



edilab

**Geotextile Testing Equipment**

# Geotextile Test Equipment

Geotextile comprises of nonwovens, wovens and multi layer composite materials made up of synthetic (polypropylene, polyester, etc.) or natural (jute, coir, textile, fibres). They may be in the form of sheets or strips and are used world over in a multitude of civil engineering construction end uses. In India too, their potential has begun to be realised. Several successful trials have already been made and several are under way.

Edilab R & D Wing, under guidance from IIT Delhi, has made a breakthrough in developing equipment for conducting relevant tests to evaluate the physical properties of geotextiles for reinforcement and stability application for soil retaining structures, steep slopes, embankments on soft soils, pavement system etc. for drainage and erosion control, separators between ballast subgrade in railways and other general applications. Such testing will help in the choice of geotextiles based on rational criteria.

## Thickness Gauge

**ELC 241**

Thickness is one of the basic physical properties used to control the quality of many geotextiles and geosynthetics.

This equipment is simple to operate and thickness of the geosynthetics/ reinforcing material can be measured with an accuracy of 0.001 mm for thickness upto 25 mm. Simple mechanism is provided to apply desired foot pressure varying from 1 to 10kPa as per various international standards. Surface plate is grounded and is rust free to enable reproducible results.



ELC 241

### Ordering Information :

**ELC 241** Thickness Gauge

## Dry Sieve Test Apparatus

**ELC 242**



ELC 242

Soil retention is a predominant function of geotextiles in drainage and filtering applications. Pore size is the key parameter that controls the ability of the geotextile to retain the soil. The Apparent Opening Size (AOS) also called the Equivalent Opening Size (EOS) was developed by US Army Corps of Engineers for evaluating

this property. AOS is the size of the holes in the geotextiles and it provides an index to the size of the largest opening through the geotextile. In conducting this test, the geotextile fabric is placed (instead of a wire mesh) in a sieving frame by using a special clamping arrangement. The test involves sieving rounded particle sizes for which 5% or less by weight, pass through the geotextile. The AOS is defined as 'Retained On' size of that fraction expressed as a standard sieve number (size).

The test is widely used for relative comparison amongst the geotextiles. Thus AOS is a means of correlating geotextile pore structure to an equivalent screen mesh size. This test is standardised by ASTM, ISO, IGS (International Geotextile Society). The apparatus consists of a 20 cm dia brass frame with clamp, a receiver and a lid.

**Ordering Information :**

**ELC 242** Dry Sieve Test Apparatus

**Optional Accessories :**

**ELC 24201 Rounded Beads** made of glass, size 0.85mm (passing 1 mm and retained at 0.85 mm)

**ELC 24202 Rounded Beads** made of glass, size 0.425 mm (passing 0.85 mm and retained at 0.425 mm)

**ELC 24203 Rounded Beads** made of glass, size 0.25mm (passing 0.425 mm and retained at 0.25 mm)

**ELC 24204 Rounded Beads** made of glass, size 0.18mm (passing 0.25 mm and retained at 0.18 mm)

**ELC 24205 Rounded Beads** made of glass, size 0.15mm (passing 0.18 mm and retained at 0.15 mm)

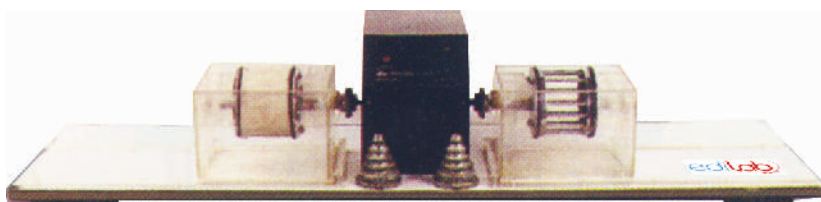
**ELC 24206 Rounded Beads** made of glass, size 0.075mm (passing 0.15 mm and retained at 0.075 mm)

**ELC 054-1 Sieve Shaker, Motorised**

Note: Sieve Shaker and Rounded Beads are to be ordered separately.

## Hydrodynamic Sieve Test Apparatus

ELC 243



ELC 243

The percentage passing of different fractions determines the porometry of the geotextile being investigated. In the Hydrodynamic Sieving Method, the geotextile specimen loaded with a certain quantity of glass bead fraction, is continuously rotated in a water trough, forcing the glass beads to pass through the geotextile openings.

The apparatus consists of two test drums of 14 cm dia and 7 cm effective length with 16 nos. of 4 mm dia rods provided circumferentially at equal spacing to hold the geotextile specimen in position. Two troughs to contain the test drums are supported on horizontal axis, facilitating free rotation and capable of being filled with distilled water to a level of 20 mm below the drum axis. The clearance between the trough and the geotextile can be maintained at about 40 mm.

The apparatus is provided with a motor drive and a change gear assembly to enable rotation of the drums at a speed of 5 rpm to 30 rpm.

For conducting the test, the geotextile specimen is cut and stitched to get a shape of 14 cm dia and 10 cm length to insert over the drum tightly, after immersing the specimen in distilled water for one hour, duly secured by rubber 'O' rings. After placing 50 g of the smallest size glass beads inside the drum, the lid is secured and the drum with the geotextile placed in distilled water to the desired level and rotated at 20 rpm for 1,500 cycles. In order to get the optimum filtration opening size, the drum is rotated at a speed of 5 rpm to 30 rpm for 250 to 2,500 revolutions. The percentage of beads passed through the geotextile by dry weight is determined. The test is repeated with increasing size of glass beads till less than 5% of the beads by weight pass through the geotextile.

Suitable for operation on 220v, 50Hz. Single Phase, AC Supply.

**Ordering Information :**

**ELC 243** Hydrodynamic Sieve Test Apparatus

**Optional Accessories :**

**ELC 24201 Rounded Beads** made of glass, size 0.85 mm (passing 1 mm and retained at 0.85 mm)

**ELC 24202 Rounded Beads** made of glass, size 0.425 mm (passing 0.85 mm and retained at 0.425 mm)

**ELC 24203 Rounded Beads** made of glass, size 0.25 mm (passing 0.425 mm and retained at 0.25 mm)

**ELC 24204 Rounded Beads** made of glass, size 0.18 mm (passing 0.25 mm and retained at 0.18 mm)

**ELC 24205 Rounded Beads** made of glass, size 0.15 mm (passing 0.18 mm and retained at 0.15 mm)

**ELC 24206 Rounded Beads** made of glass, size 0.075 mm (passing 0.15 mm and retained at 0.075 mm)

**ELC 24301** Pair of drums & tank assemblies including coupling

Note: Rounded Beads are to be ordered separately.

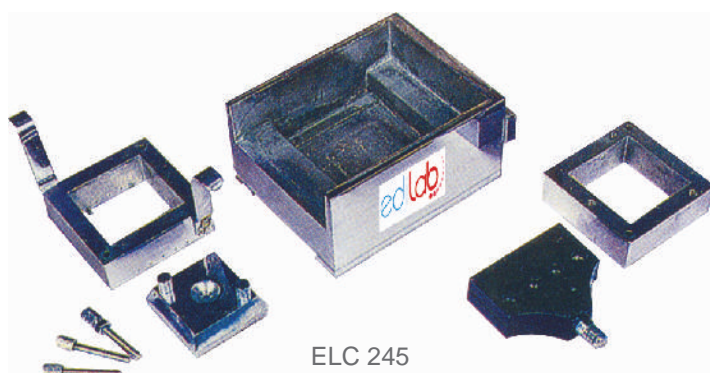
## Interface Friction

ELC 244 & ELC 245

Soil reinforcement is a recent and fast developing technique to improve soil behaviour for a variety of civil engineering works; e.g. earth retaining structures, slope stability, land slides protection works, pavement, etc.

In order to utilise fully the strength of reinforcement material while transferring load and forces via soil or aggregate to the reinforcement, a correct assessment of the soil/reinforcement frictional relationship is essential. The frictional properties can be assessed by means of a shear box which is modified either to conduct a 'Modified Shear Test' or 'Pullout Test'. In the former test, reinforcement material is placed and clamped in the plane of shear with soil above the fabric, whereas in the latter test, the fabric placed between the top and bottom shear boxes, is covered on both sides with soil and is then pulled out to evaluate the frictional resistance. This interface friction measurement apparatus has been specially designed to evaluate both 'frictional' as well as 'pull out resistance' of soil reinforcing materials at a shear rate and drainage condition as desired by the designer

These are 60x60x25 mm assemblies which can be used for soils with D85 not greater than 4.75 mm. These apparatus are to be fitted in conventional Direct Shear Test Frame



ELC 245

**Note:** The equipment offered is only an attachment to Edilab Direct Shear Apparatus which is to be ordered separately.

### Ordering Information :

**ELC 244 Interface Friction Measurement Apparatus (Shear Box Assembly)** for Modified Direct Shear Apparatus

**ELC 245 Interface Friction Measurement Apparatus (Shear Box Assembly)** for Pullout Test Apparatus

## Cone Drop Test Apparatus

ELC 247

This test was developed by the Norwegian Road Research Laboratory (NRRL) and is widely used in Europe in evaluating the resistance of geosynthetics / geotextiles to damage during installation due to dropping of sharp edged or sharp pointed stones on a geosynthetic/geotextile directly. In this test, a geosynthetic or geotextile is clamped to yield a clear diameter of 150 mm and a brass cone of 45 degree angle included, having a weight of 1 kg, is dropped through a height of 500 mm. The diameter of the resultant hole is measured with a graduated conical device.

The smaller the hole, the greater the resistance of geosynthetic/ geotextile to damage. When used in combination with other direct tensile test results, it provides a convenient means of qualitative comparison.

**The equipment consists of the following replaceable parts :**

- ELC 24701**      Graduated Conical Measure
- ELC 24702**      Brass Cone



ELC 247

### Ordering Information :

**ELC 247** Cone Drop Test Apparatus

## Cross Permeability Test Apparatus

ELC 248

Permeability of a geotextile must be substantially greater than that of the protected soil, so that water can pass freely from the soil through the fabric without build-up of hydrostatic pressure. A high value of the permeability of the geotextile also infers that partial clogging will not reduce the permeability.

Both Constant and Falling Head Permeameters are generally used for measuring normal permeability known as permittivity. Permeability is defined as the volumetric rate of flow of water per unit cross sectional area under unit hydraulic head across the plain of the geotextile. ASTM D 4491 specifies permeability test using Constant Head and Falling Head Permeameters. The constant head test is carried out using a head of 50 mm of water. Specimen diameter is 100 mm.



ELC 248

### Ordering Information :

ELC 248	Cross Permeability Test Apparatus
<b>Essential Accessories : (Excluded In Outfit)</b>	
ELC 13111	Overhead Tank 110 lts. capacity
ELC 24801	Loading unit, Dead weight type, 300 kPa capacity

## In-Plane Permeability Test Apparatus

ELC 249

This test is necessary for drainage applications. The permeameters can be of parallel flow or radial flow type. In either case, flow occurs along the plane of the permeameters. In the apparatus, flow occurs radially outwards, from a central hole to the periphery of a circular specimen. The inplane permeability is known as transmissivity which is defined as the volumetric rate of flow per unit width of geotextile and unit hydraulic head. Specimen diameter is 100 mm.



ELC 249

### Ordering Information :

ELC 249	In-Plane Permeability Test Apparatus
<b>Essential Accessories : (Excluded In Outfit)</b>	
ELC 13111	Overhead Tank 110 lts capacity
ELC 24801	Loading unit dead weight type 300 kPa capacity

## Long Term Flow Test Apparatus

ELC 250

The tests for permittivity and transmissivity help in comparing one fabric to another, but gives no indication of the hydraulic behaviour of the composite soil-fabric system. Under steady state and reversing flow conditions, fabric clogging or binding causes a decrease in water flow rate and corresponding increase in hydraulic head loss through the geotextile. When the potential for fabric clogging is significant, clogging resistance of filter fabrics should be evaluated to ensure adequate long term filter performance. As the clogging is highly soil dependent, soil fabric permeability test is suggested to determine the long term flow capability of a geotextile.

Specimen diameter : 100 mm Mould for  
 compaction of soil : 10 cm dia x 11.2 cm high  
 Head of water : Upto 37.5 cm



ELC 250

### Ordering Information :

<b>ELC 250</b>	Long Term Flow Test Apparatus
<b>Essential Accessories : (Excluded In Outfit)</b>	
<b>ELC 13111</b>	Overhead Tank 110 lts. capacity

## Gradient Ratio Test Apparatus

ELC 251

The US Army Corps of Engineers established a direct measure of geotextile clogging potential. They defined it as gradient ratio which is the ratio of hydraulic gradient through the geotextile plus 25.4 mm of the soil to that of hydraulic gradient through the adjacent 50.8 mm of the soil. It is determined after 24 hours of flow.

Specimen diameter Mould : 100 mm  
 compaction of soil : 10 cm dia x 11.2 cm high  
 Head of water : Upto 37.5 cm

### Ordering Information :

<b>ELC 251</b>	Gradient Ratio Test Apparatus
<b>Essential Accessories : (Excluded In Outfit)</b>	
<b>ELC 13111</b>	Overhead Tank 110 lts. capacity



ELC 251

# Geotextile Permeameter

ELC 254



ELC 254

The Geotextile Permeameter has been designed to meet the test requirements of water permeability of Geotextile. It has been made keeping in view the growing requirement of testing of coir geotextile. The geotextile is tested in the uncompressed state for permittivity. The determination of permittivity of geotextile is carried out, either by using constant head or falling head test procedures. The equipment can be used for performing tests as per ASTM-D4491-92. The equipment comprises of specimen holder assembly suitable for 73mm & 100mm dia sample, complete with interconnecting tubes housed inside a metal housing & mounted on a table along with a pump for delivering de-aired water from de-airing below the specimen holder assembly unit. A water tank of 100 ltrs. capacity is placed alongside the main equipment on a steel stand to store & supply de-aired water continuously, as required, during the test. Geotextile permeameter comprises of specimen holder assembly for holding specimen of dia 73mm. Housing for specimen holder complete with inlet & outlet valves, Head differential measurement arrangement mounted on a stand and a Water Tank, complete with water level gauges suitable for falling head and constant head tests.

#### The equipment consist of the following replaceable parts :

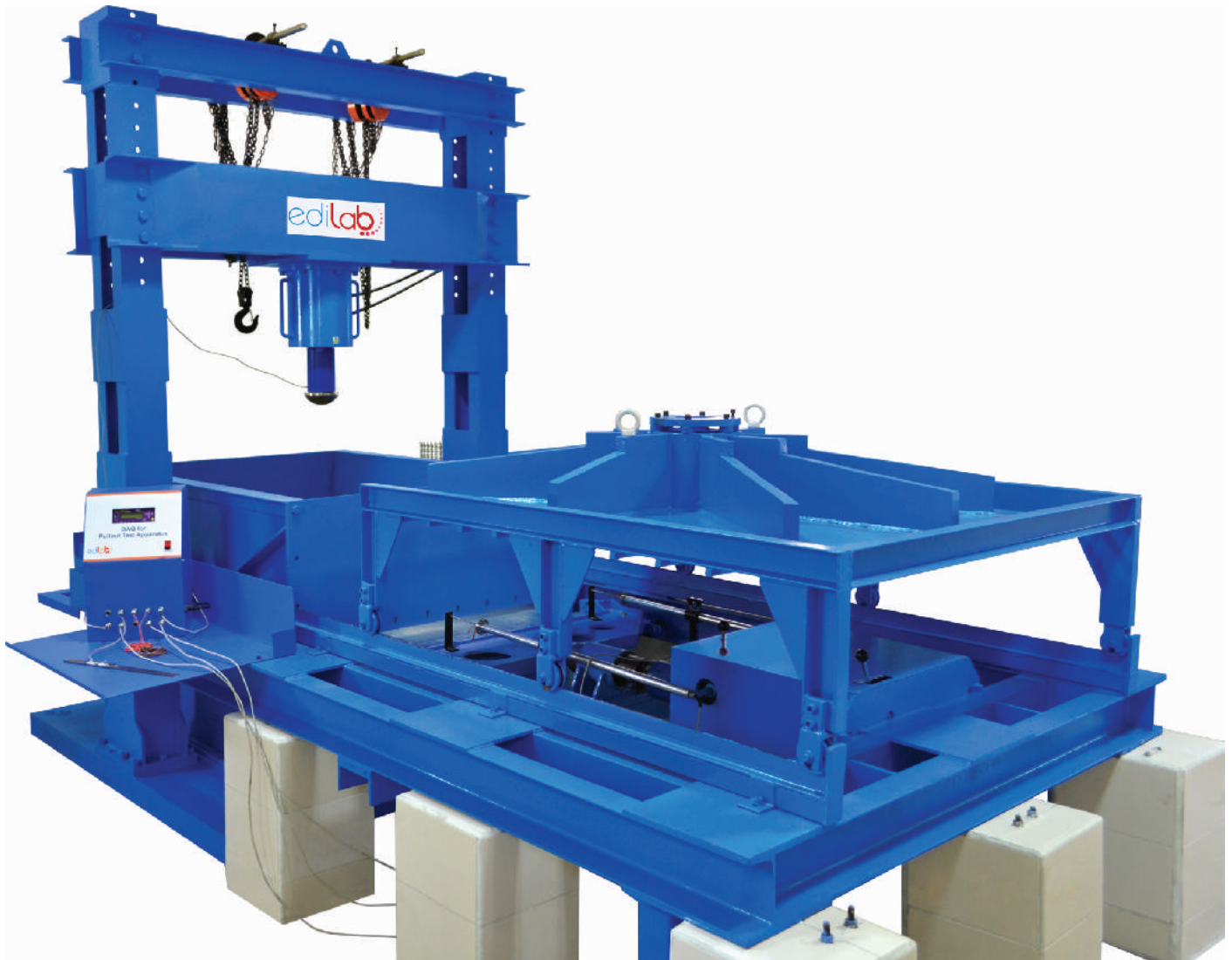
- ELC 25401** Specimen Holder Assembly for 100mm dia specimens
- ELC 097-1** De-Aired Water Apparatus
- ELC 25403** Blanking Die for 73mm dia sample
- ELC 25404** Blanking Die for 100mm dia sample
- ELC 25405** Sample collection beaker - 500ml

#### Ordering Information :

<b>ELC 254</b>	Geotextile Permeameter
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# Large Pull Out Test Apparatus for Geo Synthetics

ELC 255



ELC 255

Pull out Test Apparatus is being especially designed to measure the interface friction between GI Strips / Geosynthetics and Soil.

The use of reinforcements provides additional shear stress in the soil mass through the tensile force in the reinforcement. The considerable increase in the use of geosynthetics in the reinforced soil structures led to the development of testing procedures to evaluate their interaction properties.

Pullout apparatus is mainly used for finding the interfacial friction between GI Strips / Geosynthetics with soil. The interfacial friction coefficient is most important parameter for design of reinforced earth walls, reinforced earth slopes and other reinforcement applications.

This test is carried out to find pullout interface properties of geogrids used as reinforcement in the Soil structures.

In this method, a geosynthetic is embedded between two layers of soil. For conducting the pullout test Normal compressive stress is applied to the top soil layer & horizontal force is applied to the geosynthetic & the force required to pull the geosynthetic out of the soil is recorded.



Pullout resistance is obtained by dividing the maximum load by the test specimen width.

A plot of maximum pullout resistance versus applied normal stress is obtained by conducting a series of such tests.

The test method is applicable to all geosynthetics and all soils.

## Features

- Suitable for testing Pull Out Interface properties of Geogrids in Soil structures.
- Normal Load upto 250 kN.
- Pull Out force upto 300 kN.
- Sample Size from 600mm x 450mm to 2m x 1.5m.
- Rugged & sturdy Construction to ensure Accuracy of results.
- Variable Pull speeds available.
- Used in the design of geosynthctic reinforced retaining walls slopes & embankments
- Robust & accurate data acquisition system
- 25 Channels Data acquisition System (Feasible for expansion)

## The major components of Pullout Test Apparatus are:

- Steel Box – where sample is embedded between two layers of Soil.
- Hydraulic Jack mounted on Vertical Frame for application of Normal Load.
- Pulling Arrangement mounted on a Horizontal Frame along with the Steel Box.
- Loading Pad / Plate.
- Chain Pulley Arrangement for lifting Loading Pad.
- LVDT's to measure Sample Displacements.
- Load Cells for vertical load & pull out
- Strain Gauges.
- Stand alone data acquisition system

## Detailed Specifications:

- **Steel Box :**  
Size -1.5m x 1.0m x 1.0m.  
Material - Steel plates. Reinforcements are provided in all the plates to strengthen them.
- **Load Frame:**
  - a) Vertical Frame**  
Steel Frame 1.5m long x 2.5m high fabricated out of heavy duty Channels, Plates & other sections.
  - b) Horizontal Frame**  
Steel Frame 3.5m long x 1.5m wide fabricated out of heavy duty Channels, Plates & other sections.
- **Loading Pad:**  
1.50m long x 0.91m wide Loading pad with sufficient plate thickness & ribs etc. for reinforcement to prevent buckling at the time of application of Load.
- **Hydraulic Jack for Vertical/Normal Load:**  
Hydraulic Jack to be operated with the help of suitable Power Pack. Capacity 250kN Double Acting with 20cm ram dia & 20cm travel.
- **Spherical Seat:**  
Spherical Seat for placing above the Loading Pad.
- **Power pack for operating Jack:**  
Power Pack with Direction Control Valve for operating Double Acting Jack.
- **Measurement of Normal Load:**  
Load Cell (250kN capacity).
- **Measurement of Geosynthetics or GI Strips Displacements(Pull): 4 Nos.**  
Linear Variable Differential Transformer (LVDT) – 150mm travel with  $\pm 1\%$  accuracy.

- **Measurement of Pullout force:**

Load cell (100kN capacity).

- **Application of Pull Out Force on front face:**

Strain Controlled through Geared system.

- Arrangement for pulling out the GI Strips / Geo-synthetics:

Motorized arrangement with 3 displacement rates – (1mm/min, 3mm/min & 5mm/min).

- **Data Logger:**

Electronic Data Acquisition System (All readings – Pullout load, displacement & strain to be recorded automatically & stored at six second intervals by an electronic data acquisition system & the data can be downloaded in Excel format).

- **Foundation work:**

The equipment rests on pillars of size 10inch & height 20inch above the ground level.

**Note - Foundation Work To Be Arranged By The Customer.**

- **General requirement:**

- Chain Pulley Block – 2 Ton Capacity – 2nos.

- **Optional Requirement**

Strain Gauges

- **Note - Pullout arrangement is as per ASTM Code D 6706 -01**

- **Note -The Instrument can be customised as per Customer requirement**

**Ordering Information :**

ELC 255

Large Pull Out Test Apparatus for Geo Synthetics