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Wind catcher with downstream fog injection for thermal comfort of a school building in hot arid areas: Assessment of the hourly values air flowrate and outlet air psychrometric properties

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In 2015, the energy demand in Egypt was higher than production and represented one of the barriers for further development. However, the national short-term energy plane which implemented in 2016 decreased the issue into the minimum. This shortage is clearly larger during summer time due to extra energy demand required to drive vapor compression air conditioners to cover the building's cooling load demand. In many kinds of literature, it is reported that conventional air conditioning systems (A/C) has a large contribution to the buildings energy consumption and represent more than 70% of building energy consumption in the Middle East. Besides, the role of those A/C system refrigerants in the harmful emissions leads to the greenhouse gasses effect, while, few of those systems refrigerants contribute to depletion of the ozone layer. Nowadays there are many available passive techniques, or active technologies have been used to provide the thermal comfort condition within buildings that can be utilized as an alternative solution for reducing current energy consumption and the harmful gasses emissions. However, practical and energy efficient hybrid active and passive system that provide the cooling for buildings in summer session at best cost performance is a still a challenge worldwide and in most developing countries located in hot, arid areas. In this study, the innovative design of wind catcher with fog injection system that is appropriate for use in hot, dry areas is investigated. This followed by an assessment of the hourly values of the air flow rate with quantitative values of the outlet air psychrometric properties from this hybrid system that proposed to provide thermal comfort condition for a school building in the hot, arid area is evaluated.

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