

# “Sustainability of traditional materials and techniques in the Mediterranean cities”

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Abstract: To analyse Sustainability in refurbishment of buildings, it is necessary to determine if traditional materials or techniques are so. We have to develop studies about traditional materials, durability, maintenance, the influence of climate, and the compatibility with metals or plastics, taking attention not only in technical aspects but also economic. The normalisation has to be adapted to the different conditions in the north and in the south of Europe. We analyse in this document some criteria to consider in normalisation of buildings Refurbishment: from the previous studies to the final product.

## 1 INTRODUCTION

The incorporation of specialists and investigators coming from different areas has produced an important development in the study of the materials and techniques related to the historical and architectonic patrimony, as demonstrated by the theses and the published articles, that bear relation to the restoration and architectonic rehabilitation.

We considered that we have an exhaustive and quality information in specific areas in which the confluence of scientists and technicians has taken place, and have obtained results of great interest. Despite the previous thing, it is the moment for reflecting, for analysing the crossed way and for exposing some considerations and proposals.

There are many specialize investigators who consider that we are in a confused moment, in that prime plus the publication in the best magazines, that the solution given to the constructive problems considered in the architectonic scope. The knowledge are extended but it does not advance in construbilitá, like the reality of the materials and the constructive techniques to use in the design of the architectonical project.

Upon this context it is necessary to follow a suitable methodology in the restoration processes and/or refurbishment.

## 2 PROCEDURE

In the first place the state in which the construction is, must be known, it is necessary to locate the damages that the building presents to be able to determine if it is necessary to act, to consider the reach of the repairs to make, as well as possibilities for its execution.

Once indicated the anomalies, he fissures and cracks must be measured, as well as the angular distortions to verify movements in foundations, to locate capillarity humidity in walls, condensation and filtration, as well as the chemical composition of waters .

In this phase it can be necessary the collaboration and support of historians and archaeologists based on the patrimonial degree of the construction. Also it will be necessary to make drawings of the construction to indicate the different units.

In the second level of performance it presents two slopes, of a side to know the

causes that have originated the existing damages, this is to determine the origin of the damages and injuries that the construction presents, and another one to characterize the construction being described the composition of the different units that conform it. In any case it must define the laying of foundations and land of support, using the more suitable techniques: georadar, microgravimetry (electrical soundings), opening of test pits, tests of dynamic penetration, rotatory soundings with extraction of samples, presiométricos tests, cross-hole and down hole, static penetration, analysis and tests to the land samples, etc... To the walls, pillars, floors, vaults, cupolas must be determine the proportions, determining in addition the sections, thicknesses of such, as well as the models of the construction. Study of the constituent materials of the different constructive units determining those chemical and mechanical characteristics physical necessary to be able to verify by means of the corresponding calculations the short term stability, the possibilities of restoration and/or rehabilitation.

Equal process must be made with electricity, plumbing, air conditioning, fire-fighting, , acoustics, of security, etc.

This section which we could call of previous studies, is of great importance to obtain a suitable process of restoration. For that reason it must be well done, that takes care of and reaches to all the units that conform the construction, trustworthy, that is made by qualified personnel, techniques, procedures and tests necessary for the last aim that it is the restoration project. We understand that only in the cases of pure investigation all the techniques available must be applied.

In these previous studies usually take part equips multidiscipline integrated by scientists and technicians, chemistries, physicists, geologists, architects and engineers of the specialties of structures, and construction. In this equipment a coordinator with sufficient knowledge is necessary as to obtain a harmonic study, precise and adapted to the state in which is the construction and to the intervention proposals, like conservation, repair of damages, integral restoration or rehabilitation of the building to be destined to other functions different from the present ones, as it can be the conversion of a palace in museum, of a church in audience, a singular construction in an administrative center, hotel, cultural center, etc.

The third level of the process of intervention for the restoration of a construction corresponds to the search of solutions, elaboration of the project and execution of the work. In the first place there must be qualified propose suitable to solve the damages and injuries that the construction presents/displays being based on the made previous studies. In order to establish correct solutions we must know the origin and the causes that have caused them, as well as the mechanisms and kinetic the process that has ended at the existing anomalies. These solutions will be different according to is a rehabilitation or restoration. In any case the following premises must be contemplated:

- 1) Use of materials adapted to that construction located in a concrete place. Those will have to be used are the traditional and of that one long experience in the zone exists. The different climatologic conditions mainly, of sun conditions, of humidity, geologic, must be considered, for example in the North from Europe and the corresponding ones to the Mediterranean zone.
- 2) The greater failures that take place in relation to the materials used in the restoration are related to problems of physical or chemical mutual incompatibility between those of the construction and the new ones. Also it happens with the lack of adhesion between new and the old ones, as it is the case of placed new mortars on the old coatings, or with the effectiveness of the treatments in the case of wood against the biological agents, or of humidity by capillarity, or the consolidation or cleaning of the walls (stones, bricks, mortars), or of the durability of the new materials.
- 3) Use of possible and suitable techniques. Possible because there are favourable experiences to his use, as much by the results obtained as by the made tests that confirm their effectiveness. Adapted to the constructive element as it can be the case of structural failures with origin in the laying of foundations, land of support, pillars, walls, forged, covered..... Of here the importance of the programming of a good previous study, because without it hardly a good technique of intervention will be able to settle down.

- 4) It is important to control the constructive process testing the materials and the made construction. In special verifying the structural operation of the laying of foundations reinforcements and other elements. Consequently the following verifications will have to be made:
- Tests that define and certify the improvement obtained in the mechanical and physical characteristics of the treated structural units.
  - Tests that to certify the improvements obtained about the behaviour of the water, by means of tracing of a map of humidity before and after the treatment to avoid the ascent of the water by capillarity; tests of water tightness and permeability to the water in facades and covers; tests of adhesion of the new coatings materials; behaviour of the water by means of absorption tests steam suction, pressure, etc; aging of the treatments; heat insulation and acoustic; durability...

The last section in this process of intervention is the related one to the conservation, understanding it like the set of activities directed to that a construction conserves its state the for a long time, without it is precise to make repairs of great spread and considerable cost. Marconi says that the maintenance and conservation are the other face of the architecture and begins where the restoration finishes.

It is necessary to call the attention, and this congress is the forum adapted for it, on the taken care of lack of conservation and of recovered monuments. Great budgets are qualified to recover our historical patrimony, are made magnificent interventions obtaining itself excellent results, but the laziness and the lack of awareness of the responsible authorities, are obtaining that recovered present to the new pathologies by the abandonment and the lack of maintenance. For it it is fundamental that the author of the project and work director specify in a manual of conservation, the necessary performances, the regularity, the procedures to use referred to:

- Cleaning of covers, water-drainages, cleanings, etc.
- Inspection and replacement if outside necessary of the systems or treatments done (barrier wood antihumidity, treatments, stones or other materials, condensation humidity control, waterproofings, sealed...)
- Replenishment of deteriorated material, executed painting or treatment.