



International High- Performance Built Environment Conference – A Sustainable Built Environment Conference 2016 Series (SBE16), iHBE 2016

Integrated methodologies energy efficiency of historic buildings

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Abstract

For several years, Italian associations and research organizations have been developing strategies aimed at evaluating and increasing energy efficiency in historic buildings, offering a sort of guidelines about this issue. These strategies are intended to provide useful information for a correct approach to the energy retrofit of historic buildings, offering a framework as well as innovative technical solutions for integrated design intervention restoration of historic buildings. The purpose of the guidelines is investigating the relationship between architectural restoration and plant installations, which are – now – rarely explored problems theoretically and experimentally, by introducing the concept of improvement instead of adapting to the standards of safety and comfort, in accordance with the integrated conservation strategies (Amsterdam Declaration, 1975). Effective proposals of a historic building energy retrofit (or a cultural landscape) can be implemented in a conscious way, tending to an architectural and landscape integration, without changing the monumental building, as it often happens in the case of adaptation of a new building to the new rules. The proposed methodology is based on an interdisciplinary approach, articulated in successive phases: analysis of plant systems, measurements of environmental quality, identification of vulnerabilities, defining appropriate intervention techniques, verification of the improvement achieved. The case study concerns a historic building in Salerno (Italy) dating back to the eighteenth century, used as a school complex. It will be investigated by the morphological, technological, static, energy point of view, by the use of a BIM platform, in order to identify energy efficiency measures consistent with the technological and structural aspects. The objective is, therefore, to identify an integrated methodology of energy retrofit of historic buildings.

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Peer-review under responsibility of the organizing committee iHBE 2016

Keywords: Historic buildings; integrated approach; sustainability; reversibility; BIM

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1. The problem of energy consumption of the historic buildings.[†]

The study concerns the analysis of a historic school building, situated in Salerno, built in 1929 by engineers de Angelis and Giordano (Fig. 1). The city of Salerno, the capital of the Campania province, is a typical Mediterranean reality in Southern Italy, which stretches between the slopes of Monte Bonadies and the Tyrrhenian Sea in an area of about 60km². The city has about 135.268 inhabitants (Istat, 2011). This research started with the aim to propose a retrofit strategy for historic buildings. Italy has got about 11millions of buildings, reported by “ENEA, October 2010” and 8% of this heritage is of historical interest. The Ministry of Economic Development (MiSE 2016) analysis on public consumption estimates an energy-intensive of about 46.619 Mtoe.[‡] each year.

The legislation (Legislative Decree 102/2014, implementing Directive 2012/27 / EU of the European Parliament and the Council, through the criteria dictated by European Delegation Law 96 of August 6th, 2013) sets out the measures for the promotion and improvement of energy efficiency, for achieving national savings target: "reduction, by the year 2020, 20 million tons of oil equivalent of primary energy consumption, amounting to 15.5 million equivalent tons of final energy fuel, counted since 2010, in line with the national energy strategy. "in addition, with regard to the properties of the Public Administration, the decree establishes an obligation to "achieve the energy upgrading of at least 3 per cent yearly of the indoor air-conditioned floor area or, alternatively, lead to a cumulative energy savings in 2014-2020 of at least 0.04 Mtoe." So, the Italian national trend is moving to define the most appropriate strategies to achieve energy savings results expected and, for the first time ever, it opens application scenarios to historic buildings, a strong presence in the *country*.



Fig. 1.(a) Territorial location of the school G. Barra; (b) View of the building Barra. Source: "*The reinforced concrete slabs of the early twentieth century in Salerno. forms of degradation and for the recovery addresses*". Ing. R. Del Regno.

In order to meet these needs, the MiBACT has drafted the "GUIDELINES FOR THE IMPROVEMENT OF ENERGY EFFICIENCY IN THE CULTURAL HERITAGE", a tool for designers and administrative staff engaged in the field of energy rehabilitation of historic buildings. These guidelines show a range of architectural restoration projects involving the use of innovative, less invasive and more performing materials and technologies, a respectful character of the building historicity. Among the most valid technologies heat-reflecting insulating materials, with a low emissivity that reflects up to 60% solar radiation the thermal insulating plasters, the vacuum insulation panels, etc. are emerging.

[†] Elaborated by Anna Sessa

[‡] Mtoe (mega tonne oil equivalent)

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