VINAYAKA MISSION'S RESEARCH FOUNDATION

AARUPADAIVEEDUINSTITUTEOFTECHNOLOGY, PAIYANOOR

17CVCC89 - CONCRETE & CONSTRUCTION TECHNOLOGY LAB

LAB MANUAL

B. E III Year - V Semester

NAME: _____

ROLL NO: _____

BRANCH: _____

HoD/Civil Engg.

TESTING ON CEMENT AND CONCRETE

EXPERIMENT 1

STANDARD CONSISTENCY OF CEMENT

AIM: To determine the quantity of water required to produce a cement paste of standard consistency.

DEFNITION: Standard consistency is defined as that consistency which will permit the Vicat's plunger to penetrate to a point 5 to 7 mm from the bottom of the Vicat mould when the cement is tested.

APPARATUS: 1. Vicat's apparatus, Mould, Plunger.

2. Standard trowel
3. Stop watch.
4. Weighing balance

DESCRIPTION:

The Vicat's apparatus consists of a frame and a moving rod weighing 300 gm. The plunger is kept at the lower end of the rod. It is a cylinder 10 mm. Diameter, A pointer connected to the rod will move along with it when it is released, over a graduated scale kept in front of it. The cement paste to be tested is kept in the Vicat's mould kept below the rod on a glass plate.

PROCEDURE:

1. Carefully weigh 400 gm of cement and place it on a non-porous surface.
2. Form a crator in the centre in which add about 100 to 120 cc. of water.
3. Thoroughly mix the cement with water and fill, the Vicat's mould with the paste.
4. The interval from the moment of adding water to the dry cement to the moment of commencing to fill the mould is known as the time of gauging

and shall not be less than 3 minutes and more than 5 minutes. Lower the plunger gently and test the penetration.

5. If the penetration is between 5 to 7 mm from the bottom of the mould the quantity of water added is the required consistency.
6. Otherwise repeat the test with different percentages of water until the required penetration is obtained. Express the amount of water as a percentage by weight of the dry cement.

OBSERVATIONS:

S. No.	Weight of Cement W_1	Weight of water W_2	Reading on scale mm	W_2 / W_1	Standard consistency

CALCULATIONS: Weight of cement taken = W_1.

Weight of water added when the plunger has a penetration of 5 to 7 mm from the bottom of the mould = W_2

Percentage of water for standard consistency

$p = (W_2 / W_1) \times 100$

RESULT: Percentage of water for standard consistency is

INFERENCE:

EXPERIMENT 2

SETTING TIME OF CEMENT

AIM: To determine the initial and final setting times of cement.

APPARATUS: The Vicat's apparatus, Needle, Annular ring, Trays, Balance and Weights.

PROCEDURE:

1. Preparation of Test Block: Prepare a neat cement paste by gauging the cement with 0.85 times the water required to give the paste of standard consistency. Start a stopwatch at the instant when water is added to the cement. Fill the Vicat's mould with a cement paste with in three to five minutes after addition of water. Fill the mould completely and smooth off the surface of this paste making it level with the top of the mould. The cement block thus prepared in the mould is test block.
2. Clean appliances shall be used for gauging. The temperature of water and that of the test room at the time of gauging shall be with in $(27 \pm 2)\ ^0C$.
3. During the test the block shall be kept at a temperature of $(27 \pm 2)^0C$ and at least 90% relative humidity.

a) Determination of Initial Setting Time:

Place the test block confined in the mould and resting on the nonporous plate, under the rod bearing the needle, lower the needle gently in contact with the surface of the test block and quickly release, allowing it to penetrate into the test block. In the beginning the needle will completely pierce the test block. Repeat this procedure until the needle, when brought in contact with the test block and released as described above, fails to pierce the block for 5 to 7 mm measured from the bottom of the mould. The period elapsing between the time when water is added to the cement and this time shall be initial setting time.

b) Determination of Final Setting Time:

Replace the needle of the Vicat's apparatus with the needle with a circular attachment. The cement shall be considered as finally set, when upon lowering the needle gently to the surface of the test block the needle makes an impression there on, while the attachment fails to do so. In other words the paste has attained such hardness that the centre needle does not pierce through the paste more than 0.5mm.

The period elapsing between the time when water is added to the cement and the time at which the needle makes an impression on the surface on the test block while the attachment fails to do so shall be the final setting time.

OBSERVATIONS:

INITIAL SETTING TIME:

S. No.	Time	Reading on the scale of Vicat's apparatus

FINAL SETTING TIME:

S. No.	Time	Reading on the scale of Vicat's apparatus

RESULT:

Initial setting time of the cement =

Final setting time of the cement =

SPECIFICATION: As per I.S.: 269 – 1989 the initial setting time should not be less than 30 minutes and final setting time should not be more than 600 minutes for ordinary Portland cement.

EXPERIMENT 3

SPECIFIC GRAVITY OF CEMENT

REF: I.S 4031 - 1988

AIM: To determine the specific gravity of cement

DEFINITION: Specific gravity of cement is defined as the ratio of weight of a given volume of cement at a given temperature to the weight of an equal volume of distilled water at the same temperature both weights being taken in air.

APPARATUS: Specific gravity bottle, weighing balance

MATERIAL: Kerosene free of water, naphtha having a specific gravity not less than 0.7313 shall be used in the specific gravity determination.

PROCEDURE:

1. Wt. of empty dry specific gravity bottle = W_1
2. Wt. of bottle + Cement (filled 1/4 to 1/3) = W_2
3. Wt. of bottle + Cement (Partly filled) + Kerosene = W_3
4. Wt. of bottle + Kerosene (full). = W_4
5. Wt. of bottle + water (full) = W_5

Specific gravity of kerosene $S_k = (W_4 - W_1) / (W_5 - W_1)$

$$\text{Specific gravity of Cement} = \frac{(W_2 - W_1) \times S_k}{(W_4 - W_1) - (W_3 - W_2)}$$

RESULT: Specific Gravity of cement =

SPECIFICATIONS:

INFERENCE:

EXPERIMENT 4

COMPRESSIVE STRENGTH OF CEMENT

AIM: To find the compressive strength of given sample of cement.

APPARATUS: 7.07cm cube moulds (50cm^2 c/s area), compression testing machine, vibrating machine, Balance, Weights and Trays.

PROCEDURE: Measure the given cement and standard sand in the proportion 1:3 by weight.

1. **Standard sand:** It shall pass the 850 micron I.S. sieve and not more than 10% by weight shall pass the 600 micron I.S. sieve. Take 200 gms of cement and 600 gms of standard sand in a pan. Mix it dry with a trowel for one minute and then add water. The quantity of water shall be (0.25 P + 3) percent of combined weight of cement and sand, where P is the % of water required to produce a paste of standard consistency determined earlier. Add water and mix it until the mixture is of uniform colour. The time of mixing shall not be less than 3 minutes and not greater than 4 minutes.

2. Immediately after mixing the mortar place the mortar in the cube mould and tamp with the help of the tamping rod. The mortar shall be rodded 20times in about 8 seconds to ensure elimination of entrained air.

3. If vibrator is used the period of vibration shall be two minutes at the specified speed of 12000 vibration per minutes.

4. Then place the cube moulds in an atmosphere of $27^0 \pm 2^0$c and 90% relative humidity, submerge in clear fresh water till testing.

5. Take out the cubes from water just before testing. Testing should be done on their sides with out any packing. The rate of loading should be uniform and of 350kg/cm^2/minute.

6. Three cubes should be tested and their average should be taken as the test result. Report the result in Kg/cm^2.

OBSERVATIONS: Compressive load at three days =
Compressive load at seven days =

RESULT: Compressive strength of cement at three days =
Compressive strength of cement at seven days =

I.S. Specification: For ordinary Portland cement of grade 33 the crushing strength shall not be less then 16 MPa at 3 days, 22 MPa at 7 days and 33 MPa at 28 days.

INFERENCE:

EXPERIMENT 5

WORAKABILITY OF CONCRETE – SLUMP TEST

AIM: To determine the workability of concrete mix of given proportion by slump test.

APPARATUS: Iron Pan to mix concrete, weighing machine, trowel, slump cone, scale and tamping rod.

DESCRIPTION: The slump cone is a hollow frustum made of thin steel sheet with internal dimensions as, the top diameter 10cm, the bottom diameter 20 cm, and height 30 cm .It stands on a plane non- porous surface. To facilitate vertical lifting from molded concrete it is provided with a suitable guide attachment and suitable foot places and handles. The tamping rod is 16mm dia 60cm long and is bullet pointed at the lower end.

THEORY:

Unsupported concrete, when it is fresh, will flow to the sides and a sinking in height will take place. This vertical settlement is called slump. Slump is a measure indicating the workability of cement concrete and also slump gives an idea of W/C ratio needed for concrete to be used for different works. Slump increases with W/C ratio. A concrete is said to be workable if it can be easily mixed and easily placed compacted and easily finished.

PROCEDURE:

Mixes are prepared with W/C. ratio 0.4, 0.5, 0.55 and 0.6. For each mix take C.A. = 10 kg, F.A. = 5 kg and Cement = 2.5 kg.

1) Mix the dry constituents to get a uniform color and then add water.
2) The internal surface of the mould is to be thoroughly cleaned and place on a smooth, horizontal, rigid and non-absorbent surface.

3) Place the mixed concrete in the cleaned slump cone in 4 layers each approximately ¼ in height of the mould . Tamp each layer 25 times with tamping rod.
4) Remove the cone immediately, rising it slowly and carefully in the vertical direction.
5) As soon as the concrete settlement comes to a stop, measure the subsidence of the concrete in mm, which gives the slump.

OBSERVATIONS:

S. No.	W/C Ratio	Slump	Type of Slump
1	0.45		
2	0.5		
3	0.55		
4	0.6		
5	0.65		

RESULT:

SPECIFICATIONS:

As per I.S: 456 the degree of workability is classified as follows.

Degree of workability	Slump
Very low	0mm to 25mm
Low	25mm to 50mm
Medium	50 mm to 100 mm.
High	100 mm to 175 mm.

INFERENCE:

EXPERIMENT 6

WORKABILITY OF CONCRETE
COMPACTING FACTOR TEST

AIM: To determine the workability of concrete mix of given proportions by compacting factor test.

APPARATUS: Compacting factor apparatus, Balance, Weights, Trays, Tamping rod and Trowels.

DESCRIPTION: Compacting factor apparatus consists of two conical hoppers mounted above a cylindrical mould and fixed to a stand one above the other. The hoppers are provided with trap doors at the bottom. The dimensions of various parts are given below.

1. Upper Hopper	Dimensions in cm.
Top internal dia.	25.4
Bottom	12.7
Internal height	27.9

2. Lower Hopper	Dimension in cm.
Top internal dia.	22.9
Bottom	12.7
Internal height	22.9

3. Cylinder	Dimension in cm.
Internal Diameter	15.2
Internal Height	30.5

Distance between bottom of upper hopper and top of lower hopper is 20.3 cm.
Distance between bottom of lower hopper and top of cylinder is 20.3 cm.

DEFINITION:

Compacting factor is defined as the ratio of weight of partially compacted concrete to the weight of fully compacted concrete.

PROCEDURE:

Four mixes are prepared with W/C., ratios 0.4, 0.5, 0.55, 0.6 and 0.65. For each mix take 2.5 kg of cement, 5 kg of fine aggregate and 10 kg of coarse aggregate.

1. Mix the dry constituents to get a uniform color and then add water.
2. The internal surfaces of the hoppers and cylinder are thoroughly cleaned.
3. The sample of concrete to be tested is placed gently in the upper hopper.
4. The hopper is filled level with its brim and the trap door is opened so that the concrete falls into the lower hopper.
5. If concrete has a tendency to stick to the sides of the hopper, the concrete should be slowly pushed down by inserting the tamping rod into the concrete.
6. Immediately after the concrete comes to door of the lower hopper, it is opened and the concrete is allowed to fall into the cylinder.
7. The excess of concrete in the cylinder above the top is cut off and made level with trowels. The outside of cylinder is wiped clean.
8. The weight of the concrete in the cylinder is then determined. This weight is known as weight of partially compacted concrete.
9. The cylinder is refilled with concrete from the same sample in six layers and each is rammed thoroughly.
10. The top of fully compacted concrete should be carefully struck off level with top cylinder. The outside of the cylinder is wiped a clean and the weight of fully compacted concrete is found.

OBSERVATIONS:

S. No.	W/C	W_1	W_2	W_2-W_1	W_3	W_3-W_1	C.F. $=(W_2-W_1 / W_3-W_1)$

CALCULATIONS:

Weight of cylinder	W_1	=
Weight of cylinder + partially compacted	W_2	=
Weight of Partially compacted concrete	(W_2-W_1)	=
Weight of cylinder + fully compacted concrete	W_3	=
Weight of fully compacted concrete	(W_3-W_1)	=
Compacting factor	$(W_2-W_1) / (W_3-W_1)$.	=

RESULTS:

Maximum workability of concrete is occurring at a water / cement ratio of

_____

SPECIFICATIONS:

According to IS 456, the degree of workability in classified as follows:

Degree of workability	**Compacting factor.**
Very Low	0.75 to 0.8
Low	0.8 to 0.85
Medium	0.85 to 0.92
High	0.92 & above.

GRAPH:

A graph is drawn with water / cement ratio on x-axis and values of compaction factor on y-axis.

INFERENCE:

EXPERIMENT 7

WORKABILITY OF CONCRETE – VEE BEE TEST

AIM: To find workability of concrete by Vee-Bee consistency test in terms of Vee Bee Seconds

APPARATUS:

Vee Bee consistometer, Stopwatch, Balance, Tray, Tamping rod, measuring jar, Weights and Trowels.

THEORY:

The consistometer is used for determining the consistency of concrete by vibrating and transforming a concrete specimen from the shape of conical frustum into a cylinder.

DESCRIPTION:

The consistometer consists of a

1. A vibrator table, which vibrates a rate of 3000 vibrations / min.
2. A metal pot, which holds the specimen when the concrete is vibrated. It is secured to the vibrator table by bolts.
3. Slump cone of 300 mm high, 200 mm at the bottom and 100 mm at the top (Open both ends).
4. Swivel arm holder: A tube, which is fixed the rear of the base of the vibrator table. It has 4 positioning slots for swivel arm to position the metal cone over the slump cone or Perspex disc on the specimen or to position both of them away.
5. Swivel arms the Swivel moves freely inside the swivel arm holder. A metal rod and a guide sleeve are fixed to the swivel arm. The graduated metal rod passes through the guide sleeve.
6. Metal cone - this is in the form of a frustum of cone with open ends (funnel). This is fixed to the swivel arm
7. Graduated rod
8. Tamping rod. A metal rod of 16 mm x 60 cm. long with one end bullet ended.

PROCEDURE:

1. Position the metal cone over the slump cone. Place the concrete inside the slump cone in 4 layers each approximately 1/4 of the height. Strokes are applied by the rounded end of the tamping rod. Distribute the strokes in a uniform manner over the cross section.
2. After the top layer has been rodded, position the metal cone of the swivel arm away, and strike off the concrete, level with the top of the cone using a trowel so that the mould is exactly filled.
3. Remove any material spilled inside the metal pot or sticking on to the side of the slump filled.
4. Position the Perspex disc over the cone and note down the reading on the graduated rod (L_1). After keeping the disc away, lift the slump cone vertically and remove.
5. Position the disc over the concrete. Note down the reading of the graduated rod (L_2). The difference in the readings gives the slump in Centimeters.
6. Switch on the vibrator starting a stopwatch simultaneously. Allow the concrete to spread out in the pot. When the whole concrete surface uniformly adheres to the Perspex disc, stop the watch, simultaneously, switch off the vibrator. Note down the time in seconds. Also note the reading on the graduated rod (L_3).
7. The consistency of the concrete is expressed in Vee-Bee degrees which are equal to the time in seconds.
8. Repeat the procedure of different W/C ratios viz.: 0.4, 0.5, 0.55, 0.6 & 0.65.
9. Draw a graph between slump in centimeters and Vee – Bee Degrees.
10. Knowing the dia of the disc and the height of the concrete after Vibration ($30+ L_1 - L_3$), the Volume of the concrete can be computed.

OBSERVATIONS:

S. No.	W/C Ratio	Slump (mm)	Vee-Bee Seconds

RESULT:

SPECIFICATIONS:

INFERENCE:

EXPERIMENT 8

CUBE COMPRESSIVE STRENGTH OF CONCRETE

AIM: To determine the compressive strength of concrete using 15 x 15 x 15 cm concrete cubes.

APPARATUS: Compressive testing machine, Balance, Trays, Weights, Moulds and Trowels.

PROCEDURE:

1. Place the cube at the centre of the lower platen of the compression testing machine in such a manner that the load shall be applied to opposite sides of the cube as cast, that is, not to the top and bottom.

2. The axis of the specimen shall be carefully aligned with the centre of the thrust of the spherically seated platen. No packing shall be used between the faces of the test specimen and the steel platen of the testing machine.

3. The load shall be applied without shock and increased continuously at a rate of approximately 140kg/cm^2/min. until the resistance of the specimen to the increasing load breaks down and no greater load can be sustained.

4. The maximum load applied to the specimen shall then be recorded.

OBSERVATIONS:

Measured side of cube	=	cm
Weight of the cube	=	kg.
Load at first crack	=	kg.
Load at ultimate failure	=	kg.

CALCULATIONS:

Initial crack strength of concret $= \frac{\text{Load at first crack}}{\text{c/s area of the specimen}}$

Ultimate cube compressive strength of the concrete $= \frac{\text{Maximum Load}}{\text{c/s area of the specimen}}$

Safe compressive strength of concrete $= \frac{\text{Ultimate strength}}{\text{Factor of safety}}$

$= \frac{\text{Ultimate strength}}{3}$

RESULT:

INFERENCE:

EXPERIMENT 9

AGGREGATE CRUSHING VALUE TEST

AIM: To find Aggregate Crushing value of the given aggregate sample.

APPARATUS:

Steel cylinder, cylindrical measure, Steel temping rod, Balance, Compressions testing machine

PROCEDURE:

The aggregate passing 12.5 mm sieve and retained on 10 mm IS sieve is selected for standard test. The aggregate should be in surface dry condition before testing. The aggregate may be dried by heating at a temperature 100^{o} C for a period of 4 hours and is tested after being cooled to room temperature.

The cylindrical measure is filled by the test sample of aggregate in three layers of approximately equal depth, each layer being tamped 25 times by the rounded end of the tamping rod. After the third layer is tamped, the aggregate at the top of the cylindrical measure is leveled off by using the tamping rod as a straight edge. About 6.5 kg of aggregate is required for preparing two test samples. The test sample thus taken is then weighed. The same weight of the sample is taken in the repeat test.

The cylinder of the test apparatus is placed in position on the base plate; one third of the test sample is placed in the cylinder and tamped 25 times by the tamping rod. Similarly, the other two parts of the test specimen are added, each layer being subjected to 25 blows. The total depth of the material in the cylinder after tamping shall however be 10 cm. The surface of the aggregate is leveled and the plunger inserted so that it rests on this surface in level position. The cylinder with the test sample and plunger in position is placed on compression testing machine. Load is then applied through the plunger at a uniform rate of 4 tones per minute until the total load is 40 tones, and then the load is released. Aggregates including the crushed portion are removed from the cylinder and sieved on a 2.36 mm IS sieve. The material which passes this sieve is collected.

The above crushing test is repeated 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.

CALCULATION:

Total weight of dry sample taken = W_1 gm.

Weight of the portion of crushed material passing 2.36 mm IS sieve = W_2 gm

Aggregate crushing value = 100 W_2 / W_1

RESULT:

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

APPLICATIONS OF AGGREGATE CRUSHING TEST

The aggregate crushing value is an indirect measure of crushing strength of the aggregates. Low aggregate crushing value indicates strong aggregates, as the crushed fraction is low. Thus the test can be used to assess the suitability of aggregates with reference to the crushing strength for various types of pavement components. The aggregates used for the surface course of pavements should be strong enough to withstand the high stresses due to wheel loads, including the steel tyres of loaded bullock-carts. However as the stresses at the base and sub-base courses are low aggregates with lesser crushing strength may be used at the lower layers of the pavement.

Indian Roads Congress and ISI have specified that the aggregate crushing value of the coarse aggregates used for cement pavement at surface should not exceed 30 percent. For aggregates used for concrete other than for wearing surfaces, the aggregate crushing value shall not exceed 45 percent, according to the ISS. However aggregate crushing values have not been specified by the IRC for coarse aggregates to be used in bituminous pavement construction methods.

EXPERIMENT 10

AGGREGATE IMPACT VALUE TEST

AIM: To find Impact value of the given aggregate sample.

APPARATUS

The apparatus consists of an impact-testing machine, a cylindrical measure, tamping rod, IS sieve, balance, tamping rod and oven.

PROCEDURE

The test sample consists of aggregates passing 12.5 mm sieve and retained on 10 mm sieve and dried in an oven for four hours at a temperature 100^0 C to 110^0 C and cooled. The aggregates are filled up to about one-third full in the cylindrical measure and tamped 25 times with rounded end of the tamping rod. Further quantity of aggregates are struck off using the tamping rod as straight edge. The net weight of the aggregates in the measure is determined to the nearest gram and this weight of the aggregates is used for carrying out duplicate test on the same material. The impact machine is placed with its bottom plate fiat on the floor so that the hammer guide columns are vertical. The cup is fixed firmly in position on the base of the machine and the whole of the test sample from the cylindrical measure is transferred to the cup and compacted by tamping with 25 strokes.

The hammer is raised until its lower face is 38 cm above the upper surface of the aggregates in the cup, and allowed to fall freely on the aggregates. The test sample is subjected to a total of 15 such blows, each being delivered at an interval of not less than one second. The crushed aggregate is then removed from the cup and the whole of it sieved on the 2.36 mm sieve until no further significant amount passes. The fraction passing the sieve is weighed accurate to 0.1 g. The fraction retained on the sieve is also weighed and if the total weight of the fractions passing and retained on the sieve is added, it should not be less than the original weight of the specimen by more than one gram; if the total weight is less than the original by over one gram, the result should be discarded and a fresh test made.

The above test is repeated on fresh aggregate sample.

RESULT:

The mean of the two results is reported as the aggregate impact value of the specimen to the nearest whole number.
Aggregate impact value is to classify the stones in respect of their toughness property as indicated below:

Aggregate impact values

< 10%	**exceptionally strong;**	**10-20%**	**Strong**
10-30%	**satisfactorily for road surfacing;**	**> 35%**	**Weak for road surfacing**

Weight of the oven dry aggregate = W_1 gm
Weight of fraction passing 2.36 mm sieve = W_2 gm
Aggregate Impact value = $W_2 / W_1 \times 100$

APPLICATIONS OF AGGREGATE IMPACT VALUE

The aggregate impact test is considered to be an important test to access the suitability of aggregates as regards the toughness for use in pavement construction. It has been found that for majority of aggregates, the aggregate crushing and aggregate impact values are numerically similar within close limits. But in the case of fine grained highly siliceous aggregate which are less resistant to impact than to crushing. The aggregate impact values are higher (on the average, by about 5) than the aggregate crushing values.
Various agencies have specified the maximum permissible aggregate impact values for the different types of pavements, those recommended by the Indian Roads congress are given in Table 1.
For deciding the suitability of soft aggregates in base course construction, this test has been commonly used. A modified impact test is also often carried out in the case of soft aggregates to fine the wet impact value after soaking the test sample.

TABLE 1

Maximum Allowable Impact Value of Aggregate in Different Types of Pavement Material/Layers

Serial No.	Types of pavement material/layer	Aggregate impact value, maximum %
1	Water bound macadam(WBM), sub-base course	50
2	Cement concrete, base course (as per ISI)	45
3	(i) WBM base course with bitumen surfacing (ii) Built up-spray grout, base course	40
4	Bituminous macadam, base course	35
5	(i) WBM, surfacing course (ii) Built-up spray grout, surfacing course (iii) Bituminous penetration macadam (iv) Bituminous macadam, binder course (v) Bituminous surface dressing (vi) Bituminous carpet (vii) Bituminous/ Asphaltic concrete (viii) Cement concrete, surface course	30

EXPERIMENT 11

SPECIFIC GRAVITY AND WATER ABSORPTION TEST

AIM: To find out the specific gravity and water absorption of the given aggregate

APPARATUS:

1. Balance
2. Oven to maintain temp of 100°C to 110°C
3. Wire basket
4. Container with water
5. Trays

PROCEDURE:

About 2 Kg of the aggregate sample is washed thoroughly and placed in the wire basket when immersed in distilled water. The basket and the sample are then weighed (W_1) while suspended in water at a temp of 22°C to 32°C. The aggregates are then placed on the absorbent clothes and should be cleaned. The surface dry aggregates is then weighed (W_2). The aggregate is placed in a shallow tray and kept in an oven maintained at a temp of 110°C for 24 hours. It is then removed from the oven, cooled in an air tight container and weighted (W_4).

OBSERVATIONS:

Weight of saturated aggregate suspended in water with the basket	= W_1
Weight of basket above suspended in water	= W_2
Weight of saturated aggregate in water	= (W_1-W_2)
Weight of saturated surface dry aggregate in air	= W_3
Weight of Water equal to the volume of the aggregate	= W_3-W_5

CALCULATIONS:

Specific Gravity= dry weight of aggregate/ weight of equal volume of water =

$$\frac{W_4}{W_3-W_5}$$

Water Absorption, % = Percentage by weight of water absorbed in terms of oven dried weight of aggregate

$$= \frac{W_3 - W_4}{W_4} x100$$

INTERFERENCE:

The specific gravity of aggregates normally used in road construction ranges from about 2.5 to 3.0 with an average value of 2.68. Water absorption value ranges from 0.1 to 2.0 % for aggregates normally used in road surfacing IRC has specified the maximum water absorption valves as 10 percent for aggregate used in bituminous surface dressing and built up spray grows.