance certification, adherence to the Green Star Policy model is required. Where there are statutory requirements regarding waste diversion of process waste, such as medical waste or industrial/manufacturing waste and others, these requirements must, at a minimum, be referenced in the policy but such waste is not subject to the certification assessment process as part of a Green Star SA certification.

Waste and Materials Stream Audit

At the beginning of the performance period and prior to developing an Operational Waste and Materials Management Plan, conduct a waste and materials stream audit at the project building(s) of the entire operational waste and materials stream.

The waste stream audit should be carried out over a representative and typical week during the building's operations.

The entire waste stream at the project building which would normally leave the site and be directed to landfill, incineration, recycling, composting, or resale or be reused in the building that would otherwise have been considered waste, must be audited. This typically includes the following, but will depend on the particular project building and operations:

- ongoing consumables from normal building operations
- toners and cartridges
- ongoing e-waste (e.g. batteries, hazardous waste, such as CFL lamps
- bathroom waste
- food waste
- landscape and garden waste from the project site

- exclude waste streams that require specialist waste diversion measures and are regulated, such as medicinal waste, hazardous waste and others that would not normally enter the operational waste and materials stream
- exclude from the audit movable and/or electronic goods and construction waste resulting from churn and alterations

The audit involves the separation of the waste stream into its individual components and should be in accordance with the NEM:WA waste characterisation criteria and waste classification system. Where possible this can be done by the waste management contractor provided the data is directly linked to the project building and not an estimation of the waste stream components due to co-mingling with waste streams from other buildings. Where specific data for items such as shredded paper, hazardous waste or other operational waste and materials is available from specialist contractors this can be included in the overall calculations.

Where no accurate waste stream can be obtained from waste management contractors, the waste stream audit must be carried out onsite and can be conducted by facility/in-house staff, using the waste stream calculator (available on request from the GBCSA).

Calculations

Determine the appropriate unit for the waste stream audit, either volume or weight. This unit must be used consistently throughout the audit.

A sample Waste Stream Audit Calculator is provided for use by projects. (available on request from GBCSA)

Operational Waste and Materials Management Plan

On the basis of the waste stream audit, develop an Operational Waste and Materials Management Plan (OWMMP), which will be an extension of the Solid Waste and Materials Management Policy and must specifically address the treatment of waste and materials disposal and recycling. Such an OWMMP must be in place and operational during the performance period. Identify the objectives of the plan, by setting diversion from landfill targets (recycling targets) and/or target for reducing total materials generation (waste materials + recyclable materials);

	Operational Waste and Materials Management Plan -	
1	**Scope**: Identify the areas to which the OWMMP applies. For instance in a shopping centre, some shops may be responsible for their own waste management. Where this is the case, this must be clearly identified within the OWMMP.	☑
2	**Goals**: Identify waste and materials streams. These streams must include at least general waste, paper and cardboard, glass and plastic; in addition, identify waste streams that can be reduced upfront, such as through reusable packaging, refillable toners and others. Such identification must be in line with the waste classification relevant at the time of developing the OWMMP.	☑
3	Identify at least one additional waste and materials stream over and above the waste and materials stream identified in 2 above, that can be recycled and for which recycling facilities are provided during the performance period and where such a waste stream must be of significant volumes as identified during the waste stream audit. Examples of other waste streams that can be recycled include: metal, food waste and kitchen scraps, cooking oil, batteries and electronics.	☑
4	**Procedures and Strategies**: Clearly identify opportunities for waste and materials stream reduction (minimisation) and waste stream diversion and develop strategies accordingly	☑
5	**Responsibilities**: Outline individual roles responsible for reviewing and delivering the OWMMP	☑
6	**Performance Metrics**: Outline monitoring and measurement procedures for waste, materials and recycling streams by weight or volume	☑
7	**Quality Assurance**: Incorporate a review process to assess the success of the OWMMP and make improvements based on lessons learned	☑
8	**Time Period:** Clearly stipulate the time-period during which the OWMMP has to be in place and how often review processes have to be carried out.	☑

Similarly to the Solid Waste and Materials Management Policy, project buildings may already have in place a waste management/operational waste and materials management plan. Regardless, the OWMMP must be in line with the Green Star SA Policy and Plan/Programme Model (available on request from the GBCSA) and the requirements outlined and specifically address the operations of the building seeking certification. The OWMMP may be a standalone plan or be part of a more comprehensive Environmental Management System, as long as it is also implemented at a building level and meets the requirements outlined in this credit.

Waste to Landfill Diversion: Operational waste and materials

Calculations – Waste and Materials Stream Diversion

Waste Diversion includes source reduction, reuse, and recycling. The amount for each method of diversion must be quantified accurately and supported with documentation. To calculate the portion of ongoing consumables in the waste stream that have been reused, recycled, or composted, use the following process:

1. Use the waste contractors' reports or similarly reliable data to determine the total weight or volume of waste that was diverted from landfill/conventional disposal through reuse, recycling or composting. Data for this purpose must represent the entire performance period and may not be extrapolated.

2. Calculate the portion of ongoing consumables (as a percentage) which were diverted from the waste stream by means of recycling, reuse or composting.

A calculator will be made available to project teams to track the diversion rate during the performance period. (available on request from the GBCSA)

Batteries and hazardous operational waste and materials, such as CFL lamps, must be documented separately to demonstrate that 100% of all batteries and mercury containing lamps have been diverted from landfill.

Waste Minimisation

Waste Minimisation focuses on upfront reduction of items that could potentially enter the waste stream, whether ultimately designated for recycling or landfill. Avoided waste remains the best course of action to minimise waste and meet diversion targets. Waste minimisation necessarily goes hand in hand with sustainable procurement and purchasing strategies**,** where numerous strategies can be employed.

Examples include

Waste Minimisation Criteria	**Strategies**
Durability vs Obsolescence	favouring products that are designed for longer life and extending that life span through repair and reconditioning.
Disposables vs. long life products	avoiding products, which are designed for single or short life usage, including items such as non-refillable ball-point pens marker pens, plastic cups and cutlery and replacing these with longer life products.
Procurement Preferences	Contractor take-back scheme for packaging Products with high recycled content and refillable/reusable Products with little or no packaging Concentrated product vs diluted products where feasible Bulk purchasing
Operational Choices	eg. Double-sided printing, minimising printing and reusing scrap paper

MAT-2 Solid Waste Management

POINTS AVAILABLE 6

Develop waste minimisation strategies on the basis of the Waste and Materials Stream audit and track these during the performance period, where the Waste Stream Audit forms the baseline for documenting an overall waste reduction over a 12 months period*.

Calculations - Waste Minimisation

Track operational waste and materials over a 13 months period*, where the first month ($month_0$) establishes the baseline. Track all operational waste and materials generated on a monthly basis and establish the overall waste reduction as follows:

$$(month_0 - ((month_{1...12})/12))/month_0 \times 100 = \text{overall waste reduction}$$

0.5 points points are awarded where a project can document a minimum overall waste reduction of 10%.

**Note – For PILOT projects, this calculation can be conducted using a three month period as opposed to 12 months.*

Waste to Landfill Diversion: Movable and/or Electronic Goods

During the performance period implement a diversion programme that targets movable goods such as electric equipment and furniture as well as electronic goods.

Such movable goods are also defined as goods, which are replaced infrequently and/or may require capital programme outlays to purchase. This diversion programme must be developed in accordance with the requirements of the Solid Waste and Materials Management Policy.

The movable and/or electronic goods waste stream includes goods leaving a project building and site that have fully depreciated and reached the end of their useful lives for normal business operations and also includes leased movable and/or electronic goods, which are returned to their owner at the end of their useful lives for normal business operations. Any such goods that remain useful and functional and are moved to another floor or within the building are not included in the movable and/or electronic goods waste stream.

This waste reduction and recycling programme shall address, at a minimum, the following movable goods:

Types of movable and/or electronic goods	Minimum diversion from landfill rate by weight, volume or replacement value (to be determined on a case by case basis)
Office equipment: computers, monitors, copiers, printers, scanners, fax machines, telephones etc.	75%
Furniture: chairs, desks, tables, sofas, lamps, beds, matrasses etc.	
Appliances: refrigerators, dishwashers, water coolers, kitchen equipment, etc.	
External power adapters, televisions and other audiovisual equipment etc.	

Requirements

Implement a comprehensive waste diversion programme with associated Quality Assurance measures that ensure that movable and/or electronic goods are separated from ongoing consumables in the waste stream. This can be done by providing adequately sized containers for such goods or other building/project specific processes that will allow a clear separation of this waste stream from other waste streams.

Engage with the waste contractor(s) early on during the certification process to meet the project building's waste diversion goals and reporting requirements. Ensure that waste diversion requirements are clearly written into existing or new SLA's with all waste contractors serving the project building(s).

Ensure that if any movable and/or electronic goods are to be sold, a formal resale programme is in place, which tracks the items sold. Where movable and/or electronic goods are donated, this has to be tracked and documented and, where value is used as a metric, a replacement value has to be assumed.

Calculations

Waste Diversion is measured by the total amount (volume, weight or replacement value) of items sent for recycling or sold or donated as a portion of total waste generated. The amount for each method of diversion must be quantified accurately and supported with documentation. To calculate the portion of movable and/or electronic goods in the waste stream that have been recycled, donated or sold, use the following process:

1. For all movable and/or electronic goods handled by waste contractors, use the waste contractors' reports or similarly reliable data to determine the total movable and/or electronic goods waste volume, weight or replacement value for the performance period. Data for this purpose must represent the entire performance period and may not be extrapolated.

2. Use the waste contractors' reports or similarly reliable data to determine the total movable goods waste volume, weight or replacement value that was diverted from landfill/conventional disposal through recycling, sale or donation. Data for this purpose must represent the entire performance period and may not be extrapolated.

3. Calculate the portion of movable and/or electronic goods recycled or sold/donated.

For the purpose of this credit, the replacement value of an item is the cost of the item from a shop, reflecting its age and condition.

A calculator will be made available to project teams to track the diversion rate during the performance period. (available on request from the GBCSA)

Waste to Landfill Diversion: Construction Waste – Churn and Alterations

During the performance period have in place a diversion programme that targets construction waste diversion from landfill. This credit is only applicable to projects where construction activities as a result of Churn, Alteration or Additions are taking place during the performance period.

To confirm compliance with this credit, a waste reduction and recycling programme in line with policy requirements must be developed and must be implemented at the project building(s) during the performance period. This programme must address waste generated by any building alterations and additions within the project building(s) during the performance period. This waste reduction and recycling programme must, at a minimum, be in line with the construction waste diversion principles, methods and calculations established in Green Star SA – Office As Built v.1.

NOTE: Waste generated during facility alterations and additions only refers to base building elements, permanently or semi-permanently attached to the building itself that enter the waste stream during

facility renovations, demolitions, refits and new construction additions. Furniture, fixtures and equipment and mechanical electrical and plumbing components and items such as elevators are not included in this waste stream, since they are not considered base building elements. The programme shall be developed in accordance with the requirements set out in the Solid Waste and Materials Management Policy.This waste reduction and recycling programme shall address, at a minimum, the following base building elements:

Base building elements	Minimum diversion from landfill rate by weight or volume
Numerous building materials and components can be recovered or recycled. Common materials and reuses include: • Bricks and concrete used for clean-fill; • Timber to be salvaged for new structural or material use; timber waste ground into mulch or garden compost; • Crushed concrete used as road-base; • Plasterboard crushed for soil conditioner or for the manufacture of new plasterboard; • Steel, aluminium and other metals for reuse in the manufacture of new metal products; • Foam insulation and packaging for new insulation or soft structural forms; • Pallets for reuse • Clean plastic from packaging for new packaging materials; • Carpet and ceiling tiles may be taken back for reconditioning/recycling by the manufacturer; • Light fixtures for cleaning and reuse; • Furniture for refurbishing and reuse; and • Crushed tiles for paving or landscape decoration.	50%

A calculator will be made available to project teams to track the diversion rate during the performance period. (available from GBCSA on request)

DOCUMENTATION REQUIREMENTS / EVIDENCE

Credit	**Documentation Requirements/Evidence**
Solid Waste Management Policy	• Upload a copy of the Solid Waste and Materials Management Policy • Complete the submission checklist.
Waste Stream Audit of Ongoing Consumables and development of an Operational Waste and Materials Management Plan	• Upload a copy of the waste stream audit report and results • Upload a copy of the Operational Waste and Materials Management Plan, confirming the content of the elements that need to be covered in this audit. • Complete the submission checklist.
Waste to Landfill Diversion: Operational Waste and Materials	• Complete the calculator confirming compliance with the diversion target • Supply waste contractor receipts confirming the diversion rate
Waste to Landfill	• Complete the calculator confirming compliance with the diversion

Diversion: Movable and/or Electronic Goods	target • Supply waste contractor receipts confirming the diversion rate
Waste to Landfill Diversion: Construction Waste – Churn and Alterations	• Complete the calculator confirming compliance with the diversion target • Supply waste contractor receipts confirming the diversion rate

ADDITIONAL GUIDANCE / RESOURCES

The availability waste management services and options varies from Province to Province and must be researched and implemented on a case-by-case basis. Engage with your current waste management contractor to establish clear roles and responsibilities and review their ability to meet the building's solid waste and materials management goals.

Solid Waste and Materials Management Policy

Drafting and agreeing a policy is a collaborative effort, which requires input from the building owner, facilities management, procurement officers and product suppliers. Often the Facilities Manager heads up the development of a Solid Waste and Materials Management Policy and is often responsible for the implementation. Developing and implementing a solid waste and materials management policy can set the overall tone for waste minimisation and diversion and is the first step in ensuring successful and sustained implementation.

Waste Stream Audit

Becoming aware of a building's actual waste stream generated on a regular basis can help identify opportunities for source reduction, reuse, recycling, composting and other means of diversion and help identify appropriate infrastructure that will aid in the upfront collection and separation of waste streams and can tailor service provider responses to the waste stream of a particular project. In addition, with building users being made aware of actual waste stream information, appropriate mechanisms can be put in place that a) reduce upfront waste generation (packaging etc.), b) target reuse strategies and c) improve recycling rates.

Waste to Landfill Diversion

Although putting in place an effective and successful recycling programme with associated ongoing tracking may require time, effort and additional capital expenses (recycling infrastructure), the benefits usually associated with successful recycling programmes can far outweigh the costs. Such benefits tend to include reduced costs associated with materials purchases (e.g. packaging); reduced waste collection and disposal fees and/or income derived from recycling companies. A long-term commitment to tracking, monitoring and maintenance is essential.

BACKGROUND

Normal building operations and maintenance as well as churn and alterations can generate substantial quantities of waste. By reducing the overall waste stream to landfill through source reduction, reuse, recycling and other waste diversion strategies the demand for new materials and related harvesting and extraction of natural resources can be reduced. Furthermore, reducing the amounts of waste going to landfill will help reduce the impact of land fills on greenhouse gas emissions and the overall impact that landfills have on land resource, air and water quality.

MAT-2 Solid Waste Management

POINTS AVAILABLE 6

South African households, commerce, institutions and manufactures generate 13.5-15million tonnes of waste per year (1998). This is increasing due to population and economic growth. Gauteng, the most urbanised province, is responsible for 43% of the total waste generated in South Africa. Each person generates on average 760 kg of waste per year. (DEAT, 2006).

Disposal of waste generally has negative impacts on the environment. These impacts include contamination of surface and ground water resources and soil; emissions (methane, CO2 and others) due to natural decomposition processes, incineration and illegal burning; health and safety risks; unsightly landfill sites, etc. Processing waste provides a large scope for creating employment opportunities. Sorting of waste allows products that have a high reuse or recycle value to be extracted from conventional waste streams turning the burden of waste into a potential resource which reduces use of virgin material (DEAT, 2006).

Waste produced through the operation of a building arises from the daily processes of the building, management and maintenance activities and refurbishment associated churn (Terry & Moore, 2008). The majority of this waste is the consumables associated with the daily functions of the business, but significant environmental impacts can also arise from smaller waste streams. An example of this smaller waste stream is the replacement of the building's fluorescent lights, which commonly is on a time/cost rather than utility basis. Sent to landfill, a single fluorescent light, containing 10mg of mercury, can contaminate 30,000 litres of water beyond safe drinking standards (MTP, 2005).

According to the Paper Recycling Association of South Africa the recyclable paper recovery rate in 2006 for South Africa, as a percentage of paper consumption, was approximately 44%. When segmented, 'Offices' were performing at a recovery rate of 42%, whereas 'Homes' at only 14%. World total recovery levels showed slightly higher than the SA average at approximately 47%, with countries like Switzerland, The Netherlands and Germany at the top of the list with levels between 70% and 80%.

In addition to the environmental benefits from an effectively managed waste and recycling plan, there can be considerable economic savings. Sustainability Victoria's (2006) WasteWise programme reports that only 10% of the cost of waste is in its disposal. The other 90% is hidden costs including the costs associated with unproductive waste management work, storage and clean-up costs and the loss of valuable materials as waste. Effectively managing waste can result in reduced business risks and an enhanced social and corporate responsibility profile, which leads to in improved public relations and business continuity (Wasiluk, 2007).

To make recycling schemes more economic, it is beneficial for waste to be collected quickly and efficiently. A convenient, purpose-designed storage space ensures that sufficient waste is accumulated before it is collected, and helps occupants to store material. The purpose of this credit is to encourage and recognise the inclusion of storage space in the physical attributes of the building, regardless of the tenant operational policies such as contracting another company to segregate waste off-site.

Construction Waste during Churn and Alterations: Traditionally, the bulk of construction waste has gone to landfill, and it has been estimated by the Gauteng Provincial State of the Environment Report (SoER), June 2004, that construction and demolition waste within South Africa makes up approximately one fourth of all waste generated. This occurs despite the fact that much of the waste can be considered as a valuable resource for reuse or recycling.

Waste management on building sites is becoming increasingly common. As the availability of suitable land for landfill diminishes, and concerns about the environmental implications of waste become more widespread, reuse and recycling practices increase.

At the National Waste Summit held in Polokwane in September 2001, the Polokwane Declaration was adopted which commits South Africa to a reduction of 50% in the amount of waste being land filled by 2012 and a plan for zero waste by 2022. Future waste legislation will promote reuse and recycling,

and require manufacturers to develop products that do not create waste and that can easily be recycled.

South African Waste Information System: The Waste Act was implemented on 1 July 2009, and section 60(1) of the Waste Act requires the Minister to establish a national waste information system for the recording, collection, management and analysis of data and information on waste management. As such, the South African Waste Information System (SAWIS) was developed to support the reporting framework for the generators, recyclers, exporters and disposers of waste. Through its implementation, the SAWIS has proved to be a useful tool in informing waste management decisions. The SAWIS is a web-based system, which enables waste managers to register new waste activities and submit quarterly information on the following web-link www.sawic.org.za.

REFERENCES

Department of Environment and Tourism, http://www.environment.gov.za, http://www.environment.gov.za/ProjProg/WasteMgmt/recycling/an-a.htm

Department of Environmental Affairs and Tourism (2006) South Africa Environmental Outlook, A report on the state of the environment, http://soer.deat.gov.za/frontpage.aspx?m=2

EPA – Waste Wise: http://www.epa.gov/osw/conserve/smm/wastewise/measure-progress.htm

Inform Inc. (U.S.), Waste at Work: Prevention Strategies for the Bottom Line. http://www.informinc.org/wasteatwork.php

Institute of Waste Management of Southern Africa, http://www.iwmsa.co.za/

Market Transformation Programme (MPT) (2005) Light Emitting Diodes: Eco-Design, Innovation Roadmap, Future Energy Solutions, Didcot, UK

National Environmental Management: Waste Act (59/2008): National Waste Information Regulations

National Waste Management Strategy Implementation Project, (2005), http://www.sawic.org.za/documents/235.pdf

Paper Recycling Association of South Africa, http://www.prasa.co.za

Polokwane Declaration, http://www.environment.gov.za/ProjProg/WasteMgmt/Polokwane_declare.htm

Provincial State of the Environment Reports, http://soer.deat.gov.za/docport.aspx?m=97&d=5

South African Waste Information System (SAWIS), established in terms of Section 60 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008)

Terry, A & Moore, T [eds] (2008) Waste and Sustainable Commercial Buildings, Your Building: Profiting from sustainability, http://www.yourbuilding.org

USGBC, Leadership in Energy and Environmental Design (LEED) – Existing Buildings: Operations and Maintenance Reference Guide, 2009.

Wasiluk, K.L (2007), Business Case for Sustainable Commercial Buildings, http://www.yourbuilding.org

ECO-1 Ecological and Site Management

POINTS AVAILABLE 2

AIM OF CREDIT

To recognise and encourage practices which maintain the ecological value, reduce negative environmental impact and enhance the provision of ecological services of the site.

CREDIT CRITERIA

Minimum Requirement: Ecological Assessment	An Ecological Assessment of the site must be undertaken.
Ecological Policy and Management Plan	**2 points** are awarded if an Ecological Management Plan is in place for continuous management and enhancement of ecosystem services of the site. The Ecological Management Plan must include a Policy statement regarding the overall intentions for ecological management of the site. The Management Plan should be actively implemented and monitored during the performance period.

This Credit is '**Not Applicable**' where less than 25% of the site area (excluding building footprint), or 5% of the total site area (including the building footprint)—whichever is greater, is made up of natural vegetation.

The implementation of the management plan can be deemed '**Not Applicable**' for PILOT projects**.**

COMPLIANCE REQUIREMENTS

Notes:

1. Where the building location or the building type does not allow for or include ecological areas, this credit component is deemed **"not applicable"** and the associated point cannot be earned. The applicability of the credit is based on the determination of whether your site already has large areas of existing natural open space with indigenous vegetation or natural features such as a stream or wetland. **The credit is applicable to those sites that have natural vegetation covering at least of 25% of the total site area (excluding the building footprint) or 5% of the total site area (including the building footprint)—whichever is greater.**
2. Although it is not necessary for organizations seeking certification to develop separate policies and plans to document compliance with credit criteria, projects are required to highlight - and where not present in existing policies/plans, amend these to include - all elements of the Green Star SA Policy and Programme/Plan Model as well as the requirements outlined below.
3. All plans that are submitted as part of this credit have to be developed in line with the Green Star SA Policy and Programme/Plan Model.

ECO-1 Ecological and Site Management

POINTS AVAILABLE 2

DOCUMENTATION REQUIREMENTS/ EVIDENCE

Submit all documentation and ensure it readily confirms compliance; also complete online submission template/check list:

1. **Ecological Assessment Report**
2. **Ecological Management Policy**
3. **Ecological Management Plan**

Ecological Assessment

The purpose of the ecological assessment is to describe the ecological state and value of natural features on the project site. Of particular relevance is ecological function within a broader context – such as providing shelter or food for fauna, or improving air, water and soil quality.

Measuring and quantifying ecological value is a complex process and many different tools for assessment exist. It does however allow for incremental improvements to occur in a quantifiable way. Organisations can incrementally improve their score by reducing impacts, exercising positive influences and improving ecological functioning on an occupied site. The components of assessment are varied and could include terrestrial, freshwater, estuarine and marine environments depending on the site location.

The occupied site, on which the premises seeking Green Star certification is located, is the focus of these compliance requirements. The following process must be followed:

- Determine the basic characteristics of the site, including size and boundaries;
- Identify any natural areas found on the site, including existing natural open space with indigenous vegetation or natural features such as a stream, wetland, bush clump or ridge;
- Identify any natural areas found adjacent to the site, including existing natural open space with indigenous vegetation or natural features such as a stream, wetland or bush clump with the intention of creating or maintaining consolidated natural areas or ecological corridors by connecting different ecological features in a broader network;
- Collect biodiversity and ecosystem function information based on site inspections and verification. The assessment should involve comparable regular surveys during different seasons, and other quality measures (such as water quality) that are carried out during the performance period;
- Highlight ecological sensitivity of the site and biodiversity hotspots (using maps and/ or GPS locations that can be mapped);
- Identification of protected or threatened species and ecosystems (using maps and/ or GPS locations that can be mapped);
- Assessment of biodiversity can be assessed by documenting whether any important biodiversity features occur on site including species, ecosystems or processes that maintain ecosystems and or species and can include the following:
    - Species

i. Threatened plant or animal species;
ii. Protected trees

- Ecosystems
  i. Threatened ecosystems
  ii. Protected ecosystems
  iii. Critical biodiversity areas
  iv. Areas of high biodiversity
  v. Centres of endemism
- Processes
  i. Corridors
  ii. Large conservancy networks
  iii. Rivers and wetlands
  iv. Important topographical features

- Indication of the level to which the site has been previously disturbed; and
- Identify threats to the ecological functioning of the site.

The ecological assessment should preferably be undertaken by a suitably qualified and registered professional affiliated either to South African Council for Natural Scientific Professions (SACNASP) in accordance with the Natural Scientific Professions Act, 2003 (Act 27 of 2003); or South African Council for the Landscape Architectural Profession (SACLAP) in accordance with the South African Council for the Landscape Architectural Profession Act (Act 45 of 2000).

The assessment will be undertaken in accordance with the professional fee structure for SACNASP or SACLAP. Refer to the reference section for this credit for the website details. The cost associated with the assessment will be dependent on the size and characteristics of the site.

The ecological assessment could be done in conjunction with the preparation of the Landscape Management Plan outlined in ECO-2 by the same professional scientist or landscape architect.

Ecological Policy

An Ecological Policy or guideline document is a statement of commitment towards protecting and enhancing the ecological functioning of the site. The emphasis should be to improve the overall "function" (ecology) of the site and not only "form" (biodiversity). This document must be in place during the performance period for any points to be awarded. The policy statement forms part of the Ecological Management Plan.

The policy must state as a minimum:

- A commitment to the maintenance of existing ecological value and improvement or positive contribution to the provision of ecosystem services;
- A stated target or end state to which the natural areas on site will be improved;
- Provisions to encourage all role-players to support the objectives of the policy;
- Indication of approval by relevant management structures.

It is the intention that this policy will direct operational and maintenance requirement into the direction stated in the building owner's policy, at the premises level. It will also assist the organisation and their

service providers with measuring and managing their biodiversity and ecological value, by making the desired outcomes clear to internal and eternal stakeholders.

Ecological Management Plan

The Ecological Management Plan should clearly outline the periodic operational procedures that must be in place to maintain and improve the ecological value of natural areas in order to achieve the outcome specified in the Ecological Policy. This Ecological Management Plan must be written into the operational requirements for the building(s) seeking Green Star certification and cover the following at a minimum:

- Practical way to measure, manage and improve the biodiversity and ecosystem services of the site to:
    - Protect specifically sensitive features;
    - Enhance the site's functioning within its broader ecological context;
    - Promote design that creates external open spaces that enhance site amenity and provide environmental benefit through appropriate design (enhance existing processes and systems);
    - Maintain ecological integrity; and
    - Improve the site's ecological functioning over time.
- Scope of the Ecological Management Plan;
- Frequency of maintenance;
- Recording and reporting mechanism of measured results (such as water quality, species diversity; removal of invasive alien plant species etc);
- Procedures for prompt adjustments or repairs in response to non-compliance with physical measurements taken;
- Clearly outline the parties responsible for carrying out the Ecological Management Plan and measurements;
- Detailing how the Ecological Management Plan relates to the Site Maintenance Plan(s), including:
    - How site maintenance actions are tailored to support the objectives and prescriptions of the Ecological Management Plan; and
    - Required interventions not included in the Site Maintenance Plan(s); and
- Documented proof that proposed interventions were executed during the performance period.

The intention is to have procedures in place that allow building owners and operators to maintain and improve ecological areas, in accordance with leading practice.

Leading practice ecological management procedures must be in place during the performance period which follow ecological management and maintenance practices that significantly maintain and enhance the ecological functioning of the site, minimise water and air pollution, and enhance the provision of ecological services when compared with standard practices.

A log, in line with the frequency required for each operational element must be kept during the performance period which records the following:

- date of intervention
- results of the intervention, e.g. species diversity, water quality
- quantities applied/ saved/ diverted e.g. removal of invasive alien species
- Review particular requirements for Management Plan logs.

The following are examples of interventions that can be implemented in a phased manner with the aim of continuous improvement where the ecological value is enhanced beyond its previous existing status. It is understood that not all buildings and occupied sites will be in a position to implement all of these proposed interventions due to the location, character and size of the site. The ecological management interventions and quantification thereof should be specified in the Ecological Assessment, and the Management Plan.

Examples of Interventions	Examples of Benefits
Clear invasive alien plants, especially in mountain catchments and riparian areas	Increased water yield and improved ecological functioning
Rehabilitate wetlands	Improved water quality through filtering of pollutants and toxins, regulating water flow, restoring aquatic biodiversity and biological functioning
Maintain buffers of natural vegetation along streams and rivers	Reduced flood damage, improved ecological/ biological system functioning; ecological corridors
Reinstate natural vegetation	Improved soil quality; floral and faunal diversity
Stabilise river banks and creation of wetlands	Reduced erosion and improved soil and water quality;
Monitor compliance with effluent standards for agriculture and industry	Reduced sediment load in rivers
Indigenous and endemic planting	Improved biodiversity and creation of habitat resulting in natural pest control, pollination, seed dispersal etc.
Installation of eco-infrastructure such as owl houses, bat boxes, bird feeders and nesting logs, water features to enhance faunal diversity	Improved faunal species biodiversity and creation of habitat resulting in natural pest control, pollination, seed dispersal etc.

Source: adapted from SANBI, 2012

ADDITIONAL GUIDANCE / RESOURCES

South African legislation defines “biological diversity” or “biodiversity” as the variability among living organisms from all sources including, terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part. The term also includes diversity within species, between species, and of ecosystems (NEM: BA, 2004). In other words, biodiversity is the variety of species and ecosystems and the interactions between them.

“Ecosystem services” refer to the beneficial functions provided by ecosystems, such as water quality regulation, nutrient cycling, and soil fertility maintenance, regulation of the concentration of atmospheric gases, climate regulation through reduction of heat islands, flood retention, and cultural

and recreational opportunities. “Ecological infrastructure” is the nature based equivalent of built or hard infrastructure, and is just as important for providing services and underpinning socio-economic development. Ecological infrastructure includes, for instance, healthy mountain catchments, rivers, wetlands, coastal dunes, and nodes and corridors of natural habitat, which together form a network of interconnected structural elements in the landscape (SANBI, 2012).

This credit aims to both protect the existing biodiversity and natural systems of an occupied site, as well as encourage further enhancement of ecosystem services.

The South African legislation on biodiversity places particular importance on the protection, use and management of ecosystems and is moving away from species specific protection. This is to recognise the role and importance of intact and functioning systems that are able to supply ecosystem services to people. This is not to diminish the role of species specific legislation that is still critical for the protection of species under threat and which remains an important consideration. South Africa has a strong suite of legislation that aims to minimise the pressures on biodiversity by addressing habitat loss, land conversion, pollution loading and the illegal trade and use of endangered and protected species.

Strategic objectives for managing and conserving South Africa’s biodiversity are set out in the National Biodiversity Strategy and Action Plan (NBSAP) and the National Biodiversity Framework (NBF). Priority actions for biodiversity have been identified in the National Biodiversity Assessment (NBA) 2011 which focuses on three strategic aspects: reduce loss and degradation of natural habitat in priority areas; protect critical ecosystems and restore and enhance ecological infrastructure. Local authority environmental management and ecological assessments will also be important in the specific site context. The assessment of site specific ecological function should consider these national strategic objectives and determine what can be achieved within the context of largely transformed local urban habitats.

BACKGROUND

Although awareness of the value of natural open space within a developed matrix is growing, practical implementation of measures to protect, conserve and improve ecological space is still absent. Key shortcomings include inadequate resource allocation and failure to incorporate ecological performance into the operational objectives of developed sites. True recognition of the contribution that each and every site can make to the overall functioning of a broader ecological context lies in actively preserving existing ecological functioning and improving the ecological state over time irrespective of the size of the site or the nature of the open spaces present. Any landscape, whether office park, shopping mall, home office, or residential development, holds the potential both to improve and to regenerate the natural benefits and services provided by ecosystems. Just as recycling relies on the accumulation of individual recyclable items, so can ecological function be found in the establishment of a network of many smaller properly managed natural habitats.

It is, however, important for operators of developed sites to understand the existing and potential value that natural spaces on the site have, or can contribute to the immediate context. Through such an understanding, other maintenance and operational activities can be directed in a way that will

enhance the ecological value of the site over time. This credit plays an integrative function, providing a focus for grounds-keeping and landscape management, and ensuring that the optimisation of open spaces form part of the management commitments.

The preservation and progressive improvement of open space and ecological function should not be seen as a process that only aims at benefitting the natural environment – a proper functioning ecology will translate into benefits to the owners and occupants of sites. Benefits include improved emotional health, cleaner air and water, higher productivity, improved microclimate, natural pest control and risk mitigation. Investment in ecological functioning is therefore also an investment in human health and well-being, and as a consequence, also the financial value of a developed site.

REFERENCES

Print material:

Act No. 10 of 2004: National Environmental Management: Biodiversity Act, 2004
Act No. 107 of 1998: National Environmental Management Act, 1998
National Biodiversity Strategy and Action Plan (NBSAP), 2005
National Biodiversity Framework (NBF), 2009
National Biodiversity Assessment (NBA), 2011

Websites:

Department of Environment Affairs: http://www.environment.gov.za/
South African National Biodiversity Institute (SANBI): http://www.sanbi.org/
South African Council for Professional Natural Scientists (SACNASP): http://www.sacnasp.org.za/
South African Council for the Landscape Architectural Profession (SACLAP):http://www.saclap.org.za/

ECO-2 Grounds-keeping Practices

POINTS AVAILABLE 3

AIM OF CREDIT

To encourage environmentally sensitive landscape, hard surfaces and building exterior maintenance practices that reduce the environmental impact and improve ecological value.

CREDIT CRITERIA

Site Maintenance – Landscape Management Plan	**1 point** is awarded where a plan is in place that details the site management of landscaped areas according to leading practice methods and is actively implemented and monitored during the performance period
Site Maintenance – Hard Surfaces and Building Exterior Management Plan	**1 point** is awarded where a plan is in place that details the management of hard surfaces and the building exterior according to leading practice methods and is actively implemented and monitored during the performance period
Site Maintenance – Integrated Pest Management Plan	**1 point** is awarded where an Integrated Pest Management Plan for indoor and outdoor pest management is in place and actively implemented and monitored during the performance period.

For **PILOT projects**, implementation of the abovementioned plans can be waivered, however the plans must have been produced and submitted for the certification.

COMPLIANCE REQUIREMENTS

Notes:

1. Where the building location or the building type does not allow for or include landscaped areas, the “Landscape Management Plan” is deemed “not applicable” and the associated point cannot be earned. Type ‘na’ in the ‘points achieved’ column of the rating tool spreadsheet.
2. Although it is not necessary for organizations seeking certification to develop separate policies and plans to document compliance with credit criteria, projects are required to highlight - and where not present in existing policies/plans, amend these to include - all elements of the Green Star SA Policy and Programme/Plan Model as well as the requirements outlined in this credit for the applicable plan.
3. All plans that are submitted as part of this credit have to be developed in line with the Green Star SA Policy and Programme/Plan Model.

Site Maintenance – Landscape Management Plan

Assessment

An assessment of current landscape practice, including but not limited to plant and planting schedules, fertilizer and irrigation regimes (as applicable), landscape waste management and pest control practices is the first step in developing a landscape management plan. Work with the

landscape designer/architect (if applicable), and the contractor(s) responsible for landscape maintenance and planting, irrigation, waste, pest control and others as applicable to carry out the assessment, using the checklist in ECO-2.1 below.

ECO-2.1 Assessment Checklist – Landscape Management Plan

1.	**Plant Maintenance**					
a.	**General Plant Maintenance**	**Yes**		**No***		**Responsible Party**
	Is there a process in place that ensures that vegetation on the site is maintained according to recognized standards for professional horticultural practice, such as annual/seasonal pruning? **Target/Output:** short description of site and species appropriate plant maintenance process, according to recognized standards.	☐	Record the references of the standards applied in the Landscape Management Plan.	☐	Require that the landscape contractor supply the references.	Landscape contractor
b.	**Plant Health**					
	Is there a process in place that ensures that vegetation is monitored for plant health to prevent problems? This would include techniques to address dead, diseased or pest-infested vegetation. **Target/Output:** short process description	☐	Record details of this process in the Landscape Management Plan	☐	Develop and put in place such processes	Landscape Contractor
c.	**Plant Replacement**					
	Is there a list of acceptable plants for plant replacement that are site appropriate (endemic/biome-specific and/or indigenous and/or adapted species) and non-invasive? **Target/Output:** species list	☐	Record this list in the Landscape Management Plan. – include common and scientific names	☐	Develop such a list	Landscape Contractor
d.	**Pest management**					
	Is there a process/plan in place that ensures that pests, diseases and any other unwanted species of plants and animals are managed using Integrated Pest Management (IPM) techniques. This plan/process must be in line with the principles according to the four-tier approach stipulated by the US Environmental Protection Agency outlined in the section on IPM in this credit. **Target/Output:** Short description of fundamental IPM practices	☐	Record details of the IPM plan in the Landscape Management Plan.	☐	Develop a process that stipulates the use of fundamental IPM principles according to the four-tier approach stipulated by the US Environmental Protection Agency outlined in the section on IPM Plan requirements below.	Pest Control Contractor and/or Landscape Contractor
2.	**Invasive Species Management**					
a.	**Invasive Species List**	**Yes**		**No***		**Responsible Party**
	Does the current landscape contractor maintain and manage onsite species according to a list of plant species identified in the area as invasive as per the National Environmental Management: Biodiversity Act (No. 10 of 2004) (NEM:BA) and Alien and Invasive Species Regulations for this Act, which were published on 19 July 2013? **Target/Output**: species list	☐	Record this list in the Landscape Management Plan – include common and scientific names as they are specific to the project building area.	☐	Obtain and record such a list	Landscape Contractor
b.	**Invasive Species Management**					
	Is there a plan or process in place that covers the management of any invasive species found on the project site? This plan/process must outline the principles of the following: • Integrated pest management (IPM) strategies • A procedure for identifying and monitoring for	☐	Record the plan/process in the Landscape Management Plan	☐	Develop the plan and process	Landscape Contractor

	invasive species that may colonize the site. • Initial treatment, follow-up treatments, long-term control including monitoring, and methods to dispose of invasive plant materials to prevent spread. **Target/Output**: Plan/process outline					
3.	**Landscape Waste Management**					
a.	**Healthy plant material management**	**Yes**		**No***		**Responsible Party**
	Is there a process in place on the site that governs the management of landscape waste generated on site for composting or recycling as applicable on the site? **Target/Output**: short description of the landscape waste management process. Target to be aligned to MAT-2 Solid Waste Management, if MAT-2 pursued.	☐	Record the process in the Landscape Management Plan	☐	Develop	Landscape Contractor, Site Maintenance, Waste Management
b.	**Diseased plant disposal**					
	Is there a process in place that governs the disposal of organic plant materials generated on site that are not suitable for composting or recycling (e.g. diseased vegetation) in a manner that does not increase the likelihood of spread? **Target/Output:** short description of the process	☐	Record the process in the Landscape Management Plan	☐	Develop	Landscape Contractor, Site Maintenance, Waste Management
4.	**Soil Management**					
a.	**Fertilizers**	**Yes**		**No***		**Responsible Party**
	Is there a process in place for applying fertilizers (if needed) to ensure that application is effective and prevents harm to environmental and human health and minimise the use of artificial chemical fertilizers? Are non-chemical fertilizers specified? **Target/Output:** short description of the process and list of fertilizers with seasonal application rates.	☐	Record in the Landscape Management Plan	☐	Develop	Landscape Contractor,
b.	**Erosion and compaction**					
	Is there a process in place for alleviating soil erosion or compaction (due to site use or maintenance) that is detrimental to plant health? **Target/Output:** description of the measures in place that prevent erosion and compaction	☐	Record in the Landscape Management Plan	☐	Develop	Landscape Contractor, Site Maintenance,
5.	**Irrigation and water use**	**Yes**		**No***		**Responsible Party**
a.	**Irrigation timing and schedule**					
	Is a watering schedule in place (frequency and duration) that allows the site to meet annual volume requirements and restrictions (as applicable)? **Target/Output:** review and describe watering schedule and requirements, review irrigation targets and actual vs design volumes	☐	Record in the Landscape Management Plan	☐	Develop	Irrigation Contractor, Landscape Contractor, Site Maintenance
b.	**Irrigation water source**					
	Is the use of non-potable water sources stipulated for landscape irrigation (e.g. harvested rainwater, air-conditioning condensate, greywater, reclaimed wastewater)? **Target/Output:** non-potable water use targets for irrigation – minimum 50%. Describe process and implementation. Note synergy with section 3.b) Potable Water Use Minimisation in the Hard Surfaces and Building Exterior Maintenance Plan	☐	Record this in the Landscape Management Plan	☐	Develop the requirements	Irrigation Contractor, Landscape Contractor, Site Maintenance

* If NO, rectify and then follow the process as per the Yes column

Landscape Management Plan

On the basis of the assessment, develop a Landscape Management Plan, which must be in place during the performance period and covers at a minimum the assessed elements. The intent is that the plan contains clear procedures and strategies for landscape management which will allow building owners and operators to maintain and improve landscaped areas, in accordance with leading practice.

The Landscape Management Plan must be written in line with the Green Star SA Policy and Programme/Plan model and must clearly outline the procedures and strategies that must be in place to maintain and improve landscaped areas during the performance period. Refer to the submission checklist under documentation requirements for the full outline of the Landscape Management Plan.

Scope of the Landscape Management and Maintenance Programme

Leading practice landscape management and maintenance procedures must be embedded in the Landscape Management and Maintenance Programme and must be in place during the performance period. These procedures must follow leading landscape management and maintenance practices that significantly reduce the use of harmful chemical, energy, water, minimise air pollution, solid waste and/or chemical runoff (e.g., petrol, diesel, oil) when compared with standard practices.

The plan must address and outline the metrics, goals, procedures and frequency for all of the following operational elements:

1. **Plant Maintenance**
    - e.g. plant specific maintenance requirements, such as pruning and managing tree roots);
    - Integrated Pest Management; where an IPM Plan is being developed as per the requirements of ECO-2, Integrated Pest Management Plan, this plan can be referenced here and a note to this effect must be included in the submission documentation.
2. **Invasive Species Maintenance**:
    - e.g. processes and strategies to manage and remove invasive species (fauna and flora) and promote biodiversity and indigenous/biome-appropriate planting
3. **Landscape Waste Management**:
    - e.g. Diversion of landscape waste from landfill via mulching, composting or other means.
    - NOTE: where landscape waste diversion is also being pursued as part of MAT-2 – Solid Waste Management, a note to this effect must be included in the submission documentation.
4. **Soil Management:**
    - e.g. The minimisation of the use of artificial chemicals, including the use of soil conditioners, soil ameliorants, addition of compost, organic matter or other less polluting alternatives and maintenance of mulch layers.
5. **Irrigation and Water Use**:
    - e.g. establishment of water consumption targets, total water consumption, water collection, water retention and water sources

A log, in line with the frequency required for each operational element must be kept during the performance period, which records the following:

- date of intervention
- results of the intervention, e.g. plant conditions
- quantities applied/saved/diverted

Site Maintenance – Hard Surfaces and Building Exterior Maintenance Plan

Assessment

An assessment of current hard surfaces and building exterior maintenance practice and replacement schedules, including but not limited to general hardscape maintenance, landscape equipment use and maintenance schedules and energy efficiency targets for outdoor equipment and lighting is the first step in developing a Hard Surfaces and Building Exterior Maintenance Plan. Work with the building manager, maintenance contractor (if applicable), and the contractor(s) responsible for landscape maintenance and others as applicable to carry out the assessment, using the checklist in ECO-2.2 below.

ECO-2.2 Assessment Checklist – Hard Surfaces and Building Exterior Maintenance Plan

1.	**Hardscape Maintenance and Management**					
a.	**General Hardscape Maintenance**	**Yes**		**No***		**Responsible Party**
	Is there a list that clearly identifies preferred characteristics for replacement materials, including materials from local and regional sources, recycled content materials, certified wood, energy-efficient lighting in line with MAT-1 Procurement and Purchasing for the specific category? **Target/Output**: Detailed replacement materials list with sustainability criteria	☐	Record this list and the detailed requirements in the Hard Surfaces and Building Exterior Maintenance Plan.	☐	Compile this list on basis of as-built documentation and on the basis of leading practice materials.	Building Manager, Maintenance contractor
b.	**Material Functionality and Extended Use**					
	Is there a process in place that ensures that hardscape and landscape amenities and structures are repaired and maintained in a way that reduces harm to the environment and human health? This may include the following: - stipulating the use of low-emitting adhesives, sealants, paints and coatings for all outdoor applications in line with MAT-1 Procurement and Purchasing and IEQ-13, 14 and others as per the Green Star SA Office Design v.1 - stipulating processes that ensure that materials remain effective for their intended use, e.g. through regular cleaning and maintenance programmes of pervious surfaces **Target/Outputs**: 1. Detailed contractor requirements for environmentally preferable adhesives, sealants, paints and coatings that are allowed for use on site 2. Cleaning and maintenance schedules	☐	Record details of the contractor requirements and the cleaning and maintenance schedules in the Hard Surfaces and Building Exterior Maintenance Plan	☐	Develop and put in place such processes	Building Manager, Maintenance contractor
c.	**Cleaning methods and chemicals**					
	Are environmentally preferable cleaning methods and materials stipulated that are in line with MAN-4 Green Cleaning Performance? **Target/Outputs**: Minimum 40% by cost of all cleaning materials used for hardscape cleaning to meet environmentally preferable criteria as outlined in MAN-4 Green Cleaning Performance.	☐	Record details of the requirements in the Hard Surfaces and Building Exterior Maintenance Plan	☐	Develop detailed requirements	Building Manager, Maintenance contractor

d.	**Maintenance of high reflective materials**					
	Where there are materials installed on the site that contribute to reduced heat islands through the use of materials with a high solar reflectance index (SRI), is there a surface cleaning and maintenance programme in place that ensures that these surfaces retain their efficiency and intended use? NOTE: high SRI surfaces should be cleaned at least every two years or less in line with manufacturer requirements. **Target/Output:** Cleaning and Maintenance Schedule	☐	Record this process in the Hard Surfaces and Building Exterior Maintenance Plan	☐	Develop this process	Building Manager, Maintenance contractor
e.	**Site Safety**					
	Are processes in place that ensure that hardscape and landscape amenities and structures are maintained in way that ensure site safety and meet the needs of the intended use of the site? This may include maintenance and cleaning processes for potentially slippery surfaces or replacement programmes with materials that increase traction and reduce the use of cleaning products that are not environmentally preferable. **Target/Output**: Maintenance and or replacement programme for site safety.	☐	Record this process or programme in the Hard Surfaces and Building Exterior Maintenance Plan	☐		Building Manager, Maintenance contractor
2.	**Landscape Maintenance Equipment**					
a.	**Equipment Maintenance**	**Yes**		**No***		**Responsible Party**
	Is there an inventory of all manual and powered landscape and hardscape maintenance equipment that is used on site? Is a maintenance schedule in place for all equipment? **Target/Output:** Inventory with Maintenance Schedules	☐	Record this inventory and the maintenance schedule for each type of equipment in the Hard Surfaces and Building Exterior Maintenance Plan	☐	Carry out an inventory of all equipment on site and develop a maintenance schedule that is – at a minimum – in line with manufacturer requirements.	Building Manager, Maintenance contractor, Landscape Contractor
b.	**Low/zero-emissions and low-noise equipment**					
	Is preference given to low/zero-emissions and low-noise equipment? This may include giving preference to manual or electric-powered equipment over petrol-powered equipment. Are landscape maintenance schedules in place that will reduce air and noise pollution during normal building occupancy hours? **Target/Outputs**: 1. at least 50% of all maintenance equipment to be low/zero-emissions and/or acceptable noise level is ≤ 55dBa[1] 2. Equipment use schedule that ensures that petrol powered and noise-polluting equipment used at times, which cause least disturbance to building occupants.	☐	Record the requirements and schedules in the Hard Surfaces and Building Exterior Maintenance Plan	☐	Develop and stipulate the requirements and develop site appropriate schedules.	Landscape Contractor, Maintenance contractor,
3.	**Energy and Water Consumption**					
a.	**Energy Efficient Outdoor Fixtures and Equipment**	**Yes**		**No***		**Responsible Party**
	Are energy-efficient outdoor fixtures and equipment (e.g. pond pumps) installed and used on site, which reduce energy consumption and costs associated with site	☐	Record the inventory, the consumption targets and the replacement in the	☐	Develop the elements as required for the plan.	Site Maintenance, Building Maintenance

[1] This is a recommended level of noise adopted from the U.S. Environmental Protection Agency, Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety, 550/9-74-004, (March 1974), and the World Health Organization (WHO), Guidelines for Community Noise (April 1999).

	use and operations? If not, is a replacement plan in place that stipulates the future use of energy efficient fixtures and equipment? **Target/Output:** 1. Inventory of existing fixtures and equipment, indicating the energy consumption and energy efficiency rating as applicable. 2. Building specific targets for energy efficiency for outdoor fixtures and equipment. E.g. Lighting: minimum 50% of all outdoor lighting must have an energy efficiency grade of A. 3. Replacement Plan that requires that any replacement fixtures and equipment will carry energy-efficiency labels (Energy Star, Energy Grading A)		Hard Surfaces and Building Exterior Maintenance Plan			
b.	**Potable Water Use Minimisation**	**Yes**		**No***		**Responsible Party**
	Are systems in place that reduce or eliminate the need for potable water use for cleaning of hardscapes and building envelopes? Similarly, for outdoor water features, are systems in place that ensure the use of non-potable water (greywater, rainwater, reclaimed water) in such features? If not, is a replacement plan in place that stipulates the development and implementation of systems that will reduce or eliminate the use of potable water for cleaning and outdoor water features? **Target/Output:** 1. Short description of the non-potable water source systems for use for cleaning and water features. 2. Or Replacement Plan for non-potable water collection and use on site for outdoor cleaning and water features.	☐	Describe and specify the non-potable water systems and uses or the Replacement Plan in the Hard Surfaces and Building Exterior Maintenance Plan	☐	Develop the elements as required for the plan.	Building Maintenance, Site Maintenance,

Hard Surfaces and Building Exterior Maintenance Plan

On the basis of the assessment, develop a Hard Surfaces and Building Exterior Maintenance Plan to be in place during the performance period that covers at a minimum the assessed elements. The intent is that the plan contains clear procedures that are being used to maintain and/or improve hard surfaces and building envelopes during the performance period.

The Hard Surfaces and Building Exterior Maintenance Plan must be written in line with the Green Star SA Policy and Programme/Plan model and must clearly outline the procedures and strategies that must be in place to maintain and improve landscaped areas during the performance period. Refer to the submission checklist under documentation requirements for the full outline of the Hard Surfaces and Building Exterior Maintenance Plan.

Scope of the Hard Surfaces and Building Exterior Maintenance Plan

Leading practice hardscape maintenance procedures must be embedded in the Hard Surfaces and Building Exterior Maintenance Plan and must be in place during the performance period. 'Hardscapes', for the purposes of this credit, cover all hard surfaces and building envelopes. Best practice building exterior and hardscape management procedures must employ best practice maintenance that significantly reduce harmful chemical use, energy and water and minimise air pollution, solid waste and/or chemical runoff when compared with standard practices.

The procedures must address all of the following operational elements that occur on the grounds:

1. **Hardscape Maintenance and Management**

- E.g. Schedule of maintenance per building element / material;
- Clear record of material and surface finishes from manufacturer and supplier;
- Maintenance specifications of building elements as per manufacturer;
- Cleaning methods of hard surface and building exterior elements;
- Cleaning chemicals approved for use on site
- Approved paints and sealants for use for maintenance of building exterior;
- Cleaning of footpaths, pavement and other hardscape

2. **Landscape Maintenance Equipment**
   - E.g. giving preference to low-emitting, low noise equipment to reduce, avoid, or eliminate the use of landscape maintenance equipment that exposes site and adjacent building users to localized air pollutants and generates greenhouse gas emissions
3. **Energy and Water Consumption**
   - E.g. Water targets, water used for maintenance of hard surfaces and building envelope;
   - Energy targets and energy used for maintenance of hard surfaces and building envelopes
   - Replacement schedules for energy and water efficient equipment and fixtures

A log, in line with the frequency required for each operational element must be kept during the performance period, which records the following:

- date of intervention
- results of the intervention, e.g. plant conditions
- quantities applied/saved/diverted

Integrated Pest Management (IPM) – indoor and outdoor

During the performance period have in place an Integrated Pest Management Plan for indoor and outdoor practices in line with requirements outlined below.

Integrated pest management (IPM) is a sustainable approach to managing pests by combining biological, cultural, physical and chemical tools in a way that minimizes economic, health, and environmental risks. IPM is site-specific in nature, with individual tactics determined by the particular crop/pest/environment scenario. The IPM approach places an emphasis on the reduction of pesticide use and the implementation of preventative and alternative control measures (Sustainable Sites Initiative 2009)

The plan has to outline clearly the IPM control methods that are to be employed on site to control unwanted pests in an integrated manner. Such IPM control methods may include[2]:

1. **biological control**: using predators, parasites or microbial pathogens to suppress pests
2. **cultural and physical control**: using methods such as barriers and traps; adjusting planting location or timing; or crop rotation and cultivation techniques which expose pests to predation or destroy their food, shelter and breeding habitats
3. **chemical control**: selecting *least toxic pesticides* and using them only when needed as opposed to regular preventative spraying
4. **plant choice**: choosing plant varieties that are resistant to diseases in an area, and matching species to the site
5. **pheromone control**: using pheromones to monitor insect populations in a crop or orchard.

[2] Extract from "Integrated Pest Management, New South Wales Environmental Protection Agency: http://www.epa.nsw.gov.au/pesticides/integratedpestmgmt.htm, accessed 18 July 2013

ECO-2 Grounds-keeping Practices

POINTS AVAILABLE 3

Integrated methods that make use of monitoring and non-toxic preventative measures (e.g., site inspection and maintenance, cultural controls, pest inspection, and population monitoring) must be used to manage and minimise pest issues proactively. Regular visual inspections must be conducted to monitor both the presence of pests and effectiveness of current preventative measures. In the event that monitoring activities reveal a need for the use of pest controls, appropriate control options will be evaluated and the least-toxic option will be employed. Many of the general preventative practices are simple housekeeping and landscaping procedures that eliminate sources of food, water and shelter that attract pests to the building grounds and interior. Preventative measures are both cost-effective and provide minimal risk to building occupants.

Integrated Pest Management (IPM) Plan

The IPM plan must be included or referenced in both the landscape and the hardscape maintenance plan and must, at a minimum include the following:

1. **IPM Programme**: Outline, stipulate and follow a four-tiered IPM programme
2. **Performance Metrics and Quality Control**: Specify performance measurement metrics and quality control systems that will evaluate the effectiveness of the IPM Plan.
3. **Least-Toxic Pesticides:** Stipulate the preferred use of nonchemical methods and least-toxic pesticides, and
4. **Building Occupant and User Communications Strategy:** Have in place a strategy for communications between the IPM team and the building occupants and require universal notification, including definition of emergency conditions

1. IPM Programme

The IPM plan must outline, stipulate and follow the four-tiered approach detailed below, which is based on the Integrated Pest Management (IPM) Principles issued by the US Environmental Protection Agency. A sample table of contents, which covers these elements is found in

Contents of an IPM Programme

IPM Programme Contents	Principles	Process	Responsible Party
Action Thresholds	Before taking any pest control action, IPM first sets an action threshold, a point at which pest populations or environmental conditions indicate that pest control action must be taken. Sighting a single pest does not always mean control is needed. The level at which pests will either become an economic threat is critical to guide future pest control decisions. Five factors should be considered in setting action thresholds: economics, health and safety concerns, aesthetic concerns, public opinion, and legal concerns. Action thresholds vary by pest (termite versus ant), by site (storage room versus medial facility), and sometimes by geographic location (Northern Cape versus Western Cape), or by season (termite activity in Gauteng is much higher during the early/mid summer season than in mid winter). For some landscape pests, action thresholds will also vary depending on whether natural enemies are present.	Identify all pests, which are likely to be encountered in the building. Set action thresholds for these pests, at which point intervention will be required. Over and above setting action thresholds, also describe a process for modifying these action thresholds, if necessary, through active communication between occupants and the IPM team. Specify all items in the IPM Plan.	The specific action thresholds may be developed by a pest control contractor, consultants, or by committee
Monitor and	Not all insects, weeds, and other living	Make provisions for identifying and	Cleaning

Identify Pests	organisms require control. Many organisms are innocuous, and some are even beneficial. IPM programmes work to monitor for pests and identify them accurately, so that appropriate control decisions can be made in conjunction with action thresholds. This monitoring and identification removes the possibility that pesticides will be used when they are not really needed or that the wrong kind of pesticide will be used.	monitoring pests in close consultation and cooperation with cleaning, landscape, hardscape and other building contractors as applicable. Specify inspections, pest population monitoring, and a reporting system that allows occupants, maintenance staff, and others to report evidence of pest infestations. Specify all items in the IPM Plan.	Contractor Pest Management Contractor Landscape Contractor Maintenance Contractor
Prevention	As a first line of pest control, IPM programmes work to manage indoor spaces and exterior landscape and hardscape space to prevent pests from becoming a threat. In an indoor environment this may mean meticulous cleanliness in potentially high threat areas (e.g. food preparation areas) and in landscaping practices, this may mean using cultural methods, such as rotating between different plant species, selecting pest-resistant varieties, and planting pest-free rootstock. These control methods can be very effective and cost-efficient and present little to no risk to people or the environment.	Stipulate nonchemical pest preventive measures, which are either designed into the building and landscape/ hardscape structure or implemented as part of pest management activities. For examples of leading practice intervention, please refer to Table ECO-2.2: LEADING PRACTICE INTEGRATED PEST CONTROL under section ADDITIONAL GUIDANCE AND RESOURCES Specify all items in the IPM Plan.	Cleaning Contractor Pest Management Contractor Landscape Contractor Maintenance Contractor
Control	Once monitoring, identification, and action thresholds indicate that pest control is required, and preventive methods are no longer effective or available, IPM programmes then evaluate the proper control method both for effectiveness and risk. Effective, less *risky* pest controls are chosen first, including highly targeted chemicals, such as pheromones to disrupt pest mating, or mechanical control, such as trapping or weeding. If further monitoring, identifications and action thresholds indicate that less risky controls are not working, then additional pest control methods would be employed, such as targeted spraying of pesticides. **Broadcast spraying of non-specific pesticides is a last resort.**	Stipulate pest control methods, which are to be used when action thresholds are exceeded. For each pest, list all potential control methods considered and adopt the lowest-risk options, considering the risks to the applicator, building occupants, and the environment. The plan must give preference to nonchemical approaches, with pesticides registered for the site applied only if those approaches fail. Give preference to the use of least-risk pesticides based on inherent toxicity and exposure potential. If a pesticide that is not in the least-risk category is selected, document the reason.	Pest Management Contractor Landscape Contractor/ Outdoor Pest Management Contractor, if different from Indoor Pest Management Contractor

2. Performance Metrics and Quality Control

Put in place a mechanism for documentation of inspection, monitoring, prevention, and control methods and for evaluation of the effectiveness of the IPM plan. Specify the metrics by which performance will be measured, and describe the quality assurance process to evaluate and verify successful implementation of the plan.

Implement the strategies set out in the IPM plan and evaluate the plan annually. This evaluation must verify that the strategies specified in the IPM plan have been implemented and identify any chemical applications that did not comply with the plan.

Perform recordkeeping and documentation required under the IPM plan. Maintain records of IPM team participation and decisions, as well as pesticide applications.

3. Least-toxic pesticides

Least-toxic pesticides are here defined in accordance with the following:

1. "Products Screened by the Integrated Pest Management Programme, City and County of San Francisco" Tier III criteria (least hazardous)[3] and/or
2. GHS Category 4 in accordance with The WHO Recommended Classification of Pesticides by Hazard and Guidelines to Classification 2009.

Least-toxic pesticide status also applies to any pesticide product, other than rodent bait, which is a self-contained, enclosed bait station that is placed in an inaccessible location or applied in a gel that is neither visible nor accessible.

Rodent bait is not considered least-toxic under any circumstances. Only first-generation rodent baits are to be used, which must be in the form of solid blocks placed in locked outdoor dispensers. Universal notifications are to be sent out in accordance with the provisions made below when bait stations are refilled.

A list of the active ingredients and their application approved for use in a project are found in Table ECO-2.3 under Additional Guidance / Resources.

4. Building Occupant and User Communications Strategy

Have in place a strategy for communications between the IPM team and the building occupants. This strategy should include education about the IPM plan, participation in problem solving, feedback mechanisms (e.g., a system for recording pest complaints), and provision for notification of pesticide applications. At a minimum, the facility manager must notify any building occupant or employee who requests it and post a sign at the application site, which must remain in place for 24 hours. Notifications must include the pesticide name, registration number, treatment location, and date of application. Applications of least-risk pesticides do not require notification. For an emergency application of a pesticide, anyone who requested notice must be notified within 24 hours of the application and given an explanation of the emergency.

Universal Notification

The IPM plan has to make provisions for a universal notification system, if a pesticide, other than a least-toxic pesticide as defined above, must be applied on site. This strategy requires the project owner/manager and its pest management contractors notify building occupants of a pesticide application at least 72 hours in advance under normal circumstances and no more than 24 hours after an emergency application. Notification must be made through posted signs or other means that ensure reaching 100% of occupants. This notification system will enable occupants and staff, including especially high-risk occupants such as children, pregnant women, the elderly, people with compromised immune systems and others, to modify their plans based on pesticide use at the building.

Notification must include the following:

[3] http://www.sfenvironment.org/sites/default/files/fliers/files/sfe_th_products_screened_by_sfe_ipm.pdf

- Pesticide product name
- Active ingredient
- Product label signal word (e.g., “caution”, “danger”)
- Time and location of application
- Contact information for persons seeking more information

Emergency Conditions

Emergency Conditions must be stipulated in the IPM Plan to allow for actions open to ground staff in the event of an emergency. Although an emergency may be defined differently from project to project building, an emergency may be defined as an event presenting circumstances in which ground staff deem it necessary that the immediate use of a specific pesticide is necessary to protect the health and safety of staff and other persons, or the project site. In this case, a pesticide may be applied at a project building without following the stipulations for use of integrated and least-toxic methods.

DOCUMENTATION REQUIREMENTS / EVIDENCE

Complete submission template, providing:

Site Maintenance – Landscape Management Plan	Submit a copy of the **Landscape Management Plan**. Complete the checklist provided, confirming the contents of the Landscape Management Plan with page numbers. Provide a log for the items implemented and maintained during the performance period OR implementation can be confirmed by signature by a suitably qualified professional, countersigned by the Facilities Manager.
Site Maintenance – Hard Surfaces and Building Exterior Management Plan	Submit a copy of the **Hard Surfaces and Exterior Building Management Plan**. Complete the checklist provided, confirming the contents of the Hard Surfaces and Exterior Building Management Plan with page numbers. Provide a log for each item implemented and maintained during the performance period OR implementation can be confirmed by signature by responsible contractor, countersigned by the Facilities Manager.
Site Maintenance – Integrated Pest Management Plan	Submit a copy of **the Integrated Pest Management Plan**. Complete the checklist provided, confirming the contents of the Integrated Pest Management Plan with page numbers. Provide a log for each item implemented and maintained during the performance period OR implementation can be confirmed by signature by the Pest Management Contractor, countersigned by the Facilities Manager.

ADDITIONAL GUIDANCE / RESOURCES

Table ECO-2.3 Active Ingredients: Least-Toxic Status

Active Ingredient(s)	Application
Bacillus sphaericus	Insecticide
Bacillus subtilis	Fungicide
Bacillus Thuringiensis (subsp israelensis, var aiziwai kurstaki, var kurstaki,	Molluscicide, insecticides
Beauveria bassiana 11.3%	Insecticide
Canola oil	Insecticide
Capsaicin	Insecticide
Corn gluten meal, limestone	Herbicide
Cottonseed oil, clove oil, garlic extract	Insecticide
d-limonene	Insecticide
Ethoxylated esters and soybean oil	Adjuvant
Eugenol and 2-phenethyl proprionate (TBC)	Herbicide
Hydroprene	Insect growth regulator/ inhibitor
Indole-3-butyric acid	Insecticide
Indoxacarb 0.05%	Insecticide
Indoxacarb 0.6%	Insecticide
Iron phosphate	Molluscide
Kinoprene	Insect growth regulator/ inhibitor
Methoprene	Insecticide
Mint oil	Insecticide
Naphthaleneacitic acid	Insecticide
Potassium bicarbonate	Fungicide
Pyriproxifen	Insecticide (fleas)
s-methropene	Insecticide
Sulfluramid	Insecticide
Trichoderma harzianum	Fungicide
Xanthine and oxypurinol	Insecticide (cockroaches)

ECO-2 Grounds-keeping Practices

POINTS AVAILABLE 3

BACKGROUND

Conventional site and landscape maintenance practices can have adverse impacts on the surrounding environment and human health, which may involve the use of unsustainable volumes of potable water, harsh pesticides, and noisy carbon emitting equipment, potentially increasing grounds maintenance costs. Major areas for concern are usually found in the following:

1. Worker and building and site occupant safety and health can be severely compromised during and after application of conventional pesticides and fertilizers.
2. Top soil loss (loss of organic matter), in particular as a result of erosion on developed sites, reducing the soil's overall ability to support plant life, regulate water flow and maintain the biodiversity of soil microbes and beneficial insects that control disease and pest outbreaks.
3. Where nutrients are lost, soil is compacted and biodiversity of soil organisms is decreased, this may necessitate the use of irrigation, fertilisers and pesticides, lead to increased Storm water runoff and pollute groundwater and drinking water.

Alternative methods / sustainable grounds keeping practices have the potential to lower operating costs, if carefully planned, managed and monitored.

REFERENCES

Sustainable Sites Initiative. 2009. *The Sustainable Sites Initiative: Guidelines and Performance Benchmarks 2009*. Available at **http://www.sustainablesites.org/report.**

New South Wales EPA use of pesticides: http://www.environment.nsw.gov.au/pesticides/

New South Wales EPA Integrated Pest http://www.environment.nsw.gov.au/pesticides/integratedpestmgmt.htm

US EPA, Integrated Pest Management Principles: **http://www.epa.gov/opp00001/factsheets/ipm.htm**

USGBC, Leadership in Energy and Environmental Design (LEED) – Existing Buildings: Operations and Maintenance Reference Guide, 2009.

http://www.facilitiesnet.com/groundsmanagement/article/Planting-the-Green-Seed--8935

EMI-1 Refrigerants

POINTS AVAILABLE **2**

AIM OF CREDIT

To encourage operational practices that minimize the environmental impacts of refrigeration equipment.

CREDIT CRITERIA

Minimum requirement	A gradual replacement policy shall be in place to replace all low ODP refrigerant (or equipment).
Refrigerants Impacts	1 point is awarded where at least 80% of total refrigerant mass serving the building is made up of low ozone depletion potential (ODP) refrigerants. AND The remaining or all of the refrigerant mass is subject to leak auditing and leak testing or a continuous leak detection system during the performance period. An additional 1 point is awarded where at least 80% of the total refrigerant mass serving the building is low global warming potential (GWP) refrigerants.

Where no refrigerants are used in the building, both points above are awarded.

COMPLIANCE REQUIREMENTS

The scope of this credit includes air conditioning systems and building services refrigeration equipment. Appliances are not the focus of these criteria and are excluded from this credit.

As a minimum requirement a policy shall be in place that supports a gradual replacement programme as well as monitoring and maintaining leaks.

As a result of this policy, a plan shall be in place including as a minimum the following in order to be compliant.

- Perform an audit of the systems using refrigerants
- Date of planned replacement of each system not yet low ODP.

The first point can be achieved if the replacement policy is in place and at least 80% (of total refrigerant mass) has been converted to low ODP systems, with the remainder subject to annual leak audits / continuous leak detection.

The leak detection shall be done as follows:

- Perform leak auditing through record keeping of refrigerant purchases.

- Scheduled annual leak tests for each system or have a continuous leak detection system in place.

Only equipment with refrigerant mass larger than 3kg shall be required to have a leak detection auditing / system to be included in the calculation.

The last additional point can be achieved if at least 80% (of total refrigerant mass) of equipment operates on low GWP refrigerants.

Refrigerant Leakage

A process shall be in place to monitor the use of refrigerant and periodically inspect and test refrigeration systems to identify any possible leaks and repair them as soon as possible.

1. Leak auditing
    a. Log refrigerant use and leak test or repairs.
    b. Close records shall be kept in terms of refrigeration volume purchases during re-gassing, repairs and replacement of equipment in order to calculate any losses that may be due to leakages. Total leakages shall be maintained at less than 5% of the total mass per year during the performance period.
2. Leak test the systems once per year. The leak tests shall include basic visual inspection by a qualified technician and include the following
    a. Standing leak tests
    b. Oil residue checks
    c. Test evaporator section leaks
    d. Test condenser section leaks
    e. Suction or liquid line leaks
3. As an alternative to annual leak tests performed, an automatic leak detection system can be in place. This system to have the following in place
    a. Appropriately positioned refrigerant detectors depending on the type of refrigerant detected.
    b. An electronic monitoring unit connected to a BMS or alarm system that will provide a signal when one of the detectors picks up a leak signal.

DOCUMENTATION REQUIREMENTS

Submit all evidence and ensure it readily confirms compliance; also complete online submission template/check list:

1. **Policy** with respect to gradual replacement of refrigerants
2. **Short Report** as a result of an audit to survey the refrigeration equipment indicating
    a. Schedule of systems using refrigerants
    b. Type of refrigerant for each system with their respective ODP and GWP ratings

c. Mass of refrigerant for each system

d. Summary of total low ODP and low GWP vs total refrigerant mass

e. Summary of total refrigerant mass with leak detection vs total mass number of systems above 3kg.

f. Service reports for automatic leak detection systems

3. Logging results

a. Summary of Records of refrigerant volume purchased during the performance period and leakage calculation

b. For each system

i. Total Refrigerant Charge

ii. Refrigerant additions to the system

iii. Refrigerant removals from the system

iv. Leak tests

v. Follow up actions

vi. Testing of automatic leak test systems where fitted

4. **Short report:** Proof of annual leak detection inspections or proof of automatic detection systems in place.

ADDITIONAL GUIDANCE / RESOURCES

The table below provides ODP & GWP levels for some commonly used refrigerants and gasses.

Refrigerant/Gas	Global Warming Potential (GWP100)	Ozone Depletion Potential (ODP)
R11	4000	1.0
R12	8500	0.83
R22	1700	0.05
R134a	1300	0
R407c	1600	0
R410a	1900	0
R290 (propane)	3	0
R600 (butane)	3	0
R1270 (propene)	3	0
Ammonia	<1	0
Halon 1211	1300	3
HFC227ea (FM200)	2900	0
IG541	0	0
CO_2	1	0
Air	0	0
Water	<1	0

Table Emi-1.1: *ODP & GWP of some common refrigerants and gases*

EMI-1 Refrigerants

POINTS AVAILABLE **2**

Examples of refrigerant logs can be found on

http://www.realskillseurope.eu/real-skills-europe-toolbox

The example below is for additions and removals of refrigerants per system in order to calculate net loss.

Additions and Removals of Refrigerants:						
Date (dd/mm/yy)	**Technician/ Company**	**Amount Added (kg)**	**Amount Removed (kg)**	**Net Loss (kg)**	**Type of Repair**	**Reason for Addition or Removal (note faulty components and record repair actions or what was done with recovered refrigerant)**
05/11/2005	Tech 1/ RSE	18.0	13.5	4.5	Minor	Condenser leak (faulty brazed joint) Repaired. Refrigerant re-used
18/03/2007	Tech 1/ RSE	4.0		4.0	Minor	Leaking flare joint - tightened to correct torque
09/08/2007	Tech 2/ RSE	22.0	5.0	17.0	Major	Compressor housing cracked - replaced compressor
05/03/2009	Tech 1/ RSE	1.4		1.4	Minor	Leaking Schrader valve (missing cap). Core tightened and capped.
06/09/2010	Tech 2/ RSE	0.3		0.3	Minor	PRV replaced during routine leak test
16/02/2011	Tech 3/ RSE	4.7	2.1	2.6	Minor	Faulty Service valve (leaky gland). Replaced

BACKGROUND

Refrigerants Impacts
Environmental impacts from refrigerants leaking into the atmosphere must be minimised as far as possible, due its high impact on the release of ozone depletion or global warming potential effect.

REFERENCES

- Green Star South Africa, Public & Education Building v1
- LEED EBOM, 2009 Edition
- Green Star Australia, GSA Draft Performance tool (submitted for board approval)
- UK, Department for Environment, Food and Rural Affairs, General Guidance, Guidance: F Gas and Ozone Regulations, Information Sheet GEN 5: Refrigerant Quantity, April 2012
- REAL Skills Europe F-Gas Log and Carbon Emissions Calculator Software tool

EMI-2 Legionella

POINTS AVAILABLE 1

AIM OF CREDIT

To recognise and encourage implementation and utilisation of a water management process with intention to minimize risks associated with Legionnaires' disease.

CREDIT CRITERIA

Risk Management	**0.5 points** are awarded where there is a process to manage overall risk presented by Legionnaires' disease during the performance period. Furthermore, it should be demonstrated that such a risk management process is monitored and reviewed regularly as per SANS 893 Part 1.
Control of Legionella in water systems	**0.5 points** are awarded where there is an effective programme for treatment and control of Legionnaires' disease in water systems during the performance period as per SANS 893 Part 2.

COMPLIANCE REQUIREMENTS / EVIDENCE

To comply with the requirements of this credit, the building owner must:

1. Implement a plan to manage risks associated with Legionnaires' disease within the premises. The risk management plan must address at least, the following categories:
    a. Communication and consultation
    b. Risk identification
    c. Risk analysis
    d. Risk evaluation
    e. Risk treatment
    f. Risk monitoring and review
2. Ensure that a programme for the control of Legionella in water systems is established during the performance period and implemented. For full compliance with this credit, the programme must address the following:
    a. Water system design
    b. Water system commissioning or re-commissioning
    c. Operation
    d. Maintenance

EMI-2 Legionella

POINTS AVAILABLE 1

DOCUMENTATION REQUIREMENTS

A completed submission template incorporating a checklist which indicates compliance with the risk matrix plan and treatment programme, accompanied by the following documents:

- **Risk management plan** document, that complies with the South African National Standard - SANS 893:2013 Edition 1 Part 1 *Risk Assessment (Legionnaires' disease)*
- **Implementation programme for the treatment and control** of Legionnaires' disease which complies with the South African National Standard - SANS 893:2013 Edition 1 Part 2 *The Control of Legionella in water systems*. Evidence must be attached, as proof that the programme has been implemented and complied with.

ADDITIONAL GUIDANCE / RESOURCES

Further guidance on ways to reduce the risk and prevalence of Legionella, can be found in the South African Bureau of Standards' SANS 893 Part 1 and 2 published in May 2013.

Managing Legionella in Hot and Cold Water Systems

What needs to be done:

Building owners should carry out a full risk assessment of their hot and cold water systems and ensure adequate measures are in place to control the risks.

Using temperature control

The primary method used to control the risk from Legionella is water temperature control.
Water services should be operated at temperatures that prevent Legionella growth:

- Hot water storage cylinders (calorifiers) should store water at 60°C or higher
- Hot water should be distributed at 50°C or higher (thermostatic mixer valves need to be fitted as close as possible to outlets, where a scald risk is identified).
- Cold water should be stored and distributed below 20°C.

A competent person should routinely check, inspect and clean the system, in accordance with the risk assessment.

Identify 'sentinel' outlets (furthest and closest to each tank or cylinder) for monthly checking of the distribution temperatures. Check the hot water storage cylinder temperatures every month and cold water tank temperatures at least every six months.

Stagnant water favours Legionella growth. To reduce the risk, remove dead legs/dead ends in pipe-work, flush out infrequently used outlets (including showerheads and taps) at least weekly and clean and de-scale shower heads and hoses at least quarterly. Cold-water storage tanks should be cleaned

periodically and water should be drained from hot water cylinders to check for debris or signs of corrosion.

Design systems to minimise Legionella growth, by:

- keeping pipe work as short and direct as possible;
- adequately insulating pipes and tanks;
- using materials that do not encourage the growth of Legionella;
- preventing contamination, e.g. by fitting tanks with lids and insect screens.

Additional controls

Water samples should be analysed for Legionella periodically to demonstrate that bacteria counts are acceptable. The frequency should be determined by level of risk, in accordance with the risk assessment.

Other control methods

Other methods to control Legionella include copper and silver ionisation and biocide treatments (eg chlorine dioxide). To ensure that they remain effective their application will need suitable assessment as part of the overall water treatment programme including proper installation, maintenance and monitoring

Adapted from (Source): Health and Safety Executive, http://www.hse.gov.uk

BACKGROUND

Legionnaires' disease is a common name for one of the several illnesses caused by Legionnaires' disease bacteria (LDB). Legionnaires' disease is an infection of the lungs and is a form of pneumonia. More than 43 species of Legionella have been identified and more than 20 linked with human diseases. Legionellosis is the term for the diseases produced by LDB. In addition to Legionnaires' disease, the same bacteria also cause a flu-like disease called Pontiac fever. – Extracted for the Website (www.osha.gov) of the United States Department of Labour, Occupational Health and Safety Administration

The World Health Organisation's report titled "Legionella and the prevention of Legionellosis" makes the following statement:

"According to published research, up to 70 percent of all building water systems are contaminated with Legionella, the bacteria that cause Legionnaires' disease - a serious but preventable form of pneumonia, as well as Pontiac Fever, a flu-like illness, which recently sickened more than 200 people as a result of the widely reported outbreak at the Playboy mansion. Together, these diseases are called Legionellosis.

Occupants in your buildings can become ill when they ingest or inhale water or aerosols contaminated with Legionella. In a health care setting, it can also be transmitted through respiratory devices.

EMI-2 Legionella

POINTS AVAILABLE 1

Although anyone at any age can contract Legionellosis, the people most at risk are smokers, the elderly, and individuals with impaired immune systems."

In South Africa, there is no source with statistical data to indicate the prevalence of Legionellosis. However, there has been isolated reports of the Legionellosis cases in the hospitality and mining industries, which suggests that there is need for better prevention and control the this disease.

REFERENCES

Guidelines for the control of Legionella in Manufactured Water Systems in South Australia, 2008 (Revised 2013)

South African Standard SANS 893:2013 Part 1 & 2 (Legionnaires' disease, Risk Management and The Control of Legionella in water systems)

South African National Standards SANS-241 (Drinking water)

ASHRAE Standard Project Committee 188 (SPC 188): Prevention of Legionellosis Associated with Building Water Systems

World Health Organisation report titled "Legionella and the Prevention of Legionellosis, 2007"

Health and Safety Executive, http://www.hse.gov.uk

EMI-3 Storm Water

POINTS AVAILABLE **1.5**

AIM OF CREDIT

To recognize site-related practices which limit the disruption of natural hydrology, minimize pollution and site deterioration.

CREDIT CRITERIA

Storm Water Management	0.5 points are awarded if a Storm Water Run-Off Management plan is implemented* that ensures that the site and hard surfaces are managed by infiltration, collecting and re-using storm water runoff of the precipitation falling on site (including the roof area) as well as filtering pollutants to reduce or eliminate contamination of ground water, streams and rivers. *Note – For PILOT projects only, this plan need not be implemented in the performance period, but must have been produced.
Storm Water Run-off Reduction	0.5 additional points are awarded when the following strategies for 15% portion of the site hard surfaces are applied: Reducing Paving Surfaces and increasing maintained landscaping or modify areas to open-grid pavement system (which is at least 50% pervious). OR 0.5 additional if the existing building site has impermeable site hard surfaces (hardscaping) that accounts for less than 5% of the site (excluding building footprint)
Storm Water Quantity	0.5 additional points are awarded where implementation of an annual inspection program of all storm water facilities to confirm continued performance, was done, where peak storm water flows are calculated and disclosed for the performance period and required maintenance that was assessed was implemented.

The 'Storm Water Run-off Reduction' portion of the credit is **'Not Applicable'** to areas where the ground conditions are such that infiltration needs to be avoided because of dolomite or similar conditions which can promote the formation of sinkholes

COMPLIANCE REQUIREMENTS

Storm Water Management Plan

During the performance period, implement a storm water management plan that identifies:

- Built environment and natural environmental elements with its constraints and problems.
- On-going operational targets- short term solutions and longer term solution to be implemented over a few years.
- Issues and causes of peak flows, erosion, pollution etc.

- Implementation of source control thereby reducing the generation of increased run-off
- Implementation of repairs, maintenance and stabilization

To comply herewith, the owner has to also implement an annual inspection program of all storm water management facilities to confirm continued performance. Maintain documentation of inspection, including identification of areas of erosion, maintenance needs and repairs. Perform all routine required maintenance, necessary repairs or stabilization within 60 days of inspection.

DOCUMENTATION REQUIREMENTS

Submit all evidence and ensure it readily confirms compliance; also complete online submission template/check list.	
Where Storm Water Management Plan is produced:	
Storm Water Management Plan	Plan that ensures that the site and hard surfaces are managed by infiltration, collecting and re-using storm water runoff as well as filtering pollutants to reduce or eliminate contamination.
Where Run-Off Reduction is claimed:	
Short report with referenced site plan showing extent of reduction and add photos to verify before end after scenarios	Show that strategy been applied to reduce the hard surface areas by landscaping and 50% pervious hard surfaces for at least 15% of the areas. Where points are claimed 'not applicable', provide signed confirmation from facilities manager or building owner that ground conditions are such that infiltration needs to be avoided.
Attach 'as built' **Site Plan** showing extent of site hard surfaces	Verify that less than 5% is impermeable surfaces
Where Storm Water Quantity points are claimed:	
Short Report of inspection been done during the Performance Period of all storm water facilities to show performance of run-off reduction	Report with table of calculations that shows how peak storm water flow reductions were calculated and disclosed for the performance period

Short Report (limit to 3 pages)

ADDITIONAL GUIDANCE / RESOURCES

To limit disruption of natural hydrology by reducing impervious cover, increasing on-site Infiltration, reducing or eliminating pollution from storm water runoff and eliminating contaminants, the following could be practical sequencing of interventions:

- Firstly, preserve and restore elements of Storm water System: natural channels, eroded vegetation embankments
- Secondly manage the quantity and quality of storm water near the source
- Thirdly install new treatment measures or rainwater harvesting systems.

The following as additional interventions could have further benefits to the building's environmental impact:

- Water reclamation can reduce potable water demand considerably;
- Properly managed storm water flows can prevent the increase in flood risk and watercourse erosion typically caused by urbanisation and provide important flow return to streams, offsetting the environmental impact of upstream water supply diversions and reducing the need for costly in-ground storm water infrastructure;
- The enhanced use of natural drainage corridors and depressions can provide open space, landscaped and recreational areas and conservation benefits increasing the amenity of new urban developments (multiple use corridors); and
- Treatment of storm water closer to source minimises uncontrolled discharge of water containing high suspended solids, nutrients and organic material.

Permeable paving materials, such as porous asphalt or porous concrete, are surfaces that mimic natural infiltration. Permeable surfaces can also be designed with a turf cell reinforcement structure or open-celled pavers, and concrete or plastic grids with voids that are filled with topsoil, growing medium or aggregate to ensure that vehicle or foot traffic can still use the area securely whilst surfaces remain permeable;
Landscaping also plays an integral role in the design of most storm water treatment systems, offering opportunities for their aesthetic incorporation in the surrounding area. The use of particular plants species is important since some species will be more effective in treating storm water and better suited for surviving the ambient conditions. Co-ordination between storm water engineers, landscapers and nurseries/growers is advised to ensure that the required plants are available for planting at the correct stage in the season and during the performance period.

BACKGROUND

Storm water in practice is channelled away from sites as rapidly as possible to the nearest watercourse, wetland or coastline without much consideration for quality. The necessity to deal with both the quantity and quality of runoff is recognised through the encouragement of groundwater recharge through infiltration, and for storage and reuse of runoff.

Storm water quantity
From an ecosystem perspective it is the high frequency of smaller floods that cause the most cumulative damage. In its natural state, a landscape will absorb the rainfall from normal rainfall and minor storm events but during heavier or longer rainfall events the rainwater begins to soak into the soil. In undeveloped natural areas the amount of rainfall that will soak into the soil depends on how deep it is and its absorption capacity (clay to sandy). Some water in the soil will be drawn up and lost through evaporation and the return of moisture to the air through evaporation from the soil and transpiration by plants. The remaining water will continue to seep into the water table. The ground water, once it reaches an impermeable layer, will slowly and continuously discharges into the watercourse. The vegetation along the watercourses which protects the soil against erosion has adapted to these conditions. Only after a number of showers in close succession or a period of extended rainfall will the soil reach saturation point and excess rainfall move across the surface as

runoff. The surface runoff is constantly dispersed and the energy dissipated by the vegetation cover until it reaches the watercourse or wetland. Damage to vegetation on the slopes and along the water course is usually limited and can recover between excessive storm events. In natural conditions it is normally only the infrequent large flood events that cause extensive damage to vegetation and soil. The vegetation recovers in the years between these events.

In developed areas however, the scenario changes: rainfall is collected on impervious surfaces, roofs, roads and parking areas and immediately concentrated into storm water pipes or surface channels. There is no vegetation to absorb the light showers, the surface is impermeable and there is no infiltration into the soil. Runoff is channelled to the nearest watercourse in a concentrated stream of high energy water. This means that every rainfall event results in a flood which results in damage to vegetation along the watercourse and soil erosion. Since every rainfall event results in a damaging flood within the watercourse there is no time for vegetation to recover and it is systematically removed and the exposed soil eroded.

Storm water quality

The contaminants mostly found in storm water can be grouped according to their water quality impacts:

- **Oils, grease and surfactants:** Rubber from tyres and oil and grease washed from road surfaces, domestic and industrial sites, plus surfactants from detergents used for washing vehicles, materials or surfaces are common sources of toxic pollutants in storm water.
- **Litter:** This includes organic waste matter, paper, cigarette buds, plastics, glass, metal and other packaging materials from paved areas in urban catchments.
- **Total Suspended solids:** Suspended solids have two main constituents: organic, primarily from sewage, and inorganic, primarily from surface runoff. Turbidity from suspended solids reduces light penetration in water, affecting the growth of aquatic plants. When silts and clays settle, they may smother bottom dwelling organisms and disrupt their habitats. Since metals, phosphorus and various organics are adsorbed and transported with these particles, sediment deposits may lead to a slow release of toxins and nutrients in the waterway.
- **Nutrients:** Potential sources of nutrients are:
  – Sewage overflows;
  – Industrial discharges;
  – Animal wastes;
  – Fertilisers;
  – Domestic detergents; and
  – Septic tank seepage.

Excessive amounts of nutrients, such as nitrogen and phosphorous, can promote rapid growth of aquatic plants, including toxic and non-toxic algae. This excessive growth and oxygen depletion can cause fish and aquatic organisms to die.

- **Oxygen demanding materials:** Sources of oxygen-demanding materials are biodegradable organic debris, such as decomposing food and garden wastes, and the organic material contained in sewerage. Biological and chemical oxygen-depleting substances can cause water-borne diseases and present serious health risks.

Additional Guidance Sources:

Georgia Storm water Management Manual PDF (2001)
http://www.georgiastormwater.org
Idaho Department of Environmental Quality (2005), Catalogue of Storm water Best Management Practices for Idaho Cities and Counties
http://www.deq.idaho.gov

REFERENCES

http://www.publish.csiro.au/nid/18/pid/2190.htm
SANS 1200: LE 1982 Storm water Drainage – Standardized Specification for Civil Engineering Works
http://www.sabs.co.za
Department of Water and Environmental Affairs (Water Quality)
http://www.dwaf.gov.za/Dir_WQM/default.asp
CSIR (2000), Guidelines for Human Settlement Planning and Design, Chapter 6, Storm water Management **http://www.csir.co.za/Built_environment/RedBook/**
Department of Environment and Water Resources (2002), Introduction to Urban Storm water Management in Australia. Canberra.
http://www.environment.gov.au/coasts/publications/stormwater/pubs/stormwater.pdf
South African Water Research Commission
http://www.wrc.org.za

Inn-1 Innovative Strategies and Technologies

POINTS AVAILABLE **10**

AIM OF CREDIT

This credit is to encourage and recognise pioneering initiatives, processes or strategies in sustainable building management and operations.

CREDIT CRITERIA

Up to two points are awarded for an innovation initiative where:

- The initiative improving environmental performance is a technology or process that is considered a 'first' in South Africa or in the World;

OR

- The initiative substantially contributes to the broader market transformation towards sustainable development in South Africa or in the World.

Points are awarded as follows:

- One point is awarded when either of the above is true for the South African market;

OR

- Two points are awarded when either of the above is true for the Global market

Up to ten innovation initiatives can be awarded points under this credit, but no individual initiative can achieve more than two points in this credit. Qualifying initiatives may achieve additional points in other Innovation Credits, however the maximum points available for any one building assessment under Inn-1, Inn-2 and Inn-3 is ten (in total).

DOCUMENTATION REQUIREMENTS

Short report prepared by a suitably qualified individual which describes how the Credit Criteria have been met by:

- Including a detailed description of each innovation initiative;
- Articulating the nature and magnitude of the environmental benefit achieved by the initiative(s);
- Referencing evidence and calculations, wherever appropriate, that supports all claims. and

Inn-1 Innovative Strategies and Technologies

POINTS AVAILABLE 10

- Including any evidence necessary to demonstrate that the innovation claimed is first in the world or in South Africa (must be in the form of extracts from a peer-reviewed publication or other research acknowledgement).

ADDITIONAL GUIDANCE

Innovation points are reviewed by the Assessors, awarded entirely at the discretion of the GBCSA, and any decision is final.

An Innovation submission must be a concise report that clearly articulates the nature and magnitude of the environmental benefit achieved by proposed initiative(s). The report must distinctly justify (and quantify whenever relevant) the environmental or advocacy benefits of the initiative. Submissions that are purely qualitative or unsupported by documented data will not be awarded Innovation points.

In reviewing the submission, the Assessors and GBCSA will consider the environmental benefit of the innovative initiative relative to existing Green Star SA – Existing Building PILOT credits where relevant.

The metric used to demonstrate environmental benefit must, where possible, be the same as the metrics used in Green Star SA.

Information provided within the Innovation Credit applications may be used by the GBCSA to review the existing credits and/or develop new credits.

BACKGROUND

Compared to peer nations in North America and Europe, less is spent on building research and innovation in South Africa. This credit recognises the value that changes in design, technology and processes can have, in terms of increasing occupant comfort and safety, and consuming fewer resources, and aims to reward organisations that seek to improve the built environment in a unique way.

REFERENCES & FURTHER INFORMATION

The Building Research Establishment Innovation Den
http://www.bre.co.uk/innovationden

The South African Government Department of Environmental Affairs & Tourism
http://www.environment.gov.za

Inn-1 Innovative Strategies and Technologies

POINTS AVAILABLE 10

The South African Government Department of Science & Technology (Research & Development Tax incentives)
http://www.dst.gov.za/r-d

The Council for Scientific & Industrial Research
http://www.csir.co.za/Built_environment/

Earthlife Africa
http://www.earthlife.org.za/

The Sustainable Energy Society Southern Africa
http://www.sessa.org.za/

Inn-2 Exceeding Green Star SA Benchmarks

POINTS AVAILABLE 10

AIM OF CREDIT

To encourage and recognise existing buildings that achieves environmental benefits in excess of the current Green Star SA benchmarks.

CREDIT CRITERIA

Up to two points are awarded where there has been a substantial improvement on an existing Green Star SA credit, as follows:

- One point for a solution that results in the elimination of the specific negative environmental impact of the project targeted by an existing credit; and
- Two points for a solution that results in a substantial (e.g. 5% or greater above 'neutral') restorative environmental impact targeted by an existing credit.

Up to ten innovation initiatives can be awarded points under this credit, but no individual initiative can achieve more than two points in this credit. Qualifying initiatives may achieve additional points in other Innovation Credits, however the maximum points available for any one building assessment under Inn-1, Inn-2 and Inn-3 is ten (in total).

DOCUMENTATION REQUIREMENTS

Green Star SA – Existing Building Performance PILOT
Submit all the evidence and ensure it readily confirms compliance.
1. Short report

Short report prepared by a suitably qualified individual which describes how the Credit Criteria have been met by:

- Including a detailed description of each innovation initiative;
- Identifying the credit for which the project claims to exceed the Green Star SA benchmark;
- Substantiating why exceeding the top benchmark has a positive environmental impact;
- Quantifying, consistent with the approach of the credit with the initial benchmark, the margin by which the benchmark is exceeded; and

Inn-2 Exceeding Green Star SA Benchmarks

POINTS AVAILABLE 10

- Referencing evidence and calculations, wherever appropriate, that support all claims.

ADDITIONAL GUIDANCE

Innovation points are reviewed by the Assessors, awarded entirely at the discretion of the GBCSA, and any decision is final.

An Innovation submission must be a concise report that clearly articulates the nature and magnitude of the environmental benefit achieved by proposed initiative(s). The reports must distinctly justify (and quantify whenever relevant) the environmental or advocacy benefits of the initiative. Submissions that are purely qualitative or unsupported by documented data will not be awarded Innovation points.

The metric used to demonstrate environmental benefit must, wherever possible, be the same metric as the one used in the Green Star SA – Existing Building Performance PILOT credit that is being exceeded. For example if the building significantly reduced potable water consumption the metric used might be 'in L/person/day'.

In reviewing the submission, the GBCSA will consider how many points are awarded for the credit being exceeded, the relative environmental benefits and relative score as compared to other Green Star SA – Existing Building Performance PILOT credits.

This innovation credit applies to:

- Existing Green Star SA credits with numeric benchmarks;
- Credits where the highest threshold within the credit is set below 95%; and
- Credits where exceeding the current Green Star SA benchmark would have an environmental benefit (e.g. a larger recycling waste storage area may not have additional benefit).

BACKGROUND

The Innovation Credit is designed to encourage and recognise environmental initiatives which go beyond existing benchmarks.

REFERENCES & FURTHER INFORMATION

The Building Research Establishment Innovation Den
http://www.bre.co.uk/innovationden

The South African Government Department of Environmental Affairs & Tourism
http://www.environment.gov.za

Inn-2 Exceeding Green Star SA Benchmarks

POINTS AVAILABLE 10

The South African Government Department of Science & Technology (Research & Development Tax incentives)
http://www.dst.gov.za/r-d

The Council for Scientific & Industrial Research
http://www.csir.co.za/Built_environment/

Earthlife Africa
http://www.earthlife.org.za/

The Sustainable Energy Society Southern Africa
http://www.sessa.org.za/

Inn-3 Environmental Initiatives

POINTS AVAILABLE 10

AIM OF CREDIT

To encourage and recognise sustainable existing building initiatives, processes or strategies that are currently outside of the scope of this Green Star SA rating tool but which have a substantial or significant environmental benefit.

CREDIT CRITERIA

One point is awarded where:

- An initiative implemented in the building viably addresses a valid environmental concern outside of the current scope of this Green Star SA tool.

Up to ten innovation initiatives can be awarded points under this credit, but no individual initiative can achieve more than one point in this credit. Qualifying initiatives may achieve additional points in other Innovation Credits, however the maximum points available for any one building assessment under Inn-1, Inn-2 and Inn-3 is ten (in total).

DOCUMENTATION REQUIREMENTS

Green Star SA – Existing Building Performance PILOT
Submit all the evidence and ensure it readily confirms compliance.
1. Short report

Short report prepared by a suitably qualified professional which describes how the Credit Criteria have been met by:

- Including a detailed description of each innovation initiative and proposed credit;
- Demonstrating that the proposed credit requirements have been met by the project;
- Justifying how this credit would be different to other existing Green Star SA credits, and why it deserves to be included in Green Star SA;
- Articulating the nature and quantifying the environmental benefit achieved by the initiative(s);
- Referencing evidence and calculations, wherever appropriate, that support all claims; and

Inn-3 Environmental Initiatives

POINTS AVAILABLE 10

- Following the format set out in the Green Star SA credits to:

– Identify the category that would hold this credit;
– Propose the Aim of the Credit; and
– Establish Credit Criteria and outline Documentation Requirements, based on research and comparison with other credits within that category, which would be sufficient for demonstrating compliance.

ADDITIONAL GUIDANCE

Innovation points are reviewed by the Assessors, awarded entirely at the discretion of the GBCSA, and any decision is final.

The significance of the environmental benefit of the nominated innovation must be calculated and clearly conveyed in the submission. This credit is aimed at initiatives that provide an environmental benefit and have not been addressed by existing Green Star SA – Existing Building Performance PILOT Credit Criteria.

An Innovation submission must be a concise report that clearly articulates the nature and magnitude of the environmental benefit achieved by proposed initiative(s). The reports must distinctly justify (and quantify whenever relevant) the environmental benefits of the initiative.

In essence, the report for this credit must advocate that the initiative(s) claimed for this credit be addressed by a new credit within Green Star SA.

It must be demonstrated that there is a quantified significant environmental benefit associated with the nominated innovation initiative and that it is clearly documented and integrated into the project.

Where this credit is claimed, projects must justify how this innovation initiative differs from other existing Green Star SA credits, and why it deserves to be included in Green Star SA. To do this, the initiative must meet the following criteria, at a minimum:

- Address a valid environmental concern;
- Be at or beyond ‘best practice’ for the current South African context;
- Be quantifiable and capable of being assessed without subjective interpretation; and
- Be robust.

BACKGROUND

All Green Star SA rating tools recognise initiatives that have the potential to reduce the environmental impact of the development. Some project initiatives will provide significant environmental benefits that are not currently addressed by Green Star SA – Existing Building Performance PILOT.

Inn-3 Environmental Initiatives

POINTS AVAILABLE 10

This credit is designed to recognise such innovative initiatives.

REFERENCES & FURTHER INFORMATION

The Building Research Establishment Innovation Den
http://www.bre.co.uk/innovationden

The South African Government Department of Environmental Affairs & Tourism
http://www.environment.gov.za

The South African Government Department of Science & Technology (Research & Development Tax incentives)
http://www.dst.gov.za/r-d

The Council for Scientific & Industrial Research
http://www.csir.co.za/Built_environment/

Earthlife Africa
http://www.earthlife.org.za/

The Sustainable Energy Society Southern Africa
http://www.sessa.org.za/