In this study, the split Hopkinson pressure bar testing method was used to quantify the
dynamic strength characteristics of rocks with short cylindrical specimens. Seventy
dynamic compression tests were conducted on 10 different carbonate rocks with the
split Hopkinson pressure bar apparatus. Experimental procedure for testing dynamic
compressive strength and elastic behaviour of rock material at high strain rate loading
is presented in the paper. Pulse-shaper technique was adopted to obtain dynamic
stress equilibrium at the ends of the sample and to provide nearly a constant strain rate
during the dynamic loading. In addition to dynamic tests, the physical properties
covering bulk density, effective porosity, P-wave velocity and Schmidt hardness of
rocks, and mechanical properties such as quasi-static compressive strength and
tensile strength were determined through standard testing methods. Multiple linear
regression analyses were carried out to investigate the variation of dynamic
compressive strength depending on physical and mechanical properties of rocks and
loading rate. A three parameter model was found to be simple and provided the best
surface fit to data. It was found that dynamic compressive strength of rocks increases
with increase in loading rate and/or increase in rock property values except porosity.
Statistical tests of regression results showed that quasi-static compressive strength
and Schmidt hardness are most significant rock properties to adequately predict the
dynamic compressive strength value among the other properties. However, P-wave
velocity, quasi-static tensile strength of rocks could also be used to estimate the
dynamic compressive strength value of rocks, as well, except the bulk density and
effective porosity.