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Evaluation of Strength Studies on Self Compacting Concrete by using Foundry Sand and Hybrid Fibres

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Abstract : Self-compacting concrete (SCC) can be defined as a fresh concrete which possesses superior flow ability under maintained stability (i.e. no segregation) thus allowing self-compaction that is, material consolidation without addition of energy. Self-compacting concrete is a fluid mixture suitable for placing in structures with congested reinforcement without vibration and it helps in achieving higher quality of surface finishes the relative proportions of key. Percentage weight of total coarse aggregate. The properties of different constituent materials used in this investigation and its standard tests procedures for acceptance characteristics of self-compacting concrete.
Growth and development of SCC is really a desirable achievement within the construction industry to be able to overcome problems connected with cast-in-place concrete. SCC describes a concrete having the ability to compact itself only by way of its own weight without the advantage of vibration. SCC may lead to some significant improvement of the standard of concrete structures and open new fields for the use of concrete. Self-compacting concrete is placed or poured in the same way as ordinary concrete but without vibration. It is very fluid and can pass around obstructions and fill all the nooks and corners without the risk of either mortar or other ingredients of concrete separating out, at the same time there are no entrapped air or rock pockets. Concrete that segregates loses strength and results in honeycombed areas next to the formwork.

Introduction

General

Self-compacting concrete (SCC) can be defined as a fresh concrete which possesses superior flow ability under maintained stability (i.e. no segregation) thus allowing self-compaction that is, material consolidation without addition of energy. Self-compacting concrete is a fluid mixture suitable for placing in structures with congested reinforcement without vibration and it helps in achieving higher quality of surface finishes the relative proportions of key. Percentage weight of total coarse aggregate. The properties of different constituent materials used in this investigation and its standard tests procedures for acceptance characteristics of self-compacting concrete.

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very fluid and can pass around obstructions and fill all the nooks and corners without the risk of either mortar or other ingredients of concrete separating out, at the same time there ano entrapped air or rock pockets.

This type of concrete mixture does not require any compaction and is saves time, labor and energy.. A well designed SCC mix does not segregate, has high deformability and excellent stability characteristics.

Fiber reiinforced self-compacting concrete

Fiber reinforced concrete (FRC) can be explained as a concrete that contains spread at random oriented materials. FRP contains fibrous materials which increase its structural integrity. Normal concrete is brittle under tensile loading and mechanical characteristics of concrete might be enhanced by at random oriented discrete materials which prevent or control initiation, propagation or coalescences of crack. FRC is extremely cement based composite material strengthened with discrete, usually at random distributed fibers. Fibers of numerous shapes and dimensions created from steel, synthetic, glass and natural materials can be used.

Characteristics of scc

a) **Fillingability**: The ability of SCC to flow into and fill completely all spaces within the formwork, under its own weight, maintaining homogeneity in both vertical and horizontal directions are essential.

b) **Passing ability**: SCC is passing through congested areas of formwork even closely spaced reinforcement without blocking caused by interlocking or segregation.

c**) Resistance to segregation**: The mix has to maintain homogeneity throughout mixing, transporting and casting. The dynamic stability refers to the resistances to segregation during placement. The static stability refers to resistance to bleeding, segregation and surface settlement after casting.

Materials used

Cement

Ordinary Portland cement of 53 grade conforming to Indian Standard IS 12269-1987 was used in the experimental program.

Fine aggregate

Fine aggregate (sand) used for this entire investigation for concrete was river sand conforming to zone-II of IS 383- 1970 and it was well graded, passing through 4.75mm sieve. The sand was air dried and sieved to remove any foreign material, prior to mixing.

Coarse aggregate

SCC can be made from the most normal concreting aggregates. Coarse aggregates differ in nature and shape depending on their extraction and production .SCC has been produced successfully with coarse aggregates upto 40 mm, however these trials are made keeping maximum aggregate size of 12 mm

Foundry sand

Foundry sand is a byproduct of ferrous and non-ferrous metal casting industries. Foundries successfully recycle and reuse the sand many times in the foundry. Classification of foundry sands depends upon the type of binder systems used in metal casting

Water

The water is used in concrete plays an important part in the mixing, laying compaction setting and hardening of concrete. The strength of concrete directly depends on the quantity and quality of water is used in the mix.

Coconut fibres

Coconut fibres obtained from coconut husk, belonging to the family of palm fibres, are agricultural waste products obtained in the processing of coconut oil, and are available in large quantities in the tropical regions of the world, most especially in Africa, Asia and southern America. Coconut fibre has been used to enhance concrete and mortar, and has proven to improve the toughness of the concrete and mortar.

Steel fibres

The most common uses for stainless steel fibers is in the field of the electrical and textiles industry such as anti-radiation cloth, thermal resistant fabric, and anti-static brushes, variety, stainless steel yarns are twisted with other fibers.

Viscocrete- 20 he

Viscocrete-20 HE is a third generation super-plasticizer for concrete and mortar. The product is suitable for tropical and hot climatic conditions. It is a light brownish color liquid. Viscocrete-20 HE is especially suitable for the production of concrete mixes which require high early strength development, powerful water reduction and excellent flow ability.

Mix proportion

Mix Design is defined as the process of selecting suitable ingradients of concrete and determining the relative proportions with the objective of producing concrete of a fixed minimum strength and durability as economically as possible. The mix composition is chosen to satisfy all performance criteria for the concrete in both fresh and hardened state. However, to obtain the required properties of fresh concrete in SCC,a higher prop

Result and discussions

Compressive strength test

SI. NO.	Replacement of foundry sand	Steel fibre content	coconut fibre content	7^{th} day	28^{th} day
				N/mm2	N/mm2
1	Nominal	-	-	14.22	24.44
2	10%	0.5%	0.50%	16.88	32.88
3	10%	1.00%	1%	40	38.67
4	10%	1.50%	1.50%	35.55	42.66

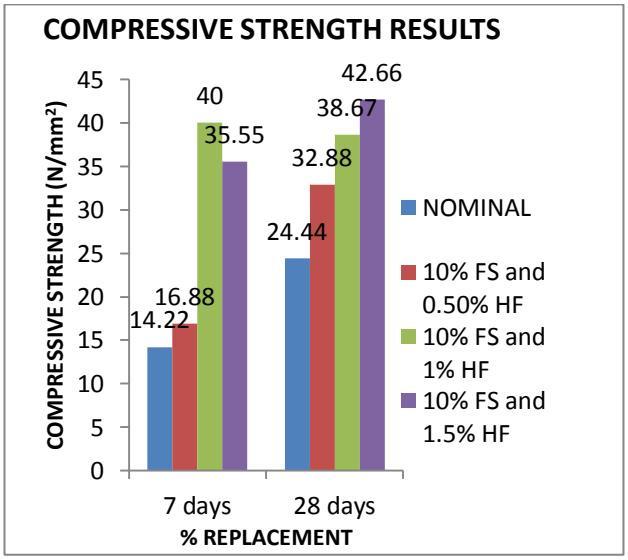

Fig:1 graph showing compressive strength

Splite tensile strength

SI. NO.	Replacement of foundry sand	Steel fibre content	coconut fibre content	7th day	28th day
				N/mm2	N/mm2
1	Nominal	-	-	2.63	3.45
2	10%	0.5%	0.50%	2.87	4.01
3	10%	1.0%	1%	4.42	4.35
4	10%	1.5%	1.50%	4.17	4.57

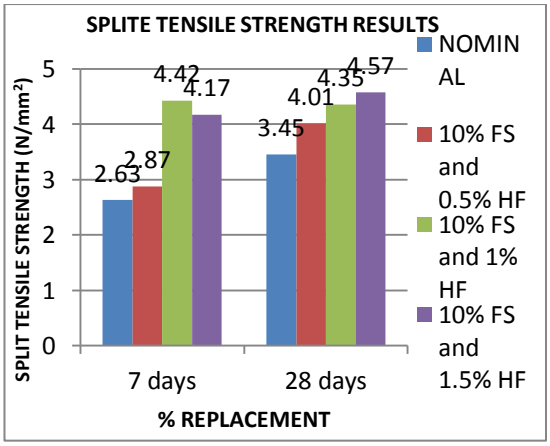

Fig:2 graph showing splite tensile strength

Flexural strength

Sl:no	Replacement of foundry sand	Steel fibre	coconut fibre	7th day	28th day
				N/mm2	N/mm2
1	Nominal	-	-	1.50	1.97
2	10%	1%	0.50%	1.64	2.29
3	10%	1.00%	1%	2.52	2.48
4	10%	1.50%	1.50%	2.38	2.70

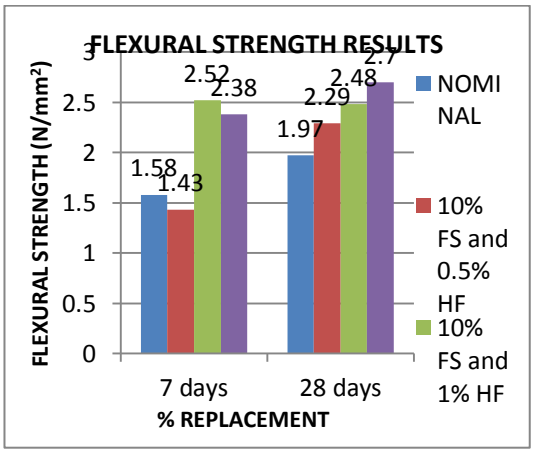

Fig:3 graph showing flexural strength

Conclusion

Maximum strength was achieved with replacement of 10% fine aggregate with foundry sand and 1% hybrid fibres.

1. Maximum compressive strength was achieved with replacement of 10% fine aggregate with foundry sand and 1% hybrid fibres.
2. Maximum increase in Flexural strength was observed at 10% replacement of fine aggregate with foundry sand and 1.5 % hybrid fibres.
3. Maximum increase in splitting tensile strength was observed at 10% replacement of fine aggregate with foundry sand and 1.5% hybrid fibreortion of ultrafine materials and the incorporation of chemical admixture are necessary.

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