OPERATING INSTRUCTIONS

Consolidation Apparatus

25-0402

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1 Introduction

1.1 The ELE Consolidation Apparatus has been designed to provide reliable results from a unit which is compact without sacrificing accuracy and repeatability. The basic arrangement of the unit is one which has been in satisfactory service for many years and care has been taken to ensure that the frame deformations do not affect the test results.

1.2 A particular feature is the provision of a loading beam having three alternative points for the weight hanger. These points provide lever arm ratios of 9:1, 10:1 and 11:1. By this means, and in conjunction with the ELE range of cell sizes, test results can be obtained in a variety of units, i.e. Imperial, Technical Metric and SI.

1.3 A typical selection of units is as follows:

Specimen diameter	Beam ratio	Weight on hanger	Stress on specimen
50.5 mm	10:1	10 kg	5 kg/cm²
3 inches	11:1	10 lb	1 ton/ft²
75.0 mm	9:1	1 kg	20 kN/m²
79.7 mm	10:1	5 kg	1 kg/m²

1.4 The maximum load capacity of the unit is 1440 kgf (3175 lbf) and this is reached when the weight hanger is loaded thus:

at 9:1 ratio position 160 kg (352 lb)

at 10:1 ratio position 144 kg (317 lb)

at 11:1 ratio position 131 kg (288 lb)

Note: these hanger loads must not be exceeded.

1.5 The apparatus incorporates a screw jack for supporting the beam whilst loading weights are being added to the hanger, and for allowing the load application to be controlled.

1.6 The vertical consolidation of the specimen is measured by a dial gauge mounted on a rigid support, carried on the frame at a point adjacent to the cell mounting.

1.7 There is no provision for levelling the beam between load increments since it has been shown that, within the angular movement of the beam, the effective ratio of the loading system does not vary.

1.8 The three lever arm (beam) ratios are fully defined in figure 1.

2 Setting Up the Consolidation Frame

2.1 Two holes are provided at the rear of the body for securing the apparatus to a suitable working surface.

Note: failure to observe the following points may result in damage to the body casting.

Ensure that the surface to which the apparatus is to be fixed is flat and clean.

Care should be taken not to over-tighten the fixings.

2.2 Check that the weight hanger (a) is at the correct pivot point for the ratio required. Pivot point PP1 for ratio 11:1, PP2 for ratio 10:1, PP3 for ratio 9:1.

2.3 To change pivot points, remove one of the 'R' clips from the pivot pin (b) and withdraw the pin. Re-position the weight hanger (a) at the correct pivot point, insert the pivot pin (b) and retain with the 'R' clip.

2.4 The small weight platform (c) situated on top of the weight hanger (a) is retained by a single screw and if necessary can be removed when changing pivot points.

2.5 To remove the weight platform (c), use a hexagonal wrench to loosen the screw in the centre of the platform, remove and lift off weight platform (c). Replace when the hanger weight has been re-positioned.

2.6 Use a spirit level on the front-end section of the beam/hanger assembly if it is in balance, making sure that the loading yoke (d) is in the vertical position and the beam support jack (e) is not in contact with the beam.

2.7 If the beam/hanger assembly is not in balance, change the angle of the beam by rotating the counterbalance weight (f) along the rod (g) until the correct balance is achieved.

2.8 Lock in position with screw (h).

2.9 Ensure that the beam support jack (e) is lowered as far as possible.

2.10 Slacken the locking nut (j) and screw the loading stem (k) to its highest position.

2.11 Lay the loading yoke (d) forward to rest on top of the beam.

2.12 Place the cell into position, locating by means of the spigot (m) on the machine base. (Adaptors are available for non-standard base recess diameter).

2.13 Make any desired connections to the points on the cell body (normally cells are despatched with plugs inserted, connectors for tubing are included with the water reservoir and the permeability attachment).

2.14 By means of the support jack screw (e) raise the beam until there is a gap of approximately 6 mm (¼ inch) between the upper surface of the beam and the underside of the slot in the frame (point n).

2.15 The jacking screw (e) may be positioned as preferred, either as shown in figures 1 and 2 or as in figure 3. To alter, slacken the grub screw in the knurled disc and unscrew from the threaded section. Remove the threaded section from the casting by unscrewing it downwards, invert it and replace in the casting. Screw the disc back on to the threaded section and tighten the grub screw.

Note: ensure that the grub screw locates in the hole in the threaded section.

2.16 Raise the loading yoke (d) to the vertical position and screw the loading stem (k) until it engages closely in the recess at the top of the cell loading pad.

2.17 Tighten the locking nut (j) to retain the loading stem.

2.18 Attach the dial gauge or transducer to the arm (q) by means of the clamp screw (r).

2.19 Adjust the height of the gauge assembly or transducer so that both dials on the gauge are reading zero (transducer setting 0.100 mm) and the gauge anvil(s) is in contact with the upper end of the loading stem. (The gauge has a special anti-clockwise dial to facilitate direct reading of consolidation).

2.20 Tighten the locking screw (t) at the back of the gauge arm (q) to hold the gauge assembly in position.

2.21 If it is required that swelling pressure is applied, add small weights onto the weight platform (c) to prevent initial swelling from occurring.

2.22 After achieving the required conditions, select the first movement of load to place on the weight hanger (a). For stiff clay this will usually be 100 kN/m² which, when using 75 mm cell at a lower ratio of 9:1, will require 5 kg on the weight hanger.

2.23 The next load increment usually double that previously used will be applied after initial stock consolidation is completed. To avoid shock loads of unknown severity being applied to the specimen, it is usual to support the beam by means of the jack whilst weights are actually being placed on the hanger. The point at which the beam is supported by the jack will be indicated by a slight clockwise movement of the dial gauge pointer.

3 Maintenance

3.1 Occasionally, check the tightness of the following components:

Nuts (V)

Gauge pillar (w)

Clamp screw (h)

3.2 No other maintenance is necessary, except for regular cleaning and drying of all readily accessible component parts, and occasional light lubrication of the jack screw and hanger pivot bearing. The main beam bearings are grease packed and, if the apparatus is used in a clean environment, it should not require attention for several years. If case of any difficulty contact ELE Service Department.

4 Assembly of Cell

4.1 The cells supplied are of the fixed ring type and a sectional view, with specimen in place, is given in figure 4. The specimen is taken from a larger sample cut out by means of the cutting ring (1) and the upper and lower faces trimmed flat. The weight of the specimen can then be determined, if required. Assemble the cell as described below. (To facilitate assembly, the seal (2) and the sealing diameter of the cell wall (3) and also the outside (small diameter) of the specimen cutting ring (4) should be lightly coated with silicone grease.)

4.1.1 Check that all components are clean and undamaged.

4.1.2 Place the lower porous disc (5) on the cell base (6) centrally inside the 3 studs (7).

4.1.3 Fit the locking ring (8) onto the cutting ring (1) containing specimen (9).

4.1.4 Gently lower the locking ring/cutting ring/specimen assembly over the 3 studs (7) until the cutting ring is sitting on lower porous disc (9).

4.1.5 Fit the 3 thumb-nuts onto the 3 studs (7) and gently tighten (excessive force is not required).

4.1.6 Gently place the upper porous disc (11) on the specimen.

4.1.7 Locate cap (12) in the upper porous disc.

4.1.8 Place cell wall (13) onto the base and gently press down until it is fully located as shown in figure 4.

4.1.9 The cell is now ready for insertion into the consolidation frame.

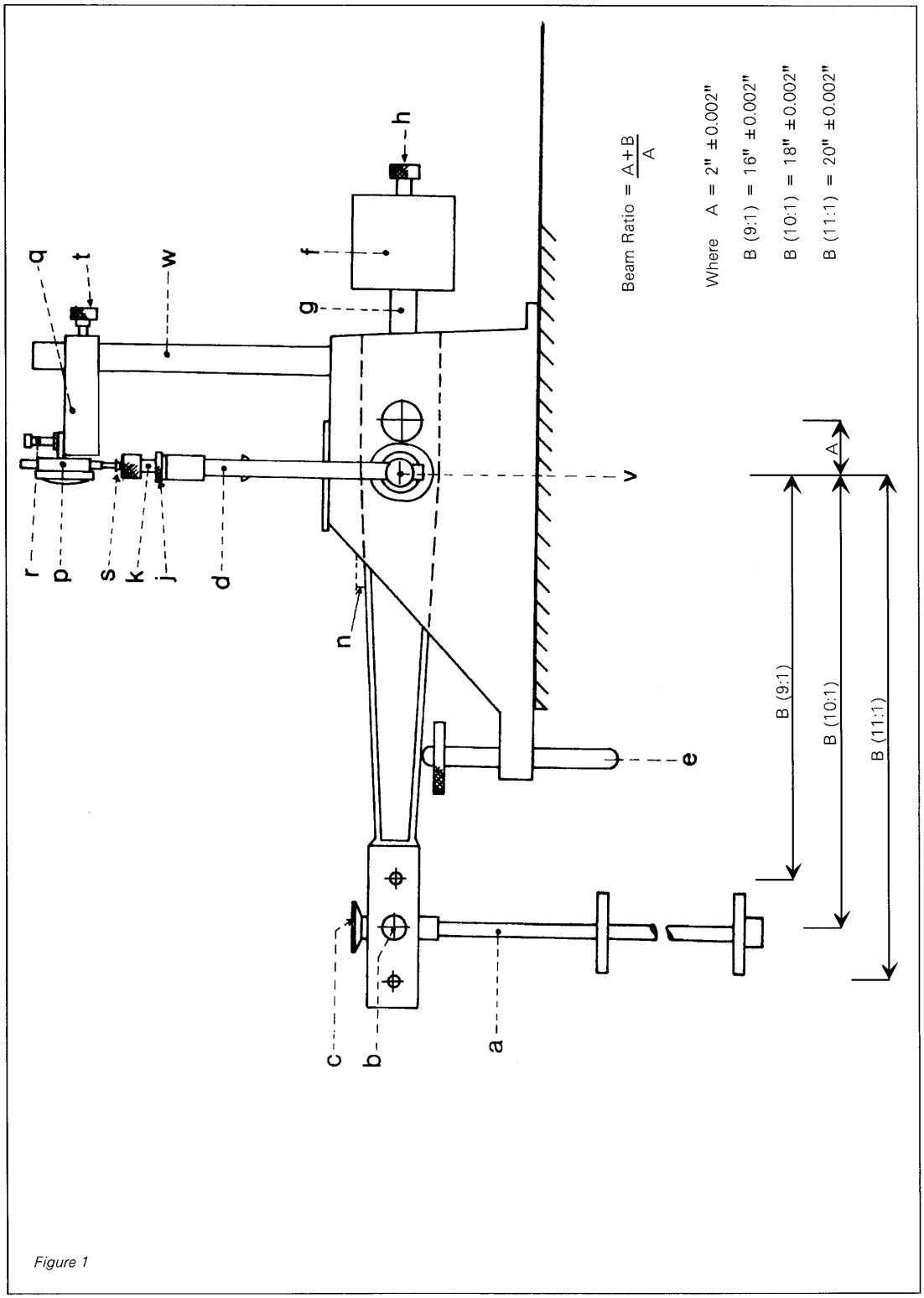

Beam Ratio = A+B / A
Where A = 2" ±0.002"
B (9:1) = 16" ±0.002"
B (10:1) = 18" ±0.002"
B (11:1) = 20" ±0.002"
A
B (9:1)
B (10:1)
B (11:1)
h
f
g
q
t
w
v
r
p
s
k
j
d
n
e
c
b
a

Figure 1

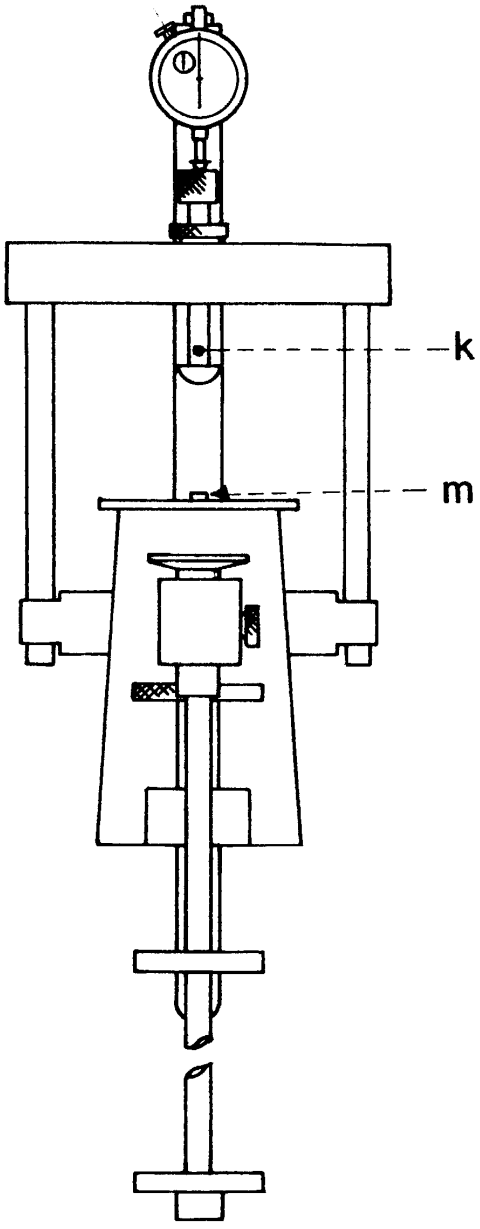
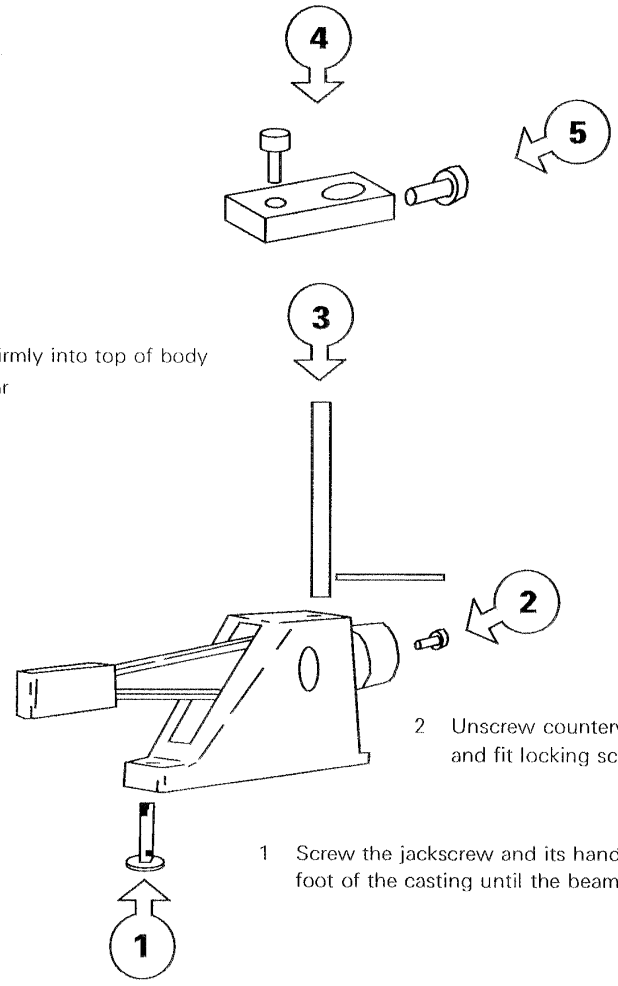


Figure 2



3 Screw gauge column firmly into top of body casting with tommy bar

2 Unscrew counterweight half an inch and fit locking screw.

1 Screw the jackscrew and its handwheel through the foot of the casting until the beam arm is supported.

Figure 3 Assembly procedure (after unpacking)

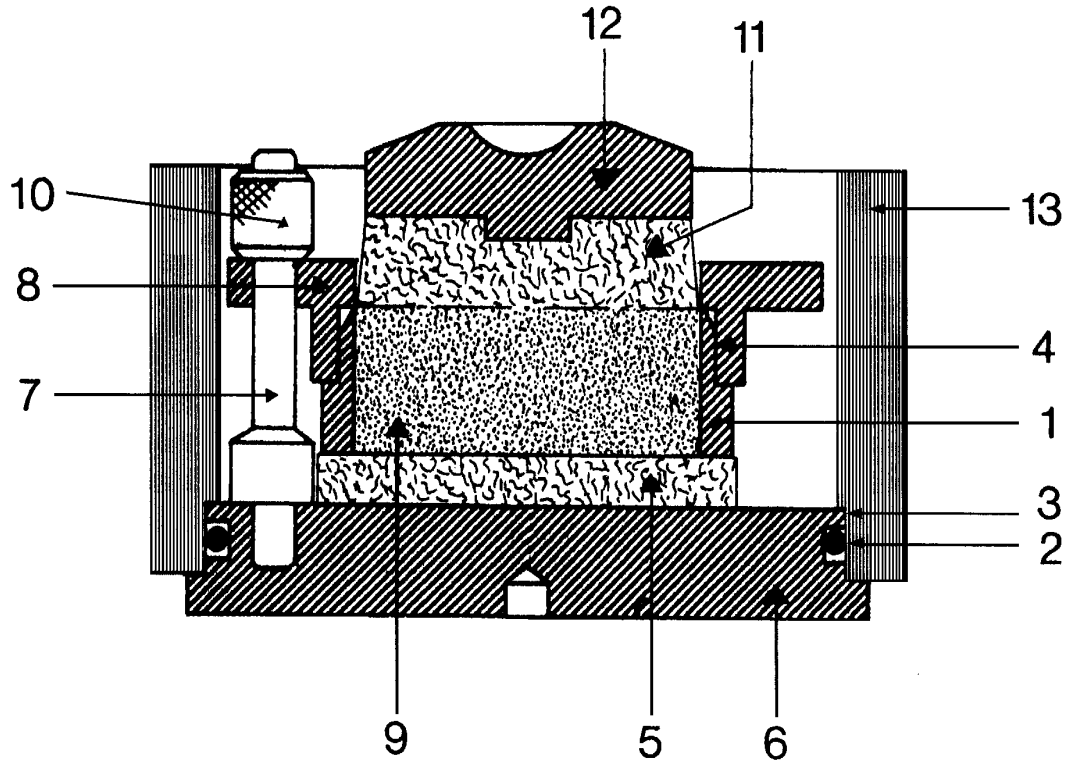


Figure 4