Development of Thermally Comfortable Paving Block Arrangement for Pedestrian Walkways

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Interlocking concrete block pavements are used to pave walkways, parking lots, roadside pavements, open spaces, religious places etc. where people used to walk. The pavements are subjected to heavy thermal loads during day time in tropical countries like Sri Lanka. Surface temperature of these pavements rise up to more than 50 degrees of Celsius during daytime. Maintaining surface temperature at a comfortable level is one of the key challenges that modern block pavers are facing.

To reduce the effect of temperature rise and maintain the thermal comfort, the behavior of the ICBP under different conditions need to be analyzed. Thermal behavior of interlocking concrete block pavement is mainly governed by the solar radiation. When the pavement is exposed to solar radiation the block gets heated. Several factors such as heat capacity, convection film coefficient, heat conductivity directly affect the temperature of the ICBP.

A finite element model was developed to predict the thermal behavior of the ICBP and the model was validated using obtained experimental data. The verified model was used to predict the thermal behavior of different arrangements. Simulation was done changing the physic of the block and also changing the laying arrangement of the block.

When the simulation was done for different conditions it is observed that,

- Increasing the gap does not affect significantly in reducing temperature
- Leaving the gap with air can reduce the temperature
- Block with vertical holes can be effectively used to reduce the temperature of top surface on pedestrian pavements.
- Change in the block size can be used effectively to reduce the surface temperature

Combination of above mentioned parameters were also simulated and the temperature reduction of selected combination was observed.

Keywords: interlocking concrete block, Thermal behavior, finite element model

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