



Integration of in situ NDT tests with petro-physical analyses for the characterization of materials and constructive techniques of ancient masonries

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In the field of the preservation of the architectural heritage, diagnostic investigations, if founded on an interdisciplinary approach, allow to provide a scientific support the diagnosis and the set up of suitable and compatible strategies of interventions. One of the exploited approaches is finalised to find correlations among several investigation techniques, that differ from each other with respect to the degree of invasivity or destructivity, the modalities of implementation (in situ or in laboratory), the kind of output (i.e. physical and mechanical, or chemical and physical).

The usefulness of finding correlations is related to the possibility to exploit less and less destructive techniques, that are also cheaper and user friendly, and that allow to achieve direct parameters characterising a certain behaviour of a phenomenology.

This paper presents a case study dealing with the application of some integrated in situ and laboratory investigations to the study for the identification and characterisation of ancient masonries. With respect to those built with modern materials, ancient masonries are more complex manufactured issues. Such a complexity is due to their composite characteristics and to the various constructive techniques that characterise them. Further than these factors, the final characteristics are also determined by the nature of the constitutive materials that, being natural stones, comprise a large variety of materials, with extremely different lithologic characteristics.

The purpose of this research is to identify a meaningful group of correlated methodologies for the investigation of masonry structures with particular reference to requirements to be non-destructive, exploitable in situ, efficient and user friendly.

Both in-situ and laboratory investigation methodologies are exploited.

The first ones comprise the transmission of sonic and ultrasonic waves and GPR prospecting, and are applied to the analysis of the masonry structure, also in order to detect possible phenomena that may affect the original conditions, as for example the presence of discontinuities and/or humidity.

The laboratory study, instead, is aimed to the identification of the constitutive materials (stone elements and mortars), the determination of their physical and mineralogical-petrographic characteristics, as well as identification of products of decay.

The results of the integrated activities, further than providing a contribution with regard to the procedures and the methodologies for the analysis of ancient masonries, provide the basis for the research of correlations between the structural characteristics and those of the constitutive elements. This is important in order to elaborate a model of the behaviour of the masonry taking into account both the masonry structure and intrinsic features of the constituent materials.