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Abstract

In tropical countries such as India, increasing the roof albedo helps to reduce the heat ingress through the roof. This further reduces air-conditioning energy consumption in conditioned buildings and increases comfort in unconditioned buildings. In order to help users determine the benefits of high albedo roofs under varying conditions, a simple calculator has been developed. Parameters such as location, building type, roof area, and surface properties of the roof are taken as inputs. Annual EnergyPlus simulations are performed for the given parameters and the results are displayed in both graphical and tabular formats. It also calculates the simple payback by comparing a given base case roof albedo with the proposed roof albedo. The calculator can perform comfort simulations for unconditioned buildings and simulates measures including a radiant barrier system and under deck roof insulation. The calculator also runs a parametric simulation between insulation thickness and roof albedo to find an optimum roof insulation thickness based on incremental internal rate of return. This paper presents the features of the cool roof calculator and the type of analysis that can be performed using the cached results.

<https://www.sciencedirect.com/science/article/pii/S0378778815300499>