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17 February 2021

To: All Authorized Persons
Registered Structural Engineers
Registered Geotechnical Engineers
Registered Inspectors
Registered General Building Contractors
Registered Specialist Contractors
Registered Minor Works Contractors

Dear Sir/Madam,

Amendments to Code of Practice for Foundations 2017

The Technical Committee (TC) on the Code of Practice for Foundations 2017 (the Code) set up by the Buildings Department (BD) regularly collects views and feedback from the practioners and the stakeholders arising from the use of the Code, and reviews the contents thereof for recommending the necessary update.

2. Having considered the TC's recommendations, certain amendments to the Code (as detailed at the Appendix) are promulgated with immediate effect from the date of this letter. The amendments have been uploaded to BD website www.bd.gov.hk under the "Codes, design manuals and guidelines" page of the "Resources" section.

3. The major amendments to the Code include:

(a) clause 1.2 – addition of "minor or temporary structures" in the glossary;

(b) clause 2.2.2(5) – revision of the design requirements for footings of minor or temporary structures;

(c) Table 2.1 – clarification on the definition of category 2 rock;

(d) clause 2.2.4 – revision of the notes on the maximum effective overburden depth of subsoil;

(e) clause 2.3.2(2) – revision of the reference criteria of acceptable settlement and rotation;

(f) clause 2.5.4(1) – addition of a note on reference guidelines for design of foundations to resist accidental loads;

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(g) clause 4.2.2(2) – revision of the testing requirements for shallow foundations on soil;

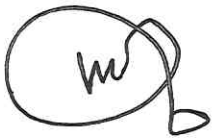
(h) clause 5.1.1 – revision of the requirement for using non-recognised type of piling system;

(i) clause 5.2.3(c) – clarification on the design requirement for the alternative approach to consider negative skin friction;

(j) clause 5.4.11(2)(b) – revision of the criteria of founding materials; and

(k) clause 5.4.11(5)(c) – provision of an alternative method in lieu of dynamic load tests.

Yours faithfully,



(HO Hon-kit, Humphrey)
Assistant Director/New Buildings 2
for Building Authority

Amendments to the Code of Practice for Foundations 2017

(February 2021)

Legends:

Amended

Deleted

Appendix

Amendments to the Code of Practice for Foundations 2017 (February 2021)

Item	Current version	Amendments
1. Clause 1.2 [1]	*Meta-sedimentary rock.* A sedimentary rock that shows evidence of having been subjected to metamorphism that differs from the conditions under which the sedimentary rock originated. *Negative skin friction.* The downdrag skin friction resulted from the consolidation of compressible soil strata.	*Meta-sedimentary rock.* A sedimentary rock that shows evidence of having been subjected to metamorphism that differs from the conditions under which the sedimentary rock originated. *Minor or temporary structures.* External building works designated as minor works items under the Minor Works Control System and other minor structures such as covered walkway, disabled ramp, hoarding, pavilion, pergola and security kiosk, etc. *Negative skin friction.* The downdrag skin friction resulted from the consolidation of compressible soil strata.

[1] Addition of "minor or temporary structures" in the glossary.

Appendix

Item	Current version	Amendments
2. Clause 2.2.2(5) 1st paragraph [2]	**(5) Footings of Minor Temporary Structures** A presumed allowable vertical bearing pressure of 100 kPa (if dry) or 50 kPa (if submerged) may be used for the design of footings on horizontal ground of minor temporary structures such as fencing and hoarding.	**(5) Footings of Minor or Temporary Structures** A presumed allowable vertical bearing pressure of 100 kPa (if dry) or 50 kPa (if submerged) may be used for the design of footings of minor or temporary structures on flat ground and founded on granular materials.
3. Table 2.1 Notes [3]	Notes: (11) The use of presumptive values does not preclude the requirement for consideration of settlement of the structure.	Notes: (11) The use of presumptive values does not preclude the requirement for consideration of settlement of the structure. (12) Category 2 rock should exclude marble and marble-bearing rocks.

[2] Revision of the design requirements for footings of minor or temporary structures.

[3] Clarification on the definition of category 2 rock .

Appendix

Item	Current version	Amendments
4. Clause 2.2.4 Notes [4]	Notes: (1) A shallow foundation is taken as one in which the depth to the bottom of foundation is less than or equal to 3m. (2) q should not include any overburden pressure that may be temporarily or permanently removed during the design life of the foundation. In its derivation, the maximum effective overburden depth of subsoil should not be greater than B_f and suitable adjustments should be made to discount any voids that may be allowed for underground utilities. (3) Figure 2.2 shows the generalised loading and geometric parameters for the design of a shallow foundation and the bearing capacity factors are given in Table 2.3. (4) Any weak geological features present in the ground may affect the validity of the bearing capacity equation. Therefore the geological characteristics of the ground should be considered in the evaluation of the bearing capacity.	Notes: (1) q should not include any overburden pressure that may be temporarily or permanently removed during the design life of the foundation. In its derivation, the maximum effective overburden depth of subsoil should not be greater than 3 m or B_f, whichever is the lesser, and suitable adjustments should be made to discount any voids that may be allowed for underground utilities. (2) Figure 2.2 shows the generalised loading and geometric parameters for the design of a shallow foundation and the bearing capacity factors are given in Table 2.3. (3) Any weak geological features present in the ground may affect the validity of the bearing capacity equation. Therefore the geological characteristics of the ground should be considered in the evaluation of the bearing capacity.

[4] Note (1) is deleted. Derivation of the maximum effective overburden depth of subsoil in Note (2) is revised to incorporate the criterion specified in Note (1).

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Item	Current version	Amendments
	(5) For shallow foundations on or near the crest of a slope, the ultimate bearing capacity may be obtained by linear interpolation between the value for the foundation resting at the edge of the slope and that at a distance of four times the foundation width from the crest. The latter may be assumed to be equal to that of a foundation placed on flat ground. Figure 2.3 summarizes the procedures for the linear interpolation. The effect of the foundation works on the overall stability of the slope should also be checked.	(4) For shallow foundations on or near the crest of a slope, the ultimate bearing capacity may be obtained by linear interpolation between the value for the foundation resting at the edge of the slope and that at a distance of four times the foundation width from the crest. The latter may be assumed to be equal to that of a foundation placed on flat ground. Figure 2.3 summarizes the procedures for the linear interpolation. The effect of the foundation works on the overall stability of the slope should also be checked.
	(6) The bearing capacity equation is applicable to rectangular shaped shallow foundations. For shallow foundation of an irregular shape, the calculation may be based on the largest inscribed rectangle as shown in Figure 2.4.	(5) The bearing capacity equation is applicable to rectangular shaped shallow foundations. For shallow foundation of an irregular shape, the calculation may be based on the largest inscribed rectangle as shown in Figure 2.4.
	(7) The effective unit weight of the soil γ_s' may be taken as follows: (a) Dry condition (see clause 1.2 for definition): $\gamma_s' = \gamma$ where γ is the bulk unit weight of the soil	(6) The effective unit weight of the soil γ_s' may be taken as follows: (a) Dry condition (see clause 1.2 for definition): $\gamma_s' = \gamma$ where γ is the bulk unit weight of the soil

	(b) Submerged condition (see clause 1.2 for definition): (i) For static groundwater: $\gamma_s' = \gamma'$ where γ' is the submerged unit weight of the soil (ii) For groundwater flows under an upward hydraulic gradient: $\gamma_s' = \gamma - \gamma_w (1 + i)$ where i is the upward hydraulic gradient; and γ_w is the unit weight of water. (c) For intermediate groundwater levels, γ_s' may be interpolated between the above limits.	(b) Submerged condition (see clause 1.2 for definition): (i) For static groundwater: $\gamma_s' = \gamma'$ where γ' is the submerged unit weight of the soil (ii) For groundwater flows under an upward hydraulic gradient: $\gamma_s' = \gamma - \gamma_w (1 + i)$ where i is the upward hydraulic gradient; and γ_w is the unit weight of water. (c) For intermediate groundwater levels, γ_s' may be interpolated between the above limits.

Appendix

Item	Current version	Amendments
5. Clause 2.3.2(2) 1st and 2nd paragraphs [5 & 6]	**(2) Reference Criteria** For buildings or structures not particularly sensitive to movement, the following movement criteria, evaluated at the base of a shallow foundation or in case of a deep foundation, the base of pile cap, may be used as a reference for developing case specific criteria: (a) The maximum total settlement should not exceed 30 mm; (b) The differential settlement between columns/ vertical elements should be limited to 1:500; and (c) The maximum angular rotation should not exceed 1:500 due to wind or other transient loads.	**(2) Reference Criteria** For buildings or structures not particularly sensitive to movement, the following movement criteria, evaluated at the base of a shallow foundation or in case of a deep foundation, the base of pile cap or the equivalent raft level for driven piles, may be used as a reference for developing case specific criteria: (a) The maximum total settlement should not exceed 30 mm; (b) The differential settlement between columns/ vertical elements should be limited to 1:500; and (c) The maximum angular rotation should not exceed 1:500 due to wind or other transient loads.

[5] Equivalent raft level for driven piles may be used as a reference for developing case specific criteria.

[6] Dead loads may be reduced to 50% for consideration in criteria 2.3.2(2)(a) and (b).

Appendix

Item	Current version	Amendments
	The above criteria should be assessed based on working loads. For criteria (a) and (b), the full dead loads should be considered, and the imposed loads may be reduced in accordance with the Code of Practice for Dead and Imposed Loads.	The above criteria should be assessed based on working loads. For criteria (a) and (b), the dead loads may be reduced to 50%, and the imposed loads may be reduced in accordance with the Code of Practice for Dead and Imposed Loads.
6. Clause 2.5.4(1)[7]	**(1) General** The foundations shall be so designed and constructed to fulfil the requirements given in this clause.	**(1) General** The foundations should be so designed and constructed to fulfil the requirements given in this clause. Note : For design of foundations to resist accidental loads, reference should be made to the relevant technical guidelines by government departments, e.g. GEO Technical Guidance Note No. 42 for the design of landslide debris impact loads.

[7] Addition of a note on reference guidelines for design of foundations to resist accidental loads .

Appendix

Item	Current version	Amendments
7. Clause 4.2.2(2) 1st and 2nd paragraphs [8]	**(2) Testing Requirements** (b) the allowable bearing pressure (q_a) determined by the bearing capacity equations given in clause 2.2.4 or other methods, except the footings of minor temporary structures described in clause 2.2.2(5); or (c) the Young's modulus, E_s (in MPa), of the bearing strata used in the estimation of settlement is greater than 1 times the SPT N-value. The number of tests should be determined with due consideration on the extent of the foundations and the variation of geology of the founding strata, and in no case be less than 2. The tests should be carried out in accordance with clause 8.2.	**(2) Testing Requirements** (b) the allowable bearing pressure (q_a) determined by the bearing capacity equations given in clause 2.2.4 or other methods, except the footings of minor or temporary structures described in clause 2.2.2(5); or (c) the Young's modulus, E_s (in MPa), of the bearing strata used in the estimation of settlement is greater than 1 times the SPT N-value. The number of tests should be determined with due consideration on the extent of the foundations and the variation of geology of the founding strata, and should not be less than one per soil type for each of the first two 500 m^2 and one for every subsequent 1 000 m^2 of the site coverage area(s) of a building. Any fraction of the test so calculated should be construed as one test. The tests should be carried out in accordance with clause 8.2.

[8] Revision of the testing requirements for shallow foundations on soil.

Appendix

Item	Current version	Amendments
8. Clause 5.1.1 3rd paragraph [9]	Application for a recognized type of pile should be made prior to seeking approval of foundation plans using such type of pile whenever possible.	Enquiry on any non-recognised pile system should be made to the Building Authority in advance to settle the design principles, prior to the submission of foundation plans using such pile system to the Building Authority for approval whenever possible.
9. Clause 5.2.3(c) 1st paragraph [10]	**5.2.3 ALTERNATIVE APPROACH** (c) The settlement behaviour of the piles under total loads should be satisfactory.	**5.2.3 ALTERNATIVE APPROACH** (c) The settlement behaviour of the piles under total loads including NSF should be satisfactory.

[9] Revision of the requirement for using non-recognised type of piling system.

[10] Clarification on the design requirement for the alternative approach to consider negative skin friction.

Appendix

Item	Current version	Amendments
10. Clause 5.3.3(1) 2nd paragraph [11]	The anchorage resistance of the piles to resist uplifting force can be determined from sub-clauses (2) and (3) below as appropriate. Where other engineering methods are used and the allowable uplift resistance of the pile shaft is based on the ultimate uplift capacity of the pile shaft, the applied factor of safety should not be less than 3 unless the ultimate uplift capacity or the parameters for assessing the ultimate uplift capacity have been verified by tests. In no cases should this factor of safety be less than 2. (a) Anchorage resistance of piles In general, the anchorage resistance of a pile may be taken as: R_a = allowable uplift resistance of pile shaft + effective self weight of pile; and R_u = ultimate uplift resistance of pile shaft + effective self weight of pile	The anchorage resistance of the piles to resist uplifting force can be determined from sub-clauses (2) and (3) below as appropriate. (a) Anchorage resistance of piles In general, the anchorage resistance of a pile may be taken as: R_a = allowable uplift resistance of pile shaft + effective self weight of pile; and R_u = ultimate uplift resistance of pile shaft + effective self weight of pile The ultimate and allowable anchorage resistance of the piles derived from bond resistance can be determined from sub-clause (2)(a) below. The ultimate and allowable anchorage resistance of the piles derived from frictional resistance can be determined from sub-clause (3)(a) or (3)(b) below.

[11] The contents of this paragraph are re-arranged.

Appendix

Item	Current version	Amendments
	The ultimate and allowable anchorage resistance of the piles derived from bond resistance can be determined from sub-clause (2)(a) below. The ultimate and allowable anchorage resistance of the piles derived from frictional resistance can be determined from sub-clause (3)(a) or (3)(b) below.	Where other engineering methods are used and the allowable uplift resistance of the pile shaft is based on the ultimate uplift capacity of the pile shaft, the applied factor of safety should not be less than 3 unless the ultimate uplift capacity or the parameters for assessing the ultimate uplift capacity have been verified by tests. In no cases should this factor of safety be less than 2.
11. Clause 5.4.11(2)(b) [12]	(b) Piles should be founded on or close to rock not inferior to category 1(d) defined in Table 2.1. Piles may be considered as founded on rock when driven to refusal by using sufficient driving energy. Driven to refusal means the actual penetration of a pile is not more than 10mm per 10 blows and the requirements specified in item (5)(d) are complied with;	(b) Piles should be founded on or close to rock materials not inferior to moderately decomposed, moderately strong to moderately weak rock of material weathering grade III or better, and with not less than 50% TCR of the designated grade. For piles driven to marble and marble-bearing rocks, the design should refer to clause 2.8.2.4(3). The piles may be considered as founded on rock when driven to refusal by using sufficient driving energy. Driven to refusal means the actual penetration of a pile is not more than 10mm per 10 blows and the requirements specified in item (5)(c) are complied with;

[12] Revision of the criteria of founding materials.

Appendix

Item	Current version	Amendments
12. Clause 5.4.11(5)(c) [13]	(c) Dynamic load tests should be carried out to verify the capacity of at least 10% of the working piles, half of which should be selected from the group of piles with greater depth. The peak driving stress at final set should also be measured which should not be less than 75% of the yield stress of the pile.	(c) Dynamic load tests should be carried out on at least 10% of the working piles, half of which should be selected from the group of piles with greater depth. The peak driving stress at final set should also be measured which should not be less than 75% of the yield stress of the pile. Alternatively, a borehole in addition to clause 7.4.4 should be carried out at a distance not more than 2 m measured from the centre of the concerned pile to verify whether the pile base is terminated on or very close to bedrock.

[13] Provision of an alternative method in lieu of dynamic load tests.