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TUBE-JACK TESTING: REGULAR MASONRY WALL TESTING

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Tube-jack testing is an enhanced non-destructive or minimally-destructive test method being developed at the University of Minho as an alternative to the traditional flat-jack test method. The tube-jack system consists of several tube-jacks, instead of flat-jacks, roughly aligned in holes drilled into the mortar joints, of the masonry to be tested, forming an equivalent flat-jack. The tube-jack system can be used similarly to the flat-jack system to test the mechanical properties of historical masonry during inspection and diagnosis of a structure.

A previous study by the authors discussed the limitations of flat-jack testing, such as inaccurate or unusable results when testing irregular masonry, inflexibility of the flat-jack size, and destruction of historical masonry units when joints are not linear. The study proposed the new enhanced tube-jack method and used finite element models to simulate the difference between conventional flat-jack tests and the new tube-jack test [1].

The development of the tube-jack prototype system and its preliminary laboratory testing were presented in the October 2012 SAHC conference in Wroclaw, Poland [2]. These preliminary tests included testing different tubing materials and fabric meshes to confine the expansion of the tubes, and testing the system in a simple masonry specimen consisting of two blocks with a mortar joint between them and loaded in compression [3]. The test was also studied through models, which revealed the necessity of testing the system in a larger masonry specimen.

In this paper the testing of the complete tube-jack system in a regular masonry wall is presented. Several single tube-jack tests were performed in horizontal joints in a regular masonry wall, made of granite and cement-lime mortar, constructed in the laboratory for this purpose. The tests were studied to determine if they could accurately estimate the stress level in the masonry. A double tube-jack test was also performed to determine if this method could be an alternative to the double flat-jack test. Finally, these tube-jack tests were compared to single and double flat-jack tests performed next to the tube-jack tests in the same masonry wall. The results and conclusions of each of these tests are discussed and possible future improvements to the tube-jack system are presented.

Keywords: Experimental testing, ND Testing, Tube-jack testing, Flat-jack testing, Masonry

References

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