Airflow characteristics and pollution distribution around a thermal manikin - Impact of specific personal and indoor environmental factors

This study presents a summary of experimental measurements on the airflow characteristics and pollution distribution around a non-breathing thermal manikin. The two objectives are: (1) to examine the extent to which personal (body posture, clothing insulation, table positioning) and environmental factors (room air temperature and ventilation flow) affect the airflow characteristic (velocity and temperature) around the thermal manikin and (2) to examine the pollution distribution within the convective boundary layer (CBL) around a thermal manikin and personal exposure to two types of airborne pollutants under factors that influence the CBL. The results show that the CBL generated by the thermal manikin influenced the airflow characteristics and pollution distribution in the breathing zone. Parameters such as room air temperature, body posture, clothing insulation, table positioning, and ventilation flow considerably affected airflow characteristics and pollution distribution around the thermal manikin. Under the specific set of conditions studied, the most favorable airflow patterns in preventing the feet pollution from reaching the breathing zone was transverse flow from the front, as it minimized the exposure at the minimum supply air velocity. Certain airflow directions exhibited a nonlinear dependence between the supply airflow rate and personal exposure. This suggests that without a better understanding of the airflow patterns in a room, the ventilation rate may therefore be increased in vain.

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