Effective Shear Design of Reinforced Masonry Beams

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Abstract:

The objective of this paper is to analyze shear design provisions for reinforced concrete masonry (RCM) beams. Design provisions from various building codes are assessed in terms of reliability and predictive capabilities. A database of 112 shear tests reported in the literature on RCM beams without stirrups is assembled, and the failure shear stresses of these beams are predicted using four different masonry design codes. The analyzed codes include CSA S304.1-04 (Canada), TMS 402-08 (US), AS 3700-2001 (Australia), and BS 5628-2:2005 (UK). A fifth set of shear design provisions is chosen as well – the General Method of shear design from the CSA A23.3-04 code for reinforced concrete. The study showed that the average V_{exp}/V_{pred} ratios for the masonry codes ranged from 1.05 to 1.53. However, high coefficients of variation for all four masonry codes indicated that low strength reduction factors are required in order to apply the design codes with appropriate levels of safety. Interestingly, the CSA A23.3 general method had the lowest coefficient of variation of all five codes, and the third lowest average ratio of tested to predicted strength. It is concluded that RCM beams exhibit similar behaviour in shear as reinforced concrete beams, and that their shear strengths can be more accurately and safely predicted using the CSA A23.3 code than current masonry codes.

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