EWP - Energy Consumption

SCORE POTENTIAL **1-10**

AIM OF CREDIT

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

CREDIT CRITERIA

Minimum Requirement	To be eligible for any points in this credit, 12 months of historic energy consumption data for the building must be available.
Energy Performance	A score of 1-10 may be awarded where percentage reductions in energy consumption are achieved during the performance period. The score is awarded based on the level of the building's actual energy efficiency performance against benchmarks.

Performance period
Performance period relates to the continuous time period during which a credit is measured or data is collected. For Energy Water Performance (EWP) certification, the performance period is the most recent 12-month period of operations preceding the submission for certification.

The end of the performance period data-set should not be older than 3 months at the time of submission.

Note: the Energy and Water Data need not be from the exact same period, provided the point above applies.

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, for which points will be awarded.

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, signed verification from a utility metering contractor (outsourced or in-house) may be presented.

Collected energy data must cover the energy use associated with the whole building, including source information (e.g. Municipal, Solar, Diesel Generators etc.) 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 by using the average of the actual information available. A maximum of 3 months in the 12 month period may be interpolated.

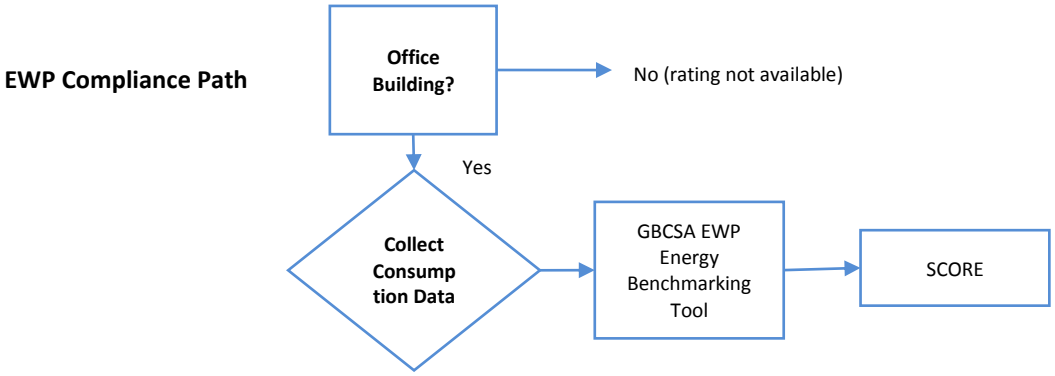
Energy use must include all building energy consumption; this could include but not be limited to:

- all common areas,
- air-conditioning and plant
- Vertical Transport

- Tenant sub-metered areas
- external lighting

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.

Figure 1. EWP Compliance Path flow diagram



<u>EWP COMPLIANCE PATH: GBCSA EWP ENERGY BENCHMARKING TOOL (office buildings)</u>:

EWP is the GBCSA's Energy Water Benchmarking Tool which can be accessed on the GBCSA's website (https://www.gbcsa.org.za/other-tools/energy-water-benchmark/).
The EWP Tool makes provision currently for office buildings only and, this tool must be used to benchmark your office building's performance.
The EWP 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 normalised for the following factors:

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

The building rating is positioned on a 10 level scale based on its performance relative to the benchmark. The calculator automatically translates the score achieved out of 10 to the number of points scored under this credit (out of 25) on the Energy Results tab.

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

1. Collect 12 months of energy consumption data

2. Benchmark office building using the EWP Tool (ensure that detailed inputs are completed, accounting for vacancy)

EWP Compliance Path Resources:

Resource	Description	Location
EWP Tool	Use to benchmark building performance	http://www.gbcsa.org.za/other-tools/energy-water-benchmark/
EWP Submission Templates (Energy & Water)	Use to submit project on Certification Engine	Certification Engine
EWP Technical Manual	Provide details on how to tackle EWP Tool	This document.
EWP Guidelines	Provide additional guidance / details on how to use benchmarking tool	http://www.gbcsa.org.za/other-tools/energy-water-benchmark/

EWP COMPLIANCE PATH POINTS:

For projects that follow through with a Green Star SA – Existing Building Performance rating, points are available from a EWP Benchmarking score of 5 and up. The table below illustrates how points are awarded based on % improvement on a EWP Benchmarking score of 5.5.

% Improvement over EWP score 5.5	ENE-1 Points
-12,0%	**2**
-7,1%	**3**
-2,3%	**4**
2,6%	**5**
7,5%	**6**
12,3%	**7**
17,2%	**8**
22,1%	**9**
26,9%	**10**
31,8%	**11**
36,7%	**12**
41,5%	**13**

46,4%	**14**
51,2%	**15**
56,1%	**16**
61,0%	**17**
65,8%	**18**
70,7%	**19**
75,6%	**20**
80,4%	**21**
85,3%	**22**
90,2%	**23**
95,0%	**24**
100,0%	**25**

Greenhouse gas emission factor data
The ultimate goal of this Tool 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 overleaf provides the kg CO_2 / kWh figures used in the calculator.

Table 1. CO2 emission of energy sources

Energy sources	**kg CO_2 / kWh**
Mains Electricity	1.2
Diesel	0.267
LPG	0.227
Natural Gas	0.202
Coal	0.354
Biogas	0.025
Town Gas (coal)	0.160

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

DOCUMENTATION REQUIREMENTS

EWP - Energy Consumption

SCORE POTENTIAL **1-10**

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

Criteria	Documentation
All	Completed Submission Template
EWP Compliance Path	• **Completed GBCSA 'EWP' Tool** Benchmarking Calculator (Offices) • Detailed input page to be completed and vacancies to be accounted for. • **12 consecutive months of electricity consumption data** (utility bills or meter readings signed off by contractor or facilities person responsible for meter readings)

Submit all evidence in the GENERAL folder and ensure it readily confirms compliance. Applicants must provide all documentation that supports their claims and calculations.

The following evidence is required in the General Folder to be assessed by Assessors: Energy Variance Factors such as:

Criteria	Documentation
Confirmation of building area (GLA)	• **Statement of confirmation** from the Building Owner Representative
Confirmation of number of occupants	• **Statement of confirmation** from the Building Owner Representative
Confirmation of occupancy hours	• **Statement of confirmation** from the Building Owner Representative
Confirmation of building address (linked to postal code)	• **Statement of confirmation** from the Building Owner Representative

ADDITIONAL GUIDANCE

Example of Simplified Normalising Method

Scaling factors are often employed to normalize variables to allow direct comparison between the baseline data and data of the building being rated. The typical formula for calculating scaling factors is shown below.

$$\textbf{Scaling factor}_{\textbf{Variable}} = \frac{\textbf{Value for Operating Variable for building to be rated}}{\textbf{Value for Operating Variable for Benchmark Buildings}}$$

Example – Operating hours

Benchmark Buildings = 80 hours

Building being rated = 85 hours

The calculation of scaling factor for Operating Hours will be:

$$\text{Scaling factor}_{\text{Operating Hours}} = \frac{85}{80} = 1.0625$$

This scaling factor can then be multiplied (or divided, depending on the application) to the comparison values to adjust it for comparison purposes. In some cases, the scaling factor will be applied to a portion (percentage) of the result due to the fact that the factor does not influence the total energy consumptions but only a portion. When this is applied, the logical methodology of why the scaling factor is applied to a certain percentage of the result is required.

It is understood that not all factors have a linear relationship with performance, but this simplified method is acceptable for the purpose of this tool.

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.

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.	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.	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.	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)	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	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 Water Performance (EWP) Tool *	

H1	Hotels larger than 50 rooms. Includes commercial kitchen facilities typically air conditioned.	The standard occupancy for this building type is assumed to be full occupancy 24 hours a day, 7 days a week.

*** Office – only building type able to use EWP certification**

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 may be implemented by Energy Service Companies (ESCos) to achieve electrical savings and obtain rebate payments from Eskom. *Note: Eskom reviews the program from time to time and it may be continued in future.*

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).

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.

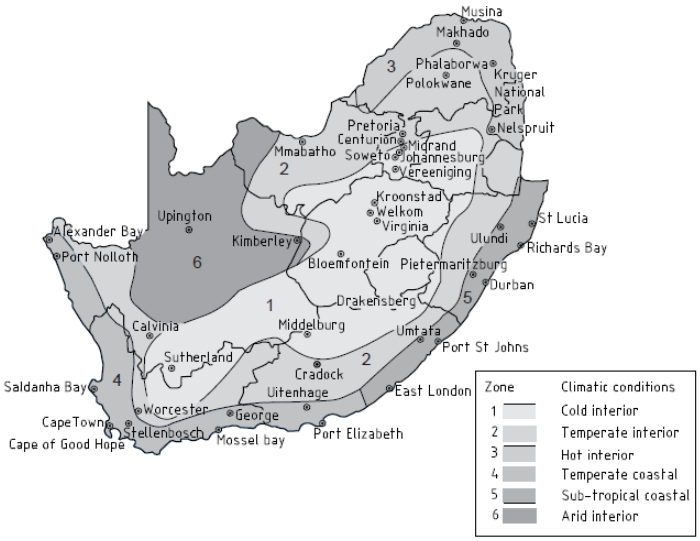
Table 2. SANS 10400-XA Maximum Energy consumption table (1)

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.							

*

* Office – only building type able to use EWP certification

Table 3. Climate Zone table (1)



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

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:

Green Star SA Existing Building Performance Technical Manual Version 1 – MAN-6: Ongoing Monitoring and Metering

ENERGY STAR benchmarking tools

http://www.energystar.gov/

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.

REFERENCES & FURTHER INFORMATION

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.
7. LEED, or Leadership in Energy & Environmental Design rating system by the U.S. Green Building Council (USGBC) http://www.usgbc.org/

TECHNICAL CLARIFICATIONS AND ERRATUM

There are currently no Technical Clarifications or Errata issued for this credit.