

Lab Work No. 3

Determination of the normal density of the cement paste

To determine the normal density and setting time of the cement paste, a Vicat's Apparatus with a ring, a cup and a spatula for preparing a cement paste are used. When determining the normal density of the dough, a metal pestle cylinder is inserted into the lower part of the rod. The pestle should be made of polished stainless steel. The surface of the pestle should be clean. When using the device, the weight of the falling part must remain constant when replacing the pestle with a needle. The mass of the moving part of the device is kept constant by mutual rearrangement of the pestle and the needle. The remaining parts of the device are selected so that the total mass is within 300 ± 2 g. The ring to the Vicat's Apparatus and the plate on which the ring is mounted during the test should be made of stainless steel, plastic or glass.

The normal thickness of the cement paste is considered to be such a consistency in which the pestle of the Vicat's Apparatus, immersed in a ring filled with dough, does not reach 5-7 mm to the plate on which the ring is mounted. The normal density of the cement paste is characterized by the amount of mixing water, expressed as a percentage of the mass of cement.

Before the test, the zero reading of the device should be checked, for which the pestle is brought into contact with the plate on which the ring is located. In case of deviation from zero, the scale of the device moves accordingly. Before starting the test, the ring and plate are lubricated with a thin layer of engine oil.

To prepare a cement dough, 400 g of cement is weighed, poured into a cup previously rubbed with a damp cloth, a recess is made in the cement, into which water is poured in one go in the amount necessary (approximately) to obtain a normal density cement dough. After pouring water, the recess is covered with cement and 30 seconds after that, first carefully mix, and then vigorously rub the dough with a spatula. The duration of mixing and grinding cement with water should be 5 minutes from the moment of pouring water.

Immediately after mixing is completed, the ring is filled with cement paste and shaken it 5-6 times, tapping on the table. Then the surface of the dough is leveled, cutting off the excess dough flush with the edges of the ring with a knife wiped with a damp cloth. Immediately after this, the instrument pestle is brought into contact with the dough surface in the center of the ring and the rod is fixed with a clamping screw, then the rod is quickly released and the pestle is allowed to freely immerse in the dough. After 30 seconds from the moment the rod is released, the depth of its immersion is recorded on a scale. The ring with the dough in the determination should not be subjected to shocks.

If the consistency of the cement dough is not correct, the amount of water is changed and the dough is closed again, trying to immerse the pestle to the depth indicated above (5-7 mm to the plate). The amount of added water to obtain a test of normal density, expressed as a percentage of the weight of cement, is determined with rounding to 0.25%.

The results of the experiments are entered in table.3.

Table 3

The Results of Determining the Normal Density of the Cement Test

Exp. №	Cement Mass, g	Water Volume, ml	Readout on the Device Scale, mm	Cement Water Demand, %