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Gap Formations Along Specimen-Bar Interfaces in Numerical Simulations of SHPB Tests on Elastic Materials Soft in Shear MARTIN N. RAFTENBERG, MIKE SCHEIDLER, U.S. Army Research Laboratory — Simulations of split Hopkinson pressure bar (SHPB) tests on elastic materials were performed using LS-DYNA. The specimens were much stiffer in dilatation than in shear. A compressible form of Mooney-Rivlin elasticity was applied with parameters evaluated from ballistic gelatin data. The bars were aluminum. The velocity prescribed on the incident bar increased over a rise time until attaining a steady-state value corresponding to a nominal strain rate of 2500/s. The rise time was varied to observe effects of pulse shaping. All calculations were 2D axisymmetric. A penalty-based contact algorithm was applied at the specimen-bar interfaces. This algorithm introduced a stiffness and a viscosity parameter. In sensitivity studies we varied the radius of the bars, the specimen's mesh, and the two contact parameters. In all calculations with the Mooney-Rivlin model, gaps formed at both specimen-bar interfaces over a wide range of strains. This gap phenomenon appears not to have been previously reported in the SHPB literature. We replaced the Mooney-Rivlin model with linear elasticity in order to explore whether the gaps were associated with material nonlinearity. We fixed Young's modulus at a value much smaller than that of aluminum. For sufficiently large Poisson ratios, we again observed gap formations at both specimen-bar interfaces.

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