Report about

Self Compacting Concrete

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Abstract:

Self-compacting concrete (SCC) has many benefits in terms of production and placement compared to traditional concrete namely, elimination of external or internal vibration for compaction, better flowability, workability and pumpability, as well as increased bonding with congested reinforcement. Moreover, the placement of SCC is faster and requires less labour. The appearance (surface finish), mechanical performance and durability of SCC can be considerably better than traditional concrete. However, the methods of production, placement, quality control and finishing are essential for SCC. Constructability issues may arise for specifiers and contractors if related standards, guidelines or practices are not appropriately followed for production and placement. Self-compacting concrete is less tolerant to abrupt changes in aggregate moisture content, chemical admixtures and water content. The type of concrete mixer, transport time and the methods of concrete placement and finishing can affect the properties of SCC. Therefore, robust quality control measures must be in place during the production and placement of SCC. The excellent flowability of SCC compared to traditional concrete makes pumping the best method of placement. However, there is a high chance of air entrainment due to a higher flow rate, which can result in bugholes and segregation. Normally SCC has less surface imperfections compared to traditional concrete, but it would be susceptible to bugholes, honeycombing and cracking if guidelines of production and placement were not followed appropriately. This chapter explains how the admixtures, aggregate moisture content and water to solids ratio should be controlled for the reliable production of SCC. Also, the effect of concrete mixers on the properties of SCC, and the methods of quality control at batching plants and during placement are explained. Finally, transport, pumping, placement and finishing of SCC with common issues and solutions will be discussed.

1. Introduction:

Self-compacting concrete (SCC) is an innovative 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 traditional vibrated concrete.

Self-compacting concrete has higher fines content than conventional concrete due to higher binder content and a different combined aggregate grading curve. These adjustments, combined with specially adapted superplasticisers, produce unique fluidity and inherent compactability.

Figure 1 : self compacting concrete

2. Materials Used for Self Compacting Concrete :

2.1 Cement :

Ordinary Portland cement either 43 or 53 grade cement can be used.

2.2 Aggregates :

The size of the aggregates used for SCC design is limited to 20mm. If the reinforcement employed for the structure is congested, the aggregate size used can be in the range 10 to 12mm. Well graded aggregates either round or cubical shape are a best choice. The fine aggregates used in SCC can be either natural aggregates or manufactured aggregates (M- Sand) with a uniform grade. The fine aggregates with particle size less than 0.125mm are generally employed.

2.3 Water :

The quality of water used is same that followed for reinforced concrete and prestressed concrete construction.

2.4 Mineral Admixtures :

The mineral admixtures used can vary based on the mix design and properties required. Mentioned below are the different mineral admixtures that can be used and their respective properties they provide. Ground Granulated Blast Furnace Slag (GGBS): The use of GGBS helps to improve the rheological properties of the self compacting concrete. Fly ash: The fine fly ash particles help to improve the filling of the internal concrete matrix with fewer pores. This improves the quality and durability of the SCC structures. Silica Fumes: The use of silica fumes helps to increase the mechanical properties of the self compacting concrete structure. Stone Powder: The use of stone powder in SCC is used to improve the powder content of the mix.

2.5 Chemical Admixtures :

New generation superplasticizers are commonly used in SCC mix design. In order to improve the freeze and thaw resistance of the concrete structure, air entraining agents are used. To control the setting time, retarders are employed.

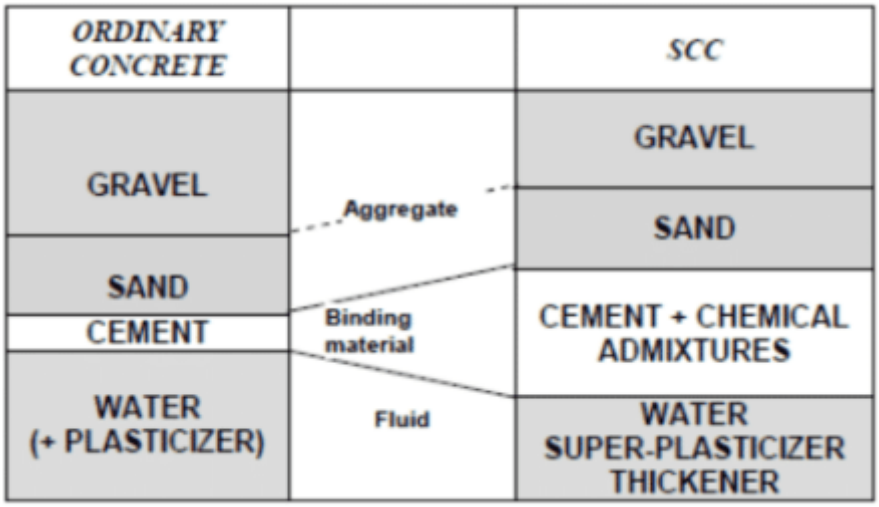

Fig.2: Material Composition of Ordinary Concrete and SCC

3. Tests and Properties of Self Compacting Concrete :

The requirements of the self compacting concrete are achieved by the properties in its fresh state. The three main properties of SCC are:

1. **Filling Ability:** This property of the concrete is the ability to flow under its own weight without any vibration provided intentionally.

2. **Passing Ability:** This property is the ability of the concrete to maintain its homogeneity.

3. **Segregation resistance:** This is the resistance of the concrete not to undergo segregation when it flows during the self compaction process.

Different tests are conducted to determine the above mentioned properties of Self compacting concrete. The tests conducted for Self compacting concrete can be categorized into three categories:

1. Filling Ability Tests.
2. Passing Ability Tests.
3. Segregation Resistance Test.

Table.1: Different Tests conducted on Self Compacted Concrete

Filling Ability Tests	**Passing Ability Tests**	**Segregation Resistance Tests**
Slump flow test	L-Box Test	V- funnel test at T5 minutes
T50cm Slump Flow	J- ring test	GTM screen stability Tests
Orimet	U- Box Test	
V-funnel Test	Fill – Box Test	

4. Advantages of Self Compacting Concrete :

The main advantages of self compacting concrete are:

1. The permeability of the concrete structure is decreased.
2. SCC enables freedom in designing concrete structures.
3. The SCC construction is faster.
4. The problems associated with vibration is eliminated.
5. The concrete is placed with ease, which results in large cost saving.
6. The quality of the construction is increase.
7. The durability and reliability of the concrete structure is high compared to normal concrete structures.
8. Noise from vibration is reduced. This also reduce the hand arm vibration syndrome issues.

5. Disadvantages of Self Compacting Concrete :

SCC construction face the following limitations:

1. There is no globally accepted test standard to undergo SCC mix design.
2. The cost of construction is costlier than the conventional concrete construction.
3. The use of designed mix will require more trial batches and lab tests.
4. The measurement and monitoring must be more precise.
5. The material selection for SCC is more stringent.

6. Applications of Self Compacting Concrete :

The major applications of self compacting concrete are:

1. Construction of structures with complicated reinforcement.
2. SCC is used for repairs, restoration and renewal construction.
3. Highly stable and durable retaining walls are constructed with the help of SCC

SCC is employed in the construction of raft and pile foundations.

7. Conclusions :

The use of this self compacting concrete is important for our country in order to eliminate corrosion in the elements while giving more strength to the concrete. We can also do finishing work for the surfaces in our country we have problems with leakage or damage to the concrete surfaces. This material can be used as a solution to this problem. The advantage of this concrete is that it does not require vibration.And use in special structures such as bridges,dam ,column , car parks, etc

8. References :

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