

Nondestructive Monitoring of Bolt Tension (Post)

F. Yang¹

In rock engineering, tensioned, fully grouted and partially grouted rock bolts have been used for many years as ground support. To date, opportunities for testing the quality of the grout in grouted rock bolts have been limited to the pullout tests and the over-coring methods. Both methods are destructive, time consuming and costly. Ultrasonic guided waves offer an opportunity to inspect the rock bolts. The Geomechanics and Mining Innovations Group in Mineral Resource Engineering of Dalhousie University is actively engaged in this advanced research. Its purpose is to find the parameters which are sensitive to the defects, the grout quality or tension load in the bolt. Group velocity and amplitude ratio have been used as the detecting parameters because of their distinct change with frequency in grouted rock bolts. Without tension load, as much as 47% decrease in wave velocity at certain frequencies was recorded in rock bolts when grouted in fully cured concrete. At the same time, the amplitude ratio shows different rates because of the energy loss in various grouted length. At present, the research is focused on the effect of tension load. A significant amount of knowledge has been accumulated over the last few years. The ultimate objective is to apply a technology for on-site nondestructive rock bolt tests.

¹Graduate student, Mineral Resource Engineering, Department of Civil and Resource Engineering, Dalhousie University, Halifax, NS