THE EFFECT OF ORIENTATION AND PROPERTIES OF TINTED SOLAR CONTROL ON CONDUCTIVE HEAT GAIN THROUGH WINDOWS

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ABSTRACT

THE EFFECT OF ORIENTATION AND PROPERTIES OF TINTED SOLAR CONTROL ON CONDUCTIVE HEAT GAIN THROUGH WINDOWS

This is a field study to evaluate the effect of vertical glazing solar control materials on solar heat gain and OTTV of the building. A test cell located in the campus of UiTM Shah Alam is used as case study. Thermocouple type T was used to measure the surface temperature of the test cell wall and window facing north and west with five different types of solar control materials which are control system, system 4, system 5, system 6 and system 7. Thermocouples was attached at external and internal surface of windows that facing north and west. The data of surface temperature was recorded by automatic data logging system at an interval of 5 minutes for duration of 50 days. The solar heat gain was calculated and compare between the system and orientations where the calculation depends on thermal characteristics of the windows, there are the SC, VLT, SEA, SER and U-value. The difference of optical characteristics of solar control materials depends on its visible transmittance. The control system has highest VLT which is 89%; therefore it has the highest solar heat gain. While, system 4 has lower VLT which is 12.7%, so the solar heat gain is lower. The value of VLT for each system 5, 6 and 7 is 73.2%, 50.7% and 32.6%. Then, the value of OTTV is depends with the orientations of the building. North have lower OTTV value than the west. The system 5 has higher OTTV value for both orientations where north 21.7 Wm^{-2} is and west is 22.1Wm^{-2}. After that, follow by control system, at north is 20.28 Wm^{-2} and west is 20.56 Wm^{-2}. For system 6, at north the OTTV value is 20.4 Wm^{-2} and west is 20.8 Wm^{-2}. System 7 has 17.7 Wm^{-2} for OTTV value at north and 18 Wm^{-2} at west. Lastly, system 4 has the lower value OTTV where 15.2 Wm^{-2} at north and 15.4 Wm^{-2} at west.

CHAPTER 1

INTRODUCTION

1.1 Background

Better designs and constructions of building can improve the energy efficiency of buildings. There are many factors that should be consider such as orientations building and the configurations, thermo physical properties of the materials, roof and the colour of design, internal and external layouts for building envelope and lastly the locations of the cores [1].

Building envelopes can transfer thermal energy. The building envelope is the comprised of various parts such as flat and sloped roofs, facades, and walls. Hence, it is important for us to manage the energy efficiency by refer through heat transfer according to the function and requirements. Window is one of the building envelopes. It is designed for air ventilation and daylightning system in buildings. The lighting system consume about 25-35% of energy supplier to the building in commercial buildings [2]. Another function of window, it allows the solar radiation. Solar radiations that enter through the window provide daylight and also heat gain to the indoor of building.

According to Sujoy Pal *et. al.,* modeling of thermal performance building depends on the amount of solar radiation arriving at the building surface. The amount of heat flow within building interior is important for understanding and predicting its thermal behaviors [3]. Thus, in order to achieve energy efficiency in buildings, we