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Reinforced Concrete Condition Assessment in Architectural Heritage. The Lion Chambers (Glasgow, UK) and the Theatre E. Duni (Matera, Italy)

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The research objective is to provide new qualitative information on the strength of reinforced concrete structures of two prominent examples of modern architecture by using innovative, non-invasive testing techniques. The first one is Lion Chambers in Glasgow (Scotland, United Kingdom) designed by the architects Salmon, Son and Gillespie and completed in 1907. It was the second example of the use of François Hennebique's reinforced concrete system in a building in Glasgow and one of the earliest in Britain. The second example is Duni Theatre in Matera (Southern Italy), designed by the architect Ettore Stella and completed in 1949.
The tests on the internal reinforced concrete columns were undertaken by using "SonReb" (SONic + REBound) method that enables assessing the concrete resistance by combining the speed of ultrasound waves and the index of surface bounce through a scleorometric test.
In fact, the sclerometer index only gives information regarding the surface layer of the building's structure. In fact, due to the effects of the natural ageing, catalysed by the presence of humidity, surface layers of concrete are affected over time by carbonatation, which increases surface rigidity, providing as a result a greatly "altered" rebound index (much greater than one would have under normal conditions).
On the other hand, the ultrasound speed, on the contrary to resistance, is inversely proportional to the age of the concrete (this seems to be due to the cracks that occur and reduce the speed). The hardening process continues over time with a consequent increase in resistance, which diminishes with the passage of time.
The paper provides the results of the tests run on the structure of the Lion Chambers and the Duni Theatre. The tests carried out are the basis of a diagnostic project that is possible to implement and monitor to guarantee a deeper knowledge, with the goal of attaining a level of thorough understanding aimed at the preservation of "Modern Architecture" in Europe.
The analysis and qualification of the 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.