Technical knowledge transfer between Algeria and Italy: Oran, an experience of architectural rehabilitation.

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Abstract

At the time of globalization, the issues related to the durability of buildings in the urban areas arise with acuteness. In the case of Algeria, some answers were tempted to be brought to the social and the environmental challenges. Thus in the building field many projects are put in place in order to attempt to reduce the housing shortage. One of these solutions proved to be the rehabilitation operations of the existing buildings. The urban fabrics sometimes very degraded and sometimes out of use, are rehabilitated already with the aim to maintain the inhabitants in place. Oran, the second town in Algeria on its way to become a Mediterranean metropolis has known during these last years (2012-2014) a great impetus as far as the rehabilitation is concerned and this thanks to the political will and to the long-term vision of the local authorities. However, it has to be noted that the rehabilitation following the international norms in the building field, requires technical know-how of a high level. Thus, Italians experts specialists in rehabilitation among which some of them graduated from the polytechnic school of Turin have answered to the call launched for the rehabilitation of the colonial buildings of Oran of the XIXth century. These professionals have contributed to a huge transfer of a technical know-how between two Mediterranean regions that are Italy and Algeria. And it is in my architect's quality asked to establish technical reports on the rehabilitation construction sites that I participate to this important meeting. A privileged witness of the trainings and of the work experience from the Algerian side (the architects, the contractors, the students in architecture, the associations interested in heritage, the builders, the unskilled workers etc....), I intend to present all the transfer process of the technical knowledge. Thus, at the beginning, the trainings were done in situ following the stratigraphy operations, the setting of the scaffolding, and the dismantling of the annoying pieces on the facades, the hydro wash, the reconstruction of the moldings and architectonic treatments...etc. Thus I will explain the process of the innovation experience of technology via the architectural heritage, the transfer terms of the technical knowledge (the products and the processes) between the Mediterranean countries through a communication based on concretes tools (iconography, pictures and video reports) of the rehabilitation of Oran.

Key words: rehabilitation - Knowledge Transfer -Oran - Italy
Introduction

Oran is the second metropolitan city in Algeria of over one million inhabitants today. It has been founded in 902-903 by two Andalusian sailors and has known two Spanish presences (1509-1708)-(1732-1791) and two ottoman presences (1708-1732)-(1791-1830) before the arrival of the French in 1831. This deep historical background is translated by the peculiarity of its town planning and its architecture. The city holds an important heritage, mainly the colonial one with architectures oscillating between the neo-classic, the eclecticism, the Rococo, the modern movement..., which finds itself marginalized in a disrupted and a sprawling city. This heritage which is a major challenge in the modernization of the city of Oran, has been the object of the rehabilitation intervention due to the building alarming report. These buildings, real jewels of the colonial architecture of the XVIIIth and the XIXth centuries, go out of use due to the lack of maintenance. In 2010, a diagnosis report has been commanded by the town planning and building direction (Direction de l’urbanisme et de la construction (DUC)) to the buildings’ inspection body (Contrôle technique des constructions (CTC)) concerning the old Spanish areas of Oran. First were the Algerian companies in the field, the works consisted of facades restoration with the resumption of terraces’ leak tightness without worrying about the common parts. These Algerian companies are Building and Public Works companies (BTP: Bâtiments Travaux Publics) and are on any account specialized in rehabilitation. Subsequently, a call was launched for the specialized international companies, thus two Spanish companies, an Italian one and a Spanish-Algerian company were retained after decisive tests of witnesses facades. A clause has been imposed in the specifications for the training the Algerians (architects, entrepreneurs, builders, architecture students..ect). One among the major objectives from the rehabilitation experience in Oran has been the training that is presented in two categories: technical training in situ directly on the ground and the theoretical training and the ground gathering courses and practice on the sites. Our continual presence in these sites allowed us to get acquainted with the rehabilitation techniques which we restore partially here. It is not easy for us in this limited text of seven (7) pages to introduce all the rehabilitation techniques realized on the

1 Reminding that Oran has known its first real rehabilitation operation in 1996 with a concise financing, some buildings in the old town have been rehabilitated. A second operation was launched in 1998 in the framework of the Algerian-German technical cooperation (bilateral cooperation agreement signed the 11th February 1997 between the Algerian government (housing and urbanism ministry) and the German Deutshe Gessellschaft Fur Technische Zusammenarbeit “GTZ”) to rehabilitate buildings in the area called les amandiers of the 1500 logements. This project (Cf.report (undated); “Projet pilote Oran cité des amandiers” OPGI Oran, 28p.) dedicated to the “improvement in the urban restructuring (Restructuration urbaine) et of the rehabilitation of the built frame (Réhabilitation du cadre bâti) in the big housing sets in Algeria”, and conducted according to the planification method by objectives, it consists to put in place a rehabilitation participative approach. None of these operations has consisted of a real technical knowledge of the rehabilitation.

2 All the rehabilitation techniques done on the site were illustrated with too many photographs in the framework of this text. We have also realized video reports that we have the intention to expose during the oral presentation.
site. We present here some aspects of the facades rehabilitation. A complete range will be displayed during the oral presentation including all the parts (facades, terraces and stairwell).

Oran rehabilitation buildings: a training site

In this text, I present new techniques unknown before this experience of rehabilitation experienced by the city of Oran. It is essentially a technical field work which explains the large number of photos that show the transfer of know-how between the Italian and Algerian labor work. Of course, when viewing the post, I could provide more details and explanation.

The rehabilitation operations in Oran concerned only the common parts namely: the facades, terraces waterproofing and the stairwells. These operations took place in different stages.

1. **Outside facades and the courtyards**
   - The preparatory works (stripping, stratigraphy…)
   - The support treatments and the restoration of the facade
   - Restoration, rehabilitation and the facade finishing.

2. **Waterproofing**
   - Accessible or inaccessible terraces and oblique roofs.
   - Waterproofing (watertightness).

3. **Stairwells and common parts**
   - The preparatory works.
   - Restoration and rehabilitation of common parts
   - Finishing works of stairwells.

**The outside facades.**
For the outside facades and the courtyards, we limit ourselves here to three (3) technical aspects: the stratigraphy, the hydro-wash and the rehabilitation of the modillions.

1.1 **Faisability study/ stratigraphic study.**
A preliminary study is necessary before giving an opinion in favor of a rehabilitation project: it is the intervention feasibility study. It includes many important points, in this case: the stratigraphic study, the photographic report, the technical and the descriptive report, the search on the material composition. The stratigraphic study never done at the rehabilitation sites in Oran, is about many intervention points of facades walls, of stairwells. The choice of these points is based on the expected rehabilitation areas.

The points raised for the stratigraphy are mentioned on a small notice where it is mentioned:
- a) The name of the site.
- b) The number of the intervention point.
- c) The date of the operation.
1.2 Hydro-wash operation
In order to find their original aspect, the surfaces made of stone and brick are cleaned by hydro-wash with high pressure variating the speed of water pressure following the degradation state of the treated surfaces. This operation realized by Algerians youngsters (builders, workers/laborers and students), is totally new in Oran.
After the hydro-wash operation, the cleaning goes on carefully and manually with a scalpel using sometimes a thinner for a finished work.1.3 Facades rehabilitation / balconies rehabilitation / modillions rehabilitation

The structural consolidation of the modillions is part of the rehabilitation operation of buildings facades. Thus, the balconies rehabilitation consisted of a structural consolidation, a dismantling and a reconstruction of the balconies floors parts with the restoration of the mouldings and the ledges. **The consolidation of the modillions went through successive stages.** The restoration and the partial structural consolidation of the existing modillions were done according to the following process: the realization of a steel armature at the inside and its binding above the balcony; the building of a formwork for filling the gaps; the structural concrete casting on the 1/3 from the moulding height; the final filling with light mortar, the artistic decorative restoration of the missing parts of the moulding and the reconstruction of the missing part and the mortar final application. We return here to the main steps.

**First step:** it is the removal of the balconies stone floor cover including the final cleaning. The cleaning of the hollow modillions by the pigeons droppings, the pigeons nests, the modillions were completely emptied.

**Second step:** start the structural consolidation of the modillions by reinforcing them vertically. Thus, the floor of the balconies are vertically drilled (holes are perceptible on the
photos) in order to insert vertically first steel rods then fill at the inside of the holes the concrete of 350kf/m³.

Figure (5) : drilling vertical holes.  
Source : the author  
The steel rods were first measured according to the modillion’s depth before inserting them in the holes.

Figure (6) : insertion of steel metallic rods.  
Source : the author

Figure (7) : Measurement and cutting of steel rods before inserting in the modillion
Source : the author

Third step :
Once the steel rods inserted vertically, we have proceeded the same horizontally. The modillions are then pierced face side in order to help penetrate the steel rods horizontally. Holes are thus dug on the modillion face. It is important to note that the number of the rods is calculated randomly according to the importance of the modillion proportio
Figure (8): vertical holes drilling of small modillions to insert steel rods.  
Source: the author.

Figure (9): drilling of big modillions to insert steel rods.

Figure (10): view at the inside of the modillion after building a formwork with steel rods.  
Source: the author.

Figure (11): view at the inside of the modillions.

**Fourth step:** the concrete of 350 kg/m³ is flowed at the inside of the modillions on the steel rods. The modillions are filled then with a light concrete (to reduce the weight). It is composed of a cement volume, a sand volume and of two polyester volumes.

Figure 12: casting of structural concrete on the 1/3 height of the modillions and the final filling with light mortar made of expanded clay.  
Source: the author.

Figure 13: view at the inside of the modillions.
At the end, a decorative artistic restoration was done on the missing parts of the moulding.

**Figure 14:** view of the rehabilitated modillion  
*Source: the author*

**Figure 15:** view of the rehabilitated facade

**Conclusion**

The trainings on the site have allowed the transfer of a “technical” know hows, the specialization of an Algerian labor force that cannot be found before the launching of the sites. This set of techniques were the object of technical notes that we have done following the rehabilitation operation. They constitute a real capital for the very first rehabilitation operations, used at present for pedagogical and academic aims. We could not put here all the techniques developed and applied on the ground in order to respect the limits imposed for the conference. We noted that the rehabilitation according to the rules of art was unknown in Algeria Oran in general and in particular. The transfer of know-how has among other clarify the differences between the operations of rehabilitation, restoration and renovation. Rehabilitation and brings comfort to today's standards while using current techniques and materials. This experience has also helped to know the different ecological materials in the context of sustainable architecture. Before, everything had to be rehabilitated must necessarily be done with cement and sometimes very concrete by ignorance. Knowledge transfer has highlighted that we can not rehabilitate buildings built of stone in the sixteenth or eighteenth century with concrete. Different lessons are learned from this experience as said green like painting with natural hues materials ... etc.. Different types of materials used are air binders binders (hydraulic lime, plaster, clay) and hydraulic binders (hydraulic lime, quick-setting cement, portland cement and diary); mortars (fat lime, hydraulic lime, bastard mortar, cement mortar, lime mortar ... etc), types of cement (blast furnace cement, pozzolan cement, white cement, portland cement); types of lime (quicklime, hydrated lime). For example, the coating of lime, which is a layer of mortar applied to a wall allows the walls to breathe and work, to prevent cracking and give a warm look to the surfaces it covers. For stucco can be slaked lime or plaster, it can be used for decorations (frames: hair, hair and mesh). Stucco slow setting is harder to work with than plaster. For mixing water can be clean water or drinking, it should not contain salt, the percentage should be between 60-70%. It is possible to obtain a mortar must be smooth and hold without dripping on the trowel (too wet mortar has a sizeable withdrawal). Mortar must be tempered as close as possible to work knowing that the transport wheelbarrow can affect the quality of the mixture. The mixing area should be clean to avoid
earthy surfaces, then it is best to choose a concrete or asphalt surface. All these recommendations are now being applied by the hand of local Oran work in site rehabilitation.