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Preliminary results on the design and construction of a split Hopkinson pressure bar (SHPB) testing device

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Preliminary results on the design and construction of a split Hopkinson pressure bar (SHPB) testing device The data obtained during high strain rate testing of materials, metals, is necessary to fulfill the requirements of information for design and development of parts and components which are submitted to high strain, e.g. shock subjected parts. In recent years we identify the need for the testing of ultra high strength steels used in the automotive industry as a resource for the enhancement of passengers safety. The aim of this work is to present the preliminary results on the design and construction of a split Hopkinson pressure bar testing device. Compressive tests are usually performed in a quasi-static condition using a compressive strain rate up to units/s. The Hopkinson's pressure bar applies strain rates of hundreds/s to even thousands/s. To achieve such high strain rates the split Hopkinson pressure bar uses longitudinal trapezoidal mechanical waves traveling along a bar and striking the sample at the speed of sound of the bar material. The shape of the wave front dictates the strain rate imposed to the specimen. A split Hopkinson pressure bar testing device was built, using a pneumatic cannon to drive a striker and generate the trapezoidal wave. It was instrumented in order to experimentally determine the striker speed and special strain gauges used to record the local and instantaneous strain on the bar at a high sample rate. To allow the planning of experiments and control the energy delivered by the striker, a map of the pressure in the pneumatic cannon against striker speeds. After that the signals recorded from the strain gauges were processed and are presented. The results were promising yielding strain rates in the order of 102/s.