ABSTRACT

Ferrocement is a highly versatile construction material with relatively recent origin with high potentials for application to a variety of structures in the areas of boat building, agriculture, industry and housing. This material exhibits a high degree of elasticity and resistance to cracking and can be made without formwork. Ferrocement has high tensile strength as high as compressive strength and the width of cracks are very small even at failure. Ferrocement is fireproof, impermeable and resistant to corrosion and marine borers. It is also resistant to damage from collision and abrasion against dock walls and other craft. A particular advantage of ferrocement lies in the monolithic nature, whereas wooden hulls must be rigidly constructed to prevent working and leakage at the joints, ferrocement has no joints, therefore no caulking and fastenings to work, loose and cause leakage. Thermal properties are very good, this being of particular interest in construction of fish holds. Ferrocement fish holds are more easily insulated than are timber or steel constructions. The main disadvantage of ferrocement is that it cannot be employed where high impact, high vibration and high wear and tear are expected. Similarly Fiber reinforced concrete possesses higher compressive strength, toughness, increased resistance to wear and tear and higher post-cracking strength. Its permeability is very low, and tensile and flexural strengths are lower than those of ferrocement. The advantage of using the fiber reinforced concrete is that it can be pumped and sprayed as ordinary concrete. As the fibers are uniformly dispersed all over the
member, the surface wear and other characteristics of concrete are considerably improved, reduces spalling and wide range of surface finishes can be imparted to concrete. The main disadvantage in using fiber reinforced concrete is that, steel fibers are being costlier at present, fiber reinforced concrete becomes more expensive in terms of materials only and the other main disadvantage is the balling effect of fibers which considerably reduce the strength of concrete.

Fibrous ferrocement which is a combination of fiber reinforced concrete and ferrocement combines the advantages of fiber reinforced concrete and ferrocement and is a promising material.

The present research work has made an attempt to study the strength and durability aspects of slurry infiltrated fibrous ferrocement produced with different fibers such as steel, GI and polypropylene and its possible applications to special structures such as earthquake resistant structures and machine foundations where there are high vibrations. Thus the main objective of this experimental investigation is to develop slurry infiltrated fibrous ferrocement as a high performance construction material. Additional work is also undertaken on the effect of combination of admixtures on the properties of slurry infiltrated fibrous ferrocement. Also an attempt is made to study the behaviour of slurry infiltrated fibrous ferrocement when cement is replaced by flyash or silicafume or metakaolin. The various strength parameters considered throughout the study are compressive strength, flexural strength and impact strength. In addition to this, toughness characteristics are also studied. The
results of the various experimental investigations have revealed the fact that slurry infiltrated fibrous ferrocement with 1% steel fiber or GI fiber or polypropylene fiber can exhibit high compressive strength and impact strength. The performance of slurry infiltrated fibrous ferrocement with steel fiber is more pronounced than slurry infiltrated fibrous ferrocement with GI fibers or polypropylene fibers.

The slurry infiltrated fibrous ferrocement produced with lower aspect ratios of fibers has shown an improved performance than slurry infiltrated fibrous ferrocement with higher aspect ratios.

The slurry infiltrated fibrous ferrocement with 15% cement replacement by flyash or 6% replacement by silicafume or 10% replacement by metakaolin has exhibited better performance. Similarly with the combinations of chemical admixture, the slurry infiltrated fibrous ferrocement has shown excellent performance.

When subjected to freezing and thawing and alternate wetting and drying the slurry infiltrated fibrous ferrocement has shown better resisting capacities proving itself better than ferrocement or fiber reinforced concrete.

The slurry infiltrated fibrous ferrocement has exhibited good properties even when subjected to sustained elevated temperatures of 100°C, 200°C and 300°C.

In general, the performance of slurry infiltrated fibrous ferrocement is more superior to that of ferrocement or fiber reinforced concrete. Thus it can very well be called as high performance construction material.