Name	RIMPA GARAI	Year	
Subject		Class	
Semester		Roll No.	12001323051

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B.	Marshall stability Test Demonstration on stripping value	6/11/21	27/11/21	

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SHAPE TEST

OBJECTIVE: The particle shape of aggregate is determine by the percentage of flaky and elongated particles contained in it. The main objective is to determine the flakiness index and elongation index of given coarse aggregates.

THEORY: Aggregates which are flaky or elongated are detrimental to the higher workability and stability of mixes. They are not conducive to good interlocking and hence the mixes with an excess of such particles are difficult to compact to the required degree. For base coarse and construction of bituminous of and cement concrete types, the presence of flaky and elongated particles are considered undesirable as they may cause inherent weakness be with probabilities of breaking down under heavy loads.

Angular shape of particles are desirable for granular base coarse due to increased stability derived from the better interlocking when the shape of aggregates deviates more from the spherical shape, as in the case of angular, flaky and elongated aggregates, the void content in an aggregate of any specified size increases and hence

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the grain size distribution of the graded aggregates has to be suitably altered in order to obtain minimum voids in the dry mix or the highest dry density.

APPARATUS:
- A set of IS sieve of sizes conforming to IS: 460 - 1962 specification for test sieves (Revised) shall be used - 63 mm, 50 mm, 40 mm, 31.5 mm, 25 mm, 20 mm, 16 mm, 12.5 mm, 10 mm, 6.3 mm.
- Standard thickness gauge
- Standard length gauge
- Balance to weigh up to the accuracy of 0.1 gm.

PROCEDURE OF FLAKINESS INDEX:

1. The sample was sieved through the set of sieves (63 mm, 50 mm, 40 mm, 31.5 mm, 25 mm, 20 mm, 16 mm, 12.5 mm, 10 mm, 6.3 mm).
2. A minimum of at-least 200 pieces of each fraction to be tested were taken and weighed as (w) g.
3. Now, each fraction was then gauged for

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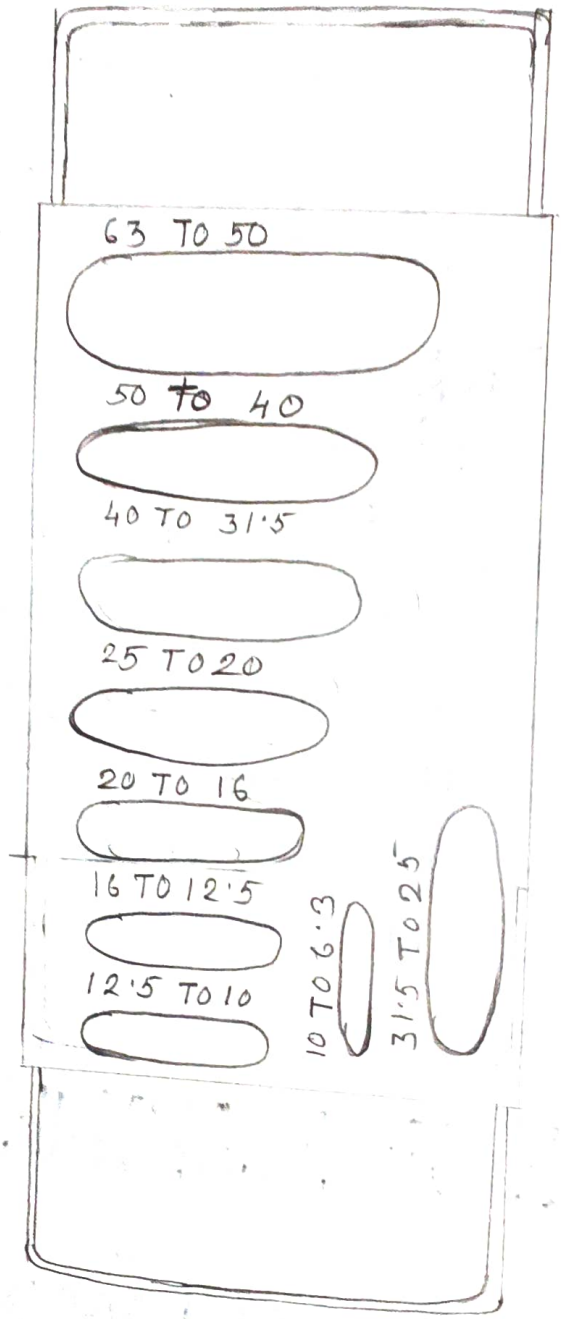

Thickness Gauge

thickness on thickness gauge through specified slot.

4. The flaky particle were passed the appropriate slot of the thickness gauge from each size range were collected and counted separately and then were weighed as (P) g.

RELEVANT STANDARD REFERENCES:

Indian standard Method of Test for Aggregates for concrete - particle size and shape, IS : 2386 (Part I) - 1963, (reaffirmed 2007).

OBSERVATIONS:

Size of Aggregates		weight of sieved fraction(g)	Thickness gauge (mm) - 0.6 times the mean sieve (4)	weight of agg in each fraction passing thickness gauge (5)
Passing through IS Sieve (mm) 1	Retained on IS Sieve (mm) 2	3		
20	16	W_1 - 205 gm	10.80	P_1 - 25 gm
16	12.5	W_2 - 102 gm	8.55	P_2 - 19 gm
12.5	10	W_3 - 100 gm	6.75	P_3 - 29 gm
10	6.3	W_4 - 30 gm	4.89	P_4 - 15 gm
		ΣW = 437 gm		ΣP = 88 gm

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CALCULATION: The flakiness index is the total weight of material passing the various thickness gauges expressed as a percentage of the total weight of the sample gauged.

$$\text{Flakiness Index (F.I)} = \frac{P}{W} \times 100$$

$$\Rightarrow \frac{88}{437} \times 100 \Rightarrow 20.13$$

Flakiness index of the entire sample of aggregates is calculated by first taking weight of each fraction of aggregate passing and retained on the specified set of sieves is noted as W_1, W_2, W_3 ——— W_g, where each of the particle from this fraction of aggregate is tried to be passed through the slot of the specified thickness of the thickness gauge are found and weighed as P_1, P_2, P_3 ——— P_g.

$$\text{Flakiness Index} = \frac{\Sigma P_1 + P_2 + P_3 + \text{——} P_g}{\Sigma W_1 + W_2 + \text{——} W_g} \times 100\%$$

As per Ministry of Road Transport and Highways Specification for Road and Bridge works, Fourth Revision, Indian Road Congress, New Delhi; Maximum allowable flakiness index of aggregates in different types of pavement constructions are —

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Sl. No.	Types of pavement Construction	Maximum Limits of Flakiness Index (%)
1	Cement concrete	35
2	Bituminous Carpet	30 (combined F.I and E.I)
3	Bituminous Concrete, Bituminous penetration macadam, Bituminous surface dressing	25
4	Bituminous macadam, water bond macadam, Base and surfacing courses	15

PROCEDURE OF ELONGATION INDEX:

1. The sample was sieved through the set of sieves (63 mm, 50 mm, 40 mm, 31.5 mm, 25 mm, 20 mm, 16 mm, 12.5 mm, 10 mm, 6.3 mm).

2. A minimum of at-least 200 pieces of each fraction to be tested taken and weighed as (W) g.

3. Now, each fraction gauged for length on length gauge through specified slot

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4. The elongated particle pass the appropriate slot of the thickness gauge from each size range was collected and counted separately and then they weighed (g) g.

Size of Agg. passing through IS sieve (mm)	Retained on IS sieve (mm)	weight of sieved fraction (g)	Length gauge (mm) - 1.8 times the mean sieve	weight of agg. in each fraction (Retaining Length gauge)
1	2	3	4	5
20 mm	16 mm	$W_1 = 181$	32.4	58gm - g_1
16 mm	12.5 mm	$W_2 = 82$	25.6	29gm - g_2
12.5 mm	10 mm	$W_3 = 70$	20.2	17gm - g_3
10 mm	6.3 mm	$W_4 = 16$	14.7	4gm - g_4
		$\Sigma W = 349$ gm		$\Sigma g = 108$gm

CALCULATIONS: The elongation index is the total weight of material passing the various length gauges expressed as a percentage of the total weight of the sample gauged.

$$\text{Elongation Index (E.I)} = \frac{g}{w} \times 100$$

$$\Rightarrow \frac{108}{349} \times 100$$

$$\Rightarrow 30.94\%$$

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PRESENTATION OF RESULT: Elongation index of the entire sample of aggregates is calculated by first taking weight of each fraction of aggregate passing and retained on the specified set of sieves is noted as $W_1, W_2, W_3 \ldots W_9$, where each of the particle from this fraction of aggregate is tried to be passed through the slot of the specified thickness of the thickness gauge are found and weighed as $g_1, g_2, g_3, \ldots g_9$.

$$\text{Flakiness Index} = \frac{\Sigma g_1 + g_2 + g_3 + \ldots + g_9}{\Sigma W_1 + W_2 + W_3 \ldots + W_9} \times 100\%$$

FI + EI = 51.07%

DISCUSSION ON RESULT: The result of flakiness index and elongation index combined found out to be 51.07% which is not permissible to use for any kind of pavement construction prescribed by Indian Road congress as in our the aggregate taken ranges from paving 20mm IS sieve and 16mm retained upto 10mm passing and 6.3mm retained on IS sieves.
So, if we consider aggregates ranging from 63mm passing) we can obtain desired values.

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EXPERIMENT No. 2

CRUSHING STRENGTH TEST OF AGGREGATE

OBJECTIVE: To determine the crushing value of the given sample of aggregate with the help of compression testing machine.

THEORY: The principal mechanical properties required in road stones are:

- Satisfactory resistance to crushing under the roller during construction and
- Adequate resistance to surface abrasion under traffic. Also surface under rigid type of heavily loaded drawn vehicles are high enough to consider the crushing strength of road aggregates as an essential requirement in India.

Crushing strength of road stone may be determine either on aggregates or on cylindrical specimen cut of rocks. The two tests are quite different not only in the approach but also in the expression of the results. Aggregate used in road construction, should be strong enough to resist crushing under traffic wheel loads.

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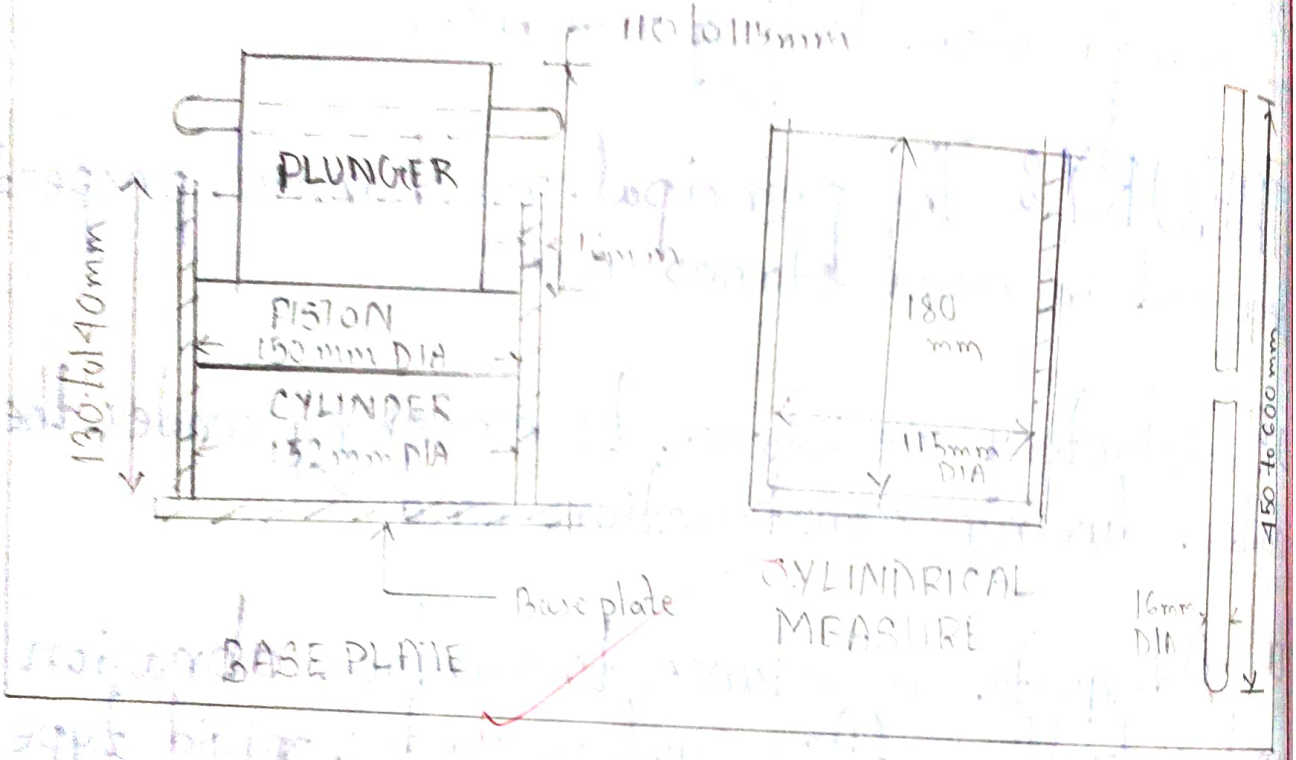
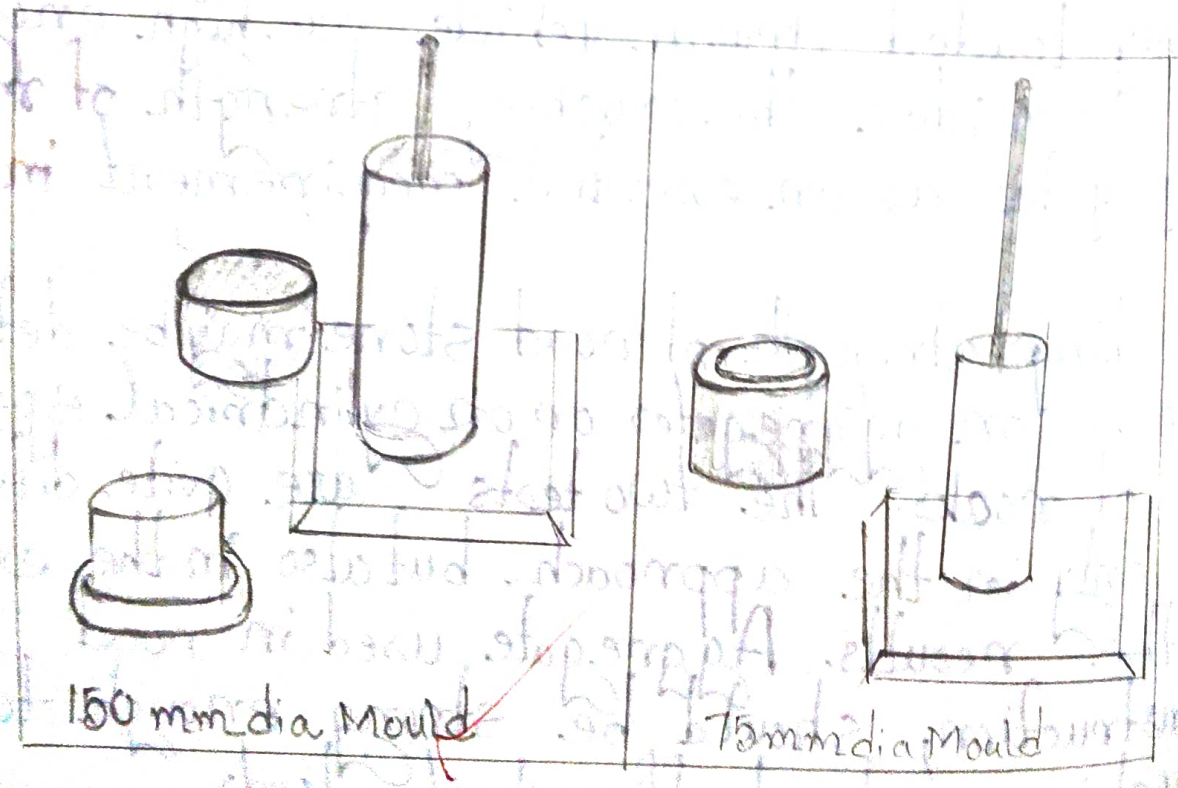

110 to 115mm
PLUNGER
PISTON
150 mm DIA
CYLINDER
152 mm DIA
130 to 140 mm
Base plate
BASE PLATE
180 mm
115mm DIA
CYLINDRICAL MEASURE
450 to 600 mm
16mm DIA


150 mm dia Mould
75mm dia Mould

If the aggregates are weak the stability of the pavement structure is likely to be adversely affected. The strength of coarse aggregates is assessed by aggregate crushing test. The aggregate crushing value provides a relative measure of resistance to crushing under a gradually applied compressive load. To achieve a high quality of pavement, aggregates possessing low aggregate crushing value should be preferred.

APPARATUS:-

- Steel cylinder with open ends and internal diameter 15.2 cm, circular base plate, plunger having a piston of diameter 15cm with a hole provided across the stem of the plunger so that a rod could be inserted for lifting or placing the plunger in the cylinder.

- cylindrical measure having internal diameter of 11.5 cm and height 18cm.

- Steel tamping rod with one rounded end, having a diameter of 1.6cm and length 45 to 60cm.

- Balance of capacity 3kg with accuracy up to 1g.

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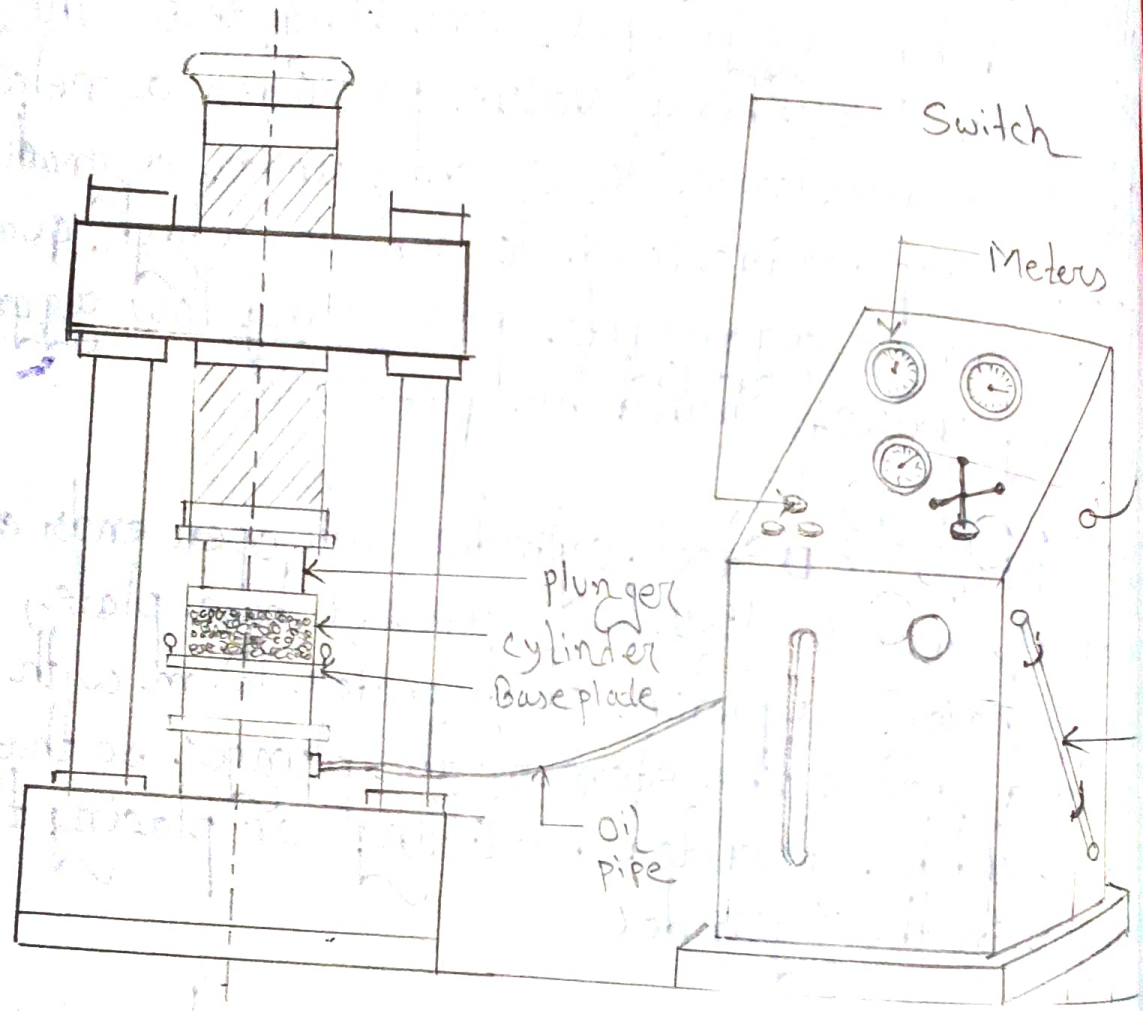

FIG- AGGREGATE CRUSHING TEST MACHINE (Compression testing machine. - 2000 kN)

Compression testing machine capable of applying load of 40 tones, at a uniform rate of loading of 4 tones per minute.

SAMPLE QUANTITY: The aggregate comprising the test sample shall be dried in an oven at a temperature 100°C - 110°C for four hours and cooled. The aggregates should pass the 12.5 mm IS sieve and retained on the 10 mm IS test sieve. The measure shall be filled about one third full of aggregate and temped with 25 strokes of the tamping rod. A further similar quantity of aggregate shall be taken and a further tamping of 25 strokes is given, the measure shall finally be filled to overflowing, temped 25 times and the surplus aggregate stuck off. The net weight of the aggregate in the measure shall be determined and this weight of sample shall be used for duplicate on the same material.

PROCEDURE: we measured the aggregate which passes through 12.5 mm IS sieve and retained on 10 mm IS sieve.

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The aggregate must be dry condition before test. which was
The aggregate dried by heating at a temperature 100°c to 110°c for a period of 4 hours and we were tested the aggregate after cool to room temparature.

Then we filled the cylindrical measure with aggregate in three layers of approximately equal depth and tamped 25 times with the help of rounded end of tamping rod.

when the third layer tamped com we leveled of top of the cylinder by the tamping rod as a straight edge. About 6.5 kg of aggregate we were taken for test samples. Then we weighted the sample. The same weight of the sample we were taken in the repeat test.

Further we placed the cylinder of the test apparatus in position on the base, one third of the test sample is placed in the cylinder and tamped 25 times with the help of rounded tamping rod. Similarly two parts of the specimen is added by us. After we maintain the total depth of material in cylinder 10 cm.

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we leveled the surface of aggregate for better fitted plunger. Then we placed the cylinder with test sample and plunger in position of compression machine.

Further, we applied load through the plunger at a uniform rate of 4 tons per minute. until the load is 40 tons. Again we sieved the crushed sample through 2.36 mm IS sieve.

Again,
The above test we performed on second sample of the same weight in accordance with above test procedure.

Thus two tests are made for the same specimen for taking an average value.

Table No: 1 Recommended Aggregate crushing value:

Sl. No.	Description	Maximum crushing value
1	Sub grade course	45%
2	Subbase + base course	45%
3	Bituminous base course + Wearing course	30%

OBSERVATION TABLE:

Sl No.	Description	Test
1	weight of oven drying aggregate passing 12.5 mm IS sieve and retain on 10mm IS sieve W1	(5539 - 2724) => 2815 gm
2	Weight of sample passes 2.36 mm IS sieve after test W2	670 gm (Passing)
3	Weight sample retain 2.36 mm IS sieve after test (W3)	2149 gm

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4	Aggregate crushing value $= \frac{W_2}{W_1} \times 100\%$	$\frac{670}{2815} \times 100$ $\Rightarrow$ 23.8%
5	$W_1 = W_2 + W_3$	(670 + 2149) $\Rightarrow$ 2815gm
6.	Avg. aggregate crushing value in %	

RESULTS: The mean of the crushing value obtained in the two tests is reported as the aggregate crushing value.

Agg. Crushing Value 23.8%

DISCUSSION: In general, larger size of aggregates used in the test, results in higher aggregate crushing value. The relationship between the aggregate sizes and the crushing values will however vary with the type of specimen tested.

CONCLUSION: The aggregate crushing value gives a relative measure of the resistance of an aggregate to crushing under a gradually applied compressive load. With aggregate of aggregate crushing value 30 or higher, the result may be anomalous, and in such cases the ten percent fine value should be determined.

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IMPACT TEST OF AGGREGATE

OBJECTIVE: To determine Aggregate Impact value of aggregate.

THEORY: Toughness is the property of a material to resist impact. This test is conducted to determine impact value of road aggregate and to assess their suitability in road construction on the basic of impact value. The principal mechanical properties required in road stones are satisfactory resistance to crushing under the roller during construction and adequate resistance to surface under traffic. Also surface stresses under rigid tyre rims of heavily loaded animal, drawn vehicles are high enough to consider the crushing strength of road aggregates as an essential requirement. Due to which the toughness and other properties of aggregates get disturbed. The magnitude of the impact would increase with the roughness of the load surface, the speed of the vehicle and other vehicular characteristics. The resistance to impact is desirable properties of aggregates. So, aggregate impact test is used to decide a suitability of soft and weak aggregate in construction of base course.

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APPARATUS:- 1. Impact testing machine.

a) weight should be 45 to 65 kg having a metal base with a plane surface of diameter not less than 30 cm.

b) Cylinder steel cup of internal diameter 102 mm, depth 50 mm and thickness 6.3 mm.

c) Metal hammer weighing 13.5 to 14.0 kg the lower end of which are cylindrical in shape is 50 mm long, 100 mm diameter with a 2 mm chamfer at the lower edge.

2. A cylindrical metal measure having internal diameter 75 mm and depth 50 mm of for measuring aggregates.

3. A straight metal tampering rod of circular cross section, 10 mm in diameter and 230 mm long, rounded at one end.

4. IS sieve of sizes 12.5 mm, 10 mm, and 2.36 mm for sieving the aggregates

5. A balance of capacity not less than 500 gm to weigh accurate up to 0.1 gm.

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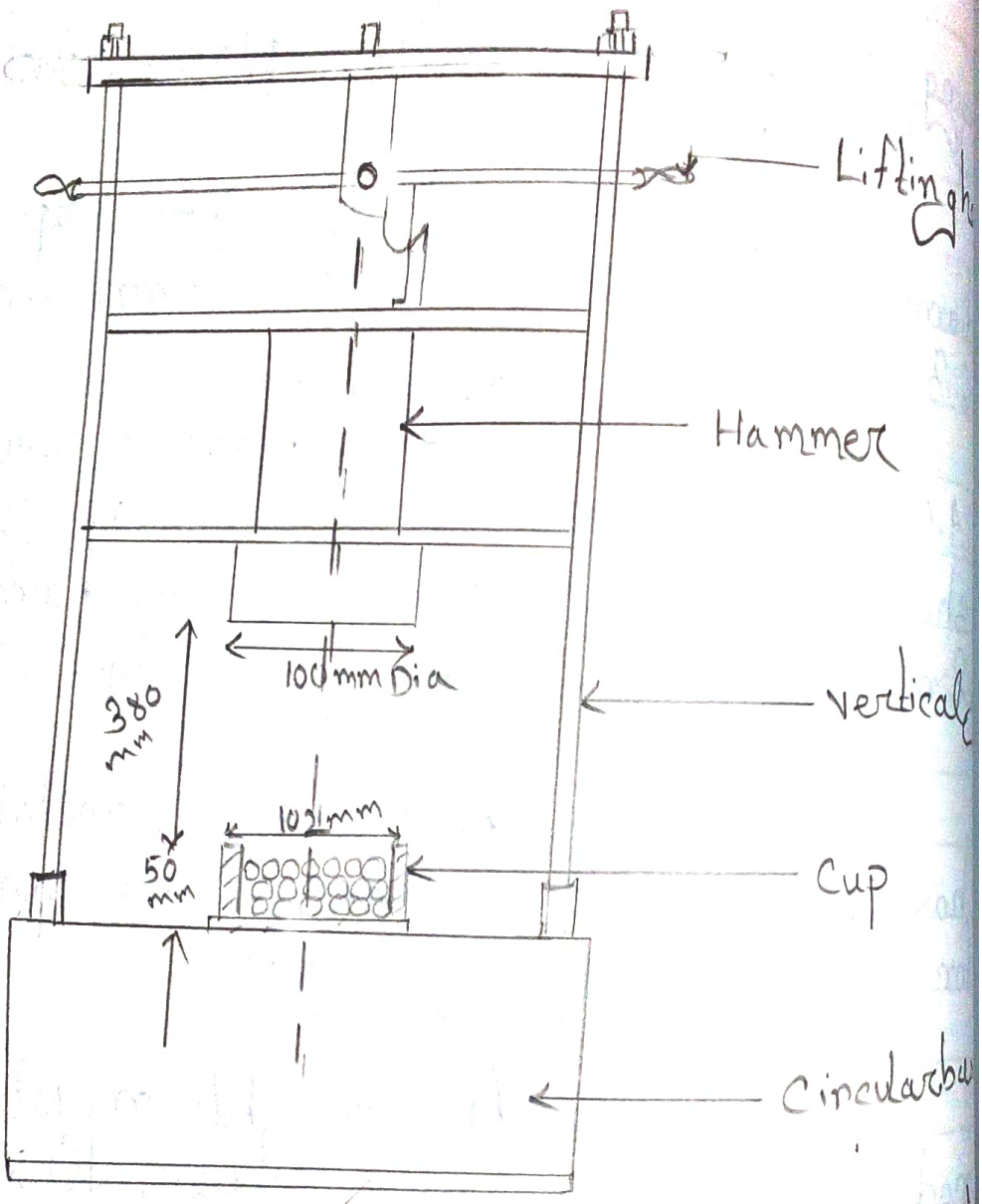

FIG: Aggregate Impact Testing Mac

6. A thermostatically controlled drying oven capable of maintaining constant temperature between 100°C to 110°C

Procedure:-

1. We dried the aggregate which passess through 12.5 mm IS sieve and retained on 10mm sieve.
2. Then we filled up to 1/3 full in measuring cylinder and tamped 25 times with the help of rounded end of tamping rod.
3. Further we filled and tamped 25 times with rounded end of tampering rod.
4. Next we filled and measure to overflow and tamped 25 times with rounded end of tampering rod.
5. We struck off the surplus aggregates using tampering rod.
6. We determined the net weight of aggregate which is used for duplicate test.

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7. The impact machine shall rest without weighing upon the level plate, block or floor.

8. We fixed the cup firmly in position on the base of the machine and the whole of the test sample placed in it and compacted.

9. The hammer shall be raised until its lower face in 380 mm above the upper surface of the aggregate in the cup and allowed for free fall.

10. The fraction retained on the sieve, we also weigh that.

Observation Table:

	Sample 1
Total dry weight of Sample (A) gm	371 gm
wt. of sample passing through 2.36 mm sieve (B) gm	64 gm
Aggregate impact value $\frac{B}{A} \times 100$	$\frac{64}{371} \times 100$ $\Rightarrow 17.25\%$

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Calculations :-

The aggregate impact value is expressed as the percentage of the fine which passing through 2.36 mm sieve formed in terms of total weight of the sample.

Aggregate Impact value $\frac{B}{A} \times 100$

$\Rightarrow \frac{64}{371} \times 100$

$\Rightarrow 17.25\%$

B = weight of fraction passing 2.36 mm IS sieve
A = wt. of oven dried sample.

for the different types of pavements:

SL NO	TYPE OF PAVEMENT MATERIAL	AGGREGATE IMPACT VALUE
1	Sub base course and WBM →	50
2	WBM base course with bitumen surfacing →	40
3	Built up spray base course →	40
4	WMM base course and WBM surfacing course →	30
5	Binder and surface course of pavement →	30

Maximum permissible aggregate impact values of soft aggregate for road construction :-

Test condition	Sub base and base	Surface course
Dry impact test	50	32
Wet impact test	60	39

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RESULTS: The mean of the Aggregate Impact value obtained in the two tests is reported as the aggregate impact value (AIV).

AN value → 17.25%.

DISCUSSION: Aggregates Impact value gives relative measure of resistance of aggregates to sudden shock or impact, which in some aggregates differ from its resistance to slow compression load.

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Experiment: Los Angles Abrasion Test of Aggregate

Objective: To determine the abrasion value of given coarse aggregates sample.

Theory: Due to the movement of traffic, the road stone used in the surfacing course are subjected to wearing action at the top. Resistance to wear or hardness in hence an essential property for road aggregates, espially when used in wearing course. Thus road should be hard enough to resist the abrasion due to traffic. when fast moving traffic fitted with pneumatic types move on the road, the agil particles present between the wheel and road surface causes abrasion on the road stone. Steel tires of animal drown vehicles, which rub against the stones, can cause considerable abrasion of the stone on the road surface. Hence in road order test the suitability of road stones to resist the abrasion action due to traffic, tests are carried out in the laboratory.

Apparatus:-

a) Los angles abrasion testing Machine:-

It consts of a hollow steel cylinder, closed at both the ends with an internal diameter of 700 mm and length 500 mm and

capable of rotating about its horizontal axis.

(II) Abrasive charge:- (i) IS sieve of size 1.7mm
(ii) Balance of capacity 5kg or 10kg.
(iii) Drying oven.

Relevant standard References:-

Indian standard Method for Test for Aggregates for concrete IV, Mechanical properties, Determination of Los Angles value, IS: 2386 (Part-IV) - 1963.

Procedure:- The sample: It consists of clean aggregates, dried in at 105°C to 110°C and coarser than 1.70mm sieve size.

Grading of test samples:-

Passing (mm)	Retained (mm)	A	B	C	D	E	F	G
80	63	-	-	-	-	2500	-	-
63	50	-	-	-	-	2500	5000	-
50	40	-	-	-	-	5000	5000	-
40	25	1250	-	-	-	-	5000	5000
25	10	1250	-	-	-	-	-	-
20	12.5	1250	2500	-	-	-	-	-
12.5	10	1250	2500	-	-	-	-	-
10	6.3	-	-	2500	-	-	-	-
6.3	1.75	-	-	2500	-	-	-	-
1.75	2.38	-	-	-	5000	-	-	-

Firstly we selected the grading to be used in the test.

2) Then, we took 5gm of sample for gradings A, B, C or D and 10kg for grading E, F and G.

Table selection of Abrasion Gauge.

Grading	No. of steel balls	Weight of charge (gm)
A	12	5000 ± 25
B	11	4584 ± 25
C	8	3300 ± 20
D	6	2500 ± 15
E	12	5000 ± 25
F	12	5000 ± 25
G	12	5000 ± 25

3) We rotated the machine at a uniform speed of 30 to 33 revolutions per minute (rpm)

Observation Table

Grading selected	sample I	sample II
Original wt. of the sample w_1 (gm)	5000gm	—
wt. of aggregates retained on 1.70 mm IS sieve, W_2 gm	4148gm	—
Loss of weight, $(w_1 - w_2)$	852gm	—
Abrasion value, $(w_1 - w_2)/w_1 \times 100$	17.04%	—

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Los Angles Abrasion Value => 17.04%

Result:— The result to the way whole number is reported as the los angles abrasion value of the material.

Conclusion:— For cement concrete pavement and dense bituminous Macadam (DBM) binder course the maxm acceptable value is 35%.

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SPECIFIC GRAVITY AND WATER ABSORPTION TEST OF AGGREGATE

OBJECTIVE: To determine the specific gravity and water absorption of coarse aggregate as per I.S: 2386 (Part III) - 1963.

THEORY: The specific gravity of an aggregate is considered to be a measure of strength or quality of the material. Aggregates having low specific gravity are generally weaker than those with high specific gravity. This property helps in a general identification of aggregates. In the asphalt mix design industry, the bulk gravity and absorption of the aggregates and the percentage of voids in the aggregates which are both important in design and control.

Water absorption also gives an idea on the internal structure of aggregate. Aggregates having more absorption are more porous in nature and are generally considered unsuitable, unless found to be acceptable based on strength, impact and hardness tests.

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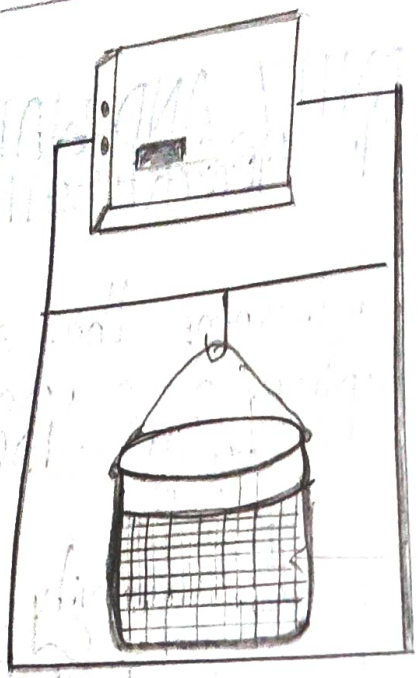

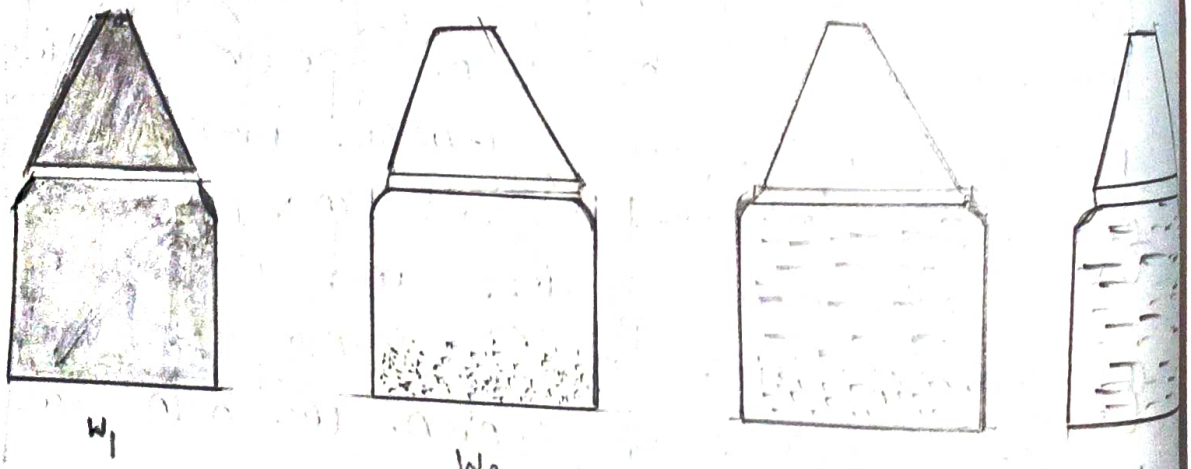

FIG- Specific Gravity Apparatus

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APPARATUS: The apparatus required for these tests are:-

(i) A balance of at least 3kg capacity, with a accuracy to 0.5g.

(ii) An oven to maintain a temperature range of 100 to 110°C.

(iii) A wire basket of not more than 6.3 mm mesh or a perforated container of convenient size, with thin wire hangers for suspending it from the balance.

(iv) A container for filling water and suspending the wire basket in it.

(v) An airtight container of capacity similar to that of basket, a shallow tray and two dry absorbent clothes.

(vi) Pycnometer of 100 mL for aggregates finer than 6.3 mm and Specific gravity bottle.

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PROCEDURE: For aggregate coarser than 6.3mm

i) We take of Aggregate sample, washed to remove fines and then placed in the wire basket. The weir basket is then immersed in water, which is at a temp. of 22°C to 32°C.

ii) Immediately after immersion the entrapped air is removed from the sample by lifting the basket 25mm above the base of the tank and allowing it to drop, 25 times at a rate of about one drop per second.

iii) The basket with aggregate are kept by us completely immersed in water for a period of 24 ± 0.5 hour.

iv) We weighed the basket and aggregate while suspended in water, which is at a temp. of 22°C to 32°C.

v) We removed the basket and aggregates from water and dried with dry absorbent cloth.

vi) We suspended back the empty basket in

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water tank and weighed.

vii) We weighed the surface dried aggregates.

viii) We placed the aggregate in a shallow try and heated to about 110°C in the oven for 24 hours.

OBSERVATION TABLE:

Specific Gravity Evaluation of coarse Aggregates

SL NO.	DETAILS	OBSERVED VALUE
1	Weight of saturated aggregate in water $(W_1 - W_2)$ g = (W_5) g	1307
2	Weight of saturated surface dry aggregate in air (W_3) g	2005
3	Weight of water equal to the volume of the aggregate $(W_3 - W_5)$ g	698
4	Weight of oven dried aggregate (W_4) g	1994
5.	Bulk specific gravity = $W_4/(W_3 - W_5)$	2.86
6.	Apparent specific gravity = $W_4/(W_4 - W_5)$	2.90
7.	Water absorption = $(W_3 - W_4)/W_4 \times 100$	0.55%

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RESULTS:- Bulk specific gravity = 2.86
Apparent specific gravity = 2.90
Water Absorption = 0.55%

CONCLUSION:- i) The specific gravity of coarse aggregate ranges from 2.5 to 3.0.

ii) The water absorption of aggregates ranges from 0.5 to 0.1%.

EXPERIMENT No.6
SPECIFIC GRAVITY TEST OF BITUMEN

OBJECT: To determine Specific Gravity of Bitumen.

THEORY: The density of a bitumen binder is a fundamental property frequently used to classify the binders for use in paving jobs. Classification of binder is done on the basis of Specific gravity of bitumen. Specific gravity is used to identify the source of bituminous binder. In case the bitumen contains mineral impurities the specific will be higher. Thus for qualitative estimation of mineral impurity in bitumen the specific gravity will be used. The Specific gravity of bitumen binder is a fundamental property frequently used as an aid to classify the binders for use in paving jobs. The specific gravity is defined as the ratio of the mass of a given volume of the bituminous material to the mass of an equal volume of water, the temperature of both being specified as 27°C.

The specific gravity of bitumen is greatly influenced by its chemical composition. When making the specific gravity determination it is important that all air bubbles shall be eliminated

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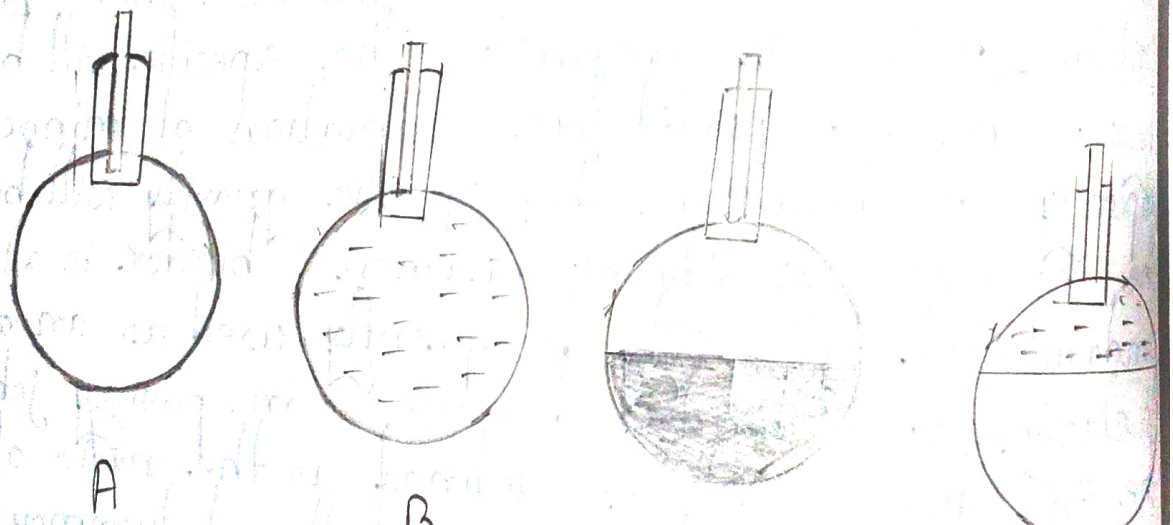

FIG:- SP GRAVITY COMPUTATION OF BITUMI
MATERIAL

infilling the apparatus and inserting the stopper while precautions shall be taken to prevent expansion and over-flow of the contents resulting from the heat of the hand when wiping the surface of the apparatus. If the bituminous material is in liquid from at 27°C, the specific gravity may be found by

Specific Gravity 0.97 to 1.02.

APPARATUS REQUIRED: As per IS:1202-1978, following apparatus are required.

Specific Gravity Bottles: It should have a capacity of 50 ml. Two types of bottles are available.

Ordinary capillary type with 6mm neck diameter.

Wide mounted capillary type with 25mm neck diameter.

Water Bath: The depth of water bath should be greater than pycnometer. It should be capable to maintain a temperature of 0.2°C.

Bath Thermometer: Range 0 to 44°C, Graduation 0.2°C.

PROCEDURE:- 1. We take clean, dry and weigh specific gravity bottle along with the stopper and weigh it (wt 'A')

2. Then we fill the sp. gr. bottle with freshly boiled distilled water and insert the stopper firmly.

3. Next we keep it in the water bath having a temp of 27 ± 1°C for not less than half an hour.

4. After that we remove the bottle, clean from outside and weigh it (weight B)

5. Then we kept the bottle to be dry.

6. We heat the bitumen to pouring temperature.

7. Then we fill the material to half the volume of the dried Sp. gr. bottle.

8. We allowed the sample bottle to stand for half an hour to suitable temperature cooled to 27°C.

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9. We weigh the bottle about half filled with the material (weight 'C')

10. We filled the remaining space with the distilled water in the specific gravity bottle.

11. We remove the bottle from container and weigh the specific gravity bottle about half-filled with the material and the other half with distilled water. (Weight 'D').

OBSERVATION TABLE:

Empty weight of bottle (A) in gm → 40 gm
weight of bottle + distilled water (B) in gm → 141 gm
weight of bottle + half-filled material (C) in gm → 93 gm
weight of bottle + half-filled materials + distilled water (D) in gm → 142 gm

Specific gravity $= \frac{C-A}{(B-A)-(D-C)}$ → $\frac{(w_2-w_1)}{(w_2-w_1)-(w_3-w_4)}$

$\Rightarrow \frac{(93-40)}{(93-40)-(142-141)}$

$\Rightarrow 1.01$

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CALCULATIONS: $\frac{(W_2 - W_1)}{(W_2 - W_1) - (W_3 - W_4)}$

$\Rightarrow \frac{(93 - 40)}{(93 - 40) - (142 - 141)}$

$\Rightarrow \frac{53}{52} \Rightarrow 1.01$ (Ans.)

RESULT: The specific gravity of Bitumen is 1.01.

CONCLUSION: The specific gravity of Bitumen range 0.97 to 1.02. The specific gravity is less than 1. It shows the bitumen is lighter than water and specific gravity is more than 1 it shows that the bitumen is heavier than water.

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