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Microclimatic performance of a restored hypogeum: the case of "Locanda di San Martino" thermal centre (SPA).

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The site of the "Sassi di Matera" classified by the United Nations Educational, Scientific and Cultural Organization (UNESCO) as World Heritage in 1993, is an exceptional example of traditional bioclimatic Mediterranean architecture.
This site is located in Basilicata in southern part of Italy and is characterized as having a Mediterranean climate, with hot dry summers and temperate and humid winters.
The average seasonal temperature is 4 _C in winter and 32 _C in summer, which often has high values close to 40 _C. Moreover winter is mild with rare frosts. Rains are mostly concentrated in autumn and winter.

Within this immense artistic heritage, the study regars hypogea habitations and stone buildings (half-hypogeum and half-built), throught monitoring a surface hypogeum and a deep hypogeum. The research focus upon the evaluation of the energy and microclimatic performance of recovered hypogeous structures today used as a thermal centre (SPA).

The analysis performed a dynamic parametric simulation using the software EnergyPlus to quantify the energetic balance of the hypogeous structures during one calendar year. The energetic valuation of the surface hypogea shows that these environments, once restored and in a condition of normal use, give indoor comfort within the limits of comfort thermo-hygrometrics.

The methodology used in the research is that of empirical research, i.e. a direct study "in situ", where the designer is an experimenter and a researcher at the same time. This methodological approach was used on particularly representative case studies: "Locanda di San Martino" thermal centre (SPA).

The huge thermal mass of the walls ensures that the microclimate indoor conditions are regular throughout the seasons, without differences in the daily thermal oscillation. Deep hypogea with an air change system cannot reach thermal-hygrometric comfort values.
The most important thing to do is to regulate indoor microclimate, before eliminating the humidity from the walls. The same environments used under normal conditions reach indoor comfort.
During the summer season the indoor temperature is in the comfort. Then these buildings often need to be heated during the summer season to shorten the huge indoor/outdoor thermal gradient.
Deep hypogeous architectures without an air change system cannot reach thermal-hygrometric comfort values. This system is useful in increasing the indoor temperature and reducing the indoor–outdoor thermal gradient. A dynamic analysis permitted us to quantify the energy balance of the hypogeous structures during a period of one calendar year. In this way, we can state that these structures have a null thermal balance during mid-season, while in summer the floor loses heat and cools the room with the opposite occurring in winter.

It can conclude that these buildings were designed as bioclimatic. In fact they can be used, after restoration, with limited use of technology systems.