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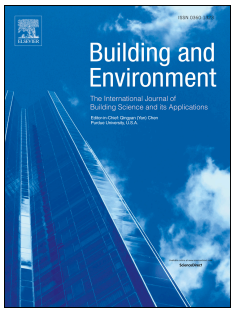

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AN EXPERIMENTAL INVESTIGATION OF THE FLOW AND COMFORT PARAMETERS FOR UNDER-FLOOR, CONFLUENT JETS AND MIXING VENTILATION SYSTEMS IN AN OPEN-PLAN OFFICE

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Abstract

There is a new trend to convert the workplaces from individual office rooms to open offices for motivating money saving and better communication. With such a shift the ability of existing ventilation systems in meeting the new requirements is a challenging question for researchers. The available options could have an impact on workers' health in terms of providing acceptable levels of thermal comfort and indoor air quality. Thus, this experimental investigation focuses on the performances of three different air distribution systems in an open-plan office space. The investigated systems were: mixing ventilation with ceiling-mounted inlets, confluent jets ventilation and underfloor air distribution with straight and curved vanes. Although this represents a small part of our more extensive experimental investigation, the results show that all the purposed stratified ventilation systems (CJV and UFAD) were more or less behaving as mixing systems with some tendency for displacement effects. Nevertheless, it is known that the mixing systems have a stable flow pattern but has the disadvantage of mixing contaminated air with the fresh supplied air which may produce lower performance and in worst cases occupants' illness. For the open-plan office we studied here, it will be shown that the new systems are capable of performing better than the conventional mixing systems. As expected, the higher air exchange efficiency in combination with lower local mean age of air for corner-mounted CJV and floor-mounted UFAD grills systems indicates that these systems are suitable for open-plan offices and are to be favored over conventional mixing systems.

Keywords: Open office, Mixing Ventilation (MV), underfloor air distribution (UFAD), Confluent jets ventilation (CJV)

1. Introduction

Although the main purpose of applying different types of heating, ventilating and air-conditioning (HVAC) systems is to remove heat and contaminants from the ventilated space, air and contaminant distribution are the direct function of the air movement which could dramatically affect the indoor air quality (IAQ) in a ventilated space. The consequences of poor indoor environmental quality have been investigated in several studies [1] and [2]. Nowadays, the current rate of energy consumption in the building sector in the developed countries is overtaking other sectors, e.g. industry and transportation [3]. A well-designed