Determination of consistency of standard cement paste

Overview

Standard consistency of a cement paste is defined as that consistency which will permit a vicat plunger having 10 mm dia and 50 mm length to penetrate to a depth of 33-35 mm from top of the mould.

Apparatus

Measuring Instruments

Name	Range	Accuracy
Vicat apparatus	IS:5513	
Balance	1000 g	1 g
Measuring cylinder	100 ml	1 ml

Other accessories

Tray, glass plate

Environmental condition

Temperature	27 ± 2^0 C
Humidity	65 ± 5 %

Procedure

1. Take 400 g of cement and place it in the enameled tray.
2. Mix about 25% water by weight of dry cement thoroughly to get a cement paste. Total time taken to obtain thoroughly mixed water cement paste i.e. “Gauging time” should not be more than 3 to 5 minutes.

3. Fill the vicat mould, resting upon a glass plate, with this cement paste.
4. After filling the mould completely, smoothen the surface of the paste, making it level with top of the mould.
5. Place the whole assembly(i.e. mould + cement paste + glass plate) under the rod bearing plunger.
6. Lower the plunger gently so as to touch the surface of the test block and quickly release the plunger allowing it to sink into the paste.
7. Measure the depth of penetration and record it.
8. Prepare trial pastes with varying percentages of water content and follow the steps (2 to 7) as described above, until the depth of penetration becomes 33 to 35 mm.

Calculation

Calculate percentage of water (P) by weight of dry cement required to prepare cement paste of standard consistency by following formula, and express it to the first place of decimal.

$$P = \frac{W}{C} * 100$$

Where,

W=Quantity of water added

C=Quantity of cement used

Technical discussion

- This test helps to determine water content for other tests like initial and final setting time, soundness & compressive strength.

Name of test	Amount of water required
Soundness (Le-chatelier method)	0.78 P
Setting time	0.85 P
Compressive strength	$\left(\frac{P}{4}+3.0\right)$ % of combined mass of cement and sand.

- Consistency refers to the relative mobility of a freshly mixed cement paste or mortar or its ability to flow. For a mortar the standard consistency is measured by flow table test.
- Generally the normal consistency for OPC ranges from 26 to 33%.

Precaution

- Gauging time should be strictly observed
- Room temperature should be well maintained as per test requirement.
- All apparatus used should be clean.
- The experiment should be performed away from vibrations and other disturbances.

Test standard reference

- IS:4031(Part 4):1988-Methods of physical tests for hydraulic cement (Determination of consistency of standard cement paste)