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ON THE IMPACT OF COOL ROOFS IN ITALIAN RESIDENTIAL BUILDINGS: EXPERIMENTAL ASSESSMENT OF SUMMER AND WINTER PERFORMANCE

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ABSTRACT The purpose of the work is to evaluate the impact of roof surface properties, i.e. reflectance, on building thermal performance in summer and winter conditions. In particular these properties have been analyzed on traditional roof brick tiles through indoor and outdoor two-years long continuous monitoring for investigating "cool roof" benefits and penalties.
The experimental campaign has been set up in a residential single family building in the central Italy, where a meteorological station and a microclimate station have been installed. The monitoring campaign consisted of the evaluation of the base case configuration and the high reflecting roof configuration, after the optimization of the reflectance properties through in-lab measurements of traditional brick tiles. Thanks to the overall analysis and to the cooperation with industrial companies producing brick tiles and reflective coatings, a new tile with notable "cool roof" properties has been produced following the traditional industrial path of the tiles already commercialized in Italy and all over the world. The final purpose of this experimental activity was to evaluate the effect, in terms of indoor thermal free-running behavior of the attic, of high reflecting tiles, previously optimized with respect to Solar Reflection Index, and to assess summer benefits and potential winter penalties in the typical temperate climate of central Italy.
First important results show that during summer the high reflective tiles are able to put down the average external roof surface temperature by more than 10°C and the indoor operative temperature by more than 3°C. During winter the average external surface temperature is lower with high reflective tiles by about 1°C. Also, comparing December-January results of both these scenarios, the indoor operative temperature basically does not register any notable reduction given by the new tiles setting.