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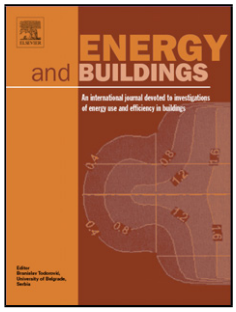

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Author: I. Hernández-Pérez J. Xamán E.V. Macías-Melo K.M. Aguilar-Castro I. Zavala-Guillén I. Hernández-López E. Simá

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Experimental thermal evaluation of building roofs with conventional and reflective coatings

I. Hernández-Pérez[a,*], J. Xamán[b], E.V. Macías-Melo[a], K.M. Aguilar-Castro[a], I. Zavala-Guillén[c], I. Hernández-López[d], E. Simá[b]

[a] *Universidad Juárez Autónoma de Tabasco, División Académica de Ingeniería y Arquitectura (DAIA-UJAT), Carretera Cunduacán-Jalpa de Méndez km. 1, Cunduacán, Tabasco, CP 86690, México*
[b] *Centro Nacional de Investigación y Desarrollo Tecnológico CENIDET-TecNM-SEP, Prol. Av. Palmira S/N. Col. Palmira. Cuernavaca, Morelos, CP. 62490, México*
[c] *Centro de Investigación Científica y de Educación Superior de Ensenada CICESE, Carretera Ensenada-Tijuana No. 3918, Zona Playitas, Ensenada, Baja California CP 22860, México*
[d] *Instituto Tecnológico de Zacatepec ITZ-TecNM-SEP, Calzada Tecnológico No. 27, Zacatepec de Hidalgo, Morelos CP. 62780, México*

Abstract

We evaluated the thermal performance of one conventional red and two white reflective roofs using two outdoor test cells situated in Cuernavaca, Mexico. The roofs of the cells are removable so that one can analyze different roofs with a different coating each. We monitored the test cells for two weeks and measured roofs surface temperature, indoor air temperature and determined the heat flux of the roofs. The red roof (RR) had a surface temperature 3°C higher than the gray roof (GR)and this difference caused the RR to have a peak heat flux 20% higher. On the other hand, the white reflective roofs (WR) reduced the surface temperature between 10 and 14.6°C compared with the GR. We obtained the daily heat gain of the roofs by calculating the area under the curve of the heat flux of each day. The WR had a daily heat gain between 59 and 80% lower than the GR, whereas the RR had a net heat gain 22% greater. Finally, using data from the experiments we validated roof model to determine the year-round performance of the roofs. From the results provided by the roof model, we estimated cost effectiveness of the roofs coatings. We found that WR are a cost-effective strategy to reduce building energy consumption in Mexico because its payback period is lower than 2 years.

*Corresponding author

Email addresses: ivan.hernandezp@ujat.mx (I. Hernández-Pérez), jxaman@cenidet.edu.mx (J. Xamán), edgar.macias@ujat.mx (E.V. Macías-Melo), karla.aguilar@ujat.mx (K.M. Aguilar-Castro), ivett@cicese.mx (I. Zavala-Guillén), ihernan@itzacatepec.edu.mx (I. Hernández-López), esima@cenidet.edu.mx (E. Simá)

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