TO DETERMINE THE PROPORTION FORM30 GRADE SELF COMPACTING CONCRETE WITHOUT FLY ASH (ANY FILLER MATERIALS)

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ABSTRECT: ***The process of selecting suitable ingredients of concrete and determining their relative amounts with an objective of producing a concrete of required strength, durability, and workability as economically as possible is termed as concrete mix design.Self – compacting concrete (SCC) is a high – performance concrete that can flow under its own weight to completely fill the form work and self-consolidates without any mechanical vibration. Such concrete accelerate the placement, reduce the labor requirements needed for consolidation, finishing and eliminate environmental pollution. Therefore in first generation SCC is used mainly for repair application and for casting concrete in restricted areas, including sections that present limited access to vibrate. Such value added construction material has been used in applications justifying the higher material and quality control cost when considering the simplified placement and handling requirements of the concrete.The successful production of self – compacting concrete (SCC) for use, is depended on arriving at an appropriate balance between the yield stress and the viscosity of the paste. Specially formulated high range water reducers are used to reduce the yield stress to point to allow the designed free flowing characteristics of the concrete. However, this alone may result in segregation if the viscosity of the paste is not sufficient to support the aggregate particles in suspension.High binder content typically includes substitutions of cement with 20 to 40% fly ash or GGBS and, in some cases low contents of micro silica employed. The cost of SCC can be reduced through the selection of adequate concrete - making materials and admixture constituents, including partial substitutions of cement and supplementary Cementations materials by readily available fillers. But the utilization of fly ash in concrete may increase the permeability of RCC structure and increase in wear & tear of top surface. Which may affect the condition of water and condition in shop floor in dust proof industries? And It is observant that with the use of large quantities of finer material (fine aggregate + cement + fly ash) the concrete is much stiff and requires more water for required workability. So here we design mix for M30 grade self-compacting concrete without fly ash or any filler materials. If we do not use fly ash or any filler material in SCC. It may increase the cost of concrete per cubic meter.***

I. INTRODUCTION

Self-compacting concrete (SCC) is an pioneering concrete that does not involve shuddering for insertion and compaction. It is able to gush under its own load, completely filling form work and achieve the full compaction, even in the occurrence of congested support. The hardened concrete is dense, uniform and has the same property and durability as standard vibrated concrete. Making concrete structure without compaction has been done in the past. Like placement of concrete underwater by the use of termie without compaction. Inaccessible areas were concreted using such techniques. The production of such mixes often used expensive admixtures and very large quantity of cement. But such concrete was generally of lower strength and difficult to obtain. This lead to the development of Self Compacting Concrete (SCC) whose concept was first initiated by Japan in the mid of 1980s. SCC is a high performance concrete that consolidates under its self-weight, and adequately fills all the voids without segregation, excessive bleeding or any other separation of materials, without the need of mechanical consolidation. The key properties of SCC are filling ability, passing ability and resistance to segregation. Filling ability helps SCC to flow through the formwork and completely fill all the spaces within it. Passing ability is the property by which it flows without any blocking. The benefit of resistance to segregation imparts the advantage to the concrete in maintaining a uniform composition hence the paste and the aggregate bind together. The application of SCC aims at obtaining a concrete of high performance, better and more reliable, improved durability, high strength and faster construction. For SCC it is generally important to use super plasticizers in order to obtain high mobility. Self-compacting concrete has been successfully used in Japan, Denmark, France, U.K., etc. It is widely been accepted because of its enhanced properties also it reduces noise pollution, saves time, labor and energy.

TABLE NO. 1: ACCEPTANCE CRITERIA FOR SCC:

S. No.	Method	Unit	Typical range of values	
			Min	Max
1.	Slump flow test	Mm	650	800
2.	T50cm slump flow	Sec	2	5
3.	V-funnel test	Sec	6	12
4.	V-funnel at T5minutes	Sec	6	15
5.	L-Box test	H2/H1	0.8	1.0

II. MATERIALS

CEMENT- Ordinary Portland cement of 53 grade from the local market was used and tested for physical and chemical properties as per IS: 4031 – 1988 and found to be conforming to various specifications as per IS: 12269-1987.

TABLE NO. 2: PROPERTIES OF CEMENT

Sr. No	Test of Cement	Results	IS Requirements
1	Consistency of Cement	30%	----
2	Initial setting time	35 min.	Minimum 30 minutes As per IS 4031-1968
3	Final setting time	300 min.	Maximum 600 minutes As per IS 4031-1968
4	Fineness	6%	Maximum 10% As per IS 269-1976
5	Soundness	1.05 mm	Up to 10.00 mm As per IS 12269-1987
6	Specific Gravity	3.01	3.15 As per IS 12269-1987
7	Compressive Strength (N/mm2)		As per IS 12269-1987
	3 Days	31.20	>27
	7 Days	42.70	>37
	28 Days	56.10	>53

FINE AGGREGATES: In the present investigation fine aggregate is natural sand from local market is used. The physical properties of fine aggregate like specific gravity, bulk density, gradation and fineness modulus are tested in accordance with IS: 383-1970& IS: 2386-3-1963.

TABLE NO. 3: PROPERTIES OF FINE AGGREGATES

Properties	Results
Fineness Modulus	2.72
Specific Gravity	2.61
Bulk Density:	
Loose	1585
Compact	1690
Grading	Zone-II as per IS: 383-1970

Coarse Aggregate: The crushed coarse aggregate of 12.5 mm maximum size semi-rounded obtained from the local crushing plant is used in the present study. The physical properties of coarse aggregate like specific gravity, bulk density, gradation and fineness modulus are tested in accordance with IS: 383-1970 & IS: 2386-3-1963.

TABLE NO. 4: PROPERTIES OF COARSE AGGREGATES

Properties	Results
Fineness Modulus	6.15
Specific Gravity	2.625
Bulk Density:	
Loose	1475
Compact	1690

Admixtures: The most important admixtures are the super plasticizers (high range water reducers), used with a water reduction greater than 20%. The use of a Viscosity Modifying Agent (VMA) gives more possibilities of controlling segregation when the amount of powder is limited. This admixture helps to provide very good homogeneity and reduces the tendency to segregation.

III. EXPERIMENTAL PROGRAM

To determine the proportion of mix design for M30 Grade of Self Compacting Concrete with Zone-2 Aggregate and Fly Ash with locally available material in Hisar, (Haryana).

- SLUMP FLOW &T50 TEST
- L-BOX TEST
- V-FUNNEL TEST AND V-FUNNEL TEST AT T5 MINUTES
- COMPRESSIVE TEST OF CONCRETE
- TENSILE STRENGTH OF CONCRETE

SLUMP FLOW &T50 TEST:

Slump flow is one of the most commonly used SCC tests at the current time. This test involves the use of slump cone used with conventional concretes as described in ASTM C 143(2002).The main difference between the slump flow test and ASTM C 143 is that the slump flow test measures the "spread" or "flow" of the concrete sample once the cone is lifted rather than the traditional "slump" (drop in height) of the concrete sample. The T50 test is determined during the slump flow test. It is simply the amount of time the concrete takes to flow to a diameter of 50 centimeters. Typically, slump flow values of approximately 600 to 750mm are within the acceptable range; acceptable T50 times range from 2 to 5sec. The water/cement ratio has been revised in each test 0.40, 0.39 & 0.38to increase the cement paste in concrete by reducing water cement ratio.

L-BOX TEST:

The L-box value is the ratio of levels of concrete at each end of the box after the test is complete at each end of the box after the test is complete. The L-box consists of a "chimney"section and a "Trough" section after the test is complete, the level of concrete in the chimney is recorded as H1, the level of concrete in the trough is recorded as H2.The L-box value (also referred to as the "L-box ratio", "blocking value", or "blocking ratio") is simply H2/H1.Typical acceptable values for the L-box value are in the range of 0.8 to 1.0.If the concrete was perfectly level after the test is complete, the L-box value would be equal to 1.0.Conversely, if the concrete was too stiff to flow to the end of the trough the L-box value would be equal to zero. The water/cement ratio has been revised in each test 0.40, 0.39 & 0.38 to increase the cement paste in concrete by reducing water cement ratio. Due to that the flow will be increased. As it allows us to increase the quantity of VMA as per cement ratio.

V-FUNNEL TEST AND V-FUNNEL TEST AT T5 MINUTES:

V-funnel test is used to determine the filling ability (flow ability) of the concrete with a maximum aggregate size of 20 mm. The funnel is filled with about 12 liters of concrete and

the time taken for it to flow through the apparatus is measured .After this the funnel can be refilled concrete and left for 5 minutes to settle .If the concrete shows segregation then the flow time will increase significantly.The water/cement ratio has been revised in each test 0.40, 0.39 & 0.38 to increase the cement paste in concrete by reducing water cement ratio. Due to that the flow will be increased. As it allows us to increase the quantity of "VMA" as per cement ratio.

COMPRESSIVE TEST OF CONCRETE:
Compressive strength of concrete is defined as the load, which causes the failure of a standard specimen. The test of compressive strength should be made on 150mm size cubes. Place the cube in the compression-testing machine. The green button is pressed to start the electric motor. When the load is applied gradually, the piston is lifted up along with the lower plate and thus the specimen application of the load should be 300 KN per minute and can be controlled by load rate control knob. Ultimate load is noted for each specimen. The release valve is operated and the piston is allowed to go down. The values are tabulated and calculations are done. Total 36 number cubes were tested in this job to find out the compressive strength of concrete M30 Grade. The compressive strength of cubes checked at 1 day, 3 days, 7 days & 28 days of curing.

TENSILE STRENGTH OF CONCRETE:
Standard beam test or modulus of rupture carried out on the beams of size (100mm×100mm×500mm), by considering the material to be homogeneous.The beam should be tested on a span of 400 mm for 100mm specimen by applying two equal loads placed at third points.To get these loads, a central point load is applied on a beam supported on steel rollers placed at third point. The rate of loading shall be 1.8 KN/minute for 100 mm specimens the load should be increased until the beam failed.Note the type of failure, appearance of fracture and fracture load.Total 18 number cubes were tested in this job to find out the tensile strength of concrete M30 Grade. The tensile strength of cubes checked at 7 days & 28 days of curing.

IV. TEST RESULTS

TABLE NO. 5: FLOW TEST OF FRESH CONCRETE

Trail mix	Slump Flow		V-Funnel		L-Box
	MM	T50(Sec)	T0(Sec)	T5(Sec)	H2/H1
1	670	5.0	11	13	0.80
2	675	4.5	10	12	0.82
3	685	3.5	8	9	0.84

TABLE NO. 6: COMPRESSIVE STRENGTH TEST OF CONCRETE CUBE

Trial Mix	Compressive Strength (N/mm2)			
	1 Days	3 Days	7 Days	28 Days
1	18.5	22.0	30.5	42.0
2	18.0	22.0	30.0	41.0
3	16.0	20.5	28.5	39.0

TABLE NO. 7: TENSILE STRENGTH TEST OF CONCRETE CUBE

Trial Mix	Tensile Strength (N/mm^2)	
	7 Days	28 Days
1	2.542	3.108
2	2.386	3.264
3	2.392	2.929

V. CONCLUSIONS

- The flow properties of concrete grade M30 get improved due to increase in cement paste.
- The compressive test shows we can make concrete without any filler material. But for that special percussion to be taken for curing.
- We cannot use this concrete in dense concrete structure. Because lot of heat of hydration generate in concrete. Due to that cracks may develop in structure.
- Overall cost of concrete will be increased by using this method (without any filler material). But it will be safe for water holding structure & for industrial floor. Where dust proof area required.
- The rheological characteristics of the mix design, on the proposed method, are found to satisfy the EFNARC requirements.

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