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Et(h)nic Architecture in Mediterranean Area

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Abstract

The study of traditional built environment and the correct use of natural resources, nowadays, represent some of the multiple opportunities to product compatible structures with the environment, aimed to cope with high-energy demanding buildings and comfortless.
The ethnic Mediterranean culture, purpose of the study, output of the traditional architectural knowledge, recognizes in the vernacular dwelling a symbiotic relationship between built and natural environment, respectful towards the territory thanks to the use of available raw materials that reduce human footprint.
The correct use of the local raw materials and the definition of rules, archetypes and shapes are the perfect evidence of this symbiotic relationship, that ages improved achieving the perfect balance with the territory.
The architectural elements, created to meet solely functional needs, changed over time, causing a rich heritage of shapes.
To enhance the properties of the modern building envelopes it is necessary, preliminarily, to analyse the logic and architectural invariant of the traditional artefacts that are brought to mind, to a greater or to a lesser degree, for inspiration and to take us back on the way of harmonic planning with the place, actualizing the proposal.

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Keywords: Built Environment; Identity; Place; Natural Light; Vernacular Architecture.

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Nomenclature

Palmento	The 'Palmento' is the place where occurred grape pressing to produce juice ('must') that was stored in large tanks. Used in industrial scale in the Hellenistic period and Roman Empire.
Masseria	The 'Masseria' (farm) was an inhabited big farm, often, even by landowners. The vast rural construction also included the peasants' accommodation, stables, warehouses and crops.
Dammuso	The term 'Dammuso' indicates the traditional island home of Pantelleria.

1. Introduction

This work is part of the PRIN (Research Projects of National Interest), financed by the Italian Ministry for University and Research (MIUR), and just completed, entitled *'La difesa del paesaggio tra conservazione e trasformazione. Economia e bellezza per uno sviluppo sostenibile'* ('Defending the landscape between preserving and transforming. Economy and beauty for a sustainable development'), coordinated by Prof. Truppi of the Struttura Didattica Speciale of Architecture in Syracuse (Italy).

The territory may be considered as a widespread cultural good, whose components thus become the *invariants* characterizing places and communities, a *layout of signs* of historic memory, which the place is soaked in, determining the evolutionary process [1].

Through the study of some construction *archetypes* [2] of the Mediterranean tradition, we intend to highlight a critical connection that, going beyond the mere contemplative and scholar approach, allows us to seize their ever-latent conceptual significance and their contemporary value. Within such research, it becomes meaningful to identify the founding hints, to outline today's operational conditions by analysing the depth of what made them possible. It is the search for the very origins, the intensely creative initial moments, where the archetype reveals the essence of construction, of form [3] and it gives back the dignity of true architecture.

The registration of the construction invariants and of identity features [4], linked to *«the notion of permanence and, therefore, aimed at maintaining reference points that are fixed, constant and not subject to changes due to time passing by»* [5], has enabled us to identify some typical building of Mount Etna's area and of Aeolian Isles around the Sicily that, in terms of features and function, represent a unique case-study, although they are widespread over the territory.

Among different models, great attention has to be dedicated to archetypical buildings like *'palmento'*, *'masseria'*, *'dammuso'*, which inspired 'spontaneous' planning – because it has been handed down from generation to another - through their constructive features and the basic assumptions. They represent the pillars for a respectful environmental design of contemporary buildings aimed at the integration with the context and its inhabitants', who will use those spaces. In these structures *form does not follow function, it is an expression of it* [6], a form drawing from history, summing up the memory of a whole people and, at the same time, becoming strongly atemporal, as it is not bound to changes in trends, but only to a *«tradition has the force of a law honoured by everyone through collective assent. It is thus accepted and obeyed, since respect for tradition gives collective control, which acts as a discipline»* [7].

This results in a constructive tradition strongly oriented towards a diversification of the parts of the building based on their function and to the optimisation of the features and performances of the techniques and materials employed for each of its components.

From this perspective, it is crucial to study their envelopes, characterized by thick bearing masses able to confer to it substantial inertial quality. Even sunlight has had a significant influence in the design, as to be considered a building material; the uptake of direct sunlight is a free contribution from which one can not ignore the purpose of energy saving, thus avoiding to use always the machines for air conditioning.

Besides the choice of the architectural forms, which often come from raw material, becomes precondition to a surface-area-to-volume ratio reduction (or Shape Factor) with the resulting of a better indoor climate conditions.

In order to prove that the resume of these traditional constructive logic can contribute to the improvement of the environmental design, perpetuating the principles through the use of innovative materials and techniques, various issues, from an energy standpoint, have been considered as case studies. Which have given significant results in terms of fossil fuels savings and interior comfort improvement, allowing to reach a fitting balance between *matter and form*, *signs and practices* [8].

2. Contexts, characteristics and specificities

2.1. Palmento (premise for wine pressing)

The grapevine is undoubtedly the most widespread crop on the Eastern Sicilian territory at the foot of Mount Etna. Although it is cultivated on all the volcano sides, it is prevailing on the Southeast slope, between 300 m and 1.259 m above sea level. The cultivated land has been terraced, following the natural slope and, in some cases, crowning the top of formerly active volcanoes [9].

The archetypal type linked to this crop is the '*palmento*' (Fig. 1). There are two types based essentially on the different use of the vats, which may be either outdoors (the most ancient and now abandoned tradition) or inside rural structure.

The vineyard hosts a number of diverse rural constructions, based on the height of the site where they are erected. Between 700 and 1.000 m above sea level, one can mainly find either two-storey villas with the winery and warehouse on the ground floor and the owner's residence on the top floor, or small-sized buildings with a single space, mostly just the premise for wine pressing. In tenant farmers' houses, more modest, as there were no special areas for keeping the wine, both the '*palmento'* and the winery were always located at the centre of the property.

The *palmenti* are invariably wide constructions, characterised by quite sharp volumetric variations. The natural irregularity of the land is always exploited by laying out the farm buildings on different levels and making sure that, after pressing the grapes (Fig. 2), the must naturally flows downwards through the vats into the tank. In the part of the territory where the vineyards were more widespread there were and still are a number of buildings exclusively used as *palmenti* for wine pressing [10].

Over time, additional small-sized structures were added to isolated *palmenti*: made of lava stone, they served as a seasonal residence to be used during wine making. These buildings whose *spontaneous proliferation of volumes, which even in the case of very basic dwellings follow the rugged land, reveal their strong organic characterisation, further enhanced by the few and narrow openings placed based on accurate functional criteria* [11], indeed, although they were not constructed based on a geometric plan, a few rules of simplicity and common sense were always complied with. As far as possible, the building's position took into account its exposure, the sunlight, the view and many other aspects that today are only rarely considered by constructors.

The features which differentiate a *palmento* from a rural building are the following:

- simple and regular structure
- lava stone walls
- North-facing openings (protecting against the North wind)
- double-pitched roof, sometimes asymmetrical
- external stone staircase allowing to enter through a window, used as a 'throwing window' for grapes
- decanting vats relying on gravity laid out in such a way as to facilitate their processing

Unlike residential constructions, the *palmento* has specific features making it a one-off on the architectural scene. In all instances it features the same elements, such as the openings mainly consisting of small windows, usually North-facing, except for the 'throwing window', facing East. This ploy is used to protect the must from the North wind, whereas the 'throwing window', projected towards the inside area of the *palmento*, was designed to capture maximum sunlight, as that is the opening through which the grapes were thrown and that was also the position of the vats for wine pressing. Inside, the ceiling was between 5 and 7 m tall. This was required by the presence of the screw-press.

The load-bearing structure of the building was always in stonework, about 60 to 100 cm thick. The roof was frequently double-pitched, at times asymmetrical, with roof shingle elements supported by intertwined canes (*incannucciato*).

There are no protruding parts, since the gutters are in-built in the stonework. The space in front was used as a farmyard. These buildings were usually erected following the land configuration and exploiting the different altitudes to make vats for wine pressing and decantation. These vats, originally made of excavated rock and later of stonework, were always at least 3 and were interconnected in order to let the must flowed from a vat to another simply thanks to natural gravity.

Fig. 1. Palmento.

Fig. 2. Machine for the pressing of grapes (inside).

2.2. Courtyard-Farm – ('Masseria')

The second archetype having a widespread presence in the territory is the courtyard house [12], in its various local aspects.

Among the three types here analysed, the courtyard house is the most common, as it is connected to the Mediterranean tradition, which is based on different construction practices employed by the Etruscans, the Egyptians, the Greeks, the Romans and the Arabs. All these populations, even if in different periods, favoured the isolated nature of the court that, from its birth on, could ensure air and light, thanks to rare and small windows open on the street.

The farms were developed around a rectangular central courtyard: the long sides of the court contained the granary - with large windows placed in the southern or north-western parts - the oil mill, the millstone, the barns - t*he straw house, the 'pagliera', has wide walls, pierced symmetrically beehive to ensure to make them dry from that bit of water, which could be introduced when the wind does beat the rain on the prospects* - [13], the cellars and the simple abodes for farmers. On one short side, there was the manor house - more refined from an architectural point of view - and on the other, the stables, the warehouses or a drywall were present.

In the Mediterranean landscape, enriched with rows of vineyards and fruit trees, the presence of beams (*'bagli'*) and farms (*'masserie'*) fits organically, forming the central hub around which the elements of the environment turn in a successful fusion between nature and built environment [14].

The farm (*'masseria'*), new centre for the production development, was born between the seventh and eighth centuries. It also includes the management, coordination offices to organize the work of the farmers coming from the towns, thus becoming, time by time, the representative icon of wealth [15].

In the late Roman period, the term '*masseria'*, indicates a larger property. The Roman term '*massa'*, indicates the estates entirety, which later becames part of the feuds during the Middle Ages. At the centre of the '*massa'*, there is the main villa.

In the Middle Ages, the meaning of the word evolves, getting the meaning of an "agricultural useof the territory", *'ad massariam faciandum, fari massaria'* and, in a more specific way, the core building where activities take place, surrounded only by temporary shacks and barns, to host farmers during the strictly necessary period dedicated to harvest or crop.

In the modern age, the term *'masseria'* indicates a complex structure, made of different types of residential buildings, intended for farmers, animals protection and tools and goods storage, thus becoming a sign of recognition of the feud itself [16].

Despite the building extension, the farm continues to maintain its temporary dwelling character, hosting a small number of families. The manor assumes a predominant role with respect to the rest of the complex, occupying the major volumetric extension, including two floors and being adjacent to the courtyard that, still today, constitutes the space where buildings used as warehouses reside. The passing of time, together with the evolution of production

necessity, have produced palimpsests in the use of individual rooms, with the consequent elimination of the stall function, in favor of *'palmenti'*, 'oil mills' (*'trappeti'*) and cellars [17].

'Baglio' (Fig. 3) is another term that can be referred to the court typology. Pertaining to the original meaning - from the Roman *'vallum'* - defines a covered space surrounded by walls with building structures placed around the court. Later, with the Normans, the term is used in the Latin vernacular *'ballium'*, indicating a fenced courtyard, useful as protection of the castle; only since 1200, the term defines the inner courtyard, heart of the castle.

In the southeastern Sicily, a small landed property spreads out with the *masseria* in the centre, hub of the economy deriving from the courtyard life, located close to another northern courtyard, surrounded by the houses [18].

The *masseria* organisation highlights the central role it assumed in the surrounding environment context. At the centre of the *masseria*, the courtyard (*bagghiu*) served as a fulcrum and stressed the importance of this architectural shape, also on a social level, as it acted as a linking point between the territory and the farming community.

The court also organizes the house architectural composition, it sets the typological structure and, at the same time, it carries out important climatic and social functions. From a climatic point of view, it provides useful shadow and works as a temperature regulator, since, after sunset, *«warm air of the courtyard, which was heated directly by the sun and indirectly by the warm buildings, rises and is gradually replaced by the already cooled night air from above. This cool air accumulates in the courtyard in laminar layers and seeps into the surrounding rooms, cooling them. In the morning, the air of the courtyard, which is shaded by its four walls, and the surrounding rooms heat slowly and remain cool until late in the day when the sun shines directly into the courtyard. The warm wind passing above the house during the day does not enter the courtyard but merely creates eddies inside, unless baffles have been installed to deflect the airflow. In this way, the courtyard serves as a reservoir of coolness»* [19].

Furthermore, during the day, due to the openings arrangement, exposed on the courtyard, and their formal composition, the sun could rarely act directly on the facades for a long period, ensuring the presence of a natural diffused light within the indoor environment.

In many areas of Sicily, windows were small sized and made of wood, as well as wooden shutters called '*mashrabija'* in Arabic, because of the double advantage brought about by a surface which was permeable to air, but refractory to solar radiation incidence on the outer envelope at the same time. Furthermore, the building placement and its orientation were chosen in such a way as to ensure the possibility to operate a natural cooling guaranteed by the rooms cross ventilation.

Where internal courtyards were present, windows were often exposed on them, allowing the passage of more fresh air and light coming from the court and activating a ventilation flow through the openings placed in correspondence on the opposite side, and exposed on the street [20].

If the courtyard is the space around which the house is structured, it is willing to take on different configurations depending on the type of housing. Even if often squared, surrounded on three sides by buildings with a plan, *the fundamental feature (...) is the fact of not being originated from a predetermined geometric order, but to follow a few basic rules: hierarchical aggregation of the rooms around the court, dictated by both functional issues of social and religious order; orientation of the rooms with respect to the sun's path during the day* [21].

The entrance was allowed thanks to a portal, in whom keystone the family crest was carved, and a covered atrium. The single-storey buildings were used as warehouses for tools and more specialized structures such as oil mills and millstones dedicated to production. In the main building, there was often the manor, opposite to the entrance of the courtyard. It was the only one two-storey building (Fig.4); and on the second floor, there was the owner's house.
This storey was accessible through internal or external staircase, placed in the courtyard, and the interior rooms were vaulted-ceiling.

The courtyard, placed in front of the main house, had a stone floor with flagstones and cobbles, equipped with channels for rainwater dispersal. Other distinctive elements enriched the court, such as the cistern and the well, which served as rainwater tanks during the rainy season.

Around the court there are several structures: one-floor buildings having pitched roofs with shingles and under-shingles, destined to seasonal farmers for their harvest tools; a technical room destined to the stone oven; stables and a kitchen, next to the most important building, that has two floors and belongs to the landowner's family [22].

Fig. 3. Courtyard (*Baglio*).

Fig. 4. *Masseria* with two-storey building

2.3. Dammuso

Another emblematic case concerning the Mediterranean material culture, both for what regards the construction type and the formal outcome, is located in Sicily, and particularly in the smaller islands, such as the Aeolian Isles or, more widely, in Pantelleria: here we can find a typical dwelling, called '*dammuso'*.

The *'dammuso'*, built with stones obtained from the land's reclamation, was used by the farmers for storing tools and to shelter from bad weather or from the scorching sun. This construction type was founded in the in the tenth century A.D. and it evolves over time until the sixteenth century. At first glance, this typical house might look like the drawing of a daring designer, while in contrast, but really it is the fruit of wisdom of the locals who have developed it taking into account the area's topography, and exploiting presence of the lava rock.

Conceived as a pinched volume provided with minimum sized openings, the *'dammuso'* has a massive masonry bearing structure, which occupies, in its planimetrical projection, about 50% of the floor area of the entire building.

The building envelope, which constitutes the skin, coincides with the bearing structure and has thick walls that can be up to about 1.30 m, presenting high thermal inertia: the massive masonry works, together with the particular shape of the lowered dome, prevented the penetration of solar radiation inside, so as to ensure warmth in winter and freshness during the summer, allowing to keep, in the latter case, a constant internal temperature of 26°C throughout the whole day.

In his peculiar form it consists of a large room, called *'sala'* (living room), on which overlooks the main bedroom, *'arkova',* and the second bedroom or utility room and pantry, *'u kammarinu'*. Outside, in front of the main façade, we can find a terrace bordered along its entire length from the *'ddukkena'*, a real masonry seat.

Another feature is the dome-shaped roof, which creates other vaults inside the dwelling. The domes, with their great surface heated by the sun, permit to avoid humidity inside and, in addiction, constitute a large space for vegetables drying. The dome is perfected through the tuff mixture and beaten with wooden sticks, in order to form a hard and waterproof layer. This cover type's characteristic form, having a reduced section if compared to the walls' one, in order to ensure passive functioning of the envelope, has also been designed for channeling rainwater towards the *'jisterna'*, an unfailing reserve of water belonging to the *'dammuso'*: for this reason, the roof borders are higher than the base of the dome, in order to bring together more easily the water in the special *'kanallata'*.

The *'dammuso'*, intended as a dwelling, has always the main facade plastered, unlike the one for shelter in the country, which has the walls left to rough stone. The floors were made of rough concrete or, in the richest buildings, decorated with tiles.

The construction techniques of the *'dammuso'* have gone evolving over time: the oldest one consisted of so-called '*casciata'*. Two larger stone walls were made: one inside and one outside, which had a gap filled with mixed inert (topsoil, gravel and sand) of a smaller size. Thanks to this technique, these walls could also be up to two meters tall, and presented several advantages: the usage of waste material; the possibility of obtaining cupboards and niches for the kitchen or the bathroom; the maintenance of the internal microclimate (cool in summer and warm in winter).

Fig. 5. *Dammuso*.

Fig. 6. Roof of *Dammuso*

The exposure of the entire structure is of great importance, because it always takes into account two main factors: the shelter from the most intense winds, but especially from the colder ones – and this is the reason why walls generally expose to the north did not include openings - and to guarantee that the dammuso could benefit from the maximum amount of light.

The energetic efficiency of *dammuso* can be summarized considering its energy operation during day and night stages. For what concerns the daytime phase, the thermal inertia of the building masses prevents access of the solar radiation inside the building, and this is favored by the presence of the sack formed by the fine aggregate within the adopted stratigraphy. This synergistic action brings about a significant thermal wave phase shift, which penetrates the wall and lowers the temperature gap (Fig.5).

Meanwhile, the vaulted ceiling, thanks to the surface treatment and to its color tending to white, safeguards the inner volume, rejecting, by reflection, part of the incident solar radiation (Fig. 6).

Nocturnal phase is characterized by the cooling of the interior, due to the irradiation, towards the outdoors, of the heat that the structure accumulates during the day. This is possible, thanks to the reduced thickness of the cover and dispersing surface.

Today, the *'dammusi'* are realized with the technique of the masonry of cut stone This has the advantage of reducing the construction time, even if the costs of procurement and processing of the stones increase, as they have to be more refined. Nevertheless, thanks to safeguard policies of the material values and the typicality of traditional artefacts, these buildings are restored and made available, above all to the tourists, so they can enjoy the comfort that originates from it for their usage [23].

3. Climatic conditions and parameters for a proper design

The Mediterranean climate has heavily influenced the architects' design choices. During the past, when air conditioning systems did not exist yet, they used materials, and consequently processed solutions that could mitigate winter and summer climatic extremes:

The Mediterranean climate has heavily influenced the architects' design choices. During the past, when air conditioning systems did not exist yet, they used materials, and consequently processed solutions that could mitigate winter and summer climatic extremes:

- the Roman domus inner courtyard, that illuminated the rooms from the top and collected rainwater;
- the building mass consisting of stones *trulli*, with an opening on the top of the dome, to ensure a good natural ventilation due to the chimney effect and to protect themselves from the heat;
- White and compact silhouettes of Mediterranean villages to reflect the heat from solar radiation.

In the past, the relationship between design and constructive moment was mediated by the so-called rules of the art matured with the passing of time. Today, the dynamics of development of building technology and the continuous introduction of new materials and components have made more critical the bond between the project and its application.

Today these products have been abandoned and underpin the landscape as representative elements of material culture of the place. At the same time, the fact that they are still used, even if with other functions and destinations,

seals the perpetuation of collective memory through a system defined by a wise usage of practices and signs in the logic of regeneration and enhancing of shared heritage.

The basis of this system is the interpretation of the building process as a complex but unitary system that needs to be analysed and studied in each of its constituent elements, in order to get to the formulation of guidelines that can be easily applied and spread.

The decreased usage of heating and cooling systems - that consume over 60% of total employed energy and are spreading more and more because of the adoption of construction systems that do not take climate into account - does not necessarily imply a waiver of this kind of comfort, but *the desirable method would be to work with the nature forces, not against them, and exploit their potential, in order to create better living conditions. In a given environment, the structure that reduces undesirable stress and, at the same time, uses all natural resources beneficial to human comfort, can be defined climatically balanced* [24]. In order to achieve this balance, a fundamental role is played by the architectural bioclimatic design and, particularly, by the energetic efficiency in the built environment.

Thus, by studying the distinctive traits of traditional house, it is possible to deduce as how cadence of the windows, for example, arises from environmental and contextual assessments. Shapes, sizes, overhangs and placements are not subjected to the rules of a free formalism, but they are dictated by the needs of ventilation and natural lighting, depending on the location of the internal rooms and their orientation with respect to external environmental characteristics. The not random and detail design of the openings and their orientation have enabled the development of typological solutions that have been transmitted over time and have remained unchanged since the creation of vernacular architectures.

Logical and constructive invariants, that allowed the characterisation of anthropized landscape over the centuries and that, to a certain extent, have been brought back to memory to inspire and lead us back onto the road of harmonization with spaces and places [25].

Therefore, the orientation of the building, the building shape and the envelope's characteristics are the aspects on which the project action must be focused on, even due to the different thermal conditions of the buildings that vary depending on season and latitude.

3.1. Case studies. Constructive invariants and archetypal principles.

The temperature inside a building varies according to the season and to its latitude. Therefore, for a better indoor comfort, it is necessary to establish its materic and formal features, as well as its location and its orientation in order for it to adjust to the climate. In general, at the Mediterranean area latitudes, two different temperature phases may be identified, corresponding to different optimal requirements for a building:

Winter: sunlight on the walls and through the windows should be maximised, in order to warm up the interiors; in addition, the building envelope should be properly thermally insulated, in order to preserve the heat accumulated.

Summer: the building should be protected against excessive sunlight, using shading systems; in addition, thick stonework walls are needed in order to favour thermal inertia; finally, the natural ventilation inside the building should be enhanced [26].

Rural buildings feature structural and formal characteristics that constitute an extremely positive solution for thermal-hygrometric comfort. The condition they create makes it possible for the standard of living of the interiors to comply with all the bioclimatic requirements that are necessary in order to obtain an energetically comfortable building.

In the design phase, special attention is paid to the following parameters:

- Exposure
- Openings' positioning and size
- Envelope
- Roof

The *palmenti* exposure is such that the winds of the Mount Etna area are always exploited. This ensures that the building is always ventilated and thus cooled. Exposure is alongside the NORTH-SOUTH axis, therefore, as there are

no protruding elements, the protection is achieved by the stonework thickness, which mitigates solar action by creating a diffused, indirect interior light.

Thanks to its material consistency and its composition, the usually dry stonework (or, sometimes, rubble masonry), fulfils the need for increased thermal transmittance of the walls, improving thermal inertia without compromising statics and solidity, acoustic comfort and fire proofness.

The stonework may have a load-bearing and buffering function, due also to its thickness, which is never inferior to 60 cm. The latter, together with the type of material, causes the thermal bridge between the interior and the exterior to drop remarkably, increasing the temperature gap between interior and exterior to more than 10°C.

The ground insulation is always guaranteed both by the masonry features and by the fact that the buildings are raised from the surrounding ground by the widespread ventilated *vespai* (literally 'wasp nests') insulating the building from the foundations and avoiding both dispersions with the surrounding ground and rising damp.

As far as the roof insulation is concerned, this is ensured by the fact that the roof is composed of:

- A load-bearing wooden structure (beams and rafters)
- *Incannucciato* (intertwined canes)
- Shingles

In addition, the building's ceiling is tall enough to guarantee that there is always an adequately and naturally ventilated area. The openings were usually limited to two doors located along the main sides and to the only 'throwing window' located on the lateral side, close to the wine pressing vats. In some cases, besides the two doors, there could be two types of windows: bigger ones on the East-looking side and a smaller window (about 40 cm wide) on the West side, above the planking level. The windows located along the main side, with a straight or curved architrave, feature stone jambs.

Among the elements that have made cozy the interiors of the farms and *'dammusi'*, during the summer months, there are, above all, the loggias, balconies, verandas, pergolas, which together have created that image characteristic of the architectural buildings in the Mediterranean area and that represented some invariants for the contribution of natural light [27].

Among the features that have given significant contributions on the energy issue, I pay attention about some of them:

- Presence of wall masses that are able to give the building envelope considerable inertial characteristics. The developed architecture on the natural local stone of sedimentary origin gave a considerable help in such situation. Thanks to the presence of the mass masonry, used not only as a division between inner and outer space, but also as elements constituting the sub-structural system, an optimal control on the external temperature variations has been obtained, mitigating and dephasing the transmission of summer heat from outside to inside;
- Continuous improvement regarding size and exposure of the openings with respect to both the thermal transmittance and the light flux;
- The system of protection, working both with regard to the direct sunlight and the external ventilation, through, as an instance, the use of pergola or verandas, typical of the Aeolian architecture; the usage of light colors on the facade plaster such as to reflect the incident light and reduce the percentage of absorption of the solar radiation;
- Reduction of the ratio S/V (Shape Factor) of the building. In this way, the direct solar influx, insisting on the lateral surface and cover of artefact could be lowered [28].

The vertical section of the Mediterranean house shows a prevalence of solid on void shades. The openings are small, especially those exposed to the south, to avoid direct radiation and excessive transmission of heat in summer days. Moreover, a great mass, typical of the materials with high density and a common feature of the traditional architecture of Mediterranean area, greatly improved the energy performance of the building envelope. This gives it a function of thermal flywheel and modulator element of the heat flows between the outside and the inside, causing a consequent energy saving for what concerns summer air conditioning [29] and a greater thermal inertia.

The phenomenon of thermal inertia occurs in specific conditions: in presence of a envelope system, an outer wall or a cover, presenting particular characteristics, including high thickness (80-100 cm); specific dimensions and

adequate position with respect to the other elements of the building; a specific surface treatment; and especially, a property which is inherent in the employed materials, so the thermic capacity of the material retaining a certain amount of heat in its interior, without transmitting it immediately to the adjacent layers. In this way, the system acquires a power of high thermal accumulation that allows it to transmit this heat to inner spaces. This process persists during a daytime, so the external solar source release endures also during the night.

3.2. Case studies. Energetic conditions of the reference buildings.

The analysis that was made on the masonry leads us to study for the phase shifting, that is, the time that the thermal wave needs to flow from outside to inside through a building material. Even more a material has thermal inertia and greater will be the phase shift; even more is the specific heat of a material and greater the phase shift; even more the material is able to absorb heat and more it will be able to give it away slowly.

$$Volumetric\ Heat\ Capacity = Specific\ Heat\ \times\ Density$$

For this reason if the phase shift is greater, then the heat will takes longer to pass inside the building; more the heat capacity has a material, more it is able to accumulate thermal energy. The damping is the heat accumulation capacity of a material. The materials with more density kg / cu m offer greater protection

By entering the data on the composition of the opaque vertical walls, the location and exposure, it has been verified that the building is within the energy class B while not having heating. This is due to a wise use of poor materials, which thanks to its thickness and its natural characteristics can give an adequate thermal comfort.

3.3. Case studies. Solar analysis.

To study the sunlight, we have applied special methods designed to capture direct light [30]. Such methods, based on the drafting of special solar maps, allow to calculate the amount of natural light and shade captured and projected by the relevant building [31].

The findings indicate that the amount of light captured inside occupies 9% of the surface of the relevant space. As a matter of fact, if the typical area size covered by the *'palmento'* is equivalent to some 60 sq m, the amount of light captured, at 10 am - when there is the highest sunlight level - is of about 6 sq m. From 10 am to 4 pm, this amount drops to the lowest level; after 4 pm, natural light is once again detected inside.

This principle is possible thanks to the two doors, located almost opposite to each other on the front and back sides, which allow to capture the same amount of sunlight in the course of the day. During the rest of the day, inside the *'palmento'* the level of sunlight is very low. This is an expedient expressly designed to ensure the highest light during the two most important times of the day, i.e. in the morning from 9 am to noon (time of wine pressing) and in the afternoon from 4 to 5 pm (when vats are washed). In addition, shade - also sought on purpose - helps the formation of must inside the vats, a process requiring ventilation, but also scarce light.

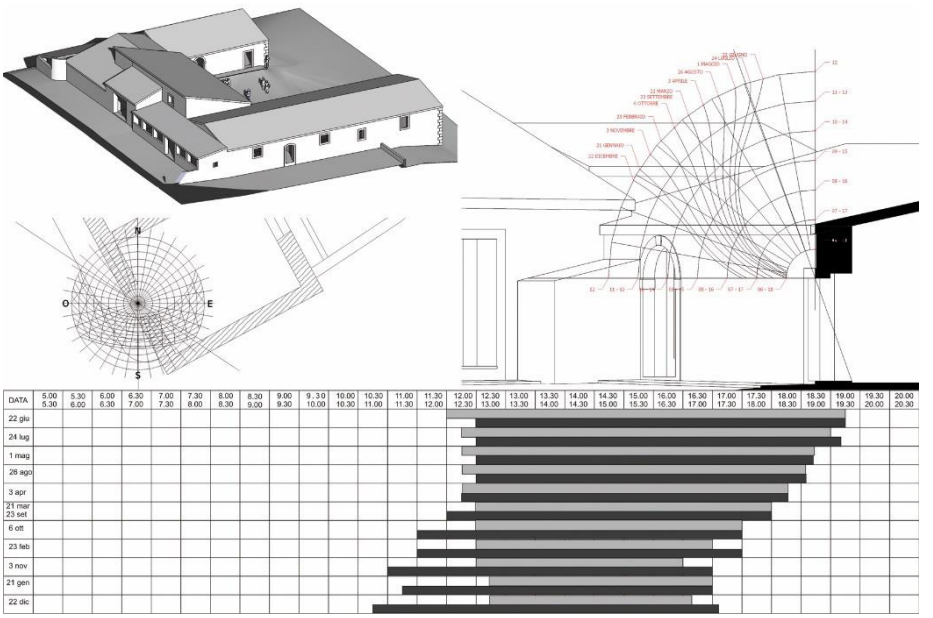

Fig. 7. Solar Analysis on reference building

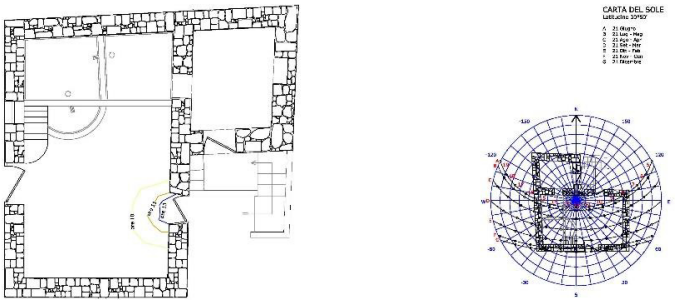

Fig. 8. Solar Analysis on building planimetry

4. Conclusions

To paraphrase the words used by K. Frampton to describe Le Corbusier's chapel of Ronchamp, associated in part to a Maltese tomb, in part to a genuine architectural structure from Ischia, its semi-cylindrical lateral chapels, lit from above through sphere-shaped skylights and oriented towards the sun, contribute to remind us that this place, now Christian, was once used as a temple of the Sun [32].

What is important in Le Corbusier's experience is the method, resulting from a combination of vernacular forms and their knowledge, description and reinterpretation, requiring a classification into analytical categories of constant features and variations alike, and turned into a new and personal universe of forms [33]. An architecture rejecting homogenisation, a trend which, in opposition to the nostalgic sentimentality of vernacular, brings back some stylistic features belonging to that production.

By inventing and re-acquiring past heritage while adjusting it to present times, an analysis of the *'modus operandi'* is carried out to establish to what extent the quality of the work is also dependent on its relations with the place in the sense of the environment, as well as on who interprets it.

These topics are at the core of the architects' effort, basing their work on aesthetic research, the research of a personal universe of forms and signs, linked to environmental issues [34]. The project is not derived *from a vision pre-determined by a rational abstraction of a geometric kind, but from a real relation to the place. This makes the project richer in perceiving and penetrating the landscape, in adjusting to the lay of the surrounding land, in using suitable materials for the relevant context* [35]; by doing so, the generalised adoption of models foreign to the history and the culture of the place can be avoided.

One of the winning policies to be implemented in order to safeguard and at the same time enhance these structures is certainly a change in their function. It is inevitable to take into account the modified working requirements in the countryside and the current standards of living of spaces, in order for a careful design of such structures to contribute not only to qualify the landscape and improve the standards of living, by focusing on living comfort and on an optimal exposure. And to create architectural models serving as a source of inspiration in terms of choice of materials, found on site, as well as the function of self-promoting cultural and entrepreneurial activities that take place in them, not just as witnesses of a remote past [36], but also because they can serve as a driving force for activities related to a quality cultural tourism.

In our case, in order to serve a different function, the *palmento*, the *masseria* and the *dammuso* to be reused need to undergoing a number of changes enabling to get more internal light by re-designing the size and the location of the openings along the sides, based on the findings of solar capturing: the integrity and the inner features of this structure can thus be preserved.

One of the main requirements regarding the envelope of these structures is the ability to control the solar factor, thermal inertia, heat dispersion, thermal insulation and energy saving content. In fact, in relation to internal comfort conditions, the behaviour of the external envelope plays an essential role to decrease the energy demand and the subsequent costs, by avoiding, thus, an indiscriminate use of machines for the air conditioning and by contributing to the reduction of CO_2 into the environment.

To make inspiration from culture and experience tangible, *one should not irrationally reject the present, nor give in to the defeatist charm of evasion; it is necessary to carry on some research oriented towards the possibilities aimed at bringing back the original essence of things in a current form, at identifying the archaic features of each breakthrough innovation* [37]. In other words, conservation is tightly reconnected with innovation.

Thus, the assumption of constructive archetypes - models for a proper environment-related design - should be incentivised, trying again to take care of the populated area, manage, retrieve and re-use the heritage of natural and cultural resources, give new meaning to legacy of the past [38]. This would provide an authoritative answer to nowadays' speculative trends, that ignore the requirements of energy saving and housing comfort, including the social aspect of our homes. The inherent existence of those principles and logics, transmitted over time, and forgotten in the last century, has to be unearthed, known, studied and updated, if possible through innovative techniques that can put the true art of building at the heart of man action again.

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