Experiment No. 01

Aim: - To find the standard consistency of cement by using vicat apparatus.

Apparatus: - Cement Vicat apparatus plunger mould.

Theory :- The standard consistence of a cement paste is define as that consistency which will permit a vicat plunger having diameter 10 mm and length 50 mm to penetrate to a depth of 33-35 mm from the top of the mould. The apparatus is called vicat apparatus. This is used find out the percentage of water required to produce a cement paste of standard consistency of the cement paste is sometime called normal consistency (CPNC).

Procedure:-

1. Take about 500 gms. Of cement & Prepare a paste with a weighed quantity of water (up to 24% weight of cement) for first trial.
2. The paste is making with standard manner and filled into then vicat mould within 3-5 minutes.
3. Shake the mould to expel the air.
4. Put the mould on the vicat apparatus & brought the plunger down to tough the surface of the paste & quickly released allowing it to sink in to the paste by its own weight.
5. Take the reading on the indicator.
6. Similarly take the other reading by changing the % of water.
7. The minimum penetration of plunger is 33-35 mm from the top if exceed then our water cement ratio is incorrect.
8. Take the another sample for correct reading.

Precautions:-

1. Paste should be allowed for more than 3-5 minutes.
2. Mixture should not be made on the open surface or any rough surface because it absurd the water.
3. Take the reading accurately.
4. Used only fresh concrete.

Result:- The standard consistency of cement is determined.

Experiment No. 2

Aim:- To determine the consistency of concrete mix of given proportions by the slump test.

Apparatus:- Iron pan to mix concrete, weighing plate form machine, spatula, trowels, slump test apparatus with 300 mm scale, tamping rod, balance is weight up to 30 kg mass & graduated cylinder & a tamping road.

Theory:- Unsupported fresh concrete, flows to the sides and a sinking in height tales place, the vertical settlement is known as slump.

In this test fresh concrete is filled into mould of specified shape and dimensions & the settlement or slump is measured when supporting mould is removed slump increase as water cement is increased. Slump is a measure indicating the consistency or workability of cement concrete. It gives an idea of water concrete needed for concrete to be used for different works. A concrete is said to be workable if it can be easily mixed and placed, compacted & finished. A workable concrete should not show any segregation or bleeding.

Procedure:-

1. Mix the dry constituents thoroughly to get a uniform color & then add water.
2. Placed the mixed concrete in the clean slump cone, mould in the 4 layers, each approx ¼ of the height of the mould. Tamping each layer 25 times with mould. For the second and subsequent layers the tamping rod should penetrate in the underlying layer.
3. Strike off the with a trowel or tamping roof so that the mould is exactly filled.
4. Remove the cane immediately rising is slowly & carefully in the vertical direction.
5. As soon as the concrete settlement comes to a stop measure the subsidence of concrete in mm which will give the slump.

Precautions:-

1. The strokes are to be applied uniformly throughout the entire area of the concrete section.
2. The experiment should complete in 3 minutes.
3. It should be ensured that the interior of the mould be quite clean & damp but not wet.
4. The base plate should be smooth & clean so that the contact is made bottom of the mould around the circumstances.
5. During filling the mould must be firmly pressed against its base.
6. Vibrations from nearby machinery might also increase subsidence; hence test should be made beyond, the range of ground vibrations.

Results:- The value of slump is 30 c.m

Experiment No.3

Aim:- To determine initial and final setting time of a given cement by vicat apparatus.

Apparatus:- Vicat apparatus and vicat plunger vicat needle, 4 mould, gauging trowel, measuring jar weighing balance, stop watch, rice plates, weight box rubber gloves & glass places.

Theory:- In order that concrete may be placed in position conveniently it is necessary that the initial setting time of cement is not too quick and after it has been laid, hardening should be rapid so that the structure can be made use of early as possible.

The initial is the stage in the process of hardening after which any crack that may appear will not re unite.The concrete is said to be finally set when it has obtained sufficient strength and hardness. Therefore certain limits far initial and final setting time have to be specified.

Procedure:-

1. Prepare a neat cement paste by garging the cement with 85 p water. P standard consistency as found before the gauging time is again kept b/w 3 to 5 minute start the step water at the instant when the water is added to the cement.
2. Fill the vicat mould and smooth off the surface of the paste making it level with the top of the mould. The cement block this prepared is known as test block.
3. For the determination of initial time and place the test block confined in the mould and ressing on non-porous plates under the rod attached with the needle B, lower the needle gently in contact with the surface of the test block and release quickly allowing it to penetrate in to the test block.
4. Repeat the procedure until the needle fails to pierce the block about 5mm measured from the bottom of the mould. The period b/w the when the water is added to the cement and the time at which the needle fails to pierce4 the test block by about 5 mm in the initial setting time.
5. For final determination of final setting time replace the needle B at the vicat apparatus by the needle with an angular arrangement C. The cement is considered finally set, when upon applying the needle C gently to the surface of the test block. The needle makes an impression there on, while the attachment fails to do so.

Precautions:-

1. The experiment should be conducted at a room temperature of 27 +- 2c and at relative humidity of ioperoent.

2. After a half minute from the instant of adding water it should be thoroughly mixed with figer for at least one minute. A ball of the paste is prepared and then it is the test no united on the non-Paraus plate.
3. For each repetition of the experiment fresh cement is to be taken.
4. Plunger should be cleaned during every repetition and make sure that it moves freely and that there is no vibration.

Experiment no 4

Aim:- To determine the compressive strength of cement, sand, aggregates concrete of given proportion.

Apparatus:- 150mm cube moulds, ramming rod, mixer, weighing machine, capping apparatus, 200 tones compression machine and 5 tones trances verse testing machine, buckets and base plate.

Theory:- One of the important properties of concrete is its strength in compression. The strength in compression has a definite relationship with all properties of concrete i.e. these properties improved with the improvement in compressive strength. The height of the test specimen in relation to its lateral dimensions greatly influences the results. The more slender the test specimen. Lower will be crushing strength. The ratio of the minimum dimension of the specimen to maximum size of aggregate should be at least 4:1

Flexure test is intended to give the flexural strength of concrete intension. The testing of concrete in flexure yields more consistent result than those obtained with tension on mortar, the flexural test is also more convenient than crushing test for the use in field.

Procedure:-

1. For preparing the concrete of given proportions (1L:2:4) by mass and w/c ratio of 6.
2. Mix thoroughly in a mechanical mixer un till until uniform color of concrete is obtained.
3. Pour concrete in the moulds oil with medium viscosity oil. Fill concrete in cube moulds in two layers each of approximately 15mm and ramming each layer with 35 blows evenly distributed over the surface of layer.
4. Struck off concrete flush with the top of the moulds.
5. Immediately after being made, they should be covered with wet mass.

Curing:-Specimen are removed from the moulds after24 hours and curing in water for 28 days.
Testing:- Compression test of cube specimen are made as soon as practicable after removal from curing pit, test – specimens during the period of their removal from the curing pit and till testing are kept by a wet blanket covering and tested in a moist condition. The size of specimen is determined to the nearest of 2mm by averaging the perpendicular dimension at least two places. The mass of each specimen is recorded.

a) Place the specimen centrally on the location marks of the compression testing machine and load is applied cant n 40 usly, uniformly and uniformly and without shock. The rate of loading is continuously adjusting through rate control value by hand to 14n/mm2 / minute or 32 tones /

minutes for cube. The load is increased until the specimen fails and record the maximum load carried by each specimen during the test also note the type of failure and appearance of cracks.

$$\text{Cube strength} = \frac{\text{average load}}{\text{Area of crass section}}$$

Precautions:-

i) Both the mould and base plate should be lightly oiled before use to prevent the concrete from sticking to the moulds.

ii) The blows should be evenly distributed over the surface of each layer.

iii) The comparison is completed the moulds should be slightly overfull, the surplus be struck off flush with trowels.

iv) The material used for mix should be dried and brought to room temp before use.

v) Cube placed in testing machine center ally on platens.

vi) The concert should be mixed in a manner to avoid loss of water.

Experiment no. 5

Aim:- To determine the workability of concrete mix of given proportions by compaction factor test.

Apparatus:- Compaction factor apparatus, trowels graduated cylinder of 1000ml capacity, balance to weigh upto 30kg tamping rod and iron bucked.

Theory:- Compaction factor test is adopted to determine the workability of concrete, where nominal size of aggregate does not exceed 40mm. It is based on def the workability is that property of the concrete which determine the amount of work required to produce full compaction. Test consists essentially of applying a standard amount of work to standard quality of concrete and measuring the result compaction workability gives an idea to concrete mix to get uniform strength.

Procedure:-

1. Keep the compaction factor apparatus on a level ground and apply grease on the inner surface of the hopper and cylinder.
2. Fasten and flap doors.
3. Weigh the empty cylinder accurately and note down the mass w1 kg.
4. Fix the cylinder on the base with fly nuts and bolts in such away that the central points of happens and cylinder lie on one vertical line.
5. Mix is to be prepared with water cement ratio.50., .60, .70 and .80.
6. Fill the freshly concrete in upper hopper gently and carefully with hand scoop without compacting.
7. After 2min, release the rap door so that the concrete may fall in the lower hopper bringing the concrete into standard compaction.
8. Immediately after the concrete has come to rest open the trap door of lower hopper and allow the concrete to fall into the cylinder and bring the concrete into standard compaction.
9. Remove the excess concuss concrete above the top of the cylinder by a pair of trowels, one in each hand will blades horizontal slide them from the opposite edges of the mould in ward to the centre with a sawing motion.
10. Clean the cylinder from all side properly find the mass of partially compacted concrete thus filled in the cylinder W2 kg.
11. Refill the cylinder with the same sample of can Crete in approximately 50mm layers vibrating each layer weaving so as to expel all the air and to obtain full compaction.
12. Struck off level the concrete and weigh the cylinder full with fully compacted concrete let the mass be W3 kg.

Precautions:-

1. The test should be carried out on a level ground.
2. The top hopper must be filled gently and to the same extent on each accession and the time b/w the end of mixing and release of concrete from top convenient.
3. The outside must be wiped clean before weighing and mass should be reared to nearest 10gm.
4. The hopper and cylinder must be washed clean and wiped before reuse.

Experiment No. 6

Aim:- Determination of necessary adjustment for the bulking of fine aggregates by field method.

Apparatus:- Balance, cylinder container, graduated cylinder, beaker, metal try, steel sule and over.

Theory:- In concrete mix design, the quantity of fine aggregate used in each batch should be related to the known volume of cement. The difficulty with measurement of fine aggregate by volume is the tendency of sand to vary in bulk according to moisture content. The extent of this variation is given by this test.If sand is measured by volume and no allowance are made for bulking, the mix will be richer than that specified because for given mass, moist sand occupies a considerably larger volume than the same mass of dry sand, as the particles are likely closed packed when the sand is moist.

If as is usual the sand is measured by loose volume, it is necessary in such a case to increase the measured volume of the sand, in order that the amount of sand put into concrete may be the amount intended for the nominal mixed used. It will be necessary to increase the volume of sand by the percentage bulking.

This experiment is intended to cover the field method of determining the necessary adjustment for bulking of the aggregate.

Procedure:-

Put sufficient quantity of the oven dry sand loosely into the container until it is about 2/3 full level all the top of sand and weigh the container. Calculate the mass of sand by deducting the mass of container.

1. Push a steel rule vertically down through a sand at the middle to the bottom and measure the height of sand. Let it be hmm.
2. Empty the sand out into a clean metal tray without any loss.
3. Add one 1% of water by mass of sand. Mix the sand and water thoroughly by hand.
4. Put the wet sand loosely into the container without tamping it.
5. Smooth and level the top surface of the moist sand and measure its depth at the middle of the steel rule. Let it be h mm.
6. Repeat the step 4 to 5 of the above procedure with 2% of water by mass.

Precautions:-

1. There should not be any in advertent loss of sample.
2. Water should be measured accurately.
3. Container should be clean and dry.

Experiment No. 7

Aim:- Finding the fineness modulus of the given aggregate for obtaining a most economical and workable mix with minimum quantity of cement.

THEORY:- The sample under test should satisfy these result so that the aggregate may give good workability under economical condition If the test aggregate gives higher fineness modulus the mix will be harsh and if on the other hand gives a lower fineness modulus, it results in an uneconomical mix. For a given workability coarse aggregate require lesser w/c ratio.

Procedure:-

a) Course Aggregate:-

1. Take 2 kg of coarse aggregate of nominal size 20 mm from a sample of 50 kg by quartering.
2. Carry out sieving by hand shake each sieve in order, 80 mm, 40mm, 20mm, 10mm, 4.75m over a clean dry tray for a period of net less than 2 minutes. The shaking is done with a varied flow.
3. Find the mass of aggregates retained on each sieve taken in order.

b) Fine Aggregate

1. Take 200kg of sand from a laboratory sample of by quartering and break day lumpe, if any in a clean dry rice plate.
2. Arrange the sieve in the order no 4.75 mm, 2.36mm, 1.18mm 600nm, 300nm and 150nm and less than 150mm. Fix them in the sieve shaking machine with the pan at the bottom and cover at the top.
3. Find the mass retained on each sieve and find the fineness modulus.

Precautions:-

1. Seive should be cleaned before use.
2. Stiff warn out brushes should not be used.
3. The sieving must be done carefully to prevent the spilling of the aggregate.
4. Do not apply pressure to force the particles through the mesh.

Experiment No. 8

Aim: - To determine soundness of given cement by i.e. LE CHATELIER METHOD.

Apparatus: - LE-CHATELIER apparatus two glass plates, temperature controlled water bath, scale, china dish to mix the paste, center balance weight box, graduated cylinder, trowel and 850 micron is sieve.

Theory:- Excess of free line and magnesia present in cement take very slowly and cause appreciable change in volume after setting. In consequence cracks, distortion and disintegration results, there by giving passage of water and atmospheric gases which may have infers cement. This effect is known as unsoundness. The expansion is prevented by limiting the quantities of free line and magnesia in cement.

The test is designed to accelerate this slaking process by application of heat and to me asure the extent of expansion and to see if this expansion test gives the extent of free line and magnesia present in cement.

Procedure:-

(a) To determine the soundness of cement.

1. Gauge 100gm of cement with 78 times the water required to make a paste of standard consistency.
2. Place the Le-Chatelier apparatus on a glass plate and fill it with the paste and level the top surface.
3. Cover the mould with another piece of glass plate or sheet and immediately submerge the whole assembly in water at a temperature of 2g *- 2c and keep there for 24 hours.
4. Measure the distance D1 b/w the indicator points after 24h and again submerges the mould in water at the temperature prescribed above.
5. Bring the water to boiling point in 25 to 30 minutes and keep it boiling for 3h.
6. Remove the mould from the water allow it to cool and measure the distance D2 b/w the indicator points.
7. The difference (D2-D1) b/w the two measurement gives the expansion of cement and it should not be more than 10mm according to i.s specification,

Precautions:-

1. The cement should be thoroughly mixed with fingers for at least one minute.

2. After filling the mould with cement paste and covering it with another glass plate. The mould with glass plate should be immediately placed in a water bath whose temp is b/w 29+- 2.C
3. The distance b/w the tips of pointers should be measured after cooling it completely.
4. During boiling water level should not fall below the height of mould.

Experiment No.09

Aim:- Determination of specific gravity & absorption on C.A.

Apparatus:- Balance of capacity 5kg weight box wire basket 200mm in dia water two far immersing the wire basket in water and absorbent cloth for surface drying of the sample.

Theory:- For design of concrete mix, information should be available about the specify gravity of the aggregates, specify gravity of an aggregate gives valuable information on its quality and properties. If the specific gravity is above or below that normally assigned to a particular type of aggregate. It may indicate that shape and grading of aggregate has altered. It is also imp indetermination of moisture contact and in many concrete mix design calculation silt is also required for the calculation of volume yield of concrete.

Procedure:-

1. Take about 5 kg of aggregate by method of quartering, rejecting all material passing a 10mm i.s. sieve.
2. Wash thoroughly to remove dust tec. From the surface of the particles. Dry to constant mass at a temp 105degree +-5c
3. Immerse the sample in water at 22 to 32.c for a period of (24+-1/2) hours 30min.
4. Remove the aggregate from water and roll the same in large piece of an absorbent cloth until all visible films of water are removed, although the surface of particles will still appear to be damp.
5. Now, weight 3kg of this sample in the saturated surface dry condition and note down the mass as wing.
6. Place the weighted aggregate immediately in the wire basket and dip in the water, weight this basket with aggregate while keeping it in water with the help of the balances.
7. Dry the sample to the constant weight at the temp of 100 to 110.C. for (24+-1/2) hor.
8. Cool to room temp & weight.
9. Calculate the specific gravity & absorption of the aggregate.
10. Repeat the procedure for fresh aggregate.

Calculation & observation:-

The specific graving of coarse aggregate is defined as the ratio b/w the mass of equal volumes of coarse aggregate and water at the same constant temp.

Bulk specific gravity= mass of sample in air
Lass in mass of sample

Precautions:-

1. The mass of sample should be accurate at all stages and should be determined to the nearest .5gm.
2. The sample should be free from foreign matter.
3. The large frog ments should be wiped individually.
4. Avoid evaporation during surface drying operation.
5. The absorbent cloth should be 1000mm * 1000mm in size it must be of such a type that it can absorlo large quantity of water.