

A Study of Masonry Arch Bridges Using Finite Element Methods

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Abstract:

In this paper, two finite-element computer programs for the analysis of masonry arch bridges are described and some numerical examples are presented. A 'no-tension' characteristic and a non-linear stress-strain relationship for the arch materials are considered in both programs. One program uses a one-dimensional analysis and the depths of the tapered beam elements are varied to simulate the development of radial cracks and crushing in the arch ring materials. The second program uses a two-dimensional analysis where separations between the elements are used to represent cracking, both in the radial direction and in the tangential direction which represents ring separation. The behavior of masonry arch bridges is examined using the numerical models and the results are compared with experimental data from large-scale tests of masonry arch bridges in Britain. Reasonable agreement between the numerical results and the experimental data is achieved.

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