Experimental Investigation on Torsional Behavior of Beam-Column Joint Wrapped With Aramid Fiber

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Abstract- *Concrete is a composite construction material plays a vital role in the construction of the nation's infrastructure. In these days, the role of concrete in all type of buildings like sky scrapers and low-rise buildings are enormous. The failure of the Structures are mainly due to the failure of the concrete in Beam-Column Joint. So the Extra care should be given while fabricating the steel in the beam-column joint and also while casting of concrete in the beam column joint. In Recent days more technical researches are going on to avoid the beam-column joint failure. The many repairing methods are mainly based on the fiber as extra admixture. In this Experiment we add the Aramid Fibre in additional with Bacillus sphaericus Bacteria to check the Torsional Behaviour of Beam-Column Joint. Beams-column joint externally wrapped with Aramid fiber was test to failure using an arrangement which transfer Torsional moment to the joint of the Beam-Column through two opposite cantilever moment arms. Aramid Fibre is a class of synthetic fibres and heat resistant. They are fibers in which the strength of the chemical bond can be exploited due to the reason the chain molecules are highly oriented along the fiber axis. Bacteria Introduction may helps in arresting the crack on its own with high volume percentage. The bacteria is the material in which the researches are going to find the usefulness obtained from the bacteria for concrete. The growth of bacteria can be done and the grown bacteria can be used in concrete to check its usage in arresting the cracks and delaying the failure of structure. The experimental work consist of casting RC Beam-Column Joint in controlled Beam-Column Joint, Design for torsion Beam-Column Joint, and fully wrapped with Aramid fiber Beam- Column Joint each 3 specimen and curing this specimen for 28 days and testing this test specimen under "Universal testing machine"..*

I. INTRODUCTION

Concrete is the construction material which is used by all the peoples in the world most widely. It have several limitations like limited ductility, it is weak in tension and little resistance to cracking. Cracks and fissures are a common problem in building structures, pavements, historic monuments and other structural members which are subjected to stress in different service conditions.

Methods currently used for crack remediation often use synthetic polymers that need to be applied repeatedly, which requires continuous monitoring and recurring expenses. Because of these disadvantages of conventional surface treatments, attention has been drawn to alternative techniques for the improvement of the concrete durability and also environmentally friendly. More Researches are going on for concrete to overcome the issues and deterioration.

The need for the improvement in construction practices are in need, since the buildings built with concrete as the time passes deterioration and need for the repair work to be done is compulsory. But the repairing of those type of buildings are Uneconomic and Time consuming. The Introduction of Fiber Reinforced polymers have been used many times in auto motives and aerospace industries. These designs are done with old code of practice. But the New code of practice classify those types of building as unsafe due to its cost consuming in-case of repair works to be done. Introduction of bacteria can help in arresting the crack in concrete. In recent it is found that microbial mineral precipitation in concrete improved the overall behavior of concrete. The process can anywhere in the the microbial cell or even some distance away or any part of the concrete within the concrete. Often bacterial activities make a change in the chemistry that leads to mineral precipitation and over saturation. The repeated investigations made to invention of new method called Bacterial Concrete Where bacteria are utilized in concrete.

II. PROPERTIES OF materials

2.1 Properties of Cement

Properties of cement are like

1. Specific Gravity

2. Fineness
3. Consistency
4. Initial setting time

2.2 Properties of Coarse Aggregate

Properties of Coarse aggregate are like

1. Specific Gravity
2. Bulk Density
3. Water Absorption
4. Fineness modulus

2.3 Properties of Fine Aggregate

Properties of Fine aggregate are like

1. Specific Gravity
2. Bulk Density
3. Water Absorption
4. Fineness modulus

III. MIX DESIGN

Mix design can be defined as the process of selecting suitable ingredients of concrete and determining their relative proportions with the object of producing concrete of certain minimum strength and durability as economically as possible. The main objective is to stipulate the minimum strength and durability. It also reveals the relation between aggregate and paste. The other conditions being equal, for workable mixes the strength of concrete varies as an inverse function of the water/cement ratio. Since the quantity of water depend upon the amount of paste, it is important that as little paste as possible should be used and hence the importance of grading. Here we use M30 grade of concrete for this project.

IV. INTRODUCTION TO FE MODELING

Engineering analysis of mechanical systems have been addressed by deriving differential equations relating the variables of through basic physical principles such as equilibrium, conservation of energy, conservation of mass, the laws of thermodynamics, Maxwell's equations and Newton's laws of motion. However, once formulated, solving the resulting mathematical models is often impossible, especially when the resulting models are nonlinear partial differential equations. Only very simple problems of regular geometry such as a rectangular of a circle with the simplest boundary conditions were tractable. But FEM made this easy to solve the problems by giving approximate solution by discretization of the structure.

4.1 FINITE ELEMENT METHOD

The basic concept of finite element method is discrimination of a structure into finite number of elements, connected at finite number of points called nodes. The material properties and the governing relationships are considered over these elements and expressed in terms of nodal displacement at nodes. An assembly process duly considering the loading and constraints results in a set of equations governing the structural response, which are established through the application of appropriate variation principle. Solutions of these equations give the response of the structure. Selecting proper elements and subdividing the structure with large number of finite elements or by taking higher order elements can increase the accuracy of solution obtained by finite element method. In modern design practice, with the advent of large and fast modern digital computers and advancement in numerical techniques; solutions to various static and dynamic problems has become fast and efficient.

4.2 Merits of Finite Element Method

- The systematic generality of finite element procedure makes it a powerful and versatile tool for a wide range of problems. Thus, flexible, general purpose computer programs can be developed and can be applied to various problems with little or no modification.
- FEM can be easily interpreted in physical terms. As well it has a strong mathematical base. Hence, finite element method can be easily applied to any problem with a proper knowledge of the physical system under

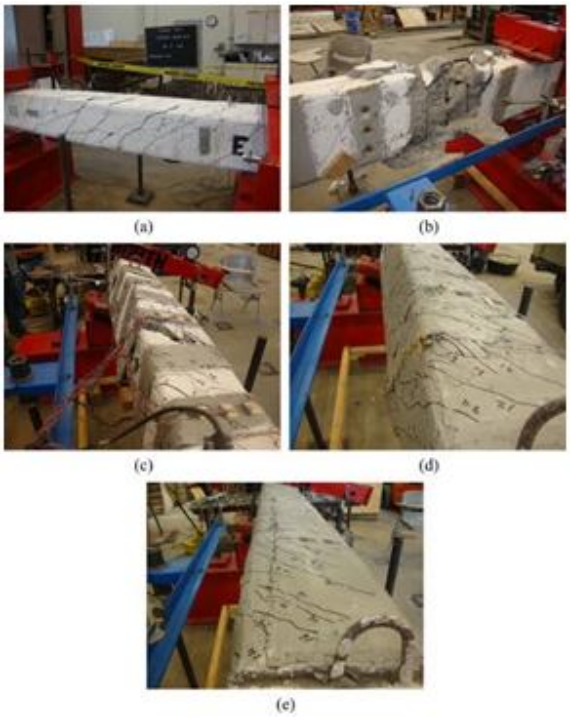

Fig 1 . Torsional behavior of RC beams

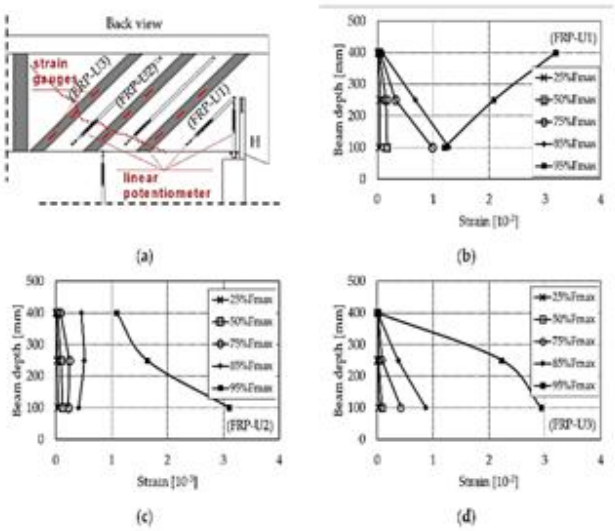

Fig 2. Investigation of RC Beam

V. CONCLUSION

In this Phase-I report, the details like Literature Review has been collected. Size of the specimen to be used for Beam-Column Joint, Cube Specimen has been selected. And all the material required for the project has been collected.

The results found are used in for analyzing. Ansys Software is used to analyze the result values. The Ansys software results are incorporated along with this project for the future doubts and for others references.

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