

A Study of Thermal Comfort in Laboratories in a Tropical Educational Institution

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ABSTRACT

This study investigates the relationship between thermal environment and the occupants' perception on thermal comfort in selected air-conditioned laboratories and natural ventilated workshops in an educational institution in Malaysia using subjective and objective assessments. Three fully enclosed air-conditioned laboratories and two natural ventilated workshops were chosen to investigate occupants' thermal perception and the impacts of the thermal environment to their productivity. Comparison of the predicted percentage of dissatisfied, preference, acceptability, general comfort, thermal sensations and the actual value tabulated from the questionnaire were presented. It was found that only Electrical Laboratory and Static & Dynamics Laboratory fell in comfort zone of ASHRAE Standard 55. The Molecular Bioscience was found to be too cold while the occupants in two natural ventilated mechanical workshops felt too hot. As a result, 91% of the respondents accepted the thermal environment in air-conditioned laboratory but still had 89% of the respondents preferred to be cooler. In natural ventilated workshops, 72% of respondents felt uncomfortable and hence 89% of the respondents preferred to be cooler. However, only 55% of the respondents dissatisfied to the thermal environment. For Static & Dynamics Laboratory and mechanical workshop 2, the percentage of dissatisfied and thermal sensation mean votes were similar to actual value. For the other three laboratories, the PPD value of electrical laboratory was 13.8% lower than APD while actual thermal environment was colder than predicted. The actual thermal environment of molecular bioscience laboratory was colder than predicted but APD value was equals to PPD. The APD value of mechanical workshop 2 was lower than PPD but the AMV value was only 0.1 difference to PMV. It could be concluded that the occupants in tropics had a higher tolerance than those in other climate but they preferred a cooler environment.

Keywords: Thermal Comfort, air conditioned, laboratories, natural ventilated, workshops, tropics, educational institution, air temperature, relative humidity, air velocity, surface temperature, mean radiant temperature, PMV, PPD, AMV, APD.