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Computation of particle detachment from floors due to human walking BASMAN ELHADIDI, Syracuse University, EZZAT KHALIFA, Syracuse University — A computational model for detachment of fine particles due to the unsteady flow under a foot is developed. As the foot approaches the floor, fluid volume is displaced laterally as a wall jet from the perimeter of the contact area at high velocity and acceleration. Unsteady aerodynamic forces on particles attached to the floor are considered. Results show that the jet velocity is $\sim$40 m/s for a foot idealized as a 15 cm circular disk approaching the floor at 1 m/s with a final gap of 0.8 mm. This velocity is sufficient to detach small particles (1$\sim$ μm). The flow accelerates at $\sim$400 m/s^2 which affects the detachment of larger sized particles ($\sim$100 μm). As the disk is brought to rest, the unsteady jet expands outwards, advecting a vortex ring closely attached to it. At the disk edge, a counter rotating vortex is generated by the sudden deceleration of the disk. Both vortices can play a role in entrainment of the suspended particles in the flowfield. Numerical studies also show that the maximum jet velocity is $\sim$20 m/s for a simplified foot immediately after heel contact in the stance phase of the gait.

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