The effect of shoe sole tread groove depth on the friction coefficient with different tread groove widths, floors and contaminants

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Abstract

Slipping and falling are common phenomena in both workplaces and our daily activities. The risks associated with slipping and falling are related to the materials of footwear/floor, contamination condition, and geometric design of the sole. Shoe soles of various tread design are very common. Tread pattern of the shoe affects friction especially under liquid-contaminated conditions. Verification of the effects of tread groove depth is significant in assisting designers in designing proper footwear for workers exposed to slippery floor conditions. In this study, we measured the friction coefficients using the Neolite footwear pads on the terrazzo, steel, and vinyl floors under three liquid-contaminated conditions. A Brungraber Mark II slipmeter was used. The footwear pads had tread grooves with a width of either 3 or 9 mm. The depth of the tread grooves ranged from 1 to 5 mm. The results showed that tread groove depth affected the friction coefficients significantly. Higher friction values were recorded for footwear pads with deeper tread grooves on wet and water–detergent-contaminated floors. The averaged coefficient of friction (COF) gain per tread groove depth increase in millimeter under these two surface conditions ranged from 0.018 to 0.108, depending on the tread groove width, floor, and contaminant.
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