Strengthening of RC Columns with Glass Fiber Wrapping System

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Abstract – The corrosion in the concrete structures due to ageing, poor protection.The necessitates advancing the deteriorated civil engineering infrastructure very much enhances with the ever growing anxiety. Therefore rehabilitating and retrofitting civil engineering infrastructure has been recognized as significant concern to be addressed. Glass fiber is a new material consisting of narrowly spaced Glass and resins which is very valuable in strengthening exertion. The crucial initiative is that it undergoes outsized strains in the vicinity of the reinforcement and the enormity of strain depends on the distribution and subdivision of reinforcement throughout the mass of concrete. In this paperback the strengthening of reinforced concrete columns using Glass fiber laminates are studied. In this study, the use of Glass fiber as an external detention to concrete specimens is investigated. The effectiveness of confinement is achieved by comparing the deeds of retrofitted specimens with that of conventional specimen.

Index Terms – Deterioration, Glass fiber, amplification, rehabilitate, retrofitting.

1. INTRODUCTION

Concrete is weak in tension and has a frail character. The concept of using fibers to progress the uniqueness of construction materials is very old. Early applications comprise addition of straw to mud bricks, horse hair to reinforce plaster and asbestos to reinforce pottery. Use of continuous reinforcement in concrete (reinforced concrete) increases strength and ductility, but requires careful placement and labour skill. Alternatively, introduction of fibers in detached form in plain or reinforced concrete may provide a better solution. The modern enlargement of fiber reinforced concrete (FRC) started in the early sixties. Addition of fibers to concrete makes it a identical and isotropic material. When concrete cracks, the erratically slanting fibers start functioning, arrest crack formation and dissemination, and thus improve strength and ductility. The failure modes of FRC are either bond failure between fiber and matrix or material failure. Fiber reinforced concrete (FRC) is concrete containing fibrous materials which increase the structural integrity. It contains short discrete fibers that are uniformly distributed and randomly oriented. Fiber includes steel fibers, glass fibers, synthetic fibers and natural fibers- each of which lend varying properties to the concrete. In addition, the character changes with varying concretes, fiber materials, geometries distribution, orientation, and densities.

2. RELATED WORK

- To assess the properties of concrete that combination of both ordinary and Glass Fiber Wrapping technique.
- To find out the maximum mix combination with a small effect on strength & durability characteristics.
- To assess flexural strength of Retrofitted concrete.

3. PORPOSED MODELLING

Sandeep G.Sawant, A. B.Sawant, M. B. Kumthekar (2013), Worked on, **"Strengthening of R.C.C. Beam- Using Different Glass Fiber"** it is summarized that the Fiber-reinforced polymer (FRP) application is a very valuable way to repair and strengthen structures that have become structurally pathetic over their life span. FRP repair systems provide an cost-effectively viable substitute to established repair systems and materials. Experimental data on load, deflection and failure modes of each of the beams were obtained. The detail route and application of GFRP sheets for strengthening of RC beams is also integrated. The achieve of number of GFRP layers and its orientation on ultimate load carrying capacity and failure mode of the beams are investigate.

Vijayakumar. A, Venkatesh Babu. D.L (2011), Worked on, **"A survey of methods and techniques used for Seismic retrofitting of RC buildings"** it is summarized that the Globe is in front of a threat of natural disasters from time to time. With particular records based on earthquake incidence, the consequences are loss of human lives and devastation of properties, which at the end of the day affects the natural cost-cutting measure. The happening of an earthquake cannot be predicted and disallowed but the vigilance of the structures to defend against earthquake forces become more important. Keeping the view of constant alteration of the seismic zones in

India, lack of proper design and detailing of structures against earthquake. A higher degree of damage in a Building is projected during an earthquake, if the seismic resistance of the building is inadequate. The verdict to strengthen it before an earthquake occurs depends on the Building's seismic conflict.

Dhanu M.N, Revathy D, Lijina Rasheed, Shanavas S (2014), Worked on, **"Experimental and Numerical Study of Retrofitted RC Beams Using FRP"** it is summarized Retrofitting means modifying the presented structures to increase the resistance of the structures against seismic activity. The objective of the current study is to scrutinize the improvements in the structural behavior of RC beams, while retrofitting using various types of FRP. The fibers used for the cram were Glass fibers and Coir Fibers. Experimental tests were conducted on RC beams and RC beams retrofitted with various FRP such as GFRP and Coir FRP. For numerical study RC beams and RC beams retrofitted with GFRP were painstaking and ANSYS software was used to build a 3D model of the beams and to analyze the beam structure. The result shows that the RC beams retrofitted with Glass reinforced Polymer makes the structure more defiant to seismic activity.

Sandeep kumar L.S, Dr.H.N.Jagannatha Reddy, Rumina Nizar (2013), Worked on, **"Retrofitting of RC beams using Natural FRP wrappin g"** it is summarized that There is a pressing need to repair or upgrade the building and civil transportation in many parts of the world. For instance with the reconstruction of buildings, it is sometimes enviable to remove supporting walls or entity supports, leading to the need for local strengthening. The strengthening and augmentation of the feat of deficient structural elements or the structure as a whole is referred to as retrofitting. Retrofit aims to strengthen a building to satisfy the requirements of the contemporary codes for seismic design. The building may not be damaged or deteriorated. The various retrofitting techniques include steel plate bonding, polymer insertion followed by concrete jacketing, use of advanced fused materials like FRP, Ferro cement etc. Silk is a natural protein, some forms of which can be woven into textiles. The protein of silk is composed mainly of fibroin and produced by certain insect larvae to form cocoons, this jute is extracted from cocoon, FRNPs exhibit several improved properties, such as high strength, high stiffness-weight ratio and flexibility in design, non-corrosiveness, high fatigue strength, and ease of claim. The Silk fibers are originate commercially in several formats: fabric, strips, wire, rolls, etc.

M. Saiid Saiidi, Jessen Mortensen, and Frank Martinovic (2001), worked on, **"Analysis and retrofit of fixed flared column with glass fiber reinforced plastic jacketing"** it is summarized that the bridge pier consists of four one-way flared columns with moment acquaintances at both ends of the column. A previous assessment of the bridge columns with reverence to the seismic requirements had shown that the captivity steel is derisory and the shear capacity near the base of the columns is subsidiary. Both of these deficiencies were addressed in budding a retrofit strategy. The seismic retrofit detail well thought-out in this study was a glass fiber-epoxy jacket. Because the columns are flared, a continuous wrap over the flared segments is not proper, as it will lead to an objectionable increase in the flexural capacity of the columns. Therefore, for the flared segments, a series of overlapping straps was suggested. The FHWA and ACI procedures were used in design. The merged properties were based on the values reported by Fyfe and Associates for their glass FRP wraps. For the prismatic part of the column, a continuous wrap is suitable. It was found that ten layers are obligatory over the prismatic part of the columns and four layers elsewhere. To establish the effectiveness of the retrofit, the as-built and retrofitted columns were analyzed for earthquakes loading using a nonlinear response history analysis computer program. The moment-curvature relationships for the columns were determined by using a moment-curvature analysis program called RCMC. Program RC-Shake was used to determine the response histories. This program accounts for stiffness and strength deprivation of reinforced concrete elements under cyclic loads.

4. RESULTS AND DISCUSSIONS

LIMITATIONS:

- FRC is used high % in cold weather.
  Freeze thaw there is restriction at the higher replacement rates.

  High sulphate (or) acid level in a marine (or) salt environment.

ADVANTAGES:

- Higher flexural strength, tensile strength and Impact Strength than plain concrete due to the presence of the glass fiber.
- GFRC is lightweight and is about 75% lighter than traditional concrete.
- The flexural strength gives it a high strength to weight ratio.
- The reinforcement for this concrete is internal and does not need additional reinforcements.
- It is versatile with great design flexibility. It can be provided in many colours, textures, patterns and surface finishes. Nearly any shape product can be formed.
- Fibers are lightweight that minimizes the load added to existing structures.
- Improved Chemical Resistance for example it has better chloride penetration resistance than steel.

- Improved shrinkage properties over plain concrete.
- It is inorganic and does not add to the fire loading of a structure.
- Good acoustic properties.

Low permeability that increases water or air pollution resistance; and GRC can lose some of its initial strength over long periods of time and this has to be taken into consideration during the design stage.

5. CONCLUSION

In this project it is clearly noticed that the use of Glass fiber laminates appears to be a useful rehabilitative measure for the existing member at distress. It is a viable alternative material for the repair and strengthening of reinforced concrete elements. The load carrying capacity and ductility of RCC member is improved by Glass fibers.In this experimental program, eight reinforced concrete columns were casted and tested up to failure. Four RC Column is to be tested to find ultimate load of the normal specimen. The remaining four columns are to be tested to find the ultimate load of the wrapped specimen. Then the columns were rehabilitated using one layer of Glass fiber laminates with the epoxy resin. The normal columns and the wrapped columns were tested up to failure. Then the behavior of the tested columns was studied.

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