Chapter 24
Effect of the Cool Roof on the Indoor Temperature in a Non-conditioned Building of Hot–Dry Climate

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Abstract The solar reflectance and absorbance of the roof surface are two significant factors affecting the thermal performance of non-conditioning buildings. Based on the qualitative analysis, the cool roof (color paint) effect analyzed in terms of indoor temperature. The maximum heat gain entered in the buildings during summer leads to higher energy consumption throughout the summer. Eight composite roof structures with cool paints layer and one without cool paint layer as the base case analyzed for the summer months of April–July. Fourier admittance method used to evaluate hourly floating temperature for roofs treated with cool paints. A simulation study carried out to obtain optimal roof structure for hot–dry climate, Jodhpur and roof structure (RS-6) with concrete, mortar, and cool coating paint combinations found most suitable in terms of minimum variation of indoor temperature. The simulation result indicates that all roof structures with cool roof performed better than roofs without cool roof.

Keywords Cool roof · Fourier admittance method · Heat gain · Thermal comfort · Hot–dry climate

24.1 Introduction

The primary consumer of energy is building sectors in recent times due to the rapid urbanization and population in the metropolitan cities. About 60%, energy consumed in the buildings for heating, cooling, and ventilation increased to 1.8% over the last forty years [1]. In buildings, thermal performance is influenced by the solar absorptance and reflectance of the roof, particularly for non-conditioned buildings. During clear sky conditions, about 20–95% of the radiation is typically absorbed by the building roofs [2]. In all the Asia Pacific Partnership (APP) countries, India ranking is highest for energy consumption in residential buildings. About 45% of the energy is consumed by residential buildings for providing indoor thermal comfort

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