

MINUTES OF BCA-SCAL, IES, ACES MEETING 2008

7 AUG 2008 (THURSDAY), 2.00PM

CONFERENCE ROOM, 5TH STOREY, MND COMPLEX

BCA

Chew Keat Chuan	Director, Building Engineering Division
Yang Kin Seng	Deputy Director, Deep Excavation & Geotechnical Dept.
Ms Andris Leong	Deputy Director, Policy & Regulations Dept.
Choong Teck Min	Senior Executive Engineer, Policy & Regulations Dept.
Ms Wai Hui Ling	Senior Executive Engineer, Policy & Regulations Dept.

SCAL

Desmond Koey	Manager
Ms Lim Tian Lee	Senior Executive Officer

IES

Low Kam Fook	Chairman, Civil Division
Tham Kwok Leong	Member, Special Task Division
Ms Wong Pui Fun	Member, Special Task Division

ACES

Lim Peng Hong	President
Dr Tan Guan	Chairman, Civil and Structural Practice Committee
Ronnie Chong	Chairman, AC Practices Committee

No.

Introduction

Follow-Up

- 1 Mr Chew welcomed SCAL, IES and ACES to the meeting to discuss on the issues raised by SCAL on the amendments to the Building Control Regulations.

Building Control Amendments

- 2 General

SCAL commented that the amendments in general seemed that there were many details to be submitted during submission of plans and permit applications.

BCA explained that most of the amendments in the Building Control Regulations involved were existing requirements or in current practice. The new requirements stipulated mainly

No.		Follow-Up
	include the requirements for geotechnical works which will come into effect on 1 Oct 2008. (Please refer to Annex A for the items highlighted.)	
3	<p><u>Duties of Specialist AC</u></p> <p>SCAL also commented that the duties and tasks to be carried out by the specialist AC were very prescriptive and seemed to be micro-managed.</p> <p>BCA replied that the requirements spelt out were necessary to demarcate clearly the responsibilities between the AC(Civil) and AC(Geo). (Please refer to Annex B for the items discussed.)</p> <p>SCAL would follow up with the council on the items discussed and give any feedback to BCA in the next meeting.</p>	SCAL
4	<p><u>Reg. 21 – Permit to carry out structural works</u></p> <p>SCAL viewed that there seems to be too many permit applications required to be made for different stages of work.</p> <p>BCA explained that after the procedure for applying permit to carry out building works was simplified since 1 Sep 2002, only one permit application is required for each project unless different project parties are involved. For example, builder for piling works is usually different from the main builder for structural works. In this case, one permit each is required for piling works and structural works.</p> <p>For para (4) (a) of Reg. 21, ACES highlighted their concern on whether it should be the responsibility of QP(Supervision), QP(Design) or the builder's PE on the impact assessment report.</p> <p>BCA replied that although the report is prepared by the builder's PE, QP(Design) or QP(Supervision) must review and agree with the report so that he is aware of the conditions at site.</p>	
5	<p><u>Supervision Team</u></p> <p>ACES mentioned that some developers assigned other works to the site supervisors (SS) in cases where the SS are appointed by the developers.</p> <p>BCA clarified that the SS should be appointed by the QP to carry out duties under the Building Control Act and</p>	

No.**Follow-Up**

Regulations. The appointment should not be done by the developers.

6 Safety Barriers

BCA suggested to IES and ACES to consider whether the main QP to also take on the task of submitting plans of fixings for safety barriers instead of having another QP to carry out this task.

IES and ACES replied that as safety barriers are specialised architectural products, the specifications are usually dictated by the architect and not by the engineer. They suggested that the architect should share some responsibilities and that the works be carried out only by licensed specialist builders for better quality control.

BCA clarified that the regulations require the fixings of the safety barriers to be designed by a PE and submitted for approval.

Conclusion

7 There being no other matters, the meeting was concluded at 3.30pm.

Drafted by: Wai Hui Ling

Vetted by: Andris Leong

Approved by: Chew Keat Chuan

BCA'S REPLY TO SCAL'S FEEDBACK ON AMENDMENTS TO BUILDING CONTROL REGULATIONS

S/N	REGULATIONS	BCA'S REPLY
1	<p>Particulars to be shown on detailed structural plans and design calculations</p> <p>9.—(1) Without prejudice to regulations 6 and 7, all detailed structural plans shall —</p> <p>(a) be in accordance with the provisions of the Act and these Regulations and any other requirement of the Commissioner of Building Control;</p> <p>(b) be signed by the qualified person who prepared the detailed structural plans and design calculations, and by an accredited checker unless the building works are of a type in respect of which the certificate of an accredited checker referred to in section 5(2)(d)(i) of the Act is not required under regulation 12;</p> <p>I bear a certificate from the qualified person who prepared and signed the structural plans on the first and last sheets of the plans stating that he has taken into consideration the loads imposed by all the building works as shown in the building plans or any amendment thereto;</p> <p>(d) bear a certificate by an accredited checker referred to in section 5(2)(d)(i) of the Act on the first and last sheets of the plans, unless the building works are of a type in respect of which such a certificate is not required under regulation 12;</p> <p>(e) clearly indicate on the respective area of every floor plan, the imposed load for which the floor system or part thereof has been designed;</p> <p>(f) show the type or types of foundation to be used;</p> <p>(g) contain the specifications of the materials to be used; and</p> <p>(h) indicate the fixing and framing details of any external cladding and safety barriers against falling from a height (if applicable).</p>	<p>To be consistent with the current practice, the requirement for</p>

S/N	REGULATIONS	BCA'S REPLY
		submission of safety barriers is stipulated here.
2	<p>9(2) The design calculations shall be prepared in such format and manner as the Commissioner of Building Control may require and shall —</p> <p>(a) contain a contents page;</p> <p>(b) be signed and endorsed by the qualified person who prepared the detailed structural plans and design calculations, and by an accredited checker, unless the building works are of a type in respect of which the certificate of an accredited checker referred to in section 5(2)(d)(i) of the Act is not required under regulation 12;</p> <p>bear a certificate by the qualified person who prepared the detailed structural plans and design calculations on the first and last sheets of the calculations stating that, to the best of his knowledge and belief, the design calculations have been prepared in accordance with these Regulations and that he is the person who prepared the design calculations;</p> <p>(d) state on the first page of the certificate of the qualified person referred to in subparagraph the number of pages per book and a numbering of every page in the book;</p> <p>(e) contain a Design Information Sheet giving a summary of the design information including, where applicable, the design loads, codes of practice, assumptions, soil investigation report, foundation system, wind loads and other information relevant to the design in question;</p> <p>(f) contain a Structural Summary Sheet showing the structural system, the form of the structure, the key structural elements, the provision for overall stability and structural analysis;</p> <p>(g) contain a Grouping of Structural Elements Sheet containing a list of designed structural elements that are similar; and</p>	

S/N	REGULATIONS	BCA'S REPLY
	<p>(h) contain an Analysis and Design of Structural Elements Sheet showing the detailed design and calculations of —</p> <ul style="list-style-type: none"> (i) the foundation; (ii) the shearwall, corewall and all structural elements resisting horizontal forces; (iii) the column and all vertical load bearing structural elements; (iv) the transfer beams or plates, cantilevers, pre-stressed beams and flat slabs; (v) the space truss and portal frame; <u>(vi) any shaft, tunnel or connections, or cavern structure;</u> <u>(vii) the retaining walls and supporting structures; and</u> <u>(viii) the overall structural system under wind loads, if applicable.</u> 	<p>Currently, design and calculations of shaft, tunnel, retaining walls, etc. are submitted for approval. To be consistent with current practice, the requirement is stipulated here.</p>
3	<p>Particulars to be shown on site formation plans and pile layout plans</p> <p>10 (2) The pile layout plans shall show —</p> <ul style="list-style-type: none"> (a) the types of piles and the specification of materials to be used; (b) the location of piles <u>and site investigation boreholes;</u> (c) the estimated pile penetration depth <u>for each design zone;</u> <u>(d) the minimum embedded pile length into competent stratum, where applicable;</u> <u>(e) the unit skin friction and unit end bearing resistance for pile designs;</u> <u>(f) the allowable pile bearing capacity before and after deduction of negative skin friction (if applicable) and details of pile joints;</u> <u>(g) the allowable total and differential foundation settlement;</u> <u>(h) the allowable vibration limit during pile installation; and</u> <u>(i) the sectional details of piles and number and type of pile load tests and the location of ultimate pile load tests.</u> 	<p>Currently, these details are to be shown on the pile layout plans for approval. To be consistent with current practice, the requirements of these details are clearly stated here.</p>

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4	<p><u>Particulars to be shown in underground building works plans</u> <u>10A.—(1) The underground building works plans referred to in regulation 4(1)(a) shall consist of or contain the following, where applicable:</u></p> <p style="padding-left: 40px;"><u>(a) plans of any tunnelling support system;</u> <u>(b) plans of any excavation and earth retaining structures;</u> <u>(c) plans of the foundation;</u> <u>(d) instrumentation and monitoring plans.</u></p> <p><u>(2) Without prejudice to regulations 6, 7 and 8, all underground building works plans shall —</u></p> <p style="padding-left: 40px;"><u>(a) be in accordance with the provisions of the Act and these Regulations and any other requirement of the Commissioner of Building Control;</u> <u>(b) be signed and endorsed by the qualified person who prepared the plans and calculations, and by the appropriate accredited checker;</u> <u>(c) bear a certificate by the qualified person who prepared the plans on the first and last sheets of the calculations stating that, to the best of his knowledge and belief, the design calculations have been prepared in accordance with these Regulations and that he is the person who prepared the design calculations;</u> <u>(d) state on the first page of the certificate of the qualified person referred to in subparagraph (c) the number of pages per book and a numbering of every page in the book;</u> <u>(e) be accompanied by an Information Sheet giving a summary of the key design and construction information including, where applicable, load conditions, codes of practice, assumptions, earth-retaining system, tunnel support system, foundation system, and other information relevant to the design and construction in question;</u> <u>(f) be accompanied by an impact</u></p>	<p>Currently, plans of underground building works are submitted under temporary earth retaining system (TERS) for record. This whole section has been added as temporary earth retaining structures will be treated like permanent structures which require plan approval. 4 types of plans related to underground building works to be submitted for approval are :</p> <ol style="list-style-type: none"> i. Tunnelling support system ii. Excavation and earth retaining structures iii. Foundation plans iv. Instrumentation and monitoring plans <p>Only plans of relevant works are to be submitted.</p>

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	<p><u>assessment report on neighbouring structures and a site investigation report; (g) be accompanied by a geotechnical report which shall contain —</u></p> <ul style="list-style-type: none"> <u>(i) a summary to highlight the key elements of the design and the issues addressed;</u> <u>(ii) evaluation and interpretation of existing information and investigation and monitoring results;</u> <u>(iii) assessment of geotechnical parameters and groundwater conditions;</u> <u>(iv) geotechnical assumptions, analysis, design and calculations;</u> <u>(v) geotechnical requirements relating to the design and construction of the underground building works including testing, validating, controlling, inspecting and monitoring;</u> <u>(vi) geotechnical reviews; and</u> <u>(vii) any other details as the Commissioner of Building Control may require; and</u> <u>(h) be accompanied by such other reports as the Commissioner of Building Control may require.</u> <p><u>(3) The plans of a tunnel support system for the design and construction of any tunnel with diameter, width or height of more than 2 metres shall contain, where applicable —</u></p> <ul style="list-style-type: none"> <u>(a) layout, sections and details of all excavation and tunnel support works showing —</u> <ul style="list-style-type: none"> <u>(i) subsurface information including plan showing layout of investigation boreholes and subsurface profile along each tunnel axis;</u> <u>(ii) maximum depth, and extent of excavation at each stage including heading, bench and invert;</u> <u>(iii) face pressure and other key performance indicators for ensuring stability of tunnel during construction;</u> <u>(iv) location of planned stoppages and necessary ground improvement and monitoring details; and</u> <u>(v) profile and the nature of the site and its surrounds including ground topography, neighbouring structures, subsurface</u> 	<p>Tunnelling support system for any tunnel with diameter, width or height of more than 2 metres</p>

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	<p><u>geological and geotechnical data, and groundwater conditions;</u></p> <p><u>(b) layout, sections, details and material specifications of tunnel support elements and structures, tunnel face support system and overall tunnel support system and other structural elements showing types, sizes and material specifications of members to be used and the connection details;</u></p> <p><u>(c) layout, sections and details of earth or ground strengthening, improvement or protection works including layout, sections and sizes of all elements, material specifications, details of inspections and tests to be carried out;</u></p> <p><u>(d) method and sequence of construction including duration and spatial limits of critical activities;</u></p> <p><u>(e) details of inspections and tests to be carried out;</u></p> <p><u>(f) details of any special precautions, groundwater control measures, control and protective measures required during excavation, installation and removal of any tunnel support element;</u></p> <p><u>(g) other specifications and relevant particulars; and</u></p> <p><u>(h) such other details as the Commissioner of Building Control may require.</u></p> <p><u>(4) The excavation and earth retaining system plans for any excavation or any building works for constructing, altering or repairing any earth retaining structure (including slope) in or for a caisson, cofferdam, trench, ditch, shaft or well for supporting earth which has a depth of more than 6 metres shall contain, where applicable —</u></p> <p><u>(a) layout, sections and details of all excavation and earth retaining works showing —</u></p> <p><u>(i) subsurface information including plan showing layout of investigation boreholes and surface profile along and across the excavation boundary;</u></p>	<p>Excavation and earth retaining system for supporting earth which has a depth of more than 6 metres</p>

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	<p><u>(ii) maximum depth, and extent of excavation at each stage; and</u> <u>(iii) profile and the nature of the site and its surrounds including ground topography, neighbouring structures, subsurface geological and geotechnical data, and groundwater conditions;</u></p> <p><u>(b) layout, sections, details and material specifications of earth retaining elements and structures, wall elevation showing the wall founding depth or penetration depth or minimum wall embedment requirement, and overall retaining system;</u> <u>(c) layout, sections and details of struts, anchors, soil nails, walers, king posts, bracings, corbels and other structural elements showing types, sizes and material specifications of members to be used, connection details, and where appropriate, inspections and tests to be carried out;</u> <u>(d) layout and sections of earth berms or slope showing type of soils, size and location of berms, internal and external drainage provisions and protection measures including against surface weathering;</u> <u>(e) layout, sections and details of earth or ground strengthening, improvement or protection works including layout, sections and sizes of all elements, material specifications, details of inspections and tests to be carried out;</u> <u>(f) layout, sections and details of permanent support system to the earth retaining system showing details of lateral bracing element, and connection details;</u> <u>(g) method and sequence of construction including duration and spatial limits of critical activities;</u> <u>(h) details of inspections and tests to be carried out;</u> <u>(i) details of any special precautions, groundwater control measures, control and protective measures required during excavation, and installation and removal of any earth retaining element;</u></p>	

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	<p><u>(j) other specifications and relevant particulars; and</u> <u>(k) such other details as the Commissioner of Building Control may require.</u></p> <p><u>(5) The foundation plans for the design and construction of foundation for buildings of 30 or more storeys shall contain, where applicable —</u> <u>(a) the layout, sections and details of all foundation works showing —</u> <u>(i) types of piles or foundation and specification of material to be used;</u> <u>(ii) location of piles or foundation and site investigation boreholes;</u> <u>(iii) pile or foundation founding depth or pile minimum embedment into competent stratum for each pile or foundation;</u> <u>(iv) unit shaft friction, pile base resistance or foundation bearing pressure;</u> <u>(v) allowable foundation capacity before and after accounting for negative skin friction where applicable, allowable tension, and lateral load;</u> <u>(vi) details of pile reinforcements, pile joints, connection with pilecap, pile shops;</u> <u>(vii) allowable total and differential foundation movement; and</u> <u>(viii) allowable vibration limit; and</u> <u>(b) the number, type of pile or foundation tests, structural integrity tests and location of preliminary test pile or ultimate load tests and site investigation for the tests.</u></p> <p><u>(6) The instrumentation and monitoring plans shall contain, where applicable —</u> <u>(a) layout and location of neighbouring structures in relation to the underground building works;</u> <u>(b) numbers, types, locations, details and other particulars of instruments for monitoring forces and movement of structural elements, building and ground movements, and variations in the groundwater or piezometric levels;</u> <u>(c) frequency and duration of monitoring;</u> <u>(d) allowable ground or building movement</u></p>	<p>Foundation for buildings of 30 or more storeys</p> <p>Instrumentation and monitoring plans</p>

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	<p><u>limits;</u> <u>(e) allowable vibration limits;</u> <u>(f) where applicable, long-term instrumentation, monitoring and maintenance requirements;</u> <u>(g) other specifications and relevant particulars; and</u> <u>(h) such other details as the Commissioner of Building Control may require.</u></p>	
5	<p>Permit to carry out structural works 21.—(1) An application for a permit to carry out any structural works (including <u>piling or site formation works</u> or the demolition of a building) under section <u>6 (1)</u> of the Act shall be in such form as the Commissioner of Building Control may require. (2) Where any part of a building under construction or undergoing alteration is to be demolished, no separate permit for the demolition works shall be required. <u>(3) For the purposes of section 6(2)(e) of the Act, an application for a permit to carry out any demolition of a building shall be accompanied by —</u> <u>(a) a method statement detailing how the demolition works are to be carried out; and</u> <u>(b) an impact assessment report on surrounding buildings.</u> <u>(4) For the purposes of section 6(2)(e) of the Act, an application for a permit to carry out any piling or site formation works shall be accompanied by —</u> <u>(a) an impact assessment report on surrounding buildings and other structures; and</u> <u>(b) a notification specifying the date of commencement of the piling or site formation works.</u></p>	<p>Currently, the requirements such as method statement and impact assessment report are stipulated in the conditions of Permit. To be consistent with current practice, these requirements are stated here.</p>
6	<p>Site records 22. For the purposes of <u>section 9(4)(d) of the Act, the supervising qualified person appointed in respect of</u> any building works shall keep and maintain at the premises on</p>	<p>Currently, site records such as site investigation report, tests on welding work etc. are required to be kept and maintained</p>

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	<p>which the building works are carried out the following documents, books and records:</p> <p><u>(a) for major building works, a schedule of the structural works to be carried out every 3 months, specifying, in particular, the excavation, installation, testing, removal, construction or fabrication of the key structural elements in the structural works;</u></p> <p>(b) a record of attendance of the qualified person and the site supervisor;</p> <p>(c) a site record book;</p> <p>(d) a copy of the approved structural plans including all amendments thereto;</p> <p>(e) a record of all the departures or deviations relating to the structural elements of the building works as provided by the qualified person appointed under section <u>8(1)(a) or 11(1)(d)(i)</u> of the Act;</p> <p>(f) a record of inspection and approval for concreting;</p> <p>(g) a record of repairs to defective structural works;</p> <p>(h) <u>a site investigation report;</u></p> <p>(i) a record of piles installed;</p> <p>(j) a record of pile load tests;</p> <p>(k) a record of tests on cement, sand and aggregates;</p> <p>(l) a record of concrete cube tests;</p> <p>(m) a record of tests on steel reinforcements;</p> <p>(n) a record of tests on pre-stressing steel;</p> <p>(o) a record of pre-stressing works;</p> <p><u>(p) a record of tests on welding works and all welders' certificates;</u></p> <p><u>(q) a record of ground anchor, soil nails or rock bolt tests and, where applicable, stressing loads;</u></p> <p><u>(r) a record of inspection and approval at each of the following stages of the building works: excavation, installation, construction and removal stage of the building works;</u></p> <p><u>(s) a record of inspection and approval for strut, soil nails, rock bolts, or anchor during installation and removal;</u></p> <p><u>(t) a record of instrumentation and monitoring reports;</u></p>	<p>at construction site. To tie in with current practice, the requirements are spelt out clearly here.</p>

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	<p><u>(u) a record of actions taken where monitoring results of earth-retaining wall deflection or adjacent ground settlements exceed the allowable limits or where damages occur in the neighbouring properties;</u></p> <p><u>(v) a record and test results of earth or ground improvement or strengthening works;</u></p> <p><u>(w) a record of tests on fixings of external claddings and safety barriers against falling from a height;</u></p> <p><u>(x) the mill certificates and test results for structural steel sections; and</u></p> <p><u>(y) a record of all other tests of or in connection with the building works.</u></p>	

BCA'S REPLY TO SCAL'S FEEDBACK ON AMENDMENTS TO BUILDING CONTROL (ACCREDITED CHECKERS AND ACCREDITED CHECKING ORGANISATIONS) REGULATIONS

S/N	REGULATIONS	BCA'S REPLY
1	<p><u>Duties of specialist accredited checkers</u></p> <p><u>7A (1) It shall be the duty of a specialist accredited checker appointed in respect of building works which comprise wholly or partly of any underground building works to —</u></p> <p><u>(a) evaluate, analyse and review the geotechnical aspects of the underground building works and perform such original calculations with a view to determining the adequacy of the geotechnical aspects of those underground building works to be erected or carried out in accordance with the plans of those building works; and</u></p> <p><u>(b) verify that the geotechnical aspects of the underground building works are consistent with the plans of those underground building works and any amendment thereto.</u></p> <p><u>(1A) Without prejudice to paragraph (1), a specialist accredited checker shall in relation to any plans of underground building works carry out the tasks set out in the Third Schedule.</u></p> <p><u>(2) It shall be the duty of the specialist accredited checker appointed under section 8(1) of the Act in respect of building works which comprise wholly or partly of any underground building works to notify the Commissioner of Building Control of any contravention or non-compliance with the provisions of the Act in connection with any of the geotechnical aspects of underground building works.</u></p> <p><u>(3) Nothing in this regulation shall impose any such duty referred to in paragraph(2).</u></p>	<p>New. This is to stipulate the responsibilities of AC (Geo).</p>

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	<p><u>on a specialist accredited checker in respect of any such contravention or noncompliance which he did not know and could not reasonably have discovered.</u></p>	
2	<p style="text-align: center;"><u>THIRD SCHEDULE</u></p> <p><u>Regulations 7A(1A) and 10(2)</u></p> <p style="text-align: center;"><u>TASKS THAT MUST BE CARRIED OUT BY SPECIALIST ACCREDITED CHECKERS</u></p> <p>The specialist accredited checker in relation to the geotechnical aspects of any underground building works shall —</p> <p>(a) in respect of any excavation or other building works to construct a tunnel with a diameter, width or height of more than 2 metres —</p> <p>(i) review the adequacy of the site investigation, namely type, extent (which shall include quantity, location and depth) and laboratory tests results relating to the design and construction of the tunnel;</p> <p>(ii) review the site investigation results and the geotechnical parameters for the design, taking into consideration onerous water conditions, seepage pressures, surcharge, earth, water, construction and accidental loadings;</p> <p>(iii) review the method or model adopted for the analysis and design including the consideration of drained, undrained and consolidation analyses, and appropriate drainage conditions;</p> <p>(iv) review the suitability of tunnelling methods, sequence of construction and tunnel support systems (including face pressures and ground support systems) to be applied;</p> <p>(v) review allowable limits of ground deformation and changes in groundwater and piezometric levels, and measures to control groundwater where required;</p> <p>(vi) review the stability of excavation and ground stabilisation or improvement works as appropriate;</p>	<p>New. This is to stipulate the tasks to be undertaken by AC(Geo) on these 3 types of underground building works :</p> <ul style="list-style-type: none"> i. Tunnel with diameter, width or height of more than 2 metres ii. Earth retaining structure (including earth slopes) with a depth of more than 6 metres iii. Foundation works for buildings of 30 or more storeys

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	<p>(vii) review soil or rock reinforcement, where applicable, including the consideration of the structural and geotechnical capacity;</p> <p>(viii) review the adequacy of instrumentation and monitoring of geotechnical engineering parameters (such as tunnel face pressures, pore pressures, water table level, ground deformation and stresses), including the consideration of location, type and number of instruments, and frequency of monitoring and reporting; and</p> <p>(ix) review the instrumentation and monitoring results, and performance, and ground conditions at the site to ensure that there is no inadequacy in the geotechnical aspects during construction if carried out in accordance with the plans of the underground building works;</p> <p>(b) in respect of any excavation or any building works for constructing, altering or repairing any earth retaining structure (including earth slopes) in or for a caisson, cofferdam, trench, ditch, shaft or well with a depth of more than 6 metres —</p> <p>(i) review the adequacy of the site investigation, namely type, extent (which shall include quantity, layout and depth) and laboratory tests results relating to the design and construction of the earth retaining structure (including earth slopes);</p> <p>(ii) review the site investigation results and the geotechnical parameters for the design of the earth retaining structure, including consideration of onerous water conditions, seepage pressures, surcharge, earth, water, construction and accidental loadings;</p> <p>(iii) review the method or model adopted for the analysis and design, including the consideration of drained, undrained and consolidation analyses, and appropriate drainage conditions;</p> <p>(iv) review the suitability of earth retaining structure types and scheme, and the method and sequence of construction to be</p>	

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	<p>applied;</p> <p>(v) review the stability of the excavation work, taking into consideration groundwater, drainage and seepage conditions, basal heave, hydraulic uplift and piping, and any ground stabilisation or improvement works as appropriate;</p> <p>(vi) review allowable limits of ground deformation and changes in groundwater and piezometric levels, and measures to control groundwater where required;</p> <p>(vii) review the design of tie-backs, soil or rock reinforcement, where applicable, including the consideration of the structural and geotechnical capacity;</p> <p>(viii) review the instrumentation and monitoring of geotechnical engineering parameters (such as pore pressures, water table levels, ground deformation and stresses), including the consideration of location, type and number of instruments, and frequency of monitoring and reporting;</p> <p>(ix) review the instrumentation and monitoring results and performance of the earth retaining structure (including any earth slope), and ground conditions at the site to ensure that there is no inadequacy in the geotechnical aspects during construction if carried out in accordance with the plans of the underground building works; and</p> <p>(x) review the adequacy of the founding or penetration depth of any embedded earth-retaining wall;</p> <p>(c) in respect of such type of foundation works for buildings of 30 or more storeys —</p> <p>(i) where caissons, rafts or piled-raft foundation are adopted —</p> <p>(A) review the adequacy of the site investigation, namely type, extent (which shall include quantity, layout and depth) and laboratory tests results relating to the design and construction of the caisson, raft or piled-raft foundation;</p>	

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	<p>(B) review the site investigation results and the geotechnical parameters (such as soil strength and deformation characteristics, pile shaft friction, downdrag, pile base resistance or bearing pressures and pile lateral geotechnical capacity) for the design of the foundation, taking into consideration the onerous water conditions, seepage pressures, and loads from surcharge, earth, water and construction;</p> <p>(C) review the method or model adopted for the analysis and design, including the consideration of drained, undrained and consolidation analyses, and appropriate drainage conditions;</p> <p>(D) review the adequacy of the foundation type and the method of construction to be applied;</p> <p>(E) where applicable, review the negative shaft friction;</p> <p>(F) review the stability of excavation for the caisson or raft during construction, taking into consideration groundwater, drainage and seepage conditions, basal heave, hydraulic uplift and piping, and any ground stabilisation or improvement works as appropriate;</p> <p>(G) review the forces and deformation of the raft or pile-raft foundation and stability of the foundation, including the consideration of short-term and longterm conditions;</p> <p>(H) review the results of load tests to ensure that pile shaft friction, base resistance, pile movement and other appropriate geotechnical parameters are consistent with the design;</p> <p>(I) review allowable limits for foundation movement;</p> <p>(J) review the adequacy of the founding or penetration depth to ensure that the geotechnical aspects are within the design; and</p> <p>(K) review the ground conditions at site and test results for the design and construction of the caisson, raft or piled-raft foundation to ensure that there is no inadequacy in the geotechnical aspects if</p>	

S/N	REGULATIONS	BCA'S REPLY
	<p>carried out in accordance with the plans of the underground building works;</p> <p>(ii) where jacked-in piles or driven piles or bored cast in-place piles or barrettes are adopted —</p> <p>(A) review the adequacy of the site investigation including the extent (which shall include the quantity, layout and depth) and laboratory tests results relating to the design and construction of the piled foundation;</p> <p>(B) review the site investigation results and the geotechnical parameters, such as soil strength and deformation characteristics, negative skin friction or downdrag, pile shaft friction, founding depth, pile base resistance, pile group effects, settlement, bearing capacity, and where applicable, lateral geotechnical capacity;</p> <p>(C) review the load tests results to ensure that the pile shaft friction, founding depth, base resistance, pile movement, and other appropriate geotechnical parameters are within the design;</p> <p>(D) review the adequacy of founding or penetration depth of piles; and</p> <p>(E) review the ground conditions at site and test results for the design and construction of the piled foundation with a view to determining whether there is any inadequacy in the geotechnical aspects if carried out in accordance with the plans of the underground building works.</p>	