Telu Madhukar* et al.
(IJITR) INTERNATIONAL JOURNAL OF INNOVATIVE TECHNOLOGY AND RESEARCH
Volume No.6, Issue No.6, October - November 2018, 9029-9032

Practical Study On FRP With High Strengthening Of Reinforcement Concrete

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Abstract: **A speculative research was carried out on the decision of reinforcing enhanced concrete columns making use of FRP product. 4 strengthened concrete cantilever columns of 200x400x1610 mm measurements, standing for the old building and construction technique, were examined. One lap-spliced and also one continual longitudinally strengthened as construct control columns, as well as their strengthened columns were checked under consistent axial tons and also turned around cyclic side lots. n current years Fiber Reinforced polymer obtained vast use reinforcing and also repair for the light beams columns and also pieces of structures and also bridges. FRP is generally made use of in the aerospace, vehicle, aquatic, building markets and also ballistic shield. Today research is mostly concentrated on the examination of the result of on the surface adhered FRP after the toughness qualities of R.C columns. Multitude of researches on R.C columns wills reveals that the column will certainly stop working because of inappropriate or inadequate arrest. In instance of FRP, it will certainly give reliable arrest to the column, this residential or commercial property of FRP makes it much ideal as enhancing product. So I had actually prepared to examine the result of FRP on toughness as well as toughness element of RC column.**

Keywords: **RC Column; FRP; Fiber Reinforced Polymer; RHA; Flyash; Course Aggregate;**

I. INTRODUCTION:

Concrete is one of the most widely used construction material. It is usually associated with Portland cement as the main component for making concrete. Ordinary Portland cement (OPC) is conventionally used as the primary binder to produce concrete. Production of Portland cement is currently exceeding 2.6 billion tons per year worldwide and growing at 5 percent annually. Five to eight percent of all human-generated atmospheric carbon-di-oxide worldwide comes from the concrete industry. Among the greenhouse gases, carbon-di-oxide contributes about 65% of global warming. Although the use of Portland cement is still unavoidable until the foreseeable future, many efforts are being made in order to reduce the use of Portland cement in concrete. On the other hand, a huge volume of fly ash is generated around the world. Most of the fly ash is not effectively used, and a large part of it is disposed in landfills which affects aquifers and surface bodies of fresh water. Fibre reinforced cement or concrete is a relatively new composite material in which fibers are introduced in the matrix as micro reinforcement, so as to improve the tensile, cracking and other properties of concrete. Glass Fiber Reinforced Concrete (GFRC) is a type of fiber reinforced concrete which are mainly used in exterior building facade panels and as architectural precast concreteThe term „geopolymer" was first introduced by Davidovits in 1978 to describe a family of mineral binders with chemical composition similar to zeolites but with an amorphous microstructure. Wallah et. al, (2006) Explained that, heat-cured fly ash-based geopolymer concrete undergoes low creep and very little drying shrinkage in the order of about 100 micro strains after one year. And it has an excellent resistance to sulfate attack. Aleem et. al, (2012) mentioned that, Geopolymer Concrete can be used in the precast industries, so that huge production is possible in short duration and the breakage during transportation shall also be minimized. It shall be effectively used for the beam column junction of reinforced concrete structures and infrastructure works. In addition to that the Flyash shall be effectively used and hence no landfills are required to dump the flyash. Anuar et. al, (2011) explained that the higher concentration of sodium hydroxide solution inside the geopolymer concrete will produce higher compressive strength of geopolymer concrete; because NaOH will make the good bonding between aggregate and paste of the concrete. In this respect, the geopolymer technology proposed by Davidovits shows considerable promise for application in concrete industry as an alternative binder to the Portland cement. The other material that can be used is fly ash and rice husk ash which are obtained from the thermal power plants and rice mills, this is formed as a fine powder in the industry, which is used as replacement of cement. They have the same properties as cement. Many studies are made with several other materials which gave the concrete to be a material made of recycled material but the parameters that are primary for the material was not satisfied. The properties of concrete in fresh and hardened state are studied in the various papers that are used as a reference for this. Some of the

properties are workability, compressive strength are the major one that are considered.

II. RELATED STUDY:

In recent decades the existing columns are undergoing retrofitting and which has become an indispensable requirement. To strengthen these existing reinforced concrete columns the application of Fiber Reinforced Polymers (FRPs) has been done. The strength, stiffness, and ductility were found to be increased invariably using these FRP, of the strengthened columns. Both the experimental studies and theoretical studies on behavior of concrete confined with FRPs showed the stress-strain behaviors for FRP confined concrete, especially the circular columns under concentric loadings. It was evident based on the theoretical and experimental results, that, the FRP confinement of a circular column was greater than that compared to square column. In case of square columns, the efficiency of FRP confinement was less because, the stresses were concentrated at the corners and the active area of the confined section by FRP was low. Hence, it was noticed that modifying a square column to a circular one will definitely increase the effectiveness of FRP confinement. Most of the existing columns are square or rectangular in cross sections as these are easy to construct by regular square and rectangular formwork, compared to circular columns. However, early investigations indicated that the FRP confinement for square or rectangular columns with sharp corners provided very little enhancement in their load carrying capacity, while confinement effectiveness increases linearly with an increase in the corner radius. Despite, the curvature of the corners could cause stress concentration. Therefore, modifying a square column to a circular column may minimize the stress concentration became an objective of this study. Existing structures sometimes requires retrofitting in cases involving change of the use of the structures, change of design codes and construction errors. Since most structures are constructed with normal strength concrete, the experiments of this study imitate that by utilizing normal strength concrete. This study investigates the technique of modifying the cross section by circularizing RC square column to circle. According to the value of the compressive strength collected. The value is high it shows that geopolymer concrete is suitable for the construction. The industrial waste or by products from thermal power plants and rice mills can be well utilized. By utilization of glass fiber in geopolymer concrete will increase the strength. By using this geopolymer concrete will reduce the carbon dioxide emission and increase the durability of the structure.

III. METHODOLOGY AND MATERIALS:

Grade of concrete M_{20} is applicable for reinforced concrete cement works for slabs, Beams, Columns etc. We have taken M_{20} grade concrete as a normal mix. The high strength concrete has its applications for high rise buildings. In this project M_{20} grade concrete is used with the partial replacement of sand by quarry dust. The production of one ton of cement emits approximately one ton of carbon dioxide to the atmosphere which leads to global warming conditions. A need of present status is, should we build additional cement manufacturing plants or find alternative binder systems to make concrete? On the other scenario huge quantity of fly ash are generated around the globe from thermal power plants and generally used as a filler material in low level areas. Alternative binder system with fly ash to produce concrete eliminating cement is called “Geopolymer Concrete”. Recently world’s first building Structural Building, The University of Queensland’s Global Change Institute (GCI) has been constructed with the use of geopolymer concrete. It is a four storey high building for public use.

Cement:

Cement is a fine mineral powder manufactured with very precise processes. Mixed with water, this powder transforms into paste that binds and hardens when submerged in water. Because the composition and fineness of the powder may vary cement has different properties depending upon its makeup. Cement is the main component of concrete. It’s an economical, high quality construction material used in construction projects. Cement is made by grinding together a mixture of lime stone and clay which is then heated at a temperature of 1450C. The granular substance called “CLINKER”, a combination of calcium, silicate, alumina and iron oxide.

Fig.3.1. Cement.

Fly ash:

Fly ash, also known as "pulverised fuel ash" in the United Kingdom, is a coal combustion product that is composed of the particulates (fine particles of fuel) that are driven out of coal-fired boilers together with the flue gases. Ash that falls to the bottom of the boiler is called bottom ash. In

modern coal-fired power plants, fly ash is generally captured by electrostatic precipitators or other particle filtration equipment before the flue gases reach the chimneys. Together with bottom ash removed from the bottom of the boiler, it is known as coal ash. Depending upon the source and makeup of the coal being burned, the components of fly ash vary considerably, but all fly ash includes substantial amounts of silicon dioxide (SiO2) (both amorphous and crystalline), aluminium oxide (Al2O3) and calcium oxide (CaO), the main mineral compounds in coalbearing rock strata.It distinguishes two classes of fly ash, Class C and Class F.

Fig.3.2. Flyash content.

Rice husk ash:

Combustion of rice hulls affords rice husk ash (acronym RHA). This ash is potential source of amorphous reactive silica, which has a variety of applicationsin materials science. Most of the ash is used in the production of Portland cement. When burnt completely, the ash can have a Blaine number of as much as 3,600 compared to the Blaine number of cement (between 2,800 and 3,000), meaning it is finer than cement. Silica is the basic component of sand, which is used with cement for plastering and concreting. This fine silica will provide a very compact concrete. The ash also is a very good thermal insulation material.

Fig.3.3. Practical model.

IV. EXPERIMENTAL ANALYSIS:

After estimating take estimated quantity of 53 grade cement and then sieve the fine aggregate from IS sieve 4.75mm and weight it to get the estimated quantity of fine aggregate. Then take the amount of coarse aggregate after sieving it from 20mm IS sieve get the estimated quantity of aggregate. Mix the cement and fine aggregate on a water tight nonabsorbent platform until the mixture is thoroughly blended and is of uniform colour. Add the coarse aggregate and mix with cement and fine aggregate until the coarse aggregate is uniformly distributed throughout the batch. Add water and mix it until the concrete appears to be homogeneous and of the desired consistency. Volume batching is not a good method for proportioning the material because of the difficulty it offers to measure granular material in terms of volume. Volume of moist sand in a loose condition weighs much less than the same volume of dry compacted sand. The effect of bulking should be consider for moist fine aggregate. For unimportant concrete or for any small job, concrete may be batched by volume.

Spread out the measured quantity of coarse aggregate and fine aggregate in alternate layers. Pour the cement on the top of it, and mix them dry by shovel, turning the mixture over and over again until uniformity of colour is achieved. Water is taken in a water-can fitted with a rose-head and sprinkled over the mixture and simultaneously turned over. This operation is continued till such time a good uniform, homogeneous concrete is obtained.

Fig.4.1. Hand mixing.

Mixing of concrete is almost invariably carried out by machine, for reinforced concrete work and for medium or large scale mass concrete work. Machine mixing is not only efficient, but also economical, when the quantity of concrete to be produced is large. They can be classified as batch-mixers and continuous mixers. Batch mixers produce concrete, batch by batch with time interval, whereas continuous mixers produce concrete continuously without stoppage till such time the plant is working.

Fig.4.2. Machine mixing.

S.NO	OXIDE	COMMON NAME	APPROXIMATE AMOUNT(%)
1	CaO	Lime	0.3-2.2
2	SiO_2	Silica	86.94
3	Al_2O_3	Alumina	0.2
4	Fe_2O_3	Iron oxide	0.1
5	MgO	Magnesia	0.2-0.6
6	Na_2O	Soda	0.1-0.8
7	K_2O	Potassia	2.15-2.30

Fig.4.3. Ratio of rice huck.

V. CONCLUSION:

The retrofitting technique using CFRP Sheets resulted in significant improvement in drift capacities of the columns with only continuous longitudinal re-bars. However, in lap-spliced longitudinal re-bars this retrofitting technique did not work properly. Applying CFRP directly cannot provide enough confinement stress to increase frictional force between the lap-spliced longitudinal reinforcements. The bonding of segmental circular covers significantly increased the confining effect and hence the load-carrying capacity of columns. It was even evident that efficiency of circularized columns was more than the columns with rounded corners. Finally, the method of modifying a square column to circular section by circularizing process proved to be effective in maximizing the load-carrying capacity of the CFRP confined columns.

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