EXPERIMENT NO.- 05

EXPERIMENT NAME:

DETERMINATION OF INITIAL SETTING TIME AND FINAL SETTING TIME OF CEMENT WITH VICAT APPARATUS

INTRODUCTION

- Cement, when mixed with water, forms slurry which gradually becomes less plastic with the passage of time and finally a hard mass is obtained.
- In This process, a stage is reached when the cement paste is sufficiently rigid to withstand a definite amount of pressure.
- Cement, at this stage is said to have set and the time required to reach this stage is termed ***Setting Time***.
- The term ***Initial Setting Time*** indicates the beginning of the setting process of cement paste when cement paste starts losing its *plasticity*.
- The ***Final Setting Time*** is the time elapsed between the moment the water is added to cement and time when the paste completely lost its plasticity and attained sufficient *stability* to resist certain definite pressure.
- As per ASTM C150, Ordinary Portland Cement (OPC) should have the initial setting time not less than 45 minutes and final setting time not more than 375 minutes.

REFERENCED DOCUMENT
ASTM C191.

APPARATUS

- Same as for the *Determination of Normal Consistency of Cement* (See Experiment 04).

TEMPERATURE AND HUMIDITY

- The temperature of the air in the vicinity of the mixing slab ,the dry cement, molds, and base plates shall be maintained between 20 and 27.5^{o}C (68 and 81.5^{o}F).
- The temperature of the mixing water and of the moist closer or moist room shall not vary from 23^{o}C (73.4^{o}F) by more than 1.7^{o}C (3^{o}F).
- The relative humidity of the laboratory shall be not less than 50 %.
- The moist closet or moist room shall be so constructed as to provide storage facilities for test specimens at a relative humidity of not less than 90%.

PROCEDURE

Preparation of Cement Paste

- Mix 650 gm of cement with the percentage of mixing water required for normal consistency following the procedure describe in experiment 04.

Molding Test Specimen

- Allow the time of setting specimen to remain in the moist cabinet for 30 min after molding without being disturbed.
- Determine the penetration of the 1-mm needle at this time and every 15 min thereafter for Ordinary Portland Cement (Type I and every 10 min for Rapid Hardening Cement, Type III) until a penetration of 25 mm or less is obtained.

Molding Test Specimen (Contd..)

- For the penetration test, lower the needle **D** of the rod **B** until it rests on the surface of the cement paste.
- Tighten the set screw, **E**, and set the indicator, **F**, at the upper end of the scale, or take an initial reading.
- Release the rod quickly by releasing the set screw, **E**, and allow the needle to settle for 30 sec; then take the reading to determine the penetration.
- No penetration test shall be made closer than 1/4 inch (6.4 mm) from any previous penetration and no penetration test shall be made closer than 3/8 in (9.5 mm) from the inside of the mold.
- Record the results of the all penetration tests and, by interpolation or by plotting penetration vs. setting time curve, determine the time when a penetration of 25 mm is obtained.
- This is the *Initial Setting Time*. The *Final Setting Time* is when the needle does not sink visible in to the paste.

PRECAUTIONS

- All the apparatus shall be free from vibration during the penetration test.
- Take care to 10 mm needle straight, and needle must be kept clean as the collection of cement on the side of the needle may retard the penetration, while cement on the point (tip) may increase the penetration.
- The time of setting affected not only by the percentage and the temperature of the water used and or kneading the paste received, but also by the temperature and humidity of the air and its determination is therefore only approximate.

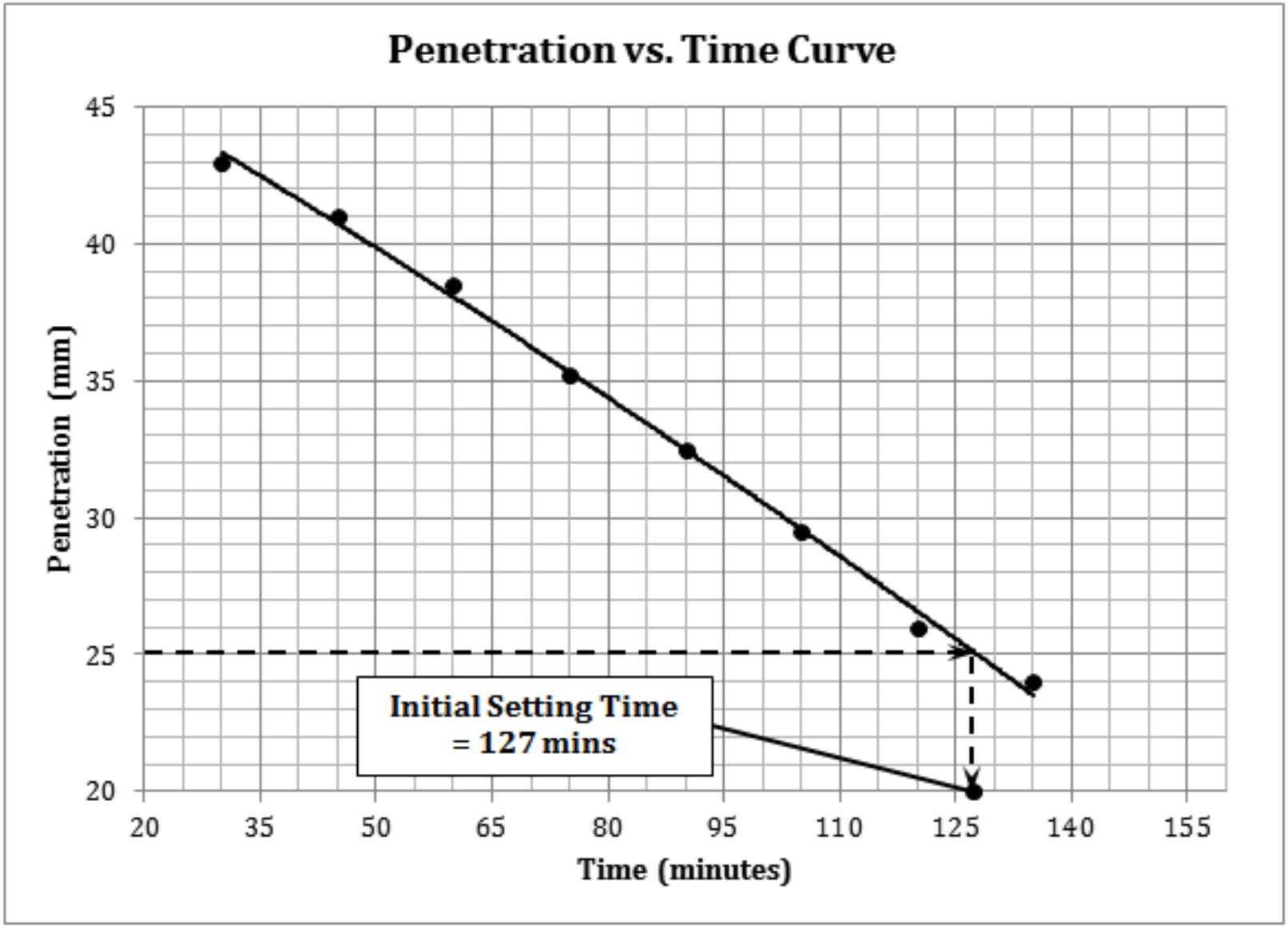
CALCULATION

- Calculate the time required for 25 mm penetration from a plot of penetration (in mm) against time (in min) in plain graph paper. This time is arbitrarily defined as the ***Initial Setting Time***.

QUESTIONS??

- Does this cement Satisfy ASTM standard requirements for *Initial Setting Time*?
- What is the significance of *Setting Time*?
- Distinguish between *Hardening* and *Setting*.
- What is *Quick Setting Cement*?
- How does the *Fineness* affect the time of setting?
- What is the function of a *Retarder*?
- Describe the factors affecting the *Initial Setting Time* of cement.

SAMPLE GRAPH



EXPERIMENT 05

Data Sheet

Determination of Initial Setting Time and Final Setting Time of Cement with Vicat Apparatus

Time (minutes)	Penetration (mm)

RESULT

Initial Setting Time =

Final Setting Time =

Student No. :

Group :

Date :

Signature of Course Teacher