

# **Application of fiber optic BOCDA sensor for measuring tensile force of ground anchor**

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We have implemented a fiber optic BOCDA(Brillouin Optical Correlation Domain Analysis) sensor to measure the tensile force of ground anchor. The ground anchor should have little change in tensile force during use. However, when the ground anchor is abnormal, its tensile force is reported to decrease or increase. Therefore, it is necessary to monitor the tensile force of the ground anchor for the safety of the slope. The ground anchor testbed was built with the same concrete block which used in construction site, hollow type hydraulic cylinder, manual type hydraulic pump and load cell. The fiber optic BOCDA system was implemented using phase modulation of light for distance position decision, together with single side band modulation of probing light for Brillouin frequency decision. Strain gauge and fiber optic BOCDA sensors were used to measure the strains of the bearing plate while applying load up to 45 tf. The signal of strain gage increased as the load increase but its magnitude was different at different location. Also, the strain gage signal value was changed as we rotate the bearing plate. The distributed strain of bearing plate measured using fiber optic BOCDA sensor showed periodic increase and decrease following circular path around the anchor head. The average value of all measured strain and tensile load value showed linear relationship. From these results, we conclude that the measurement of tensile force of ground anchor from the strain of bearing plate is possible by measuring distributed strain with the fiber optic BOCDA sensor while single point strain measurement is insufficient.