DIRECT SHEAR TEST

STANDARD OPERATING PROCEDURE (SOP) FOR OPERATING THE DIRECT SHEAR STRENGHT TESTING MACHINE FOR STRENGTH TEST AND ANALYSIS PURPOSES

LOCATION - FACILITY	MOSELEY MORAMORO
SUBDIVISION	MINING – OK TEDI LABORATORY
REVISED EDITION	1ST EDITION
REVIEW DATE	1ST JULY 2022
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University of Technology

Mining Engineering
Department

STANDARD OPERATING PROCEDURE (SOP)

FOR OPERATING DIRECT SHEAR MACHINE

Table of Content

NOTE

USAGE POLICIES & INSTRUCTIONS

- This equipment can only be operated upon approval from either the Laboratory Manager or a Technical Officer, or operated with the assistance or supervision of a technical officer.

- Strict compliance to operating procedures and safety requirements is required to operate this equipment. No Exceptions for substandard practices!

- If this equipment is acting unusual while operating STOP IMMEDIATELY! Please REPORT this malfunction to the Technical Officer and discuss the severity of the fault before proceeding or tag-out as faulty equipment.

- Any accidental damage to equipment or incidents encountered while operating this equipment must be reported immediately.

EQUIPMENT DETAILS

Direct Shear Strength Testing Machine

Purpose:

This SOP ensures that the operator may operate this equipment appropriately according to the operating procedures to get reliable output without damages to the equipment or causing injuries to the operator. The shear strength of rock discontinuities is an important parameter to consider in the stability analysis and design of engineering structures in rock masses, slopes, tunnels, open pit mine and foundations. The Shear strength test is conducted to test the rock shear strength on discontinuity planes.

This DR-44 Direct Shear Testing machine is composed of a main unit which applies the load to a test specimen in the shear box (cell) and a dynamometer which displays the load applied, as measured.

Hazards:

- Eye protection (safety glasses) against projectile fragmented pieces
- Footwear (safety boots) for equipment components or test specimen fragments falling on to the foot.

Safety Requirements:

Personal Protective Equipment (PPE)

1. Safety glasses
2. Safety boots
3. Safety gloves (for operator)
4. Industrial Hardware Clothing PPE (Reflector wear)

Tools & Materials Required:

Recommended Test Specimens

1. Rock specimen

Test Specimen Prepared

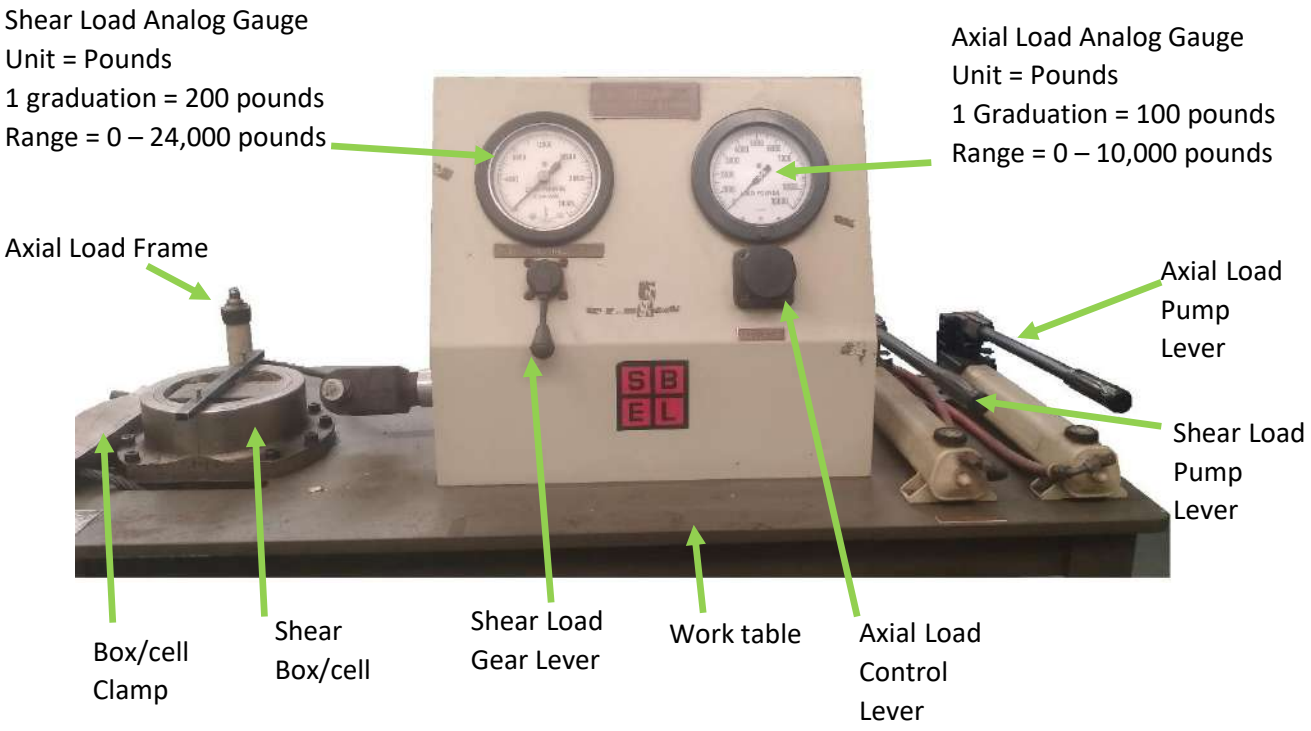
1. Cylindrical
2. Cubic

Specifications

SPECIFICATIONS FOR THE DR-44 DIRECT SHEAR MACHINE

No	Specifications	Capacities
1	Maximum Shear load capacity	24,000 Pounds
2	Maximum Axial load capacity	10,000 Pounds
3	Unit per graduation for Shear Load Gauge	200 Pounds
4	Unit per graduation for Axial Load Gauge	100 Pounds
5	**Compression Test**	
6	Maximum Distance between Columns	15 mm
7	Effective Area of Table	162 cm x 61 cm (L x W)
8	4" Dia. Ram	250 mm (25cm dia.)
9	Cell diameter (interior)	70 mm (7 cm)
10	Cell height	70 mm (7 cm)
11	Oil-pressure level in pump pressure vessel	hydraulic oils
12	Cell lubrication	Grease Lubrication

Compositions



SETTING UP

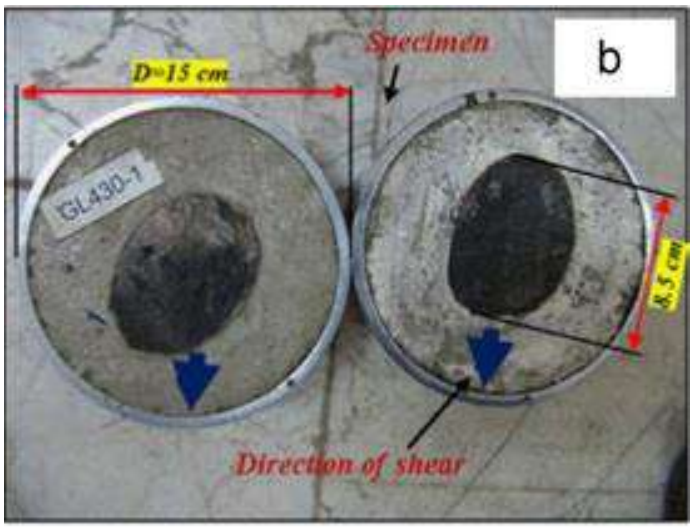
Setting-Up Procedures

Setting up for DR-44 Direct Shear Machine

1. To prepare specimen to test, first separate inside cylinder cell from the outside cover cells by using the 30 cm handle rod with screws to mount onto the inside cylinder cell to serve as handle to pull coupling cells apart.
2. Then you wipe them clean of any dust or dirt that may be on the walls of the cells.

3. Now with the clean cells apply grease and wipe it over the surface of all the cells to lubricate, to avoid cement paste sticking permanently and causing resistance with the task to pull the cells apart.
4. Then fit the inside cylinder cells into the cover cells using the 30 cm handle rod again

5. Place each half of the specimens in the center of the Hoek cells, with the contacting surface of the fracture plane and align carefully so that the surfaces fit congruently together, as in nature.
6. Mix little amount of cement with water creating paste to fill up the void in the cell, around the specimen in both cells.
7. Leave the specimen to dry over 24 hours of cure time



8. The cement paste must be filled up to the brim of the cells with the contacting surfaces of the discontinuity plane protruding out enough to make contact when the cells are clamped together.

9. When the two halve cells have cured and hardened, now we carefully align the 2 cells together so that they are in contact congruently, as insitu in nature.
10. Insert pin bolt to connect the upper shear cell to the shaft
11. Then mount the upper cell the axial load lock pin and then clamp the coupling cells together with the clamp. That is done by pump

12. Finally when the component cells are completely coupled and secured with the clamp, connecting to the shear and axial pumps and the cells, apply slight load on the pump to tighten up connections.
13. Now the shear machine is ready to apply load to the specimen till fracture.

OPERATING PROCEDURE

Operating Procedures

Operating DR-44 Direct Shear Machine

For conducting Shear Tests follow the equipment set up procedures below to set up the equipment before proceeding onto actually conducting the experiment on the test specimen;

Note: Load is given in Pounds (lbs) thus to convert to Newtons (N). 1 lb = 4.448 N. To convert 29.1 lb to Newtons, we can use the conversion factor: 29.1 lb x 4.448 N/lb = 129.1488 N

1. First while the 2 hydraulic pumps (Axial and Shear) are maintained at lock position, you set axial load lever to either push or pull, depending on how you've positioned the specimen to be cells.
2. Then adjust the Axial load control knob to set the load to a UCS known range of for the rock type to be tested.

3. Now remove the Axial load pump and the Shear load pumps pins and free the handles to start pumping to apply load in the Axial and the Shear direction

4. Now start applying load gradually pumping and observe the increase in the Shear load (Stress) until reaching the failure point and the cell comes loose, and the shear load is executed data and is collected

5. After the test is completed the cells have to be cleaned from the cells again, and the cells separated to prepare for next test. Done by using the 30 cm handle rod to mount the handle and pull out the inner circle.