

Anchor Bolts in Masonry Under Combined Tension and Shear Loading

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Abstract:

The objective of this research was to investigate the behavior of anchor bolts in grouted concrete block masonry under combined tension and shear loading. Combinations of tension and shear loads were applied to anchor bolts embedded in nominal 8 inch (200 mm) thick concrete masonry wall panels. L-bolts with a $\frac{3}{4}$ inch (19 mm) diameter were placed at an effective embedment depth of 4 inches (100 mm), in accordance with MSJC (1999) and UBC (1997) provisions. The masonry wall panels were fully grouted, unreinforced walls that measured nominally 40 inches (1.0 meter) square. A total of 64 anchor bolts were tested.

Results from the anchor bolt tests indicate that the linear interaction relationship currently used in design is overly conservative. It is recommended that an elliptical interaction with exponents of 5/3 be used for the combined tension and shear loading of anchor bolts in concrete masonry. The elliptical interaction equation provides a more rational design basis and will allow designers to more efficiently use anchor bolts, increasing the combined loading design strengths by as much as 32 percent.

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