

Nondestructive testing methodology to assess the conservation of historic stone buildings and monuments

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1 INTRODUCTION

Castles, temples, churches, and palaces are examples of the built heritage and constitute an important part of cultural life. These ancient constructions normally include massive masonry walls and natural stone. Safeguarding the stone built heritage is of unquestionable importance, so adequate intervention techniques on materials and structures must be developed and studied.

Proper conservation/rehabilitation of historic stone buildings should start with appropriate analysis and diagnosis and understanding of the causes of deterioration of the existing materials [1], which, in some cases, may lead to structural failures. Studies and analysis, however, should be carried out on the building stone with the lowest degree of intrusion and the fullest respect for its physical integrity, following the principles for safeguarding the architectural heritage [2], which were defined in the international charters of Athens and Venice [3]. One of the main dilemmas that diagnosis has to deal with is the removal of material for mechanical and physical characterization and at the same time respecting the ancient building. Having this difficulty in mind, the scientific community has been defending the principle of minimum intrusion and proposing alternative nondestructive techniques to evaluate the mechanical and physical properties of construction stone and its behavior [4].

In this chapter, a summary of the main nondestructive tests (NDT) used in historic stone buildings is presented. Furthermore, an NDT methodology to assess the conservation of historic stone buildings is proposed, and based on this methodology, a case study is presented of St. Leonard's Church, a Portuguese monument built in Atouguia da Baleia village in the 13th century.