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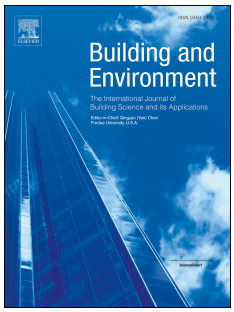

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Dynamic meshing modelling for particle resuspension caused by swinging manikin motion

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Abstract

Human-induced wake flow characteristics and its impact on particle re-dispersion from the floor was investigated by performing CFD simulations of a moving thermal manikin model. The manikin moved with realistic kinematic motion which included swinging arms and legs. This was performed using dynamic-meshing which updated the grid with each time step to represent the manikin motion. The wake flow and fluid dynamics generated from three walking speeds (0.8m/s, 1.2m/s and 1.8m/s) were compared. Particle transport from the floor and its re-dispersion was tracked by the Lagrangian approach. The results showed that the flow field had a strong dependence on the walking motion. For example the flow behind the body showed a downwash flow originating from the head, at mid-height the flow followed the manikin, and at the leg and feet, there was slight upwards flow. At the front of the body, flow streamlines showed the flow was pushed out and was pulled back around the body into the wake. These flow patterns provided the basis for particle re-suspension from the floor and dispersion through the air. After the manikin stopped walking, the wake continued forwards and passed over the manikin body. When the wake momentum dissipated, thermal plume effects became significant which influenced the airborne particles to spread over time. The particle concentration entering the frontal zones of the body during the walking was evaluated to show the level of occupants exposure to contaminants.

Keywords: Computational Fluid Dynamics; Wake Flow; Particle Dispersion; Human Walking; Lagrangian Approach

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