



A methodological non destructive approach for the conservation or structural repair of the Medioeval stone pillars of the Basilica of Santa Maria di Collemaggio in L'Aquila.

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The Medioeval Basilica of Santa Maria of Collemaggio in L'Aquila (XII century) due to the history and the election of Pope Celestino V, the Celestine Pardon, as well as to the artistic features, has a great religious and historic relevance. The whole Basilica was severely damaged during the earthquake of April 2009 and in particular the transetto zone with the cupola collapsed and ruined completely. By means of the project "Starting Afresh with Collemaggio" the Italian company Eni signs a memorandum of understanding with the city of L'Aquila for the restoration of the monument and of Collemaggio site. For this reason a wide and complex multidisciplinary diagnostic campaign was carried out in order to prepare the final design. A specific aspect concerned the diagnosis of the fourteen octagonal pillars of the central nave in terms of state of conservation and structural behavior. Each pillar consists, more or less, in forty big squared blocks of different local carbonatic stones. The diagnosis was preliminary executed by means of visual checks and mapping of the materials and of the structural damages. Subsequently non destructive ultrasonic and endoscopic techniques was carried out. The ultrasonic data were elaborated in order to obtain distribution maps of the velocity in the plane sections. To understanding the compressive strength of the stones and the resistance of the pillars, according to structural instances, destructive, compressive tests, and non destructive, ultrasonic and sclerometric measures, were performed of carbonatic blocks quarried in the surroundings of L'Aquila. The compressive destructive results, inclusive of ultrasonic and sclerometric results, were compared with those non destructive obtained on the stone blocks of the pillars.

The results allow to establish that three typologies of carbonatic stone were used. In many cases the surface of the stone, due to previously heartquake, was replaced with thick pieces of different stones. According to the surface treatment, as well as to the state of conservation of the blocks, it is possible to distinguish if the original stones can or must be replaced or repaired. In case of replacement of a block a part of it could be reused for replacing other missing parts or portions. The compressive resistance is very variable and ranging within 20 and 60 Mpa. Therefore a particular attention must be dedicated in choosing new stones with high compressive resistance as well as in design the structural interventions according to the whole behavior of the pillar arising from the finite elements computational model