Mix Grade Concrete by Using Admixture

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Abstract— This research focus on the efficient design and integration of underground utilities, specifically stormwater management and water supply systems, are critical components of modern urban infrastructure. As urbanization continues to accelerate, the proper management of these utilities becomes paramount to ensure sustainable and resilient urban environments. This master's thesis delves into the complicated area of designing and integrating stormwater and water supply systems within the below ground situation. The research aims to address the complex challenges faced in harmonizing these vital utilities while considering factors such as infrastructure lifespan, environmental impact, cost-effectiveness, and societal well-being. Through comprehensive analysis, advanced modeling, and real-world case studies, this thesis seeks to contribute to the existing knowledge by providing innovative insights and practical solutions that can guide urban planners, engineers, and policymakers in their pursuit of creating smart and livable cities.

Key words: M45 Grade, Self-Compacting Concrete, Passing Ability, Compressive Strength, Tensile Strength

I. INTRODUCTION

Self-compacting concrete (SCC) represents one of the most significant advances in concrete technology for decades. Inadequate homogeneity of the cast concrete due to poor compaction or segregation may drastically lower the performance of mature concrete in-situ. SCC has been developed to ensure adequate compaction and facilitate placement of concrete in structures with congested reinforcement and in restricted areas

SCC was developed first in Japan in the late 1980s to be mainly used for **highly congested reinforced structures in** seismic regions (Bouzoubaa and Lachemi, 2001). As the durability of concrete structures became an important issue in Japan, an adequate compaction by skilled labors was required to obtain durable concrete structures. This requirement led to the development of SCC and its development was first reported in 1989 (Okamura and Ouchi, 1999)

SCC can be described as a high performance material which flows under its own weight without requiring vibrators to achieve consolidation by complete filling of formworks even when access is hindered by narrow gaps between reinforcement bars (Zhu et al, 2001), SCC can also be used in situations where it is difficult or impossible to use mechanical compaction for fresh concrete, such as underwater concreting, cast in-situ pile foundations, machine bases and columns or walls with congested reinforcement. The high flowability of SCC makes it possible to fill the formwork without vibration (Khayat et al, 2004). Since its inception, it has been widely used in large construction in Japan (Okamura and Ouchi, 2003). Recently, this concrete has gained wide use in many countries for different applications and structural configurations (Bouzouban and Lachemi, 2001)

Fibers include glass hers, Steel fibers, tubers and sync fibers. Within these diffent fibers that characteristics of fiber inforced concrete changes wid vary concretes, fiber materials, geometries, lution, ntation and dentes" Its properties would obviously, depend upon the well-organized under of between misher and the fibres which is largely dependent on the types of tibes, fibre rientation, geometry of fibres, compaction and mixing techniques and size of aggregate. Our main aim is to increase the strength of the one by ading con fiber to it.

Plain concrete is good in compression but weak in le rength with med dactiley and linte sistance to cracking is one of sipil pavements cracks are formed due to the variation in shrinkage. temperature and heavy live lab. This type of crete is known as Fiber reinforced Conce this thesis an attempt will be made in view the behavior of concrete mixed with RECON 3 FIBER in comparison with plain concrete.

II. OBJECTIVE

Today SCC is used in large quantity on new innovative designs as it has many benefits and advantages as described.

Therefore, a new aspect in civil engineering is always fascinating like the addition of Recron-3s in Self Compacting Concrete (SCC) has reduced various drawhacks that were seen and analysed during the performance of the SCC These reasons helped me to research and analyse the different proportions of mixing Recron-3s in Self Compacting Concrete and to find the necessary data in terms of strength improvement and durability requirements and are described in the results section.

1) An experimental approach is to be done on Self Compacting Concrete mixing Recron-3 in different proportions as 0%, 0.30%, 0.60%, 0.90% and 1.2% in the concrete mix of M45 SCC.
2) To calculate the strength in self-compacting Concrete in all the forms with and without Recrun-Jacorresponding respectively in strength and durability of the structure.
3) To calculate the strength in Self Compacting Concrete mixed with Recron-Is and analyse these strengths with the above calculated strengths (e. cumpressive strength, flexural strength and split tensile strength).

III. MATERIAL AND METHOD

A. Cement:

Portland Slag Cement (PSC):
Portland Slag Cement, commonly known as PSC, is blended cement. Slag is, essentially, a non-metallic product comprising of more than 90% glass with silicates and alumina-silicates of lime. At JSW Cement, we use superior quality slag produced at our steel manufacturing plant, conforming to IS: 12089 standards for producing PSC. It is created with a combination of upto 45-50% slag. 45% - 50% clinker, and 3-5% gypsum. PSC has been voted as the most suitable cement for mass construction because of its low heat of hydration
The multi-fold advantages of PSC

1) Ultimate compressive strength.
2) Low risk of cracking.
3) Improved workability.
4) Better compatibility with all types of admixtures Superior finish.
5) Ease of pumping.
6) Better resistance against alkali-silica reaction.
7) Minimised shrinkage cracks.

B. Fine Aggregates

Locally available in Ganderbal Sinds river, which is then passed through 4.75mm 15 sieve and is then brought under various testing procedures. As we are well known of the fact that almost 50% fine aggregates are used in SCC so it has been carefully categorized fine aggregates and the requirements of fine aggregates as per 15 383-1970 are being tabulated below with the results as shown below:

Sr no	properties	Result
1	Specific gravity	2.67
2	Fineness modulus	2.75
3	Bulk density	1620kg/m3
4	Water absorption	0.4%

C. Coarse Aggregates

These are also available locally in same Ganderbal Sindh river, which is passed through 12.5 mm 15 sieve and the aggregates retained on 4.75 mm sieve are used in this research and the quantity of coarse aggregates in SCC is very much less as compared to fine aggregates. These aggregates should be round, properly graded and smaller in maximum site which increases the flow ability and passing ability of SCC during the placement and avoids necessary bleeding and segregation. The important properties of coarse aggregates required for maintaining strength in SCC

Sr,no	Properties	Result
1	Specific size	10mm
2	Specific gravity	2.68
3	Bulk density	1565kg/m3
4	Water absorption	0.51%

D. Recron

Recron-3s fibres are the advanced type of engineered microfibers with a special cross-section of "triangular" to be used as secundary reinforcement to steel in the concrete. It actually helps the main steel in increasing SCC's resistance against various difficulties like cracking shrinkage and al shows increase in various strengths as flexural strength, transverse strength and split tensile strength of normal concrete as well as SCC. It also helps both the concrete form to achieve desired improvements in Abrasion as well as impact strengths. Recron-3s is a reinforcing material which has find its applications not only in construction industry but also in others like asbestos coment sheets, automotive battery papers, filtration fabrics, cement-based products in which there is a considerable increase in the strength
Properties, Features and Benefits

1) Plastic and drying shrinkage is highly reduced in both normal concrete and in SCC .
2) It stops the development of micro and macrocracks in the concrete .
3) Increases the overall strength in compression.
   flexure and split tensile strength
4) It increases the homogeneity of the concrete structure.
5) It also decreases permeability to a larger extent.
6) In the end increases the Durability and life span of the structure which is the most requirement in every case.
7) The most important feature of Recron-3s is that it is compatible with all commonly used admixtures in concrete.

IV. CONCLUSION

The results obtained from the various mix designs were analysed and obtain some useful conclusions regarding the strength characteristics of Fibre Reinforced Self Compacting Concrete (FRCSCC) especially when mixed with Recron-3s for M45 grade Self Compacting Concrete. There were so many analysations and conclusions that can be described in the following lines:

- By the addition of various percentages of Recron-3s fibres i.e., 0.30%, 0.60%, 0.90%, 1.2% by volume decreases the slump flow but there is much increase in the compressive strength and tensile strength as well.
- By increasing the percentages of recron-3s above 0.90% leads to the more decrease in the Slump flow and goes against the EFNARC guidelines.
- With the increase of Recron-3s fibres from 0% it has shown efficient increase in the compressive strength as shown in the above observation tables but when the concentration is increased beyond 0.90% it shows decline in the strength.
- Further it has been found that with increase of the compressive strength, the flexural strength has also got increased to a greater strength at an optimum value of 0.70% of Recron-3s.

REFERENCE

[1] Akim choudappa yallappa, Marabathina maheswara rao and vinod nagpure. "Experimental Investigation of Recrons Fiber reinforced Concrete International Journal of Emerging Trends in Engineering and Development. Vol. 6, Issue 5(Oct-Nov. 2015).

[2] Dinesh G Shelavale, Ketan R Patil, Kalpesh Patil and Ab hist M Bombe "Testing on use of Hypo sludge and Recron Is Fibre in Cement Concrete International Journal on Recent and Innovation Trends in Computing and Communication Vol-4, Issue 4 (April 2016).

[3] Dr Sunil V Desale and Bhagyashri Rode "Tise of Industrial Waste and Recron 3s Fiber to Improve the Mechanical Properties of Concrete". Indian journal of research paripex Vol-4, Issue: 7 (July 2015).