FULLY-AUTOMATED RESONANT COLUMN & TORSIONAL SHEAR SYSTEM

Geocomp's resonant column and torsional system is based on the Long-Tor Resonant Column Apparatus developed by Dr. Vincent P. Drnevich (patent 1974) at Purdue University. The term Long-Tor denotes the capability of the apparatus to vibrate specimens in ei- ther a longitudinal or torsional mode of vibration. The basic principle of the resonant column device is to excite one end of a confined cylindrical soil specimen in a fundamental mode of vibration by means of torsional or longitudinal excitation. Once the fundamental mode of resonance frequency is established, measurements are made of the resonance frequency and amplitude of vibration from which wave propagation velocities and strain amplitudes are calculated using the theory of elasticity. The shear modulus is determined from the derived velocity and the density of the specimen.

The resonant column test is used to measure shear modulus (G) and the damping ratio (D) at small shear strains. These values are a function of strain level. In the test, the shear strain level is increased step-by-step and the shear modulus and damping ratio are measured. The result of the test is a relationship between shear modulus and shear strain and between damping ratio and shear strain over a shear strain magnitude of 10-6 to 10-4 percent. Higher strain levels associated with extreme loads such as earthquakes and wave loading can not be achieved by resonant column testing using the electromagnetic force actuator to twist the specimen. For higher shear strains, our device can be switched to shearing in torsion. The torsional shear phase can be run to obtain shear modulus and damping up to shear strains of 10% depending on the stiffness of the soil. We can also subsequently shear the specimen along any stress path possible in a triaxial cell. Specimens can be consolidated isotropically or anisotropically.

A typical resonant column-torsional shear test on a specimen involves the following steps:

- Consolidation to the first stress condition
- Measurement of G and D versus shear strain at end of primary consolidation and at 3 times during secondary consolidation
- Consolidation to the second stress condition
- Measurement of G and D versus shear strain at end of primary consolidation and at 3 times during secondary consolidation
- Repeat above through final stress condition. Run torsional shear test to 10% strain to measure G and D for higher shear strain levels. Run triaxial compression test to measure shear strength of the specimen, drained or undrained.

Testing Capabilities

Geocomp's resonant column torsional shear testing system is a complete system capable of performing the following tests:

- Resonance in torsion.
- Damping Ratio in torsion.
- Torsional shear up to 2 Hz
- Triaxial or stress path after torsional shear

Geocomp RCTS turnkey system consists of the following:

- LoadTrac-II
- Two FlowTrac-II's
- Electro-Magnetic Drive System
- Torsional Shear System
- All built-in electronics and data acquisition
- Full automation through all phases of a test

Applicable Standards

•ASTM D4015 •ASTM D-4767 •AASHTO T-297

Technical Specifications

Motor	Stepper motor with built-in controls
Travel	Built-in displacement transducer with 76 mm (3 in.) range and 0.0013 mm(0.00005 in) resolution
Displacement	Control from 0.00003 to 35 mm per minute (0.000001 to 1.3 in. per minute)
Flow Range	0.000006 to 3 cc per second
Power	110/220 V, 50/60 Hz, 1phase

	Dimensions	Weight (approx.)
LoadTrac II	464 x 546 x1206 mm (18 x 21.5 x 47.5 in.)	55 kg
FlowTrac II	203 x 406 x 470 mm (8 x 16 x 18.5 in.)	14 kg

Models

FlowTrac II Models	
FTII-250-nn	250 cc capacity
FTII-750-nn	750 cc capacity
nn	Maximum pressure range for system: 1400 and 3500 kPa (200 and 500 psi) available (resolution of pressure will be 0.00005 times the range)
LoadTrac II Models	
LTII-5,000	22 kN (5,000 lbs.) frame capacity
LTII-10,000	45 kN (10,000 lbs.) frame capacity
LTII-20,000	90 kN (20,000 lbs.) frame capacity

Accessories

Triaxial cells to test samples up to 305mm (12.00 in.) diameter, membranes, porous stones and sample preparation accessories upon request.