

Approval & Reception Procedure

DG – Geotechnical Department	
Checking ground conditions of shallow foundation	Document no. ARP/DG/17
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1. Reference standard

Regulamento de Fundações, Guia de Dimensionamento de Fundações, Section 3.2.4, 4.1, 4.2 and 4.3.

2. Information to be submitted

- Shallow foundation characteristics (type and dimensions);
- Site investigation results;
- Record of descriptions of the soil and rock exposed in excavations;
- Excavation records (location, contractor, equipment, level and depth);
- Design load of foundation;.
- Design founding level.

3. Reception procedure

3.1 General

There are a variety of methods for determining the bearing capacity of shallow foundations, direct method and estimated bearing resistance can be used. These methods using values of the shear strength of soils or correlating bearing pressures with results of in-situ field tests, such as SPT N value, tip resistance of CPT, vane shear tests and Plate load test results. Foundation settlement may be estimated based on theory of elasticity or stress-strain behaviour.

Design assumptions and soil parameters shall be verified during construction. The designer shall nominate what supervision, including verification of soil parameters, will be undertaken during the construction period.

3.2 Shallow foundations founded on soils

When structural fill is needed in foundation construction, the reception for compaction should follow Approval & Reception Procedure ARP/DG/07 "Compaction of Sub-grade".

To verify the required soil strength, one of the following field tests shall be performed:

Plate load test -----1 test for each 1000m² or part thereof

Cone penetration test ----- 1 test for each 1000m² or part thereof

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Standard penetration test -----1 test for each 1000m² or part thereof

Vane shear test -----1 test for each 1000m² or part thereof

The depth of CPT, SPT and Vane shear test below the anticipated foundation level should normally be between 1 and 3 times the width of the foundation elements. For rafts the depth of tests or borings should normally be equal to or greater than the foundation width unless bedrock is encountered within this depth. The mutual distance between the test points should normally be 30 m.

3.3 Shallow foundations founded on rock

To identify the depth and quality of the founding rock. one of the following field tests shall be performed::

Plate load test -----1 test for each 1000m² or part thereof

Pneumatic drill test -----1 test for each 1000m² or part thereof, such should be test until at least 4.5 m into the category of rock specified for founding.

Mechanical core test -----1 test for each 1000m² or part thereof, such should be test until at least 4.5 m into the category of rock specified for founding.

4. Acceptance criteria

- Structural fill Requirements : If the determined relative density complies with the requirement of specification (or $\geq 95\%$ of modified proctor if not specified), then the compactness on the area of that level shall be considered to be acceptable.

Plate load test: The test is deemed to be unsatisfactory if the maximum settlement of the plate exceeds S_p given by the following equation:

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$$S_p = 3 \times S_f \times \left(\frac{B+b}{2B} \right)^2 \times \frac{m+0.5}{1.5m}$$

The use of the test is not recommended unless the B/b is not much than 3, and the profile of the soil is uniform. The maximum test load is 3 times allowable working pressure.

where

S_p = maximum settlement of the plate;

S_f = allowable settlement of footing under allowable working load;

B = diameter or least dimension of footing;

b = diameter or least dimension of plate;

m = length to width ratio of footing, where $m \geq 1$.

A plate loading test may be carried out on a homogeneous sandy soil layer for estimating the design bearing resistance of a foundation and normally is not suitable for very soft and soft cohesive soils.

- Pneumatic drill test: The test goes through a total depth of 4.5m below the base of the foundation. Wherein the necessary time is measured to drill every 300mm. Normally the base of the tested is not acceptable when some measured time is less than 2 minutes;
- The results of Cone penetration test, Standard penetration test, Vane shear test and Mechanical core test shall be checked that the principles used in design are appropriate for the geotechnical features of the ground which are encountered. Any deviations from the ground type and properties assumed in the design shall be reported to the engineer responsible for the project.