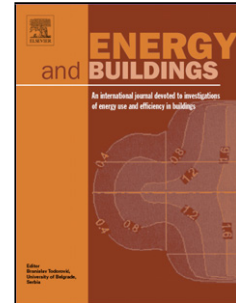


Accepted Manuscript

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PII: S0378-7788(17)31417-2
DOI: <http://dx.doi.org/doi:10.1016/j.enbuild.2017.04.054>
Reference: ENB 7550

To appear in: *ENB*

Received date: 30-9-2016
Revised date: 23-3-2017
Accepted date: 20-4-2017

Please cite this article as: A.L.Poisello, V.L.Castaldo, C.Piselli, C.Fabiani, F.Cotana, Thermal performance of coupled cool roof and cool façade: experimental monitoring and analytical optimization procedure, Energy and Buildings <http://dx.doi.org/10.1016/j.enbuild.2017.04.054>

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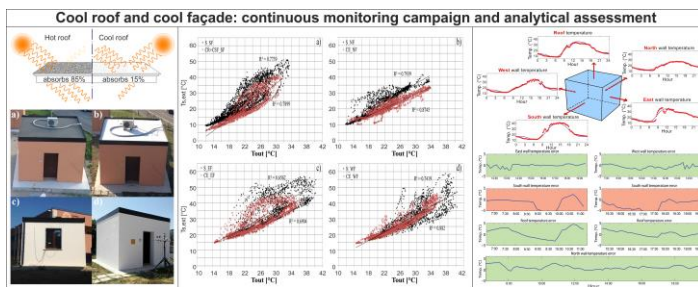
Thermal performance of coupled cool roof and cool façade: experimental monitoring and analytical optimization procedure

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Graphical abstract



Highlights

1. The cooling capability of two envelope solutions is experimentally investigated.
2. An analytical model optimizing the experimental setup is implemented.
3. Cool façades considerably contribute to decrease surface temperatures.
4. The combination of roof and facades leads to a 4.4°C indoor temperature reduction.
5. An accurate analytical prediction of the building thermal behavior is achieved.

ABSTRACT

While UHI mitigation potential of cool roofs has been deeply investigated compared to cool facades, still not sufficient research effort has been dedicated to quantify the benefits of combined cool building products.

The present work evaluates the thermal performance of an innovative cool roofing membrane and a cool façade painting applied on a prototype building. Moreover, an analytical procedure able to predict the cool coating thermal performance is elaborated. Such methodology can be used to determine the passive cooling potential of each product as a separate envelope component and as a combination. To this twofold aim, a preliminary in-field monitoring is developed. Therefore, a sensitivity analysis is performed to evaluate the separate and combined passive cooling contributions of the roof and the differently oriented facades.

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