A REVIEW ON ENGINEERED CEMENTITIOUS COMPOSITE (ECC)

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Abstract: *Bendable concrete is also known as ECC (Engineered Cementitious composites) is a class of ultra-ductile fiber reinforced cementitious composite characterised by high ductility and tight crack with control. Bendable concrete is an easily moulded mortor based composite reinforced with specially selected short random fiber (PVA) Polyvinyl alcohole fiber. This material is capable to exhibit considerably enhanced flexibility an ECC has a strain carrying capacity more than 3 per as compared to conventional concrete ie:0.01per this acts more like a ductile metal rather than like a brittle glass in this paper literature survey on properties of bendable concrete in terms of compressive strength and flexural strength.*

Key Words: ECC-engineered cementitious composite, PVA- polyvinyl alcohol fiber, flexural strength, compressive strength

1.INTRODUCTION:

Engineered Cementitious Composites developed in the last decade, will contribute to safer, more durable, and sustainable concrete infra-structure that is cost-effective. This concrete has the strain-hardening property but can be processed with conventional equipment. This concrete has strain capacity of about 3 to 5% as compared to 0.01% of normal (conventional) concrete. ECC is a unique class of high-performance fiber-reinforced cementitious composites featuring high tensile ductility and durability. Flexural strength to the concrete is induced by the fibres admitted to the concrete. The concrete is produced with 2% of optimal volume of different fibres. ECC flexes without fracturing, due to the interaction between fibres, sand, and cement working in a matrix that binds everything together within the material. In addition to reinforcing, the concrete with fibres, acts as ligaments to bond it more tightly. Due to this instead of fracturing, the material undergoes a process called micro-cracking, wherein the energy of the tensile strain is diffused into a number of tiny cracks producing cracks of extremely small size, averaging less than 60 μm in width, roughly half the width of a human hair (Kalepalli,2006). Initially self-healing concrete costs roughly three times as much as conventional concrete. But its lower lifecycle cost is ascribed to lower repair frequency and lesser consumption of materials due to its higher ductility and durability which leads to savings in the cost.

Conventional concretes are almost unbendable and have a strain capacity of only 0.1% making them highly brittle and rigid. This lack of bendability is a major cause of failure under strain and has been a pushing factor in the development of an elegant material namely, bendable concrete. This material is capable to exhibit considerably enhanced flexibility. A bendable concrete is reinforced with micromechanically designed polymer fibers. ECC is made from the same basic ingredients as conventional concrete but with the addition of High-Range Water Reducing (HRWR) agent is required to impart good workability.

However, coarse aggregates are not used in ECC, the powder content of ECC is relatively high. Cementations materials, such as fly ash, may be used in addition to cement to increase the paste content. Additionally, ECC uses low amounts, typically 2% by volume, of short, discontinuous fiberes. ECC incorporates super fine silica sand and tiny Polyvinyl Alcohol-fiberes covered with a very thin (manometer thick), silk coating. This surface coating allows the fiber to begin slipping when they are over loaded so they are not fracturing. It prevents the fiber from rupturing which would lead to large cracking. Thus, an ECC deforms much more than a normal concrete but without fracturing. The behaviour of ECC under flexural loading and it can be seen that the beam can deform sufficiently without direct failure. ECC has proved to be 50 % more flexible than traditional concrete, and 40% lighter, which could even influence design choices in skyscrapers. Additionally, the excellent energy absorbing properties of ECC make it especially suitable for critical elements in seismic zones.

The challenge in making a lightweight concrete is decreasing the density while maintaining strength and without adversely affecting cost. Introducing new aggregates into the mix design is a common way to lower density of concrete. Normal concrete contains four components, cement, crushed stone, river sand and water. The crushed stone and sand are the components that are usually replaced with lightweight aggregates.

2.OBJECTIVE:

- To study the effect on flexural strength for varying depths of ECC by keeping water/cement ratio constant.
- To model the parameters for predicting flexural strength for intermediate depths.
- To verify and test important fact about the bendable concrete
- To check the behaviour of (ECC)Bendable concrete under compression and flexure strength test.
- To check the strain carrying capacity of ECC.
- To workout the various properties of ECC at various condition

3.LITERATURE REVIEW:

Chapter gives the idea about the previous work done on the detailed study about properties of bendable concrete and also workout the various properties of ECC at various condition.

Literature review of previous work presented as below

- Victor c.li (2007) said that beyond the peak load, ECC is no different than normal fiber reinforced concrete showing tension softening response the high tensile ductility is of great value in enhancing the ultimate limit state(ULS)in terms of structural load and deformation capacity as well as energy absorption.in this manner ECC can offer structural safety improvements.

- Victor c. li (2009) said that ECC is highly damage tolerant under extreme loading, including reverse cyclic loading and low velocity impact.
- Sagar ghadhiya (2015) said that compressive strength decreases with increase in the cementitious material i.e. flyash, silica fume, LP etc incorporation SL into matrix can effectively increase compressive strength at all stages especially at early stage.
- Jun zhang, qing wang2 and zhenbo wang (2017) said that addition of PVA-polyvinyl alcohole fiber helps to increase the strain carrying capacity of ECC.

4.DISCUSSION:

Studied above research paper we check the effect on compressission strength and effect on strain carrying capacity of ECC and also discuss about ultimate limit state (ULS) in terms of structural load and deformation capacity as well as energy absorption.

5.CONCLUSION :

Based on above paper we can conclude as follow

1) Compressive strength of ECC is decreases with increase in cementitious material i.e. fly ash, silica fume, LP etc
2) Addition of PVA fibers increases the strain carrying capacity of ECC.

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