Our Ref : BCA BC 15.0.3
Date : 29 February 2008

CIRCULAR TO PROFESSIONAL INSTITUTES

NEW REQUIREMENT FOR ENVELOPE THERMAL PERFORMANCE OF RESIDENTIAL BUILDINGS

Objective

1 This is to inform qualified persons, developers and building owners of a new requirement for envelope thermal performance of all residential buildings, known as Residential Envelope Transmittance Value (RETV).

Background

2 The Envelope Thermal Transfer Value (ETTV) requirement does not apply to buildings that are designed to be naturally ventilated. However, it has become increasingly common for residential buildings to be air-conditioned, and thus there is a need to regulate the efficiency of their envelopes so that air-conditioning energy used can be minimized.

3 BCA commissioned a study in 2007 with a view to expanding the ETTV concept to residential buildings. As the air-conditioners in residential buildings are usually turned on at night, the envelope thermal performance standard was fine-tuned to apply specifically to the operating pattern of these residential buildings. This is given the name Residential Envelope Transmittance Value (RETV) to differentiate it from ETTV, which applies to buildings that primarily operate the air-conditioning system during the day.

New Requirements

4 For all residential buildings with a gross floor area of 2000m^2 or more, the RETV of the building, as determined in accordance with the formula set out in the Code on Envelope Thermal Performance for Buildings, shall not exceed 25 W/m^2. This requirement is deemed to be satisfied if the building with external walls of masonry construction, satisfies the following criteria:

WWR Bldg <0.3 and SC facade <0.7
Or
WWR Bldg <0.4 and SC facade <0.5
Or
WWR Bldg <0.5 and SC facade <0.43

Where:
WWR: Window to wall ratio
SC: Shading coefficient of fenestration = SCglass X SCshading device

5 For all non-residential buildings with an aggregate air-conditioned area of more than 500m2, the ETTV of the building, as determined in accordance with the formula set out in The Code on Envelope Thermal Performance for Buildings, shall not exceed 50 W/m2. This remains unchanged from the existing requirements.

6 We have combined ETTV and RETV guidelines into one Code of Practice called "The Code on Envelope Thermal Performance for Buildings" which can be downloaded from the BCA website, www.bca.gov.sg.

7 The revised Section I of the Approved Document is also attached as Appendix A.

Effective date

8 The RETV requirement for residential building as set out in the new Code will be applicable to all new developments with applications to URA for Written Permission made on or after 15 April 2008.

Pre-submission consultation

9 For any clarifications you may contact: -

Wong Jung Keen 63257389
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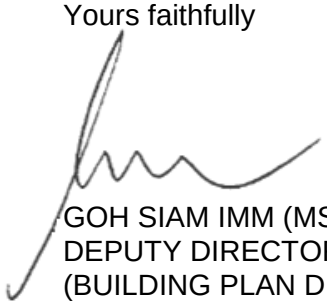
Dissemination to members

10 I would appreciate it if you could convey the contents of this circular to members of your organization.

11 Thank you.

Yours faithfully



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APPENDIX A

Revised Section I of the Approved Document, dated 29 Feb 08

I ENERGY EFFICIENCY

I.1 OBJECTIVE

I.1.1 The objective of paragraphs I.2.1 and I.2.2 is to facilitate efficient use of energy.

I.2 PERFORMANCE REQUIREMENT

I.2.1 A building shall be designed and constructed with energy conservation measures to reduce –

(a) solar heat gain through the roof;

(b) solar heat gain through the building envelope;

(c) air leakage through doors, windows and other openings on the building envelope;

(d) energy consumption of lighting, air-conditioning and mechanical ventilation systems; and

(e) energy wastage through adequate provisions of switching means.

I.2.2 Commercial buildings with a gross area of more than 500 m^2 shall be installed or equipped with means to facilitate the collection of energy consumption data.

I.3 ACCEPTABLE SOLUTION

I.3.1 The requirements in paragraphs I.2.1 and I.2.2 are deemed to be satisfied if the design and construction of a building comply with the specifications set out in paragraphs I.3.2 to I.3.8.

I.3.2 **Air-conditioned building**

I.3.2.1 For all residential buildings with a gross floor area of 2000m^2 or more, the Residential Envelope Transmittance Value (RETV) of the building, as determined in accordance with the formula set out in the "Code on Envelope Thermal Performance for Buildings" issued by the Commissioner of Building Control, shall not exceed 25 W/m^2.

I.3.2.2 The requirements in paragraphs I.3.2.1 are deemed to be satisfied if a residential building with external walls consisting of masonry construction, satisfies the criteria below:

$$WWR_{Bldg} < 0.3 \text{ and } SC_{facade} < 0.7$$
Or
$$WWR_{Bldg} < 0.4 \text{ and } SC_{facade} < 0.5$$
Or
$$WWR_{Bldg} < 0.5 \text{ and } SC_{facade} < 0.43$$

Where:
WWR: Window to wall ratio
SC: Shading coefficient of fenestration = SC_{glass} X $SC_{shading\ device}$

I.3.2.3 For all non-residential buildings with an aggregate air-conditioned area of more than 500$m^{2,}$ the Envelope Thermal Transfer Value (ETTV) of the building, as determined in accordance with the formula set out in the "Code on Envelope Thermal Performance for Buildings" issued by the Commissioner of Building Control, shall not exceed 50 W/m^2.

I.3.2.4 In respect of roofs with skylight, the roof thermal transfer value (RTTV) as determined in accordance with the formula set out in the "Code on Envelope Thermal Performance for Buildings" issued by the Commissioner of Building Control, shall not exceed 50 W/m^2.

I.3.2.5 In respect of roofs without skylight, the average thermal transmittance (U-value) for the gross area of the roof shall not exceed the limit prescribed in Table I1 for the corresponding weight group.

TABLE I1

Maximum thermal transmittance for roof of air-conditioned building

Weight group	Weight range (kg/m^2)	Maximum thermal transmittance ($W/m^{2\circ}K$)
Light	Under 50	0.5
Medium	50 to 230	0.8
Heavy	Over 230	1.2

Note: *1* *The requirements in paragraphs I.3.2.1 to I.3.2.3 apply to buildings with a gross floor area exceeding 500 m^2.*

2 *In the case of semi-detached, terraced and linked houses, each unit of the semi-detached, terraced or linked houses is construed as a building for the purpose of the above note (1)*

I.3.3 **Non air-conditioned building**

I.3.3.1 The thermal transmittance (U-value) of the roof, as determined in accordance with the formula set out in the "Code on Envelope Thermal Performance for Buildings" issued by the Commissioner of Building Control, shall not exceed the limit specified in Table I2 for the corresponding weight group.

TABLE I2

Maximum thermal transmittance for roof of non air-conditioned building

Weight group	Weight range (kg/m^2)	Maximum thermal transmittance ($W/m^{2\circ}K$)
Light	Under 50	0.8
Medium	50 to 230	1.1
Heavy	Over 230	1.5

Note: *1* *The requirement in paragraph I.3.3.1 does not apply to the following –*

(a) *buildings with a gross floor area not exceeding 500 m^2;*

(b) *open-sided sheds;*

(c) *linkways;*

(d) *covered walkways;*

(e) *store rooms and utility rooms; and*

(f) *plants and equipment rooms.*

2 *Where a building is partially air-conditioned and the aggregate air-conditioned area is less than 500 m^2, the requirement in paragraph I.3.3.1 shall apply if the total gross floor area of the building exceeds 500 m^2.*

I.3.4 **Air tightness and leakage**

I.3.4.1 All windows on the building envelope shall not exceed the air leakage rates specified in SS 212 – Specification for Aluminium Alloy Windows.

I.3.4.2 Where the door opening of any commercial unit is located along the perimeter of the building envelope, that unit shall –

(a) be completely separated from the other parts of the building; and

(b) has its air-conditioning system separated from and independent of the central system.

Note: *1* *The requirements in paragraphs I.3.4.1 and I.3.4.2 do not apply to non air-conditioned buildings.*

2 *The requirement in paragraph I.3.4.2 also applies to commercial units, the doors of which open into an exterior open space, external corridor, passageway or pedestrian walkway.*

I.3.5 **Air-conditioning system**

I.3.5.1 Where the cooling capacity of any air-conditioning system exceeds 30 kW, the equipment shall comply with the relevant provisions of SS CP 530 - Code of Practice for Energy Efficiency Standard for Building Services and Equipment.

I.3.6 **Artificial lighting**

I.3.6.1 The maximum lighting power budget in a building shall comply with SS CP 530 - Code of Practice for Energy Efficiency Standard for Building Services and Equipment.

I.3.7 **Switching control**

I.3.7.1 Air-conditioning system shall be equipped with manual switches, timers or automatic controllers for shutting off part of the air-conditioning system during periods of non-use or reduced heat load.

I.3.7.2 Lighting control for artificial lighting shall be provided in accordance with SS CP 530 - Code of Practice for Energy Efficiency Standard for Building Services and Equipment.

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I.3.7.3 In any hotel building, a control device acceptable to the Commissioner of Building Control, shall be installed in every guestroom for the purpose of automatically switching off the lighting and reducing the air-conditioning when a guestroom is not occupied.

I.3.8 **Energy auditing**

I.3.8.1 For buildings used as offices, shops, hotels or a combination thereof, suitable means for the monitoring of energy consumption shall be provided to all incoming power supply to a building and the sub-circuits serving –

(a) a central air-conditioning system;

(b) a major mechanical ventilation system;

(c) a vertical transportation system;

(d) a water pumping system;

(e) the general power supply to tenancy areas;

(f) the general lighting supply to tenancy areas;

(g) the general power supply to owner's premises; and

(h) the general lighting supply