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Comparison of shear strength of beams based on different codes of practice

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In the design of concrete structures, design for flexure can be achieved by providing longitudinal reinforcement accurately. However design of transverse reinforcement has not been understood as yet. Major design codes do not give adequate guidelines and are loose on predicting shear behaviour to match the test results. Hence a detailed study is required to improve the situation. The main objective of this study is to carry out a state of the art review and to evaluate the shear design approaches. This involves finding when such theories are justifiable for reinforced concrete.

In this study a comparison of test results based on 12 simple test beams and shear strength predicted by several major codes are evaluated. These test beams have been subjected to single or two point loads. A part of test data is presented in Table 1
Table 1: Comparison of test results and shear strength predicted from codes

Author	f'_c MPa	D (m)	b (m)	Tested strength	Calculated shear strength (kN)			
					BS	Canadian	ACI	Australian
Hsiung & Frantz	43	.49	.152	110.3	108.4	109.5	109.3	116.5
Hsiung & Frantz	43	.49	.305	200.2	217.2	219	219	233.3
Hsiung & Frantz	43	.49	.457	339	325.2	328.4	328	249.4
Hsiung & Frantz	43	.49	.457	349.8	325.2	328.4	328	249.4

For all practical beams material and load factors are taken as unity. From the results it is clear that codes give safe or conservative designs in most situations. In the BS code there are limitations on the use of high strength concrete. It is restricted to the use of concrete characteristic strength to a maximum of 40 MPa Recent studies have shown ACI shear design procedure underestimates the influence of the reinforcement ratio. This leads to underestimate the shear contribution from the concrete. The shear predictions based on the Australian code seems to give slightly high estimates. Australian code also has restricts the use of high strength concrete. In conclusion shear predicted by various codes avoid shear failures rather than designing for shear strength.

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