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(57) Abstract :
A self-compaction concrete (SCC) is a special concrete developed to easily flow and pass through reinforcement and fill the formwork without any external force. And saves time, energy and cost of construction. In this study we have conducted test on workability of SCC and various components of concrete matrix such as cement, coarse aggregate, fine aggregate, water and chemical admixtures and found appropriate results of our project. SCC is more efficient in flow ability and fills the formwork without any external forces and provides flexibility to design and cast a structure with different shapes. This project study contributes to the comparing and understanding of properties of nominal a self-compaction concrete with various mix proportions. We have conducted various workability tests like Flow table test, slump cone test, J-ring test, L-Box test, U-Box test, Vfunnel test in our laboratory to determine the difference between the nominal and c self-compaction concrete. We have also conducted SEM analysis on cement and Nano silica particles used in the project.

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FORM - 2

THE PATENTS ACT, 1970

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THE PATENTS RULES, 2003

COMPLETE SPECIFICATION

(Section 10; rule 13)

Investigational study on workability of self-compaction concrete

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The following specification particularly describes the invention and the manner in which it is to be performed:

Investigational study on workability of self-compaction concrete

Field and background of the invention

Self-compacting concrete (SCC) 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 achieving full compaction, even in the presence of congested reinforcement. The hardened concrete is dense, homogeneous and has the same engineering properties and durability as old-style vibrated concrete. The segregation of vibrating equipment improves the environment on and near construction and precast sites where concrete is being placed, reducing the exposure of workers to noise and vibration. SCC is still not widely used in India in spite of its several advantages including discount in labor and fast track construction etc. This is because of lack of sufficient data and evidence on SCC made of materials available in the different parts of the country and hence insufficient certainty of engineers in producing this material. India devours overflowing supply of fly ash, with its sources well distributed across the country. SCC generally holds a high powder content which keeps the concrete cohesive with high flow ability. This high powder satisfied is required to maintain a sufficient yield value of the fresh mix and cement cannot be the only powder material in SCC. For achieving economy, a extensive part of this powder could also contain fly ash. SCC can quarter more than 200 kg/m3 of fly ash which is observed as a high-volume addition. Hence it is careful worthwhile to examine the influence of fly ash in SCC. Concrete usually has unique and complicated microstructure which makes it hard to observe and explore the presence of mineral. Replacement of concrete ingredients alters the concrete microstructure and mechanical properties of concrete. However, there may be some imperfection and failure due to replacement of major concrete ingredients. Analysis of microstructure of concrete is the modern approach to examine the mineral composition in the concrete. X- ray Diffraction Analysis, Scanning Electron Microscope and Energy Dispersive Spectroscopy analysis are some of the contemporary techniques used for phase identification, micrograph and chemical characterisation of the unknown elements in the hydrated cement paste of concrete. The outcome from the micro structural study of concrete would give a clear idea about the development and distribution of hydration products in the hydrated cement paste obtained from the concrete sample. In this research paper, the sustainability of concrete was studied and analysed through Scanning Electron Microscope. The comparison between the compressive strength of the mixes were analysed and correlated with the microstructure of the concrete mixes. The microstructure of the concrete mixes were analysed using Scanning Electron Microscope (SEM) which practically helps to visualize the microstructure of the hydrated cement paste. The objective of this study is to experimentally analyse and study the strength and micro structural behavior of sustainable High performance concrete by replacing the concrete elements with alternative cost effective by-products.

MATERIALS USED:

Cement Cement is such a material that has cohesive and paste properties in the presence of water such cement is called hydraulic cement. These involve introductory of silicates and aluminates of lime obtained from limestone and clay. In this experiment 53 grade ordinary Portland cement (OPC) with brand name Jaypee cement was used for all SCC mixes. The cement used was replacement and without any bumps, the testing of cement was done as per IS: 8112-1989. Fine aggregates The sand used in this present study is collected from the bed of river Tungabhadra the sand passing through 4.75 mm size sieve is used in the preparation of concrete mix. The sand confirms to grading Zone II as per IS: 383- 1970 (Reiterated 1997). The properties of sand such as fineness modulus and specific gravity remained resolute as per IS: 2386-1963. The specific gravity of fine aggregate is originate to be 2.64 and consuming fineness modulus 2.62. The water absorption is 1.5%. The bulk density of fine aggregate in compact state 1768 kg/m3 . Properties of fine aggregate Properties Fine aggregate Bulk Density 1670 kg/m3 Specific Gravity 2.74 Water Absorption 1.29 Fineness modulus 2.42 Coarse aggregate The coarse aggregate used in this present education is 12mm (40%) & 16mm (60%) down size graded confirm to IS 383- 1970 (Reaffirmed 1997) locally available crushed stone gained from local quarries. The physical properties have been determined. The specific gravity of coarse aggregate is found to be 2.65. The water absorption is 0.3%. The bulk density of coarse aggregate in compact state is 1584kg/m3. Physical Properties of Coarse aggregate Properties Coarse aggregate Specific Gravity 2.649 Bulk Density 1670 Water Absorption 0.78% Impact Value 24.3 % Fineness modulus 6.5 Water The water used in the mixing of concrete was potable water and its free from organic content, turbidity and salts confirms to IS 456-2000 was used for mixing and for curing throughout the experiment program. Super plasticizer As the locally available PCE based super plasticizers proved to be very effective in SCC; this study is carried out using such type of super plasticizers. CONPLAST SP430 Commercially available poly- carboxylic ether based super plasticizer it is an admixture of a new generation based on modified polycarboxylic ether. Conplast SP430 is a super plasticizer manufactured by Dom Constructive Solutions, was used in this experimentation. Its use enhances the workability of the mix and strength aspect, helps in producing a better compaction and finishing. It also permits reduction in water content. Conplast SP430 High performance superplasticising admixture Description Conplast SP430 is a chloride free, superplasticising admixture based on selected sulphurated naphthalene polymers. It is supplied as a brown solution which instantaneously separates in water. Conplast SP430 disperses the fine particles in the concrete mix, permitting the water content of the concrete to perform more successfully. The very high levels of water lessening imaginable allow foremost increases in strength to be obtained. Typical dosage of Conplast SP430 The optimum dosage of Conplast SP430 to meet specific requirements should always be determined by trials using the materials and conditions that will be experienced in use. This allows the optimization of admixture dosage and mix design and provides a complete assessment of the concrete mix. Preliminary points for such trials, based on the primary use of the product, are to use a dosage within the normal typical ranges. For high strength, water reduced concrete the normal dosage range is from 0.70 to 2.00 liters/100 kg of cementitious material, including PFA, GGBFS and micro silica. For high workability concrete the normal dosage range is from 0.70 to 1.30 liters/100 kg of cementitious material. Where a combination of performance is required, such as some increase in workability combined with reduced water content, then the whole range of dosages from 0.70 to 2.00 liters/100 kg of cementitious quantifiable can be considered. Mix design Conplast SP430 Where the primary intention is to improve strengths, initial trials should be made with normal concrete mix designs. The addition of the admixture will allow the removal of water from the mix whilst maintaining the workability at the levels obtained before the use of the admixture. After initial trials, trivial modifications to the overall mix design may be made to optimise performance. Where the primary intention is to provide high workability concrete, the starting mix design should be one right for use as a pump mix. Advice on mix design for flowing concrete is existing from the Fosroc Customer Service Department. In correctly considered flowing concrete, the amended dispersion of the cement particles and the more competent use of mixing water will improve assortment cohesion. The 13 slight air entrainment obtained with Conplast SP430 will also help to minimise bleed and segregation. After early trials, minor adjustments to the mix design may be made to adjust performance. Compatibility Conplast SP430 Conplast SP430 is compatible with other Fosroc admixtures used in the same concrete mix. All admixtures should be extra to the concrete discretely and must not be diverse together prior to addition. The significant proper- ties of concrete encompassing more than one admixture should be evaluated by the trial mix technique suggested on this data sheet to ensure that effects such by way of undesirable impedance do not occur. Conplast SP430 is suitable for use with all types of ordinary Portland cements and cement replacement resources such as PFA, GGBFS and silica fume

Uses of conplast SP430

• To provide excellent acceleration of strength gain at early ages and major increases in asset at all ages by knowingly tumbling water demand in a concrete mix.

• Predominantly suitable for precast concrete and other high primary strength necessities.

• To significantly expand the workability of site mixed and precast concrete without growing water demand.

• To provide improved durability by swelling ultimate strengths and plummeting concrete permeability

• In screeds it reduces the water content required to elasticity suitable workability for placing and compaction. Advantages of conplast SP430

• Major increases in strength at early ages without increased cement contents are of particular benefit in precast concrete, agreeing earlier disrobing times.

• Makes possible major reductions in water: cement ratio which allow the creation of high strength concrete without excessive cement fillings

• Use in making of flowing existing permits easier construction with quicker placing and compaction and summary labor costs without increasing water contented.

• Increased workability levels are maintained for longer than with ordinary sulphurated melamine admixtures.

• Improved interconnection and particle dispersion minimises segregation and bleeding and expands propel ability

• Chloride free, safe for use in prestressed and reinforced existing.

• In screed material, the lower water contented leads to nearer drying times

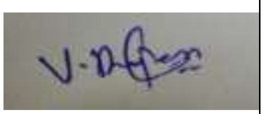
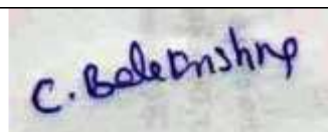
Compressive strength is the ability of the material or structure to carry the loads on its surface with out any crack or deflection. A material under compression inclines to reduce the size, while in tension, its size gets stretches. Compression strength test is carried on cube or cylinder as the ordinary specimen of the test. This test is often restrained on a universal testing machine. The compressive strength was conducted as per IS 516 (1959). The concrete was mixed and casted in 100 x100x 100 mm3 cube mould. The casted cube mould was compacted by vibration process for 1 minute. Then, the casted cubes are allowed to set for 24 hrs under room temperature. After 24 hours, the casted cube moulds are removed and submerged in to the water bath. After 28 days curing, the cube samples are taken out from the water bath and tested form compressive strength in Compression Testing Machine Assessment of test The compression strength is used to determine the hardness of cubical specimen of concrete. Concrete specimen strength depends upon cement, aggregate, bond, W/C ratio, curing temperature and size of specimen. The compression strength is calculated by dividing the maximum load attained during the test by the cross-sectional area of the specimen. formula Compressive strength = (P/A) (N/mm2) • Weighing device • Tools and containers for mixing • Tamper (16 mm diameter & 600 mm height) • Testing machine • Three cubes (150 mm side) Procedure for compression strength test Prepare a concrete mix with the proportions such as 1:1.5:3 with w/c =0.5 by means of the hand mixing. Prepare three testing cubes, they should be clean and oiled. Metal molds should be sealed to their base plates to prevent loss of water. Fill the concrete in the cubes in three layers, tamping each layer of 35 blows with the help of tamper. Fill the molds completely, make the top evenly and cleanup of the real outside the cubes. Leave the specimen in the curing room for 24 hours. After that open the molds besides immerse the concrete cubes in a water basin for 7,14&28 days. Before testing check the testing, machine bearing surfaces are wiped clean. Carefully center the cube on the lower platen and ensure that the load will be applied to two opposite cast faces of the cube. Without shock, apply and increase the load continuously at a normal rate within the range of (0.2 N /mm 2.s to 0.4 N/mm 2.s) until no greater load can be sustained. Compressive strength = (P/A) (N/mm2) Where P=Applied load(N) A=Area of the specimen (mm 2) Compressive strength values for Nominal concrete Result for compression strength test Compression strength test of the concrete cube for 7 days is 14.20 (N/mm2) Compression strength test of the concrete cube for 28 days is 20.30(N/mm2)

Objective

When compared with normal concrete self compaction concrete shows a significant increase due to well compacted as density increases in concrete strength also increases. Self-compacting concrete (SCC) 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 achieving full compaction, even in the presence of congested reinforcement. The hardened concrete is dense, homogeneous and has the same engineering properties and durability as old-style vibrated concrete. The segregation of vibrating equipment improves the environment on and near construction and precast sites where concrete is being placed, reducing the exposure of workers to noise and vibration. SCC is still not widely used in India in spite of its several advantages including discount in labor and fast track construction etc. This is because of lack of sufficient data and evidence on SCC made of materials available in the different parts of the country and hence insufficient certainty of engineers in producing this material.

We Claim

1. We claim that from overall study, it is clear that the micro structural behaviour of concrete influences the strength characteristics of the mix. From the test results of compressive strength, it was observed that replacement of concrete ingredients fairly improves on the strength of concrete mixes.
2. We claim that in SEM Observations, the existence of mineral elements and their reactions with the supplementary materials are studied which gives an initiative to understand the microstructure of the concrete mixes. Based on the comparison of the microstructure of concrete mixes, it is clear that the hydration process in the mixes with supplementary materials was different from conventional concrete mix.
3. We claim that SCC is recommended in complicated frameworks which have narrow places and congested steel bars, because it can flow throw this places very smoothly and without vibration and give the best compaction and surface finishes.
4. We claim that trial and error method was been used to design the SCC mix because there is no standard method for SCC in any institutes and concrete mix plants.
5. We claim that SCC is recommended in high rise building because by using SCC the time for construction will be shorter and also the cost will be cheaper than using ordinary concrete.
6. We claim that SCC do not depend in a single test, but it depends in all of the four tests and it must pass all of them to be called Self compacting concrete.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	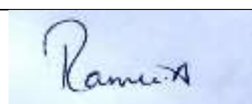	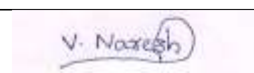	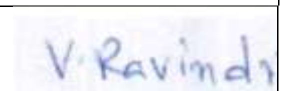
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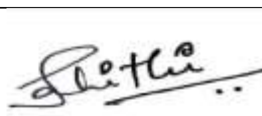			
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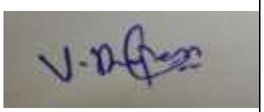
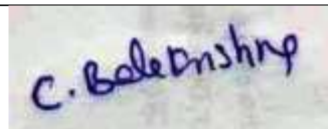
ABSTRACT
A self-compaction concrete (SCC) is a special concrete developed to easily flow and pass through reinforcement and fill the formwork without any external force. And saves time, energy and cost of construction. In this study we have conducted test on workability of SCC and various components of concrete matrix such as cement, coarse aggregate, fine aggregate, water and chemical admixtures and found appropriate results of our project. SCC is more efficient in flow ability and fills the formwork without any external forces and provides flexibility to design and cast a structure with different shapes. This project study contributes to the comparing and understanding of properties of nominal a self-compaction concrete with various mix proportions. We have conducted various workability tests like Flow table test, slump cone test, J-ring test, L-Box test, U-Box test, Vfunnel test in our laboratory to determine the difference between the nominal and c self-compaction concrete. We have also conducted SEM analysis on cement and Nano silica particles used in the project.

Keywords — Self-constricting, Matrix, Mix proportion, SEM analysis.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	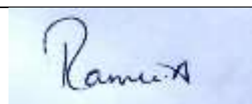	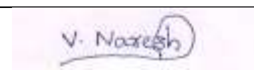	
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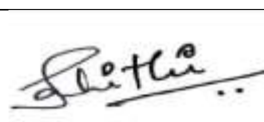			
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