ABSTRACT

Title of Thesis: THE DYNAMIC CHARACTERTIZATION OF IMPACT-MITIGATING MATERIALS USING ELECTROMAGNETIC VELOCITY GAUGES

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The use of certain polymer materials is actively being examined as means to passively reduce the damaging effects of impact loading. With uncertainty of the dynamic environments in which these materials achieve optimal performance, a further investigation is necessary to analyze the dynamic behavior of the viscoelastic material as loading rate varies. This study was conducted using a polymeric Split-Hopkinson pressure bar while using electromagnetic velocity gauges for measuring stress-strain data to obtain material characteristics of the test specimens. Frequency domain characteristics were obtained by fitting a rheological model to test data. Strain-rates observed during the study were on the order of 10^3 s^{-1}. A polymeric Split-Hopkinson pressure bar was used instead of a conventional elastic bar to reduce the impedance mismatch with the test specimens. Electromagnetic velocity gauges were employed to justifiably neglect the dispersion and attenuation effects that accompany the use of viscoelastic bars.