MONITORING CERAMIC CONSTRUCTION SOLUTIONS ON FLAT ROOFS

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INTRODUCTION

The ROOFTILES project seeks to assess ceramic horizontal construction solutions, focusing on (rehabilitated or newly built) roofs, which improve the energy efficiency of buildings and outside floorings to reduce the heat island effect of our cities. To assess the efficiency of the different construction solutions, it was proposed to develop and construct validation prototypes under real conditions, in which the thermal performance of various ceramic systems could be simultaneously monitored and assessed with a view to improving the energy performance of buildings or urban environments.

CONSTRUCTION OF PROTOTYPES FOR FLAT ROOFS

This study sets out the progress made in constructing and developing sensorised and connected prototypes with a flexible configuration, which allow integration of different ceramic construction solutions on flat roofs under the same conditions. Figure 1 shows the scheme of the longitudinal cross-section and ground plan of the designed prototypes and the assembly and installation of these prototypes on the ITC roof deck.

***Figure 1**. Left (ground plan and cross-section of the reference prototype). Right (image of the assembled prototypes)*

After studying the types of roofs in the existing stock of buildings and analysing the ceramic systems available in the market, two prototypes were constructed (Figure 2) that would allow energy performance to be assessed. The first (prototype 0) represented a roof from the 1980s with small thin slabs of fired clay (known as Catalan tile) (Thermal transmittance U=1.79), while the second (prototype 1) was rehabilitated with a ceramic ventilated roof system.

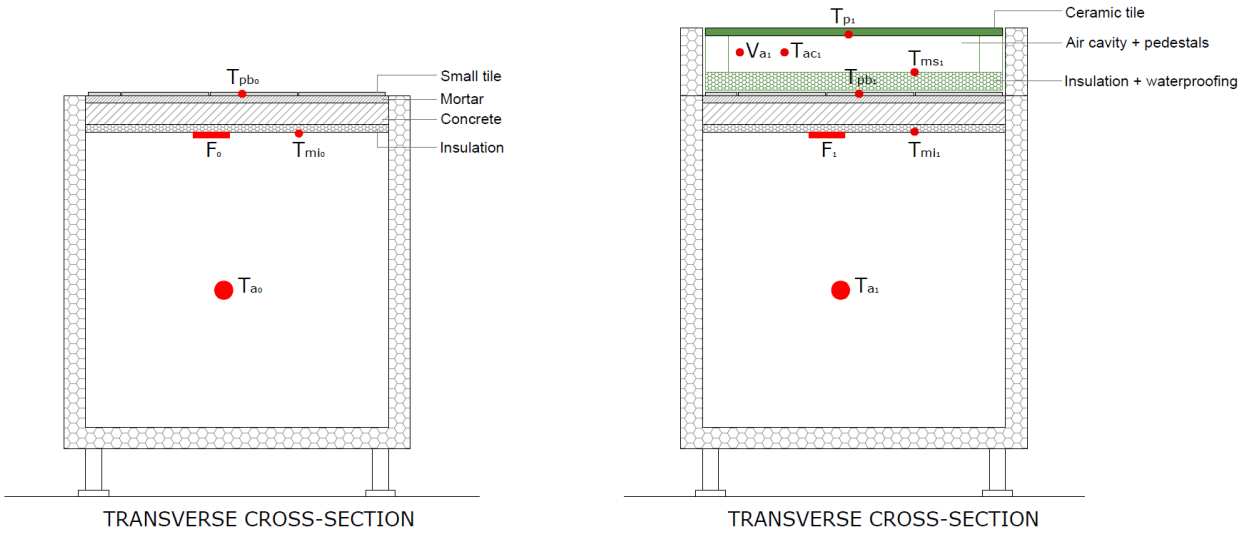

***Figure 2.** Left: prototype transverse cross-section (Prototype 0: 1980s roof). Right: prototype transverse cross-section (Prototype 1: Rehabilitated with ventilated roof)*

DEVELOPMENT OF THE MONITORING SYSTEM

Together with the construction of the prototypes, an acquisition system (ADAM modules) of the experimental data collected with the sensors fitted in the prototypes was installed (Table 1). The program generates a database for data storage, as well as a graphic interface that displays the variables recorded in real time, enabling the prototypes (0 and 1) to be monitored continuously for subsequent analysis.

Monitoring sensors	Temperature	Heat flux	Air speed	Wind	Solar radiation
Prototypes	Type T thermocouple	Hukseflux sensor	Omrom sensor	-	-
Weather station	Capacitive ceramic THERMOCAP sensor with screen guard	-	-	Direction and speed vane	Pyranometer

***Table 1**. Sensors fitted in the prototypes for monitoring them*

CONCLUSIONS

The results obtained in the initial monitoring of the prototypes have allowed them to be appropriately validated. This enables the performance of innovative roofing systems (Figure 2) that reduce building energy demand to be monitored and evaluated by comparing this with reference roof performance.

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