The six major areas in which Steel Fibers can be used to achieve hi-strength, durable and economical concrete are:

a) **Overlays**
Roads, Airfields, Runways, Container, Movement and Storage Yards, Industrial Floors and Bridges.

**Advantages of using SFRC**
- Fatigue and impact resistance increased
- Wear and tear resistance increased
- Joint spacing increased
- Thinner pavements possible due to higher flexural strength of SFRC
- Long service life with little or no maintenance

b) **Pre-cast Concrete Products**
Manhole covers and Frames, Pipes, Break-Water Units, Building Floor and Walling Components, Acoustic Barriers, Krebs, Impact Barriers, Blast Resistant Panels, Vaults, Coffins etc.

**Advantages of using SFRC**
- Fatigue and impact resistance increased
- Thinner sections possible with SFRC reducing handling and transportation costs.
- Reduced consumption and savings in cost of materials makes pre-cast products competitive in price with cast iron or reinforced concrete products.
- Products possess increased ductility and resistance to chipping and cracking. SFRC products suffer less damage and loss during handling and erection
- Overall improvement in all structural properties
- Many different sizes and shapes of pre-cast units possible with SFRC.
c) **Hydraulic and Marine Structures**
Dams, Spillways, Aprons, Boats and Barges, Sea Protection Works.

**Advantages of using SFRC**
- Outperforms conventional materials by exhibiting superior resistance to cavitations and impact damage due to wave action, hydraulic heads and swirling water currents.
- Ideally suitable for repair of hydraulic and marine structures

d) **Defence and Military Structures**
Aircrafts Hangers, Missile and Weaponry Storage Structures, Blast Resistant Structure, Ammunition Production and Storage Depots, Underground Shelters etc.

**Advantages of using SFRC**
- Exhibits high ductile and toughness resulting in superior resistance to blast, impact and falling loads and missiles.
- Fragmentation effect very less compared to other material due to confinement effect of fibers on concrete.
- Far superior resistance to fire and corrosion
- High resistance to penetration by drills hammers etc, almost impenetrable.
- A highly versatile material with longer service life.

e) **Shotcreting Applications**
Tunnel Linings, Domes, Mine Linings, Rock-Slope Stabilization, Repaint and Restoration Distresses Concrete Structures etc.

**Advantages of using SFRC**
- Highly efficient, convenient and economical compared to mesh and bar reinforcement used in conventional shot crating.
- One stage operation for irregular profiles.
- High resistance to abrasion and impact loads.
- Reduction in ‘shadow’ effects resulting in compact and dense layer.
- Improvement in ductility
- Only high performing technique suitable for tunnel and drainage lining, rock stabilization jobs and also for repair of bridges, dams, storage tanks etc.
- Construction of energy-efficient domes and shell structures possible.
f) Special Structures
Machine Foundations, Currency Vaults and Strong Rooms, Impact and Fiber-Protective Shells and Lost Forms, Column-Beam Joints in Seismic-Resistant Structures, End Zones of Prestressed Concrete Elements, High Volume Steel Fiber Reinforce Concrete structures made out of SIFCON and CRC (Slurry Infiltrated Fiber Concrete and Compact Reinforced Concrete)

Advantages of using SFRC
- Improved performances under action of any kind of loading
- High seismic-resistance in buildings due to ductile behaviors of joints and connections

1.5.2 Some applications in India
Fiber reinforced concrete is in use since many years in India, but the structural applications are very much limited. However, its application is picking up in the recent days. Following are some of the major projects where large quantities of steel fibers are used.

1. More than 400 tons of Shaktiman Steel Fibers have been used recently in the construction of a road overlay for a project at Mathura (UP).
2. They have also been successfully used at the end anchorage zones of prestressed concrete girders for resisting bursting and spalling forces in bridge projects in Bangalore and Ahmedabad executed by one of the reputed construction companies.
3. The fibers have also been used for heavy-duty industrial floors.
4. Other projects include Samsonity Factory-Nasik, BIPL Plant-Pune, KRCL-MSRDC tunnels, Natha Jakri Hydro Electric Plant, Kol HEP, Baglihar HEP, Chamera HEP, Sala HEP, Ranganadi HEP, Sirsisilam project, Tehri Dam project, Uri Dam Project, etc.
5. Used in many tunnelling projects and for slope stabilisation in India.
2. High-Performance Composite Infrastructural Systems Utilizing Advanced Cementitious Composites

This system is a partially cast-in-place high-performance composite frame system (HPCFS) developed by selectively using high-performance materials, including (1) continuous fiber-mat high performance fiber reinforced concrete (HPFRCs) called slurry infiltrated mat concrete (SIMCON), (2) discontinuous fiber HPFRCs called slurry infiltrated fiber concrete (SIFCON), and (3) high-strength, lightweight aggregate fiber reinforced concrete (HS-LWA FRC). These advanced composites exhibit superior strength, energy-absorption capacity, and/or decreased weight, and are thus ideally suited for an innovative seismic-resistant design. No conventional concrete materials are used.

2.1 Technical Approach

Partially cast-in-place HPCFSs are built using stay-in-place formwork elements made by encasing light steel sections and tubes into advanced cementitious composites including (1) continuous HPFRCs and (2) discontinuous fiber HPFRCs. The "core" of the beam and column members is cast-in-place HS-LWS FRC. The stay-in-place formwork also serves as surface reinforcement, thus replacing conventional steel reinforcement and simplifying casting of the member core by eliminating reinforcement congestion. Furthermore, by encasing steel elements into HPFRC, their fire resistance and durability is improved. The construction procedure consists of first welding or bolting together of the stay-in-place formwork, followed by casting in place of HS-LWA FRC in both (1) the member core and (2) the beam-column joint region. Since the subsequent floor can be erected as soon as the steel elements are bolted together, it is anticipated that the speed of construction per story can be comparable to that of conventional, prefabricated steel frames. If successful, the proposed concept will result in advanced concrete frame systems exhibiting high strength and seismic resistance, while being faster and more cost effective to construct than conventional cast-in-place systems.