Foundation Works (Rock Penetration Composite Piles)

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

(a) The pile is to be an assembly of 500 x 100/125 thick precast prestressed spun concrete pile (concrete grade strength not less than 78.5 MPa) with or without additional steel reinforcing bars jointed to a grade S355J0 / S450J0 (BS EN:10025) or equivalent steel H section or steel cage base.

(b) Test installation of pile no.(s) *[please refer to approval letter for details]* _____ should be carried out to verify the design assumptions before commencing to install any other piles. Prior to the commencement of test installation works, a test boring proposal giving details of the actual boring system to be used on site, operating mechanism of the drill bit, maximum volume of air supply and pressure to be applied in different soil and rock strata, minimum rate of advancement of drill bit, ground and piezometer monitoring arrangement, criteria for satisfactory performance of the boring operation, monitoring procedures for checking the rates of boring operation and any necessary precautionary measures to prevent excessive overbreak or ground loss and undue disturbance to sub-soil should be submitted for consideration. Monitoring of the ground settlement, ground water level and actual boring rate should be provided by a T3 site supervision staff of RSE's stream full time. Consent to the commencement and carrying out of the foundation works will not be given until the test boring proposal has been submitted and found satisfactory.

Upon satisfactory completion of test installation, the anticipated rates of advancement of boring operation in different soil and rock strata for the remaining working piles should be evaluated and included in a test installation report which shall be submitted to the Buildings Department for record before commencing to install any other piles. The Buildings Department should be notified of the time and date of the installation so that the test installation may be witnessed by a representative from the Department.

(c) *Predrilling* – Predrilling at locations in close proximity of the piles should be carried out to better identify the quality of the founding material during construction of the piles and to confirm the appropriate founding levels. The number of predrill boreholes required should be such that the pile tip of every such pile should be within 5 m from a predrill borehole. The predrilling should be sunk to at least 5 m below the rock head of the specified category in accordance with the Code of Practice for Foundations 2017 or the designed length of the rock socket of the nearest pile, whichever is the deeper. The records of predrilling works should be submitted within 21 days upon completion of the predrilling works.

(d) *Post-construction proof drilling* – Upon completion of the piles, some additional proof drill holes should be sunk to at least 5 m below the as-built top level of the rock socket of the nearest pile or to the as-built bottom level of the rock socket, whichever is the deeper, to verify the rockhead profile and hence assess the adequacy of the socketed length of these piles. The number of such proof drill holes should be at least 2 for sites with 100 or less piles; or 1% of

the number of piles for sites with more than 100 piles (any fraction of a proof drill hole so calculated should be construed as one additional proof drill hole).

(e) *Test on bearing strata* – Test to verify the uniaxial compressive strength (UCS) or equivalent point load index strength (PLI_{50}) of the founding material for piles socketed in Cat 1(c) or better rock should be carried out. The number of tests conducted should be such that there is at least 1 such test performed on rock specimen taken within 5m of every installed pile. Testing should be carried out by a laboratory* accredited under the Hong Kong Laboratory Accreditation Scheme (HOKLAS)^.

(f) The requirements of sampling and testing of grout are as follows:

(i) For each grout mix one sample of grout shall be provided from each 10 batches of grout, or every 10 m^3 from the amount of grout produced in a day, whichever is the lesser, to determine the crushing strength of the grout. Samples shall be provided not more than 1 hour after the grout has been mixed and shall be protected from weather before test cubes are made.

(ii) Compression testing of grout test cubes should be carried out in accordance with the methods specified in CS1:2010 using 100 mm size cubes. Testing should be carried out by a laboratory* accredited under the HOKLAS^. Test results[@] should be reported on a HOKLAS Endorsed Certificate and appended with a statement signed by the Registered Structural Engineer to confirm that the acceptance criteria set out in the Building (Construction) Regulation 59 have been complied with, and should be submitted within 21 days after testing.

(g) Qualified site supervision of the sampling of cement grout and making and curing of test cubes by an experienced and competent person 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.

(h) Regarding the use of precast prestressed spun concrete piles (PPSCP):

(i) The piles should be manufactured in accordance with the quality assurance scheme as detailed in the submitted technical report. Concrete cube test reports and mill certificates of the prestressing bars for the batch of piles delivered to the site should be submitted within 60 days of the delivery of the piles to the site as supporting documents for the foundation works for the verification of compliance with the required standards.

(ii) All PPSCP delivered to site should be visually inspected and certified by the Registered Structural Engineer to ensure quality. The inspection reports shall be submitted within 21 days after inspection.

(iii) At least 2% of the piles with a minimum of one pile per batch per delivery to the site for each type of pile shall be core tested; respective results shall be certified by the Registered Structural Engineer and submitted within 21 days after testing.

(iv) Non-destructive tests on a representative number of welded joints between segments should be carried out with a sampling rate of not less than 10% of the total number of welded joints. The reports of such tests, with the joint locations clearly specified, should be submitted within 21 days after testing.

(i) Regarding the use of structural steel:

For welding of structural steel works, welding procedures and welders should be assessed/tested in accordance with the appropriate provisions of the Annex A to the Code of Practice for the Structural Use of Steel 2011. Before installation of the spliced sections of the piles, non-destructive tests on a representative number of welded joints should be carried out with a sampling rate of not less than 10% of the total number of welded joints in accordance with the appropriate provisions of the Annex A to the Code of Practice for the Structural Use of Steel 2011 and by a laboratory* accredited under the HOKLAS^. The test reports[@], with the joint locations clearly specified, should be submitted within 21 days after testing.

(j) Regarding the use of steel reinforcing bars:

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^. The 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 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^.

(k) Welder test for welded joints between steel reinforcing bars/capping plate:

A completed welded joint specimen of steel reinforcing bars/capping plate should be produced by each welder for 100% NDT and 4 tensile tests (2 on top bars and 2 on bottom bars). The test records should be submitted within 21 days after testing.

2. You are reminded that site supervision of the foundation works by a team of supervisors shall be provided each by the Authorized Person, the Registered Structural Engineer and the Registered Specialist Contractor in accordance with the Technical Memorandum for

Supervision Plans 2009 and the Code of Practice 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.

3. Under Building (Administration) Regulation 10, the following documents are required to be submitted:

(a) For structural steel of Classes 1 and 2 classified in accordance with the Code of Practice for the Structural Use of Steel 2011, a copy each of the mill certificates of the structural steel used, which should be submitted within 60 days of the delivery of the structural steel to the site and appended with a statement signed by the Registered Structural Engineer to confirm that the requirements of chemical composition and mechanical properties appropriate to the class and grade of steel have been complied with and the structural steel used is produced from a manufacturer with an acceptable Quality Assurance system.

(b) One set of foundation record plans and report together with the Form BA14 stipulated in Building (Administration) Regulation 25 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 pile as constructed. The report should include, for each pile, the date of construction, the quality and quantity of materials used, the grouting records, the excavation and boring records (including the advancement rate of drill bit, air pressure used, volume of air supply/flushing medium), settlement and groundwater drawdown records, the predrilling and post-construction proof drilling records and test reports on the bearing strata 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.

4. Where structural steel of Class 2 is used, the following conditions are imposed under item 6 in section 17(1) of the Buildings Ordinance:

Sampling and testing of structural steel should be carried out in accordance with the Annex D to the Code of Practice for the Structural Use of Steel 2011. Testing should be carried out by a laboratory* accredited under the HOKLAS^. The test results[@] should be appended with a statement signed by the Registered Structural Engineer who has prepared the plans and submitted within 60 days of the delivery of the structural steel to the site for confirmation of the followings:

(i) All structural steel used for the construction and the test specimens covered by the test reports are in accordance with the classes and grades of steel shown in the approved plans.

(ii) Sampling and testing of structural steel used have been carried out in accordance with the Code of Practice for the Structural Use of Steel 2011.

(iii) The acceptance criteria appropriate to each class and grade of steel used have been complied with.

(iv) Testing of steel has been carried out by a laboratory* accredited under the HOKLAS^.

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

6. Consent to the commencement and carrying out of the pile cap and superstructure works will not be given until the predrilling and post-construction proof drilling records and the test reports as specified in paragraphs 1(c) to 1(k) and 4 above, and the mill certificates of the structural steel used, the foundation record plans, report and Form BA14 specified in paragraph 3(a) and 3(b) above have been submitted and found satisfactory, and that the required proof tests have also been satisfactorily carried out by a laboratory* accredited under the HOKLAS^.

7. All significant signs of distress during the construction works should be reported promptly to the Buildings Department. 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.