

Study on Corrosion of Reinforced Concrete Beams with Fly Ash and Glass Fiber Reinforced Polymer

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Abstract: Reinforced concrete has good durability and excellent structural performance. But there are cases of early deterioration due to a number of factors, one prominent factor being corrosion of steel reinforcement. The process of corrosion sets in due to ingress of moisture, oxygen and other ingredients into the body of concrete, which is unsound, permeable and absorbent. Cracks due to structural and other causes such as creep, shrinkage, etc also allow ingress of moisture and other harmful ingredients and thus accelerate the rate of corrosion. There are several interactive factors both external and internal, which lead to corrosion of reinforcement and ultimately failure of structures. Suitable addition of mineral admixture like fly ash in concrete improves the strength and durability of concrete due to considerable improvement in the microstructure of concrete composites, especially at the transition zone. Secondary reinforcement in the form of fibre is added to concrete, which provides three dimensional random reinforcement in the entire mass of concrete.

Reinforced concrete beams of size 0.1 m X 0.15 m and length 1m have been cast using M25 grade of concrete. The beams after curing process were subjected to corrosion process by impressing an external Direct Current (Galvanostatic Method) for a period of 15 days under stressed and unstressed conditions. The corroded beams were tested by applying two point loads to determine the ultimate load carrying capacity and cracking pattern and the results of specimens were compared with that of the companion specimens. Gravimetric method is used to quantify corrosion that has occurred.

The steel reinforcement in concrete can be protected from corrosion by applying coating on rebars and providing modified environment around them. In this experimental work, an attempt is made to study the reduction of corrosion in rebars by applying Epoxy Nitro Zinc Primer coating. The concrete beams, which consists of Ordinary Portland Cement (OPC) and fly ash were cast using coated and uncoated rebars and tested under both stressed and unstressed conditions. The Epoxy Zinc Rich Primer is a product of FOSROC Chemicals (India) Ltd. and available in the name of Nitro Zinc Primer.

M25 grade of concrete with Ordinary Portland Cement (OPC) and fly ash (replacing OPC 40% by weight) have been used. Uncoated rebars and rebars coated with Nitro Zinc Primer were used. Selected specimens were added with Glass fiber reinforced polymer (0.7% by weight of Cement).

Keywords : Carbonation, Corrosion, Cracking, Spalling.