



Modern Building Materials, Structures and Techniques, MBMST 2016

Experimental Investigation Of The Behaviour Of Brick Lintels

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Abstract

Ceramic bricks are most frequently used for arranging the cladding layer of external layered masonry walls. The recent tendency has focused on a thinner cladding layer. Masonry lintels are used for making openings in the cladding layer. The article presents the results of experimental investigation in masonry lintels of 85 mm and 55 mm in width and 2 m long span. The experimentally established and calculated according to EC6 recommendations masonry lintels bearing load capacity has been compared.

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Peer-review under responsibility of the organizing committee of MBMST 2016

Keywords: masonry, brick lintel, reinforced bed joint.

1. Introduction

For erecting brick buildings, lintels have long been decorative accents on facades. Since ancient times masonry lintels have been applied: brick lintels, wedge-shaped and arched lintels. Brick lintels have the simplest structural solution. Brick lintels have been used for openings up to 2 m long. Their structural solution is also rather simple. Similar lintels are reinforced constructively applying to a wall thickness of 130 mm within the area of 0.2 cm² of reinforcement. Reinforcement is overlapped behind the wall and exceeds 250 mm. The main function of reinforcement is to withstand the weight of the lower rows of bricks. A 20-30 mm thick layer of mortar protects reinforcement from the impact of an aggressive environment. Recently, in many cases, prefabricated lintels of steel or reinforced concrete are used. The expansion of the stock of masonry products has assisted in putting into use blocks.

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An increase in using outer layered walls has resulted in the installed veneer layer applying ceramic bricks. Recently preserving the environment and reducing energy consumption in the production of materials, a tendency for thinning the veneer of layered walls is noticed. For setting up the veneer layer, ceramic bricks of 85 or 55 mm instead of those of 120 mm in width are applied. In this case, for making openings, new type of brick lintels are used. The bottom row of bricks hung on the longitudinal reinforcement of bed joint is the key distinguishing feature of mentioned type lintels. Thus, the heat insulating layer is covered and no any other inclusions (for example, precast reinforced concrete or steel lintel elements) in the veneer layer can be observed (Fig. 1). Building experience shows that, under the brick of 120 mm in width, brick lintels without additional intermediate fastenings can be used when the span is up to 2 m. When openings are larger, brick lintels are additionally suspended on special supports at certain distances.

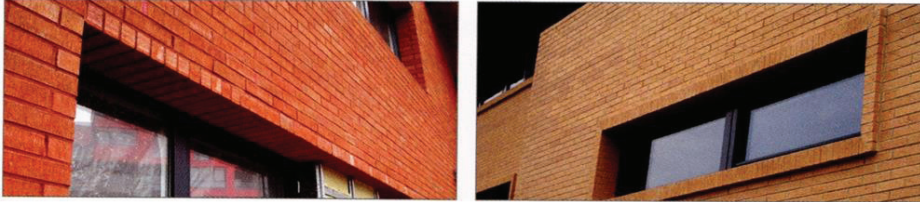


Fig. 1. Examples of the brick lintels.

Brick lintels are installed using bricks, specific bed joint reinforcement Murfor and special joints. A structural solution to the brick lintel is shown in Fig. 2 illustrating the principle of installing the lintel and fixing the bottom line of bricks to the bed joint reinforcement.



Fig. 2. A structural solution of brick lintels.

The lintels shown in Fig. 2 can be attributed to masonry wall beams according to EN 1996-1-1 (EC6) [1]. However, with reference to EC6, masonry wall beams make a part (stripe) of the wall above the opening the height of which is greater than $0,5l_{ef}$ (where l_{ef} – effective span of masonry wall beams). The height of the wall stripe of masonry lintels (Fig. 2) above the openings is frequently lower than $0,5l_{ef}$, and therefore their bearing capacity can be calculated as that of the longitudinally reinforced masonry beam. Literature does not provide enough data on the behaviour of brick lintels of a narrower width (85 – 55 mm) under acting loads.

The article presents experimental investigation in the lintels made of small width ceramic bricks and draws a comparison between the calculation of the bearing load capacity of lintels according to EC6 and experimental research.

2. Experimental programme

For examining the behaviour of masonry lintels, two series of specimens were produced. The specimens (lintels) were built from ceramic hollow bricks. The first series of lintels (SP1) used the bricks of 85 mm while the second (SR2) – the bricks of 55 mm in width. The lintels were made using general-purpose mortar M10 and they were put by high skilled bricklayers in the laboratory. Murfor reinforcement of bed joints was used for specimens. The

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