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Optimizing roof insulation for roofs with high albedo coating and radiant barriers in India

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Abstract

To make roofs energy efficient, typically two types of techniques are followed: surface treatments (cool roofs, radiant barriers) and thermal property modifications (roof insulation). The [interplay](#) between these two techniques has been studied using energy simulations. A single storey, daytime operational, office building of 200 m² area has been simulated for five climatic zones in India. A total of 88 different roof combinations have been studied for each climatic zone. An economic analysis using [Internal Rate of Return](#) has been performed to identify a suitable roof [insulation thickness](#) for a roof with high [albedo](#), and radiant barrier combination. The [incremental](#) benefits in energy savings reduces by [adding insulation](#) after a limit. For a roof with albedo of 0.6 and radiant barrier emittance of 0.2, the optimized roof *R*-value is 0.49 m² K/W in hot and dry and composite climates, 0.31 m² K/W in warm and humid and temperate climates, and 1.02 m² K/W for cold climates.

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