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Assessment of heat island effect from different pavement designs

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In this study, the impacts of the different pavement materials on the overall temperature of the pavements adding to the long-term HI effect of the temperature fluctuation on the surrounding environment were investigated. Three different AC pavement designs (Design I, II and III) in the National Pingtung University of Science and Technology (NPUST) Expressway were implemented. The temperature data at different depths (20cm, 45cm and 60cm) during the hot summer season were logged. Their impacts on the surrounding environment were studied by comparing the temperatures at different depths of the three designs with the atmospheric temperatures. The results showed that Design II gained heat at a faster rate and produced higher temperatures, almost 50C warmer than the other designs immediately after the highest temperatures of the day. There was a significant difference in temperature change between Design II and the other designs, while the difference between Design I and III was less with the former showing slightly more rate and higher temperatures. Despite the higher temperatures in Design II during the day, all the designs cooled to similar temperatures during the night. Again, the release of heat was faster in Design II than any other design. When comparing the energy stored within the pavement designs, Design II indicated the highest amount. This shows that Design II had a lower solar reflectance hence the higher temperatures recorded under the same solar radiation condition. Design III recorded the least energy stored, an indication that its ability to reflect solar energy was higher than the two. In mitigating the heat island effect, pavements like Design III are of good help. Night temperatures are less affected since less heat will be stored in the pavement during the day, resulting to less heat released when the temperature drops.

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