
Theory and verification of small-diameter initial stress measurement by overcoring technique using multi-axial strain gauge - Measuring three-dimensional stresses of rock mass from the ground -

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The overcoring technique is a method used for measuring three-dimensional initial stresses in deep underground rock masses. Two methods used for the measurement of initial stress—measurement by compact conical-ended borehole overcoring and by a multi-axial strain gauge—have been standardized by the Japan Geotechnical Society. However, the latter method requires substantial labor and cost because it needs a large overcoring diameter of more than 200 mm after the multi-axial strain gauge is buried in the pilot hole and because grouts must be left to harden. In addition, this method usually involves horizontal drilling into the tunnel wall, which is difficult to perform from the ground because the hole has a large diameter. In this study, the theory underlying a small-diameter overcoring technique was developed for the aforementioned method to reduce the labor and cost involved in using the method and to enable the measurement of three-dimensional initial stresses during ground drilling. The first half of the manuscript explains the measurement theory for a three-layer cylindrical model using the classical elastic theory. The second half presents a verification of this theory by comparing its results with conventional results and through an in situ test.
