Summary of Decisions of the Structural Engineering Committee
SEC 03/2011 held on 24.02.2011

(a) Case 03/2011

Issue:

1. Rational design approach – Maximum design parameters for large diameter bored piles using shaft grouted friction and end bearing

2. Pile spacing less than one pile diameter

3. Acceptance criteria for loading test on trial piles

Recommendation:

1. To accept the rational design method for the design of large diameter bored piles using shaft grouted friction and end bearing on soil:

   a) The ultimate shaft friction resistance in Colluvium / Completely Decomposed Granite (CDG) to be 2.4 SPT-'N' but limited to 140kPa with a factor of safety of 2.

   b) The allowable end bearing capacity for highly to completely decomposed granite layer to be 1000kPa with SPT-'N' larger than or equal to 200.

   c) The allowable pile capacity for combined shaft grouted friction and end bearing of large diameter bored piles, shall be the summation of the maximum ultimate values as given in item 1(a) divided by a factor of safety of 2 and the allowable end bearing given in 1(b). The ultimate shaft friction capacity subject to the satisfactory results of proof loading test on two proposed trial piles.

2. To grant the modification to Building (Construction) Regulations 26(5)(a) to permit the spacing between centers of the proposed large diameter bored piles to be less than the minimum requirement of one pile perimeter but subject to a clear pile spacing of not less than 2m.

3. To allow adopting acceptance criteria for loading test on trial piles which do not follow Code of Practice for Foundation (CoP Fdn) as below:

   a) Maximum settlement at head of pile does not exceed the value

$$\frac{PL}{AE} + \frac{D}{50}$$

where

P = 2 x allowable pile capacity (based on capacity derived from shaft friction)
L = pile length
A = cross sectional area of pile
E = equivalent young's modulus of pile
D =diameter of trial pile

b) Residual settlement at the head of the pile does not exceed the value

$$\frac{D}{50}$$

Decision: Members endorsed the Recommendations subject to the following:

a) As the proposed skin friction parameters adopted for this project differ from those parameters adopted in some previous projects in Hong Kong, RSE should also provide calculations to substantiate the calculated pile capacity based on the parameters of previous projects is on a conservative side.

b) A detailed quality assurance proposal on grouting works shall be submitted. It shall specify the measures to be adopted in controlling the grout pressure, volume and time.

c) 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 smaller, to determine the crushing strength of the grout. Samples shall be provided not more than 1 hour after the grout has been mixed.

d) Minimum 1% of total no. of working piles, i.e. one working pile should be selected for proof test by the imposition of a test load of not less than 1.25W and minimum 5% of total no. of working piles, i.e. 3 working piles for full core-drilling tests.

e) Considering the practicality, site conditions and safety, and all large diameter bored piles are capped by a single raft cap, the chance of single pile failure in excessive settlement is very unlikely. The global FoS of the entire pile group has been assessed as 3.02 therefore the test load for working pile is set at 1.25W.

f) RSE shall submit mitigation measures in case cold joint is formed.