EXPERIMENT NO.- 04

EXPERIMENT NAME:

DETERMINATION OF NORMAL CONSISTENCY OF CEMENT WITH VICAT APPARATUS

INTRODUCTION

- The amount of water content that brings the cement paste to a standard condition of wetness is called ***Normal Consistency*.**
- It has marked effect upon the time of set as well as upon other properties.
- The paste at normal consistency is fairly stiff and is used only for the determination of time of set and soundness.
- The usual range of value of *Normal Consistency* lies between **22** to **30** Percent by weight of dry cement.

REFERENCED DOCUMENT
ASTM C 187

APPARATUS

Balance

(Sensitive to 0.1 mg) set of metrics weights. The permissible variations on weights in use in weighting the cement shall be as prescribed in Table 4.1. The permissible variations on new weights shall be one half of the values in Table 4.1.

Table: 4.1: Permissible variations on weights

Weight (gm)	Permissible Variations on Weights in use, plus or minus (gm)
500	0.18
300	0.15
250	0.13
200	0.10
100	0.07
50	0.04
20	0.02
10	0.02
5	0.01
2	0.01
1	0.01

APPARATUS (Contd..)

Three Glass Graduates ….. 200 or 250 ml capacity

Mixing Plate, Small Trowel, Three 4 in. Square Glass Plates

VICAT APPARATUS

- The Vicat Apparatus shall consist of a frame **A** (Figure 4.1) bearing a movable rod **B**, Weighing 300g, one end **C**, the plunger end, being 10 mm in diameter for a distance of at least 50 mm in length.
- The rod **B** is reversible; and can be held in any desired position by a set screw **E**, and has an adjustable indicator **F** which moves over a scale (graduated in millimeter) attached to the frame **A**.
- The paste is held in a rigid conical ring **G**, resting on a glass plate **H** about 100 mm, square.
- The rod **B** shall be made of stainless steel having a hardness of not less than 35 HRC (Rockwell Hardness Number), and shall be straight with the plunger end which is perpendicular to the rod axis.
- The ring shall be made of a non- corroding, non-absorbent material, and shall have an inside diameter of 70 mm at the base and 60 mm at the top and a height of 40 mm.

❑ In addition to the above, the Vicat apparatus shall conform to the following requirements:

Weight of movable rod	**300 ± 0.5 gm (0.661 lb ± 8 grains)**
Diameter of plunger end of rod	10 ± 0.05 mm (0.394 ± 0.002 in)
Diameter of needle	1 ± 0.05 mm (0.039 ± 0.002 in)
Height of ring	40 ± 1 mm (1.57 ± 0.04 in)
Inside diameter of ring at bottom	70 ± 3 mm (2.75 ± 0.12 in)
Inside diameter of ring at top	60 ± 3 mm (2.36 ± 0.12 in)
Graduated scale	The graduated scale, when compared with a standard scale accurate to within 0.1 mm at all points, shall not show a deviation at any point greater than 0.25 mm

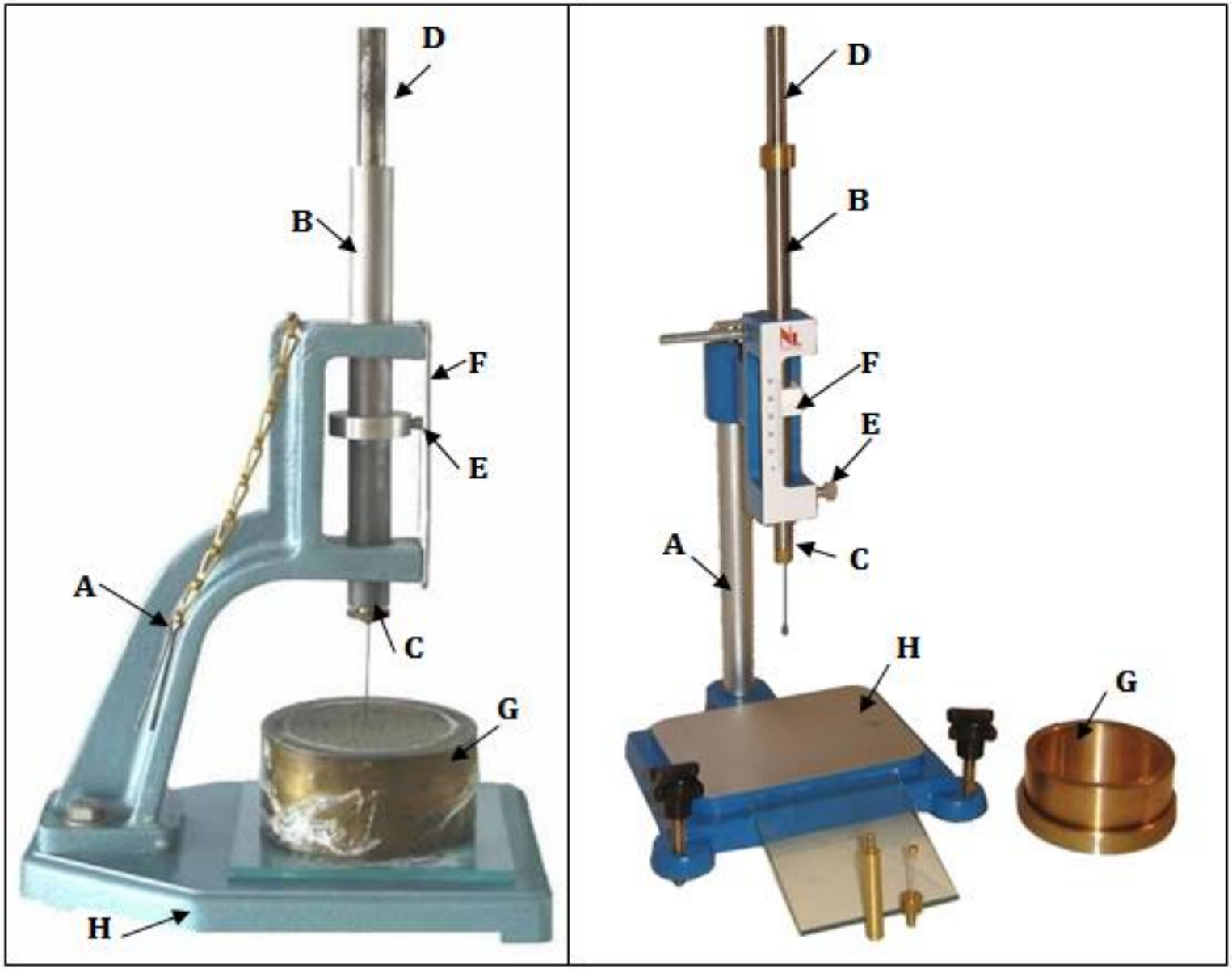


Figure 4.1 Vicat Apparatus

TEMPERATURE AND HUMIDITY

- The temperature of the air in vicinity of the mixing slab, the dry cement, molds, and base plates shall be maintained between 20 and 27.5°C (68 and 81.5°F).
- The temperature of the mixing water shall not vary from 23°C (73.4°F) by more than ±1.7°C (3°F).
- The relative humidity of the laboratory shall be not less than 50%.

PROCEDURE

Preparation of Cement paste:

- Weigh out 650 gm cement and place on the mixing plate.
- Form crater in the center and add a measured quantity of water.(the water required for normal consistency for ordinary cement ranges from 22 to 30% by weight).
- Turn the material at the outer edge in to the crater within 30 sec with a trowel.
- After an additional interval of 30 sec for the absorption of the water, complete the operation by continuous, vigorous mixing, squeezing and kneading with the hands for 1.5 min.

Molding Test Specimen:

- Quickly form the cement paste into the approximate shape of a ball with gloved hands.
- Then toss six times through a free path of about 60 in.(150 mm)from one hand to another so as to produce a nearly spherical mass that may be easily inserted in to the vicat ring with a minimum amount of additional manipulation.
- Press the ball, resting in the palm of one hand, into the larger end of the conical ring G (Figure 1.1), held in the other hand, completely filling the ring with paste.
- Remove the excess at the larger end by a single movement of the palm of the hand.
- Place the ring on its larger end on a plane, no absorptive plate H, and slice off the excess paste at the smaller end at the top of the ring by a single oblique stroke of a sharp-edged trowel held at a slight angle with the top of the ring and smooth the top, if necessary, with a few light touches of the pointed end of the trowel.
- During these operations of curing and smoothing take care not to compress the paste.

Consistency Determination:

- Center the paste confined in the ring, resting on the plate, under the rod **B**, (Figure 4.1) the plunger end of which shall be brought in contact with surface of the paste, and tighten the set-screw **E**.
- Then set the movable indicator **F** (10 mm dia) to the upper zero mark of the scale, or take an initial reading, and release the rod immediately.
- This must not exceed 30 sec after completion of mixing.
- The apparatus shall be free of all vibrations during the test.
- The paste shall be of normal consistency when the rod settles to a point 10±1 mm below the original surface in 30 sec after being released.

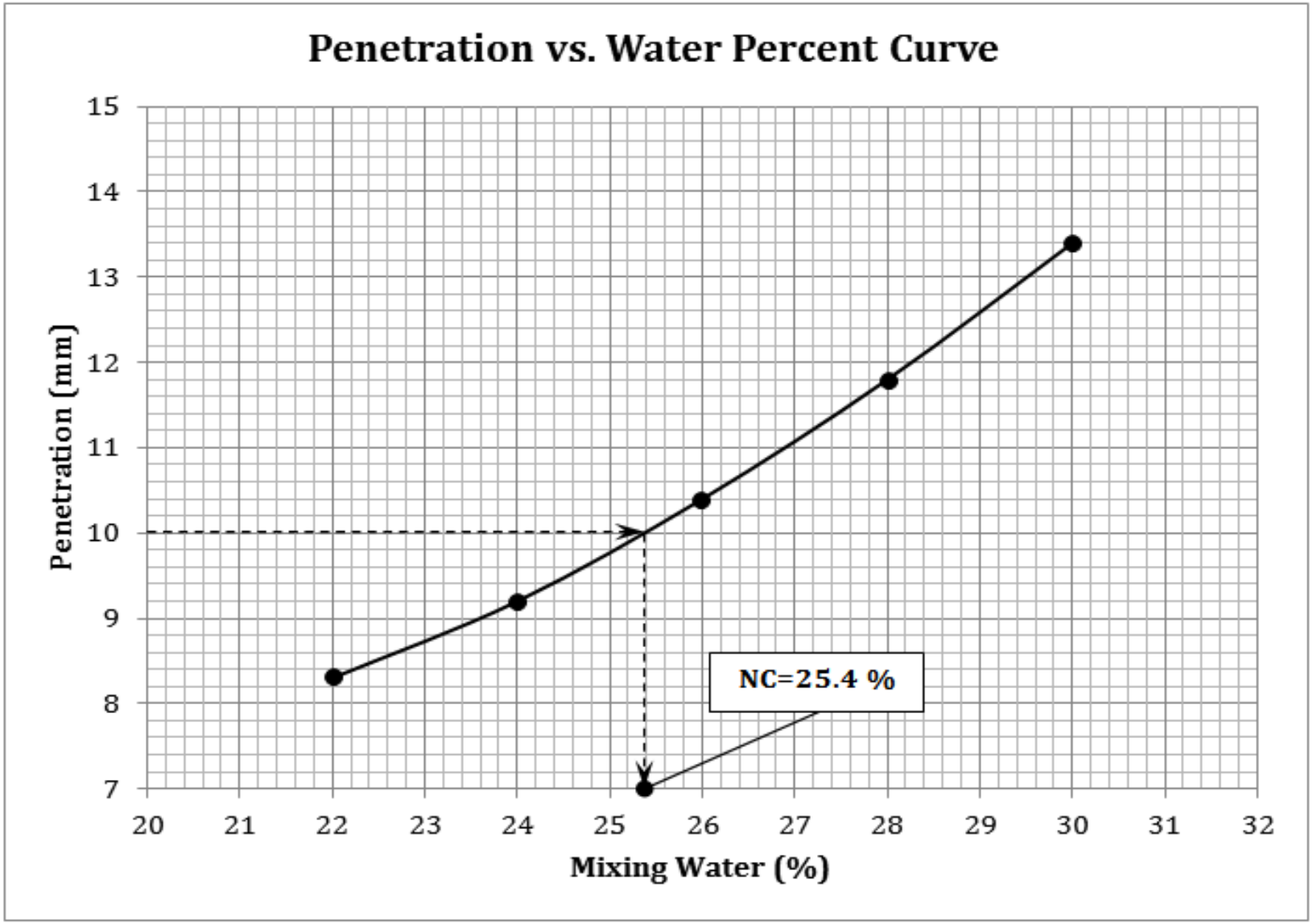
CALCULATION

- Calculate the amount of water required for normal consistency to the nearest 0.1% and report it to the nearest 0.5% of the weight of the dry cement.
- Plot the amount of mixing water used as abscissa and observed penetration as ordinate in a plain graph paper.
- Then using this plot determines the amount of water required for 10 mm penetration.

QUESTIONS??

- Does this cement satisfy ASTM standards requirements for normal consistency?
- Describe the factors affecting the normal consistency of cement.

SAMPLE GRAPH



EXPERIMENT 04
Data Sheet
Determination of Normal Consistency of Cement with Vicat Apparatus

Obs. No.	*Percentage of Water (%)*	*Penetration (mm)*
01		
02		
03		
04		
05		

RESULT

Percentage of Water required for Cement Paste or Normal Consistency = **%**
(to the nearest 0.5 %)

Student No. :
Group :
Date :

Signature of Course Teacher