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TECHNICAL NOTE

425 - Energy simulation of a vernacular House in Santana / Madeira Island – Case Study

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Santana is a rural village in the north side of Madeira Island. Santana vernacular houses are quite typical in terms of their architectural image, but they also offer hight levels of comfort to their inhabitants. The climate of Madeira Island is mainly influenced by the Sea, so it is charaterised by the occurance of frequent low daily thermal amplitudes and by temperatures values near the comfort levels. However, since the altitude of Santana is near 500m from the sea level and this village is settled in the North side of the island, some cooling effects drive to lower temperatures than it can occur in other places of this island. Its is also not frequent that direct solar radiation reach the windows of these buildings, since the mountains of the island shade, long hours of the diurnal period, the path of the sun. This occurs particularly in winter time when the altitude angle of the sun is much lower. Another important feature is the frequently occurrence of cloudy sky which also reduces the solar gains in winter.

With the aim of extracting rules to apply in the design of passive houses to be built in this particularly region, and to validate the energy efficiency of this traditional constructions and architecture, some simulations have been done with the energy plus simulation program. This program provides the facility of extracting comfort reports based on the Fanger equation of comfort (ISO 7730), which can give to the architect a precise idea of the performance of the building without the need of consumption reports, which generaly greatly depend on the effiicciency of the machines within the building. A validation with the portuguese thermal codes was also done, with the aim of finding the requirements for the construction that should be implemented in new buildings.

The simulations with energy plus have shown that the comfort could be easly achieved without the need of special active systems. This can be explained by the hight levels of insulation that are present in this construction (particularly in the roof) and by the maritime type of climate.