

BS 1377 Part 9 : 1990 Standard

In the design of shallow foundation or traffic surface, design engineers need to know the bearing capacity of soil underneath. Plate bearing test is carried out in the field to serve this purpose. Results from the test can be used as design parameter or used to confirm the design assumption.

- The test shall be carried out in general accordance with BS 1377: Part 9 1990 'in-Situ Tests'.
- A circular plate having a maximum diameter of 300 - 600mm shall be used.
- Excavate to the test level as quickly as possible to minimise the effects of stress relief, particularly in cohesive fills. A mechanical excavator may be used provided that the excavator bucket does not have teeth and the last 100mm depth of excavation is carried out carefully by hand.
- Carefully trim off and remove all loose material and any embedded fragments so that the area for the plate is generally

level and as undisturbed as possible.

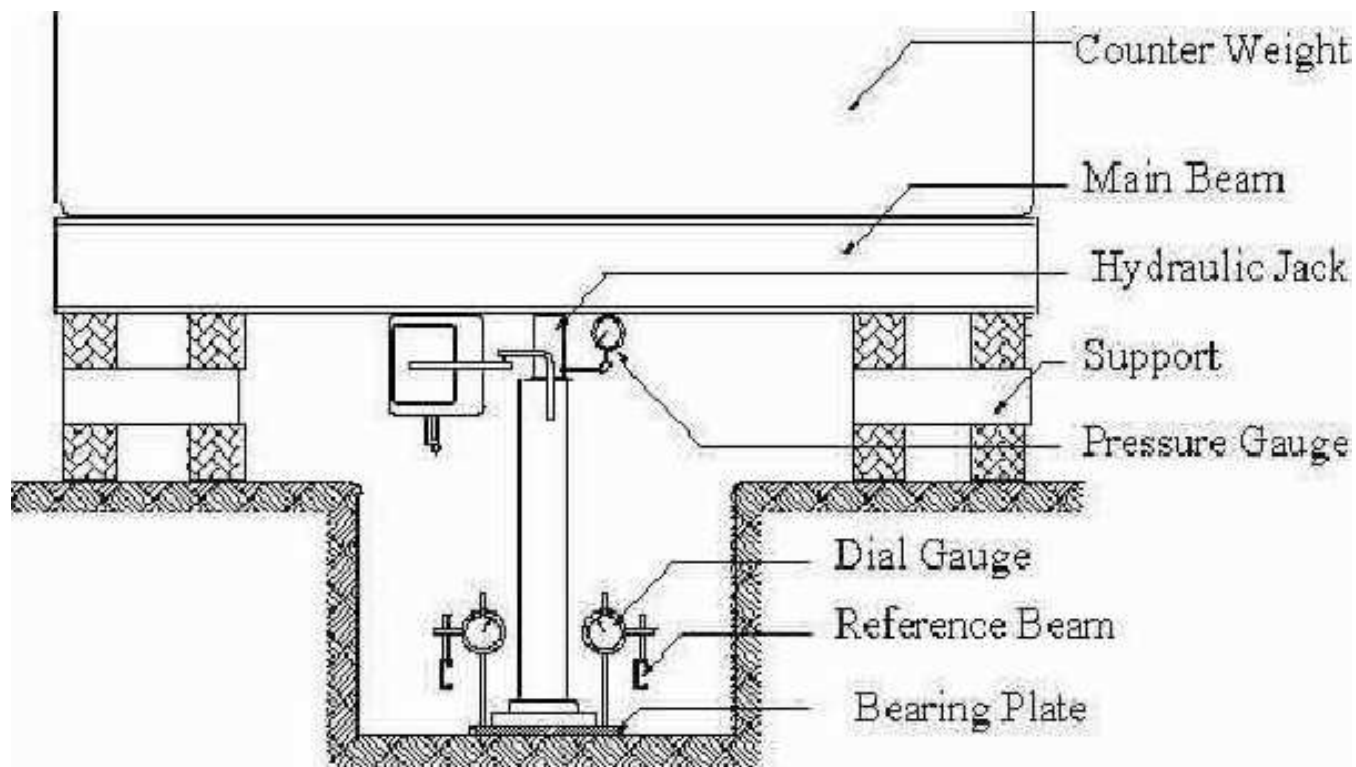
- Protect the test area and the apparatus from moisture changes, sunlight and the effects of adverse weather as soon as the test level is exposed and throughout the test.
- The plate shall be placed on a thin layer (10 to 15mm thick) of clean dry sand to produce a level surface on which to bed the plate.
- Set up the loading and deflection, measuring systems so that the load is applied to the plate without eccentricity and the deflection system is outside the zone of influence of the attachments to the plate. During these operations a small seating load may be applied to the plate to enable adjustments to be made: this seating load shall be less than 5kN/m².
- The load shall be applied in five increments. Settlement reading will be taken at 0.50 minute intervals for the first 2 minutes, and 1 minute intervals thereafter, until detectable movement of the

plate has stopped, i.e. until the average settlement rate is less than 0.02mm per 5 minute interval.

- At each increment the pressure shall be maintained as near as possible constant.
- After the final test increment has been completed, the pressure in the hydraulic pump shall then be released and the settlement of the plate allowed to recover. When the recovery is essentially complete, the residual settlement value shall be recorded.
- Our Range of Pressures start from 0 -1500 psi on the gauge

Test Setup

Equipment and Apparatus



- Counter weight such as box or platform with heavy material such as concrete, steel, etc. Total counter weight should be at least 10% greater than the anticipated maximum test load.
- Hydraulic jack for applying the load
- Proving ring, 1 kg accuracy, for measuring the load
- Bearing Plate, 350mm 450mm and 600mm Diameter
- Four Dial gauges, reference beams.

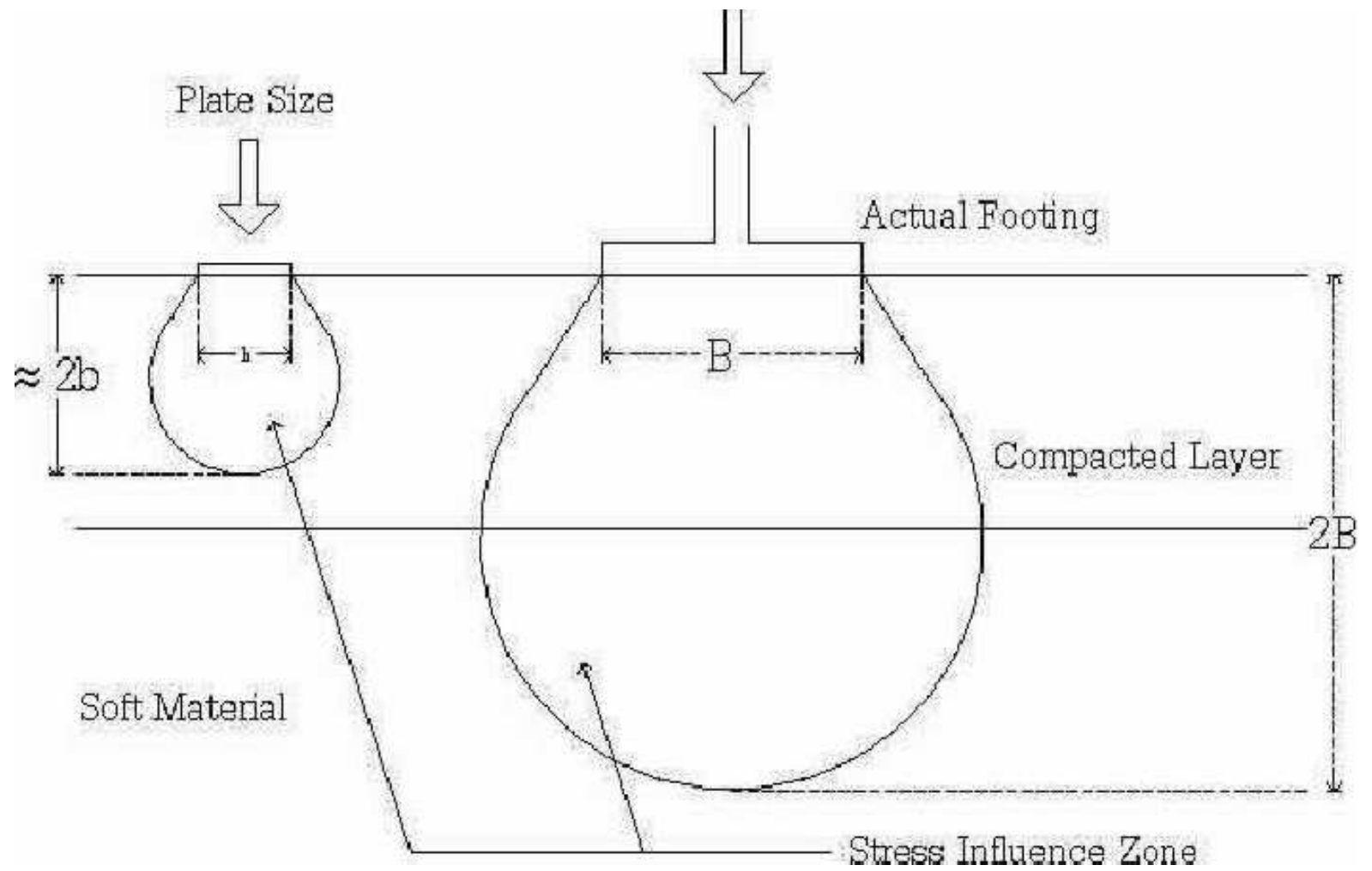
Testing Procedure

- Select test location and depth at the point where the real foundation will be constructed, if possible. If the test is performed in a test pit, width of the pit should be at least 4 to 5 times of plate diameter.
- Apply the load to the plate in steps by means of hydraulic jack pushing against the counter weight until reaching the maximum test load. Unloading should also be done in the backward steps. Read and record the load of every step from proving ring.
- Read settlement from the dial gauges. 3 to 4 dial gauges should be placed separately at 120° or 90° respectively.

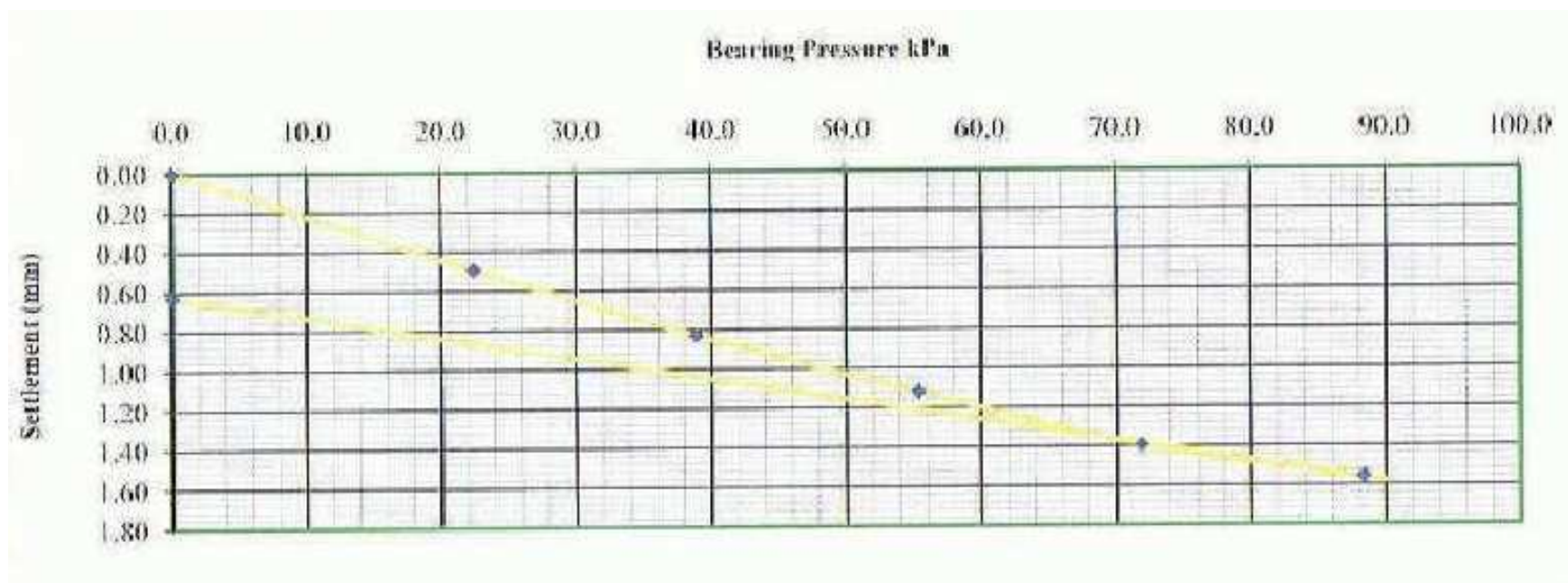
Interpretation of the Test Result

Results from the test shall consist of raw data, load-settlement curve, yield pressure, recommended allowable pressure for foundation design, and modulus of subgrade reaction (K) for road design.

Illustration of Scale Effect in Foundation Design



Load-settlement curve from Plate Bearing Test



Das, B.M. (1995) suggested following formula for calculating bearing capacity of the actual

footing to correct the scale effect.

For cohesive soil

$$q_u (F) = q_u$$

For cohesionless soil where

$q_u \sim$ = bearing capacity of footing

$q_u (p)$ = bearing capacity of test plate

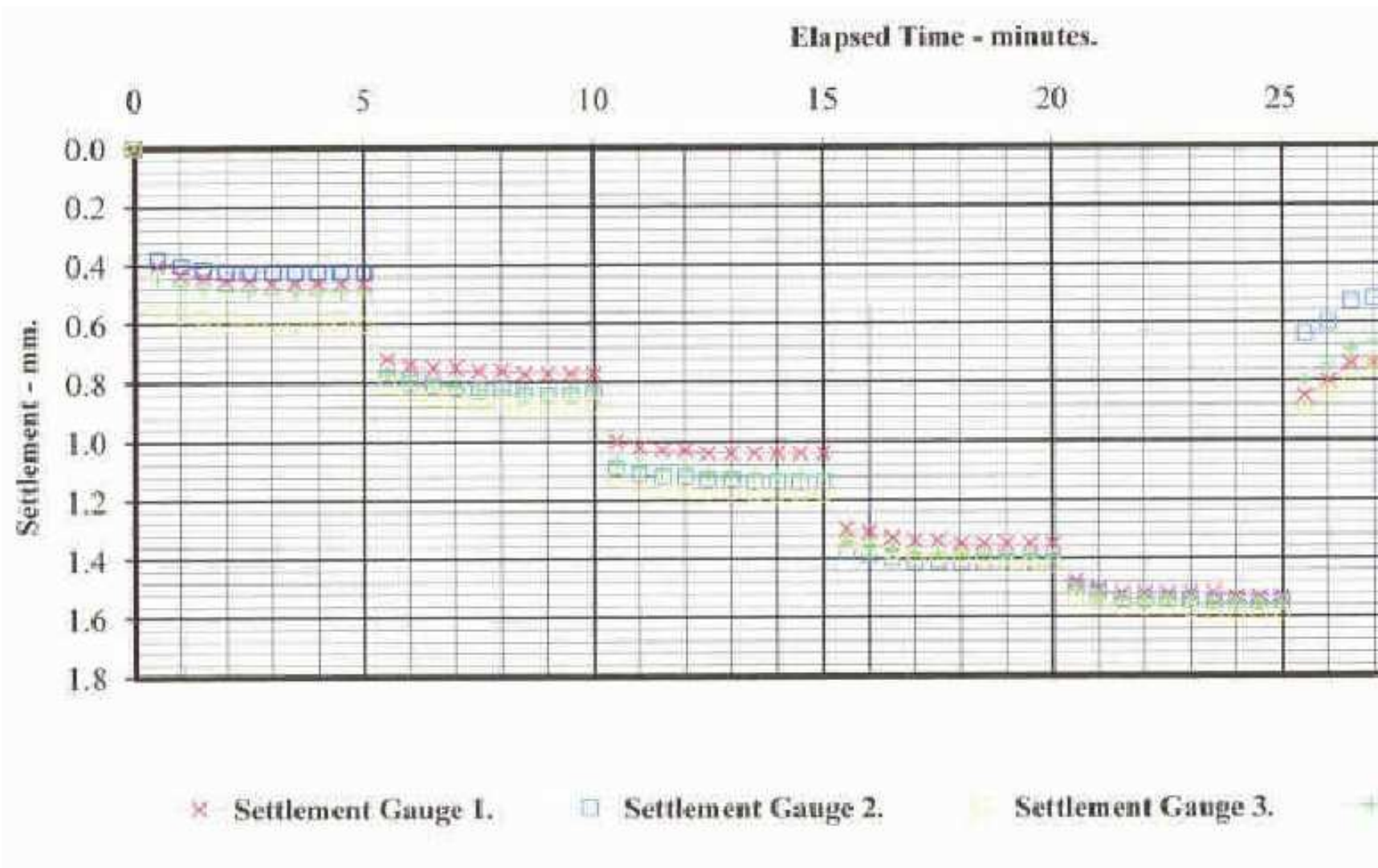
B_f = breadth of footing

B_p = breadth of test plate

If the above method give too high bearing capacity, Engineer should use judgment to limit allowable pressure to be more reasonable for each type of soil condition.

The prediction of settlement can also be done from the load-settlement curve from the test.

Determination of time over settlement



Advantages of the Test

- Gain understanding of foundation behavior which will enable the evaluation of foundation bearing capacity and settlement under loading condition.
- Quick and easy to perform.

Limitations

- Plate bearing test can give bearing capacity of subsoil up to the depth about twice of plate diameter only.

- There is a scale effect due to size of testing plate is smaller than the actual footing.