Oedometer test

Consolidation testing for settlement parameters.

- incremental and constant rate of strain loading
- back pressure chamber
- coefficient of consolidation
- coefficient of permeability
- lateral earth pressure coefficient
- preconsolidation stress
- sample disturbance
- constrained modulus

BACKGROUND
The oedometer test is classical in soil mechanics for obtaining parameters for calculation of consolidation settlements and for assessing stress history of soils. Equipment and procedures have been developed at NGI for handling very soft clays or other difficult materials to obtain as reliable and credible parameters as possible.

TESTING EQUIPMENT AND PROCEDURES
A cylindrical soil specimen with cross-sectional area of 20, 35 or 50 cm$^2$ and typical height of 20 mm is enclosed in a stainless steel ring. Top cap and base plate are provided with porous stones to which two drainage tubes are connected. Oedometer specimens are always mounted with dry filter stones to prevent swelling of the unloaded specimen.

The commonly used test procedure includes an unload-reload loop to account for the effects of sampling disturbance and two overnight loadings under constant effective stress to determine points on the 24-hour virgin compression line. It is then possible to determine the 24-hour preconsolidation stress value. The duration of the other load increments are usually in the range 1.0 to 2.5 hours, depending on soil type. Constant head permeability tests are carried out before unloading, as a routine for the incremental loading oedometer test. For constant rate of strain tests, direct permeability measurements are made occasionally to check the back-calculated values from the measured pore pressures.

The coefficient of consolidation is determined from the coefficient of permeability and the tangent constrained modulus on the stress-strain curve both for incremental and constant rate of strain (CRS) tests. For incremental tests, the coefficient of permeability is based on direct measurements and the time compression curves.

Procedures have been developed to correct for the effects of sampling disturbance.

SPECIAL FEATURES / CAPABILITIES
- $K_O$-oedometer cell where horizontal stress can be measured during axial loading, unloading and reloading
- 4 incremental and 7 CRS devices
- $G_{\text{max}}$ (max shear modulus) can be measured by bender elements in top and bottom of specimen, by measuring the shear wave velocity through the specimen
• Back pressure up to 700 kPa can be applied
• High stress oedometer testing ($\sigma_v' = 25$ MPa)

**Key NGI references:**


Example applications of oedometer test

**Geotechnical problem**

![Diagram of geotechnical problem]

- Settlement properties of soft clay

**Laboratory test results**

![Graph of laboratory test results]

- Measurement of earth pressure coefficient, K0
Measurement of permeability under back pressure

Kontakter

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