

## Abstract

The presented work focuses on the nondestructive tests dedicated for *in situ* evaluation of masonry structures. Four types of tests are being analyzed: flat-jack test, penetrometric test, double-punch test and Schmidt hammer test. The thesis has experimental character and bases on several testing campaigns conducted on laboratory prepared elements as well as existing structures.

The first investigation program analyzes the factors influencing the flat-jack tests. The two most common tests (level of compressive stress and stress-strain relationship) are repeated with different shapes of flat-jacks. As the results show, the shape of flat-jacks and the distance between them highly affect the outcomes of stress – strain tests. Too small flat-jacks can lead to wrong measurements of masonry deformability. During stress tests no significant differences have been recorded.

The second group of studies is dedicated to assessment of mortar in the brick wall joints. The new-developed penetrometer RSM 15 was used for mortar strength evaluation. The influence of stress level, higher content of moisture and type of mortar has been studied. Additionally two factors (mortar strength and specimen slenderness) strongly affecting the results of double punch test were analyzed. In case of low-strength mortars the possibility of overestimation of the compressive strength rises with the increase of confinement of the specimen.

The last investigation program focuses on development of the new correlation function for a Silver Schmidt hammer. All data were collected from three historical buildings localized in Cracow. As a complementary studies a modification of the correlation function (proposed in UIC 778-3 for regular Schmidt hammer) dedicated to special structures has been proposed.

**Keywords:** *flat-jack, Schmidt hammer, penetrometer, double-punch test, minor-destructive testing, mortar strength, masonry, in-situ diagnostic.*