Module 4 Part 4

MS1525: 2019 Clause 10.0 Building Energy Performance

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10 Building energy performance

10.1 Scope of building energy simulation method

The building energy simulation method is a performance based approach to compute the predicted energy use of buildings

10.2 The building energy simulation should be performed twice.

1. Base (Compliance to MS1525)
2. Design

The design building shall be modelled accurately from the architectural design drawings available.

10.4 The base building shall be modelled as the model assumed for deriving the building OTTV with the following characteristics:

a) same floor area as the design building;

b) same number of floors as the design building;

c) same function (internal load) as the design building; and

d) complying with the minimum requirements for OTTV, RTTV, Roof U-value, Lighting and ACMV components and equipment under Clauses 5, 6, 7, and 8.

Must Meet MS1525

As Designed

a) same floor area;
b) same number of floors;
c) same function (internal load);
d) Same weather;
e) Same population and;
f) working hours

10.4.1 The base building shall be as functional as the design building and shall share all the same characteristic of the design building with the exception of the following:

a) building envelope;
b) lighting, daylighting and lighting control; and
c) ACMV system.

NOTES:

Other parameters such as population, working hours and building function shall remain the same for both the design and base buildings.

10.5 Simulation programmes

The simulation programme should include calculation methodologies for the building components being modelled and incorporate the following:

a. a minimum of hourly variation in occupancy, lighting power, miscellaneous equipment power, thermostat set-points, and ACMV system operation, defined separately for each day of the week and holidays;
b. thermal mass effects; and
c. sufficient thermal zone to model the design building.

NOTE.
The simulation program should have a report such as ANSI/ ASHRAE 140, CIBSE Applications manual AM11 or equivalent and the report should be furnished by the software developer.

10.5.2 Climatic data

The simulation program should perform the simulation using a Test Reference Year weather data that consist of, at least, hourly values of climatic data, such as temperature and humidity from representative climatic data, for the city in which the design building is to be located. For cities or urban regions with several climatic data entries, and for locations where weather data are not available, the designer should select weather data that best represent the climate at the onstruction site, but should not be more than 300 km away of a design location and be of similar altitude and land/cityscape.

10.6 Compliance

Compliance will be established if:

a) the design building annual energy use, does not exceed the base building annual energy use as calculated by the same simulation programmes; and

b) the energy performance rating for equipment or components specified in the design building are not less than the rating used to calculate the base building energy consumption.

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10.7 Exceptional compliance

10.7.1 Utilisation of on-site renewable energy sources (such as photovoltaic) or site-recovered energy, is encouraged. The annual energy consumption of the design building is permitted to be reduced by subtracting 100 % of the annual renewable energy or site-recovered energy utilised.

10.7.2 If the on-site renewable energy sources or site-recovered energy sources meet or exceed the energy used by the design building as simulated as per the requirement here, modelling or simulation of the base building need not be performed.

Building Energy Intensity is used to gauge the energy efficiency of a building based on the building floor space.

It is a measurement of the building's annual energy consumption (kWh/yr) divided by it's gross floor area (GFA in m^2).

GFA to follow the definition by DBKL.

BEI FORMULA

$$BEI = \frac{\text{Building Energy Consumption (kWh/yr)}}{\text{Gross Floor Area (m}^2\text{)}}$$

Building energy consumption shall include all landlord and tenants usage including installations that serve the whole building *except car parks* and Data Centre Equipment.

Gross Floor Area (GFA) shall exclude car park areas and Data Centre Room.

$$BEI = \frac{(TBEC - CPEC - DCEC)}{GFA_{\text{excl. carpark}} - DCA - GLA \times FVR} \times \frac{52}{WOH}$$

This formula is to be applied for office buildings only where the operating hours is based on 52 hours per week.

The term 52/WOH is used to normalise the operating hours for buildings with different operating hours to ensure an 'apple-to-apple' comparison.

However, normalisation should be only for operating office hours within 8.00am to 6.00pm daily. Outside of these 'solar-affected' hours, the actual energy use should be measured and excluded from the BEI computation.

Examples A:

1) Office operating 55 hours/wk

2) Office operating 48 hours/wk

1) WOH = 55. Then $WOH_{norm} = \frac{52}{55} = 0.945$

2) WOH = 48. Then $WOH_{norm} = \frac{52}{48} = 1.083$

WOH shall be during "*solar hours*"

And within **38** to **62** hours/wk

WHY SO ?

FVR is the weighted floor vacancy rate of a building's GLA. The FVR (%) of GLA is equal to the non-occupied lettable area divided by the GLA

The FVR in the BEI formula is applied at the CVA stage to take into account the actual reading affected by vacancy.

At Design Assessment stage, full occupancy (i.e. **FVR = 0%**) is to be assumed.

THANK YOU

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