BILATERAL AGREEMENT CNR /CNRST – MAROCCO

2014-2016

ITALIAN SUPERVISOR: MATTONE Manuela

ITALIAN TEAM: RESCIC Silvia, MECCHI Anna Maria, FRATINI Fabio

MAROCAIN SUPERVISOR: IBNOUSSINA Mounsif

MAROCAIN TEAM: MARO Abdellatif, NOCAIRI Mohamed, ALEGRIA José Alberto, RAIHANE Mustapha, BOUZAROUATA Souad, GAMRANI Naoual

RESEARCH PROGRAMS

TITLE: Stabilization of earthen plasters: exchange of knowledge and experiences between Italy and Morocco

RESEARCH PROPOSAL: The research proposal in the national and international context Widely spread in many European, American, Asian and African countries, earth structures bear important and significant witness of knowledge, building technics, technological culture that holds unique landscape values besides historical ones. Ecologic material par excellence, earth had been used since antique times to build architectural structures; then it went into a period of complete oblivion as a consequence of the wide diffusion of industrial products. Although until a few times ago the use of earth for buildings has been associated with images of poverty, cultural and social relegation, it stands out as a careful way to employ resources, showing implicit, innate and very significant features of sustainability, unlikely ascertained in most common building materials. In addition, the realization and the maintenance of the earthen construction has always required a lot of work that has helped to improve ties within local communities. Recently, however, its use has become the object of renewed interest not only for developing countries, but also for a new emerging market. In fact earth: - is widely available in nature at an extremely low price; - is used without the necessity of special transformations, requires a reduced energy amount for its processing and allows to work with a minimum impact on the environment; - gives the opportunity to build high living comfort structures, thanks to its traspirability and thermal insulation. The only drawback of these architectures is the limited durability of the material against the aggressive action exerted by external agents that makes it necessary the application of protection layers (plaster) made with earth. However, these plasters, while being completely compatible with the earthen substrate and providing complete breathability of the walls, they needed and continue to need constant maintenance. The research program aim is to design and test the effect that different types of stabilizers (the traditional ones and those coming out from new research) have on the durability of earthen plasters in order to be able in the future to realize even more durable and with reduced maintenance needs. It is in this context that we want to propose the collaboration between the CNRST of Morocco (Department of Geology of the University of Cadi Ayyad) and our Institute (ICVBC-Institute for the Conservation and the Valorization of Cultural Heritage): in Morocco there is a long tradition of protection and maintenance of earthen architecture while in Italy we are now gaining experience especially in earth plasters for interior and in external plasters for new construction (both earthen ones and straw bales ones). Our research team, made up of researchers of CNR ICBVC and the Polytechnic of Turin, has, since the 80s, developed researches in the conservation of the architectural heritage and historic statuary thanks to multi-disciplinary skills (chemists, architects, petrologists). The interest in architectural materials has also led, since the beginning of the 2000s, to the development of researches on earthen architecture conservation both in Italy and non-European countries (Morocco, Syria, Mexico, Afghanistan). The collaboration with the Moroccan research group will enable to get more information and further skills in this area. Research Program The research program aims to investigate the effect that different types of stabilizers (traditional ones and new ones coming out from the research) have on the performance of the earthen plaster. In particular, we will evaluate the resistance to atmospheric and anthropic agents trying to identify which are the parameters (compositional, geotechnical) that play a role, preserving however the breathability of the material. This will make it possible to acquire the information necessary to develop in the future more durable earthy mixtures to be applied both on existing and new buildings. In order to achieve this goal, the Moroccan group project will identify an earthen architecture, representative of those prevailing in Morocco, and the compositional and geotechnical characteristics of its coating (plaster) will be analyzed and studied. This material will be used by the Moroccan group to prepare plasters by addition of additives belonging to the Moroccan tradition (lime,

gypsum, etc.) and by the Italian group adding additives (gypsum, bitumen, casein, etc.) outcoming from the research already developed in the laboratory. Specimens to be used in laboratory will be prepared by following a procedure common for both the research groups, concerning the type of wall on which they will be applied and the drying conditions. Both research groups, with the instruments and methods in their possession, will evaluate the performance with regard both to mechanical properties and resistance to degradation (water) trying to understand/identify which are the parameters that affect durability of the final product. The specimens of plaster made in Italy then will be sent for the characterization in Morocco and vice versa. The plasters that will perform better will therefore be applied in Morocco on the selected construction. This will allow not only to evaluate their behavior upon the time but also to study its interaction with the support. The bilateral cooperation offers the possibility to have significant and useful impacts: Moroccan territory is in fact rich of earthen constructions, even of great architectural value, which need to be adequately maintained and protected. As far as it concerns the Italian group, the identification of the parameters involved in the durability of earthen mixtures, will make it possible to create new more durable mixtures in order to achieve a remarkable development of the market for this type of product. In addition, concerning the conservation of the architectural heritage, both Italian and outside Europe, it will be possible to work with reliable technical solutions that will ensure good durability and reducing the need for maintenance/resurfacing.

OBJECTIVES: The main goals of the research project are the followings: - Assessment of the durability performance of the plaster stabilized (both Moroccan and Italian plasters) on the basis of specific tests (e.g. spray erosion test, geolong test) and knowledge of the factors involved by studying from the compositional (presence of reaction products, changes in the behavior of the crystal lattice of clay minerals) and geotechnical point of view; - Study of the compatibility between the stabilized plaster and the different types of constructions which can be found in the Moroccan territory; - Exchange and enrichment of knowledge and experience that we own in this field with those of the Moroccan research team; - Publication of the results achieved in international journals. The development of this research will contribute significantly: - To reduce the frequency of maintenance/renovation interventions of plaster coatings; - To encourage the use of raw earthen material in modern architecture; - To develop new skills concerning construction companies; - To contribute to the conservation of the building cultures linked with the existing earthen architecture; - To improve the effectiveness of the maintenance/restoration interventions of earthen architectural heritage. The development of this bilateral cooperation, with the exchange of knowledge that will ensue, may also suggest new research topics and determine the establishment of a network of partnerships wider spread to other countries within which each group has already developed contacts. Finally, as part of this project, the Moroccan colleagues are planning to organize an international conference, scheduled for 2015, in order to meet together the largest number of professionals (builders, architects, construction companies, etc.) with the aim to promote the development of earthen architecture both in Morocco and in Italy.