

Developing A Comfortable and Energy Efficient Government's Office Building Design

[A Collaborative Research between Building Technology & Innovation Section, Architectural Branch, JKR and Environmental Building Research Group]

1.0 ABSTRACT AND PROBLEM STATEMENT

JKR has over the years become the driving forces on development and construction of government buildings such as government office buildings, schools, police stations and residential quarters for government staff. JKR has design standard office building for government since 1960's and currently some buildings for government office were also design by appointed consultants.

The current trends on office building design worldwide has shifted on office that is not only efficient and environmental friendly but also provides high level of comfortable and user response space layout to suite to new office space usage. Thus the future standard for government office building design must be responsive with dynamic works environment focusing on the whole building design solution, which are comfortable, energy efficient and create productive environment.

The question is, does the government office design is comfortable for employee? In providing comfortable works area, are office buildings designs with Energy Efficient criterion?

Studies shows current office building in Malaysia consumes high energy with average Building Energy Index (BEI) of 200 to 300 kWh/m²/yr, whereas the BEI between 65 to 135 kWh/m²/yr is achievable if the building were design with high consideration on climatic and energy efficient consideration as demonstrated by GEO in Bangi and LEO Building in Putrajaya.

In hot and humid climates like in Malaysia, exploiting natural sunlight have draw back of increasing heat gain into the building, which in turn increases the use of air-condition load if designer does not carefully understood the impact of solar radiation. Use of daylighting is not considered as an important design criterion in most government buildings. The main reason is the misconception of differentiating sunlight and daylight characteristics.

Generally sunlight transmit solar heat gains but proper daylight do not consist of heat gain. Direct use of natural light (sunlight & daylight) builds direct solar heat gain and glare on the office occupants. Furthermore high cooling load and energy consumption are unresolving issues that bear by the building owner.

Although there were effort to protect direct solar radiation by introducing shading device, there are little guideline can be found. Some previous researches studied the impact of solar shading, window size and room geometry on building daylight distribution and energy consumption as demonstrated by Zain-Ahmad, 2002; Sharifah and Sai, 2004; Ossen, 2005; Loutzenhiser et al., 2007; Havid et al., 2008; Lim et al., 2009}, however, the process of environmental research demonstrates the performances of building elements; they are not really applied the occupant comfortable in office building as a whole. So far, there is lack of focus of integrating the building system to fulfill building environmental performance requirements and occupant comfort.

This study investigates the effect of natural lighting on existing office building designs and the impact on occupant comfort as well as energy efficiency in office building. The research will begin with the investigation of a number of existing government offices. The study will be conducted using both social or field survey and computer simulation modeling software. The findings of the study will be

in the form of reports and guideline for building designer. The proposed office building design guideline will not only comply with the MS: 1525 building performance criterion but also look for innovative solutions appropriate for Malaysia climate and office space requirement today and in future.

2.0 RESEARCH ISSUES

- Current office building in Malaysia consumes high energy. Research shows office building in Malaysia have Building Energy Index (BEI) of 200 to 300 kWh/m²/yr, whereas the BEI between 65 to 135 kWh/m²/yr is achievable as demonstrated by GEO in Bangi and LEO Building in Putrajaya.
- Occupant comfort (thermal & visual) unintentionally neglected by most designers, thus occupant 'forces' to adjust their working area position to achieve comfortable settings.
- Lack of standard guideline for the designer to produce good and comfortable office building design and Energy Efficient building is believed among the reason for the two issues mentioned above.

3.0 OBJECTIVES

The objectives of the research include:

- To investigate current government office design layout and design profile in view to find out the level of daylighting & visual occupant comfort and energy Efficient Building.
- To identify critical criteria for daylighting & visual comfortable office and energy efficient office space, layout and design.
- To design a prototype office and other offices spaces that is comfortable and Energy Efficient.
- To prove and verify the above prototype design using computer simulation modeling.
- To produce design guideline for designers.

4.0 SCOPE OF STUDY

The study is confined to the following:-

- Study on a number of government office building typology design by JKR or private consultant.
- The main spaces studied will be typical officers' offices or rooms. Additional study may includes:-
 - Meeting or discussion rooms.
 - Open Plan Office.
 - Circulation spaces.
- Computer simulation modelings are also part of the study either to examine and verify several identified variables in office prototype design which will be a main criteria of good office design solutions.