Building and Construction Authority

We shape a **safe**, **high quality**, **sustainable** and **friendly** built environment.

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See **Distribution**

Dear Sir/Madam

AMENDMENTS TO THE BUILDING CONTROL REGULATIONS RELATED TO UNDERGROUND BUILDING WORKS

The Building Control Regulations will be amended to implement those changes in the Building Control (Amendment) Act 2007 relating to underground building works which is expected to come into effect under the 2nd stage implementation on 1 Oct 2008. The key changes are listed in Annex A. The Building and Construction Authority invites you to comment on these key changes.

2 Please return your response as soon as possible and in any event not later than Thu, 21 Feb 2008, either:

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3 I would appreciate it if you could bring the contents of this circular to your members' attention. Thank you.

Yours faithfully,

ONG SEE HO
COMMISSIONER OF BUILDING CONTROL

ANNEX A

KEY CHANGES IN THE PROPOSED BUILDING CONTROL (AMENDMENT) REGULATIONS 2008 – RELATED TO UNDERGROUND BUILDING WORKS

Regulation (changes are shown in red+underlined)		Comments
2	**Definitions** "geotechnical report" means calculations, plans or report prepared in respect of underground building works by a qualified person who is a geotechnical engineer showing – (i) the results of the findings, evaluation and interpretation of the site investigation and laboratory tests; (ii) assessment of and recommendations on the geotechnical aspects for the design and construction of the underground building works; and (iii) plans showing those elements of building works designed by the person who is a geotechnical engineer.	Provide a definition for the term "geotechnical report"
4	**Application for approval of plans of building works** (1) For the purposes of section 5(1) of the Act, an application for approval of the plans of building works shall be accompanied by the following documents: (a) the following plans of the building works prepared in accordance with these Regulations and such other requirements as the Commissioner of Building Control may specify from time to time: (i) building plans; (ii) detailed structural plans and design calculations; (iii) where applicable, underground building works plans; (iv) site formation plans and pile layout plans; and (v) where applicable, civil defence shelter plans;	Consequential amendments
10A	**Particulars to be shown on underground building works plans** (1) The underground building works plans referred to in regulation 4(1)(a) shall consist of or contain the following, where applicable: (a) plans of tunnelling support system; (b) plans of excavation and earth retaining structures;	New regulation that lists the requirements on the documents that are applicable and to be submitted for underground building

Regulation (changes are shown in red+underlined)	Comments
(c) plans of foundation, and (d) instrumentation and monitoring plans. (2) Without prejudice to regulations 6, 7 and 8, all underground building works plans shall – (a) be in accordance with the provisions of the Act and these Regulations and any other requirement of the Commissioner of Building Control; (b) be signed and endorsed by the qualified person who prepared the plans and calculations, and by the appropriate accredited checker; (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; (d) state on the first page of the certificate of the qualified person referred to in sub-paragraph (c) the number of pages per book and a numbering of every page in the book; (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; and (f) be accompanied by impact assessment report on neighbouring structures and site investigation report; (g) be accompanied by a geotechnical report which shall contain (i) a summary to highlight the key elements of the design, and the issues addressed; (ii) evaluation and interpretation of existing information and investigation and monitoring results; (iii) assessment of geotechnical parameters and groundwater conditions; (iv) geotechnical assumptions, analysis,	works.

Regulation (changes are shown in red+underlined)	Comments
design and calculations; (v) geotechnical requirements relating to the design and construction of the underground building works including testing, validating, controlling, inspecting and monitoring; (vi) geotechnical reviews; (vii) any other details as the Commissioner of Building Control may require; and (h) be accompanied by such other reports as the Commissioner of Building Control may require. (3) The plans of tunnel support system for the design and construction of tunnel with diameter, width or height of more than 2 metres, shall contain where applicable – (a) layout, sections and details of all excavation and tunnel support works showing – (i) subsurface information including plan showing layout of investigation boreholes and subsurface profile along each tunnel axis; (ii) maximum depth, and extent of excavation at each stage including heading, bench and invert; (iii) face pressure and other key performance indicators for ensuring stability of tunnel during construction; (iv) location of planned stoppages and necessary ground improvement and monitoring details; (v) profile and the nature of the site and its surrounds including ground topography, neighbouring structures, subsurface geological and geotechnical data, and groundwater conditions; (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; (c) layout, sections and details of earth or ground strengthening, improvement or protection works including layout, sections	

Regulation (changes are shown in red+underlined)	Comments
and sizes of all elements, material specifications, details of inspections and tests to be carried out; (d) method and sequence of construction including duration and spatial limits of critical activities; (e) details of inspections and tests to be carried out; (f) details of any special precautions, groundwater control measures, control and protective measures required during excavation, installation and removal of any tunnel support element; (g) other specifications and relevant particulars; and (h) such other details as the Commissioner of Building Control may require. (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 – (a) layout, sections and details of all excavation and earth retaining works showing – (i) subsurface information including plan showing layout of investigation boreholes and surface profile along and across the excavation boundary; (ii) maximum depth, and extent of excavation at each stage; and (iii) profile and the nature of the site and its surrounds including ground topography, neighbouring structures, subsurface geological and geotechnical data, and groundwater conditions. (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; (c) layout, sections and details of struts, anchors, soil nails, walers, king posts, bracings, corbels and other structural	

Regulation (changes are shown in red+underlined)	Comments
elements showing types, sizes and material specifications of members to be used, connection details, and where appropriate, inspections and tests to be carried out; (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; (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; (f) layout, sections and details of permanent support system to the earth retaining system showing details of lateral bracing element, and connection details; (g) method and sequence of construction including duration and spatial limits of critical activities; (h) details of inspections and tests to be carried out; (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; (j) other specifications and relevant particulars; and (k) such other details as the Commissioner of Building Control may require. (5) The foundation plans for the design and construction of foundation for buildings of 30 or more storeys shall contain, where applicable – (a) the layout, sections and details of all foundation works showing – (i) types of piles or foundation and specification of material to be used; (ii) location of piles or foundation and site investigation boreholes; (iii) pile or foundation founding depth or pile minimum embedment into competent stratum for each pile or foundation;	

Regulation (changes are shown in red+underlined)	Comments
(iv) unit shaft friction, pile base resistance or foundation bearing pressure; (v) allowable foundation capacity before and after accounting for negative skin friction where applicable, allowable tension, and lateral load; (vi) details of pile reinforcements, pile joints, connection with pilecap, pile shops; (vii) allowable total and differential foundation movement; (viii) allowable vibration limit; (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; (6) The instrumentation and monitoring plans shall contain where applicable: (a) layout and location of neighbouring structures in relation to the underground building works; (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; (c) frequency and duration of monitoring; (d) allowable ground or building movement limits; (e) allowable vibration limits; (f) where applicable, long-term instrumentation, monitoring and maintenance requirements; (g) other specifications and relevant particulars; and (h) such other details as the Commissioner of Building Control may require.	
Duties of QP 24A (1) Every qualified person appointed to prepare the plans of geotechnical aspects of underground building works under section 8 or 11 shall carry out the tasks set out in the Seventh Schedule. (2) Every qualified person appointed to supervise the geotechnical aspects of underground building	Provision to make clear the duties of QP appointed to undertake geotechnical aspects of underground building works

Regulation (changes are shown in red+underlined)		Comments
	works under section 8 or11 shall carry out the tasks set out in the Eighth Schedule.	
27A	**Underground Building Works** For the purposes of sub-paragraph (c) in the definition of 'underground building works' under Section 2(1) of the Act, the foundation works for buildings of 30 or more storeys that are prescribed as underground building works shall be all types of foundation works.	While all types of foundations of buildings of 30 or more storeys comes under definition of underground building works, the extent of involvement of PE(Geo) for each type of foundation is spelt out in the Seventh Schedule.
50	**Penalty** (1) Any qualified person, builder, site supervisor or developer of building works as the case may be, who contravenes regulation 24A, 25, 26, 29 (1) or (2), 30 (1), (2), (3), (4), (5) or (6), 31 (1), (2) or (3), 32, 33, 34, 34A, 35 (1) or (2), 36 (1) or (2), 37, 38 (3), 40 (1) or (2), 44, 45 (1) or 46 shall be guilty of an offence and shall be liable on conviction to a fine not exceeding $10,000 or to imprisonment for a term not exceeding 12 months or to both.	Consequential amendments to include application of current penalty to new provisions on underground building works
	SEVENTH SCHEDULE Regulation 24A **DUTIES OF QUALIFIED PERSON APPOINTED TO PREPARE THE PLANS OF GEOTECHNICAL ASPECTS OF UNDERGROUND BUILDING WORKS**	Prescribed duties of design QP for geotechnical aspects of underground building works.
1)	In the **preparation** of plans relating to the geotechnical aspects of any excavation or other building works to construct a **tunnel** with a diameter, width or height of more than 2 metres, the appointed qualified person shall — (a) determine the site investigation, namely type, extent (which shall include quantity, layout and depth), method of sampling, coring and laboratory tests results for the design and construction of the tunnel; (b) analyse the site investigation results and determine the geotechnical parameters for the design, taking into consideration onerous water conditions, seepage pressures, and surcharge,	

Regulation (changes are shown in red+underlined)		Comments
	earth, water, construction and accidental loadings; (c) determine and adopt appropriate method or model for the analysis and design including the consideration of drained, undrained and consolidation analyses, and appropriate drainage conditions; (d) determine suitability of tunnelling method, sequence of construction, and tunnel support system including face pressures and ground support system; (e) determine allowable limits of ground deformation and changes in groundwater and piezometric levels, and measures to control groundwater where required; (f) analyse the stability of excavation and determine the ground stabilization or improvement works as appropriate; (g) design soil or rock reinforcement, where applicable, including the consideration of the structural and geotechnical capacity; (h) determine the 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 (i) assess monitoring results and site conditions to ensure that the geotechnical aspects during construction are within design assumptions and parameters at every critical stage of construction, and review or modify the design so as to ensure its adequacy as appropriate.	
2)	In the preparation of plans relating to the geotechnical aspects of 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, the appointed qualified person shall — (a) determine the site investigation, namely type, extent (which shall include quantity, layout and depth), method of sampling, coring and laboratory tests results for the design and construction of the earth retaining structure	

Regulation (changes are shown in red+underlined)	Comments
including earth slope; (b) analyse the site investigation results and determine the geotechnical parameters for the design of the earth retaining structure including consideration of onerous water conditions, seepage pressures, and surcharge, earth, water, construction and accidental loadings; (c) determine and adopt appropriate method or model for the analysis and design including the consideration of drained, undrained and consolidation analyses, and appropriate drainage conditions; (d) determine suitability of earth retaining structure types and scheme, and the method and sequence of construction; (e) analyse the stability of the excavation work, taking into consideration groundwater, drainage and seepage conditions, basal heave, hydraulic uplift and piping, and determine the ground stabilization or improvement works as appropriate; (f) determine allowable limits of ground deformation and changes in groundwater and piezometric levels, and measures to control groundwater where required; (g) design tie-backs, soil or rock reinforcement, where applicable, including the consideration of the structural and geotechnical capacity; (h) ensure that drawings of the earth retaining structure, including earth slopes, are consistent with the calculations relating to the geotechnical aspects; (i) determine 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; (j) assess monitoring results and site conditions to ensure that the geotechnical aspects during construction are within design assumptions and parameters at every critical stage of construction, and review or modify the design so as to ensure its adequacy as appropriate.	

Regulation (changes are shown in red+underlined)	Comments
3) In the preparation of plans relating to the geotechnical aspects of such type of foundation works for **buildings of 30 or more storeys**, the appointed qualified person shall — (A) where **caisson, raft or piled-raft** foundation is adopted: (a) determine the site investigation, namely type, extent (which shall include quantity, layout and depth), method of sampling, coring and laboratory tests results for the design and construction of the caisson, raft or piled-raft foundation; (b) analyse the site investigation results and determine 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; (c) determine and adopt appropriate method or model for the analysis and design including the consideration of drained, undrained and consolidation analyses, and appropriate drainage conditions; (d) determine suitability of the foundation type and the method of construction; (e) where applicable, determine and analyse the negative shaft friction; (f) ensure that the drawings of the foundation are consistent with the calculations relating to the geotechnical aspects; (g) analyse 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 determine the ground stabilization or improvement works as appropriate; (h) analyse the forces and deformation of the raft or pile-raft foundation and stability of the foundation including the consideration of short-term and long-term conditions; (i) determine the number, location and types of load tests, analyse the results of load tests	

Regulation (changes are shown in red+underlined)	Comments
to ensure that pile shaft friction, base resistance, pile movement and other appropriate geotechnical parameters are consistent with the design, and as appropriate, review or modify the design so as to ensure its adequacy; (j) determine the allowable limits for foundation movement; and (k) determine founding depths on site to ensure that the geotechnical aspects are within the design. (B) where **jacked-in pile or driven pile or bored cast in-place pile or barrette** is adopted – (a) determine the site investigation including the extent (which shall include the quantity, layout and depth), method of sampling, coring and laboratory tests results for the design and construction of the piled foundation; (b) analyse the site investigation results and determine 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; (c) determine the load tests and analyse results of load tests to ensure that the pile shaft friction, founding depth, base resistance, pile movement, and other appropriate geotechnical parameters are within the design, and as appropriate, review or modify the design so as to ensure its adequacy.	
EIGHT SCHEDULE Regulation 24A **DUTIES OF QUALIFIED PERSON APPOINTED TO SUPERVISE THE GEOTECHNICAL ASPECTS OF UNDERGROUND BUILDING WORKS** In the supervision of geotechnical aspects of any excavation or other building works to make a **tunnel**	Prescribed duties of supervision QP for geotechnical aspects of underground building works.

Regulation (changes are shown in red+underlined)	Comments
with a diameter, width or height of more than 2 metres, the appointed qualified person shall – (a) supervise the implementation of instrumentation and monitoring of geotechnical parameters in accordance with the instrumentation and monitoring plan; (b) assess the ground conditions at the site and construction of the tunnel in relation to its impact on the geotechnical aspect of the design and review the performance and results of instrumentation and monitoring of the tunnelling works such that the geotechnical aspects are within the design at every critical stage;	
2) In the supervision of geotechnical aspects of any excavation or any building works for constructing, altering or repairing any **earth retaining structure** including slope, in or for a caisson, trench, ditch, shaft or well with a depth or height of more than 6 metres, the appointed qualified person shall – (a) supervise the implementation of instrumentation and monitoring of geotechnical engineering parameters in accordance with the instrumentation and monitoring plan; (b) determine adequacy of the founding or penetration depth of embedded earth-retaining wall on site; and (c) assess the ground conditions at the site and construction of the earth retaining structure (including earth slope) in relation to its impact on the geotechnical aspect of the design and review the performance and results of instrumentation and monitoring of the earth retaining structure including earth slope such that the geotechnical aspects are within the design at every critical stage.	
3) In the supervision of geotechnical aspects of such type of foundation works for buildings of 30 or more storeys, the appointed qualified person shall – (A) where **caisson, raft or piled-raft foundation** is adopted: (a) determine the founding or penetration depth of the caisson, raft and or piles on site; (b) assess the ground conditions at the site and construction of the caisson, raft or piled-raft foundation in relation to its impact on the geotechnical aspect of the design, analyse	

Regulation (changes are shown in red+underlined)	Comments
the results of load tests, and review the performance and results of instrumentation and monitoring of the caisson, raft or piled-raft foundation to verify that the geotechnical aspects are within the design at every critical stage; (B) where **jacked-in piles or driven piles or bored cast in-place piles or barrettes** are adopted: (a) determine the founding or penetration depth of the piles on site; (b) assess the ground conditions at the site, analyse the results of load tests, and review the performance and results of instrumentation and monitoring of the piles to verify that the geotechnical aspects are within the design at every critical stage.	

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