BUILDING MORTARS WITH MINERAL BINDERS

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1. CLASSIFICATION

Ordinary mortars are well homogenized mixtures of binders, sand and water which can harden in air or in water depending on the used binder. Some additives can also be used at their preparation.

The mortars can be used for masonry and also for coatings.

According to STAS 1030-1985, ordinary mortars can be classified such as:

a) Taking into consideration their utilization:

- Pointing mortars;
- Coating mortars.

b) Taking into account the used binder:

- Mortars with lime;
- Mortars with cement;
- Mortars with plaster;
- Mortars with clay-bond.

c) Classification according to compressive strength is presented in table 1.

d) Classification according to the humidity resistance:

- Mortars resistant to a relative humidity of the air less than 60%;
- Mortars resistant to a relative humidity of the air bigger than 60%;
- Water resistant mortars.

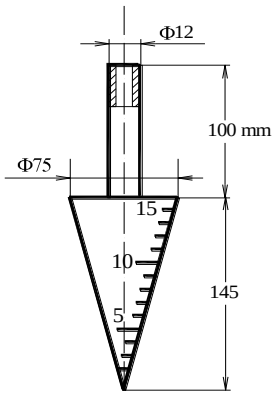
Table 1 *Classification of mortars according to the compressive strength*

Mark of mortar	M0.4	M1	M2.5	M5	M10
Compressive strength at 28 days, daN/cm^2, min.	4*	10	25	50	100
Compressive strength at 28 days, N/mm^2, min.	0.4*	1.0	2.5	5.0	10

* - this value is obtained at three months age

2. CONSISTANCY

To determine the consistency the fresh mortar sample must be mixed again for 3 minutes in order to become homogenous. The mortar is then introduced into a tronconic vessel made of steel sheet. The mortar is compacted then by 25 pricks done by a metallic stick which has a diameter of 10-12 mm and by stroking the bottom of the vessel to the table on which it is sitting. The mortars surface is levelled by a metallic line. The standard cone (fig. 1), watered before determination, is put into a vertical position having its peak in the centre of mortars surface and is freely released into the mortar only under the effect of its own weight. The depth of penetration is read on the cone, in cm. Consistency determination is done 3 times; after each determination, the mortar is mixed for 30 s and the cone is washed.



The final consistency is the arithmetical mean of all the three determinations that were done and is expressed in cm.

Depending on the type of mortar and the use of it, the consistency must be between the limits presented in tables 2 and 3.

Fig. 1

Table 2 *Masonry mortars*

Destination	Consistency (cm)
- Masonry made of full bricks or concrete blocks with natural or artificial easy aggregates;	8...13
- Masonry made of holes bricks or ceramic blocks with holes;	7...8
- Masonry made of stones or compacted blocks of concrete;	4...7
- Masonry made of small blocks or plates of BCA;	11...12
- Masonry made of small blocks of BCA with thin joints.	8...9

Table 3 *Coating mortars*

Destination	Consistency (cm)
a) Manual coatings:	
- On masonry made of small blocks, plates or strips of BCA:	
- for spraying layer	12...13
-for rough-cast	9...11
-for the skin layer	13...14
- On masonries made of other materials:	
- for spraying layer	11...13
-for rough-cast	8...9
-for the skin layer	12...14
b) Mechanically made coatings:	
- for spraying layer	≤12

-for rough-cast	11...12

3. APPARENT DENSITY

In order to establish the apparent density of a mortar, a cylindrical steel sheet vessel will be used having a volume of 2 dm^3 (V_a); the vessel must also have a prolongation frame.

The vessel is weighted m_1, after which the prolongation frame is placed and the mortar is poured into the vessel. The mortar is compacted, according to its consistency, as:

- For consistency of max. 6 cm , 10 strikes with the wood rod;
- For consistency bigger than 6 cm, 25 stings with metallic rod.

Than the prolongation frame is taken out and the mortar is levelled by means of a metallic line, the vessel is weighted again m_2.

Apparent density ρ_a of the fresh mortar is computed with by:

$$\rho_a = \frac{m_2 - m_1}{V_a} \qquad (kg/m^3) \qquad (1)$$

The apparent density is the mean of the three determinations. For ordinary fresh mortars the value of apparent density must be between 1950 and 2200 kg/m^3.

4. SEGREGATION TENDENCY

The segregation tendency is the mortar's property to separate on its components due to different densities, as result of some repeated shocks (vibrations) or because of a long rest. Because of these phenomena, the aggregate deposits on the bottom of the case, the cement paste and the water are separated from the mortar's surface, three layers of different consistency resulting on the case height.

The segregation tendency, figured by S coefficient of segregation, is made by:

- comparison made on segregation tendency of different types of mortars, determinations being done at a consistency of 8-9 cm;
- verification of segregation tendency of the mortars that are to be used; in this case the determination is made at the real consistency of those mortars.

A cylindrical steel vessel (fig. 2) is used for determination made of three distinct parts which can be put together due to some clips. The following procedure must be respected:

- for the sample prepared for vibration, the homogenised mortar is introduced into the cylindrical vessel, so that its top level to be under 1 cm to the vessel's edge; the mortar is stringed 25 times with metallic rod of 10 – 12 mm diameter, and then it is vibrated on vibrating table for 30 s;
- for sample prepared for the rest, the homogenised mortar is introduced into the cylindrical vessel until its top, it is stringed 25 times with metallic rod of 10 – 12 mm diameter, and then it is left in rest for 30 minutes, its surface being covered with a glass plate.

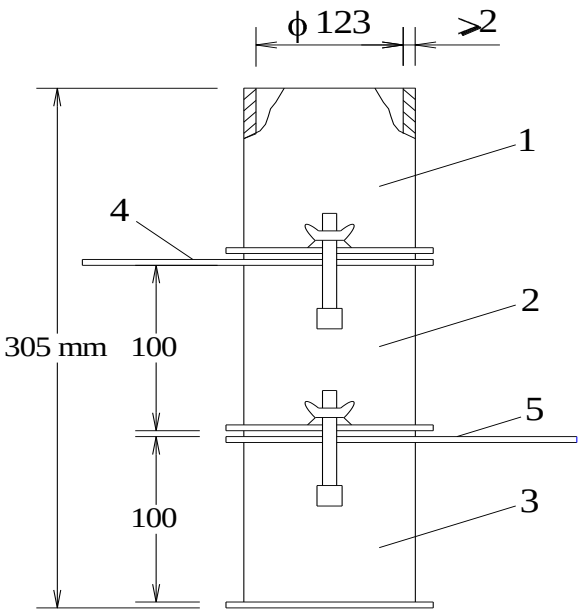


Fig. 2

After one of the two procedures presented above is accomplished, the determination is continued such as:

- by use of palette 4, the mortar and water separated in the superior part are taken (ring 1) and then remixed for 30 s; after that, its consistency is determined C_s;
- the mortar from the middle part of the vessel (ring 2) is removed by use of palette 5;
- the mortar from the lowest part (ring 3) is then remixed for 30 s, then its consistency is determined C_i.

The segregation tendency it is established taking into consideration the difference between the dislocated volumes by standard cone in the superior mortar and in the inferior one. It is denoted by segregation coefficient S, which can be computed such as:

$$S = \frac{\pi}{48}(C_s^3 - C_i^3) \qquad (cm^3) \qquad (2)$$

The values of consistencies C_s and C_i are the mean values of three determinations made on the mortar.

The segregation tendency, expressed by help of segregation coefficient, must be less than:

- 50 cm^3, for masonry mortars;
- 40 cm^3, for coating mortars.

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