

# **INITIAL AND FINAL SETTING TIME OF CEMENT**

## **1. Objective**

For convenience, initial setting time is regarded as the time elapsed between the moments that the water is added to the cement, to the time that the paste starts losing its plasticity. The final setting time is the time elapsed between the moment the water is added to the cement, and the time when the paste has completely lost its plasticity and has attained sufficient firmness to resist certain definite pressure. The temperature of moulding room, dry materials and water shall be maintained at  $27 \pm 2^\circ\text{C}$ . The relative humidity of the laboratory shall be  $65 \pm 5$  percent.

## **2. Apparatus Required**



**Fig. 1: Balance**

On balance in use, the permissible variation at a load of 1000 g shall be  $\pm 1.0$  g. The permissible variation on new balance shall be one-half of this value. The sensibility reciprocal shall be not greater than twice the permissible variation.



**Fig. 2: Vicat's Apparatus**

Vicat apparatus should conform to IS: 5513-1996. It consists of an arrangement to hold the plunger of 10 mm diameter and two other needles which are made to freely fall into a mould filled with the cement paste and the amount of penetration of the needles of plunger can be noted using the vertical graduations from 0 mm to 50 mm.



**Fig. 3: Stop Watch**



**Fig. 4: Gauging Trowel**

Gauging trowel conforming to IS : 10086-2021

## **3. Reference**

IS 4031(Part 5):1988 Methods of Physical test for Hydraulic Cement: Determination of Initial and Final Setting Times (First revision). Reaffirmed- 2019

## **4. Procedure**

### **4.1 Preparation of Test Block**

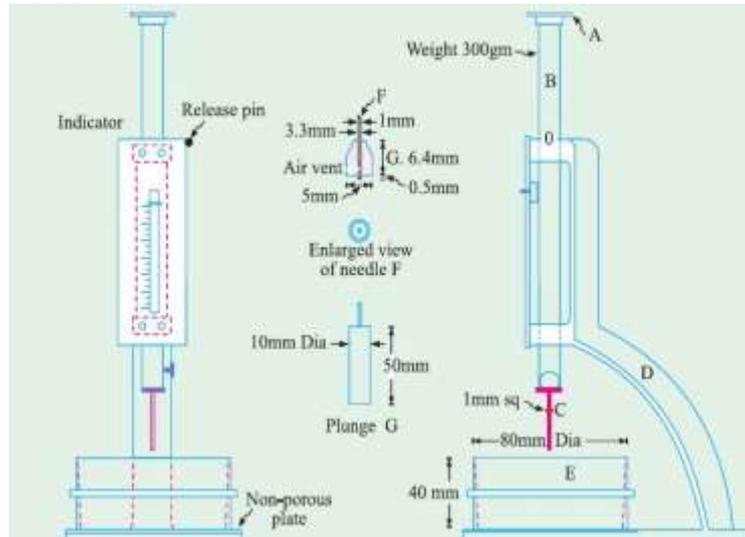
1. Prepare a neat cement paste by gauging the cement with 0.85 times the water required to give a paste of standard consistency. Potable or distilled water shall be used in preparing the paste. The paste shall be gauged in the manner and under the conditions prescribed in IS:4031 (Part 4)-1988.
2. Start a stop-watch at the instant when water is added to the cement. Fill the Vicat mould with a cement paste gauged as above, the mould resting on a nonporous plate. Fill the mould completely

and smooth off the surface of the paste making it level with the top of the mould. The cement block thus prepared in the mould is the test block.

3. Immediately after moulding, place the test block in the moist closet or moist room and allow it to remain there except when determinations of time of setting are being made.

#### 4.2 Determination of Initial Setting Time

1. Place the test block confined in the mould and resting on the non-porous plate, under the rod bearing the needle ( C ); lower the needle gently until it comes in contact with the surface of the test block and quickly release, allowing it to penetrate into the test block. In the beginning, the needle will \ completely pierce the test block.



**Fig. 5: Needles used in Vicat's Apparatus**

2. Repeat this procedure until the needle, when brought in contact with the test block and released as described above, fails to pierce the block beyond  $5.0 \pm 0.5$  mm measured from the bottom of the mould. The period elapsing between the time when water is added to the cement and the time at which the needle fails to pierce the test block to a point  $5.0 \pm 0.5$  mm measured from the bottom of the mould shall be the initial setting time.

#### 4.3 Determination of Final Setting Time

1. Replace the needle (C) of the Vicat apparatus by the needle with an annular attachment (F).
2. The cement shall be considered as finally set when, upon applying the needle gently to the surface of the test block, the needle makes an impression thereon, while the attachment fails to do so.
3. The period elapsing between the time when water is added to the cement and the time at which the needle makes an impression on the surface of test block while the attachment fails to do so shall be the final setting time.
4. In the event of a scum forming on the surface of the test block, use the underside of the block for the determination.

### 5. Observation and Recording

- Weight of given sample of cement is \_\_\_\_\_gms
- Volume of water addend (0.85 times the water required to give a paste of standard consistency) for preparation of test block \_\_\_\_\_ ml
- The normal consistency of a given sample of cement is \_\_\_\_\_ %

S. No.	Setting Time (second)	Penetration(mm)
1		
2		
3		

**Table 1:** Initial and Final Setting Time of Cement

### 6. Conclusion / Result

1. The initial setting time of the cement sample is found to be .... (shall be reported to the nearest five minutes.)
2. The final setting time of the cement sample is found to be .... (shall be reported to the nearest five minutes.)