DETERMINATION OF SHEAR STRENGTH FOR HIGH GRADE CONCRETE.

ASAWARI SANER , JYOTI TAMBE , KOMAL SONAWANE , HARSHADA THAKUR , ANUJA DHATRAK

Student, Department of Civil Engineering, Loknete Gopinathji Munde Institute of Engineering Education & Research, Nashik, Maharashtra, India
Professor, Department of Civil Engineering, Loknete Gopinathji Munde Institute of Engineering Education & Research, Nashik, Maharashtra, India

ABSTRACT

Shear strength is very complex phenomenon as it involves various factors such as grade of steel, grade of concrete,% of steel, etc. Most of building codes determine shear strength of RC beam with help of empirical equations based on experimentation and comparing their equations with other building codes like ACI, AASHTO, LRFD, EC, CANADIAN Code and JAPANESE Code etc. Moreover IS:456-2000 Table no.19 gives values of design shear Strength of concrete up to M40 grades only. A preliminary experimentation is undertaken using L shaped specimen without any longitudinal reinforcement. It is observed that the developed equation stands well with the equations obtained by some of the researchers and also estimates the values in fair agreement with the experimental values. The present study involves study of the codal provisions as well as the contribution of different researchers in predicting the shear strength of R.C. beams.

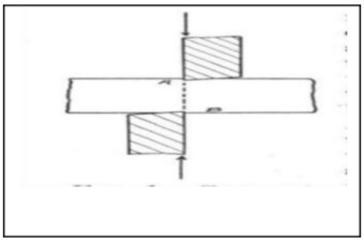
INTRODUCTION

Shear is defined as the action of two equal and oppositely directed forces whose lines of action are in planes very close together. A shear load force tends to produce a would be ideal, but this would be very difficult to achieve due to the unknown effect of interaction of the large number of variables and also because the failure criterion of concrete is not fully known. sliding failure on a material along a plane that is parallel to the direction of the force. The problem of shear in RC beam has been a major concern of engineers.

The parameters influencing shear strength of RC beam:

1) Grade & % of steel.
2) Shape of beam.
3) Dimensions of beam.
4) Shear reinforcement – (bent-up, vertical stirrup, inclined stirrups)
5) Types of loading.

The current provision and empirical equations used for the shear design are mostly based on the research carried with concrete of 40MPa or less. Again these equations proposed by researchers are complex .Hence there is a need to further simplify these equations for better understanding and easy application by the designers. The minimum shear reinforcement for HSC beams needs to be rationalized to avoid brittle failure of the beams and adequate control of the shear cracks.



Shear force in reinforced concrete member is transferred in various ways. For slender beams where a/d is greater than 2.0 ~ 3.0, shear force is carried by the shear resistance of un-cracked concrete in the compression zone, the interlocking action of aggregates along the rough concrete surfaces on each side of the crack, and the dowel action of the longitudinal reinforcement. For relatively short beams, however, after the breakdown of beam action, shear force is resisted mainly by arch action.

OBJECTIVES

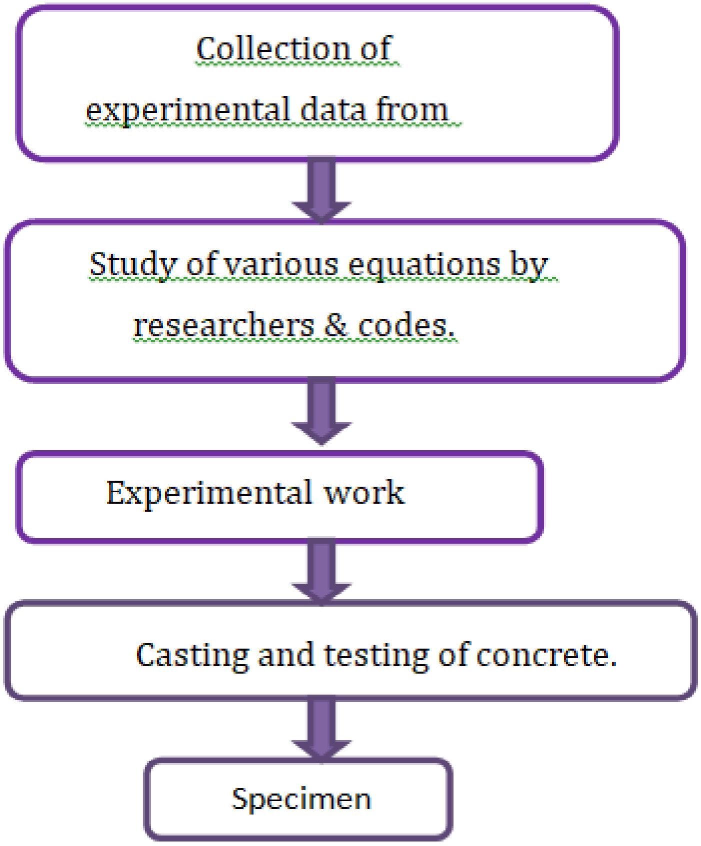
Basically, in this project our main objective is to find the shear strength for concrete grades up to M40 and above M40 grade. The present work is outlined to fulfill the objectives as follows:

1)Study of the available equations in the literature of predicting design shear strength of concrete.

2)Conducting preliminary experimentation on L-shaped concrete specimen without Providing reinforcement.

3)Developing the equation for predicting the design shear strength of concrete and validating the same with other experimental data.

METHODOLOGY:



Based on the literature, L-shaped shear test specimens were prepared from 150 mm cubes by inserting a thermocol block of 90 mm×60 mm in cross section and 150 mm high into the cube mould before casting of concrete.. All the test specimens were cast and cured for 28 days. A 150×85×10 mm size MS plate was placed on left side portion of 90 mm face. Mild steel bar of 12 mm diameter was placed over the centre of the plate. Another MS bar of 22 mm diameter was placed at the edge of the plate.

1)A simplified design equation is also derived within the limited range of effective depth for practical purposes.

2)A rational and mechanics-based equation is proposed for the prediction of shear strength of reinforced concrete beams without web reinforcement.

3) Comparisons with experimental data indicate that the proposed equation estimates properly the effects of primary factors, such as concrete strength, longitudinal steel ratio, shear span-to-depth ratio, and effective depth. It is shown that the proposed equation is considered better than the other equations compared in this study with respect to accuracy and estimation of primary factors.

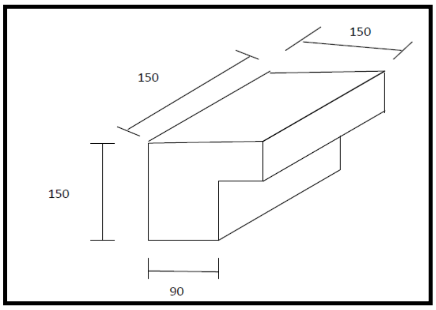


Fig. Geometry of Test Specimen

The Equation obtained for

Ultimate shear strength is:

$$V = \frac{0.65\, f_{ck}^{\,0.425} \times b \times d \times p_t^{\,0.68}}{10 \times \left({}^{a}/_{d}\right)}$$

PROPERTIES OF TEST SPECIMEN:

F_{ck}	p%	a/d	b(cm)	d(cm)	TEST RESULT(KN)
24	1.8	3.92	30.7	46.6	233
25	1.69	3.98	30.5	46	168
24	2.28	4.01	22.9	45.7	173
26	1.71	4.01	30.5	45.7	215
25	1.76	3.95	30.5	46.2	220
27	2.34	3.97	23.1	46	202
26	1.77	3.97	30.5	46	208
25	1.26	3	24	120	468
34	4.16	3.6	15.2	27.2	117
31	4.16	3.6	15.2	27.2	112

CONCLUSIONS

1) There is a scope to perform the experiments to generate empirical equations for high grade concrete.

2) IS 456:2000 has given the values of design shear strength only for Normal Strength Concrete. The

3) work will be limited to conducting the experiments only on L-shaped specimen of the concrete without having any longitudinal reinforcement.

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BIOGRAPHY

Asawari S. Saner (Student)
BE Civil Engineering Department, Loknete Gopinathji Munde Institute of Engineering Education & Research, Nashik, Maharashtra.

Jyoti M. Tambe (Student)
BE Civil Engineering Department, Loknete Gopinathji Munde Institute of Engineering Education & Research, Nashik, Maharashtra.

Komal S. Sonawane (Student)
BE Civil Engineering Department, Loknete Gopinathji Munde Institute of Engineering Education & Research, Nashik, Maharashtra.

Harshada K. Thakur (Student)
BE Civil Engineering Department, Loknete Gopinathji Munde Institute of Engineering Education & Research, Nashik, Maharashtra.