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A study on high rate deformation of additively manufactured lattice structures HOSSEIN SADEGHI, JOSEPH ABRAHAM, JOSEPH MAGALLANES, Karagozian & Case, DHRUV BHATE, PADT Inc — Due to recent advances in additive manufacturing (AM), parts with complex geometries which were not possible to fabricate through traditional manufacturing techniques, can now be fabricated. Specifically, AM has enabled fabrication of structures with architected lattice structure to design parts with optimized mechanical performance and reduced weight. However, the mechanical performance of parts created by AM under dynamic loads is not well-understood and further studies are needed to characterize such materials at various loading rates. In this study, high rate deformation of stainless steel lattice structures fabricated by AM is studied. Cylindrical samples with internal lattice structure are fabricated by a powder bed fusion system. Hollow cylindrical samples with the same length, outer diameter, and mass but with larger wall thicknesses are also fabricated. Samples are tested under high rate deformation using a split Hopkinson bar equipment. It is observed that the lattice structure exhibits a better performance compared to an equivalent hollow cylinder with a thicker wall but the same length, diameter, and mass. Finite element simulation of the specimen under the dynamic loads are also performed and the results are compared with experimental measurements.

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