"SELF COMPACTING CONCRETE : A ECO-NOMIC CONCRETE OF NEXT DECADE"

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Abstract

Self-compacting concrete (SCC) is a modern concrete that does not require vibration for placing and compaction. It is able to flow under its own weight, completely filling formwork and gain full compaction, even in the presence of engorged reinforcement. The hardened concrete is obtuse, homogeneous and has the same engineering properties and durability as traditional vibrated concrete. Complex shape of concrete structures and densely arranged bars make it more difficult to use a vibrator. Vibratory compaction is noisy and hurtful to the health of construction workers, as well as an irritation to people in the neighborhood. In remote areas it is difficult to find able workers to carry out the compacting work at construction sites. The hardened properties like compressive strength, split tensile strength, flexural strength and impact strength are found in experimental work and are compared with M25 grade of concrete. In the present context the Self Compacting Concrete can be proved as blessing to construction industry, Due to industrialization there is a huge quantity of red mud, rice husk ash created. Red clay and rice husk ash is an industrial waste, causing threat to environment. This paper based on experimentation describes the use of Red Mud and rice husk ash for construction work, through modified Self Compacting Concrete. Some percentage of cement has been replaced by Red Mud and rice husk ash in the concrete.

Keywords

Self-compacting concrete, industrial waste, modified concrete fly ash; super plasticizer, compressive strength. Split tensile strength , flexural strength and impact strength

Introduction-

The Self Compacting Concrete is an advanced concrete that does not require vibration for placing and compaction. It is able to flow under its own weight, completely filling formwork and gaining full compaction, even in the presence of dense reinforcement. The hardened concrete is dense, homogeneous and has the same engineering properties and strength as traditional vibrated concrete.It is environmental-friendly, as industrial wastes are used and concreting is noise-free. It Reduced equipment costs as no vibration are required. It reduced manpower (example- against 150 nos. for normal concreting, 50 nos. for SCC were used in one of the sites.).Shortened construction time (Eg-Against 15 hrs. for normal concreting, 11hrs. For SCC.). Early strength gain. Reduced formwork costs as no. of repetitive uses with SCC are more than with normal concrete (50% roughly more.). congested reinforcement possible. More innovative design, more complex shape, thinner section, etc are possible. Reduced bleeding, proper compaction even in congested areas, no honeycombing etc. Safe working environment is possible due to the elimination of manual labour (vibrating operator, mason etc.) for compaction and finishing works. Fewer defects and hence reduced remedial work. Improved durability. Easier placing, better surface finishing. Decreased Permeability: Increased density and long term pozzolanic action of fly ash, which ties up free lime, results in fewer bleed channels and decreases permeability. Increased Durability: Dense fly ash concrete helps keep aggressive compounds on the surface, where destructive action is lessened. Fly ash concrete is also more resistant to attack by sulfate, mild acid, soft (lime hungry) water, and seawater. Reduced Sulfate Attack: Fly ash ties up free lime that can combine with sulfate to create destructive expansion. Reduced Shrinkage: The largest contributor to drying shrinkage is water content. The lubricating action of fly ash reduces water content and drying shrinkage.

Literature Review-

[N R Gaywala and D B Raijiwala 2013]- The maximum compressive strength for self compacting concrete can be obtained by addition of 15% of fly ash in mix as compared to addition of 25%, 35%, 45% and 55% cement replacement by fly ash. M25 grade of concrete and Mix-3 (35% fly ash) compressive strength, tensile strength, flexural strength and pull out strength result are nearer so in construction of heavily congested reinforcement structures and high rise buildings, this mix proportion can be adopted.

[K.S. Johnsirani, Dr. A. Jagannathan, R. Dinesh Kumar 2013]-

The results of the hardened properties of SCC such as compressive strength and split tension strength had shown that the higher strength has been obtained for SCC_25% mix of about 34.62 Mpa and 2.36 Mpa respectively. While fine aggregate replacement of quarry dust increases with the gradual decreases in the strength values after replacement of 25% of quarry dust. In the case of 100% replacement of quarry dust there will be highly decrease in the compressive strength of cube and split tensile strength of cylinder.

[Prof. Aijaz Ahmad Zende , Dr R. B. Khadirnaikar 2014]- Particularly in India, the use of Self-compacting concrete for routine construction is not much because of the lack of awareness while in countries like Canada apart from Japan, SCC is used for the routine construction and with research data available, an awareness can be spread in order to utilize the various benefits of this material. It is not fully clear whether existing design codes for structural concrete can be practical in case of self-compacting concrete. Use of viscosity modifying agents along with high-range water reducing agent are very essential for flowability and segregation control. A better understanding of the rheology of SCC has made it easier to know the functions of fines, superplasticizers, and VMA in SCC, and the compatibility between these and gives the designers a clear understanding of the mechanical properties including stress strain characteristics of SCC in its hardened state. No standard codes are available for the mix design of self compacting concrete apart from few methods developed by the researchers and many institutions, RMC, companies are using their own methods with one or other limitations. Thus some generalized method can be developed taking into the consideration all the aspects.

[Rajdip Paul and Debashis Bhattacharya2015]- In this paper author found and concluded that in spite of its short history, self compacting (or –consolidating) concrete has confirmed itself as a revolutionary step forward in concrete technology. It can be shown by cost analysis, that SCC in precast concrete plants can be more economically produced than conventional concretes, in spite of the slightly higher material price. Cost comparisons should always be made on the basis of integral costs. The most important task for research is to develop SCC's with decreased sensitivity to variations in constituents and environmental influences. This holds particularly true for in-situ concrete's, with medium and low strengths.

[Ashok Kumar Yadav and Vikas Singh 2015]-
It has been observed that the compressive strength of self-compacting concrete produced with the combination of admixtures such as (SP+VMA) goes on increasing up to 2% addition of red mud. After 2% addition of red, the compressive strength starts decreasing compacting is the compressive strength of self-compacting concrete produced with (SP+VMA) is maximum when 2% red mud is added. The percentage increase in compressive strength at 2% addition of red mud is + 9.11 thus, it is observed that maximum compressive strength of self-compacting with the combination of admixtures (SP+VMA) may be obtained by adding 2% red mud. The compressive strength of concrete increases with the addition of Red Mud up to 2% then reduces and comes to no increase at almost 4% addition. So it can be concluded that an addition of 4% Red Mud may be made to SCC without any loss to its compressive strength.
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[Arulsivanantham. P, Gokulan R 2017]- Self Compacting Concrete (SCC) can save time, cost, enhance quality, durability and moreover it is a green concept.
1.Due to its ability to guide itself into every nook and cranny in the form, SCC can produce nearly nil defects concrete. Number of pouring points can be reduced, thus eliminating the cumbersome activity of pipe laying over the pour.
2.About 40 to 50% of cement content can be replaced by materials like fibers; cost of the concrete is greatly reduced. The number of skilled supervisors, engineers, vibrator operators and pipe fitters can drastically be reduced. Formwork can be used for more number of times. Cost of repairing the structure is reduced as the numbers of defects are reduced to a great extent.
3.Since the concrete is capable of self-consolidating and reaching the difficult areas in moulds, manual variables in terms of placing and compacting concrete is nil. This factor ultimately yields defect less, better- quality concrete structures.

Conclusion- SCC gives good finishing as compared to ordinary concrete without any external mean of compaction. The maximum flexural strength for self compacting concrete can be obtained by addition of 15% of fly ash in mix as compared to addition of 25%, 35%, 45% and 55% cement replacement by fly ash.The maximum pull out strength for self compacting concrete can be obtained by addition of 15% of fly ash in mix as compared to addition of 25%, 35%, 45% and 55% cement replacement by fly ash. The maximum compressive strength for self compacting concrete can be obtained by addition of 15% of fly ash in mix as compared to addition of 25%, 35%, 45% and 55% cement replacement by fly ash. The maximum tensile strength for self compacting concrete can be obtained by addition of 15% of fly ash in mix as compared to addition of 25%, 35%, 45% and 55% cement replacement by fly ash.

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