DEFENSIVE ARCHITECTURE OF THE MEDITERRANEAN
XV to XVIII Centuries

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Abstract
The citadel of Algiers was built in 1516. Since the Ottoman Regency, the medieval citadel was destroyed and the reconstruction of the new Qasabah was located on the most highlight of the medina. It is the first military edifice built during the Othoman regency. Initially the citadel contained a powder keg, a walkway, Janissaries residence and their mosque. Several buildings were added to this whole defensive through time: the palace of Dey, its mosque and hammam and the palace of the Beys. The stratigraphic analysis shows that the several intervention constructions; demolition and reconstruction took place over several centuries. Since 2003, the Executive Decret n°03-324 of the law 98-04 on protection of cultural heritage in Algeria was implemented. This allowed today a better care of the restoration projects of this whole military building. Today the citadel of Algiers is under a work of more rigorous restoration. Several processes are conducted by different architects specializing Heritage. These include the restoration of the powder keg, Dey palace, the main entrance, etc. This work aims to present the different strata of the constructive citadel, the constructive typology of some buildings located intra muros highlighted during the work of restoring.

Keywords: Citadel of Algiers, constructive strata, constructive typology, Algeria

1. Introduction
Since the Ottoman occupation of Algiers by Barbarous brothers, the reinforcement of the wall of the citadel, the gates and the fortifications was started. From the proclamation of Arudji’s authority, he started the rebuilt of the citadel some 300 m higher than the oldest one. It was located toward the more culminating point of the city (Missoum, 2003). The citadel was constructed around 1552-1572/73 (Golvin, 2003). The first illustration which exists was drawn by a Spanish prisoner in 1563 (Braudel, 1966). On this draw (Fig. 1), the citadel appears a military building in the top of the medina and it is separated from all district of the city. The citadel probably enclosed, at the beginning, a parapet walk, the powder keg and the janissaries Diwan's room. According to Missoum (2003), in the Simancas files, this place is described by: "the Diwan room is a large patio with porticos on the sides and sections of walls. There is a seat of Agha and pavements with small braids in the back of the wall where Mazoulaghas sit." Its construction date goes back to 1596-1599. In 1817, the Dey 'Ali Khūdja removed from the Jenina Palace located in the lower part of the city to the citadel, thus transforming it from the military barracks to a fortress-palace. There is no any date of construction of the other buildings such as the palace of the Dey and all dependencies, its mosque and hammam, the harem, the janissaries mosque and the palace of the Beys. (Fig. 2, 3). Very few documentations speak about the restructuring of the military barracks to a palace during 'Ali Khūdja and later Hüsseyn Pāshā governments. Thus in situ investigation has helped us to understanding the construction of this symbolic monument.
2. Startigraphic analysis of the citadel

The study on the citadel showed that several actions of construction such as demolition and rebuilding took place successively through time. Unfortunately, we do not have any dating. Only materials and constructive techniques reveals these actions. The architectural stratification applied to the patio of the palace, as specific study (Mileto, 2007), showed that the constructive phases are characterized by negative and positive actions of construction and transformation's which have altered what existed (Fig. 4 and 5).

The period of use which are interposed between the successive constructive phases are expresses by anthropogenic degradation due to the use of the palace as well as deterioration mainly due to earthquakes, the bomb damage and to the atmospheric agents (marine or sea salt). The architectural stratification thus showed by strata; which represent different part of the retentive filler actions that have occurred throughout the history of this building as well as negative interfaces which are the traces of the demolition. The example of the southeastern part shows negative interfaces because there were demolition then positive interface representing the rebuilding of these same interfaces. The southeast face undergone numerous phases of construction. On part of the patio, negative interfaces due to demolition and positive interfaces due to reconstruction of these same negative interfaces are obvious to the eye. The architectural strata for this part of building are arranged in different directions. Two stratigraphic units of masonry (USM) were determine such as construction and demolition, each one having their own materials. The positive interface where the first line of east-western gallery was built to create different various closed spaces. Thus the columns were enclosed in the bricks masonry walls indicating that there were two galleries in the two opposite sides of the patio. The walls have opening (windows and doors). The negative interface shows the demolition of the built gallery to create opening. The stratigraphical units are distinguished by the used materials. In this case we have a traditional masonry made of bricks 3x12x20 cm size bound by lime mortar having 3cm thickness. Beside the filling layers built by industrialized bricks 5x10x20cm size are bound by cement mortar of 1cm thickness. On the other hand, the stratigraphical study of the north
façade shows us that the intervention are minimal and that this part of this building has only positive interfaces which represent the strata of repair. The southern and western façade underwent heightening which sheltered respectively the Harem and the private apartments of the Dey (Fig. 6 a, b)

Fig.6a,6b- Column of the gallery enclosed in the bricks wall © Abdessemed-Foufa 2006

3. Materials and walls constructive techniques

3.1 Palace of the Dey

According to historical sources it is known that only two Deys; in fact Ali Khudja and Hüseyn Pâshâ; lived at the palace. Thus various installations inside the palace were made such as the harem, the apartments of the Dey, the music room, the hammam and kitchen. The palace of the Dey is occupying the north-eastern angle of the citadel. Its form is a rectangle with a large interior court or patio (Fig 7 and 8). In the south-eastern angle is located the advanced entry called sqifa. The palace constitutes the greatest part of the citadel considering its volume and surface. The whole building is heterogeneous because of its different strata and periods of construction. The constructive typology of the Dey's Palace are various. Some walls are in load bearing masonry using bricks and lime mortar, others are in bricks masonry with lime mortar (Fig.9). The figure shows in grey the walls made of mixed bricks and stones in regular way, in light grey the walls are made of earthen emplekton walls, in dark grey walls are regular with bricks and in blue the walls are made of full bricks.

Fig. 7- 3D View of the Palace © Abdessemed-Foufa 2012

Fig.8- Lithography of the patio (Lessore and Wyld, 1833)

Fig.9- Different constructive typologies indicated on the plan of PKZ, 1980
Since 1716 earthquake some others techniques were introduced in order to resist seismic loads (Abdessemed-Foufa, 2005, 2010, 2015 a, b). Inside the walls three logs of wood are insert in all its depth. The wooden logs used here are cypress (Cupressaceae) called "thuya". These logs of wood are laid every 80 to 120 cm. This kind of disposition of the two materials, one rigid and the other flexible, allowed horizontal force distribution during earthquake. One of the most important reasons for this lack of damage is the damping from the friction induced in the masonry. Thus, the diagonal shear cracks in the walls of brick masonry will decreases (Abdessemed-Foufa, 2005, 2008, 2010, 2015 a, b). Beside all brick masonry walls are linked to the other by an alternate crossing of wood logs. This linking system at angle constitutes a traditional reinforcement techniques to prevent vertical walls from the out-of-plane collapse (Abdessemed-Foufa, 2005, 2008, 2010, 2015 a, b). The walls partitions are linked their orthogonal ones. The connections are often embedded of the masonry and the logs of wood which are laid out transversely and longitudinally in the crossing walls (Fig. 10).

Fig 10. Reinforced brick masonry with logs of thyua ©Abdessemed-Foufa 2006

One of the particular details at Algiers is the arch-column departure in which three logs of wood are insert and superimposed on two layers of bricks. This system guarantees a good resistance to forces during earthquake by a slip movement or by rolling. In another way at the intersection of two arches three to five logs of wood are inserted to absorb horizontal stresses due to earthquake (Fig. 11) (Abdessemed-Foufa, 2005, 2008, 2010, 2015 a, b).

Fig. 11- Details of the arch-column departure ©Abdessemed-Foufa 2006

3.2 The mosque of the Dey

Concerning the other existing buildings in Algiers Citadel, they practically did not undergo a transformation like the palace. The Dey mosque also called the mosque of the Qasaba is the work of the two last Deys of Algiers (Fig. 12 a, b and c). The basement of the mosque which represents the first floor is made of stone blocks with an "opus quadratum" arrangement. The stone blocks are probably dating from the ancient time (Icosium). The second and third floors are made of brick masonry walls laid with lime mortar (Fig. 13).

Fig.12- a- Plan of the Citadel mosque © (Chergui 2007)
Sometimes we can find logs of wood insert in the masonry. The cupola is made of brick between which are inserted logs of wood. This constructive typology informs us that it was constructed using the earthquake-resistant techniques, measures taken after 1716 earthquake.

3.3 The janissaries mosque

The second religious building was entirely built with brick masonry wall laid with lime mortar in an "opus testaceum" arrangement. The bricks are 3x10x22 size and the lime thickness is 3cm. Thickness of brick and mortar are equal (Fig. 14 15 and 16).

3.4 The powder magazine

This building was destroyed several times by powder explosion. During its reconstruction (Fig. 17) an "opus mixtum" arrangement was
used for the thick walls (80-120cm). The walls were built according to a regular distribution of bricks layers and stone layers (Fig. 18 and 19). We have also identified another wall made of earth and bricks called *tapia valanciana*. This constructive technique was probably used at the beginning of the citadel construction using the local traditional system which has an earthquake resistant action (Cristini and all, 2009).

3.5 the external walls

External walls surrounded the citadel are also the city walls. These walls are very thick more than 300 cm. They also are carrying twelve batteries which surround the entire city. The constructive typology of this kind of walls is a load bearing walls constituted by two facing filled by mud and lime mortar called *Roman concrete* or *Almohad concrete* (Fig. 20 and 21).

**Fig. 17-** Plan of the powder magazine ©Messikh 2014

**Fig. 18-** The powder magazine before and after restoration ©Abdessemed-Foufa 2006

**Fig. 19-** Masonry wall made of layers of bricks and stones ©Abdessemed-Foufa 2006

4. Conclusion

The citadel of Algiers is one of the greatest military fortification of the 16th century restructuring during the 18th century in the Algerian coastal area. It has suffered much constructive stratification due to several damage (historical earthquake, bombing construction and new disorder construction). The particularity of the Citadel is the numerous transformations undertaken through time. First the restructuring of the janissaries barracks to a palace. Different actions of construction inside the patio shows it's transformation. Second the construction of all dependencies of the palace inside the citadel. Identification of materials and constructive typologies indicate that they are a lot. Many of them has an earthquake-resistant measure such as reinforced masonry by logs of thuya which was introduced in construction after the great earthquake of Algiers.

Today this historical cultural heritage is under investigation of restoration process. The
restoration's intervention shows constructive typologies of different buildings inside the citadel and it constitute an exhaustive manual of rehabilitation (Abdessemed-Foufa, 2009). The investigation during the years 2006 to 2008 allowed us to highlight the technique of construction and local materials. These techniques will establish in a form of a manual referring within the framework of the restoration in Algeria. The investigation during these two years while the training of the architects of the ministry of Culture also allowed us to understand the transformation of the palace undergone during the time.

Notes
This work has been finalized during the training of architects, engineers and archeologists of the Ministry of Culture with the collaboration of IPOGEA from Matera, University of Firenze and University of Blida 1. Thanks to the Director of Cultural Heritage of the Ministry of Culture which allow us to do the training at the Citadel of Algiers despite the restoration project of this historical building.

References


PKZ., (1980). Project of the Citadel Restoration, Graphic documentation: Plan, section and façade,

University “Saad Dahleb” Blida 1 and IPOGEA., (2006-2008). Training courses: “Initiative of training for the recovery and the valorization of the Casbah of Algiers according to the traditional techniques and their reuse in an innovating way”.