The use of adobe in the traditional buildings of Sardinia
Typological and construction innovation
between XIXth and XXth century

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Earthen architectures, or architectures in which earth as a building material is the main component, are nowadays frequent topic of studies and researches run world-wide. Representing the archaic local building tradition they witness the specificity of the technical solutions adopted in different cultures, climates, habitats.

The island of Sardinia is retained in Italy the Region with the most conspicuous earthen built heritage, and therefore represents, at least in a national context, a privileged reference. The use of earth as a building material is concentrated in the southern part of the island in an area included roughly between Oristano (north) and Cagliari (south) along the plain called Campidano, where the diffusion was capillary and used to cover in a close past almost the totality of the buildings in rural and town settlements. Except for the capital, built with the limestone extracted from the hills on which the town was founded, earth was used with excellent skills to build houses as far as public buildings; the typological variety shows itself in the elementary residential cell as far as in palaces, in shelters for the animals as far as in industrial structures. Nevertheless the earth building is mostly represented in general by a court house whose repetition creates the morphology of our settlements. An approximate estimate lists about 90,000 buildings spread in almost 30 towns, which means that about a third of the Sardinian traditional heritage is built with earth. The used building element is adobe, formed generally in the standard size 40 × 20 × 10 cm, but changing measures according to specific local uses and personal needs. (Figure 1)

The area in object is an alluvial plain, where woods and stones were of more difficult reach. The soil available in the plain of Campidano shows often a very different composition in the various areas, changing the content of minerals and clay, as much as granulometry and texture. The nature of the clay though is almost everywhere adequate to the specific purpose of the adobe production, except rare cases the...
physical characteristics fall in the range of the adapted soils, so that it was generally possible for the private builder to use the materials excavated *in loco* for the foundations to make his own bricks (Angius and Casalis 1833).

Several interviews made in our early researches to old producers and builders testify the spread culture of self building, the diffusion of deep-rooted skills possessed by everyone, able to compose optimised mixtures of earth, straw and water, to obtain a product of acceptable resistance. It is still readable in the composition of the ancient bricks the efforts the producers had to make to bring the mixture of a bad soil to an acceptable building «standard»: for example, a bigger amount of straw testify the excess of clay content.

In the bigger centres it was also possible to find real production plants where one or more men were able to produce manually 200–300 bricks a day. The production system was the same found throughout the world, mainly manual, rarely helped by animals. The mixture was prepared one day in advance with earth, water and straw. On the next day, using wooden forms the men produced the bricks laying them directly on the ground and letting them dry in the sun.

This production stood alive in most cases up to the end of the 50’s, when the same producers simply replaced earth with cement, easier to work and apparently more durable, and introduced into the market the concrete block.

These years stated the end of a building culture, the interruption of traditions and *savoir-faire* carried over since thousands of years, as it is demonstrated also by recent archaeological founding.

As mentioned before, the most frequent built typology is represented by the court house. (Figures 2, 3)

In order to better identify this buildings we can still use the description made in 1941 by the geographer M. Le Lannou (Le Lannou 1941):

The house of the south is the most complex and at the same time the most complete of all Sardinian rural buildings. The house opens on the road with a wide portal often rectangular, more frequently surmounted by a camber or round arch... The portal is the only entrance to the house. It opens to a square courtyard, completely surrounded by buildings and walls. The house itself stands on the opposite side of the portal. It is preceded by a porch with a descending roof kept by wooden or brick pillars... Along one or more sides of the yard we can find also some more perfumatory buildings, sometimes open on the courtyard, too: shelters for the cattle, the cart and the tools, the wood supply, the oven, the mill and the donkey that turns it. When these buildings lean on the wall towards the road then the portal becomes access to a tunnel like to a monumental entrance. In the courtyard a
well is never missing, often in open air. The porch (lolla, in local dialect) is more than an external element, a real living room... In the windy and hot plains of southern Sardinia, the loggia is a useful remedy to climate excesses. Windows and doors of the house open to the court giving light and air to the rooms...

The court is then reduced to essential, structurally introverted, communicating with the external just through the entrance portal (unless later divisions or obstructions do not force to open new doors to the road). This is also the reason why the sequence of tall walls along the roads, scanned by portals, is the representative sight of southern Sardinian town centres. (Figure 4)

Despite this homogeneity, the typology of the court house hides an extraordinary variety of differences, given by the multiplicity of the building specific elements: dimension and extension, orientation, access and relation to the road, internal relationship among the buildings, can be combined to a wide-ranging record of cases. For an easy interpretation we can resume the diversities depending on three main characters: social typology of the owner (poor, well-to-do, rich) and consequent size of the property, typology of the relation through the access to the road, typology of the buildings. (Figure 5)

This schematisation suggests the variety of the possible cases that lead to a non-static texture. Actually it is the former scarcity of the buildings in the urban texture given principally by the presence of the court, the prevalence of empty on full, the main cause allowing intense modifications.

The process of division due to inheritance sharing became later the prevalent reason of morphological modification, and as a result, of urban transformation: the first visible consequence was the raising of a wall in the middle of the court. The filling, at least partial, of the empty space of the court followed immediately after. The new disposition of the spaces forced new openings of doors and windows, often the closure of the loggia; the buildings grew in height and length coming closer up to touch each other. It is almost always easy to read these morphological transformations confronting the cadastral maps of the end of 1800—beginning 1900, although sometimes the interventions have been so deep and important that only with a radical work we are able to recognise now the original situations. (Figure 6)
THE ADOBE SHELL

If the morphology of the settlement system was often changing, according to the succession of owners and new needs, the building techniques used throughout the centuries remained the same, showing a well established possess of the construction skill.

From direct witness (now disappearing as the former builder and adobe producers have reached a certain age) and from rare specific documents we were able to find about a few of our public buildings we got the information on the provenience of some of the building materials, as far as about the wall construction, the horizontal closures, the openings and their frames, the finishing, the plasters and mortars, the particular details of more difficult building parts.

The building laid rarely directly on the floor, without foundation. More often some excavation occurred from which the soil was then used to produce the adobe bricks necessary for the raise of the walls. These excavations were then filled with non worked river stones, bounded with clay or lime mortar. The stone foundation was frequently carried 50–80 cm up from the ground, to keep the adobe wall away from possible humidity raising from the soil for capillarity. (Figure 7)

The walls were completely build with adobe, in the frequent size 40 x 20 x 10 cm (this measure varied in the size but never in the relation 4:2:1) produced directly in the building site, more rarely bought. The lay of the wall was whole-brick, and previewed the pose of the bricks always by the width with offset joints. This disposition was kept also in the corner and in the T-joints, where the bricks were cut at? of the length to avoid the superposing of the joints of the next layers. In more rare cases the bricks were laid alternatively by the length and by the width, in a double brick thickness, so that the corner could be realised with entire bricks (Sanna 1999) (Figure 8)

The internal walls were sometimes made with the same adobes put by the width, the wall having a thickness of 20 cm.
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The mortar employed was traditionally made of the same mixture used for the fabrication of the bricks: clay, sand and water; just the straw was here not any more added as the shrinkage effects (frequent in soils rich of clay) were less important in thin layers. At the end of the 19th century, when a significant innovation appeared to change the traditional way of building, the mortars would systematically preview a mix of clay and lime in a relation 2:1 for all type of walls, including the adobe ones.

The plasters were traditionally made in at least two layers: the first one creating the right support for the finish was again of a mixture close to the one used for the bricks, with a finer soil, often sieved and with addition of straw. The straw was often replaced with grain chaff, very short fibres that allowed an easier workability. The plaster was laid in a thickness of 1-1.5 cm. The final finish was always made with a lime plaster, at least on the exterior walls where a major protection was needed. An intermediate layer was also often realised, with less straw and a small percentage of lime.

One of the most important documents that gave us an extraordinary amount of information on traditional building processes and of intervention on existing structures is represented by the Capitolato d’Appalto that accompanies a project for the enlargement of the house belonged by Antonio Nobilioni in Quartu Sant’Elena. The house was bought by the Municipality on 3rd August 1853, with the intention of moving its head office after the renovation of the building. (Figure 9) In 1868 the planner addressed to the Town Council a report explaining aims and methods of the project, all completed with the mentioned technical specifications which define exactly materials and building characters to be used in the work:

**Artide 21**

Brick walls - 10 burnt bricks

All arches of the porch will be built with this bricks, together with those of the hall and the staircase, bound with a lime and sand mortar taking care that this last one will have to be finer and carefully sieved before being used.

2° adobe bricks

The adobe wall will be cemented with a well prepared clay and sand mortar. The brick course will be with alternate joints, namely the thickness of each course and its length will be formed by bricks disposed by the length and by the width, alternate, so that the joints would never correspond not inside and not outside.
In general all walls will be plastered, rendered and floated with a sand and lime mixture and painted with whitewash.

**Article 22**

**Brick vaults**

The porch will be covered with cross vaults with lower rises; they will be built with the mentioned bricks and cemented with a lime and sand mortar, painted twice up to 2/3 of the arch starting from the impost, and closed with a key brick put by the length.

The entrepreneur will choose the cast he will retain most adapted, provided that it is solid and well built, the Administration will adopt it, too.³

It is also to be noted that these indications represent an exception among the great amount of the buildings that continued to be raised in a quite archaic manner.

**OPENINGS**

The theme of the openings assumes in all places and times a crucial meaning. The court house with its introverted nature gives in a more important way to the portal (especially) and to all doors and windows a particular significance. It is obviously impossible to give a systematic list of all cases, but nevertheless we chose some criteria of orientation in the wide scenario given by all different building solutions (Sanna 1999).

The first case is represented by the elementary window, a simple opening obtained in the adobe wall kept by a wooden (juniper) architrave, lacking in lateral supports. This type of window could have a very small dimension, not exceeding the square meter. In rare cases the architrave could be replaced by a flat or depressed adobe arch.

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**Figure 10**

*Abaco delle finestre di Riolo* elaboratore: Carlo Atzeni
A development of the previous example came due to a first contamination with the more refined building art of the late 1800. In this case the architrave was surmounted by a discharging arch, made with burnt bricks, and the lateral supports were also brick made well joined to the adobe wall. This type of opening had at least two shutters and width dimension above 1 meter. The use of burnt bricks underlines the better cure put in details like the edges of the window side supports, well more resistant than the adobe ones.

The case of the opening realised with an arch is definitely to be referred to the later typology «a palazzu». It is characterised by a camber arch all made with burnt bricks, often exposed face. The positioning of the bricks is sometimes rotated to give the proper angle to the internal jamb, and confers to the external the light and shade effect that characterises nowadays the historical town centres.

The last example of opening finds an external decoration made with pre-fabricated terracotta profiles, later made of cement. This type of window is obviously more appropriate to the palace typology, but it is to be found also in court houses. (Figure 10)

The entrance doors fit to the same building language, but they were not related to the court house typology and actually belonged just to the building opened on the road front. The door carried the same characters of the windows, showing the only difference in the use of stone, often worked, for the arch and the supports.

The portal had a special meaning in the court house. It was often the only entrance to the house and brought therefore to the external all information related to the owner family. (Figure 11)

The portals left nowadays are almost always surmounted by an arch, often three centred, made out of adobe or fired bricks, very rarely of stone. It is
most probable though that the ancient portals were surmounted instead by an architrave, as the wooden frames still show. But if the materials, less the form, were changing, the geometrical relations were frequently constant: 2.4 m in the width corresponded to as many in height, up to the arch impost. The keystone carried often the initials of the owner or the symbol of his job.

**Floors and roofs**

The floors connote a constant building pattern common to different areas and related to buildings of different typology. The room type is rarely wider than 5 metres, always covered with a wooden beam structure on which a plank floor is laid. The wood beams are posed at a general distance of 80 cm and the plank floor is directly nailed on them. Very rarely is the double frame with bearing beam to be found, so the charges are divided in fact just on the two walls. The wood used was preferably juniper, replaced later (when the size of the juniper trunks were not any more sufficient) by chestnut-tree wood.

The roofs, according to the simple shape to be covered, is almost always a pitched roof with thick bearing beams (ridge board and binding rafters) laid directly on the walls carrying a secondary wooden frame. (Figure 12) A reed thatch was fixed on top, on which an earthen screed was keeping the channel tiles. Wherever the walls were not raised to bear the roof weight, a system of trusses was realised. This simple system was very often used as the span to be covered were normally contained. For bigger spans stone or brick pillars inserted in the adobe wall carried the point loads of the truss.

The eaves are a very important building detail, serving to crown the building and at the same time protect the walls from rain—and stream waters. The solutions found are various and employ different materials, starting with the simple overhang accomplished with channel tiles disposed so that they...
hang over the wall. It is a common building art spread in all Mediterranean areas, also shared with stone wall typologies. (Figures 13a, b)

Another example is related to the channel tiles laid on a overhang produced with more tiles, in more refined cases replaced by burnt bricks. This last solution would be more frequent during the course of 19th century when the new town fashions started to influence the building art of the countryside. At the end of the century, according to new norms, the parallel gutter started to be mandatory: the first adopted immediate solution was to place by the length a line of tiles on top of the wall; the tiles would be superimposed and well sealed in order to avoid any water infiltration in the wall below. From this the consequent evolution was the realisation of the crown wall at whose inside the gutter could be hidden.

In the domain of the research carried in the past years at our Department we synthesised most of these topics in various publications included a Cd-rom titled «Arte del costruire-Guida al recupero dell’edilizia storica di Quartu», processed in accordance with the recent studies that deal with the knowledge of pre-modern and modern building cultures and techniques with the aim of restoration and rehabilitation. We referred especially to the stream of the Manuals for the Rehabilitation of Rome, Città di Castello (Giovanetti 1992) and Palermo where this type of approach is evident. The Codex of Practice written more recently for the rehabilitation of the «Sassi di Matera» by Antonino Giuffrè (Giuffrè 1997) has improved this studies adding new contributes about the operational systems. Manuals and Codex of Practice are giving now an original and precious contribution for a contemporary understanding of the various building practices bringing us to a revaluation of the culture of materials in order to solve in an appropriate manner the problems joined to the knowledge and the intervention on historical centres and traditional architecture. From this point of view our research defined in depth each building element, its production, the put into realisation, the durability, its relation to the context.

**TYPOLOGICAL AND CONSTRUCTION INNOVATION**

At the end of 1800 and during the course of 1900 a major change occurs: new typologies come close to the basic type of the court house and integrate in the urban context, responding to a demand of new functional needs and especially a new necessity of self social-representation of the raising rural bourgeoisie. (Figure 14)

The most evident effect is represented by the introduction of the new typology of the front road palace inserted in an urban texture of court houses. The introversion of the house gets completely upset in order to gain a face on the public road where new decorated façades show openings and balconies more adapted to a new lifestyle.

Evidently this new model gets perfectly inserted in between the ancient tissue, and lives together with the adobe introverted houses, never in conflict. The
common building material is used as always, the differences being in the reinforcements of the corners, posts, architrave and cornices, and the importation from the town of new building materials (especially iron) for elements like balconies and balusters.

Among the residential typologies of new conception of the end of the 19th century some rare cases are also to be mentioned that concern adobe buildings which not only occupy the court, but in fact overturn its constructive logic. It is the case of some villas replacing the open spaces of the town centres: one particular example is to be found in Quartu Sant’Elena and it is represented by the Villa Fadda. It is a great neo-classic complex built on the influence of the famous school of Gaetano Cima in Cagliari. Of the same architect another villa in the same style was built in San Sperate.

Another mention is to be made about public buildings and industrial settlements. The use of adobe is to be found in both of them, although often accompanied by reinforcements made of stone or burnt bricks. Examples are to be found in many villages and towns, such as Quartu, Selargius, Pirri, the mining area of Sulcis where townhalls, distilleries, slaughter-houses, glass-work plants, brick-kilns all built mainly with adobe bricks, fusing tradition and innovation, ancient and actual skills, and influencing the following building production.

NOTES

1. Among others, Quartu Sant’Elena-areas Pizz’e Serra and Fantan’e Orus. Selargius, Villasor-area cemetery.
2. "La casa del sud è la più complessa e anche la più completa delle case rurali di Sardegna. L’abitazione si apre sulla via con un largo portale talvolta rettangolare, più spesso sormontato da un arco ribassato o semicircolare ... Il portale è l’unico ingresso della abitazione. Dà su un cortile di forma quadrangolare, completamente circondato da costruzioni o da muri. La casa d’abitazione è sul lato del cortile opposto al portale. E’ preceduta da una loggia formata da un tetto a spiovente sostenuto da pilastri di legno o di mattoni ... Su uno o più lati del cortile ci sono delle costruzioni sommariate, spesso aperte anch’esse sul cortile come la loggia: sono i ripari per i buoi da lavoro, per il carro e gli utensili, per la provvista di legna, per il forno, per il mulino rustico e per l’asino che lo fa girare. Quando questi ambienti s’addossano al muro che bordeggia il cortile dalla parte della strada, il portale dà accesso ad una specie di tunnel che forma come un’entrata monumentale. Nel cortile non manca mai il pozzo, spesso all’aperto. La loggia (in sardo sa lolla) è, più che una galleria esterna, una vera e propria stanza d’abitazione ... Nelle pianiure sarraceniche e ventose della Sardegna meridionale, la loggia è così un utile rimedio agli eccessi dei climi. Sulla loggia si aprono porte e finestre dell’abitazione propriamente detta. Le stanze interne prendono luce solo di qua, e tutte danno sulla loggia, con porte a vetri o con una finestra».

3. Articolo 21
Murature Laterizi – 1° Mattoni cotti
Saranno costruiti con mattoni così detti del campione tutti gli archi del portico, del vestibolo, ed i rampanti e ripiani della scala, cementati con malta di calce e sabbia avvertendo che quest’ultima dovrà essere alquanto più fina e prima di esser posta in opera diligentemente crisellata.
2° Laterizi o mattoni crudi
La muratura in mattoni crudi, sarà cementata con impasto di terra e calce ben manipolata.
I corsi dei laterizi saranno a giunti alternati, cioè lo spessore di ogni corso e la sua lunghezza sarà formata da mattoni disposti in lungo ed in trasverso, alternati in modo che le commessure di un corso non corrispondano a quelle del corso successivo nè internamente nè esternamente.
In generale tutti i muri saranno intonacati, arricciati e trattazzati con malta di calce e sabbia ed imbianchiti con latte di calce.

Articolo 22
Volte in mattoni
Le volte che dovranno coprire il portico saranno a crociera ed a monta alquanto depressa. verranno costruite con mattoni del campione cementati con impasto di calce e sabbia, e imbiancate in doppio fino ai due terzi dell’arco, a partire dall’imposta e chiuse in chiave con un mattoncino di punta.

Per l’armatura l’impresario potrà scegliere quel sistema che stimerà migliore, purché sia solido e ben congegnato, verrà adottato anche dall’Amministrazione.

4. Materiali per un Manuale-Atlante per il recupero dell’insediamento e del paesaggio rurale della Sardegna» (Scientific coordinator: Antonello Sanna Università di Cagliari), integrating the Ricerca Scientifica di Rilevante Interesse Nazionale Tradizioni del Costruire nel Territorio Nazionale: «Continuità ed evoluzione delle tecniche edilizie per la salvaguardia ambientale del contesto insediativo minore» (Scientific coordinator: Adolfo Cesare Dell’Acqua Università di Bologna).
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REFERENCE LIST


Among the general texts we recall some other volumes:


