The ability to resist shattering forces is greatly enhanced with the introduction of synthetic fibers to the concrete. When plain concrete is compressed, it will shatter and fail at first crack. Synthetic fibers manufactured specifically for concrete prevent the effect of shattering forces by tightly holding the concrete together.

Abrasion resistance is provided when synthetic fibers are used because the water-cement ratio at the surface is not lowered by variable bleed water. The water-cement ratio is more constant at the concrete surface. This improvement is assisted by the internal settlement support value of the synthetic fibers contributing to uniform bleeding.

Synthetic fibers reduce the amount of plastic cracking of the concrete. This improves the impact resistance of concrete. The relatively low modulus of the synthetic fibers provides shock absorption characteristics.

Synthetic fibers help the concrete develop its optimum long-term integrity by the reduction of plastic settlement and shrinkage crack formation, lowered permeability, and increased resistance to abrading, shattering, and impact forces. Synthetic fibers are compatible with all admixtures, silica fumes, and cement chemistries.

CORROSION OF STEEL IN CONCRETE

WHAT is Corrosion of Steel?

ASTM terminology (G 15) defines corrosion as "the chemical or electrochemical reaction between a material, usually a metal, and its environment that produces a deterioration of the material and its properties." For steel embedded in concrete, corrosion results in the formation of rust which has two to four times the volume of the original steel and none of its good mechanical properties. Corrosion also produces pits or holes in the surface of reinforcing steel, reducing strength capacity as a result of the reduced cross-sectional area.

WHY is Corrosion of Steel a Concern?

Reinforced concrete uses steel to provide the tensile properties that are needed in structural concrete. It prevents the failure of concrete structures which are subjected to tensile and flexural stresses due to traffic, winds, dead loads, and thermal cycling. However, when reinforcement corrodes, the formation of rust leads to a loss of bond between the steel and the concrete and subsequent delamination and spalling. If left unchecked, the integrity of the structure can be affected. Reduction in the cross-sectional area of steel reduces its strength capacity. This is especially detrimental to the performance of tensioned strands in prestressed concrete.

WHY Does Steel in Concrete Corrode?

Steel in concrete is usually in a noncorroding, passive condition. However, steel-reinforced concrete is often used in severe environments where sea water or deicing salts are present. When chloride moves into the concrete, it disrupts the passive layer protecting the steel, causing it to rust and pit.

Carbonation of concrete is another cause of steel corrosion. When concrete carbonates to the level of the steel rebar, the normally alkaline environment, which protects steel from corrosion, is replaced by a more neutral environment. Under these conditions the steel is not passive and rapid corrosion begins. The rate of corrosion due to carbonated concrete cover is slower than chloride-induced corrosion.

Occasionally, a lack of oxygen surrounding the steel rebar will cause the metal to dissolve, leaving a low pH liquid.