Heaven's Light is Our Guide

Rajshahi University of Engineering & Technology
Rajshahi

DEPARTMENT OF CIVIL ENGINEERING

Expt. No. .....

Name of Expt .....

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SUBJECT :	**SUBMITTED BY :**
COURSE NO. :.....	**NAME : .....**
DATE OF EXPT.:	**CLASS : .....**
DATE OF SUB. :.....	**GROUP : ..... ROLL NO .....**
	SESSION : .....

Introduction : The test method covers the determination of normal consistency of the hydraulic cement.

Definition :

Normal Consistency : Normal consistency is the term, which is used to determine the percentage of water required for preparation of cement paste.

Significance :

a. To determine the amount of water required to prepare hydraulic cement paste for testing.

b. This parameter is necessary to know initial, final setting time and the soundness of cement.

Apparatus :

a. Weight and weighting device : It should conform the requirements of specification C-1005.

b. Glass graduates : It is of 200 or 250 ml capacity and conforming to the requirements of C-490.

c. Vicat apparatus :

(i) Weight of moveable rod = (300 ± 0.5) gm

(ii) Diameter of plunger end of rod = (10 ± 0.05) mm

(iii) Length of plunger = 50 mm

(iv) Diameter of needle = (1 ± 0.5) mm

(v) Length of needle = 50 mm

(vi) Inside diameter of ring at bottom = (70 ± 3) mm

(vii) Inside diameter of ring at top = (60 ± 3) mm

(viii) Height of ring = (40 ± 1) mm

Explanation :

Vicat apparatus is shown in the figure. It is continuous of a frame to which it attatched a moveable rod weighting 300 gm and having diameter and length as 10 mm and 50 mm respectively.

An indicator is attatched to the moveable rod. This indicator is made of a vertical scale and it gives the penetration.

The vertical mould is in the form of a cylinder and it can be split into 2 holes. The vicat mould is placed on a non-porus plate. There are 3 attatchments square needle plunger and needle with a annular collar.

It is used for initial setting time test. The plunger is used for consistency test and theneedle with

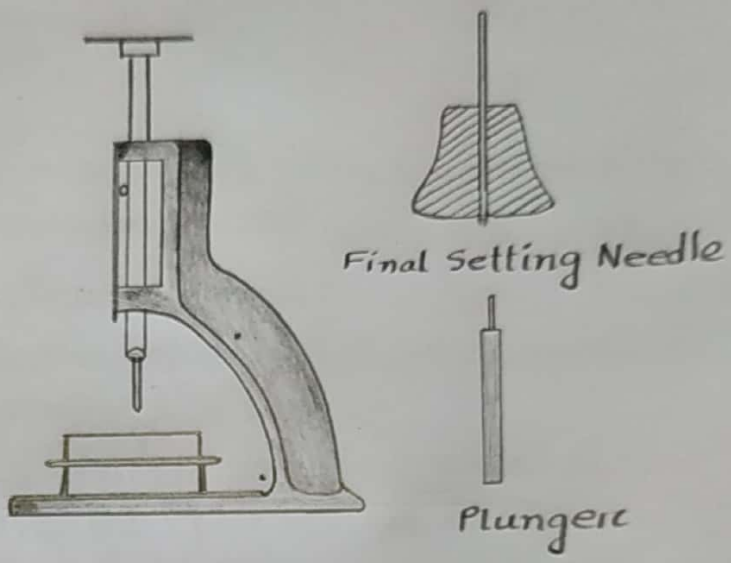

Figure : Vicat Apparatus

annular collar is used for final setting time test.

Procedure :

a. 650 gm of cement was mixed with a unknown quantity of water following C-305.
b. All water was placed in bowl.
c. Water was added to cement and was allowed 30 seconds for absorption of water.
d. The mixture was started and had mixed at slow speed 140±5 revolution per minute for 30 seconds.
e. The mixture was stopped for 15 seconds and during this time scraped down into the paste batch any paste that might be had collected inside of the bowl.
f. The mixture was started again at a medium speed (285±10 rpm) and mixed for 1 minute.

a. The cement paste was formed quickly into the approximately shape of a ball with glovet hands.
b. It was tossed for 6 times through a free path of 6" from one hand to another so as to produce nearly a spherical mass.
c. The ball was pressed, resting in the palm on one hand into the largere end on the conical ring, hold with the other hand.

d. The ring was placed on its largerc end on the base plate, sliced off excess paste at the smallerc end at the top of the ring by sharcp-edged trowel held at slight angle in the top of the ring and smoothed the top.

a. The paste was centred to confined in the ring, resting on the plate, underc the rod.
b. The plungerc end was brought in contact with the surface of the paste.
c. The set screw was tightened, the moveable indicatorc was set to upperc zerco marck on the scale.
d. The rod was released immidiately.
e. The settlement of plungerc was noted.
f. Trial pastes werce made with varying percentage of waterc until it reached normal consistency that was found when the plungerc penitrated (10±1) mm from the top.

Calculations :

Result :

Normal Consistency =

Discussions :

a. Air temperature was between 20 - 27.5 °C.
b. Mixing water temperature was 23 ± 2 °C.
c. Relative humidity of lab was less than 50%.
d. No pressure was applied on paste during cutting and smoothing.
e. Vicat apparatus was free from any vibration.

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Introduction : This test method covers the determination of normal consistency of hydraulic cement by Vicat needle.

Definition :

Initial Setting Time : It is regarded as the time elapsed between the moment the water is added to the cement to the time the paste starts losing its plasticity.

During the test it is specified as the period elapsed between the time when the water is added to the cement and the time at which the Vicat apparatus needle penetrates the test block 25 mm from the top.

Final Setting Time : The time elapsed between the moment the water is added to the cement and the cement, when, the paste has completely lost its plasticity and attains sufficient strength to resist certain pressure.

During the test, it is specified as the period elapsed from the the water is added to the cement to the time at which the Vicat apparatus needle doesn't penetrate more than 0.5 mm.

Significance :

a) To determine the amount of water required to perepare hydraulic cement paste for testing.
This parameter is necessary to know initial and final setting time & soundness of cement.

Apparatus :

1) Weight and weigh ing device : The weighting device shall confirm the requirement of specification C-1005

2) Glass graduates : 200 or 250 mL capacity and conforming to the requirements of C-490

(i) Weight of moveable rod = (300 ± 0.5) gm

(ii) Diameter of Plunger end of road = (10 ± 0.05) mm

(iii) Length of plunger = 50 mm

(iv) Diameter of needle = (1 ± 0.5) mm

(v) Length of needle = 50 mm

(vi) Inside diameter of ring at bottom = (70 ± 3) mm

(vii) Inside diameter of ring at top = (60 ± 3) mm

(viii) Height of ring = (40 ± 1) mm

Explanation :

Vicat apparatus is ~~ho~~ shown in the figure. It is continuous of a frame to which it attatched a moveable rod weighting 300 gm and having diameter and length as 10 mm and 50 mm p~~e~~ respectively.

An indicator is attatched to the moveable rod. This indicator is made of a vertical scale and it gives the penetration.

The vertical mould is in the form of a cylinder and it can be split into two holes. The vicat mould is

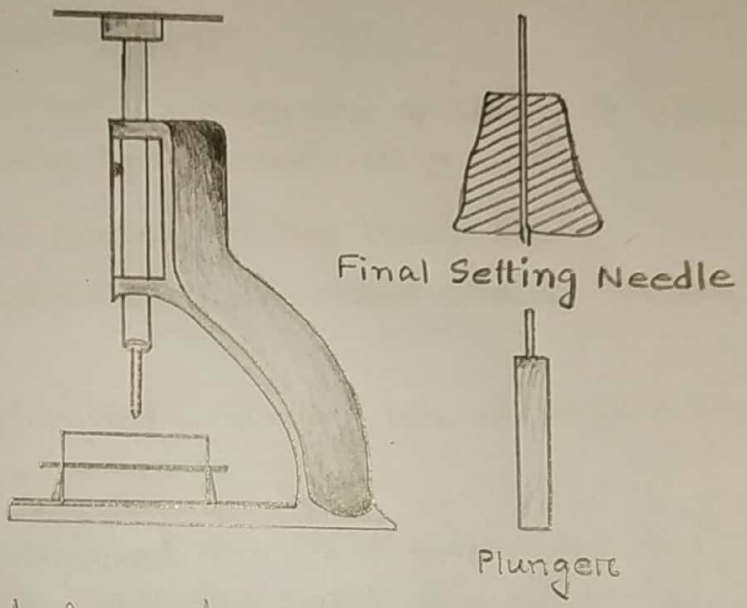

Figure: Vicat Apparatus.

placed on a non-porous plate. There are 3 attatchments square needle plunger and needle with an annular collar.

It is used for initial setting time test. The plunger is used for consistency test and the needle with annular collar is used for final setting time test.

Procedure :

1. Preparation of cement paste

a. 650gm of cement with measured quantity of water was mixed following the procedure C-305.

b. All the water was placed in the bowl.

c. Cement was added to the water and allowed 30 seconds for absorption.

d. The mixer was started and was mixed at a slow speed (140±5 rpm) for 30 seconds.

e. The mixer was stopped for 15 seconds and during this time scraped down into the patch any paste that might have collected on the sides of the bowl.

f. The mixer was started at a medium speed (285±10 rpm) and mixed for 1 minute.

2. Moulding of test specimen :

a. The cement paste was quickly formed into approximately a shape of a ball with glovet hands.

b. The ball was tossed 6 times through a free path of 6" from one hand to another so as to produce nearly a spherical mass.

c. The ball was pressed, resting in the palm on one hand, into the largerc end on the conical ring, hold with the other hand.

d. The ring was placed on its largerc end on the baseplate, sliced off excess paste at the smallerc end at the top of the ring by sharp-edged trowel held at slight angle in the

top of the ring and smoothed the top.

a. The specimen was kept in moist chamber for 30 mins. after moulding.
b. The needle was lowered of 1 mm until it rests on the surface of cement paste.
c. The set screw was tightened.
d. The indicator was settled.
e. The initial reading was taken.
f. The needle was allowed to settle for 30 seconds.
g. The reading was taken to determine the penetration.
h. The phenomenon was repeated after 3 minutes and continuing that.
i. All the result was recorded and the time was calculated.
j. The final setting time was obtained when the needle didn't pinned visible inside the paste.

Result :

Initial setting time :

Final setting time :

Discussion :

i. Aire temperature was between (20 - 27.5)°C.

ii. Mixing watere temperature was between (23 ± 2)°C.

iii. Relative humidity of lab room was less than 50%.

iv. No pressure was applied on paste during cutting and smoothing.

v. Vicat apparatus was free from any vibration.

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Introduction : This test covers determination of compressive strength of hydraulic cement mortars using 2" (50 mm) cube specimens.

Significance :

a. Means of determining the compressive strength of hydraulic cement and other mortars.

b. This method is referenced by other methods and specifications.

Apparatus :

a. Weights and weighing device

b. Glass graduates

c. Specimen mould [2" cube; shall have not more than 3 cube compartments]

d. Mixer, bowl and paddle

e. Flow table, flow mold

f. Tamper

g. Trowel

h. Moist cabinet

i. Testing machine

Procedure:

a. Oils and greases were applied on the surface of the mould using cloths or other means.

b. The mould faces and base plate were wiped to remove any excess release agent and to achieve an even coating on the interior surfaces.

c. The surfaces were sealed where the halves of the mould joined by applying coating.

d. After placing the mould on its base plate carefully, any excess oil or grease was removed with a dry cloth from the surface and base plate to which a sealant was used.

a. The standard proportion was considered 1 part of cement to 2.75 parts of sand by weight.

b. The ratio of water by cement (w/c) was 0.485

a. The mortar was mixed mechanically in accordance with practice C-305.

a. A layer of mortar of 1" was placed in all cubes. The mortar was tamped 32 times.
b. Tamping pressure was to ensure the uniform fill-ing of the mould.
c. The next layer was filled and tamped as before.
d. The top of all cubes was extended slightly above after tamping.
e. The top surface was cut and smoothed by trowel.
f. All the cubes were kept in moist closet or moist room for 20 to 72 hours.

a. The cubes prepared for both 3 days and 7 days were removed after 3 days and 7 days respectively.
b. The above mentioned cubes were demoulded after 24 hours and kept in water for curing.
c. The surfaces were wiped carefully.
d. The sample was placed in the testing machine below the centre of the upper bearing block.
e. The load reading was taken at failure.

Calculations :

Result :

Compressive strength of cement mortar at 3 days =

Compressive strength of cement mortar at 7 days =

Discussions :

a. Temperature at mixing place was 20 - 27.5 °C.

b. Temperature of mixing water 23 ± 1.7 °C.

c. Rubber gloves were used while mixing.

d. Relative humidity at moist room was

e. Before loading, the surfaces were checked for curvatures. If there had any curvature, the face was ground.

f. Molding of the specimens was started within a total of not more than 2 minutes 30 seconds. after completion of original mixing of mortar batch.