

# EXPERIMENTAL ANALYSIS AND COMPARISON OF LATTICE REINFORCED BEAM AND CONVENTIONAL REINFORCED BEAM

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## ABSTRACT

The main objective of experimental analysis is to study the various possible shapes of shear reinforcement. Study the effect of the shape of stirrups provided in the beam. The experimental investigation focused on the various types of shear reinforcement in the reinforced concrete beams. Conventional RCC beam and latticed RCC. These two types of shear reinforcement are studied thoroughly; conventional stirrups, welded latticed bars, Beam strength as well as beam deflection are the main parameters in the project that was considered in this study.

Shear failure in reinforced concrete beams is one of the most unwanted modes of failure. This type of failure mode of beam made it essential to explore more effective ways to design these beams for shear. It is observed in the reinforced concrete beams that failure due to shear is more dangerous than the failure due to bending. The diagonal cracks that developed due to over shear forces in beam are wider as compared to the flexural cracks. The economy, durability, serviceability and safety of shear reinforcement in reinforced concrete beams led to the study of other alternatives. Lattice reinforcement is a new type of shear reinforcement. It is welded bar.

In this project, an experimental study of the conventional reinforced concrete beam and latticed reinforced concrete beam have been studied. Several numbers of both types of the beam were analyzed by experimental work and deflection is measured by applying concentrated load applied at the center of the beam surface. The analysis was done for the simply supported condition. Experimental analysis is carried out in lab and results were compared in terms of strength and deflection.

## 1 INTRODUCTION

Building is the structure made of the assembling or casting of different component such as beam, column, slab etc. beam is the main structural component in the beam. The main function of the beam is to support the super structure and transfer the load to the column. Being the most important structural member the study and research is carried out on this component. Generally the beam which is constructed is in square shape. And the stirrups provide to tie the main reinforcement are in square shape.

The concept of providing triangular reinforcement over the square shape is slating side of triangular shape can distribute and transfer properly. So experiment is carried to check whether bearing capacity of the beam affect or not. How much deflection occurs in the beam after application of the load is clarified.

In this project, an experimental study of the square shape stirrups reinforced concrete beam and triangular shape stirrups reinforced concrete beam have been studied. Three numbers of both types of the beam were analysed by experimentally at the laboratory under the observation of the technical

person and deflection is measured by applying concentrated load (point load) applied at the centre of the beam surface. The analysis was done for the simply supported condition. Experimental analysis is carried out and results were compared in terms of strength and deflection.

## 2 EXPERIMENTAL PROGRAM

The test was carried out on the structural laboratory in conastrovision engineering consultant’s pvt.ltd. On UTM. A universal testing machine (UTM), also known as a universal tester, materials testing machine or materials test frame, the specimen is placed in the machine one by one and simply supported condition is maintained. Geometric center of the surface of the beam was calculated manually and then marked on the surface of the beam. With the help of bar point load condition of the test setup is maintained. Load is applied gradually by the UTM machine.as the load increases the deflection on the beam is recorded by the machine. Which was useful to draw load verses deflection graph and to study the graph of each specimen. The loading capacity of machine is 1000kN.

### 2.1 Specimens

Mainly specimen were categorised into two group beam1 and beam2. Beam 1is for square shape stirrups reinforcement in beam. And another that is beam2 for triangular shaped stirrup beam. Mainly sizes of beam described with the help of diagram.

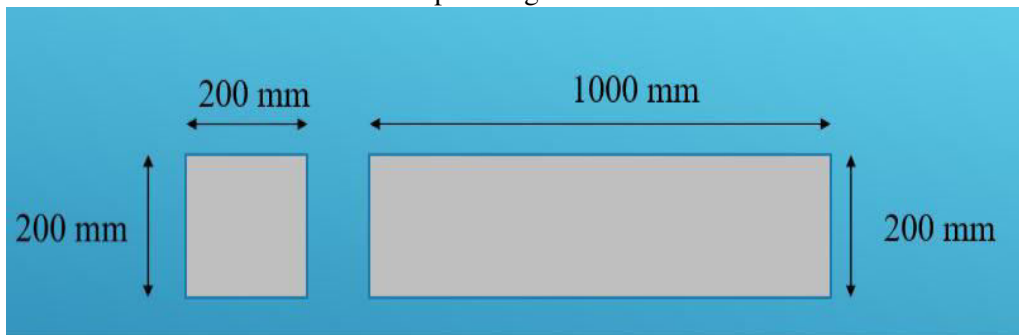


Fig No. 1 Geometry of the beam

Table No. 1 general information of the specimen.

Sr.No	Name of beam	Abbreviation	Grade of concrete	Clear cover (mm)	Steel used (Kg)
1	Square shape stirrups reinforced beam	C1	25	25	3.875
2		C2	25	25	
3		C3	25	25	
4	Lattice reinforced concrete beam	L1	25	25	3.875
5		L2	25	25	
6		L3	25	25	

### 2.2 Material properties

All beam specimens tested in this study were constructed with concrete casts at rosewood society. The Material were used for concreting was cement, sand, aggregate, water. Mould were made with the help of the labour as per the dimension required. Square stirrups and triangular were tied to main reinforcement.



Fig No. 2 Lattice reinforcement



Fig No. 2 square shape stirrups reinforcement

The beam were casted at the rosewood park society. The grade of concrete 25. And steel used of the fe 500. Concrete were mix with the help of concrete mixer. Compaction was carried with the help of tamping rod,travel. Curing was done by gunney bags for 28 days. After curing period of the beam, beam were tested.



Fig No. 3 curing of concrete beam

Table No. 2 Quantity of material required

Material	Ratio (1:1:2)	Volume (Required)	Density	Weight (Required)
Sand	1:4	0.064 m <sup>3</sup>	1602 kg/m <sup>3</sup>	102.528 kg
Cement	1:4	0.064m <sup>3</sup>	1440 kg/m <sup>3</sup>	92.16Kg
Aggregate	2:4	0.129 m <sup>3</sup>	1680 kg/m <sup>3</sup>	216Kg

### 2.3 Test Setup

A 1000 kN compression testing machine was used to conduct the compressive tests on all of the beam specimens. The data of load and displacement were recorded simultaneously from the beginning of the tests until the failure of the column specimens was reached.



Fig No. 4 Experimental setup of concrete beam

### 3 RESULTS

Table No.3 load and deflection of the tested sample.

Sr.No	Name of beam	Abbreviation	Peak load(kN)	Average peak load	Deflection (mm)	Average deflection (mm)
1	Square shape stirrups beam	C1	122	109.66	20.18	19.16
2		C2	102		19.13	
3		C3	105		18.18	
4	Lattice reinforced concrete beam	L1	75.33	84.02	29.38	30.39
5		L2	78.50		30.14	
6		L3	98.25		31.36	

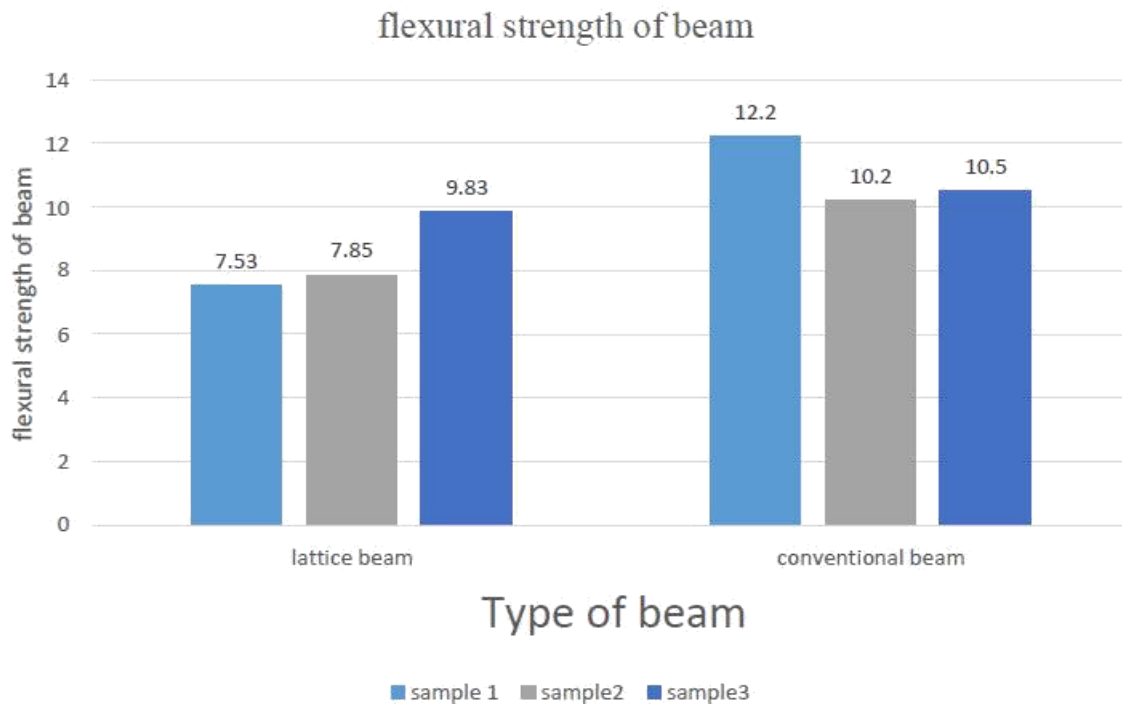


Fig No. 5 Graphical representation of strength of beam (Self-made)

#### 4 CONCLUSIONS

Load bearing capacity of square shape stirrups reinforced concrete beam is 20 % more than the lattice reinforced concrete beam as the physical properties of the beam kept constant. Deflection of square shape stirrups reinforced concrete beam is 20% less than the latticed reinforced concrete beam.

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