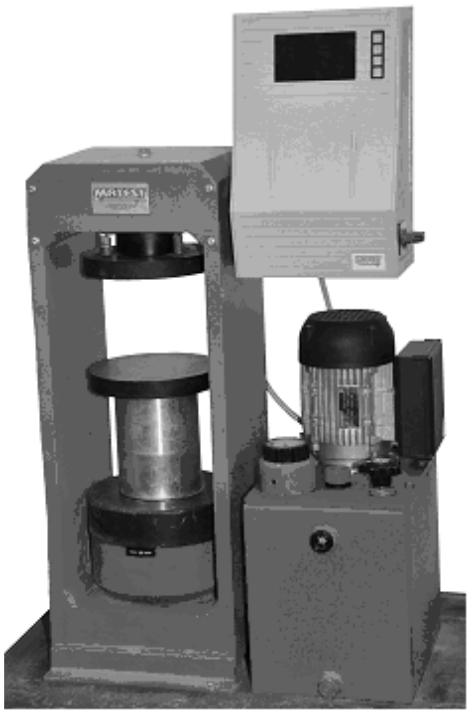
Department of Building Engineering

EXERCISE NR 11

Building ceramics - determination of compressive strength

Instructions from the lab:
"Building engineering and building materials"

11 .1. Determination of compressive strength of ceramic elements



Rys. 11.1. Prasa hydrauliczna do badania wytrzymałości na ściskanie.

The test specimen should be aligned with the centre of the pressure plate hinge so as to ensure a stable position. No spacer material should be used. Four lengths of steel strip the same width as the outer wall surface and 50 mmlonger than it may be laid, two on top and two at the base, aligning them at each end, in the case of:

- elements intended for installation on the surface of the external wall;
- elements intended for laying on mortar strips;
- elements prepared by grinding.

The recommended load increment is given in Table 11.1. Initially apply the usual load increment and when it reaches approximately half of the expected maximum load, adjust the increment so that the maximum load is achieved in no less than approximately 1 min.

Table 11.1. Recommended sample load increase for compressive strength testing

Expected compressive strength (N/mm ^{2})	Load increase (N/mm^2)/s
<10	0.05
11 to 20	0.15
21 to 40	0.3
41 to 80	0.6
>80	1.0

Calculation and expression of results. The compressive strength f_c of the specimen shall be calculated by **dividing the maximum load achieved by the area of the loaded surface**.

The result should be given with an accuracy of 0.1 N/mm^2.

The compressive strength can be converted for calculation purposes into the normalized strength f_b. To obtain it, the compressive strength of the element should be multiplied by the shape factor δ , and by a multiplier depending on the seasoning method α, i.e.:

$$f_b = f_c \times \alpha \times \delta [MPa] \qquad (11.1)$$

where: f_c – compressive strength [MPa],

α – multiplier depending on the seasoning method:

α = 1.0 for the air -dry condition and for the condition with humidity up to 6%,
α = 0.8 for the dried to constant weight state,
α = 1.2 for wet condition (immersion in water),
δ – shape factor according to Table 11.2.

Table 11.2. Shape factor δ, taking into account the dimensions of the tested samples after surface preparation

Height[1)] mm \ Width mm	50	100	150	200	≥ 250
40	0.80	0.70	-	-	-
50	0.85	0.75	0.70	-	-
65	0.95	0.85	0.75	0.70	0.65
100	1.15	1.00	0.90	0.80	0.75
150	1.30	1.20	1.10	1.00	0.95
200	1.45	1.35	1.25	1.15	1.10
≥ 250	1.55	1.45	1.35	1.25	1.15
Note: Linear interpolation between adjacent aspect ratio values is allowed. [1)] height after surface preparation					

The strength classes of ceramic masonry units can be classified in accordance with the standardized compressive strength classes in Table 11.3.

Table 11.3. Compressive strength classes of ceramic elements

Compressive strength classes	**Normalized compressive strength in N/mm^2 not less than**
5	5.0
7.5	7.5
10	10.0
12.5	12.5
15	15.0
20	20.0
25	25.0
30	30.0
35	35.0
40	40.0
45	45.0
50	50.0
60	60.0
75	75.0

Group -……/team …… Date……

1. ……

2. ……

3. ……

4. ……

5. ……

Exercise 11

DESIGNATION OF COMPRESSIVE STRENGTH OF MASONRY ELEMENTS

Product name:……

Product strength class:…….

Calculation of the form factor *δ:*

Linear interpolation:

$$H(x) = f(x_1) + \frac{f(x_2) - f(x_1)}{x_2 - x_1}(x - x_1)$$

For height *δ:*

For width *δ:*

Coefficient *δ:*

Pattern	Load increase	Field compressed surface	Maximum load	Compressive strength	Normalized strength	Class compressive strength
	(N/mm²)/s	mm²	kN	N/mm²	N/mm²	
1						

Conclusions:

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