

Approval & Reception Procedure

DG - Geotechnical Department	
Pile Bearing Resistance Verification Procedure A Pile Static Loading Test	Document no: ARP/DG/13
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1. Reference standard

《Regulamento de Fundações》、《Guia de Dimensionamento de Fundações》、《Standard Test Methods for Deep Foundations Under Static Axial Compressive Load, ASTM D1143》、《Code of Practice for Foundations 2017, The Buildings Department, HK》、《Technical code for testing of building foundation piles · JGJ 106-2014》、《Standard Test Methods for Deep Foundations Under Static Axial Tensile Load, ASTM D3689》。

2. Approval procedures

2.1 Piles manufacturer approval

For PHC piles, GDF requirements should be followed and the LECM Report No 2024.

For Steel piles, REAE requirements should be followed.

3. Reception procedure

3.1 Reception procedure of piles delivery on site

According to LECM Report No 2024 requirement for PHC piles.

According to REAE requirement for Steel piles.

4. Submission and approval of test proposal

4.1. Document submission for construction record and design information of piles

- A. Construction project information ;
- B. Pile characteristics(type , diameter and verticality) ;
- C. Construction record(location, contractor, length and embedded length, combination of piles, concrete strength, amount of rebars) ;
- D. Construction machine specification(driving machine, hammer, cushion, bored-pile drilling machine, casing, drill-bit) ;
- E. Characteristic value of pile loading capacity or design loading capacity under working load etc. ;
- F. Site investigation results ;
- G. Calibration record of devices for the determination of forces, stresses or strains and displacements ;

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H. Other technical documents which are helpful for performing the test safely and smoothly.

4.2. Test apparatus and procedure

- A. Submission and approval for the qualification of test agency ;
- B. Information and section for the test apparatus include but not limit the jack system, load cell, dial gage, survey mark and survey equipment, and the calibration certificate of those apparatus within 12 months effectiveness.
- C. The layout drawings and the structural stability verification calculation for the reaction system for the loading test include the weight platform (or jack pile machine, or reaction piles), cross beam, main beam and footing. The structural stability verification calculation for the foundation capacity.
- D. Testing procedure include the amount of the loading and unloading cycles, increment during loading and unloading stage, duration time for maintaining the load, criterions for loading and unloading; duration time for maintaining the maximum test load and the removal criterions; termination criterions of test.
- E. Safety and risk assessment and response measures during the test period.

5. Rest time before the test

The rest time of tested piles before the test should satisfy the rest time in the following table, when there is no mature regional experience:

Type of soil		Rest time (day)
Sand		7
Silt		10
Cohesive soil	Unsaturated	15
	Saturated	25

6. Amount of test

The amount of piles for performing the loading test should not be less than 1% of the total pile amount and should be at least 1 pile.

7. Maximum test load

The maximum test load for the compressive loading test and for tensile loading test should be 2 times of the characteristic value of pile loading capacity or design loading capacity under working load. The duration time for

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maintaining the maximum test load should be at least 72 hours.

8. Acceptance criteria

8.1 Compressive loading test

Unless otherwise stated in the Technical Specification of the project, on completion of testing, the results of load tests on piles shall comply with all the following requirements simultaneously (ASD, 1993:86) :

- a) The settlement at any load shall be less than twice the settlement at 90% of that load (Brinch Hansen's criteria); otherwise, the pile is considered to have failed.
- b) If one of the values of the total or residual settlement exceeds the respective calculated value given by the following formula, the pile is considered failed according to the settlement criterion in the loading test.

$$S_t = 0.7 \frac{F_c L}{AE} + \frac{B}{120} + 4 \text{ mm} ; \quad S_r = \frac{B}{120} + 4 \text{ mm}$$

Where :

S_t - Total settlement ; S_r - Residual settlement ; F_c - Maximum test load
 L - Total length of pile; A - Cross section area of pile; E - Young's modulus of pile
 B - diameter or least lateral dimension of the pile ;

8.2 Tensile loading test

Unless otherwise stated in the Technical Specification of the project, on completion of testing, the results of load tests on piles shall comply with all the following requirements simultaneously :

- a) If one of the values of the total or residual movement exceeds the respective calculated value given by the following formula, the pile is considered failed according to the movement criterion in the loading tes. °

$$S_t = \frac{F_c L}{AE} + 4 \text{ mm} ; \quad S_r \geq 4 \text{ mm} \quad \text{or} \quad S_r \geq 25\% S_t$$

Where :

S_t - Total movement ; S_r - Residual movement ; F_c - Maximum test load

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L - Total length of pile; A - Cross section area of pile; E - Young's modulus of pile

- 8.3** When the fail test result is shown for the tested pile, two additional piles must be installed and two additional pile static loading tests for these two piles shall be performed. If any one of these two piles fails to comply with the acceptance criteria, the design of the pile foundation shall be reassessed or soil improvement shall be considered.