

## CFD Modelling and Thermal Performance Analysis of Ventilated Double Skin Roof Structure

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**Abstract :** In hot countries, the major challenge is the air conditioning. The increase in energy consumption by air conditioning stems from the need to live in more comfortable buildings, which is understandable. But in Djibouti, one of the countries with the most expensive electricity in the world, this need is exacerbated by an architecture that is inappropriate and unsuitable for climatic conditions. This paper discusses the design of the roof which is the surface receiving the most solar radiation. The roof determines the general behavior of the building. The study presents Computational Fluid Dynamics (CFD) modeling and analysis of the energy performance of a double skin ventilated roof. The particularity of this study is that it considers the climate of Djibouti characterized by hot and humid conditions in winter and very hot and humid in summer. Roof simulations are carried out using the Ansys Fluent software to characterize the flow and the heat transfer induced in the ventilated roof in steady state. This modeling is carried out by comparing the influence of several parameters such as the internal emissivity of the upper surface, the thickness of the insulation of the roof and the thickness of the ventilated channel on heat gain through the roof. The energy saving potential compared to the current construction in Djibouti is also presented.

**Keywords :** building, double skin roof, CFD, thermo-fluid analysis, energy saving, forced convection, natural convection

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