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Thermal Performance Investigation in Cooling Season for a Corner Double Skin Façade with Rotating Glass Louvres

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Abstract

A corner Double Skin Façade curtain walling facing south and west orientation that has been applied in Athens Greece was examined during cooling season. The external skin of the double skin façade is made out of rotating sandblasted striped glass louvres on its external skin on both elevations. During the cooling season, measurements were done on both elevations with the intention to examine in detail the performance of the curtain walling. Measurements were done using thermocouples in particular areas of the construction for several days and different methods were followed to allow the determination of the airflow in the cavity. The external skin which is adjustable was examined in vertical and inclined position with the aim to identify when it is performing properly and how its performance can be optimized. Throughout the analysis, it was realised that the South elevation is functioning ideally thanks to a multi-layered shading that is achieved by the sandblasted striped glass louvres when they are positioned inclined. On the contrary, it can be identified that the west elevation is not performing sufficiently as the vector of the solar irradiance is differing in comparison to the midday where the irradiation is facing the south orientation from a significantly different position. As a result the multi-layered shading in the west elevation is not functioning properly and for this reason the measured temperatures on both the internal skin of the Double Skin Façade and the interior of the building prove that corrective measures are required with the aim to avoid overheating problems.

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Keywords: Double Skin Façade; Glass rotating louvres; Corner configuration; Cooling dominant climate.

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1. Introduction

Double skin facades were commonly chosen in central and northern European climates. Such an architectural trend has been applied to a significant amount of non-residential buildings in Greece. Studying the available literature, it can be realised that there are not available studies that have been done on applied typologies of double skin facades in southern European climates which in contrary to central and northern European climates are cooling dominant, exposed on significantly higher temperatures and solar irradiation. This is the reason why there is necessity to provide such knowledge and documentation to ensure better construction solutions in the Southern European building stock.

2. Scope

The aim of the present research is to investigate the thermal behaviour of a corner double skin façade with rotating glass louvres on the exterior skin of the curtain walling, see Fig.1, which has been installed in Athens, Greece, during cooling season.



Fig. 1. The corner double skin façade that has been investigated.

3. Project description

The two elevations of the double skin façade are facing to the south and west orientations. The cavity of the double skin façade has a width of 1,10m and height of 13m, as in Fig 2.

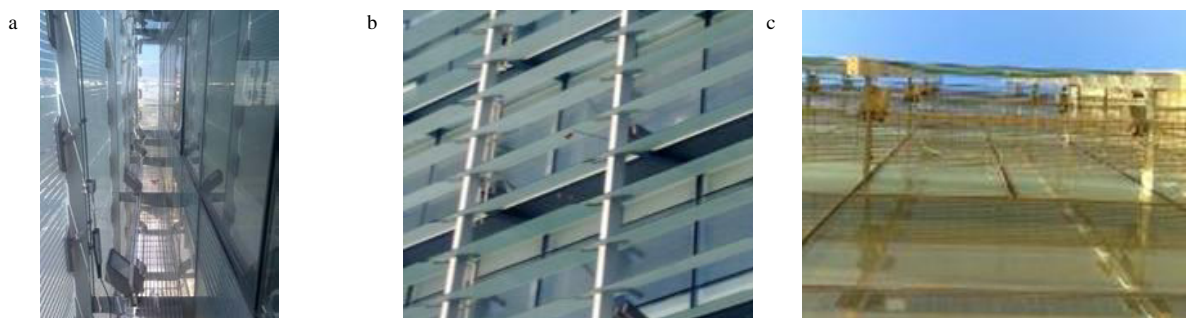


Fig. 2. (a) Double skin façade details from the cavity; (b) with the louvres opened; (c) of the entire cavity.

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