Department	School of Engineering and the Built Environment
Supervisors	Dr Aikaterini Marinelli and Dr Aamir Khokhar
Project Title	Optimizing restoration techniques on historic masonry walls

PROJECT DESCRIPTION

Given the increasing demand for strategies aiming at the protection of the structural cultural heritage, developing sustainable methodologies for the use of a variety of civil engineering materials and systems is fundamental for optimizing their global behaviour and standardizing intervention techniques that both meet the most up-to-date codification issues at European level and comply with the philosophy and principles of the International Charter for the conservation and restoration of monuments and sites. Engineering problems related to conservation and restoration of Cultural Heritage are attacting attention by engineers and researchers, offering many opportunities for novel research and industry collaborations.

For the case of the non-extensively studied structural typology of multi-leaf stone masonry walls, the connection between distinct structural wall parts together with the quality and characteristics of all masonry materials involved, are crucial elements of the actual structural response and strongly influence the extent and specific requirements for retrofitting interventions.

The aim of the proposed PhD research is to study, both experimentally and numerically, a variety of strengthening techniques for multi-leaf stone masonry walls appropriate for historic monuments, some of which are already used empirically. The parametric investigation of factors affecting the efficiency of such interventions is needed for their optimisation, in terms of both cost and structural performance, and it will contribute to forming design guidelines with immediate applications on historic masonry structures.

The research is in line with the current Scottish Government's Programme and Edinburgh Napier University will cooperate with Public bodies and Industry partners in the sector.

Academic qualifications

A first degree (at least a 2.1) ideally in Civil Engineering, with emphasis on Structures and Structural Mechanics, with a good fundamental knowledge of a) Structural Analysis, b) Mechanics of Materials and c) Computational Mechanics. Further academic experience on Structural Laboratory work will also be considered positively.

English language requirement

IELTS score must be at least 6.5 (with not less than 6.0 in each of the four components). Other, equivalent qualifications will be accepted. Full details of the University's policy are available online.

Essential attributes:

- Experience of fundamental laboratory skills
- Competent in Computational Mechanics
- Knowledge of Structural engineering with applications on Masonry structures
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

Indicative Bibliography	Theodossopoulos, D. (2012) Structural design in building conservation, Routledge. Hyslop, E., McMillan, A., Maxwell, I. (2006) Stone in Scotland, UNESCO Publishing. Corradi, M., Borri, A., Poverello, E., Castori, G. (2017) The use of transverse anchors as reinforcement of multi-leaf walls. Materials and Structures, 50: 114. D'Ayala, DF., Paganoni, S. (2011) Assessment and analysis of damage in L'Aquila historic city centre after 6th April 2009. Bull Earth Eng 9 (1): 81.
Enquiries	For informal enquiries about this PhD project, please contact Dr Aikaterini Marinelli: A.Marinelli@napier.ac.uk
Web page	https://www.napier.ac.uk/research-and-innovation/research-degrees/application-process