

Foundation Works (Large Diameter Bored Piles)

In giving this approval of plans, I hereby impose the following conditions under item 6 in section 17(1) of the Buildings Ordinance (BO):

- (a) *Pre-drilling* – Pre-drilling for each pile should be carried out to better identify the quality of the founding material during construction of the bored piles and to confirm the appropriate founding levels. The pre-drilling should be sunk to at least 5 m below the rock head of the specified category in accordance with the Code of Practice (CoP) for Foundations 2017 or the designed length of the rock socket of the pile, whichever is the deeper. The records of pre-drilling works should be submitted within 21 days upon completion of the pre-drilling works.
- (b) *Post-construction proof drilling* – Upon completion of each pile, proof drilling should be carried out at the concrete/rock interface to check the quality of concrete and founding rock and to ensure that concrete and rock are in good contact at the interface. The length of the concrete/rock core should be at least 1 m above and below the interface.
- (c) *Test on bearing strata* – Test to verify the uniaxial compressive strength (UCS) or equivalent point load strength (PLI₅₀) of the founding material for piles founded on Cat 1(c) or better rock should be carried out. A minimum of 1 number of such test should be performed on rock specimen obtained at the location of each installed pile. Testing should be carried out by a laboratory* accredited under the Hong Kong Laboratory Accreditation Scheme (HOKLAS)^.
- (d) *Ultrasonic echo sounder test* – Prior to the installation of reinforcement cage and concreting, ultrasonic echo sounder tests should be carried out by an independent testing agency to measure the profile of excavation of the pile shafts and the dimensions of the bell-outs, where present.
- (e) *Ultrasonic Crosshole Sonic Logging test* – Test to verify the homogeneity and integrity of concrete should be carried out for the entire length of each pile, and shall make reference to ASTM D6760 by a laboratory* accredited under the HOKLAS^. Provision of access tubes for carrying out of the test should not be less than 4 numbers for bored pile of shaft diameter less than 2000mm, and 6 numbers for that of 2000mm and above.
- (f) Sampling and testing of steel reinforcing bars should be carried out in accordance with CS2:2012. Testing should be carried out by a laboratory* accredited under the HOKLAS^. Test results@ should be submitted within 60 days of the delivery of the steel reinforcing bars to the site%. The test reports should be appended with a statement signed by the registered structural engineer (RSE) to confirm the following:
 - (i) All steel reinforcing bars used for the construction and the test specimens covered by the test reports are in accordance with the types and grades of steel shown in the approved plans.

- (ii) Sampling and testing of steel reinforcing bars used have been carried out in accordance with CS2:2012.
 - (iii) The acceptance criteria appropriate to each type and grade of steel reinforcing bars used have been complied with.
 - (iv) All steel reinforcing bars tests have been carried out by a laboratory* accredited under the HOKLAS^.
- (g) Sampling of concrete and compression testing of concrete test cubes should be carried out in accordance with the methods specified in CS1:2010. Testing should be carried out by a laboratory* accredited under the HOKLAS^. Test results@ should be submitted within 21 days after testing. The test reports should be appended with a summary which contains information on locations of concerned structural elements, concrete grades and dates of cast. The summary should also include previous summary information of concrete cube test reports in chronological order. The test reports should also be appended with a statement signed by the RSE to confirm the following:
- (i) All concrete used for the construction and concrete cubes covered by the test reports are in accordance with the concrete grades shown in the approved plans.
 - (ii) Concrete cube sizes, rates of sampling fresh concrete for testing and acceptance criteria for compressive strength set out in clause 10.3.4.2 of the CoP for Structural Use of Concrete 2013 have been complied with.
 - (iii) All concrete cube tests have been carried out by a laboratory* accredited under the HOKLAS^ and in accordance with the methods specified in CS1:2010.
- (h) Concrete should be obtained from concrete suppliers certified under the Quality Scheme for the Production and Supply of Concrete except for those exceptional projects permitted under clause 11.7.1 of the CoP for Structural Use of Concrete 2013 where documents should be submitted by the RSE at least one week prior to commencement of works to prove that the concrete supplier is operating under an approved quality system.

2. The following conditions in respect of qualified supervision of works are imposed under item 6 in section 17(1) of the BO:

- (a) Qualified site supervision of the reinforced concrete works, including sampling of concrete and steel reinforcing bars and making and curing of test cubes, by experienced and competent persons as defined in 2(b) and 2(c), should be provided to ensure that the works are carried out in accordance with the plans approved and that the required standards are complied with.
- (b) The RSE should assign a quality control supervisor to supervise the works, determine the necessary frequency of inspection by the quality control supervisor which should not be less than once a week, and devise inspection check lists. The minimum qualifications and experience of the quality control supervisor is

to be the same as the technically competent person (TCP) of grade T3 under the RSE's stream, as stipulated in the CoP for Site Supervision 2009.

- (c) The registered general building contractor (RGBC)/registered specialist contractor (RSC) should assign a quality control co-ordinator to provide full time on site supervision of the works and devise inspection check lists. The minimum qualifications and experience of the quality control co-ordinator is to be the same as the TCP of grade T1 under the RGBC's/RSC's stream, as stipulated in the CoP for Site Supervision 2009.
- (d) The names and qualifications of the supervisory personnel representing the RSE and the RGBC/RSC respectively should be recorded in an inspection log book. The date, time, items inspected and inspection results should be clearly recorded in the log book. The log book should be kept on site for inspection by representatives of the Buildings Department (BD).

3. Where steel reinforcing bar (rebar) products such as cut and bent rebars, reinforcement cages and the like are fabricated off-site in a prefabrication yard, the following conditions in respect of qualified supervision of off-site rebar prefabrication works (referred hereafter as "Prefabrication Works"⁺) are imposed under item 6 in section 17(1) of the BO:

- (a) Qualified site supervision of the Prefabrication Works⁺, including sampling of steel reinforcing bars, by experienced and competent persons as defined in 2(b) and 2(c), should be provided to ensure that the works are carried out in accordance with the plans approved and that the required standards are complied with.
- (b) The names and qualifications of the supervisory personnel representing the RSE and the RGBC/RSC respectively should be recorded in an inspection log book. The date, time, items inspected and inspection results should be clearly recorded in the log book. The log book should be kept in the prefabrication yard and a copy of it should be kept on site for inspection by representatives of the BD.

4. You are reminded that site supervision of the foundation works by a team of supervisors shall be provided each by the authorized person, the RSE, the registered geotechnical engineer and the RSC in accordance with the Technical Memorandum for Supervision Plans 2009 and the CoP for Site Supervision 2009 to ensure that the quality of the foundation works is up to standard and that the works are carried out in accordance with the plans approved and in such a manner as not to render inadequate the margin of safety of, or impair the stability of, or cause danger to any building, structure, land, street or services. Details of site supervision for the foundation works shall be included in the supervision plan and submitted prior to or at the time of application for consent to the commencement of the foundation works.

5. Under regulation 10 of the Building (Administration) Regulations (B(A)R), one set of foundation record plans and report together with the Form BA14 stipulated in regulation 25 of the B(A)R to certify the completion of the foundation works are required to be submitted. The record plans should include details of the characteristic features of the site and the identification, location, size, depth and level of each foundation unit as constructed and the report should include, for each foundation unit, the date of construction, the quality and quantity of materials used, the concrete test cube results, the excavation records, the results of rock specimen tests,

the ultrasonic echo sounder tests and the ultrasonic crosshole sonic logging tests, the predrilling and post-construction proof drilling records and should also be accompanied by an assessment report with a rockhead contour plan prepared based on the ground investigation, the predrilling and the post-construction proof drilling.

6. Your attention is also drawn to PNAP APP-18, the Technical Memorandum for Supervision Plans 2009 and the CoP for Site Supervision 2009 regarding the requirements on predrilling and post-construction proof drilling works.

7. Consent to the commencement and carrying out of the pile cap and superstructure works will not be given until the records of predrilling and post-construction proof drilling, the test reports as specified in paragraphs 1(a) to 1(g) above, and the foundation record plans, report and Form BA14 specified in paragraph 5 above have been submitted and found satisfactory, and that the required proof tests have also been satisfactorily carried out.

8. All significant signs of distress during the construction works should be reported promptly to the BD. Where the ground settlement reaches or exceeds the trigger value of the "Alarm Level" defined in the monitoring scheme, the Chief Highway Engineer/Research and Development, Highways Department (Attention: Land Surveyor/Geographic Information System, telephone number: 2762 3498, fax number: 2714 5290, email: lsgis.rnd@hyd.gov.hk) should be notified promptly together with the relevant details of the monitoring.

* A Directory of Accredited Laboratories in Hong Kong is obtainable from the Hong Kong Accreditation Service (HKAS) Executive, Innovation and Technology Commission.

A laboratory's accreditation for an individual test or calibration may be granted, modified or withdrawn at any time. Up-to-date information on accredited laboratories and their scopes of accreditation are available on the internet at the HKAS website at <http://www.itc.gov.hk/hkas/>.

^ Test to be carried out by a laboratory* accredited under the HOKLAS or by other laboratory accreditation bodies which have reached mutual recognition agreements/arrangements with the HOKLAS for the particular test concerned.

@ The test carried out by an accredited laboratory should be within its scope of accreditation. To ensure this, test results should be reported on a HOKLAS Endorsed Certificate or equivalent Certificate/Report issued from other laboratory accreditation bodies which have reached mutual recognition agreements/arrangements with the HOKLAS.

% The 'site' refers to the prefabrication yard for cases covered by paragraph 3 above.

+ Prefabrication Works refer to the fabrication works of steel rebar products, such as cut and bent rebars, reinforcement cages and the like, covered by this approval of plans carried out in the prefabrication yard.