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Material response mechanisms are needed to obtain highly accurate experimental shock wave data

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The field of shock wave compression of matter has provided a simple set of equations relating thermodynamic and kinematic parameters that describe the conservation of mass, momentum and energy across a steady shock wave with one-dimensional flow. Well-known condensed matter shock wave experimental results will be reviewed to see whether the assumptions required for deriving these simple R-H equations are met. Note that the material compression model is not required for deriving the 1-D conservation flow equations across a steady shock front. However, this statement is misleading from a practical experimental viewpoint since obtaining small systematic errors in shock wave measured parameters requires the material compression and release mechanisms to be known. A brief review will be presented on systematic errors in shock wave data from common experimental techniques for fluids, elastic-plastic solids, materials with negative volume phase transitions, glass and ceramic materials, and high explosives. Issues related to time scales of experiments and quasi-steady flow will also be presented.