Investigation into mechanical behaviour of rock samples under dynamic loads

Abstract: Some rock engineering applications require the behaviour of rocks to be known under high strain rate loading. Dynamic properties of rocks are important for mining and civil engineering operations such as cutting, excavating, drilling, blasting and crushing. In this study, split Hopkinson pressure bar (SHPB) method, which is commonly used for dynamic testing of rocks, is used. 7 limestone samples were tested using this method. Analysing the results of dynamic tests, testing procedure for determining the time-dependent compressive stress and elastic behaviour was explained. Analysis of results showed that dynamic equilibrium condition and constant strain rate during the tests could be achieved with pulse shaping technique. Under same testing conditions, increase in stress with time (loading rate) is more significant for strong samples compared to weak samples. Duration of constant strain rate during testing is larger for strong limestone samples than weak samples. It was found that elasticity modulus is strongly related to strain rate. Samples having high strain rate had lower elasticity modulus. It was found that dynamic compressive strength of rock tested in this study was about 2.5 times the static strength.