

ANALYTICAL MODELING OF COLD-FORMED STEEL TRUSSES SUBJECTED TO BLAST LOADS

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ABSTRACT

Cold-formed steel (CFS) trusses provide a practical and cost effective means to structurally support sloped roofs. With the advent of design requirements in the United States that mandate government facility envelopes be shown to resist blast loads, CFS trusses are now regularly being analyzed and designed to resist blast loads. Analytical models of varying fidelity ranging from idealized single degree-of-freedom (SDOF) to high-fidelity nonlinear finite element have been used to accomplish this purpose. This paper describes a nonlinear finite element methodology used to analyze CFS trusses. The primary objective pursued in developing this methodology was to model truss constituent members with sufficient fidelity to capture localized nonlinear material behavior likely to be experienced in CFS trusses subjected to blast loads in a computationally efficient manner. Realizing this objective required modeling decisions to address issues related to load derivation and application, connection definition, boundary condition idealization, mesh discretization, and nonlinear material model formulation. Comparisons are made to results from an SDOF model in order to illustrate issues associated with using lower fidelity approaches to design CFS trusses to resist blast loads.