Lab Work No. 5

Determination of bending concrete strength

To test the samples for bending, instruments of any design can be used that satisfy the following requirements: the average rate of increase in load should be (0.05±0.01) kN/s or (0.12±0.02) MPa/s in terms of unit area of the reduced section of the beam. Samples are mounted on the supports of the bending device so that those faces that were horizontal during manufacture were in a vertical position.

MII-100 machine — The upgraded Michaelis device, which retains the same lever system with a 1:50 shoulder ratio and the same grip. The main difference is that the load on the sample is created by moving a heavy load on the upper arm using an electric motor.

The machine consists of two main parts: a bed and a beam, pivotally mounted on a bed stand using triangular prisms. The electric motor located on the beam, rotating the spindle through the gearbox, moves the load along the guide rails. The rocker goes out of balance and presses on the linkage system, which transfers the force increased by 50 times to the specimen installed in the grip. The speed of movement of the load is maintained constant by the centrifugal regulator and corresponds to the loading of the sample at a speed of (1 ± 0.1) N/s.

The load moves until an increasing load destroys the sample. At the same time, the beam turns on the prisms so that the shank of the microswitch hits the thrust washer of the shock absorber and the engine turns off. The lead screw is connected by a gear to a counter, which is calibrated so that it shows the stresses (kgf/cm^2) arising in the sample. When the sample is destroyed, the meter fixes the value of the tensile strength of the material during bending (kgf/cm^2).

The advantage of the MII-100 machine is the ability to directly determine the value of tensile strength by the meter without additional calculations; however, the accuracy of determining the bending strength on the Michaelis device is slightly higher.

To start the MII-100 machine in operation, it is connected to a 220 V power supply network. Then the sample is inserted and fixed in the gripper and the toggle

switch is switched to the «Forward» position. This closes the electric circuit, which includes the electric motor, microswitch and centrifugal regulator.

After the destruction of the sample, the toggle switch is placed in the «Back» position. In this case, an accelerated return of the load to its original position occurs, since the engine turns on without a centrifugal speed controller. At the end of the stroke, by pressing the lever, the load turns on the centrifugal regulator and the speed of the load is slowed down. When the load reaches the extreme left position, the micro switch opens the circuit and the machine mechanism returns to its original position.

Maintenance of the MII-100 machine. The loading speed on the MII-100 machine is measured by a stopwatch on the counter; it should be (0.4±0.04) kgf/cm^2 per second. In the event of a discrepancy between the actual and the required loading speeds, the speed is controlled by moving the contact of the centrifugal controller.

Before turning on the MII-100 machine in the network, make sure that the voltage of the network matches the voltage for which the machine is designed. The MII-100 machine must be grounded. The contact rings of the centrifugal controller of the machine are cleaned with alcohol in case of contamination, but at least after 40...50 hours of operation. The motor collector is cleaned as necessary. Carbon brushes are replaced as they wear; brushes are considered worn if the length of their remaining working part is less than 5 mm.

The MII-100 machine must be installed on a solid horizontal surface in a room with a temperature of at least 15 ° C. It is not allowed to install the machine in a room whose air contains aggressive vapors and gases that cause corrosion of critical parts (support prisms, electrical appliances). It is necessary to ensure that cement dust and dirt do not get into the supports, as well as the correct installation of the levers on the support prisms. At least once a month, the guides and bearings of devices and machines are lubricated with machine oil, and gears with a technical vaseline.

To determine the tensile strength of cement during bending and compression, beam samples 40x40x160 mm in size are made from a plastic cement mortar of a normal consistency of 1:3 composition by weight (1 part cement and 3 parts sand) at a water-cement ratio (W/C) of at least 0.4.

The results of the experiments are entered in table.5.

Table 5

The Results of Determining the Strength of Concrete in Bending

Name of Defined Indicators	Values for Individual Samples			Test Result
The Tensile Strength in Bending, MPa				