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A Review on Self Compacting Concrete

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Abstract: Self-compacting concrete was first developed by okamura in japan in 1980 to achieve durable concrete structures. Important study on self-compacting concrete with consider to identification of mix proportions. The paper mainly focuses on the mix proportions by partial replacement of cement and fine aggregate by various eco-friendly materials and to critically review the mechanical properties of self compacting concrete. It was observed that fine materials improve the properties of self compacting concrete at low water cement ratio and addition of super plasticizer.
Keywords : self compacting, concrete, plasticizers.

I. INTRODUCTION

Self-compacting concrete was first developed by in 1980 to achieve durable concrete structures Concrete is one of the imperative components for any class of construction work. For the most part, concrete is compacted by a vibrator or steel bar subsequent to being set inside the formwork to expel the ensnared air after which it turns into a dense and homogeneous material Compaction is critical part of manufacturing a concrete and it is to produce a uniform concrete mix with required quality and strength properties. Self-compacting concrete (SCC) have high flexibility their execution that allows concrete to be put in entangle shapes with no strain vibration. Super plasticizers and different added substances are utilized creation of SCC; super plasticizers affect high ease and prevent segregation,. Additionally, the utilization of self-compacting concrete in development decreases the accomplishment time at 40% contrasted with typical cement.

II. MATERIALS

The Materials used in SCC are the same as in conventional concrete except that an excess of fine material and chemical admixtures are used. Also chemical additive will be required because minor variations in the quantity of water or in the proportions of aggregate and sand will make the SCC unstable, that is, water or slurry may separate from the remaining material. The powdered & materials pozzolanic materials helps the SCC to flow better and it is also react in SSC To achieve more durable concrete. SCC is designed with limits on the nominal maximum size (NMS) of the aggregate, the amount of aggregate, and aggregate grading. However, when the workability is high, the potential for segregation and loss of entrained air voids increases. Following are bases which are commonly used as super plasticizers.

A. Sulfonated Naphthalene Formaldehyde(SNF)
B. Acrylic Polymer based(AP)
C. Coplymer of Carboxilic Acrylic Acid with Acrylic Ester(CAE
D. Cross Linked Acrylic Ploymer(CLAP
E. Polycarboxylatethers(PCE
F. Multicarboxylatethers(MCE
G. Polyacrylates

Combination of above different bases of New Generation super Plasticizers or High Water reducing agents(HRWRA) have different water reduction capacities. The advantage of this water reduction can be taken either to increase the strength as in high strength concrete or to obtain a better Flow ability as in case of self compacting concrete.

III. PRODUCTION OF SCC

Based on the original conception of Okamura and Ozawa, in general three types of SCC can be distinguished:

A. Powder Type Self Compacting Concrete

This is proportion to give the required self compatibility by reducing by reducing the water-powder (material<0.1mm) ratio and

provide adequate segregation resistance.

B. Viscosity Agent Type Self-Compacting Concrete

This type is proportioned to provide self compaction by the use of a viscosity modifying admixture to provide segregation resistance. Some additive are used for obtaining the desired deformability.

C. Combination Type Self-Compacting Concrete

This type is proportioned so as to obtain self compatibility mainly by reducing the water powder ratio, as in the powder type, and a viscosity modifying admixture is added to reduce the quality of fluctuation of the fresh concrete due to the variation of the surface moisture content of the aggregates and their gradations during the production .This facilitates the production control of the concrete.

V. PROPERTIES OF SCC

Hardened properties of SCC Development of solid quality with time: The compressive quality, as a standout amongst the most vital properties of Hardened concrete, when all is said in done is the trademark material incentive for the characterization of concrete in national and universal codes. At the present time there is research to result in generalized conclusions with this reality..The comparison of hardening processes shows that the strength development of SCC and conventional concrete is similar. For young SCC aged up to 7 days the relative compressive strength spreads to a greater extend as given in the CEB-FIB Model Code 90, whereas higher values as well as lower ones are reached. Especially if limestone powder is used higher compressive strengths are noticeable at the beginning of the hardening process. Modulus of elasticity: As it is known, the modulus of elasticity of concrete depends on the proportion of the Young´s moduli of the individual components and their percentages by volume. A relative small modulus of elasticity can be expected, because of the high content of ultrafine and additives as dominating factors and, accordingly, minor occurrence of coarse and stiff aggregates at SCC.

A. Advantages of Self-Compacting Concrete

1) Improve the quality of concrete effectively: good mechanical performance, density and durability;
2) Use industrial wastes as admixture, it's favorable for environmental protection;
3) Save electric energy;
4) Reduce environmental noise, improve the working environment and safety;
5) Greatly reduced the labor;
6) A high degree of automation of the construction, improve production efficiency, shorten the construction period;
7) Solve the vibration problems of traditional concrete construction , ensure that the embedded parts, reinforced, pre-stressed hole position do not shift in vibration;
8) Increase the freedom of the structure design.

B. Advantages of SCC for Contractor

1) More homogeneous concrete surfaces result in reduced cost .
2) Very suitable for repair jobs, are they small or large scale
3) SCC is very use full in ready mix concrete.
4) See allows more economic production processes.
5) No vibration work.
6) Higher speed of cement putting.
7) Less completing work required, particularly for chunks.
8) Equipment (e.g. cranes, pumps and) required for a shorter timeframe
9) Less labor required.
10) Placing issues brought on by overwhelming and thick fortification are diminished.

C. Advantages of SCC for Specifiers and their Clients

1) Less noise can extend working hours in densely populated areas.
2) Very smooth floor slabs can make tiling possible without installing a screed.
3) Durability of the structure can be improved because of reduced damages and more homogeneous concrete cover
4) Vibration and compacting is no longer a design criteria.

D. Limitations of SCC

1) The development of a SCC requires a large number of a trial batches.
2) Slump changes with time: self-compacting concrete slump losses larger than other types of concrete as the change of time, high efficiency water reducing agent is used in engineering to solve this problem
3) Self-consolidating concrete is required to flow and fill special forms under its own weight, it shall be flowable enough to pass through highly reinforced areas, and must be able to avoid aggregate segregation
4) Self-compacting concrete with a similar water cement or cement binder ratio will usually have a slightly higher strength compared with traditional vibrated concrete, due to the lack of vibration giving an improved interface between the aggregate and hardened paste.

E. Application

1) *Current Condition on Application of Self-Compacting Concrete in Japan:*
After the development of the prototype of self-compacting concrete at the University of Tokyo, intensive research was begun in many places, especially in the research institutes of large construction companies.. The first application of self-compacting concrete was in a building in June 1990.

VI. CONCLUSION

It is viewed as that the fundamental obstructions for making self-compacting concrete broadly utilized have been understood. SCC is produced using the conventional concrete ingredients, which are practically same utilized as a part of producing in conventional concrete.

Properties of fresh and hardened SCC should be established in the laboratory before their use in the field. Even though the initial cost of SCC is comparatively higher than the conventional concrete. Considering the long service of the structure, minimum maintenance, labor cost, and cost due to the vibrators required, benefit cost ratio is very much in help in case of SCC. The learning of SCC has moved from area of research to application But in India, this knowledge is to be widespread.

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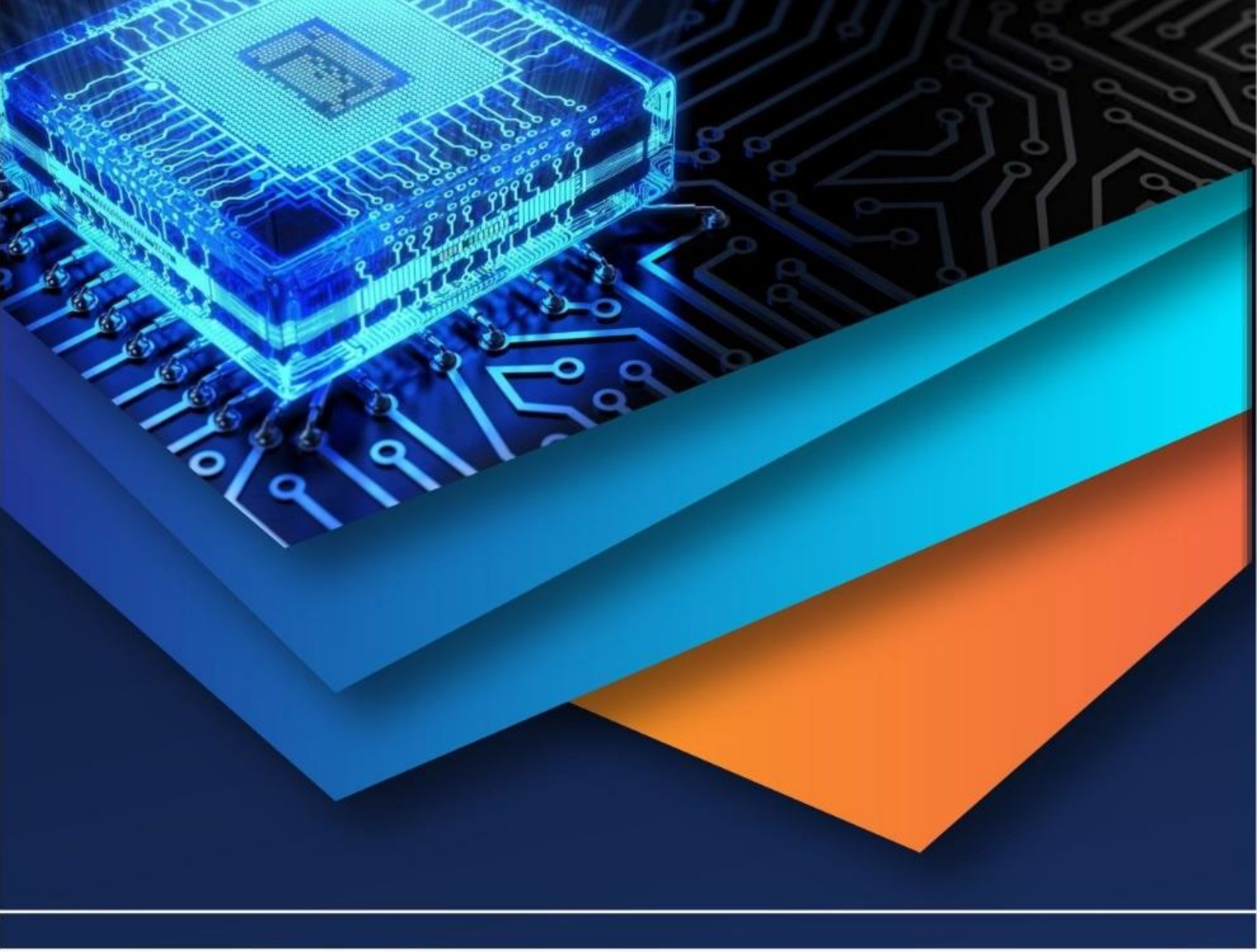

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