LAB MANUAL

SESSION: 2020-21

SUBJECT CODE: KCE 751
CONCRETE LAB

BRANCH –CIVIL ENGINEERING
FACULTY INCHARGE- MR. ASHISH VERMA
LAB INSTRUCTOR- MR. PRASHANT

INDEX

LIST OF EXPERIMENTS

EXPERIMENT NO. 1

STUDY OF IS CODES FOR (I) AGGREGATES (II) CEMENTS (III) ADMIXTURES (IV) FLY ASH

1- OBJECTIVE

Study of IS codes for (i) Aggregates (ii) Cements (iii) Admixtures (iv) Fly ash

I) AGGREGATES

Aggregates shall comply with the requirements of IS 383. As far as possible preference shall be given to natural aggregates.

Other types of aggregates such as sial and crushed over burnt brick or tile, which may be found suitable with regard to strength. durability of concrete and freedom from harmful effects may be used for plain concrete members. but such aggregates should not contain more than 0.5 percent of sulphate's as SO and should not absorb more than 10 percent of their own mass of water,

Heavy weight aggregates of light weight aggregates such as bloated clay aggregates and sintered fly ash aggregates may also be used provided the engineer-in-charge is satisfied with the data on the properties of concrete made with them.

SIZE OF AGGREGATES

The nominal maximum size of coarse aggregate should be as large as possible within the limits specified but in no case greater than one-fourth of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and fill the comers of the form, For most work, 20 nun aggregates is suitable. Where there is no restriction to the flow of concrete into sections, 40 nun or larger size may be permitted. In concrete elements with thin sections, closely spaced reinforcement or small cover, consideration should be liven to the use of 10 mm nominal maximum size.

Plums above 160 nun and up to any reuonable aize may be used in plain concrete work up to a maximum limit of 20 percent by volume of concrete when specifically permitted by the enaineer-in-charao. The plums shall be distributed evenly and shall be not closer than 1'0 mm from the surface.

II) CEMENT

The cement used shall he any of the following and the type selected should be appropriate for the intended use:

- 33 Grade ordinary Portland cement conforming to IS 269
- 43 Grade ordinary Portland cement conforming to IS 8 112
- *53* Grade ordinary Portland cement conforming to IS 12269
- Rapid hardening Portland cement conforming to IS 8041
- Portland slag cement conforming to IS 4;5
    - Portland pozzolana cement (fly ash based) conforming to IS 1489 (Part 1)

  - Portland pozzolana cement (calcined clay based) conforming to IS 1489 (Part 2)
  - Hydrophobic cement conforming to IS 8043
- Low heat Portland cement conforming to IS 12600
- Sulphate resisting Portland cement conforming to IS 12330

Other combinations of Portland cement with mineral admixtures of quality conforming with relevant Indian Standards laid down may also be used in the manufacture of concrete provided that there are satisfactory dati on their suitability, such as performance test ~ concrete containing them.

Low heat Portland cement conforming to IS 12600 shall be used with adequate precautions with regard to removal of formwork, etc.

High alumina cement conforming to IS 6452 or super sulphated cement conforming to IS 6909 may be used only under special circumstances with the prior approval of the engineer-in-charge. Specialist literature may be consuIted for guidance regarding the use of these types of cements.

The attention of the engineers-in-charge and users of cement is drawn to the fact that quality of various cements mentioned in 5.1 is to be determined on the basis of its conformity to the performance characteristics given in the respective Indian Standard Specification for that cement. Any trade-mark or any trade name indicating any special features not covered in. The standard or any qualification or other special performance characteristics sometimes claimed indicated on the bass or containers or in advertisements alongside the 'Statutory Quality Marking' or otherwise.

III) ADMIXTURES

- Admixture, if used shall comply with IS 9103. Previous experience with and data such materials should he considered in relation to the likely standards of supervision and workmanship to the work being specified.
- Admixtures should not impair durability If concrete nor combine with the constituent to form harmful compounds nor increase the risk of corrosion of reinforcement.
- The workability, compressive strength and the slump loss of concrete with and without the use of admixtures shall be established during the trial mixes before use of admixtures
- The relative density of liquid admixtures shall he checked for each drum containing admixtures and compared with till' specified value before acceptance.
- The chloride content of admixtures shall be independently tested fill each batch before acceptance.
- If two or more admixture used simultaneously in the same concrete mix. Jala should be obtained to assess their interaction and to ensure their compatibility.

IV) FLY ASH

To utilize fly ash as a Pozzolana in Cement concrete and Cement Mortar, Bureau of Indian Standard (BIS) has formulated IS: 3812 Part - 1 2003. In this code quality requirement for siliceous fly ash (class F fly ash) and calcareous fly ash (class C fly ash) with respect its chemical and physical composition have been specified.

The main objective of using fly ash in most of the cement concrete applications is to get durable concrete at reduced cost, which can be achieved by adopting one the following two methods:

1. Using Fly ash based Portland Pozzolana Cement (PPC) conforming to IS:1489 Part-1 in place of Ordinary Portland Cement

2. Using fly ash as an ingredient in cement concrete.

The first method is most simple method, since PPC is factory-finished product and does not requires any additional quality check for fly ash during production of concrete. In this method the proportion of fly ash and cement is, however, fixed and limits the proportioning of fly ash in concrete mixes.

The addition of fly ash as an additional ingredients at concrete mixing stage as part replacement of OPC and fine aggregates is more flexible method. It allows for maximum utilization of the quality fly ash as an important component (cementitious and as fine aggregates) of concrete.

EXPERIMENT NO - 02

TO DETERMINE THE WORKABILITY OR CONSISTENCY OF CONCRETE MIX OF GIVEN PROPORTION BY SLUMP TEST.

1. OBJECTIVE

To determine the workability or consistency of concrete mix of given proportion by slump test.

2. APPARATUS

Iron pan to mix concrete, weighing machine, trowel, slump cone, scale and tamping rod.

3. 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 measu6, 0.7 and 0.8. For each mix take 10 Kg. C.A., 5 Kg., FA and 2.5 Kg. Cement.

1) Mix the dry constituents thoroughly to get a uniform color and then add water.

2) The internal surface of the mould is to be thoroughly cleaned and placed on a smooth, horizontal, rigid and non absorbent surface.

3) Place the mixed concrete in the cleaned slump cone in 4 layers each approximately 1/4 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 subsistence of the concrete in cms, which gives the slump.

Note: Slump test is adopted in the Laboratory or during the progress of the work in the field for determining consistency of concrete where nominal max., size of aggregates does not exceed 40 mm. Any slump specimen which collapses or shears off laterally gives incorrect results and at this juncture the test is repeated only true slump should be measured.

4. OBSERVATIONS

S.No	W/c Ratio	Slump in mm
1	0.5	
2	0.6	
3	0.7	
4	|0.8	

5. PRECAUTIONS:

1) The strokes are to be uniformly applied through the entire area of the concrete section.

2) The cone should be removed very slowly by lifting it upwards without disturbing the concrete.
3) During filling the mould must be firmly pressed against the base.
4) Vibrations from nearly machinery might also increase subsidence; hence test should be made beyond the range of ground vibrations.

COMMENTS: This test is not a true guide to workability. For example, a harsh coarse mix cannot be said to have same workability as one with a large portion of sand even though they have the same slump.

Recommended slumps of concrete mix of various works

S.No	Description of work	Recommended slump in cms
1	Road work	2.5 to 5.0
2	Ordinary beams to slabs|	5 to 10
3	Columns thin vertical section & retaining Walls etc	7.5 to 12.5
4	Mass concrete(Runway, |Pavements)	2.5 to 5

\

EXPERIMENT NO. 03

TO DETERMINE THE RELATIVE CONSISTENCY OF FRESHLY MIXED CONCRETE BY THE USE OF COMPACTING FACTOR TEST

1. OBJECTIVE

To determine the relative consistency of freshly mixed concrete by the use of Compacting Factor Test

2. REFERENCE

IS; 1199-1959, SP : 23-1982

3.THEORY

Compacting Factor Test: The compacting factor test is designed primarily for use in the laboratory but it can also be used in the field. It is more precise and sensitive than the slump test and is particularly useful for concrete mixes of very low workability as are normally used when concrete is to be compacted by vibration. The method applies to plain and air-entrained concrete, made with lightweight, normal weight or heavy aggregates having a nominal maximum size of 40 mm or less but not to aerated concrete or no-fines concrete.

4. Apparatus

Compacting Factor Apparatus, Trowel, Scoop about 150 mm long., Balance capable of weighing up to 25 kg with the sensibility of 10 g. Weights and weighing device, Tamper (16 mm in diameter and 600 mm length), Ruler, Tools and containers for mixing, or concrete mixer etc.

5. PROCEDURE

1. The internal surface of the hoppers and cylinder shall be thoroughly clean and free from superfluous moisture and any set of concrete commencing the test.
2. The sample of concrete to be tested shall be placed gently in the upper hopper using the scoop. The trap door shall be opened immediately after filling or approximately 6 min after water is added so that the concrete fails into the lower hopper. During this process the cylinder shall be covered.
3. Immediately after the concrete has come to the rest the cylinder shall be uncovered, the trap door of the lower hopper opened and the concrete allowed falling to into the cylinder.
4. For some mixes have a tendency to stick in one or both of the hoppers. If this occurs the concrete shall be helped through by pushing the tamping rod gently into the concrete from the top.
5. The excess of concrete remaining above the level of the top of the cylinder shall then be cut off by holding a trowel in each hand, with the plane of the blades horizontal, and moving them simultaneously one from each side across the top of the cylinder, at the same time keeping them pressed on the top edge of the cylinder. The outside of the cylinder shall then be wiped clean. This entire process shall be carried out at a place free from vibration or shock.
6. Determine the weight of concrete to the nearest 10 g. This is known as "weight of partially

compacted concrete", Wp.

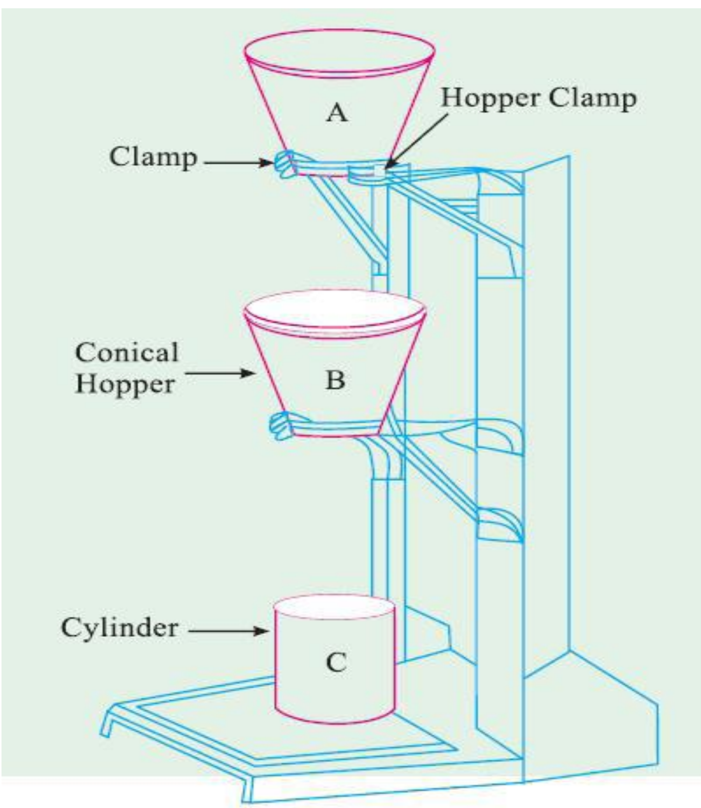
7. Refill the cylinder with concrete from the same sample in layers approximately 50 mm depth. The layers being heavily rammed with the compacting rod or vibrated to obtain full compaction. The top surface of the fully compacted concrete shall be carefully struck off and finished level with the top of the cylinder. Clean up the outside of the cylinder.

8. Determine the weight of concrete to the nearest 10 g. This is known as "weight of fully compacted concrete", Wf.

9. The compacting factor, Fc can be calculated as follows:

The compacting factor = weight of partially weighted concrete(W_p)/ weight of fully compacted concrete(W_f)

Figure :-



Compacting Factor Apparatus

6. OBSERVATION

S.no	Description	Sample 1	Sample 2	Sample 3
1	Weight of Empty Cylinder (W1)			
2	Weight of Cylinder + Free Fall Concrete (W2)			
3	Weight of Cylinder + Hand Compacted Concrete (W2)			
4	Weight of Partially Compacted Concrete (Wp=W2-W1)			
5	Weight of Fully Compacted Concrete (Wf=W2-W1)			
6	The Compacting Factor =Wp/Wf			

Conclusion:- The compacting factor of the given sample of the concrete is…………………..

EXPERIMENT NO: 04

DETERMINATION OF THE COMPRESSIVE STRENGTH OF CEMENT CONCRETE SPECIMENS

1.OBJECT

Determination of the compressive strength of cement concrete specimens.

2.APPARATUS

Testing Machine, two steel bearing platens with hardened faces (As per IS: 516- 1959).

3.THEORY

Tests shall be made at recognized ages of the test specimens, the most usual being 7and 28 days, ages of 13 weeks and one year are recommended if tests at greater ages are required. Where it may be necessary to obtain the early strength, test may be made at the ages of 24 hours + 1/2 hour and 12 hours + 2 hours. The ages shall be calculated from the time of the addition of water to the dry ingredients.

Number of Specimens

At least three specimens, preferably from different batches, shall be made for testing at each selected age.

4.PROCEDURE

Specimens stored in water shall be tested immediately on removal from water and while they are still in the wet condition. Surface water and grit shall be wiped off the specimens and any projecting fines removed. Specimens when received dry shall be kept in water for 24 hours before they are taken for testing. The dimensions of the specimens to the nearest 0.2 mm and their weight shall be noted before testing.

Placing the specimen in the Testing Machine The bearing surfaces of the testing machine shall be wiped clean and any loose sand or other material removed from the surfaces of the specimens which are to be in contact with the compression platens. In the case of the cubes, the specimen shall be placed in the machine in such a manner that the load shall be applied to opposite sides of the cubes as cast, that is, not to the top and bottom. The axis of the specimen shall be carefully aligned with the center of thrust of the spherically seated platten. No packing shall be used between the faces of the test specimen and the steel platten of the testing machine. As the spherically seated block is brought to bear on the specimen, that movable portion shall be rotated gently by hand so that uniform section may be obtained. The load shall be applied without shock and increased continuously at a rate of approximately 140 Kg/sq cm/min. Until the resistance of the specimen to the increasing load breaks down and no greater load can be sustained. The maximum load applied to the specimen shall then be recorded and the appearance of the concrete and any unusual features in the type of failure shall be noted.

5. CALCULATION

The measured compressive strength of the specimen shall be calculated bydividing the maximum load applied to the specimen during the test, by the cross sectional area, calculated from the mean dimensions of section and shall be expressed to the nearest Kg/sq.cm. Average of three values shall be taken as the representative of the batch provided the individual variation is not more than + 15% of the average. Otherwise, repeat tests shall be made.

In case of cylinders, a correction factor according to the height to diameter ratio of specimen after capping shall be obtained from the curve shown in fig. 1 of IS: 516-1959. The product of this correction factor and the measured compressive strength shall be known as the corrected compressive strength, this being the equivalent strength of a cylinder having a height/diameter ratio of two. The equivalent cube strength of the concrete shall be determined by multiplying the corrected cylinder strength by 5/4.

6.REPORTING OF RESULTS

The following information shall be included in the report on each test specimen:

a) Identification mark
b) Date of test
c) Age of specimen
d) Curing conditions including date of manufacture of specimen in the field
e) Weight of specimen
f) Dimensions of specimen
g) Compressive strength
h) Maximum load and
i) Appearance of fractured faces of concrete and type of fractures if these are unusual

7.RESULT

Compressive strength of Concrete --------------.

EXPERIMENT NO. 05

TO DETERMINING THE FLEXURAL STRENGTH OF MOULDED CONCRETE FLEXURE TEST SPECIMENS

1.OBJECTIVE

To determining the flexural strength of moulded concrete flexure test specimens

2. REFERENCE

IS : 516 - 1959, IS: 1199-1959, SP : 23-1982, IS : 10086-1982

3.THEORY

Age at Test - Tests shall be made at recognized ages of the test specimens, the most usual being 7 and 28 days. Where it may be necessary to obtain the early strengths, tests may be made at the ages of 24 hours ± ½ hour and 72 hours ± 2 hours. The ages shall be calculated from the time of the addition of water to the dry ingredients.

Number of Specimens - At least three specimens, preferably from different batches, shall be made for testing at each selected age.

4.APPARATUS

Testing Machine - The testing machine may be of any reliable type, of sufficient capacity for the tests and capable of applying the load at the rate specified in 5.5. The permissible error shall be not greater than ± 2 percent of the maximum load.

Beam Moulds - The beam moulds shall conform to IS: 10086-1982. The standard size shall be 15 × 15 × 70 cm. Alternatively, if the largest nominal size of the aggregate does not exceed 19 mm, specimens 10 × 10 × 50 cm may be used.
Weights and weighing device, Tools and containers for mixing, Tamper (square in cross section) etc.

5.PROCEDURE

1. **Sampling of Materials -** Samples of aggregates for each batch of concrete shall be of the desired grading and shall be in an air-dried condition. The cement samples, on arrival at the laboratory, shall be thoroughly mixed dry either by hand or in a suitable mixer in such a manner as to ensure the greatest possible blending and uniformity in the material.
2. **Proportioning -** The proportions of the materials, including water, in concrete mixes used for determining the suitability of the materials available, shall be similar in all respects to those to be employed in the work.

3. **Weighing -** The quantities of cement, each size of aggregate, and water for each batch shall be determined by weight, to an accuracy of 0.1 percent of the total weight of the batch.
4. **Mixing Concrete -** The concrete shall be mixed by hand, or preferably, in a laboratory batch mixer, in such a manner as to avoid loss of water or other materials. Each batch of concrete shall be of such a size as to leave about 10 percent excess after moulding the desired number of test specimens.
5. **Mould -** The standard size shall be 15 × 15 × 70 cm. Alternatively, if the largest nominal size of the aggregate does not exceed 19 mm, specimens 10 × 10 × 50 cm may be used.
6. **Compacting -** The test specimens shall be made as soon as practicable after mixing, and in such a way as to produce full compaction of the concrete with neither segregation nor excessive laitance.
7. **Curing -** The test specimens shall be stored in a place, free from vibration, in moist air of at least 90 percent relative humidity and at a temperature of 27° ± 2°C for 24 hours ± ½ hour from the time of addition of water to the dry ingredients.
8. **Placing the Specimen in the Testing Machine -** The bearing surfaces of the supporting and loading rollers shall be wiped clean, and any loose sand or other material removed from the surfaces of the specimen where they are to make contact with the rollers.
9. The specimen shall then be placed in the machine in such a manner that the load shall be applied to the uppermost surface as cast in the mould, along two lines spaced 20.0 or 13.3 cm apart.
10. The axis of the specimen shall be carefully aligned with the axis of the loading device. No packing shall be used between the bearing surfaces of the specimen and the rollers.
11. The load shall be applied without shock and increasing continuously at a rate such that the extreme fibre stress increases at approximately 7 kg/sq cm/min, that is, at a rate of loading of 400 kg/min for the 15.0 cm specimens and at a rate of 180 kg/min for the 10.0 cm specimens.
12. The load shall be increased until the specimen fails, and the maximum load applied to the specimen during the test shall be recorded. The appearance of the fractured faces of concrete and any unusual features in the type of failure shall be noted.

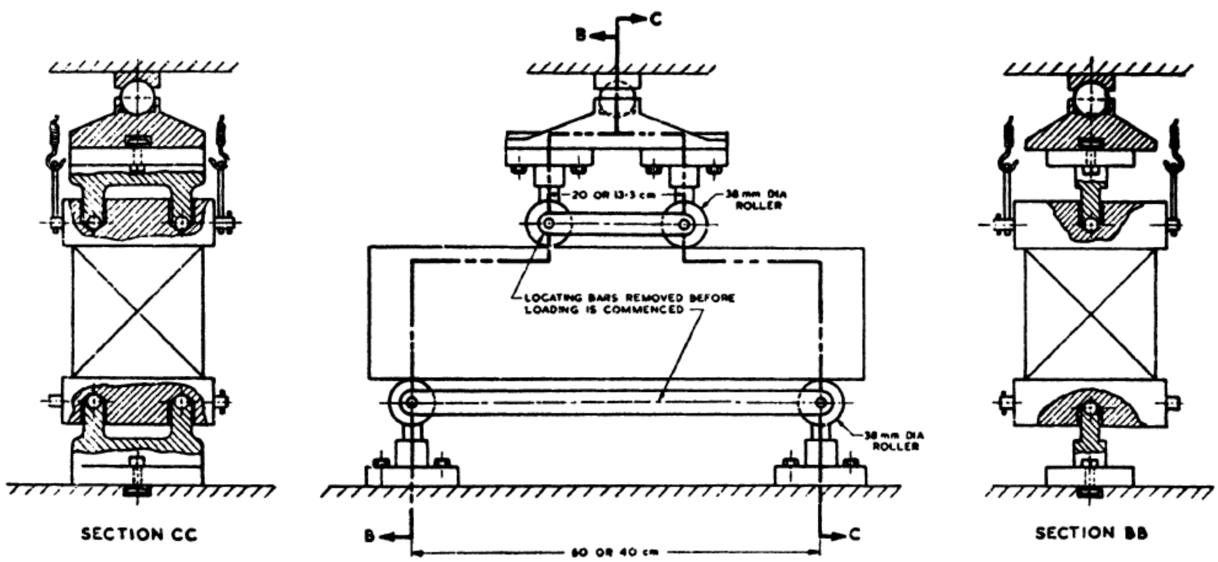


FIG. 3 ARRANGEMENT FOR LOADING OF FLEXURE TEST SPECIMEN

5.OBSERVATION

Calculation of mix proportion

Mix proportion of concrete	For 1 cubic meter of concrete	For 1 batch of mixing
Coarse aggregates(kg)		
Fine aggregates(kg)		
Cement(kg)		
Water(kg)		
S/A		
w/c		
Admixture		

S.no	Age of specimen	Identification mark	Size of specimen (mm)	Span length (mm)	Maximum load (N)	Position of Fracture ‗a‘ (mm)	Modulus of Rupture (MPa)
1	7 DAYS						
2							
3							
4	28 DAYS						
5							
6							

6.CALCULATION

The flexural strength of the specimen shall be expressed as the modulus of rupture fb, which, if = a‘ equals the distance between the line of fracture and the nearer support, measured on the centre line of the tensile side of the specimen, in cm, shall be calculated to the nearest 0.5 kg/sq cm as follows:

$f_{b=}$ (P x l)/(a x $d^{2)}$

when, a‘ is greater than 20.0 cm for 15.0 cm specimen, or greater than 13.3 cm for a 10.0 cm specimen, or

$f_{b=}$ (3P x a)/(b x d^2)

when , a‘ is less than 20.0 cm but greater than 17.0 cm for 15.0 cm specimen, or less than 13.3 cm but greater than 11.0 cm for a 10.0 cm specimen

where,

P- max load in kg applied to the specimen

l- length in cm of the span on which the specimen was suppported

b-measured width in cm of the specimen

d-measured depth in cm of the specimen at the point of failure

7. CONCLUSION

i) The average 7 Days Modulus of Rupture of concrete sample is found to be …..…..

ii) The average 28 Days Modulus of Rupture of concrete sample is found to be …..….

EXPERIMENT NO. 06

Effects of admixtures:- accelerator, retarder, super plasticizer.

1.OBJECTIVE

Effects of admixtures:- accelerator, retarder, super plasticizer.

Accelerator:- Accelerating Admixture - an admixture that causes an increase in the rate of hydration of the hydraulic cement and thus shortens the time of setting, increases the rate of strength development, or both.

Accelerating admixtures are added to concrete either to increase the rate of early strength development or to shorten the time of setting, or both. Chemical compositions of accelerators include some of inorganic compounds such as soluble chlorides, carbonates, silicates, fluosilicates, and some organic compounds such as triethanolamine.

Calcium chloride is a common accelerator, used to accelerate the time of set and the rate of strength gain. It should meet the requirements of ASTM D 98. Excessive amounts of calcium chloride in concrete mix may result in rapid stiffening, increase in drying shrinkage and corrosion of reinforcement. In colder climates, calcium chloride should not be used as an anti-freeze. Large amount of calcium chloride is required to lower the freezing point of the concrete, which may ruin the concrete.

Accelerators counteract the influence of cold weather, which slows down the curing and setting process.

A contractor can use one anytime a curing process needs speed. The admixture may allow a concrete worker to remove forms earlier, get onto a concrete surface earlier for finishing, and sometimes even put loads on it earlier, such as when diverting foot traffic to do patching.

Retarder:-

The use of this admixture is defined in ASTM C494. There are two kinds of retarders, defined as Type B (Retarding Admixtures) and Type D (Water Reducing and Retarding Admixtures). The main difference between these two is the water-reducing characteristic in Type D that gives higher compressive strengths by lowering w/cm ratio.

Retarding admixtures are used to slow the rate of setting of concrete. By slowing the initial setting time, the concrete mixture can stay in its fresh mix state longer before it gets to its hardened form. Use of retarders is beneficial for:

- Complex concrete placement or grouting
- Special architectural surface finish
- Compensating the accelerating effect of high temperature towards the initial set
- Preventing cold joint formation in successive lifts.

Retarder can be formed by organic and inorganic material. The organic material consists of unrefined Ca, Na, NH_4, salts of lignosulfonic acids, hydroxycarboxylic acids, and carbohydrates. The inorganic material consists of oxides of Pb and Zn, phosphates, magnesium salts, fluorates, and borates.

Commonly used retarders are lignosulfonates acids and hydroxylated carboxylic (HC) acids, which act as Type D (Water Reducing and Retarding Admixtures). The use of lignosulfonates acids and hydroxylated carboxylic acids retard the initial setting time for at least an hour and no more than three hours when used at 65 to 100 ^{o}F.

A study performed on the influence of air temperature over the retardation of the initial set time (measured by penetration resistance as prescribed in ASTM C 403 – 92) shows that decreasing effect with higher air temperature (Neville1995). The table below describes the effect of air temperature on retardation of setting time:

Superplasticizers (High Range Water reducer):-

ASTM C494 Type F and Type G, High Range Water Reducer (HRWR) and retarding admixtures are used to reduce the amount of water by 12% to 30% while maintaining a certain level of consistency and workability (typically from 75 mm to 200 mm) and to increase workability for reduction in w/cm ratio. The use of super plasticizers may produce high strength concrete (compressive strength up to 22,000 psi). Super plasticizers can also be utilized in producing flowing concrete used in a heavy reinforced structure with inaccessible areas.
Another benefit of super plasticizers is concrete early strength enhancement (50 to 75%). The initial setting time may be accelerated up to an hour earlier or retarded to be an hour later according to its chemical reaction. Retardation is sometimes associated with range of cement particle between 4 – 30 m m. The use of superplasticizers does not significantly affect surface tension of water and does not entrain a significant amount of air. The main disadvantage of superplasticizer usage is loss of workability as a result of rapid slump loss and incompatibility of cement and superplasticizers.

Super plasticizers are soluble macromolecules, which are hundreds of times larger than water molecule (Gani, 1997). Mechanism of the super plasticizers is known as adsorption by C_3A, which breaks the agglomeration by repulsion of same charges and releases entrapped water. The adsorption mechanism of super plasticizers is partially different from the WRA. The difference relates to compatibility between Portland Cement and super plasticizers. It is necessary to ensure that the super plasticizers do not become fixed with C_3A in cement particle, which will cause reduction in concrete workability.

Typical dosage of superplasticizers used for increasing the workability of concrete ranges from 1 to 3 liters per cubic meter of concrete where liquid superplasticizers contained about 40 % of active material. In reducing the water cement ratio, higher dosage is used, that is from 5 to 20 liters per cubic meter of concrete. Dosage needed for a concrete mixture is unique and determined by the Marsh Cone Test.

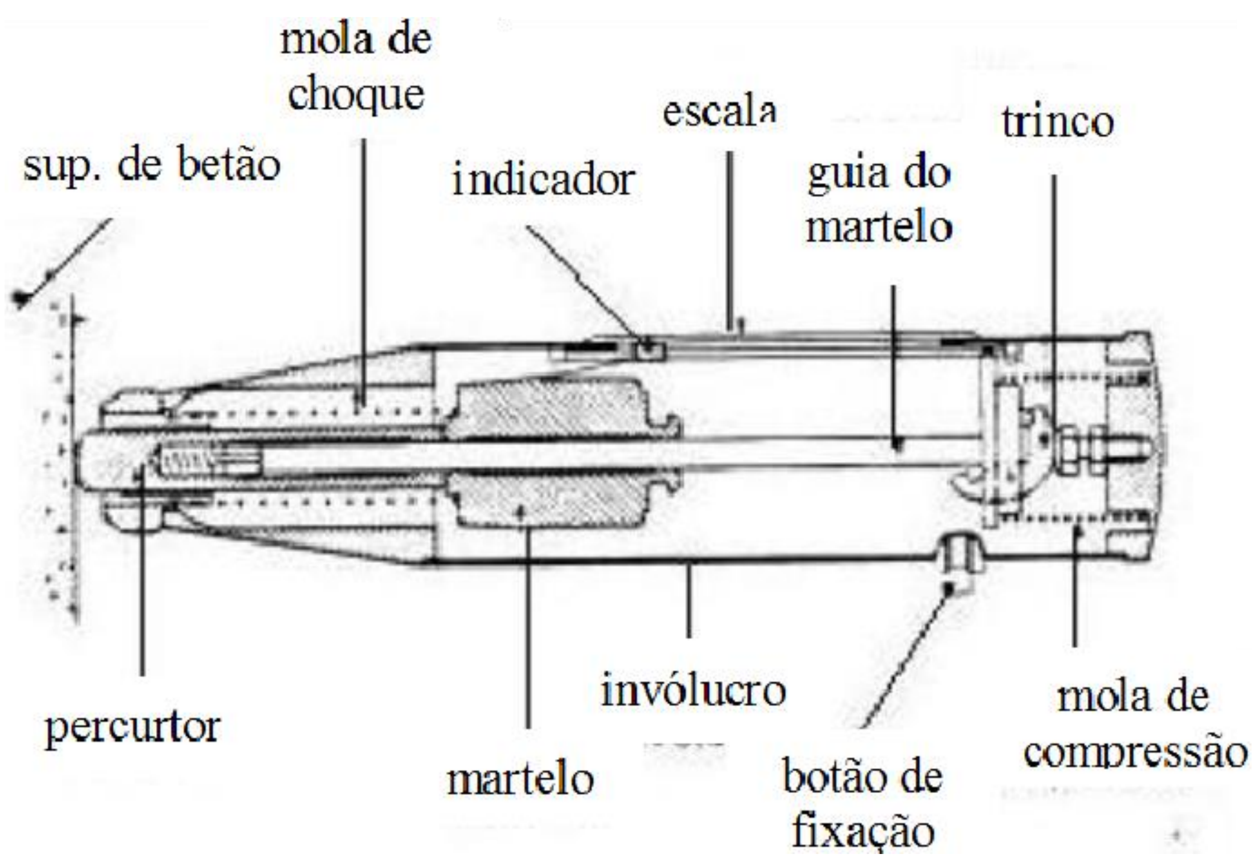
There are four types of super plasticizers: sulfonated melamine, sulfonated naphthalene, modified lignosulfonates and a combination of high dosages of water reducing and accelerating admixtures. Commonly used are melamine based and naphthalene based superplasticizers. The use of naphthalene based has the advantage of retardation and affecst slump retention. This is due to the modified hydration process by the sulfonates

EXPERIMENT NO:- 07
TO DETERMINE THE COMPRESSIVE STRENGTH OF CONCRETE BY USING THE REBOUND HAMMER.

1.OBJECTIVE
To determine the compressive strength of concrete by using the rebound hammer.

2.APPARATUS
Rebound Hammer instrument, Abrasive Stone

3.PROCEDURE
Hold the instrument firmly so that the plunger is perpendicular to the test surface. Gradually push the instrument toward the test surface until the hammer impacts. After impact, maintain pressure on the instrument and if necessary depress the button on the side of the instrument to lock the plunger in its retracted position. Read the rebound number on the scale to the nearest whole number and record the rebound number. Take ten readings from each test area. No two impact tests shall be closer together than 25 mm (1 in). Examine the impression made on the surface after impact, and if the impact crushes or breaks through a near-surface air void, disregard the reading and take another reading.



4.**RESULT AND REMARK-**

Make at least ten readings from a concrete surface and discard the highest and lowest rebound numbers. Average the remaining eight numbers. If desired, take a few test readings before you complete your series of ten regular tests. Use the average rebound number to estimate the strength of the concrete. Compare your average rebound number to the chart shown on your Concrete Rebound Hammer.

Average Rebound Number	**Quality of Concrete**
>40	Very good hard layer
30-40	Good layer
20-30	Fair
<20	Poor concrete