Energy Efficiency Planning Scheme Policy

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1 Introduction

This Planning Scheme Policy outlines ways an applicant can demonstrate compliance with the requirements of the **Energy Efficiency Code**.

2 Definitions

For the purposes of this Planning Scheme Policy, the following definitions apply.

Air Conditioning Efficiency Factor: the ratio of the Building Space Load divided by the electrical energy input (expressed in kilowatt hours per annum per square metre, kWh,a/m^2) of the proposed air conditioning plant.

Average Lighting Power Density: the average lighting power density given as Watts/m^2 of lit floor area representing the power demand of the proposed lighting design. The lighting power density is the sum of the lit areas of each development multiplied by their individual lighting power density limits divided by the total lit area of the building.

Building Occupation: a development is deemed to be occupied when at least 60% of the leasable space has been occupied. Where the building is not fully occupied, the compliance report is to allow for partial occupation, demonstrate methodology, and justify reasons for adjustment.

Building Space Load: the total annual heat load (expressed in kilowatt hours per annum per square metre, kWh,a/m^2) that must be removed or added to a building interior by mechanical plant, such as air conditioning, to maintain specified conditions. This figure excludes loads which are attributed directly to the air conditioning system itself, ie fresh air cooling/heating, fans, chillers, boilers and pumps.

Circuit Efficacy: the circuit efficacy of a lighting circuit is the initial (100 hour) lumen output of the lamps, divided by circuit watts and including losses due to ballasts and other ancillary gear.

East facing: walls and glazed areas facing more than 30° east of true north, and more than 30° east of true south.

Economic Initiatives: any initiative that is shown by a 'net present value' (or discounted cash–flow) analysis of life–cycle costs to provide pay–back within five years (refer to *AS45376—Life Cycle Costing—An Application Guide*). This calculation is to contain a sensitivity analysis of the discount rate, typically between 5% and 7%.

Energy Efficiency Compliance Certificate: the Energy Efficiency Compliance Certificate certifies that the stated energy efficiency measures have been installed and documents the performance of the building.

Energy Efficiency Report: the Energy Efficiency Report certifies that energy ratings have been undertaken in accordance with the Energy Efficiency Code and Planning Scheme Policy and that the information contained in the EPS is correct.

Energy Performance Statement: the Energy Performance Statement (EPS) documents compliance with the requirements of the Energy Efficiency Code and Planning Scheme Policy by the provision of the information in *Table 1* of the Planning Scheme Policy.

Greenhouse Target: a single number used to quantify a building's or building system's greenhouse gas generation potential. It is expressed as tonnes of carbon dioxide per annum per square metre (tonnes CO_2/am^2) unless described otherwise. The greenhouse target is derived by applying the CO_2 generating coefficient of 0.9803 kgCO_2/kWh electricity.

North facing: walls and glazed areas facing within 20° west and 30° east of true solar north.

North Point: in any discussion relating to orientation of a building or part of a building, a reference to north is a reference to true solar north. True solar north varies from magnetic north depending on the location. In Brisbane, magnetic north is approximately 11.5 degrees east of true solar north.

Overall Thermal Transmission (OTT) Factor: the overall thermal transmittance of the building envelope. Calculated in accordance with ASHRAE Standard, *ASHRAE/IES 90.1—1989*, Section 8.4.1. The overall thermal transmittance of the building envelope assembly is calculated in accordance with the following equation:

$U_0 = \sum U_I A_I / A_0$

$= (U_1A_1 + U_2A_2 + ... + U_nA_n)/A_0$

where

U_0 = the area–weighted average thermal transmittance of the gross area of an envelope assembly, i.e. the exterior wall assembly including fenestration and doors, the roof and ceiling assembly, and the floor assembly—$W/m^2 °C$

A_0 = the gross area of the envelope assembly—m^2

U_I = the thermal transmittance of each individual path of the envelope assembly i.e. the opaque portion or the fenestration—$W/m^2 °C$

U_I = $1/R_I$ (where R_I is the total resistance to heat flow of an individual path through an envelope assembly)

A_I = the area of each individual element of the envelope assembly—m^2.

For a worked example refer to Council's **Technical Guidelines for Assessing Energy Efficiency**.

Shaded Portion of Glass: the minimum proportion of glass shaded by external shading devices during the months of December, January and February from 10am to 4pm.

Shading Coefficient of Glazing: the ratio of solar heat entering through a specified window or glazing compared to unshaded clear glass.

Specialist Task/Function Lighting: special purpose lighting requiring illuminance on the task of 1,000 lux or more.

Specified Conditions: conditions in air conditioned spaces are not to exceed 24°C and 50% relative humidity, or be less than 21°C and 30% relative humidity for the period 8am to 7pm from Monday to Friday.

'TRY' Weather Data: hourly weather data for a year for use in simulation of the performance of active and passive solar energy systems, building energy systems and indoor climate calculations (Reference: Test reference year weather data described by CSIRO as having been determined as representative of the climatic region is available from ACADS).

West facing: walls and glazed areas facing more than 20° west of true north, and more than 20° west of true south.

3 Documentation to be submitted

3.1 What to submit

This section outlines information that is to be submitted with any development application for commercial, retail or hotel use where gross floor area is greater than 2,500m^2. Each application is requested to submit the following:

- an Energy Performance Statement (EPS)
- an Energy Efficiency Report (refer to Council's **Technical Guidelines for Assessing Energy Efficiency** for a pro forma of this report)
- an Energy Efficiency Compliance Certificate to be submitted within 60 days of completion of the first year of Building Occupation (refer to Council's **Technical Guidelines for Assessing Energy Efficiency** for further detail).

3.2 How to comply

Energy Performance Statement

Each application is to provide an Energy Performance Statement (EPS). A summary of the appropriate information for each type of development is provided in *Table 1*. An EPS is to demonstrate satisfactory compliance with the intent and performance criteria for the relevant type of development.

The contents of an EPS are to show how the project meets the objectives of the **Energy Efficiency Code**, including but not necessarily limited to the following:

- a description of all options considered and the reasons for selecting the chosen option
- energy consumption for all base building central energy–consuming equipment installed as part of the development, including fuel type and time of use, are to be itemised
- average lighting power densities for each of the functional area types, including office, lobby, circulation, etc. but excluding tenancies, are to be scheduled
- a description of the air conditioning plant, including filtration. Where high efficiency filtration will use outside air quantities of less than those specified in *AS1668.2—The Use of Mechanical Ventilation and Air Conditioning in Buildings—Mechanical Ventilation for Acceptable Indoor Air Quality*, modelling is to be submitted for scenarios with and without such filtration.

Subject to any special conditions being requested under Section 5, each application that addresses the Purpose and Performance Criteria of the **Energy Efficiency Code** will have deemed to comply.

Energy Efficiency Report

An Energy Efficiency Report is to be submitted certifying that the energy ratings have been undertaken in accordance with this Planning Scheme Policy and the information contained in the EPS is correct. The report is to be certified by a suitably qualified consultant (refer to Council's **Technical Guidelines for Assessing Energy Efficiency** for a pro forma of this report).

Energy Efficiency Compliance Certificate

All projects will be requested to submit a compliance certificate prepared by a suitably qualified consultant, within 60 days of completion of the first year of building occupation. The Energy Efficiency Compliance Certificate is to certify that the stated energy efficiency measures have been installed and the building operates to predicted performance (refer to Council's **Technical Guidelines for Assessing Energy Efficiency** for further detail). If the compliance certificate reveals that the proposed measures have not been installed, Council will request details of how the management of energy issues is to be addressed.

Audit procedures by Council

Council intends to undertake audits of commercial, retail and hotel buildings to randomly check compliance with the provisions of the **Energy Efficiency Code**.

4 Energy assessment techniques

The assessment techniques required by the **Energy Efficiency Code** to determine building, lighting and air conditioning energy loads and efficiencies are described in technical terms in Section 2—Definitions. This section attempts to describe these techniques in simple terms.

Worked examples are provided in Council's **Technical Guidelines for Assessing Energy Efficiency** for Overall Thermal Transmission, Average Lighting Power Density and Daily Solar Heat Entry through Glazing. Indicative Lighting Efficacies are also outlined.

Overall Thermal Transmission (OTT) factor

This factor describes the overall thermal transmission characteristics of the external structure and skin of the building averaged over the entire envelope. The area of each individual material is multiplied by its thermal transmittance factor.

The resultant number for each material, including roof floor, wall and glazing, is then added together and divided by the total area of the outside of the structure. The OTT that results is a single number expressed in watts per square metre per degree Celsius (W/m^2C). Energy efficient building envelopes are characterised by low OTT figures.

Building Space Load

Building Space Loads relate only to commercial office building and hotel projects over 2,500m^2 gross floor area. Building Space Load figures approximate the

Table 1 Compliance requirements for proposals over 2,500m^2 gross floor area(1)

Issues to be addressed in EPS	Retail buildings	Commercial office/hotels
Building design, materials and thermal properties	✓	✓
Minimum circuit efficacies	✓	✓
Average Lighting Power Density(2)	✓	✓
Lighting and control systems	✓	✓
Sun protection to reduce cooling loads	✓	✓
Daily solar heat entry though glazing	✓	✗
Air distribution and handling systems	✓	✓
Air Conditioning Efficiency Factor	✗	✓
Overall thermal transmission calculation	✓	✗
Building Space Load	✗	✓
Summary of computer modelling	✗	✓

(1) Alterations and additions of over 2,500m^2 gross floor area need to consider energy performance of both new and existing work, plant and equipment.

(2) Average Lighting Power Density is to be calculated excluding lighting for individual tenancies.

amount of energy used in a building for cooling and heating. Computer based thermal simulation programs are used by suitably qualified assessors.

Under the **Energy Efficiency Code**, the key feature of the calculations for this factor is that the non–construction related variables are standardised and weather data is specified. The Council's **Technical Guidelines for Assessing Energy Efficiency** include standardised figures for internal loads and conditions (people, lighting and equipment) and occupancy profiles (the way a building is used) for use in determining Building Space Load.

Building Space Load figures for different buildings can be directly compared ensuring that the comparisons are valid and do not 'penalise' buildings with atypical work practices, such as 24 hour operations where the tenant use of the building differs significantly from the average.

Lighting Efficiency

Maximising lighting efficiency starts from the premise of providing appropriate levels of indirect (or non–glare) daylight within a building.

Artificial light is to supplement natural light wherever possible during the day and ideally be sophisticated enough to adjust to different lighting levels in different areas due to distance from windows and changing external light levels due to time of day, orientation or weather variations. It will also vary to suit different uses in different areas.

In general, lighting design works backwards from determining the required lighting level or illuminance in an area (lux), the efficiency of the lamps and light fittings, and then determines how many fittings and lamps are needed in a given area to provide the desired levels. More efficient lamps and light fittings reduce the number required in any given area or lighting level.

Average Lighting Power Density

Average Lighting Power Density is the number of watts consumed by the lighting in any given space divided by the area of that space. It is expressed in watts/m^2.

Energy efficient lighting arrangements will use light fittings that efficiently direct the light to where it is needed and lamps with high light output per unit of energy provided, expressed as lumens per Watt, or lm/W. For example:

- incandescent lamps—approx 12–14 lm/watt
- ordinary fluorescent lamps—approx 72 lm/watt
- triphosphor fluorescent lamps—approx 92 lm/watt
- compact fluorescents—approx 70–80 lm/watt
- metal halide lamps—approx 70–120 lm/watt.

Using incandescent lamps to light a surface will need up to nearly eight times more energy to light a given area than with triphosphor fluorescent lamps, i.e. the average lighting power density will be nearly eight times greater.

Circuit efficacy

The circuit efficacy factor measures how much of the total energy provided to a lighting circuit is actually delivered to the lamps to be used for lighting and the efficiency of the lamps themselves (in the first 100 hours of lamp use) in converting the energy to light.

Some electrical devices associated with specific lighting types use energy to run the devices to control the lamps properly. The energy used to power these control devices is, therefore, not able to be converted into light energy by the lamps. For example, ballasts are used in fluorescent lights and transformers are required to step 240 volt power down to 12 volts for low voltage halogen lamps.

4.1 Computer energy modelling—commercial office buildings and hotels

Commercial office building and hotel applications are requested to provide evidence of computer modelling of predicted building space loads and air conditioning efficiency factors, and are to submit modelling runs based on:

- building form and fabric descriptions of the proposed structure as submitted to Council
- plant description and control strategies as per the submitted design
- internal casual heat loads and occupancy profiles used in the modelling as described for the building classification in Council's **Technical Guidelines for Assessing Energy Efficiency**.

The assessment system intends to allow full credit for passive design initiatives and energy–saving plant components, i.e. economy cycles and optimal start programs. It is important that control strategies and system components are also accurately represented and reported.

Non–airconditioned spaces may be excluded from the overall assessment. However, the methods employed for comfort control are to be stated for each area.

Energy modelling

The CSIRO–nominated TRY weather data for Brisbane Airport Monitoring Office is to be used in the calculation of all predicted energy loads. The simulation period is to be from day 1 to 365 inclusive.

The computer modelling and calculation method used is to be commercially available and satisfactorily evaluated, e.g. by the International Energy Agency's Building Energy Simulation Test and Diagnostic Method (BESTEST). Other methods approved by an authority recognised by Council may also be used.

Lighting

Lighting power densities for all areas are to be scheduled and included in the simulation. Specialist task/function related lighting is to be excluded from the assessment.

Emergency lighting components must comply with *AS2293.1—Emergency Evaluation Lighting for Buildings—System Design, Installation and Operation.*

5 Special conditions

Applicants may request an exemption or relaxation from the requirements of the **Energy Efficiency Code** where any of the following special conditions apply:

- site orientation, shape or other exceptional site conditions that significantly affect building energy targets
- where it is the view of an accredited consultant that the prescribed standard usage profiles in Council's **Technical Guidelines for Assessing Energy Efficiency** are inapplicable to the proposed development
- novel construction—where there are prima facie grounds for believing the prescribed assessment techniques do not address or reliably assess the performance of the construction being proposed
- heritage place—where new construction or renovation relates to a heritage place and the heritage values of the place would be diminished by compliance with the requirements of the Code.

Applicants are requested to provide the specified information outlined in Section 3. Approval may allow merit based assessment, subject to the provision of economic initiatives.