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Impulsive loading of cellular media in sandwich construction JOSEPH MAIN, National Institute of Standards and Technology, GEORGE GAZONAS, U.S. Army Research Laboratory — Motivated by recent efforts to mitigate blast loading using energy absorbing materials, this paper investigates the uniaxial crushing of cellular media in sandwich construction under impulsive pressure loading. The cellular core material is modeled using a rigid, perfectly-plastic, locking idealization, as in previous studies, and the front and back faces are modeled as perfectly rigid. Pressure loading is applied to the front face with the back face unrestrained, and two forms of pressure input are considered: a triangular pulse and an idealized impulse of zero duration. The equation of motion for this system, which generalizes previous results for a fixed back face, is derived in nondimensional form in terms of a single coordinate representing the remaining mass fraction of uncompressed core material. Predictions of this analytical model show excellent agreement with computational simulations using the explicit finite element code LS-DYNA. This analytical model is used to investigate the influence of the relative distribution of mass among the core and the front and back faces, with the total mass held constant. An optimal mass distribution is obtained by maximizing the total impulse that can be absorbed, while limiting the back-face accelerations to a specified level.

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