DETERMINATION OF PENETRATION

STANDARD

- IS: 1203 – 1978

DEFINITION

- Penetration of a bituminous material is the distance in tenths of millimeter that standard needle will penetrate vertically into a sample under standard conditions of temperature, load and time.

APPARATUS

- Standard Penetration apparatus
- A metal or glass cylindrical flat-bottomed container essentially with the following dimensions

  For penetration below 225

  Diameter 55mm

  Internal depth 35mm

  For penetration between 225 and 350

  Diameter 70mm

  Internal depth 45mm
- Needle shall be made up of straight, highly polished, cylindrical, hard steel rod.
- Water bath 10 liters capacity thermostatically Controlled and maintained within the temperature of 25 ± 0.1^0C.
- Thermometer capable of reading temperature up to 250 ^{0}C.

PROCEDURE

- Soften the material to a pouring consistency at a temperature not more than 60 ^{0}C for tars and pitches and not more than 90 ^{0}C for bitumen above the approximate respective softening points.
- Stir it thoroughly until it is homogeneous and free from air bubbles and water.
- Pour the melt in to the container to a depth of at least 10mm in excess of the expected penetration.

- Protect the sample from dust and allow it to cool in atmosphere at a temperature between 15 to 30 ^{0}C for 11/2 to 2hours for 45mm deep container and 1 to 11/2 hours for 35mm deep container.
- Unless otherwise specified carry out testing at a temperature of 25 $\pm$ 0.1^{o}C.
- Place it along with the transfer dish in the water bath at 25 $\pm$ 0.1^{0}C and allow it remain for 11/2 to 2hours for 45mm deep container and 1 to 11/2 hours for 35mm deep container.
- Fill the transfer dish with water from the water bath to a depth sufficient to cover the mould completely.
- Remove the transfer dish along with the mould from water bath after specified period of time and put it upon the stand of penetration apparatus.
- Adjust the needle (previously washed, cleaned well with benzene and dried) just to make contact with the surface of the sample.
- The sum of the weights of the needle, carrier and super imposed weights i.e. the total moving weight shall be 100 $\pm$ 0.25grams.
- Bring the pointer to zero.

Penetration test for bitumen.

- Release the needle for five seconds and measure the distance penetrated.
- Make at least three determinations at points on the surface of the sample not less than 10mm apart and not less than 10mm from the side of the dish.

- After each test, return the sample and transfer dish to the water bath and wash the needle with benzene and dry.
- In case of material of penetration greater than 225 make three determinations on each of two identical test specimens using a separate needle for each determination, leaving the needle in the sample on completion of each determination to avoid disturbance of the specimen.

REPORT

- Express the depth of penetration of the needle in tenths of mm.
- The value of penetration reported shall be the mean of not less than three determinations whose values do not differ by more than the difference given below

Penetration	Maximum difference
0 to 49	2
50 to 149	4
150 to 249	6
250 and above	8

PRECISION

- The duplicate results should not differ by more than the following

Penetration	Repeatability	Reproducibility
Below50	1 Unit	4 Units
Above50	3% of their mean	8% of their mean

PRECAUTIONS

- If the sample contains extraneous matter, it should be sieved through I.S. Sieve 30 (IS: 460-1962).
- To avoid over heating at the bottom of the container, use of an air oven or sand bath is recommended.
- While the needle is penetrating into the sample, if there is any movement of the container, that determination shall be discarded.

Format for recording

FORM D23

Punjab State Road Sector Project
PWD B&R Branch, Govt. of Punjab
Punjab Roads & Bridges Development Board

BITUMEN PENETRATION TEST

Trial No.	1			2			3		
Specimen	A	B	C	A	B	C	A	B	C
Initial Reading									
Final Reading									
Average Value									

Remarks: _____

_____

Approved/Not Approved:

Contractor's Representative	Materials Engineer Consultant	Resident Engineer Consultant