《基礎作業守則2017年》

屋宇署已成立技術委員會，工作範疇包括收集及考慮建築業界就使用《基礎作業守則2017年》（《守則》）所得出的意見及回應。屋宇署現因應技術委員會的建議，公布以下《守則》的修訂內容[1]：

(a) 附錄A1－2021年2月；

(b) 附錄A2－2022年7月；及

(c) 附錄A3－2023年8月。

2. 遵從《守則》的規定可被視為符合《建築物（建造）規例》的相關條文。認可人士、註冊結構工程師及註冊岩土工程師應遵守《守則》訂明的規定，以及建築事務監督就基礎工程發出並臚列於附錄B的其他相關《認可人士、註冊結構工程師及註冊岩土工程師作業備考》的最新補充指引及規定。

3. 認可人士／註冊結構工程師／註冊岩土工程師並應遵守載列於附錄C與基礎工程相關的設計、建造、行政及程序的規定。

建築事務監督 余寶美

檔　　號：BD GP/BREG/C/11(IV)

初　　版：1980年2月
上次修訂版：2021年3月
本修訂版：2023年8月 （助理署長／拓展(2)）
（一般修訂）

[1] 暫只提供英文版本。

Appendix A1
(PNAP APP-18)

Amendments to the Code of Practice for Foundations 2017

(February 2021)

Legends:

Amended

Deleted

(8/2023)

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.

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.

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).

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

Item	Current version	Amendments
	(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.

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).

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.

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.

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.

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.

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.

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.

Appendix A2
(PNAP APP-18)

Amendments to the Code of Practice for Foundations 2017

(July 2022)

Legends:

Amended

Deleted

(8/2023)

Amendments to the Code of Practice for Foundations 2017 (July 2022)

Item	Current version	Amendments
1. Clause 4.2.2(2)(a) [1]	**(2) Testing Requirements** When one of the following conditions applies, a sufficient number of plate load tests should be carried out to verify the allowable bearing pressure and settlement estimation for shallow foundations: (a) the allowable bearing pressure (q_a) based on the presumed values in Table 2.1 exceeds 300 kPa (unless the net increase in bearing pressure (i.e. q_a - q_o) is less than 50 kPa); or	**(2) Testing Requirements** When one of the following conditions applies, a sufficient number of plate load tests should be carried out to verify the allowable bearing pressure and settlement estimation for shallow foundations: (a) the allowable bearing pressure (q_a) based on the presumed values in Table 2.1 exceeds 300 kPa (unless the net increase in bearing pressure (i.e. q_a - q_o) is less than 50 kPa), except category 3 intermediate soil; or
2. Clause 5.3.3(1)(a) and (b) [2 & 3]	(a) Anchorage resistance of piles …… Proof test is normally required to justify the tension capacity of piles unless such capacity is taken as less than half of the compressive capacity resulting only from shaft friction and bond between the pile and the surrounding soil. In any case, the adequacy of the related soil mass and rock cone supporting the pile should be checked for uplifting effect.	(a) Anchorage resistance of piles …… Proof test is normally required to justify the tension capacity of piles. When the tension capacity of piles is taken as less than half of the compressive capacity resulting only from shaft friction and bond between the pile and the surrounding soil/rock, and the tension piles have already been considered for selection for compression proof test, then tension proof test is not required. In any case, the adequacy of the related soil column and rock or soil cone supporting the pile should be checked for uplifting effect.

Item	Current version	Amendments
	(b) Anchorage resistance limited by effective weight of soil mass/rock cone The anchorage resistance against uplifting force would be limited by the effective weight of the soil mass and rock cone that can be mobilised by the piles. The ultimate anchorage resistance of a pile or a pile group, R_u, therefore should not exceed the effective weight of the soil mass and rock cone as derived from sub-clauses (2)(b) and (3)(c) below such that:	(b) Anchorage resistance limited by effective weight of soil column and rock or soil cone The anchorage resistance against uplifting force would be limited by the effective weight of the soil column and rock or soil cone that can be mobilised by the piles. The ultimate anchorage resistance of a pile or a pile group, R_u, therefore should not exceed the effective weight of the soil column and rock or soil cone as derived from sub-clauses (2)(b) and (3)(c) below such that:

1 Exclusion of category 3 intermediate soil from the requirement of plate load test.

2 Clarification on the proof test requirement for tension piles.

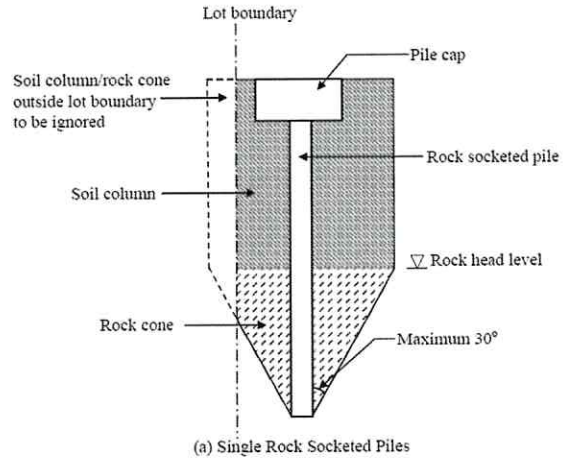
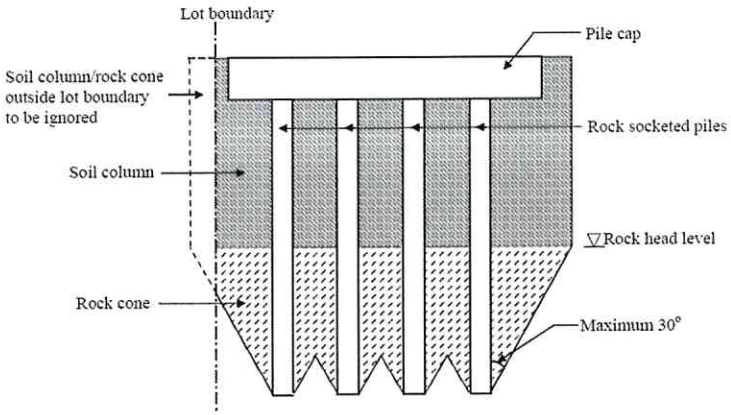
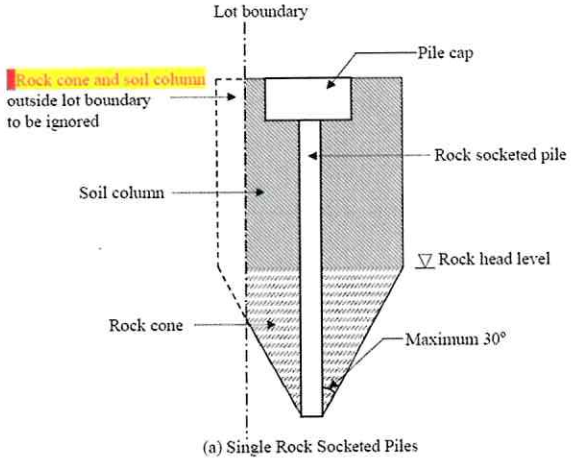
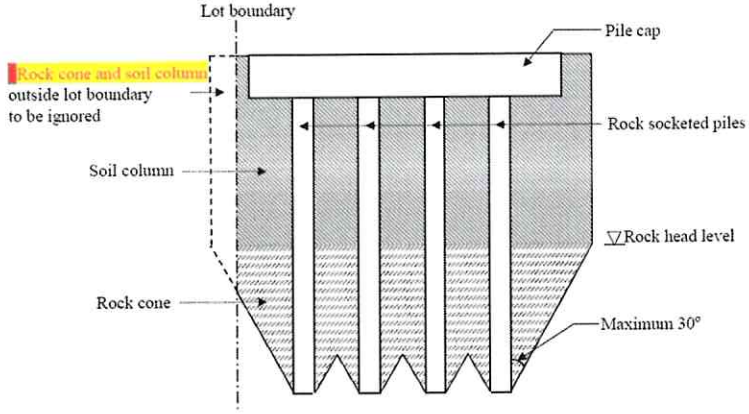
3 Clarification on the checking of the related soil column and rock or soil cone.

Item	Current version	Amendments
3. Clause 5.3.3(2)(b) [4 & 5]	(b) Assessment of the effective weight of the rock cone and soil column For single or group of closely-spaced piles (i.e. with overlapping rock cone/soil column) that derive the ultimate tension resistance from rock socket, the configuration of the rock cone/soil column as given in Figure 5.1 may be used, and the assessment of the effective weight of the rock cone and soil column should be based on the following assumptions : (i) The half angle of the rock cone at the toe of the pile should not exceed 30 degree measuring from the vertical. (ii) Only the column of overburden soil directly above the rock cone should be considered, and the soil friction at the vertical face of such soil column above the rock cone should be ignored. (iii) Effective weight of the rock cone and the soil column should be adopted. Any part of the rock cone or soil column falling outside the lot boundary should be ignored. (iv) For a group of closely-spaced piles subjected to tension, overlapping effect should be considered when assessing the volume of rock/soil cone to be	(b) Assessment of the effective weight of the rock cone and soil column For single or group of closely-spaced piles (i.e. with overlapping rock cone and soil column) that derive the ultimate tension resistance from rock socket, the configuration of the rock cone and soil column as given in Figure 5.1 may be used, and the assessment of the effective weight of the rock cone and soil column should be based on the following assumptions : (i) The half angle of the rock cone at the toe of the pile should not exceed 30 degree measuring from the vertical. (ii) Only the column of overburden soil directly above the rock cone should be considered, and the soil friction at the vertical face of such soil column above the rock cone should be ignored. (iii) Effective weight of the rock cone and the soil column should be adopted. Any part of the rock cone and soil column falling outside the lot boundary should be ignored. (iv) For a group of closely-spaced piles subjected to tension, overlapping effect should be considered when assessing the volume of rock cone and soil

Item	Current version	Amendments
	used for resisting the combined uplift force.	column to be used for resisting the combined uplift force.
	(v) For a group of piles with same individual tension capacity, checking of rock/soil cone failure of individual pile is not necessary when the group effect has been considered as stated in (iv) above.	(v) For a group of piles of the same size with the same individual allowable anchorage resistance, checking of overlapping effect on rock cone failure of individual pile is not necessary when the group effect has been considered as stated in (iv) above.
	(vi) Where the tension capacities of piles within a pile group are not the same, checking of rock/soil cone failure of individual pile is required. The effective weight of the overlapping part of rock cones between piles may be distributed to each pile on a pro-rata basis according to the tension capacities of the piles.	(vi) Where the allowable anchorage resistances of piles within a pile group are not the same, checking of overlapping effect on rock cone failure of individual pile is required. The effective weight of the overlapping part of rock cones and soil columns between piles may be distributed to each pile on a pro-rata basis according to the allowable anchorage resistances of the piles.

[4] Clarification on the checking of overlapping effect on rock cone failure for piles with rock socket.

[5] Clarification on the assessment concerning the rock cone and soil column.

Item	Current version	Amendments
4. Figure 5.1 [6]	 (a) Single Rock Socketed Piles  (b) Group of Closely-Spaced Rock Socketed Piles **Figure 5.1 Configuration of Rock Cone/Soil Column for Rock Socketed Piles**	 (a) Single Rock Socketed Piles  (b) Group of Closely-Spaced Rock Socketed Piles **Figure 5.1 Configuration of Rock Cone and Soil Column for Rock Socketed Piles**

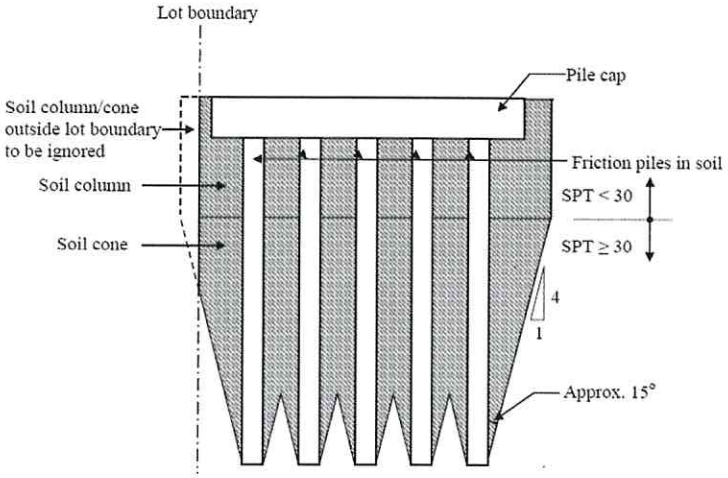
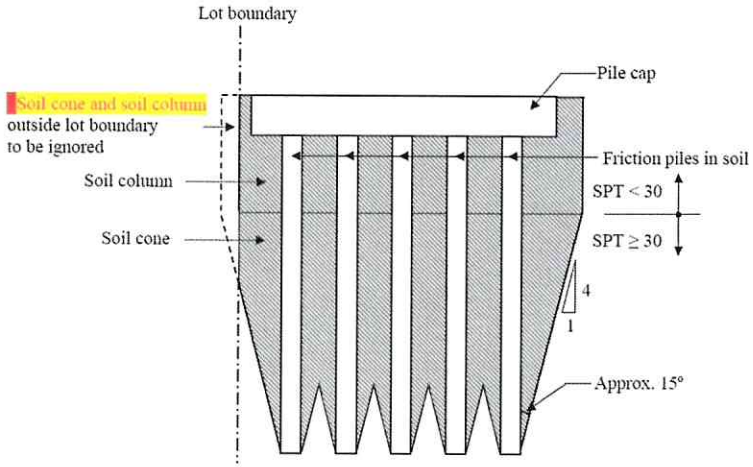
[6] Clarification on the assessment concerning the rock cone and soil column.

Item	Current version	Amendments
5. Clause 5.3.3(3)(c) [7 & 8]	(c) Assessment of the effective weight of the soil cone/soil column For a group of closely-spaced piles (i.e. with overlapping soil cone/soil column) that derive the ultimate tension resistance from friction in granular soil, the configuration of the soil cone/soil column as given in Figure 5.2 may be used, and the assessment of the effective weight of the soil cone/soil column should be based on the following assumptions: (i) For single pile subjected to tension, checking on soil cone failure is not required. (ii) For soil with an SPT N-value of not less than 30, the angle of dilation of the soil cone should not exceed 1 in 4 (i.e. approximate 15 degree). For soil with an SPT N-value of less than 30, the angle of dilation of the soil cone should be taken as zero. (iii) Skin friction on the face of the soil cone/soil column should be ignored. (iv) Effective weight of the soil cone/soil column should be adopted. Any part of the soil cone/soil column falling outside the lot boundary should be ignored. (v) For a group of closely-spaced piles with same	(c) Assessment of the effective weight of the soil cone and soil column For a group of closely-spaced piles (i.e. with overlapping soil cone and soil column) that derive the ultimate tension resistance from friction in granular soil, the configuration of the soil cone and soil column as given in Figure 5.2 may be used, and the assessment of the effective weight of the soil cone and soil column should be based on the following assumptions: (i) For single pile subjected to tension, checking on soil cone failure is not required. (ii) For soil with an SPT N-value of not less than 30, the angle of dilation of the soil cone should not exceed 1 in 4 (i.e. approximate 15 degree). For soil with an SPT N-value of less than 30, the angle of dilation of the soil cone should be taken as zero. (iii) Skin friction on the face of the soil cone and soil column should be ignored. (iv) Effective weight of the soil cone and soil column should be adopted. Any part of the soil cone and soil column falling outside the lot boundary should be ignored. (v) For a group of closely-spaced piles of the same size

Item	Current version	Amendments
	individual tension capacity, overlapping effect of the soil cones should be considered when assessing the volume of soil cone/soil column to be used for resisting the combined uplift force.	with the same individual tension capacity, overlapping effect of the soil cones should be considered when assessing the volume of soil cones and soil columns to be used for resisting the combined uplift force.
	(vi) Where the tension capacities of piles within a pile group are not the same, checking of soil cone failure of individual pile is required. The effective weight of the overlapping part of soil cones and columns between piles may be distributed to each pile on a pro rata basis according to the tension capacities of the piles.	(vi) Where the tension capacities of piles within a pile group are not the same, checking of overlapping effect on soil cone failure of individual pile is required. The effective weight of the overlapping part of soil cones and soil columns between piles may be distributed to each pile on a pro-rata basis according to the tension capacities of the piles.

[7] Clarification on the checking of overlapping effect on soil cone failure for piles in granular soil.

[8] Clarification on the assessment concerning the soil cone and soil column.

Item	Current version	Amendments
6. Figure 5.2 [9]	 **Figure 5.2 Configuration of Soil Cone/Soil Column for Group of Closely-spaced Friction Piles in Soil**	 **Figure 5.2 Configuration of Soil Cone and Soil Column for Group of Closely-spaced Friction Piles in Soil**
7. List of Figures[10]	…… Figure 5.1 Configuration of Rock Cone/Soil Column for Rock Socketed Piles Figure 5.2 Configuration of Soil Cone/Soil Column for Group of Closely-spaced Friction Piles in Soil	…… Figure 5.1 Configuration of Rock Cone and Soil Column for Rock Socketed Piles Figure 5.2 Configuration of Soil Cone and Soil Column for Group of Closely-spaced Friction Piles in Soil

[9] Clarification on the assessment concerning the soil cone and soil column.

[10] Corresponding amendment to the titles of the figures.

Appendix A3
(PNAP APP-18)

Amendments to the Code of Practice for Foundations 2017

(August 2023)

Legends:

Amended

Deleted

(8/2023)

Amendments to the Code of Practice for Foundations 2017 (June 2023)

Item	Current version	Amendments
1. Contents [1]	**5. Pile Foundations** 5.1 General 5.1.1 Recognized Types of Pile Foundations … **8. Testing of Foundations and Ground** 8.5 Core-Drilling Test	**5. Pile Foundations** 5.1 General 5.1.1 Common Pile Foundation Types … **8. Testing of Foundations and Ground** 8.5 Proof Core-Drilling Test
2. List of Tables [2]	Table 2.9 Reference Value for Redundancy Factor	Table 2.9 Reference Value for Redundancy Factor Table 2.10 Presumed Allowable Vertical Bearing Pressure under Foundations on Marble Bedrock and Presumed Allowable Bond or Friction Between Marble and Concrete or Grout for Piles
3. Table 2.1 Notes: (6) [3]	Notes: (6) The bearing surface of rock on which the foundation will be rested should be of the designated category and in an intact condition for a depth not less than 600 mm.	Notes: (6) The bearing surface of rock on which the foundation will be rested should be of the designated category and no rock core within 600 mm depth from the pile base is logged as "non-intact" in accordance with GEOGUIDE 3.

1 Revision of recognized types of pile foundations to common pile foundation types and core-drilling test to proof core-drilling test.

2 Inclusion of Table 2.10.

3 Clarification on rock condition within 600 mm depth from the pile base.

Item	Current version	Amendments
4. Table 2.1 Notes [4]	Notes: (12) Category 2 rock should exclude marble and marble-bearing rocks.	Notes: (12) Category 2 rock should exclude marble and marble-bearing rocks. (13) Reference should be made to clause 2.8 and GEO Technical Guidance Note No. 26 (TGN 26) for foundation design in areas underlain by marble and marble-bearing rocks.
5. Table 2.2 Notes [4]	Notes: (2) The presumed value of transient tension is for design for transient load such as wind load.	Notes: (2) The presumed value of transient tension is for design for transient load such as wind load. (3) Reference should be made to clause 2.8 and GEO TGN 26 for foundation design in areas underlain by marble and marble-bearing rocks.

[4] Addition of a note on reference for foundation design in areas underlain by marble and marble-bearing rocks.

<table>
<tr><th>Item</th><th>Current version</th><th>Amendments</th></tr>
<tr><td>6. Clause 2.8.2.4 [5]</td><td>2.8.2.4 FOUNDATIONS BEARING ON MARBLE BEDROCK

(3) Piles Driven to Marble Bedrock
…</td><td>2.8.2.4 FOUNDATIONS BEARING ON MARBLE BEDROCK

(3) Piles Driven to Marble Bedrock
…
(4) Presumed Allowable Bearing Pressure and Bond or Friction

The presumed allowable bearing pressure under foundations on marble bedrock and the presumed allowable bond or friction between marble and concrete or grout for piles as stipulated in Table 2.10 could be applicable in lieu of rational design method.

Table 2.10 Presumed Allowable Vertical Bearing Pressure under Foundations on Marble Bedrock and Presumed Allowable Bond or Friction Between Marble and Concrete or Grout for Piles

<table><tr><th>Description of marble bedrock</th><th>Presumed allowable bearing pressure (kPa)</th><th>Presumed allowable bond or friction between rock and concrete or grout for piles (kPa)</th></tr></table></td></tr>
</table>

[5] Inclusion of presumed allowable bearing pressure and bond or friction for foundations bearing on marble bedrock and Table 2.10.

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		Marble Class I or II and with not less than 95% TCR of the designated grade, which has a minimum UCS of rock material not less than 50 MPa (or an equivalent point load index strength PLI_{50} not less than 2 MPa) — 7 500 — 700 (under compression or transient tension) Marble Class I or II and with not less than 85% TCR of the designated grade, which has a minimum UCS of rock material not less than 25 MPa (or an equivalent point load index strength PLI_{50} not less than 1 MPa) — 5 000 — 350 (under permanent tension) Notes: (1) Notes on using presumed allowable bearing pressure and bond or friction as given in Table 2.1 and 2.2 respectively should also be applicable, where appropriate. The TCR of the designated grade shall also be proved within the zone of influence of the foundation load, whereas the minimum zone of influence should not be less than three times the diameter of the pile base.

Item	Current version	Amendments
7. Clause 5.1 1st paragraph [6]	All pile foundations should be durable, of adequate load carrying capacity and of a recognized type suitable for the ground conditions. The piles should be able to withstand the expected wear and deterioration throughout the intended design working life of the superstructure that they support.	All pile foundations should be durable, of adequate load carrying capacity and suitable for the ground conditions on which the foundations rest. The piles should be able to withstand the expected wear and deterioration throughout the intended design working life of the superstructure that they support.
8. Clause 5.1.1 [6]	**5.1.1 RECOGNIZED TYPES OF PILE FOUNDATIONS** A recognized type of pile foundation is a piling system which has been proved satisfactory to the Building Authority and incorporated into a list which is available from the homepage of the Buildings Department. The RSE usually in conjunction with the RSC experienced in a piling system which is not a recognized type may seek recognition of the system by submitting all technical details of the system to the Building Authority, including material specification, manufacturing process, method of installation, method of assessing pile capacity, applicability relating to ground conditions and selected examples of uses of the system elsewhere, if applicable. A demonstration of	**5.1.1 COMMON PILE FOUNDATION TYPES** The pile foundation types that are commonly used in Hong Kong and their particular requirements are given in clause 5.4.1 to 5.4.12.

[6] Revision of recognized types of pile foundations to common pile foundation types.

Item	Current version	Amendments
	the performance of the system is usually required. 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. Table 5.2 Notes [7]	Notes: (2) Subgrade reaction is to be reduced in the direction of loading.	Notes: (2) Subgrade reaction is to be reduced in the direction of loading. (3) For the ratio of pile spacing to pile diameter less than 3, alternative methods (e.g. elastic continuum method etc.) for checking the effect of lateral load on pile group should be used.
10. Clause 6.5.2(c)[8]	Load tests, core-drilling tests or any other suitable tests to confirm the load-carrying capacity, integrity and material properties of the existing foundations; and	Load tests, proof core-drilling tests or any other suitable tests to confirm the load-carrying capacity, integrity and material properties of the existing foundations; and

[7] Clarification on the reduction factor for horizontal subgrade reaction when ratio of pile spacing to pile diameter is less than 3.

[8] Revision of core-drilling tests to proof core-drilling tests.

Item	Current version	Amendments
11. Clause 6.5.3(b)[9]	Core-drilling test on each reuse pile to verify the concrete strength, founding level and founding condition. The core-drilling test should be carried out in accordance with clause 8.5.	Proof core-drilling test on each reuse pile to verify the concrete strength, founding level and founding condition. The proof core-drilling test should be carried out in accordance with clause 8.5.
12. Clause 6.5.6(b)[10]	Core-drilling tests on each reuse footing to verify the concrete strength, founding level and founding stratum condition.	Proof core-drilling tests on each reuse footing to verify the concrete strength, founding level and founding stratum condition.
13. Clause 7.4.4[11]	**7.4.4 POST CONSTRUCTION PROOF DRILLING** *Large Diameter Bored Piles, Barrettes and the Like* To ascertain the soundness of the interface, core-drilling should be carried out at the concrete/rock interface for each of the large diameter bored piles, barrettes and the like. The core-drilling should cover at least 1 m above and below the interface.	**7.4.4 POST CONSTRUCTION PROOF DRILLING** *Large Diameter Bored Piles, Barrettes and the Like* To ascertain the soundness of the interface, interface proof drilling should be carried out at the concrete/rock interface for each of the large diameter bored piles, barrettes and the like. The core-drilling should cover at least 1 m above and below the interface.

9 Revision of core-drilling test to proof core-drilling test.

10 Revision of core-drilling tests to proof core-drilling tests.

11 Revision of core-drilling to interface core-drilling.

Item	Current version	Amendments
14. Clause 7.4.5 2nd paragraph[12]	Alternative procedures and acceptance criteria other than test loading or core-drilling with sound justification based on recognized foundation engineering principles and relevant to a particular site and building may also be adopted, provided that the following are submitted to the Building Authority to demonstrate the suitability of the proposed method of testing:	Alternative procedures and acceptance criteria other than test loading or proof core-drilling with sound justification based on recognized foundation engineering principles and relevant to a particular site and building may also be adopted, provided that the following are submitted to the Building Authority to demonstrate the suitability of the proposed method of testing:
15. Clause 8.1 3rd paragraph[13]	Except standard penetration tests (see clause 8.3) and proof test by core-drilling (see clause 8.5), all tests specified in this Chapter should be carried out by a HOKLAS accredited laboratory.	Except standard penetration tests (see clause 8.3) and proof core-drilling test (see clause 8.5), all tests specified in this Chapter should be carried out by a HOKLAS accredited laboratory.
16. Clause 8.5[14]	**8.5 CORE-DRILLING TEST** Proof core-drilling test is commonly used in large diameter bored piles, barrettes and the like which can reveal the soundness of the founding rock, concrete and the interface between the pile and the rock. When carrying out core-drilling tests:	**8.5 PROOF CORE-DRILLING TEST** Proof core-drilling test is commonly used in large diameter bored piles, barrettes and the like which can reveal the soundness of the founding rock, concrete and the interface between the pile and the rock. When carrying out proof core-drilling tests:

[12] Revision of core-drilling to proof core-drilling.

[13] Revision of proof test by core-drilling to proof core-drilling test.

[14] Revision of core-drilling test/tests to proof core-drilling test/tests.

附錄 B

（認可人士、註冊結構工程師及註冊岩土工程師作業備考 APP-18）

與基礎工程相關的
《認可人士、註冊結構工程師及註冊岩土工程師作業備考》

(a) 《認可人士、註冊結構工程師及註冊岩土工程師作業備考》（《作業備考》）APP-22 — 基礎及地庫挖掘工程中的地下水位降低情況；

(b) 《作業備考》APP-24 —《鐵路條例》、《地下鐵路（收回土地及有關規定）條例》及《建築物條例》附表 5 所列地區的第 3 號地區的鐵路防護措施；

(c) 《作業備考》APP-30 — 附表所列的半山區地區內發展的岩土工程管制；

(d) 《作業備考》APP-49 — 地盤勘測及土地勘測；

(e) 《作業備考》APP-61 — 附表所列地區第 2 號及第 4 號地區內發展的岩土工程管制；

(f) 《作業備考》APP-62 — 保護污水和排水隧道；

(g) 《作業備考》APP-97 — 處理同意展開建築工程及街道工程的程序；

(h) 《作業備考》APP-134 — 大嶼山北岸指定地區的發展；及

(i) 《作業備考》APP-137 — 打樁和類似操作所引致經地下傳送的震動及地面沉降。

（2023 年 8 月初版）

附錄 C

（認可人士、註冊結構工程師及註冊岩土工程師作業備考 APP-18）

與基礎工程相關的設計、建造、行政及程序規定

基礎的設計及建造

樁基礎

如註冊結構工程師擬採用的樁基礎系統於本地基礎建造工程的作業方式而言不屬常見，或不符合《基礎作業守則 2017 年》（《守則》）載列的規定／條件，呈交採用有關樁基礎系統的基礎圖則以供審批前，應盡可能就所涉的設計原理獲取建築事務監督的同意。這可便利註冊結構工程師繼續進行相關設計時更有把握，同時避免工作白費。

2. 於呈交圖則前，應按照《認可人士、註冊結構工程師及註冊岩土工程師作業備考》（《作業備考》）ADM-19 所載的建議預先與建築事務監督進行查詢及會議。

3. 應向建築事務監督呈交所有與擬採用的系統有關的技術詳情，包括物料規格、生產過程、埋置方法、評估樁柱承載能力的方法、關乎土地狀況的適用程度，以及擬議系統在其他地方的應用例子（如適用）。一般而言，亦須進行示範以證明擬議系統的效能符合要求。

4. 嵌岩工字鋼樁或打入的承重工字鋼樁所用的樁段或須附上證明，顯示其符合《建築物（建造）規例》第 3 條的規定。基礎工程如擬採用此類樁段，呈交圖則以供審批前，應盡可能向建築事務監督提供以下資料作考慮之用：

(a) 樁柱生產過程的簡要說明；

(b) 樁柱的識別標記及廠房標籤的樣本；

(c) 出廠證明書的樣本；

(d) 樁柱的截面特性，包括容限的數據；

(e) 樁柱的化學及機械特性，包括一般規格、最大碳當量值，以及由獲香港實驗所認可計劃（實驗所認可計劃）認可的實驗所或已與實驗所認可計劃達成相互承認協議／安排的其他實驗所認可機構認可的實驗所發出而達滿意程度的測試結果；

(f) 焊接規格，包括焊接程序測試規格、焊接程序測試報告的樣本及焊枝規格；

(g) 樁柱的承載能力；

(h) 樁柱設計；

(i) 品質保證及質量控制計劃，包括生產過程的簡要說明，以及產品檢驗及質量管理系統證明書；及

(j) 獲實驗所認可計劃認可的實驗所，或已與實驗所認可計劃達成相互承認協議／安排的其他實驗所認可機構認可的實驗所發出的測試報告。

5. 屋宇署網站(www.bd.gov.hk)“資源”欄目下“可被視為符合規定”的頁面載有一份清單，列出已向建築事務監督呈交上文第4段提及所須呈交的資料並獲信納的工字鋼樁樁段。就基礎的設計和建造而言，這些樁段獲視為符合《建築物（建造）規例》第3條的規定。如擬採用的工字鋼樁樁段不在清單上，建築事務監督可要求在呈交基礎圖則時，同時提供上文第4段所述的全部資料，以作考慮之用。

《土力工程處技術指引第53號》

6. 土木工程拓展署的土力工程處於2023年1月19日發布了《技術指引第53號》。在符合該指引表一所列的條件下，如採用該指引有關基礎岩層的設定容許數值於基礎系統設計，建築事務監督就基礎圖則發出批准時，會根據《建築物條例》第17(1)條第6項施加以下條件：

(a) 分析基礎沉降時，須仔細考慮建成後的樁長／基礎水平與土壤／構築物的相互作用；

(b) 須對由基礎支承的構築物進行評估，以確認構築物能承受上文(a)項所述的沉降情況；

(c) 基礎工程竣工時，須向建築事務監督呈交報告，內容須涵蓋上文(a)項及(b)項所述的分析及評估；

(d) 須執行沉降監察計劃，以監察基礎於上蓋結構施工期間的狀況。在樁帽／上蓋結構工程施工前，亦須呈交監察計劃，以徵求建築事務監督同意；及

(e) 視乎情況，於申請佔用許可證或就改動及加建工程呈交表格 BA14 前呈交構築物沉降的最終表現檢討報告，而報告須涵蓋上文(d)項所述的沉降記錄。建築事務監督信納最終表現檢討報告符合要求，才會發出佔用許可證，或認收表格 BA14。

淺基礎

7. 無鋼筋混凝土填料常用於鋪平不平坦或傾斜的岩石表面，以建造淺基礎，惟置於基腳或筏式基礎之下的大型無鋼筋混凝土填料(即最大深度超過 1 米的填料)應視為結構構件，並按照《混凝土結構作業守則 2013 年》設計。

委任註冊專門承建商進行預鑽、建造後的驗證鑽探及取芯鑽探驗證測試

8. 所有預鑽、建造後的驗證鑽探及取芯鑽探驗證測試必須由註冊專門承建商（現場土地勘測工程類別）進行。獲委任進行《建築物（建造）規例》第 20 條所定取芯鑽探驗證測試的承建商應聲明其與基礎承建商的關係，包括其是否為基礎承建商的控權公司、附屬公司或有聯繫公司，又或是否與基礎承建商有財政上的關係（例如兩者的董事由同一人出任），或於有關基礎工程中是否持有財務權益。

大直徑鑽孔樁接面處驗證鑽探

9. 就大直徑鑽孔樁、矩形樁及同類樁柱，接面處的混凝土與基岩應有良好接觸，而樁柱底部以下的岩石應一致地達到所需級別。為方便在接面處進行驗證鑽探，可留下直徑不少於 150 毫米而延伸至接面處上方大約 1 米之處的管道。在接面處進行驗證鑽探期間觀察到的輕微不完美之處(例如發現有薄的沉積物層、接面處的混凝土出現分離情況，或樁柱底部以下的岩石存在風化縫隙）或可以接受，前提是註冊結構工程師／註冊岩土工程師可提供理據，以及在有需要時進行額外的驗證鑽探，以證明有關情況為可接受的。另一種做法是，註冊結構工程師可在基礎圖則中載列糾正任何該等不完美之處的補救工程建議。有關建議應提供施工方案和註冊結構工程師所定監督措施的詳情。

呈交圖則及申請展開工程同意書

10. 呈交基礎圖則或記錄時，如須提供岩土報告及輔證文件，該等報告及文件應由註冊岩土工程師擬備及簽署；詳情請參閱《作業備考》APP-141。

11. 沿地盤界線安裝樁牆及灌漿帷幕是額外的預防措施，可保障對沉降敏感的構築物、道路或地下設施不致因鄰近安裝嵌岩工字鋼樁而在過程中可能受到不良影響。就此，除非已呈交相關樁牆安裝工程和灌漿工程的記錄圖則及評估報告，否則建築事務監督可能會不同意展開位於地盤界線10米以內的樁柱工程。為方便審批展開工程同意書的申請，註冊結構工程師可同時呈交有關樁柱適用的表格BA8，以及相關樁牆和灌漿工程的記錄圖則與評估報告。如地盤屬大型規模，可分階段申請展開嵌岩工字鋼樁工程的同意書，註冊結構工程師／註冊岩土工程師應呈交額外的評估報告，以證明作出有關申請時，地盤已採取足夠的預防措施。

12. 除了在須先符合已施加條件的情況（例如須就對沉降敏感的建築物進行施工前的狀況勘測和為毗鄰建築物提供撐柱等）外，屋宇署或會考慮同時批准基礎工程圖則及同意展開有關工程。如認可人士／註冊結構工程師有意善用同步申請圖則批准和展開工程同意書的簡化程序，則應在呈交相應基礎圖則以供審批的32天後，方呈交徵求同意展開工程的申請，以免造成不必要的行政混亂。

13. 為減少建築地盤的閒置時間，板樁／管樁牆等擋土構件的安裝工程及最初階段挖掘與側向承托工程[1]（如適用）可與基礎工程同時進行。一俟擋土構件妥善安裝，可在基礎工程最終竣工前，就餘下的地下結構挖掘工程申請展開工程同意書及呈交相應的監督計劃。此舉使地下結構挖掘工程能在審查基礎記錄圖則及安排驗證測試期間進行。

14. 下述條件達成前，建築事務監督不會同意展開和進行樁帽及上蓋結構工程：

(a) 已呈交基礎記錄，並獲信納；

(b) 已呈交表格BA14，證明基礎工程已竣工；

(c) 已完成所需的驗證測試，並獲信納；及

(d) 已符合所有相關已施加的條件，包括物料測試的規定。

表格BA14、基礎記錄圖則及報告

15. 基礎工程竣工後，根據《建築物（管理）規例》第25條，應呈交證明基礎工程竣工的表格BA14。特大地盤的基礎工程可適當地分階段進行，並分別進行驗證測試。如擬作

[1] 最初階段挖掘與側向承托工程指經批准圖則所顯示，現有地面水平向下至第一層支撐杆底部但不超過1.5米深的挖掘工程，以及第一層橫擋和支撐杆的豎設工程。

出此類分階段安排，應盡早諮詢屋宇署。為加快驗證測試的選樁過程，呈交表格 BA14 前，可先另行呈交基礎記錄圖則及報告。

16. 如所呈交的記錄圖則及報告具備足夠資料，屋宇署會在收到基礎工程適用的表格 BA14 的 14 天內通知認可人士／註冊結構工程師所選定進行驗證測試的樁柱。為避免不必要的延誤，認可人士／註冊結構工程師應確保基礎記錄圖則及報告備齊所有有關建成樁柱的資料。

17. 在以下情況須就樁柱設計的反演分析進行複審及呈交修訂樁柱荷載表的基礎圖則：

(a) 如樁柱的實際長度與暫准長度相差多於 5%；或

(b) 如鄰近樁柱實際長度的差異致使樁柱荷載出現明顯的重新分布或反映當中存在陡斜的基岩地形。

如變化顯著，須進行額外的土地勘測以證明有關偏差是可接受的。屋宇署會視乎個別情況訂定額外土地勘測的要求。就附表所列地區第 2 號及第 4 號地區的基礎工程，應留意《守則》第 7.8 段及《作業備考》APP-61 所載的規定。

18. 為樁柱設計的反演分析進行的複審和經更新的樁柱荷載表，可連同證明打樁工程已竣工的表格 BA14 和相應的打樁記錄圖則一併呈交。屋宇署會着手揀選樁柱以進行荷載測試並同步審批樁柱荷載表，以加快處理表格 BA14。

19. 就大直徑鑽孔樁基礎工程，如不少於 85% 的建成樁柱已完成混凝土及岩石接面處的驗證鑽探，認可人士可向屋宇署呈交表格 BA14。此外，如在此階段已有足夠證明，可無須呈交所有 28 天齡期混凝土立方塊的測試結果。倘若已呈交在審批基礎圖則時所須呈交的其他資料，而有關資料獲信納，即使餘下的接面處驗證鑽探及混凝土立方塊測試仍在進行，屋宇署亦會揀選樁柱樣本進行取芯鑽探驗證測試。如其後發現違規之處，屋宇署可要求進行額外的取芯鑽探驗證測試。只有所有接面處的驗證鑽探和取芯鑽探驗證測試結果及所需呈交的文件獲信納，表格 BA14 方可獲認收。

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