

Ancient earthen constructions and antiseismic dwellings: Boni's project after the earthquake of 13th January 1915 (Avezzano, Italy)

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Abstract

After the earthquake of 13th January 1915, the archaeologist Giacomo Boni (1859-1925), inspired by ancient building techniques, proposed the reconstruction of Marsica and the Middle Liri Valley with earthen dwellings. With the cooperation of the Italian Ministry of Agriculture, he organized an exhibition where he collected samples of vegetal trellises which were an essential support to implement these techniques. Furthermore, he rebuilt two huts on the Palatine (Orti Farnesiani): one rectangular, the other circular, inspired by terracotta urns which he himself had discovered a few years earlier exploring the famous ancient tombs in the Forum Romanum, near the temple of Antonino and Faustina, by the Via Sacra. Boni's unusual proposal was intended as an alternative to the plans put forward by seismic engineering which was developing in Italy at that time. This is a prime example of a clash between two different outlooks and cultures (humanism versus science) each of which claimed to offer solutions to attenuate the effect of earthquakes. We have so far been unable to establish whether any earthen dwellings were actually constructed in Marsica or the surroundings of Sora for the survivors of the earthquake of 13th January 1915. Unfortunately, only one of the many houses built with this technique, still existing in the Soran countryside can be dated (1924).

Key words *earthen constructions – Middle Liri Valley (Italy) – antiseismic houses*

1. Introduction

After the Avezzano, 1915 earthquake, one of the first tasks the authorities had to face (Baratta, 1915a,b) was to manage and coordinate the resettlement of the population who had escaped the disaster. First of all they were accommodated in tents and in railway wagons; after that, thanks to the solidarity of the readers of leading national newspapers, they were housed in wooden or metal barracks, of which we have a simple illustrative documentation. In

order to offer the survivors the maximum amount of immediate economic housing, it was decided to apply the typical method of building used in the two areas, dry architecture, most common in Marsica and in Roveto Valley and earthen architecture, made by underlaced thin branches properly plastered, easy to find in the surroundings of Sora and Broccostella.

The first proposal is attested by a letter of the engineer M. E. Cannizzaro, addressed to *La Tribuna* of Rome and published on 25th January 1915, only twelve days after the tragic event, in which he explained the need to guarantee the survivors permanent, safe, easy to build and above all economic shelter. There-

fore he proposed to use the huts built by coalmen, which were characterized by three poles, two vertical ones terminating with a branch in order to insert the third one horizontally.

The roof was made from branches and sprays, covered with different types of weeds (sorghum, broom). The hut had a rustic stone flooring, covered with straw.

2. Giacomo Boni's research

It is very interesting to follow the second hypothesis, concerning earthen architecture, mostly supported by the archaeologist Giacomo Boni (1859-1925). Only a few years before he had explored the famous archaic sepulchres in the *Forum Romanum*, near the temple of Antonino and Faustina, by the via Sacra. These tombs can be traced to the houses built on the Palatine slope and inserted chronologically between the protovillanovian and the evolved villanovian period (Boni, 1902, 1903, 1905, 1906).

Typical of these sepulchres are the urns representing rectangular huts, characterized by round corners. Under the roof we can distinguish a hole to illuminate and give air to the inner part of the urn; a sort of door is realized in black ceramic. These urns together with the pole-holes concerning huts discovered during the excavations in the *Forum* (near the *Regia*) and on the Palatine (*Germalus*), have been fundamental for experts in reconstructing the typical habitation system of the Iron Age. Therefore it is important to note how a careful survey of the holes and roof drains canals allowed the architect A. Davico in 1951 the graphic restitution of a latial hut, which was very successful.

At the same time as the excavations, Boni was working on a monograph with the title *Casa Romuli*, unpublished until 1954, although it had been cited since 1903 by D. Vaglieri (Tea, 1954). In this study, structured as a glossary, Boni showed, in relation to the habitable architecture of our ancestors, that two were the types of huts usually built. The round one «dating back to the age in which a special use was made of leather and its substitutes, flexible ma-

terials common to nomad populations and sheep-farmers» and the «rectangular one when these populations had begun to till the fields and appreciate the usefulness of a fixed abode and began to build with rigid materials ranging from wood to stone». He supposed the round hut to be consonant with the epoch of Romulus and attributed to the other hand, the rectangular type to the Sabine farmers of Titus Tazio. In order to reconstruct them, he studied the Renaissance painting for a long time and explored the country of the Veneto in proximity of the Po delta.

In the final part of this monograph, Boni analyses some terms connected with earthen architecture, for example *paries craticius* (gratings covered with mud), *aceratum* (prehistoric mortar made of mud, sludge or earth mixed with water and beaten straw) and *luteum opus* (closed weaving covered with mud). In this last term some Latin authors recognized one of the first wall-techniques the men copied observing swallows' nests.

Boni, confident of the results of his historical, archaeological and ethnological studies, and trusting in the ability of the local workers, asked the Ministry of Agriculture for the authorisation to proceed with experiments, towards the realization of cheap earthquake resistant buildings, which foresaw the employment of this ancient building method.

In rural building in Abruzzo, earthen dwellings (also called «casette» or «pinciaie») had already been historically documented from the early nineteenth century (Ortolani, 1961; for other areas of Italy, cf. Santoponte-Emiliani, 1941 and Baldacci, 1958). The spread of this type of earthen building was linked to the growth of the labouring class triggered by a boom in the population between 1830 and 1850 which was not flanked by a proportional rise in farm-workers' wages. Earthen dwellings represented a poor quality low cost solution to the housing problem in Abruzzo.

It is interesting that Giacomo Boni's proposal did not take local tradition into account, but put forward protohistorical forms of building. This was based on the erudite conviction that these dwellings incorporated a highly esteemed knowledge of building also from the

antiseismic standpoint. This type of building, however, also presented many negative aspects: earthen dwellings have been estimated to last around 50 to 60 years and from the point of view of seismic response, this type of building has proved the worst on every macroseismic scale (*cf.* the latest by Grünthal, 1993).

The persistence of humanist knowledge in the sphere of mitigating seismic effects is a curious recurrent finding which has a long tradition in Italian culture and has already been noted (Guidoboni, 1989). In this context, it may not be surprising that a government agency welcomed Boni's proposal. In fact the Ministry drew up the letter (Circolare N. 4306) of the 18th February addressed to the agricultural trusts, asking for vegetal samples to use for these experiments. Grating walls obtained from split canes, branches of elm, willow, hazel tree and osier; mats made with marsly canes were mostly sent from Bagnocavallo (Ravenna), Catania, Eboli (Salerno) and Melfi (Potenza) in order to be analyzed by a Board formed by one member of the Ministry, Prof. Cesare Ceradini (Director of the Rome School of Application of Engineers) and the well-known architect Gustavo Giovannoni (1873-1947). At the exposition on 20th March at Villa Mills, were present private enterprises and institutions like the Royal School of Vinegrowing of Catania and the Chair of Agriculture of Melfi (*Bollettino*, 1915; Artioli, 1917; Beranger, 1995).

On the Palatine (Orti Farnesiani, Rome) Boni rebuilt the two huts, which, according to the invaluable evidence of Eva Tea, were destroyed after their planner's death (Ducci, 1920; Tea, 1932). But we can probably trace to Boni the model of a round hut existing in Rome at the Antiquarium Palatino (fig. 1). Characterized by a circular plan, delimited by a drainage canal the hut shows every constructive element and underlines in that way its particular structure. We do not know exactly the real motivations that induced Boni to undertake these studies, which were very successful, also for their teaching character. It should be recalled what Boni himself wrote to his good friend Froila: «I am building the hut on the



Fig. 1. Italic-type hut built by Giacomo Boni on the Palatine (from Ducci, 1920, plate X).

Palatine as the last monument to a tradition which is dying out in the arrogance of contracting engineering» (Tea, 1932).

These were the years in which antiseismic engineering was developing in Italy, fostered by the problems of rebuilding Messina and Reggio Calabria destroyed by the 1908 earthquake. These were also the years in which large sums of public money were used for the first time to rebuild dwellings after an earthquake, inevitably giving rise to new economic situations, not always easy to control. Seen in this light, Boni's «archaeological» proposal can also be construed as a possibility, albeit illusory, to delay the growth of building on an industrial scale which had already shown a considerable capacity for organization and building achievement (*cf.* the data and reports published by the Italian Building Union covering rebuilding after the 1917-20 earthquakes).

The construction of the ancient earthen dwellings is described by Boni in great detail. The walls of the rectangular hut were composed of elm and willow branches densely inset in an armour of chestnut poles. The pavement consisted of tufa splinters and the roof of two chestnut poles. The round hut differed by the walls of plastered mats while the roof was made with «*scopiglio*» (interlaced vegetal materials).

The Board, in a final document, expressed a positive opinion concerning the initiative undertaken by Boni. The proposed houses had the advantage of being built and maintained by the «same farmers who for many reasons should be returned to their land, certain that they no longer have anything to fear from the earthquake. This construction also has the advantage of using the natural local building materials without resorting to materials from elsewhere like planks for the huts, concrete and iron for the reinforced concrete without giving rise to the sad destruction of the few wooded areas remaining in the region».

Referring to the choice of the hut type the Board considered with favour the rectangular one, which could be easily extended and divided into many rooms. The three members mentioned above, expressed themselves in the final document: «As far as the most appropriate building is concerned, the Board considers that the stone walling should be used for the raised platform of the floor as well as for the walls up to 2 m in height in the area around the fireplace, both when this is located in a small room and when it is in the corner of the main living room. For the remainder of the walls, the double layer of trellis of the kind used in timber frameworks should be adopted, making sure that the joints are solid so that the frame will hold its shape. Wicker-work could be used for the external surface: it is more rustic in appearance and more resistant to impact; it also allows a better use of nearby woodland (elm and beech). Instead, the inside should be in reed-matting smoothly plastered over, while the outside should be covered with rough-cast plaster.

Finally, the roof should be in wooden roofing-tiles or interwoven vegetal materials rest-

ing whenever possible on planks, or simply on the timber frame in cheaper dwellings [...] Underneath the roof insulation could be ensured by a thin layer of plastered reed-matting».

The Board concluded the report listing the evidence on the economic factor of Boni's proposal (each hut cost L. 40 per m², and this amount would have been reduced on site) and formulated «the recommendation that the state agencies would not ignore this means of making a simple but practical contribution to seismic building which embodied the results of thousand of years of traditional building in Italy».

We have to add other three considerations which are strongly connected with the success of earthen architecture: the resistance, solidity and flexibility of the wooden frame, very useful in the areas of the Marsica and the Middle Liri Valley, often struck by earthquakes.

These peculiarities can be noticed in the «*pisè de terre*» type (earth compressed in bulkheads) and in the «*adobe*» variant type (earthenbricks dried in the sun) as well as in the more elementary type made by clay mixed with husk (*pula*), to be laid by hand or with rudimentary tools, a technique that we find in the examined area.

Up to now we have not been able to certify if in Marsica or in the surroundings of Sora, earthen architecture was actually realized for the survivors of the earthquake of 13th January 1915. Unfortunately only one of the many houses built with this technique, still existing in the Soran countryside can be dated. We can only go back as far as 1924, the year written in the wet clay under one hut's top beam. This episode of rebuilding after the 1915 earthquake did not have a significant effect on building projects in general. It remained an example of the clash in outlook and culture which were still apparent at the turn of this century. On the one hand, a humanist culture inspired by a past held to be so prestigious as to merit imitation and which could still win the ears of government agencies. On the other, we find the birth of seismic engineering which owed the development of modern antiseismic regulations to the disasters which occurred at that time.

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