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A Systematic Review of the Indoor Environment in Dwellings Based on Modes

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Abstract : Occupants spend much time indoors and seek a comfortable environment. The indoor environment is very much dependent on parameters such as temperature, relative humidity and air velocity. However, these parameters differ according to the operational modes of the dwellings, which include free running, cooling, heating, and mixing. Free running mode means no active cooling and heating is used to maintain thermal comfort inside the dwellings. Cooling and heating modes are the active cooling and heating devices being operational. Mixed modes include the combined form of free running, cooling and heating. This review paper analyzes parameters related to the indoor environment, such as temperature, relative humidity, and air velocity, based on the operation modes of the dwellings and examines how these parameters vary across different operation modes of the dwellings. A systematic search was done in the Scopus database using relevant keywords. A two-phase screening process was used: initial title/abstract review and full-text assessment. Irrelevant articles other than journal papers or in a language other than English were excluded, and relevant articles were analyzed in detail. Data on temperature, relative humidity and air velocity were analyzed in relation to the operational modes of the dwellings. In FR mode, air temperature, relative humidity and air velocity were in the range of 7.5 - 32.5°C, 20 - 78 % and 0 - 0.89 m/s. In the combined CL, HT and mixed mode, air temperature, relative humidity and air velocity ranged between 1.5 - 31.7°C, 35 - 79 % and 0 - 0.55 m/s. In FR mode, the environmental conditions, including air temperature, relative humidity, and air velocity, were observed to have a wider range compared to the combined CL, HT, and mixed modes. Specifically, the air temperature in FR mode reached higher values, and air velocity was also higher, indicating potentially more dynamic air movement. On the other hand, the combined CL, HT, and mixed mode had slightly more stable conditions, with lower air velocity and a smaller range of air temperature, which could influence comfort levels differently.

Keywords : dwellings, modes, indoor environment, temperature, relative humidity, air velocity
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