Geocomp

Technologies to manage risk for infrastructure

Resonant Column-Torsional Shear

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

Applicable Test Standards

- ASTM D4015
- ASTM D4767
- AASHTO T297

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

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

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 either 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 cannot 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.

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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 0.6 in. per minute)

FLOW RANGE
0.000006 to 3 cc per second

POWER
110/220 V, 50/60 Hz, 1 phase

DIMENSIONS
LoadTracII
464 x 546 x 1206 mm
(18 x 21.5 x 47.5 inches)

FlowTracII
203 x 406 x 470 mm
(8 x 16 x 18.5 inches)

WEIGHT
LoadTracII
55 kg (120 lbs.)

FlowTracII
14 kg (30 lbs.)

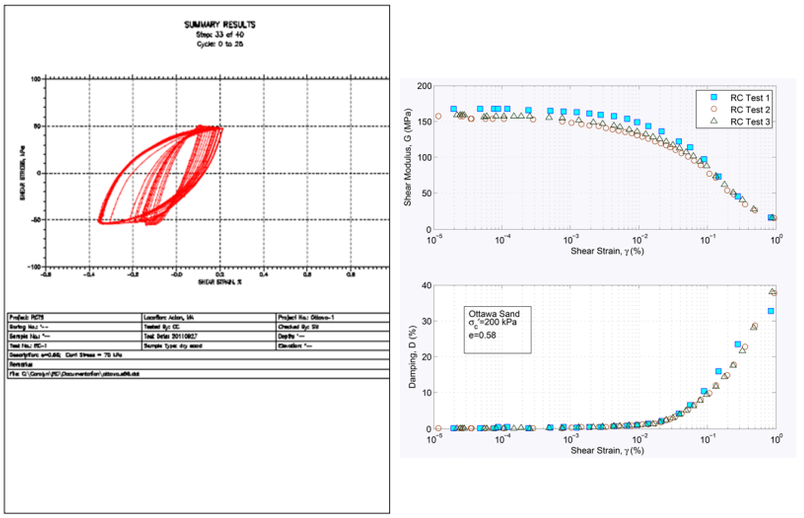
MODELS
LoadTracII Models: Frame Capacity
LTII-10,000: 45 kN (10,000 lbs.)
LTII-20,000: 90 kN (20,000 lbs.)

FlowTracII Models: Frame Capacity
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)

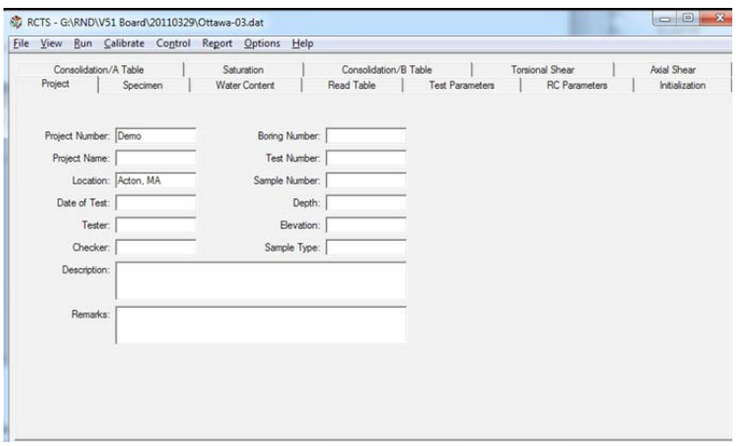
ACCESSORIES
Triaxial cells to test samples up to 305 mm (12.00 in.) diameter, membranes, porous stones and sample preparation accessories upon request.

GEOCOMP RCTS TURNKEY SYSTEM CONSISTS OF:

- LoadTrac-II
- One sample FlowTrac II
- Pneumatic controller for cell pressure controls
- Electro-magnetic drive system
- Torsional shear system
- Full built-in electronics and high speed data acquisition
- Full automation through all phases of a test



Typical Test Output



User-friendly Interface