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Constitutive Model Constants for Low Carbon Steels from Tension and Torsion Data[1] NACHHATTER BRAR, University of Dayton Research Institute, Dayton, OH, VASANT JOSHI, Naval Surface Warfare Center, Indian Head, MD, BRYAN HARRIS, University of Dayton Research Institute — Low carbon C1010 steel is characterized under tension and torsion to determine Johnson-Cook (J-C) strength model constants. Constitutive model constants are required as input to computer codes to simulate projectile (fragment) impact on structural components made of this material. J-C model constants (A, B, n, C, and m) for the alloy are determined from tension and torsion stress-strain data. Tension tests are performed at a strain rate of $\sim$1/s at room temperature. Tests at high strain rates are performed at high temperatures to 750°C. J-C strength model constants determined from these data are: A=367 MPa, B=700 MPa, n=0.935, C=0.045, and m=0.643. Similar values for other low carbon steels (1006, 1008, and 1020) are compared. Torsion tests at quasi-static and high strain rates are performed at room and high temperatures. J-C model constants are evaluated from equivalent tensile stress-strain data obtained from torsion data using von Mises flow rule. These constants are compared to those determined from directly measured tensile data.

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