COMPARISON OF SHEAR RESISTANCE OF HIGH STRENGTH CONCRETE BEAM WITHOUT SHEAR REINFORCEMENT BY DIFFERENT CODES

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Abstract: **This paper presents the comparison of shear resistance of high-strength concrete beam without shear reinforcement by different codes. Various researchers has studied the shear resistance of beam by different code . An attempt has been made to study shear strength of high strength concrete beams without web reinforcement of different codes and compare the test results .**

Keywords: High strength, concrete, shear,codes

Introduction: **This chapter presents a review of comparison made by different code of shear resistance of beam without shear reinforcement in this special topic. Use of high strength concrete in construction sector, has increased due to its improved mechanical properties compared to ordinary concrete. One such mechanical property, of shear resistance of concrete beams is an intensive area of research. To Estimate the shear resistance of beams, standard codes and researchers all over world have specified different formulae considering different parameters into consideration. In this chapter the comparison of shear resistance of beam without shear reinforcement and the parameter affecting it is been discussed..Previously researchers have done on this beam by experimental and design base and now it is extended to different codes and etc.**

Ahmad et al. (1986) :studied the effects of the a/d ratio and longitudinal steel percentage on the shear capacity of bezms without web reinforcement. For their tests, the concrete strength was maintained as constant as possible with fi in the range of 63 to 70 MPa.Findings were similar to previous experiments with a transition in the failure mode at an a/d ratio of approximately *2.5.* The envelope involving limits on a/d and p which separates shear failures from flexural failures was found to be similar to the envelope for the normal-strength concrete. However, more longitudinal steel was required to prevent flexural failures. Ahmad proportional

Later on, Bazant and Kazemi (1 99 1) performed tests on geometrically similar beams with a size range of 1 : 16 and having a constant a/d ratio of 3.0 and a constant longitudinal steel ratio, p.. This study confirmed the size effect phenomenon and helped corroboratethe previously published formula. However, the deepest beam tested was relatively small and the authors concluded that for beams larger than 16 inches (406 mm) additional reductions in shear strength due to size effect were likely.

Kim and Park (1994) performed tests on beams with a higher than normal concrete strength (53.7 MPa). Test variables were longitudinal steel ratio, p, shear span-to-depth ratio, a/d, and effective depth. d. Beam heights varied from 170 mm to 1000 mm while the longitudinal steel ratio varied from 0.01 to 0.049 and dd varied from 1.5 to 6.0. Their findings were similar to Kani's from which it was concluded that the behaviour of the higher strength concrete is similar to that of normal-strength concrete. However, since only one concrete strength was investigated no general conclusions could be made with respect to concrete strength and shear capacity In fact, he found that the shear strengths of the beams with 100 MPa concrete were only marginally greater than the shear strength of the 40 MPa beams.

Stanik used the modified compression field theory proposed by the CSA Standard (CSA 1994) to predict the response of his test beams. He found good agreement between his experirnental results and these predictions. He also proposed to use an effective aggregate size of zero in the modified compression field theory method for the very high-strength concretes in order to account for the insignificant gain in shear strength from the lower concrete strengths. Stanik also performed a cornparison between his experimental results and

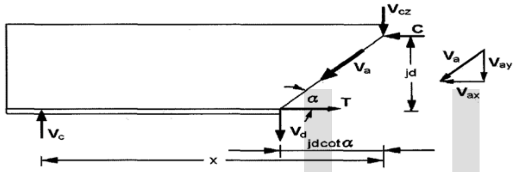
the AC1 Code (AC1 committee 3 18-1995) expressions. He found that the AC1 expressions substantially overestimate the shear contribution of concrete, notably in the deeper members In fact, he found that the shear strengths of the beams with 100 MPa concrete were only marginally greater than the shear strength of the 40 MPa beams

Shear transfer mechanism :

The factor assumed to carry the shear force in cracked concrete to support when no shear reinforcement is provided for illustrated in free body diagram

1. Concrete Compression Zone
2. Dowel Action
3. Aggregate Interlock
4. Arch Action

In addition to this beam arch action also also contributes to shear resistance



Forces acting in a beam element within the shear span

Concrete compression zone:

Gradually cracks widen in the concrete shear resistance of concrete va decreases while vc and vd increase..Finally when aggregate interlock reaches failure shear large shear force transfers rapidly to compression zone causing sudden and explosive failure to beam action when arch action is low

Dowel action:

Shear reinforcement causues by dowel action increases as shear resistance decreases. Consequently it has significant effect in member with no shear reinforcement member.when inclined cracks cross longitudinal reinforcing bar force act on dowel Eg-deflection at bar of face crack, aggregrate around the bar try to resist deflection by interlocking with each other as it sums up with total shear resistant of dowel action

Agregrate interlock:it is generally believe that aggregrate interlock transfers a large part of shear force to the support.when aggregrate interlock of longitudinal reinforcement ratio with added bar of beam the width os flexural cracks get smaller due to increased shear resistance and consequently the vd decreases

Arch action:

When beam develops a flexure-shear interaction the shear resistance of beam develops two mechanism arch and beam meachanism.when arch action contributes more than beam action then meber can achieve considerably more load than diagonal cracking

Design criteria for different type of code for shear resistance of beam without shear reinforcement:

Shear design by Aci code:

According to ACI Building Code 318 [9], the shear strength of concrete members without ransverse reinforcement subjected to shear and flexure is given by following equation

Compressivestrength of concrete at 28 days in MPa.

Bwd- Width

depth - Effective cross section in mm.

MuVu – Factored moment and Factored shear force at Cross section.

ρ – Longitudinal Reinforcement Ratio.

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$$V_c=\left(0.16\sqrt{f_c'}+17\frac{V_u d}{M_u}\right)b_w\,d\,(N)\left(for\ \frac{a}{d}\geq 2.5\right)$$

$$V_c=\left(3.5-\frac{2.5M_u}{v_u d}\right)X\,[Eq\ 1]\left(for\ \frac{a}{d}<2.5\right)$$

Shear Design by Canadian Equation

According to Canadian Standard [11], the shear strength of concrete members is given by following equation:

Compressive strength of concrete at 28 days in MPa.

Vc=0.2root(fc)bxd

$$V_c = 0.2\sqrt{f_c'}\,bw\,d$$

Compressivestrength of concrete at 28 days in MPa.

Bwd- Width d-depth in cross section

Shear design by Indian standard code-

Vc=max=tuc max xbxd/1000

Ptlimit
Vuc=Tucxbxd

Vuc/2=vc
1-Vud> vuc provide shear
Reinforcement2-Vud< vuc theoretically no
shearreinforcement is required

Shear design by eurocode-

Vc=0.18k(100qfc)
K= K=1+rootr(200)/d

CONCLUSION:

HERE BY IT HAS BEEN SEEN THAT THERE ARE DIFFERENT PARAMETER CONSIDERED IN DIFFERENT CODES HENCE IS CODE GIVES A GOOD RESULT AMONGST THE OTHER CODE,BUT STILL RESEARCH SHUD BECARRIED OUT IN DEEP FOR ACCURATE RESULT

References-Separate Categories of Simple Beam Tests",
***ACI Journal, Proceedings*, 68(2) (1971), pp. 138–143.**
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		INDIAN CODE	AMERICAN CODE	CANDIAN CODE	EUROPEAN CODE
WIDTH	**B=250 D-400**	**34KN**		**71.26KN**	**194.67KN**
DEPTH	**D=400 B=250**	**M20 31KN**		**77.5KN**	**15KN**
	Q=1.94%				**36.6KN**
	B=250 D=350	**30KN**		**135KN**	**13.89**
	Q=1.94%				**38.49 KN**
FCK	**B=400 D=700**	**M60 30KN**		**216.88KN**	**22KN 36.6 KN**
	Q=1.94%				**32.08KN**
	B=250 D=700 Q=1.94%	**30.25KN**		**NIL**	**25.6KN**