

Review on Special Concrete and Mix Design

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Abstract: - Among the various properties of concrete, its compressive strength is considered to be most important and is taken as index of its overall quality. The water cement ratio directly affects the strength of concrete. Low water cement ratio possesses high strength and its high value gives lower strength. But it is restricted to a certain limit. There should not any shrinkage cracks and creep in concrete due to temperature variation. It is also important to know the flexural strength to estimate the load at which the concrete members may crack.

Concrete is most widely utilized man made material, without which modern architecture and construction would not be possible. Today humans consume no material except water in such tremendous quantities. According to Roman history, concrete was firstly made in 9000 BC.

Good concrete has to satisfy performance requirement in the plastic and hardened state. In the plastic state concrete should be workable and free from segregation and bleeding. Where segregation is the separation of coarse aggregate and bleeding is the separation of cement paste from main mass. In its hardened state concrete should be strong, durable, impermeable and it should have minimum dimensional changes.

I INTRODUCTION

Concrete is friendly to the environment. Concrete is a recyclable material in addition to that its production releases least amount of by products. Concrete has ability to absorb vast proportions of waste products from other industries such as fly ash from thermal power stations, granulated blast furnace slag from steel industry, silica fume from silicon smelting plant etc. Concrete absorbs CO₂ throughout its lifetime through carbonation, helping reduce its carbon footprint.

Durability of concrete structure should be more which is affected by environmental, chemical, physical, mechanical causes. Durable concrete is one which can withstand the conditions for it has been designed, without deterioration over a period of years.

II. SPECIAL CONCRETE

Special concrete is defined as concrete which meets special performance and uniformity requirements that cannot always be achieved routinely by using only

Conventional materials and normal mixing, placing and curing practices. The requirements may involve enhancements of characteristics such as placement and compaction without segregation, long-term mechanical properties, early-age strength, toughness, volume stability, or service life in severe environments.

Interest in advanced cement-based materials is not solely because of their increased brute strength. They possess other high-performance properties as well, such as low permeability, limited shrinkage and increased corrosion resistance, all valuable characteristics for the construction industry.

Characteristics of special concrete:

1. Special concrete is used in extreme weather.
2. Good cohesiveness or sticky in mixes with very high binder content
3. Some delay in setting times depending on the compatibility of cement, fly ash and chemical admixture
4. Slightly lower but sufficient early strength for most applications
5. Comparable flexural strength and elastic modulus
6. Better drying shrinkage and significantly lower creep
7. Good protection to steel reinforcement in high chloride environment
8. Excellent durability in aggressive sulphate environments
9. Lower heat characteristics
10. Low resistance to de-icing salt scaling

a) Reinforced Concrete

Since concrete is a brittle material and is strong in compression. It is weak in tension, so steel is used inside concrete for strengthening and increasing the tensile strength of concrete.

For a strong, ductile and durable construction the reinforcement shall have the following properties:

1. High strength
2. High tensile strain
3. Good bond to the concrete
4. Thermal compatibility
5. Durability in the concrete environment

b) Prestressed Concrete

An ordinary concrete beam, even without a load, struggles to carry its own weight. When service loads are added to the weight of the beam, it develops hairline cracks. As time

passes, these cracks will get larger and eventually the concrete will crumble. Hence to avoid these changes the prestressed concrete was invented.

There are many advantages of prestressed concrete

- 1) More efficient members (i.e., smaller members to carry same loads)
- 2) Much less cracking since member is almost entirely in compression
- 3) Precast members have very good quality control
- 4) Precast members offer rapid field erection
- 5) Concrete remains un-cracked which makes the structure weather resistant, durable and it protects steel from corrosion.

The disadvantages of prestressed concrete

- 1) The design of prestressed concrete is more complicated
- 2) It requires skilled supervision and good quality control
- 3) It also needs equipments and machineries for prestressing

III. READY MIX CONCRETE

Ready-mix concrete is a type of concrete that is manufactured in a factory or batching plant, according to requirement of customer and then delivered to a work site. It is transported by the truck mounted transit mixers. Ready Mixed Concrete is also referred as the customized concrete products for commercial purpose. The Ready-mix Concrete Company offer different concrete according to user's mix design or industrial standard.

Ready Mixed Concrete, or RMC as it is popularly called, refers to concrete that is specifically manufactured for delivery to the customer's construction site in a freshly mixed and plastic or unhardened state. Concrete is a mixture of Portland cement, water and aggregates, sand and gravel or crushed stone. In traditional work sites, each of these materials is procured separately and mixed in specified proportions at site to make concrete. Ready Mixed Concrete is bought and sold by volume - usually expressed in cubic meters. RMC can be custom-made to suit different applications.

RMC is manufactured under computer-controlled operations and transported and placed at site using special equipment and methods. RMC assures its customers numerous benefits. RMC is preferred to on-site concrete mixing because of the precision of the mixture and reduced worksite confusion. It facilitates speedy construction through programmed delivery at site and mechanized operation with consequent economy. It also decreases labour, site supervising cost and project time, resulting in savings. Proper control and economy in use of raw material result in saving of natural resources.

IV. BATCHING AND MIXING PLANTS

The principal functional elements of every stationary concrete production plant comprises of the

following units -

- Storage of materials – Silos, containers and bins.
- Batching arrangement.
- Measuring and recording equipment.
- Mixing equipment.
- Control system.
- Electrical, hydraulic and pneumatic drives.
- Conveying systems (belt / screw conveyors)

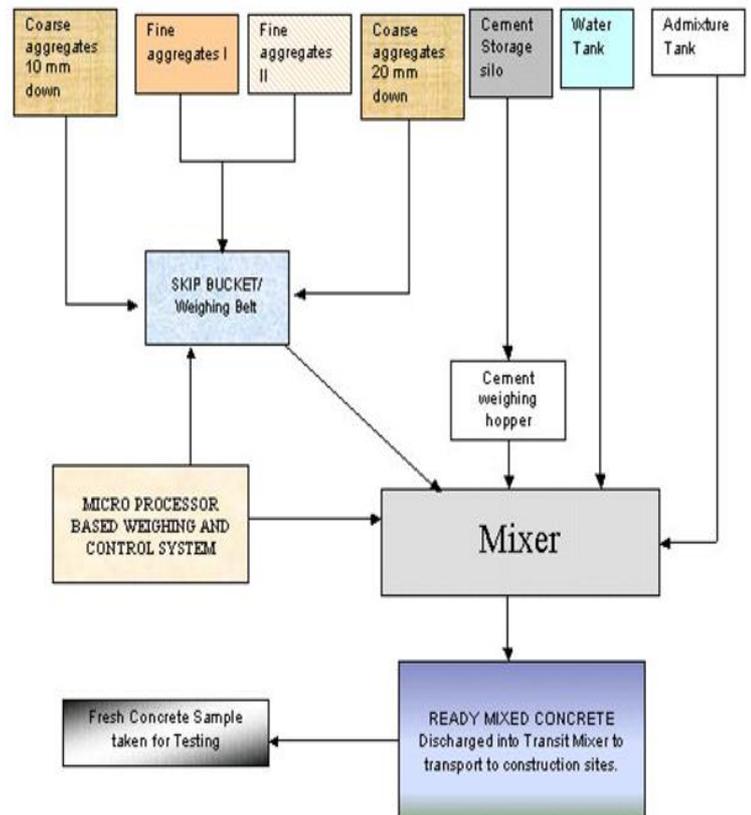


Figure 1: Flow Chart of RMC

V. CONCLUSIONS

While studying the special concrete we found out an extraordinary concrete named as transparent Concrete through which light can pass and this concrete can be used for decorative purposes, which is of great advancement in concrete technology.

In addition to that we found a concrete which can be used in underwater concreting known as tremie concrete. Also we got a light weight concrete which can float on water having its unique properties.

Considering the importance of special concretes, RMC was selected for a case study in this project. For detailed study, we have visited RMC plant of M/s. Malkhare Builders Pvt. Ltd. Situated at Chitegaon about 20 km from Aurangabad. It is observed that the better quality controlled can be exercised for a factory made concrete called as 'Ready Mixed Concrete' over

the site mixed concrete. In long term, the use of RMC gives durable and longer service life of the structures with minimized maintenance. This results in overall economy of the project. Hence the day by day use of RMC is increasing and recording a present demand of Aurangabad city of about 400 cum per day with a scope of 800 cum per day in a couple of years.

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