Test set-up to evaluate compressibility properties of PVD implanted cohesive soil

Name of Equipment/ Assembly	Test set-up to evaluate compressibility properties of PVD-implanted cohesive soil
Related Standards to be accorded	
Need of Equipment/ Assembly	This apparatus will be used to test the compressibility properties of embankments with prefabricated vertical drain (PVD) installed for different soil properties, drainage, and loading conditions. Prefabricated Vertical Drains, also known as Wick Drains or band drains are prefabricated geotextile filter-wrapped plastic strips with molded channels. These act as drainage paths to take pore water out of soft compressible soils that consolidate faster under a constant surcharge load. It typically involves applying a mechanical load to a soil section and measuring its consolidation parameters under different conditions. A scaled laboratory model of the different soils with PVDs will be prepared though this fabricated assembly.
Features/Capabilities /Specifications	The assembly shall consist of the following: • **Loading Frame** with capacity of 250 kN vertical load to house the set up with the horizontal clearance of 100 mm on all sides from the test tank. • **Soil Tank** of at least 1000 mm (maximum 1200 mm) diameter and 1000 mm height. Half the side of the tank wall is to be made of Mild steel and half side of the tank made of translucent material, like Acrylic. The wall thickness shall be adjusted to take the applied load. • **Top Plate: Four plates** o A plate to cover the tank with a 2 mm distance at the edges to avoid friction. The plate shall be perforated and shall have two discharge plugs in opposite directions. The plugs will help (i) to drain out the water collected from the soil system and (ii) to measure the pore pressure developed in the soil mass. o A circular plate of 200 mm diameter with a minimum thickness of 25 mm, with chequers or grooves as per Fig. 4 (Cl. 3.3) of IS 1888. o A circular plate of 300 mm diameter with a minimum thickness of 25 mm, with chequers or grooves as per Fig. 4 (Cl. 3.3) of IS 1888. o A circular plunger with 50 mm diameter and height of 50 mm • **A Vacuum Pump System** (with a capacity of 50 kPa) designed to extract water from the soil system through the drain plug on the top cover plate. The setup includes an intermediate arrangement to collect the extracted water, preventing it from reaching the vacuum pump. This water collection system should also attach with a weighing balance to monitor the weight of extracted water continuously. • **A framework consisting of vertical and horizontal rod connections** (as illustrated in Fig. 1) designed for placement inside the tank to facilitate the insertion of PVDs in various configurations. The assembly's height shall be adjustable but not exceeding 900 mm. • **Load and Observation Assembly with Capacity** of Actuators having Hydraulic Servo Power Pack with a capacity of 300 bars, System shall be capable of providing two types of Loading i.,e, Dynamic and Static. All the sensors/transducers shall have a calibration certificate and calibration contract for two years after completion of validity of first calibration. o **Actuator:** 20 kN capacity, Stroke Length 100mm (±50mm), Frequency range 0.1 Hz - 5Hz o **Actuator:** 100 kN capacity, Stroke Length 100mm (±50mm), Frequency range 0.1 Hz - 5Hz

	○ **Load Cells:** Capacity 10 kN, Load accuracy: ± 1% of the indicated load value (01 no.) ○ **Load Cells:** Capacity 25 kN, Load accuracy: ± 1% of the indicated load value (01 no.) ○ **Load Cells:** Capacity 100 kN, Load accuracy: ± 1% of the indicated load value (01 no.) ○ **Displacement Transducer**: 25 mm capacity with 0.001 mm resolution. (04 Nos.) ○ **Displacement Transducer:** 100 mm capacity with 0.001mm resolution. (04 Nos.) ○ **Strain Gauge:** 25 nos. ○ **Pore pressure transducer**: 2.5 MPa, (Load accuracy: ± 1% of the indicated pressure value) - 04 no. ○ Vibrating wires for all the sensors with the required length. • **16-channel Data acquisition (DAQ)** system with an extension up to 30 channels ○ Input facility required for Load cell, pressure sensor, LVDT and Strain Gauges ○ With 18-bit resolution and capacity of 1000 sample/sec, • **Computer system a**long with the following ○ Desktop/laptop computer with Intel i7 or equivalent processor, 2 TB SSD, 8 GB RAM, compatible motherboard. With a monitor, keyboard and mouse. With a 2-year warranty. ○ Compatible software for analysis ○ Configurable controlling unit system for DAQ ○ Printing kiosk • **Power Supply** requirements shall be mentioned clearly. • Demonstration of the assembly of the system and software training shall be provided at our place. • UPS (Uninterrupted Power Supply) system with 4-hour continuous power backup capacity to run the electronic & electrical system of the equipment.
Experimental and Research Capabilities	The setup shall possess Possibilities for Conducting 1. Load test on PVD-implanted soil straight and deformed drains 2. Static Plate load Test 3. Cyclic Plate Load Test 4. Dynamic Plate Load Test 5. CBR Test 6. Tests for determination of Modulus of Resilience 7. Educational and Demonstration Purposes
Make	• Clear mention Make in the bid
Electrical Supply Requirement	• Electricity supply requirements (voltage and phase) shall be clearly mentioned
Size and weight	• **Detachable/ Assemblable Units:** The equipment shall be dismantlable as placed in the available infrastructure, The maximum dimensions of the door are given below. • The dimension of any unit/ part of the apparatus shall not exceed 2.7 meters (L) x 1.5 meters (W) x 1.9 meters (H). • Mention area required for positioning of equipment. • Mention total weight of the equipment. • Mention specific requirement of foundation/pedestal for resting the equipment, if any. • Mentioned need of vibration isolated, if needed
Water and air supply requirements	• Mention the requirement to supply of compressed air, if any. • Mention the requirement and arrangement of water supply, if any.

Compatibility of parts	• In case of accessories from make differing to the make of equipment, compatibility shall be checked and certified by the bidder.
Calibration Certificates, technical manual and SOP	• The calibration certificates shall be provided with equipment and accessories. • Validity of calibration certificate for all devises shall not be less than one year. • Technical manual and Standard Operating Procedure document shall be provided.

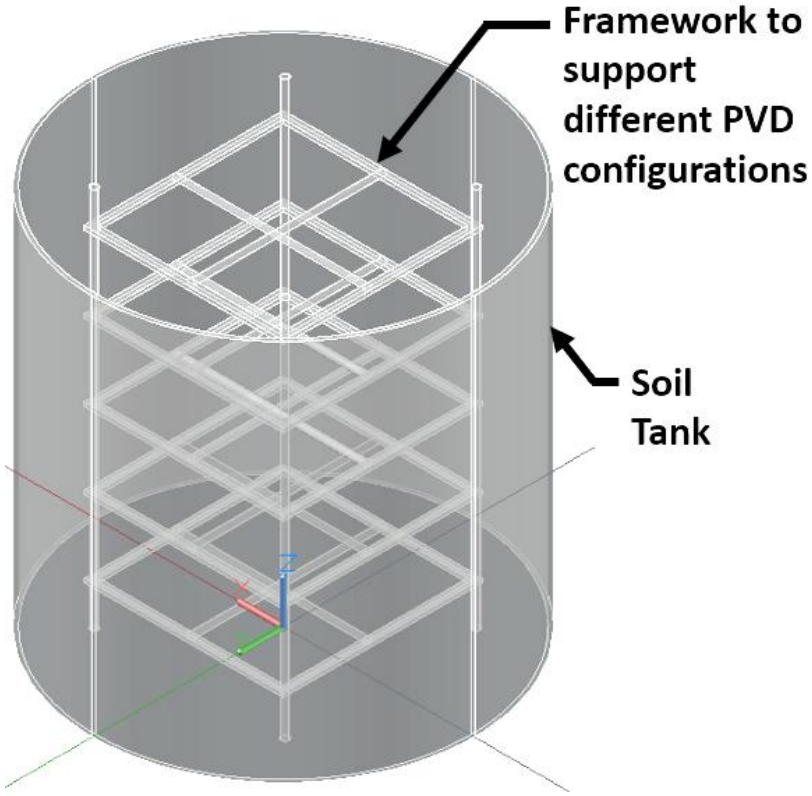

Figure 1. Framework to support different PVD configurations within the soil tank