



VITCON 9005 SF

Silica Fume Concrete Additive

DESCRIPTION

VITCON 9005 SF is a filter powder generated from the reduction of high purity quartz – ferrosilicon metals or silicon metals. VITCON 9005 SF consists primarily of very fine smooth spherical silicon oxide particles. When VITCON 9005 SF is added to concrete, it changes the rheology and reacts with the cement hydration products to dramatically improve physical properties of concrete like strength, durability and impermeability.

TECHNICAL DATA

PARAMETERS	VITCON 9005 SF	IS15388:2003	ASTM C 1240-2003	EN 13263-2005
SiO ₂	> 85%	>85%	85% min	> 85%
CaO	0.2 - 0.7			
Al ₂ O ₃	0.4 - 0.9			
Fe ₂ O ₃	1 – 2			
LOI	< 4%	4% Max	6% max	4% max
Moisture	< 3%	3% Max	3% max	
Pozzolonic Activity Index	> 105%		105% min	100% min
Bulk Density	550 to 700 Kg/m ³	>500 kg/m ³	550 to 700 kg/m ³	
Retention in 45 micron sieve	< 10%	Max. 10%	10% max	
Compressive Strength at 7 days as % of ctrl sample	87%	85% Min.		



DOSAGE

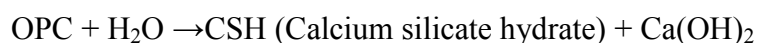
VITCON 9005 SF is usually added to the concrete mix at a ratio of 7% to 8% by weight of cementitious material. The dosage can be minimized to around 5% in case of ternary blended systems. Moreover, in case of HPC, the dosage can be further increased to 10% by weight of cement. But it is always advisory to go for trial mix to determine the optimum dosage. Addition of VITCON 9005 SF helps to achieve high early strength with reduction in total cementitious material content in comparison with the normal OPC concrete.

MECHANISM

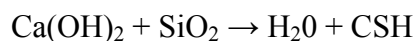
VITCON 9005 SF improves concrete through two mechanisms:

1. Pozzolonic effect

When water is added to OPC, hydration occurs forming two products, as shown below:



In the presence of VITCON 9005 SF, the silicon dioxide from the VITCON 9005 SF will react with the calcium hydroxide to produce more aggregate binding CSH as follows:



The reaction reduces the amount of calcium hydroxide in the concrete. The weaker calcium hydroxide does not contribute to strength. When combined with carbon dioxide, it forms a soluble salt, which will leach through the concrete causing efflorescence, a familiar architectural problem. Concrete is also more vulnerable to sulphate attack, chemical attack and adverse alkali-aggregate reactions when high amounts of calcium hydroxide is present in concrete.

2. Micro filler effect

VITCON 9005 SF is an extremely fine material, with an average diameter 100 times finer than cement. At a typical dosage of 8% by weight of cement, approximately 100,000 particles for each grain of cement will fill the water spaces in fresh concrete. This eliminates bleed and the weak transition zone between aggregate and paste found in normal concrete. This micro filler effect greatly reduces permeability and improves paste-to aggregate bond in VITCON 9005 SF concrete compared to conventional concrete.

The VITCON 9005 SF reacts rapidly providing high early strength and durability. The efficiency of VITCON 9005 SF is 3-5 times that of OPC and consequently concrete performance can be improved drastically.



ADVANTAGES

Due to its very fine nature and thus greater surface area, VITCON 9005 SF increases the water demand. The use of a super plasticizer to compensate for the higher water demand is universally recommended. Super plasticizers have a greater effect in VITCON 9005 SF concrete than in normal concretes because of larger surface area. It is possible now to dose high dosage of super plasticizers for very low water cement ratios concrete without bleeding and segregation problems encountered with normal OPC concrete. It enables us to produce highly flowable concrete without segregation and very high strength concrete (70 to 120 MPa).

VITCON 9005 SF also lubricates the concrete and increases pump ability. Since VITCON 9005 SF concrete exhibits significantly reduced bleeding, the potential for plastic shrinkage is increased. Thus it is necessary to protect the surface of freshly placed VITCON 9005 SF concrete to prevent rapid water evaporation. Practices outlined in the Guide for Hot Weather Concreting (ACI 305) and for Concrete Floor and Slab Construction (ACI 302) should be followed to provide a good surface. Curing should begin immediately following the finishing operation and can include all types of normal curing such as fogging, water spraying, plastic sheets and curing membranes.

APPLICATIONS

Because of the pozzolonic and micro filler effect of VITCON 9005 SF, its use in concrete can improve many of its properties opening up a wide range of applications including:

1. Corrosion Resistance

The reduced permeability of VITCON 9005 SF provides protection against intrusion of chloride ions thereby increasing the time taken for the chloride ions to reach the steel bar and initiate corrosion. In addition, VITCON 9005 SF concrete has much higher electrical resistivity compared to OPC concrete thus slowing down the corrosion rate. The combined effect generally increases structure life by 5 –10 times. VITCON 9005 SF concrete is therefore suitable for structures exposed to salt water, de-icing salts, i.e. Harbour structures, ports, bridges, docks, onshore constructions situated in areas with chlorides in the ground water, soil and in the air.

2. Sulphate Resistance

VITCON 9005 SF concrete has a low penetrability and high chemical resistance that provides a higher degree of protection against sulphates than low C₃A sulphate resisting cements or other cementitious binder systems.

3. Heat Reduction

By replacing cement with VITCON 9005 SF and observing the efficiency factor of VITCON 9005 SF, a lower rise maximum temperature and temperature differential will take place for concrete with the same strength. It performs better than slag and fly-ash blends in thick sections. It is also the most effective way of achieving low heat without sacrificing early age strength.



4. Waterproof Concrete

Because of its low permeability, VITCON 9005 SF can also be used as an integral waterproofing material for underground structures, e.g. car parking lots.

5. High Strength Concrete

VITCON 9005 SF in conjunction with VITCON range of super plasticizers is used to produce very high strength concrete (70 – 120 MPa). High strength concrete provides large economic benefits to developers e.g. reduced column and wall thickness in tall buildings and improved construction schedule. It is also much easier to pump VITCON 9005 SF concrete up the high-rise buildings during construction.

6. Shot Crete

VITCON 9005 SF is used in shotcrete whether produced by wet or dry process to reduce rebound loss, to increase application thickness per pass, improve resistance to wash out in marine construction or wet areas and to improve the properties of hardened shot crete. With fibres it can eliminate mesh and reduce cracking.

7. Abrasion Resistance

VITCON 9005 SF concrete has very high abrasion resistance. In floor and pavement construction its use saves money and time and improves operational efficiencies for the facility operator. It also improves the hydraulic abrasion-erosion resistance of concrete thus making it suitable for use in dam spillways.

8. Chemical Resistance

VITCON 9005 SF concrete is widely used in industrial structures exposed to an array of aggressive chemicals. This makes it useful in chemicals as well as petrochemical industries.

HEALTH & SAFETY

VITCON 9005 SF is non-toxic, non-flammable and non hazardous. However, any splash on the human body should be washed out immediately with plenty of water.

PACKAGING

VITCON 9005 SF is available in 25 kg bags.

STORAGE

Must be stored in original packaging at ambient temperature, dry place under shed. The bags must be protected from direct sunlight.

SHELF LIFE

If stored in tightly closed original bags under the above conditions, it has a shelf life of 12 months.