

Flexural Tension in Unreinforced Masonry: Evaluation of Current Specifications

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Abstract:

The objective of this paper is to use probabilistic methods to assess the safety level of unreinforced masonry panel walls subjected to out-of-plane wind loads designed according to the MSJC and IBC codes. Data from 327 full-scale tests are examined to develop statistics on the flexural bond strength of the masonry. A lognormal distribution with a coefficient of variation of 0.50 was prescribed for the flexural tension strength. Reliability analyses indicated that the safety level against flexural tension failure is consistent with that inherent in construction with other materials subjected to wind loading, even with using a one-third increase in allowable stress. However, the level of safety was not uniform with different types of masonry construction. Using an allowable stress of 25% of the mean ultimate flexural tension stress from full-scale tests results in a safety level that is consistent with current design. Therefore, it is concluded that the one-third stress increase for unreinforced masonry in flexural tension under wind loads is justified. Empirical observations also bear out the adequate safety level of structures designed with the one-third stress increase; there has not been an undue amount of failures. Since the IBC has prohibited the use of the one-third stress increase, it is proposed that the allowable flexural tension stresses in the MSJC code be increased by one-third to compensate for this.

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