Knowledge of modern architectural heritage in Sardinia through construction techniques. The case of rural architecture of Arborea (OR)

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1. Introduction
A full and meaningful knowledge of buildings that need restoring is always necessary and proper, in order to fulfill a good intervention; this is especially true if we are talking about modern buildings, that are still not known enough from the technological point of view, though the constructive aspects are substantial to understand their historic essence, and their value. Even more important for modern buildings than for the ancient ones, this kind of pointed knowledge is essential, not only as the base of an intervention, but also to increase our awareness of the necessity of preserving a heritage that, due to negligence, abandon, incongruous interventions and demolitions, is at risk of being lost, before being understood.

It’s in this direction, and with this purpose, that this paper is oriented, presenting some aspects of an ongoing doctoral research about the construction techniques used to build the city of Arborea (OR), in Sardinia, Italy, at the time of its foundation during the 20s and 30s of the XX century. The city of Arborea was born, under the name Villaggio Mussolini, as a service centre within a territory, the plain of Terralba, subject of an great activity of reclamation.

The reclamation was carried out within the wider project, originated from the plans of A. Omodeo, of a better control and exploitation of Sardinian rivers in order to provide irrigation and electricity to the island, and a great contribution to its realization was given by the industries of the so-called grupo sardo: Società Imprese Idrauliche ed elettriche del Tirso (1913), Società Elettrica Sarda (1911) and Società Bonifiche Sarde, SBS (1918); this one dealt the reclamation in the plain of Terralba, covering an area of 18000Ha, in synergy with the creation of an artificial basin on Tirso river.

Thanks to the reclamation the land, initially swampy, wild and almost completely uninhabited, could be divided in plots, irrigated, cultivated and settled. The realization of the building and streets necessary to the completion of the endeavor, was devolved upon the Società Sarda Costruzioni (SSC) directed by eng. Carlo Avanzini and established as a longa manus of SBS in 1922 [Pisu, 1995, pag.152] and to which is attributable the most of the buildings erected in the land until its fusion with SBS, about 10 years later. Buildings constructed in that period have similar characteristics, both stylistic and constructive: a style that has a lot in common with eclecticism [Pellegrini, 2000,], evident in the buildings of the urban core but also visible in the other buildings within the rest of the reclaimed land. This style goes at the same pace with a preference for the traditional constructive system based on the bearing masonry but, if necessary, it could give the way to the reinforced concrete technology and to the frame, as happened in case of the big industrial buildings. Among the first buildings, even previous to the foundation of the urban core,
we can find those of the productive centres; firms that, each of them covering a land of about 800Ha, constituted rural settlements and the first step of the agrarian transformation, that was followed by a further division of the land in small farms that were given to colonists, most of them coming from Veneto and Polesine. All of these centres were designed in the same way, so that they show the same typological and constructive characteristics, except for small variation related often only to decorations; they well represent the choral nature of the whole endeavor.

The focus of this paper will be on these productive centres, now in a state of severe decay, with the purpose that the study of their construction techniques could provide the basis for the knowledge of the architectural heritage of the entire settlement; This awareness could be the first step toward maintenance and preservation of the identity and the history of Arborea, providing premises, starting points, means and tools for future restoration interventions of a heritage that, in spite of its exceptional nature, has been little studied, and there is still much to know, especially from the technological point of view.

2. The productive centers: the firms
The centers that will be analyzed here are those built with great speed during the years 1924-1925, that SSC equipped with agency buildings, houses for workers, farmhouses, cowsheds, cellars, barns, warehouse, workshops, transformer room. [SBS, 1928, pag.22]; all these buildings were organized around a court/farmyard, as to recreate an intimate dimension and a sort of neighborhood in a land that didn’t have other landmarks yet. These centers, erected before the foundation of Villaggio Mussolini, are six, that is Alabirdis, Tanca del Marchese, Torrevecchia, S’Ungroni, Linnas, Pompongias. Other centers, those of Sassu, have been erected only after 1934 when draining of the namesake pond started, by means of the water pump designed by Flavio Scano; to them, in the meantime joined Luri but, since it was designed with another structure, it won’t be analyzed here.

2.1 Construction techniques
The study of the construction techniques by which they were made by is based mostly on the available literature, old pictures and on direct metric surveys. The lack of availability of archival documents makes the research more difficult, but the possibility of doing inspections on site and surveys, and the severe state of decay of some of those buildings, allow us to highlight their constructive characteristics. It has been possible to observe that the predominant constructive system is the one based on the bearing masonry, flanked by a frequent utilization of reinforced concrete that, however, resulted in the realization of pillars or floors; with the exception of cylindrical silos for fodder, entirely constructed in reinforced concrete.

Buildings that are to be described here, are agency buildings and cowshed, in particular the agency building in Alabirdis, the cowshed in S’Ungroni and those in Tanca Marchese. The typology of agency buildings, or farmer’s house, it’s repeated with little variations in the centers of Alabirdis, S’Ungroni, Pompongias, Torrevecchia e Linnas; in Tanca Marchese, the building known as
farmer’s house is more similar to the typology of the houses for workers, from which the agency buildings differed mostly for the elegance of the structures and of the decorations [Pellegrini, 2000, pag.60], to highlight the authority of those who lived there.

The agency building in Alabirdis is a two-storey building with a rectangular plan; at the ground floor, on the back, we can find a portico. The principal façade, on the current Oberdan street, is treble and consists of two side wings and a central one, a little rearward; here, the ground floor consists of a treble portico, that coincides with a loggia characterized by round-arch windows supported by reinforced concrete pillars. We’ve just touched on the importance of the decorations in this kind of building; here the front is characterized by decorations in horizontal bands on the ground floor, on the first floor we find a band decorated with a geometric motif that reminds a sort of framework, and a decorative under-gutter frieze; also the masonry below the round-arch windows of the loggia is decorated with a floral pattern, and the portion of the masonry above the same windows, instead, with an arch design. These decorations are made both by simply painting the plastered surface, and by placing lime in high-relief, as in the case of the under-gutter frieze, but also by carving and then painting the plaster as in the case of the framework decoration on the first floor. The bearing structure of the building is the masonry, made of trachytic stones 50 cm thick in every floor, finished with a layer of plaster 3 cm average thick. Floors of the side wings of the building are made of wood, organized in a unique frame of grossly squared beams (14x15cm, width x height) placed at a average distance between 50cm and 60 cm; above them, a layer of boards 3 cm thick and above this, a screed of 4cm average thick. The pavement is made of decorated cement tiles, 2 cm thick. The floor above the entrance portico, is made of reinforce concrete; in fact, on the façade, two reinforced concrete pillars 25x25cm sized bear a reinforced concrete beam sized 12x22cm parallel to the façade, and other two reinforced concrete beams 22x16cm sized perpendicular to the façade, instead. On these beams rests a reinforced concrete floor slab of 10 cm thick; there are no curbs. The stairs are recessed between the bearing walls and are made of reinforced concrete cantilever steps. The original wooden roof is no more existing.

The cowshed that we can find in S’Ungroni, well represents the typology adopted in the productive centres, even if it shows a variation compared to those in Alabirdis, Linnas and Torrevecchia that was characterized by a gable roof with the ridge parallel to the longitudinal axis; in S’Ungroni, instead, that kind of roof parallel to the longitudinal façade intersects portions characterized by the opposite orientation, creating two tympanums parallel to the long side of the rectangular basis.

The building covers an area of approximately 400 sqm; the animals stood
back-to-back along the long walls of the building. The bearing structure is the masonry made of trachytic stones, of 50 cm thick and within the building we can find two rows of reinforced concrete pillars of the size of 25x25 cm placed at a longitudinal average distance of 3.90 m and a cross distance of 2.20 m. On every couple of pillars rests a wooden truss, made of a king post sized 23x19 cm and struts sized 18x15 cm, connected to the tie beam by means of metallic straps in correspondence to the pillars. In the gable roofs parallel to the longer façade, above the first struts there are others, made of two wooden beams combined together, each one sized 21x7 cm, connected to the king post by means of metallic straps and to the tie beam by means of spikes. Furthermore, a structure that reminds a sort of dormer constructed by means of another structure made of wooden beams and slats, improved the ventilation of the interior. Above the principal rafter we find purlins sized 13x15 cm placed at about 1 m centers, and a common rafters made of slats sized 4x8 cm, a layer of canes and then roof tiles.

The portion of the orthogonal gable roof, is no more existing because it has almost totally collapsed and so it’s no possible to make a metric survey; but from what has remained and thanks to the analogy with the cowshed in Pompongias, which has been photographed before the collapse, it’s possible to establish that four wooden beams connected the ridge of the central truss resting on pillars, with the four corners of the base quadrangle so covered. Central rows of pillars defined the area reserved to the animals and the area reserved to the personnel assigned to taking care of the cattle. The pavement is made of concrete, and troughs are made of reinforced concrete. Windows frame are placed at 2 m weight from the ground, sized 120x60 cm; they have a reinforced concrete architrave 20cm height, and the frames of the hopper-windows are wooden.

The cowshed that we can find in Tanca Marchese is deeply different from those of the other centres. Here, at the beginning of the reclamation, the direction of SBS was settled, in one of the few buildings already existing, and created the first experimental farming; so, the first buildings were built here, probably since 1919, so before the foundation of SSC. In particular, the cowshed that will be described included also a barn, on the upper floor, as it happens nowadays, so the necessity of bearing the hay weight and of resisting to fire could have been some of the reasons to determine to use the reinforced concrete frame instead of masonry.
In fact, the so-called “old cowshed” show framed structure like the Hennebique typology, characterized by rectangular knots of about 4.60x2.45m in the central span, and about 4.60x3.15m in the side ones. Pillars in the interior of the building are 25x25cm sized, instead the perimetral ones are 26x40cm. The main beams, parallel to the longitudinal axis, are 36x16cm sized, instead the secondary beams, orthogonal to the others and placed both in the middle of the length of the main ones and in correspondence to the pillars, are 26x10.5cm sized; the floor is made of a r. c. floor 10 cm thick. Both the pitched roof is made of a reinforced concrete floor slab. In the ground floor, the claddings are made of concrete blocks, instead in the first floor, it seems that claddings are made of adobe. Windows frame are placed at 1.60 m height from the ground, sized 180x85 cm; they have a reinforced concrete architrave 20cm height and 2.20m length, and the frames of the windows are made of iron.

3. Conclusions
From what has been presented in this article, we can be able to infer some considerations; in particular is interesting to notice the difference between the constructive techniques used to build the cowshed in Tanca Marchese, that is the reinforced concrete frame, compared to the one used for the other cowshed in the centres erected later. It’s known that rural buildings requires more time to be touched by new technologies [Gussoni, 1934, pag. 1], and this aspects, associated with the strangeness of that system for traditional rural architecture in Sardinia, which is characterized by techniques, typologies, local and traditional so different from those used by SBS/SSC, represent a great value of novelty. The modernizer spirit that inspired the whole reclamation endeavor is recognizable and tangible in the technological aspects of this pioneering period. It’s not yet clear why later buildings, after these experimentations in Tanca Marchese, have been constructed by means of the bearing masonry; this change of direction cannot be due to a technical inability, which, thanks to the constructions built for the reclamation, had become a successful construction builder in condition to carry out important works, as the excavation for the foundation of Rinascente building, the construction of Salesiani’s building and of the aqueduct in Cagliari; in Nuoro, the construction of the post office designed by Angiolo Mazzoni [Pisu, 1995, pag. 153, 211, 212]. It’s rather possible that the use of local manpower and the necessity of fast realizations, have determined to use a constructive technology more suited and absorbed by manpower, saving the use of new materials and technologies to specific typologies as fodder silos, and the to construct completion elements such as reinforced concrete troughs in S’Ungroni.
Since 1933 SSC has been absorbed by SBS which had passed under I.R.I.
control, and ended the heroic period of the society, even if it has been possible, in the following years, to build some of the most interesting buildings in Arborea, such as the GIL building and the House of the Fascist Party, both designed by G.B. Ceas, and the draining pump of Sassu, designed by F. Scano; in these buildings, finally, we can notice a stylistic review towards a more modern style, than the one who had characterized the Avanzini’s period. Otherwise, we can state that, during their activity, Avanzini and SSC ensured the appearance that is still nowadays recognizable, both in the urban center and in the productive centers, both in the civil buildings and in rural buildings; the cultural value of this heritage definitely goes beyond the value of the individual building, in favor of the one of the whole settlement.

Notes
1 Among the most important previous studies, see La casa del Balilla di Giovanni Battista Ceas ad Arborea di Sanjust P. Santoni S., in La costruzione moderna in Italia 2001, Edilstampa Roma
2 Società Bonifiche Sarde Archive, has a fundamental role in this research. All the documents of the society, such as projects, drawings, administrative documents, but also some documents related to SSC, are stored there. Nowadays there are difficulties in entering the archive, that is also very huge and not organized; it has been possible, so far, to consult only a part of the archive. Other interesting and useful materials is stored in the Historic Municipal Archive; missing information has been collected by surveys, studies and analogies with similar buildings.
3 On one of the walls we can see an incision, A1921, that probably means the year in which the construction has been completed.
4 Industrial Reconstruction Institute.

References
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