Flexural Bond Strength of Masonry Assemblies with Lightweight Grout

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Abstract:

Lightweight (LW) grout has many potential benefits in masonry construction including minimizing mass, improving thermal performance, and reducing the potential for shrinkage cracking via internal curing. However, there has been insufficient testing of masonry assemblies with LW grout to suggest appropriate design modification factors akin to the lambda factor in ACI 318-19 for LW concrete. The objective of this paper is to study the tensile bond behavior of masonry assemblies grouted with LW grout and to suggest appropriate equations for predicting design capacity. A moment couple testing device with additional capacity compared to the traditional ASTM C1072 bond wrench device, was designed specifically for grouted masonry assemblies. Two different grout mix designs were examined: one using expanded clay (EC) and one using expanded slate (ES) aggregates. These grouts were used to form two-unit, fully grouted masonry assemblies for testing. This paper discusses the design of the moment couple test device, describes the preparation of the grouted prisms used to test flexural bond strength, and examines the relationship between grout density and the flexural bond strength of the prisms. The results of the testing indicate that the current tabulated values for fully grouted masonry subjected to tension normal to the bed joint may be sufficiently conservative for use with assemblies comprised of LW grout, but optimal reduction factors for the existing design equations in TMS 402-22 were proposed based on test results. The reduction factors were selected to increase the average ratio of tested to predicted capacity of the EC and ES grouted specimens to equal the average ratio of tested to predicted capacity for specimens prepared with normal-weight (NW) grouts of similar compressive strength in the literature. The relationship between the proposed reduction factor and the equilibrium density of the grout was additionally examined and the data follows a similar trend as the lambda factor in ACI 318-19 for LW concrete with an increase equilibrium density corresponding to a decrease in the required design capacity reduction.

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