9th International Masonry Conference
July 7, 8, 9 2014
Guimarães, Portugal

EuLA European Lime Association

IMC Students' Challenge

Maximum Compressive Load of Masonry Prisms

1st Testing Report

January 2014

1 Introduction

The "**IMC Students' Challenge**" is an initiative of the Organizing Committee of the 9th International Masonry Conference, to be held in Guimarães, Portugal, during July 7-9, 2014. This competition is sponsored by EuLA - the European Lime Association.

The objective of this competition is **to predict the maximum compressive load** of two types of masonry prisms, as stated in the previous announcement. The present report provides information about the construction of the specimens and the mechanical properties of mortar at 14 and 28 days.

2 Construction of the Specimens

Two types of prisms were built: a) hollow concrete block masonry and b) solid clay brick masonry (see Figure 1). The mortar used has a volumetric ratio of 1:1:6 (cement – lime – sand), using materials according to European norms (CEM II/B-L 32,5N; CL 90-S; natural sand).

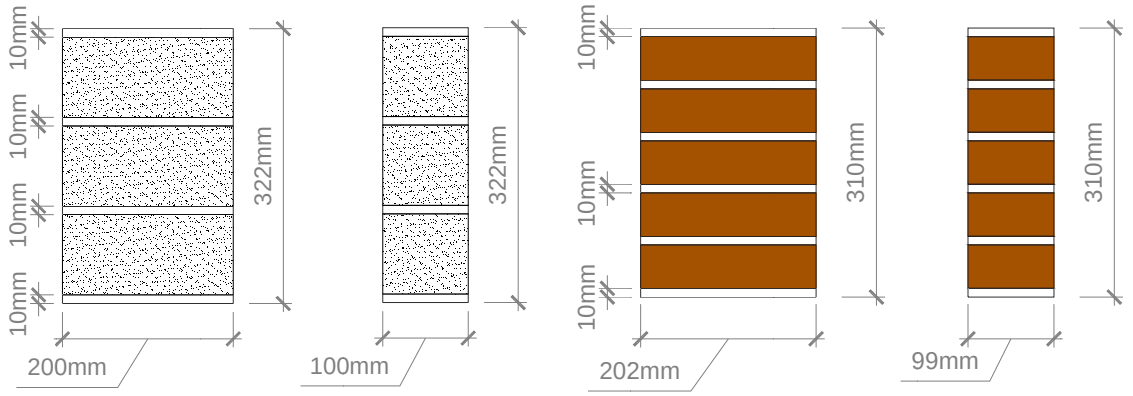


Figure 1 Geometry of specimens: (a) concrete hollow prims (front and lateral view); and (b) brick prisms (front and lateral view)

The masonry units were chosen so that they contained minimum amount of imperfections. The technique used to build the specimens allowed the control of the thickness of the mortar joints, as shown in Figure 2. Three specimens of each kind were built and are curing at a temperature of 20 °C ± 2 °C and relative humidity of 60% ± 5%. The final configurations of both types of specimens are presented in Figure 3.

Sampling and storage of the mortar used for the masonry specimens was made according to EN 1015-11:1999. After the mould removal, mortar specimens were placed under the same conditions as the masonry specimens.

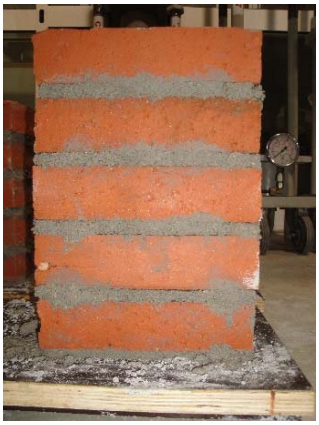
The eccentric compressive tests on masonry prisms will be carried out on July 7, 2014, 216 days after the specimens' construction.

(a)

(b)

Figure 2 Construction of the specimens: (a) concrete hollow prims; and (b) brick prisms

(a)



(b)

Figure 3 Final configuration of the specimens: (a) concrete hollow prims; and (b) brick prisms

3 Flexural and compressive strength of mortar samples

Three prisms (160 mm × 40 mm × 40 mm) were tested for flexural strength at 14 and 28 days, as presented in Figure 4. Consequently, six half prisms were tested for compressive strength, as shown in Figure 5. General requirements of EN 1015-11:1999 to determine the flexural and compressive strengths were followed, with the exception of the loading method. Both tests were carried out under displacement control, in order to provide force-displacement curves capable of describing post-peak behaviour (see Figure 6 and Figure 7 for flexural strength and compressive strength, respectively).

Flexural and compressive strength values of all specimens at 14 and 28 days are presented in Table 1 and Table 2, respectively. Cv indicates the coefficient of variation. It was not possible to obtain a proper force-displacement curve of MS.C1, due to a problem with the Linear Variable Differential Transformer (LVDT). Specimen MS.C12 proved to be an outlier so its results are not provided.

(a)

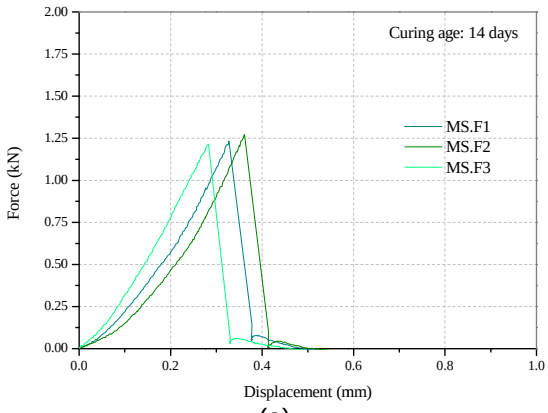
(b)

Figure 4 Flexural test: (a) before; and (b) after.

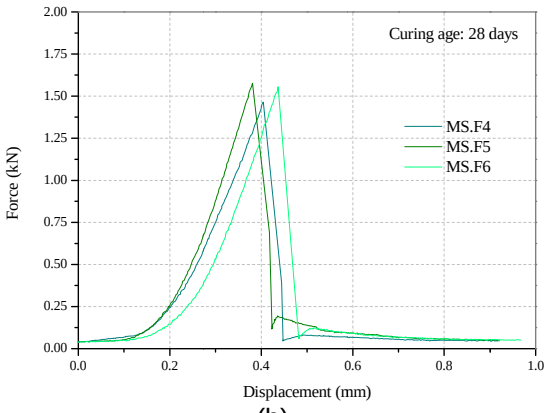
(a)

(b)

Figure 5 Compression test: (a) before; and (b) after.

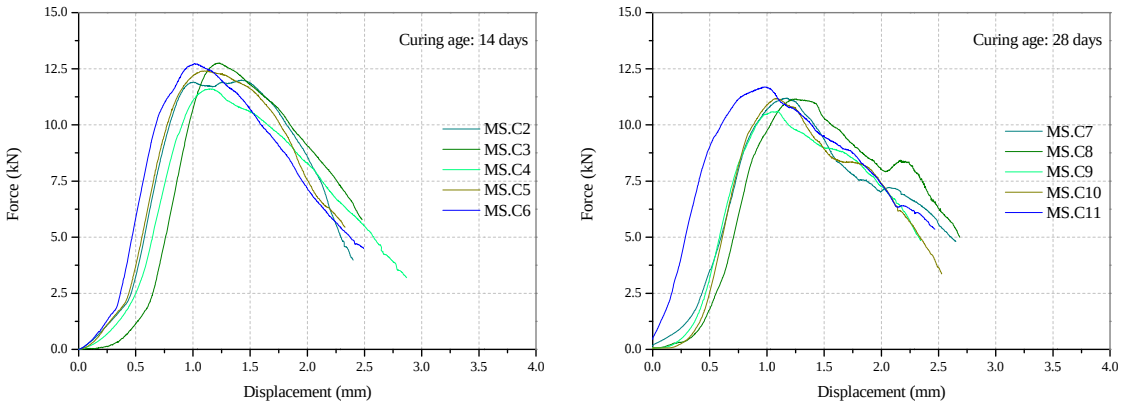


(a)



(b)

Figure 6 Force-displacement curves regarding the flexural behaviour at: (a) 14 days; and (b) 28 days.



(a) (b)

Figure 7 Force-displacement curves regarding compression behaviour at: (a) 14 days; and (b) 28 days.

Table 1 Flexural strength of mortar at 14 and 28 days

	14 days			28 days	
	F (kN)	f_{xm} (MPa)		F (kN)	f_{xm} (MPa)
MS.F1	1.23	2.9	MS.F4	1.46	3.4
MS.F2	1.27	3.0	MS.F5	1.58	3.7
MS.F3	1.21	2.8	MS.F6	1.56	3.6
Average	1.2	2.9	Average	1.5	3.6
C_V (%)	2.0	2.0	C_V (%)	3.2	3.2

Table 2 Compressive strength of mortar at 14 and 28 days

	14 days			28 days	
	F (kN)	f_m (MPa)		F (kN)	f_m (MPa)
MS.C1	11.39	7.12	MS.C7	11.20	7.00
MS.C2	12.00	7.50	MS.C8	11.16	6.98
MS.C3	12.76	7.98	MS.C9	10.61	6.63
MS.C4	11.61	7.26	MS.C10	11.18	6.98
MS.C5	12.42	7.76	MS.C11	11.69	7.31
MS.C6	12.73	7.96	MS.C12	-	-
Average	12.2	7.6	Average	11.2	7.0
C_V (%)	4.4	4.4	C_V (%)	3.1	3.1

4 Conclusions

The present document is the first testing report for the "**IMC Student's Challenge**", and it provides information about the construction of the specimens and the mechanical properties of mortar at 14 and 28 days.

The mechanical properties of the bricks and blocks will be presented in the next report.

The tests on the masonry prims will be carried out on July 7, 2014 (during the 9th IMC), 216 days after the specimens' construction.

Guimarães, January 2014

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