

Non-destructive Techniques and Tools for the Thermal Characterisation of Historic Buildings

Sonia Álvarez-Díaz, Architect-Researcher. Energy Division, CARTIF Technology Centre, Spain

The energy characterization of a building allows to obtain an initial energy model of the building to be used as a basis for the study of energy improvements to be implemented in the building. The application of non-destructive techniques to obtain the characterization of the building envelope is an essential part of a historic building, to minimize the damage to the building when performing the studies, since it is not necessary to intervene in the walls to obtain the necessary information.

Currently there are different non-destructive techniques that are commonly used with the aim of minimizing interventions on the elements of a building. For the thermal characterization of the building envelope, the use of thermography is quite widespread, since it is possible to detect the temperature and emissivity of surfaces with an image, as show in Figure 1. To know the U-value of the envelope, a heat flux meter can be used, which allows us to calculate its value without knowing the thickness of the wall or the type of materials that compose it. The heat flux meter measures outside and indoor air temperature and compares it with the inside wall surface temperature and automatically calculates the U-value of the wall.

After identifying the main thermal properties of the elements of the envelope, the dynamic simulation model of the building can be generated by energy simulation software like TRNSYS¹, EnergyPlus², etc., to identify the building performance.

The use of this type of techniques and tools have been applied in projects as RENERPATH and RENERPATH-2³ (Energy rehabilitation of heritage buildings for public or private use) with the objective of the identification of measures to reduce energy consumption and to improve applicable energy performance.

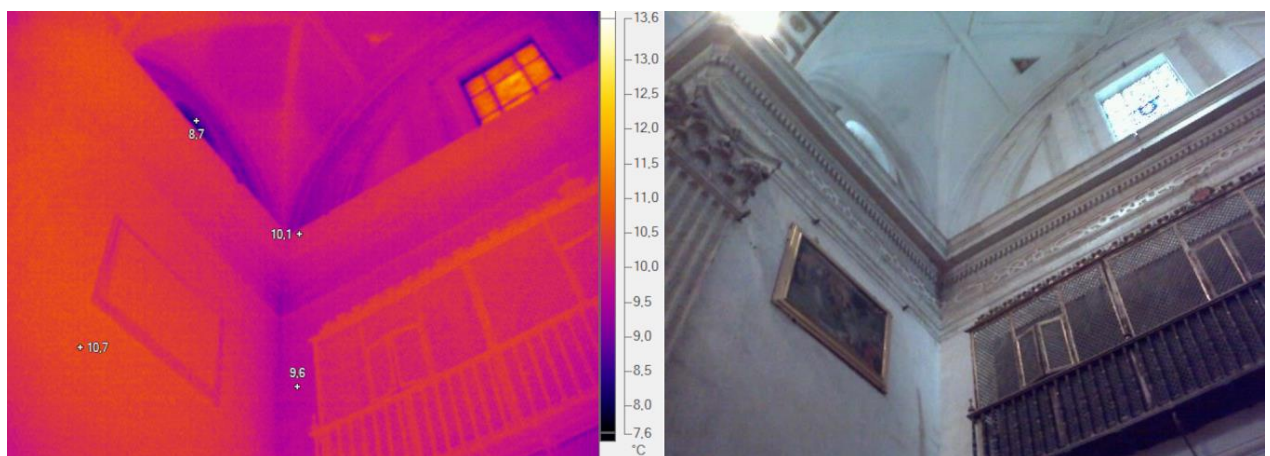


Figure 1: Thermography image (left) and original image (right) of the Collegiate Church of Villagarcía de Campos (Valladolid, Spain).

The use of non-destructive techniques is essential for the interventions that will be necessary in the coming years to achieve the proposed sustainability objectives, not only for historic buildings, but also for the existing building stock.

¹ TRNSYS software: <http://www.trnsys.com/>

² EnergyPLUS software: <https://energyplus.net/>

³ RENERPATH-2 project: <http://www.renerpath2.eu/>