



Study on Vernacular Architecture Patterns to Improve Natural Ventilation Estimating in Humid Subtropical Climate

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Abstract

Wind ventilation is an efficient design strategy for the natural cooling system (NCS) in humid climates. The building forms can generate different pressures and temperatures to induce natural ventilation. This study has been carried out in Rasht city, Iran in 2017. The method was performed using a computational fluid dynamic (CFD) approach simulation to study variance between the proposed and the actual results of a design. The goal of the study is to assist architects to design optimum building form for natural ventilation. Hence, the purpose of this study was to investigate the effect of the form on natural ventilation. On this basis, wind flow simulation was performed using Design Builder Version 4.5. In this paper, the present usage of natural ventilation of rural residential buildings in Rasht area the application of this methodology. Initially, wind simulation was carried out based on actual building specifications. Then the proposed L-shaped extension was added to the building. The results showed that if the rectangular form is turned into an L shape, it can offer a better flow pattern for wind in all rooms, but the speed will be reduced.

Keywords: Vernacular Architecture; Natural Ventilation; Humid Subtropical Climate; Abrishami House; Wind Cooling System.

1. Introduction

Many countries and governments are seeking to increase the use of renewable energies such as solar, wind, biomass and geothermal resources due to concerns related to fossil fuels, such as limited reserves and environmental impacts like climate change and increasing demand for electricity [1-3]. During the last two decades, the interest in natural ventilation in buildings has been reawakened because of the increasing awareness on emission of greenhouse gases and the need for an efficient passive ventilation system as a part of green building architecture. In this regard, ventilation having appropriate size would be appeared as a way to save energy [4-6]. One of the most important functions in architecture is housing. Because people spend most of their time at home, so the building should be designed in such way that initially provide thermal comfort for habitants [7].

Natural ventilation has been widely used in buildings due to the great potential for energy conservation and indoor air quality (IAQ) promotion [8, 9]. Also, the fundamental purpose of buildings is to provide a comfortable living environment protected from the extremes of climate. In this regard vernacular buildings evolved gradually to meet environmental, socioeconomic, and sociocultural factors of the society to meet the changing lifestyle over a period of time. These buildings have obtained deep harmonization with site surrounding and have imposed minimal environmental impacts. According to ASHRAE Standard 55 (2013), thermal comfort is the condition in which the mind expresses satisfaction with the thermal environment and is assessed by subjective evaluation [10]. The main factors that influence

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