

The “SonReb” method for qualifying the reinforced concrete structure

© Antonella GUIDA¹ & Antonello PAGLIUCA¹ & Alessandro TRANQUILLINO MINERVA²

¹ University of Basilicata, School of Engineering, DAPIT - Department of Architecture, Planning and Infrastructures for Transport, Potenza (Italy)

² Building Engineer, Gravina in Puglia (Italy)

Conference Theme

GI-9 - From artefact to historical site : geoscience and non-invasive methods for the study and conservation of cultural heritage

ABSTRACT

In recent years, a lot of studies on built heritage emphasize the need to use appropriate techniques to evaluate the current condition of the structure before designing an intervention. In fact, the technicians very often encounter a lot of economic and logistical problems that are a barrier to planning of suitable diagnostic tests; and that need consideration with regards to the masonry buildings or reinforced concrete buildings.

The research focuses on the restoration of reinforced concrete buildings, that begin to show signs of decay and deterioration.

In the reinforced concrete structures, the most important properties are - among others - the concrete compressive strength, the concrete condition and steel bars yield strength and fracture. Through the concrete compressive strength, other concrete properties can be obtained, such as elastic modulus, tensile strength and durability. So to do this, the “destructive” methods (that require a local removal of material) and “non-destructive” tests such as the sclerometer test, the ultrasonic test and the combined method called “SonReb” can be used.

The combined results from different “non-destructive” tests are very interesting instruments to assess the concrete strength. This methodological approach can help to reduce the possible errors when using the sclerometer and ultrasonic tests separately; in this way, the combined method called “SonReb” (SONic + REBound) was developed.

In fact, it has been noticed that the humidity content of a structural element can influence the sclerometer index and - at the same time - the ultrasonic speed. Using a combined method it is possible to balance some of the errors made when the two methodologies used separately. Moreover, this combined method requires short time to obtain the results, it's a non-invasive method and it does not affect the resistance of structural elements.

The above defined methodology has been tested on a post-war building which is located in Gravina in Puglia (Italy): the “Centrone” Theatre; it was built using a mixed structure, i.e. reinforced concrete and bearing masonry built of local stone. The building was used until the '90s and now is abandoned.

The diagnostic tests have shown a sufficiently high ultrasonic speed and homogeneous surface values. These data were compared with the method “SonReb” to improve - as said before - the qualitative interpretation of results; the analysis showed satisfactory results of the state of concrete condition.

The analysis and qualification of the masonry structures of built heritage show how this approach is useful for classifying the pathological events on each building and to implement the innovative solutions to improve the durability of a restoration intervention.