VISVESWARAIAH TECHNOLOGICAL UNIVERSITY
BELGAUM, KARNATAKA

SHRI. B.V.V. SANGHA'S

# BASAVESHWAR ENGINEERING COLLEGE, BAGALKOT-587102

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## DEPARTMENT OF CIVIL ENGINEERING

**A Project Report On**

# "STUDIES ON DUCTILITY OF REINFORCED CONCRETE BEAMS IN SHEAR"

***Approved By***
***Karnataka State Council for Science and Technology,***
***Indian Institute of Science, Bangalore***

| PROJECT GUIDE | HEAD OF DEPARTMENT | PRINCIPAL |
|---|---|---|
| Dr. S.S. Injaganeri | Dr. C. B. Shivayogimath | Dr. R. N. Herkal |

## PROJECT ASSOCIATES


| Name of Students | University No. |
|---|---|
| Mr. GANESH G. KUNDLESHWAR | 2BA05CV019 |
| Miss. SUJATA P. AKKASALIGAR | 2BA05CV080 |

# ABSTRACT

***Keywords:*** ***diagonal cracking strength; ultimate shear strength; reinforced concrete; ductility; shear force; web strain; flexural strain; compressive strength; tensile strength.***

*The behaviour of reinforced concrete beams in shear at failure is distinctly different from that in flexure. The absence of large deformations and inadequate warning before failure makes the shear failures more catastrophic than flexural failures even in the presence of shear reinforcement and the same has been revealed by several studies on structures damaged by earthquake.*

*The earthquake forces influence the Civil Engineering structures and buildings and are proportional to the mass of its components. Hence, the primary task of a design engineer is to reduce the mass of the structure and also to ensure that the buildings posses enough ductility to avoid brittle failure. One way to reduce the mass or its dead weight is the use of light weight aggregate concrete in construction*

*Ductility is the capacity of a system or structure to absorb energy by deforming in the inelastic region, hence due consideration must be given to capacity of a structure to absorb energy rather than to its resistance. Ductility is one of the most important factors affecting the behaviour of a structure during earthquake and it depends upon the type of material used and also the structural characteristics of the assembly. The use of high strength concrete in modern high-rise buildings has significant effect on ductility of members. The basic approach of earthquake resistant design is not only to be based on the strength and deformability but also on ductility capacity of structure with limited damage but no collapse. The IS 13920:1993 (Ductility detailing of Reinforced Concrete Structures subjected to Seismic forces) has incorporated few provisions to ensure enough ductility in reinforced concrete structures. Also, over the years sufficient research has been carried out, yet there are no clearly defined methods for quantifying the ductility of a structure.*

*Ductility is measured in terms of a ratio or factor and is generally expressed as the ratio of maximum deformation that a structure or element can undergo without significant loss of*

*yielding resistance to the initial yield deformation. In order to determine the ductility ratio of an element, yield displacement and ultimate displacement must be obtained and also defined clearly. Hence, it is planned to test normal, medium and high strength RC beams in shear under servo controlled testing machine and to develop a suitable design methodology by quantifying the ductility ratio.*

*A total of three beams of different compressive strengths with a constant value of longitudinal reinforcement and shear span-to-depth (a/d) ratios were tested in the laboratory. The beams were cast without shear reinforcement to study the adequacy of ductility in shear with increase in compressive strength of concrete. The beams were tested under three point loading under displacement mode. The mid-span deflection, load corresponding to diagonal cracking & ultimate stage and web strains are measured. The test results are analyzed and a comparison is made between normal and high strength concrete beams.*