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來函檔號 Your reference : CB4/PAC/R70
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8 August 2018

Mr. Anthony CHU
Clerk to Public Accounts Committee
Legislative Council Secretariat
Legislative Council Complex
1 Legislative Council Road
Central, Hong Kong

Dear Mr. CHU,

Public Accounts Committee

Consideration of Chapter 8 of the Director of Audit's Report No. 70

Sha Tin Section of Route 8

With reference to your letter ref. CB4/PAC/R70 dated 24 July 2018 sent to the Development Bureau, requesting the Administration to provide response and/or information on matters set out in Part (III) to the Appendix of your letter, we provide below our responses :

Contract B

(a) according to paragraph 3.23 of the Audit report, Contractor B contended that it was beyond his reasonable contemplation at the time of tender that additional ground investigation and stabilization works to another two slopes located in the vicinity affected by the blasting works of EN Tunnel had to be carried out before obtaining a blasting permit.

At the public hearing, Project Manager/Major Works Project Management Office, HyD said that additional ground investigation and stabilization works had to be carried out as squatter huts erected on the above two slopes might be affected by the blasting works. Please advise:

(i) are there any guidelines for the Administration to follow on assessing the impact of public works projects on the nearby residents in the vicinity of works sites, in particular the structure of their houses. If yes, a copy of these guidelines. If no, how would the Administration handle these cases;

Response :

The Administration has put in place relevant guidelines for project offices to follow on assessing the impact of public works projects on the nearby residents in the vicinity of works sites. As a general guide, the Project Administration Handbook for Civil Engineering Works (PAH) specifies in its Chapter 4 Section 1.3 that project offices should give due consideration of construction methods and imposed constraints, as well as prevention of accidental damage requiring repair beyond the scope of routine maintenance. Section 4.1.2 of Geoguide 2 also advises that because of the dense urban development in Hong Kong, construction activities can often affect adjacent property. It is therefore essential that investigations should cover all factors that may affect adjacent property, including features such as slopes and retaining walls. Where possible, records of ground levels, groundwater levels and relevant particulars of adjacent properties should be made before, during and after construction. Where damage to existing structures is a possibility, adequate photographic records should be obtained. Adjacent buildings, structures and buried services, including pipes conveying water, gas or sewage, should be specifically considered, as they may be affected by vibrations, ground settlement or movement, or changes in groundwater levels during and after construction activities on the site. Hospitals and other buildings containing sensitive instruments or apparatus should be given special consideration.

There are also specific guidelines established for projects of special nature. For example, for projects involving rock blasting, Chapter 4 Sections 3.5 and 4.6.13 of the PAH stipulate that project office should conduct and submit a Blasting Assessment (BA) as part of the geotechnical submissions to the Geotechnical Engineering Office (GEO) of the Civil Engineering Development Department (CEDD) for comment and agreement. The BA submission should contain, among other information, a report containing an assessment of the effects of blasting works, and proposals of preventive measures, to demonstrate that the proposed blasting would not cause any injury to persons or damage to property and sensitive receivers, including streets, structures, foundations, railways, public utilities, watermains, drains, sewers, gas mains and other services, geotechnical features such as slopes, retaining walls, boulders, tunnels, caverns, etc. that may be damaged or destabilized by the proposed blasting works. The necessary content of a Blasting Assessment is given in its Appendix 4.7. At the construction stage, the contractor should obtain a Blasting Permit from the Commissioner of Mines prior to commencement of the blasting works. The contractors should demonstrate that all necessary measures have been in place to prevent the blasting works from causing damage or adverse effects to adjacent facilities and structures, significant disruption to traffic or undue nuisance to the public, or any risk of injury to the public and the people working on site. The Blasting Permit will not be issued until the Blasting Assessment and Method Statement have been found satisfactory and the site is ready for blasting with all the site preparatory works completed to the required standards as per Chapter 7 Section 21.6 of the PAH. Copies of relevant part of the guidelines are enclosed in **Appendix A**.

(ii) measures taken/to be taken to enhance the accuracy of site condition information to be obtained from preliminary site investigations for major public works projects in the future. Whether extensive horizontal directional coring will be used for all tunneling works in future to obtain more accurate information;

Response :

The Administration has published the Geoguide 2 – "Guide to Site Investigation" (the Guide) giving guidance on good site investigation practice for project offices to plan and carry out investigation of the sites, with the purposes of assessing their suitability for civil engineering and building works, and acquiring knowledge of site characteristics that affect the design and construction of such works and the security of adjacent properties. The Administration also conducts regular review and update to the Guide (last updated in December 2017) to incorporate the latest technical guidelines and the best practices relating to site investigation, thereby enhancing the accuracy of site condition information obtained from site investigation for public works projects.

For projects that involve tunneling works in particular, Sections 4.6 and 10.9 of the Guide provide guidelines for the relevant site investigation works. The Administration also encourages the use of long horizontal boreholes parallel to the proposed tunnel alignment to obtain more comprehensive ground information and relevant guidelines are available in GEO Technical Guidance Note No. 24 – "Site Investigation for Tunnel Works". Copies of relevant part of the guidelines are enclosed in **Appendix B**.

(b) having regard to the administration issues of Contract B, please advise measures taken/to be taken to strengthen the checking of accuracy of tender documents, contract clauses, drawings and BQs prepared by consultants for major public works contracts in future;

Response :

Civil engineering construction contract is a very complex legal document containing several inter-related documents each of which plays an important role in defining the obligations and responsibilities of the parties concerned or in providing information on the works to be constructed. In recognition of its importance, the Administration highlights in the synopsis of Chapter 5 of PAH reminding project offices

that it is essential to prepare the contract documents for each contract with great care and by an experienced professional who has thorough knowledge of the works to be constructed. It is also necessary to scrutinize the contract documents for comprehensive coverage, accuracy and consistency with one another before tenders are invited. Sections 1.3 to 1.5 of the Chapter require project offices to exercise care in avoiding any ambiguities or discrepancies in the documents which form a contract, seek advice from contract advisers on tender documents when genuine doubts emerge and submit tender documents for contracts estimated to exceed $300M in value to the Legal Advisory Division (Works) of DEVB for legal vetting prior to calling for tenders. In particular, Section 7.2 of Chapter 5 gives guidance on preparation of Bill of Quantities (BQs). The Administration has also updated this Section to specify the need of minimizing omitted items as far as practicable and the BQs should undergo a checking process to ensure the completeness and accuracy of the BQ and elimination of major errors. To enhance the accuracy of the BQs prepared by the consultants, the Administration highlights in Chapter 6 Section 3.12 of the PAH and Development Bureau Technical Circular (Works) No. 7/2017 requesting the project offices and the consultants to conduct a pre-tender cross-checking procedure in the preparation of BQs and use Building Information Modeling technology in project design stages, which can enhance the preparation and/or checking of the BQs. Also, the Administration keeps reminding project offices to duly reflect the consultants' performance in their performance reports in accordance with Appendix A and B of Development Bureau Technical Circular (Works) No. 3/2016 if deficiencies in the quality of tender documents prepared by them are identified. Copies of relevant part of the guidelines are enclosed in **Appendix C**.

Contract C

(c) *with reference to paragraphs 3.40 and 3.41 of the Audit Report, details of measures to be implemented to ensure the consistency of time programmes for interface works in all major public works contracts in future.*

Response :

To ensure the consistency of time programmes for interface works in public works contracts involving multi-contract arrangements, Section 9.1 in Chapter 5 of PAH requires that for projects (i) involving sequential handling-over of the project site among contractors of concurrent contracts and/or (ii) in which the work progress of one contractor is dependent on that of another contractor in the same project, the project offices should carefully assess the compatibility of the multi-contract arrangement with the preferred contract forms of the project. Besides, time allowance for programme of interfacing works varies depending on the scale and complexity of the interfacing works to be encountered by the project concerned. For a consistent approach in assessing the allowance for critical site activities, including interfacing works with other parties, the Administration has enhanced the Chapter 5 of PAH in 2018 to introduce a checklist under its Appendix 5.57 requesting project offices to complete the checklist with relevant directorate officer's endorsement prior to tender invitation. Copies of relevant part of the guidelines are enclosed in **Appendix D**.

Yours sincerely,

(Victor FY CHAN)
for Secretary for Development

Encl.

c.c. Secretary for Transport and Housing (fax no. 2537 6519)
Secretary for Financial Services and the Treasury (fax no. 2147 5239)
Director of Highways (fax no. 2714 5203)
Director of Civil Engineering and Development (fax no. 2246 8708)
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Director of Architectural Services (fax no. 2810 7341)
Director of Electrical and Mechanical Services (fax no. 2882 9042)
Director of Audit (fax no. 2583 9063)

CHAPTER 4

PROJECT DESIGN AND ESTIMATES

The parts of the PAH shown in blue and bold should only be updated by Works Branch of Development Bureau.

Rev	Issue Date	Amendment Incorporated
First Issue	December 2016	NA
1	25 August 2017	Amd No. 3/2017
2	24 October 2017	Amd No. 4/2017

1. GENERAL CONSIDERATIONS FOR DESIGN

1.1 AUTHORITY

Preliminary and detailed design of capital works projects should commence in accordance with the project status indicated in ETWB TCW No. 4/2006.

1.2 RESOURCES

The design should be undertaken either:

(a) By in-house staff, or

(b) By consultants, or staff of other departments/offices/divisions in cases where capacity to undertake the design does not exist in-house, or where there is a lack of in-house expertise, or

(c) By quasi-government organisations or private parties in cases where the design and construction of the Works are entrusted to them.

Reference should be made to Chapter 1 (Project Planning) and the Handbook on the Selection, Appointment and Administration of Engineering and Associated Consultants (EACSB Handbook) on the resources planning and the procedures for the employment of consultants for design of projects. Reference should also be made to Chapter 8 (Term Contract Works) regarding situations mentioned in sub-paragraph (c).

1.3 DESIGN OBJECTIVES

The basic aim of the design process is to produce a design that is:

(a) Capable of performing the intended functions throughout the design life,

(b) Environmentally acceptable, both during construction and in the long term,

(c) Within the scope approved by FC,

(d) Economical in terms of both capital and recurrent costs, and

(e) Free of potential hazards and risks to the clients, frontline workers, users and maintenance parties as far as possible.

In connection with (d) above, the project engineer should exercise the best control of the project cost and the following aspects should be considered critically (DEVB's memo ref. () in DEVB(W) 505/83/04 dated 3.8.2015):

(i) Fit-for-purpose designs are designs with appropriate optimality criterion and robustness. Such designs should be adopted and over-redundancies, such as temporary provisions and standby equipment which are not fully justified,

should be cut down. In addition, the adoption of standard or precast designs for cost saving and/or better work efficiency purposes should be explored,

(ii) Consideration on optimum contract packaging should be made from a cost saving perspective. There is no hard-and-fast rule on the sizing of contracts, but there is strong tendency that works contracts exceeding $1 billion may exceed the capability of many Group C contractors. Splitting into contracts below this value will help upkeep tender competition,

(iii) Where substantial electrical and mechanical (E&M) works are involved in the main building/civil engineering works contracts, consideration should be more favourably made to the direct letting of E&M works contracts or the use of nominated E&M sub-contracts as the lumping of substantial E&M works into the main building/civil engineering works contracts might lead to a higher management overhead and project risk at the E&M sub-contractors' front and hence a higher tender price, and

(iv) Discretion should be made to look into the merits of the standardised requirements (including those in prevailing circulars, planning manuals or handbooks) which have been developed in the past for their respective justifications and may lead to additional cost in the project, and to review whether the additional cost arising from such requirements is justified. In case substantial cost can be saved without seriously affecting the original intent of the policy associated with such requirements, exemption from relevant authority (such as the Works Branch of DEVB) in complying with these requirements should be sought.

The project engineer should give due consideration to the following:

(a) Safety, both during construction and in service,

(b) Appearance, and compatibility with other adjacent private and public projects,

(c) Construction methods and imposed constraints,

(d) Possible future expansion and development,

(e) The effect on utilities,

(f) Future inspection, maintenance and operation,

(g) Prevention of accidental damage requiring repair beyond the scope of routine maintenance, e.g. serious damages to bridges by vehicles/ships with illegally high loads/masts,

(h) Adoption of energy efficient features and renewable energy technologies in government projects and installations,

(i) Adoption of a strategic and holistic approach to greening and landscape and urban design in order to blend in with the adjacent developments and projects, and

(j) Adoption of a flexible and balanced approach for tree planting.

The following considerations should also be borne in mind by the project engineer:

(a) Administrative procedures, particularly that required for land and legal matters, must progress in parallel with the design. Project engineers should note that Land (Miscellaneous Provisions) Ordinance has been put into force. The administrative procedures relating to this Ordinance should be taken into account when excavation is required in the project.

(b) The need to obtain specialist advice (architectural, structural, geotechnical, environmental, landscape, traffic, water supply, drainage, electrical and mechanical and marine works, etc.) should be identified as early as possible and sufficient lead time should be allowed,

(c) The social, legal, economic, technological, natural and political environment should be borne in mind when selecting a preferred design option,

(d) Government policies and traditional practice should also be considered when determining a preferred design option, and

(e) The need to clear technical vetting requirements by the relevant Authority should be identified as early as possible and sufficient lead time allowed. A list of some common authorities is set out at Appendix 4.5. Project engineers, however, should note that the list might not be exhaustive.

With regard to safety in design, the project engineer should apply the principle of "Design for Safety" to avoid introducing a hazard to the workplace by eliminating it in the first place at the design or planning stage. For projects where Systematic Risk Management (SRM) under ETWB TCW No. 6/2005 is adopted, the project engineer is recommended to expand the SRM to include "Design for Safety" in order to achieve the best project outcomes more efficiently. The project engineer should refer to the Guidance Notes of Design for Safety and the Worked Examples of Design for Safety available on DEVB's website via the following link:

http://www.devb.gov.hk/en/publications_and_press_releases/publications/index.html.

1.4 METHODOLOGY

The design of a project is generally an iterative process, involving the following basic steps:

(a) The formulation of a conceptual design,

(b) The identification of suitable alternatives, and the selection of a preferred basic scheme,

(c) The detailed design calculations and analysis, and

(d) The drawings.

carried out for a Government project, a copy of the contractor's final ground investigation field work report(s) and any associated laboratory testing report(s) should be submitted directly to the GIU by the Client Department or Office, together with any associated digital data (which should be in AGS or other recognised format) within three months upon the finalisation of the report(s). Each report should be accompanied by a completed Document Submittal Form (available from the Librarian, CEL) stating that the reports are factual. If a report comprises multiple volumes, these should be listed on the Document Submittal Form. These factual reports are kept in the Public Section of the GIU. For those ground investigations carried out under either a term contract or an individual contract administered by the GEO, the necessary submissions will be undertaken directly within the GEO, and therefore no action by the Client Department or Office is necessary.

Interpretative reports and/or data submitted to the GEO (except those produced by the GEO or its Consultants) in support of Government developments are passed to the GIU via the GEO District Divisions and are kept in the Government Section.

The GIU does not contain any documents which are classified as Restricted, Confidential or a higher category, and such documents should not be submitted.

3.5 CERTIFICATION AND CHECKING AND AUDITING OF DESIGN PROCESSES

(Ref.: SETW's memo ref. () in ETWB(PS) 105/118/ Pt. 3 dated 7.4.2004, Review of Project Implementation Issues of HATS Stage I – Implementation Plans on the Recommendations)

The project engineer should certify the correct completion of the design processes in a standard certificate (Appendix 4.3). The design should be checked as a whole using one of the following approaches corresponding to the risk and complexity of the Works:

(a) For simple and straightforward designs, the designs should be checked by a checking officer, generally for correctness of assumptions and concepts, the method of working, practicality of construction and order of size, plus some detailed checking of critical members or sections. The checking officer is given the design memorandum, design calculations and drawings of the Works as designed. The checking officer should certify the completion of the checking process in a standard certificate (Appendix 4.3). The checking officer need not be an officer from outside the design team, although it is always desirable to have a checking officer who is not associated with the design.

(b) For complicated or unusual Works, or for Works, which could result in serious consequences if they fail, complete and thorough checking by a checking officer independent of the design team should be executed. Under this approach, the checking officer is given drawings of the Works as designed, the design memorandum, other information on functional/performance requirements and applicable design standards of the Works, but without the design calculations. The checking officer then verifies the design as shown on drawings by executing an independent set of calculations. The checking officer should certify the completion of the checking process in a standard certificate (Appendix 4.3) and tenders should not be invited without this certificate.

The Chief Engineer/Regional Office Head should decide which checking approach is to be adopted for each individual project. The checking officer should be a professional engineer suitably experienced in the type of Works being checked. The Chief Engineer/Regional Office Head is responsible for appointing a suitable checking officer.

The District Divisions of the GEO, CEDD exercise geotechnical control over public developments by auditing the geotechnical aspects of the designs of permanent works and, in the case of tunnel works, the associated temporary works, and the adequacy and standards of site supervision. Geotechnical submissions, as defined in paragraph 4.6.2, are required to be submitted to the GEO for auditing (ETWB TCW Nos. 29/2002, 29/2002A, 4/2004 and 15/2005). For slopes and retaining walls, foundation works within the Scheduled Areas of the Northwest New Territories and Ma On Shan and the Designated Area of Northshore Lantau, tenders should not be invited for any part of the geotechnical works until the geotechnical design has been accepted by the GEO. For tunnel works, where the GEO raises major geotechnical concerns on the public safety aspects of the geotechnical design (or the related Particular Specification or the Employer's Requirements (for Design and Build (D&B) contracts)), the project office must resolve such concerns with the GEO before tenders are invited. For projects that involve rock blasting, the project office should submit a Blasting Assessment as part of the geotechnical submissions to the GEO for comment and agreement. Tenders should not be invited for any part of the geotechnical works until the Blasting Assessment has been accepted by the GEO.

For complicated Works or Works of a nature that there is limited local experience, such as a very long-span bridge, tunnelling works or major underground structures, the project office shall consider if an independent checker from an independent organisation which is separate from that of the designer should be employed to vet the structural or geotechnical design of the whole or part of the Works.

3.6 REVISION OF DESIGN CALCULATIONS, RECORDS AND DRAWINGS

Design calculations, records and drawings should be revised and updated as the need arises. Major design revisions should be checked in the same manner as the original design.

For the compilation of as-constructed design calculations, records and drawings, reference should be made to Chapter 7 (Contract Management).

3.7 DESIGNS BY CONSULTING ENGINEERS

For projects employing consultants for planning and design, the consultants should be requested to submit the complete set of design calculations, records and drawings to the client office/division at the end of the design stage, together with a certification (Appendix 4.7 of EACSB Handbook) for the proper completion of the design process and checking of the design. The consultants should be requested to undertake and warrant to the client office/division that the client office/division will become the absolute and exclusive owner of the complete set of design calculations, records, drawings and documents and all intellectual property rights subsisting therein free from all encumbrances save those intellectual property rights belonging to a third party.

4.6.13 Projects Involving Blasting

Where designs involve substantial rock excavation, the designer should consider whether blasting would be required for the project. Rock excavation by blasting can adversely affect the stability and integrity of slopes, retaining walls, roads, railways, structures, buildings, services and utilities through ground vibrations and other effects such as fly rock and air-overpressure. The transport, storage and use of explosives for blasting may also pose a safety hazard to the public and disruption of traffic.

If blasting is specified or permitted in the construction works, a Blasting Assessment should be undertaken at the design stage to assess such adverse effects and potential hazards, and to propose adequate and necessary protective, preventive, precautionary and other mitigation measures to demonstrate the practicality of carrying out blasting works and to prevent the works from causing injury to workers and the public, significant disruption to traffic, undue vibration and movement to existing structures and services, or undue nuisance to the public.

The Blasting Assessment should be prepared by a competent person with at least four years relevant experience in blast design and supervision of blasting works, and should be submitted with the curricula vitae of its author to the GEO for agreement prior to tendering of the contract. For complex projects, such as those involving blasting in densely populated or sensitive area, a competent person with more experience would be required. The necessary content of a Blasting Assessment is given at Appendix 4.7. The project office should also consult CGE/Mines of the GEO as early as possible regarding the issues related to the transport, storage and use of explosives. These issues should be properly addressed prior to tendering for the contract and suitable contract requirements should be included.

The project office should ensure that all critical requirements and constraints identified in the Blasting Assessment are properly addressed and a realistic programme for the blasting works is included in the tender documents. The project office should also submit the curricula vitae of the key personnel of the resident site supervision team to the GEO for acceptance, prior to the commencement of the works.

In order to obtain a permission to carry out blasting under the Cap 295 Dangerous Goods Ordinance, the Contractors should demonstrate that all necessary measures have been in place to prevent the blasting works from causing damage or adverse effects to adjacent facilities and structures, significant disruption to traffic or undue nuisance to the public, or any risk of injury to the public and the people working on site. For opencast blasting, such measures should be in place for each blast before the explosives would be provided for loading into blast holes. The project office shall allow sufficient time in the contract for the application of the blasting permits and licences. Detailed information on the use of explosives and the procedures for applying the blasting permits and licences are given in Section 21 of Chapter 7.

4.7 LANDSCAPE AND GREENING WORKS

It is the government's policy to enhance the quality of our living environment through active planting, and proper maintenance and preservation of trees and other vegetation. To promote greening, greening provisions, including site coverage of greenery, roadside and median utility free planting zone (DEVB TCW No. 2/2012), bridge greening (DEVB TCW No. 2/2013), greening of slopes and retaining walls, skyrise greenery, and trees for preservation or

APPENDIX 4.7 CONTENTS OF A BLASTING ASSESSMENT

A Blasting Assessment shall consist of the following:

(a) Site plans clearly indicating the proposed areas of blasting and locations of all sensitive receivers including streets, structures, foundations, railways, public utilities, water mains, drains, sewers, gas mains and other services, geotechnical features such as slopes, retaining walls, boulders, tunnels, caverns, etc. that may be damaged or destabilised by the proposed blasting works.

(b) A report containing the results of a study, including the site topography, geology, ground, groundwater and surface water conditions, and the physical site constraints, sensitive receivers and site history.

(c) A report containing examination of the conditions of the sensitive receivers on and adjacent to the site.

(d) A report containing an assessment of the effects of blasting works to demonstrate that the proposed blasting would not cause any injury to persons or damage to property and sensitive receivers.

(e) Proposals of preventive measures to be carried out for sensitive receivers, if considered necessary.

(f) A list of the action limits to be specified for the implementation of blasting works, including blasting vibration limits and air-overpressure limits, etc. to ensure that the blasting works to be carried out would not cause any injury to persons, damage to sensitive receivers, significant disruption to traffic or undue nuisance to the public. The limits proposed shall take into account the existing conditions of all sensitive receivers. The source of the limits and documentary evidence of consultation and agreement, where appropriate, with the key stakeholders (e.g. owners or maintenance agents) of the sensitive receivers shall be provided.

(g) An outline of the blast design to demonstrate that the blasting works could be safely carried out and the proposed limits and any other constraints could be satisfied.

(h) A document setting out the safety management system to be employed, and the working procedures and sequences, where appropriate, for all blasting works.

(i) Particulars of the site inspections, surveys and monitoring to be carried out to check and measure the effects of blasting, including plans showing the locations of the monitoring stations, the performance criteria and the action limits.

(j) Proposals of protective and precautionary measures to be taken, including any evacuation and closure of public areas (such as roads and other facilities) and warnings needed to protect the sensitive receivers and the safety of the public and workers.

(k) Proposals of the arrangement for delivery of explosives to the site to demonstrate the practicability of completing the blasting works and the rock excavation needed within the construction period.

(l) If an on-site explosive store is considered necessary, a report containing an assessment of its feasibility and proposed arrangement.

CHAPTER 7

CONTRACT MANAGEMENT

The parts of the PAH shown in blue and bold should only be updated by Works Branch of Development Bureau.

Rev	Issue Date	Amendment Incorporated
First Issue	December 2016	NA
1	27 February 2017	Amd No. 1/2017
2	29 May 2017	Amd No. 2/2017
3	25 August 2017	Amd No. 3/2017
4	19 December 2017	Amd No. 5/2017
5	16 May 2018	Amd No. 1/2018

require that the dispute be referred to arbitration. Upon receipt of the adjudicator's decision, the Works Department should critically review the adjudicator's decision and timely consult with LAD(W) before the decision is made on whether or not to refer the dispute to arbitration.

For record purposes, works departments shall submit adjudication details to the Development Bureau in accordance with the prescribed forms at Appendix 7.58 and Appendix 7.59.

21.4.3 Disclosure of confidential information to the Public Accounts Committee

A Special Conditions of Contract for revising GCC Clause 8 is provided in ETWB TCW No. 29/2003 to allow Government to disclose confidential information under certain conditions to the Public Accounts Committee of the Legislative Council concerning matters relating to settlement agreements or the outcome of the arbitration or any other means of resolution of dispute.

21.5 DISCOVERY OF ANTIQUES OR UNUSUAL/SUSPICIOUS OBJECTS (Subsumed from PWDTC No. 14/73; Ref.: SETW's memo ref. (01AVE-01-2) in ETWB(W) 515/84/02 dated 7.12.2006)

When any antique or article of value is discovered during the execution of public works, the following procedures should be taken:

(a) For in-house contracts, the resident site staff (RSS) should report to the Engineer in charge of the contract who should then report the matter to the Head of his office and simultaneously contact the Executive Secretary (Antiquities and Monuments), AMO of LCSD. Upon receiving such report, staff of the AMO will conduct inspection at discovery site as soon as possible.

(b) Where it is not possible to contact the AMO immediately, the Engineer should, at his discretion, decide on the measures to be taken and then confirm them with the AMO as early as possible.

(c) For consultant-managed contracts, the RSS should adopt the same procedure as for in-house contracts and the Engineer should report the discovery to the Employer without delay.

(d) The Contractor should also be instructed to carry out all necessary measures for protection or removal, if any, as requested by the appropriate authorities.

In the event that unusual or suspicious objects are found on the Site, it is important that the RSS and the Contractor pay particular attention and take care of these objects and, if in doubt, report immediately to the Police and ER for direction.

21.6 USE OF EXPLOSIVES

21.6.1 General

For projects that involve blasting for rock excavation, the Contractor shall obtain a Blasting Permit from the Commissioner of Mines under the Cap. 295 Dangerous Goods Ordinance (DGO), prior to commencement of the blasting works. The Contractor shall provide a Method Statement when applying for a Blasting Permit. The Method Statement should incorporate all the requirements defined in the Blasting Assessment Report prepared by the Consultants during the design stage, and shall include:

(a) the method and sequence of the blasting work;

(b) details of the proposed blast design;

(c) procedures for review of the blast design based on information from drilling of blast holes and inspection of the blast location by a geologist;

(d) preventive, protective and precautionary measures;

(e) monitoring plans;

(f) contingency plans; and

(g) the organisation of the site personnel and their responsibilities.

The Contractor may make revisions to the Blasting Assessment Report prepared at the design stage to suit their method of work or the site conditions, provided that such revisions are endorsed by the project office or its Consultants and accepted by the GEO.

Where rock blasting is to be carried out under a flight path and flying rock may cause a hazard to aircraft (including helicopters), the Director of Civil Aviation shall be informed accordingly.

The Blasting Permit will not be issued until the Blasting Assessment and Method Statement have been found satisfactory and the site is ready for blasting with all the site preparatory works (e.g. construction of blasting cages, vertical screens, blast doors, monitoring stations, site magazine, designated unloading area, slope improvement works required etc.) completed to the required standards. The time required for processing a Blasting Permit application depends on the quality of the Contractor's submission and the progress of the site preparatory works. In cases where blasting works need to proceed urgently, the project office should liaise closely with the Mines Division of the GEO. Mines Division will facilitate the processing of applications, as far as possible, provided that safety and security in the transport, storage and use of explosives is not compromised.

21.6.2 Reporting

The details of the reporting system required by a Contract are normally stated in the specifications and such a system should be implemented and monitored accordingly. For each blast, the following data, additional to that required by the specifications should be recorded:

(a) name(s) and Mine Blasting Certificate number(s) of shotfirer(s);

(b) location and identification number of the blast;

(c) date and time of the blast;

(d) quantities and types of explosives and detonators delivered;

(e) quantities and types of explosives and detonators destroyed on site, or returned to Government Explosives Depot or site magazine;

(f) blasting details including numbers and pattern of holes drilled, depth, diameter and inclination of the holes, initiating system and sequence, actual charges per hole, rock face orientation and throw direction;

(g) approximate volume of rock or length of tunnel blasted;

(h) details of any vibration and air-overpressure readings taken;

(i) records of implementation of any evacuation of premises and/or road closure prior to the blast; and

(j) records of inspection of the sensitive receivers before and after the blast by the Contractor's Engineering Geologist or Geotechnical Engineer when required under the Contract.

For any adjacent sensitive receivers (e.g. structure, slope, building, utility, facility etc.) that may be prone to damage by vibration from blasting under the Contract, consideration should be given to taking appropriate vibration monitoring readings even if similar monitoring measures are not stated in the specifications. The Contractor should be instructed to take the necessary readings together with readings from other normally occurring vibrations for comparison purposes, e.g. vibration due to heavy road vehicles.

21.6.3 Resident Explosive Supervisors

Resident Explosive Supervisors (RES) belong to the Resident Site Staff (RSS) team. The project office shall liaise with Mines Division in the project planning stage to work out the explosives delivery logistics and the blasting programme so that any need for RES can be ascertained. The number of RES in the RSS team is dependent on the number of daily blasts required and the explosives delivery arrangement agreed with Mines Division. The site supervisory staff performing the duties of RES should be registered with the Competent Supervisor and their details sent to Mines Division for record. The project office or its Consultant should also consult Mines Division regarding the required training and experience, and the duties of the RES.

When required, RES should be deployed to accompany and keep watch over the explosives to be transported or handled by the contractor until all the explosives are stored in a site magazine, consumed or destroyed at the blasting site. This is to enhance security by preventing explosives being stolen, lost or otherwise mislaid.

In general, the RES duties should include the following:

(a) check that the amount of explosives drawn from the Government Explosives Depot or site magazine complies with the explosives requisition documents;

(b) ensure that all explosives drawn are delivered to either the project site magazine or the blast locations and loaded into the blast holes, and that explosives are not stolen, lost or otherwise mislaid (see (d) below for unused explosives);

(c) check that the explosives drawn are loaded and connected by the shotfirer according to the shotfirer's Charging Details as shown in Appendix 7.42; and

(d) witness the destruction of any unused explosives by the shotfirer on site, or the return of unused explosives to the site magazine.

21.6.4 Additional Site Supervision Requirements for Blasting Works

The supervision requirements for projects involving rock blasting are in addition to the qualified site supervision package of Category I, II and III supervisors as defined in ETWB TCW No. 29/2002, 29/2002A and Appendix 7.47 of the PAH. General requirements relating to the supervision of blasting works are given in section 4.3.

The site supervision duties of the Competent Supervisor for blasting works should include:

(a) checking the Contractor's Blasting Method Statement and the Contractor's Blasting Assessment;

(b) checking (including both document and site checks) for each blast, that the Contractor's blast design and its implementation, including the installation of protective, precautionary, preventive measures, comply with the Blasting Permit requirements;

(c) verifying on site that the ground conditions and geology are as stated or assumed in the Blasting Assessment, and that the preventive, protective and precautionary measures as given in the Method Statement are adequate for the actual site conditions;

(d) ensuring that the preventive measures (e.g. slope upgrading works), when required, have been properly carried out prior to commencement of the blasting works, and that the protective and precautionary measures are carried out in accordance with the Method Statement prior to each blast;

(e) monitoring regularly the condition of all sensitive receivers and carrying out inspections and reviews before and after each blast;

(f) supervising directly the work undertaken by the RES and Category III supervisors for blasting works; and

(g) preparing monthly reports with records of the condition of the site, sensitive receivers, adjacent ground, structures and services, etc.

The additional duties of a Category III supervisor for blasting works should include the following particular items:

(a) checking the locations and depths of all the blast holes for each blast;

(b) inspecting the construction of preventive works, if required, for the sensitive receivers;

(c) inspecting the provision and installation of all necessary protective and precautionary measures prior to each blast, in accordance with the blast design;

(d) monitoring the site operations and working methods to ensure that they meet the safety requirements set out in the Blasting Permit;

(e) inspecting the condition of all sensitive receivers before and after each blast;

(f) checking the adequacy of monitoring of sensitive receivers before and after blasting; and

(g) reporting the findings of the above checks and inspections to the Competent Supervisor before approval is given to go ahead with the blast.

21.7 PAYMENTS OF WAGES

Should it come to the attention of any staff on the Site that a group of workers may not have been paid or not paid correctly, then the matter should be relayed to the ER/Engineer. It is recognised that this information may only be rumour or hearsay but the ER/Engineer should consider the matter and, if deemed necessary, make prompt referrals to the Labour Relations Division of Labour Department in respect of suspected non-payment of wages to workers. A standard proforma for reporting of incidents is shown in Appendix 7.43.

In July 2008, SDEV promulgated a set of contract measures to prevent non-payment of wages for implementation in all capital works contracts (other than maintenance contracts and E&M supply and installation contracts). The measures include installing smart card systems at sites to keep attendance records; requiring written employment contracts for site personnel and requiring employment of Labour Relations Officers (LRO) to handle employment matters and to monitor payment of wages and Mandatory Provident Fund (MPF) contribution. Moreover, there are provisions for reimbursement of Contractor's contribution to the MPF for his site personnel. To assist project officers in processing the reimbursement in a consistent manner, SDEV has promulgated guidelines at Appendix 7.51. The guidelines do not attempt to deal comprehensively with the relevant contract provisions and should not be taken as an aid to their interpretation. It should be noted that there is no substitute for reading and considering the relevant provisions in the particular circumstances of each contract. (Ref.: SDEV's memo ref. (024Q5-01-4) in DEVB(W) 510/17/01 dated 18.1.2010)

It is an offence under the Employment Ordinance for wages which become due on the expiry of the last day of the wage period to be paid later than 7 days thereafter. Whilst it

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Geotechnical Engineering Office
Civil Engineering and Development Department
The Government of the Hong Kong
Special Administrative Region

4. General Procedures

4.1 Extent and Sequence of Investigation

4.1.1 General

The extent of the investigation depends primarily upon the magnitude and nature of the proposed works and the nature of the site.

A site investigation wil1 normally proceed in stages, as follows : desk study; site reconnaissance; detailed examination for design, including ground investigation, topographic and hydrographic survey and special studies; follow-up investigations during construction (Figure 1). *This may be followed by appraisal of performance. Some of the stages may overlap, or be taken out of sequence; for example, the site reconnaissance may well take place before completion of the desk study.*

The costs of a site investigation are low in relation to the overall cost of a project and may be further reduced by intelligent forward planning. Discussion at an early stage with a specialist contractor will help to formulate an efficient and economic plan. The technical requirements of the investigation should be the overriding factor in the selection of investigatory methods, rather than their cost.

As far as possible, assembly of the desk study information should be complete, at least in respect of those aspects related to ground conditions, before ground investigation begins. A preliminary ground investigation may be desirable to determine the extent and nature of the main ground investigation. The extent of the ground investigation is discussed in Chapter 10.

For regional studies or site investigation of projects covering large areas, e.g. road, tunnel or transmission line routes, techniques such as engineering geological and geomorphological mapping, terrain classification and hazard analysis may be useful to delineate critical areas so that detailed investigations can be concentrated in areas where they are most required (Brand et al, 1982; Griffiths & Marsh, 1984; Hansen, 1982).

4.1.2 Adjacent Property

Because of the dense urban development in Hong Kong, construction activities can often affect adjacent property. It is therefore essential that investigations should cover all factors that may affect adjacent property, including features such as slopes and retaining walls (see Chapter 7 and Section 8.3). Where possible, records of ground levels, groundwater levels and relevant particulars of adjacent properties should be made before, during and after construction. Where damage to existing structures is a possibility, adequate photographic records should be obtained.

Adjacent buildings, structures and buried services, including pipes conveying water, gas or sewage, should be specifically considered, as they may be affected by vibrations, ground settlement or movement, or changes in groundwater levels during and after construction activities on the site. Hospitals and other buildings containing sensitive instruments or apparatus should be given special consideration.

Special permission or approval must be obtained when the site is above or near the Mass Transit Railway Corporation's tunnels or structures, or is within the Mid-levels Scheduled Area (see Appendices A and B; see also Chapter 7). The approximate locations of these two features are shown in Figure 2.

4.2 Desk Study

As a first stage in a site investigation, a desk study is necessary and Appendix A indicates the types of information that may be required. Much information about a site may already be available in existing records. A summary of the important sources of information is given in Appendix B. Readers are advised to take note of any warning messages on the data, check with the relevant data owners on the reliability, accuracy and completeness of the data they require where necessary, taking into account the needs of their project. Readers are also invited to provide feedback to the GEO should the need to update this Geoguide 2 be identified.

[Amd GG2/01/2017]

A new geological survey is currently underway in Hong Kong to replace the existing 1:50 000 scale geological maps and memoir (Allen & Stephens, 1971); new 1:20 000 scale geological maps will become available between 1986 and 1991 (Figure 3). The new geological survey uses different nomenclature for certain major rock divisions and rock types (Addison, 1986; GCO, 1988; Strange & Shaw, 1986); this should be used wherever possible.

An important source of basic geotechnical information is the Geotechnical Area Study Programme (GASP) publications available from the Government Publications Centre. Systematic terrain evaluation has been undertaken at a scale of 1:20 000 covering the entire Territory (Brand et al, 1982). These publications generally contain Engineering Geology, Terrain Classification, Erosion, Landform and Physical Constraint Maps. Selected areas of the Territory have also been evaluated at the 'district' scale of 1:2 500, but these have not been published. The GASP programme and the areas covered by the GASP publications are shown in Figure 4, and examples of some of the 1:20 000 maps are given in Figure 5.

The Geotechnical Information Unit also contains numerous records of boreholes from throughout the Territory, as well as useful records of landslides, rainfall and piezometric data, and laboratory test results on soil and rock samples. Relevant data can be easily accessed by geographical location of the site. Further details of the Geotechnical Information Unit are given in Appendix B.

A useful bibliography on the geology and geotechnical engineering of Hong Kong is also available (Brand, 1992). Local maps and plans are easily obtained (Table 1), and as-built records of private developments are retained by the Buildings Ordinance Office or the Public Records Office (see Appendix B). Valuable information may often be obtained from aerial photographs, as discussed in Chapter 6.

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4.6 Site Investigation for Tunnel Works [Amd GG2/01/2017]

Pre-tender site investigation should be as comprehensive as possible to provide adequate information for the design of tunnel works and contract preparation. In addition to the geological and hydrogeological conditions, the site investigation should identify utilities and buried installations to ascertain whether they will interfere with or be affected by the tunnel works (see ETWB TC(W) No. 17/2004 for government projects). [Amd GG2/01/2017]

There are inherent uncertainties in the subsurface geology and hydrogeology, regardless of the extent of site investigation. Also, physical constraints, e.g. existing buildings and subsurface installations could limit the pre-tender site investigation for particular sections of tunnel works. Therefore, it is essential to make provision for additional ground investigation in the works contract to check and monitor continuously the actual conditions against those assumed, and to take measures to deal with conditions not anticipated but having significant impact on the design, construction, or on life and property.

[Amd GG2/01/2017]

The US Army Corps of Engineers Manual (USACE, 1997) includes a practical guide to the relative cost of site investigation as a proportion of the estimated construction cost. Based on this guide, the typical cost of site investigation for a deep tunnel located in difficult ground conditions and in a dense urban area is about 3-4% of the estimated construction cost. Notwithstanding, the cost of site investigation for a particular project depends greatly on the quality, suitability and adequacy of available information, and the data needed for the design and risk management of the types of tunnel works involved. The client should include adequate funding for site investigation in the project cost estimate. [Amd GG2/01/2017]

Site investigation for projects involving tunnel works should be phased. This approach is necessary as different phases of the project have different requirements. Also, the tunnel alignment and design requirements can change during route planning or design.

[Amd GG2/01/2017]

Using the data obtained at each phase, the impact of the proposed excavation method on the sensitive receivers identified and the geotechnical risks at each tunnel section should be assessed. The risk assessment should be reviewed when the tunnel alignment is fixed and as more information becomes available. [Amd GG2/01/2017]

Some simple guidelines on site investigation for tunnelling are given in ITA (2009). An outline of the engineering considerations and site investigation techniques for rock tunnels, based on IMMM (2003), is given in Table 13. Supplementary information on ground investigation techniques is given in Appendix F. [Amd GG2/01/2017]

For sources of information and expertise, reference should be made to Appendix B of this Geoguide and GEO (2016) for general guidance on, and sources of information for SI and tunnels in Hong Kong. Reference should also be made to Geoguide 4 (GEO, 1992), which contains guidance on site investigation for cavern schemes, much of which is also applicable to tunnels and shaft construction. [Amd GG2/01/2017]

Information on the pre-Quaternary geology of Hong Kong is given in Sewell et al (2000).

The Hong Kong Geological Survey (HKGS) section of GEO/CEDD has the most detailed information on the geology of Hong Kong and offers an advisory service. HKGS should be consulted, especially at the planning stage of new projects involving tunnel works, in the formulation of geological models, anticipation of difficult areas, and the verification of significant geological features (faults, dykes, contact zones between geological units, etc.). This consultation process in actual projects also allows feedback of important geological information from the project to existing geological archives maintained by HKGS.

[Amd GG2/01/2017]

silt- and clay-rich layers, should also be mapped.

[Amd GG2/01/2017]

(iii) During the initial phase of ground investigation, emphasis should be directed to developing a representative geological and hydrogeological model rather than testing. The ground investigation should focus on examining and logging the saprolite profile in detail, with emphasis placed on identifying the presence of adversely-oriented, weak silt- and clay-rich layers, especially in the vicinity of the weathering front, regardless or not whether these layers daylight in the slope under investigation. The ground investigation should also identify any such features within the rock mass where they may influence slope stability.

[Amd GG2/01/2017]

Suitable techniques for detailed examination of the saprolite profile should include:

[Amd GG2/01/2017]

(a) full-face mapping and logging of cut slopes, after stripping of surface cover, and adjacent exposures, [Amd GG2/01/2017]

(b) excavation and logging of trial pits, and [Amd GG2/01/2017]

(c) logging of drillholes. [Amd GG2/01/2017]

Suitable techniques for detailed examination of the saprolite profile may also include: [Amd GG2/01/2017]

(d) excavation of trenches or adits, [Amd GG2/01/2017]

(e) continuous sampling in drillholes using triple tube core barrels with air-foam as the flushing medium, and

[Amd GG2/01/2017]

(f) downhole geophysical logging and other downhole techniques, including borehole televiewer and impression packer. (Technical guidelines on the use of downhole geophysical investigation techniques in the identification of weak layers are given in Section 33).

[Amd GG2/01/2017]

10.9 Specific Guidance for Tunnel Works [Amd GG2/01/2017]

10.9.1 Preliminary Design Stage [Amd GG2/01/2017]

In the preliminary design stage, recommendations are made on a preferred tunnel

alignment and the scope of works, including risk mitigation measures based on assumed methods of excavation. Ground investigation with a geophysical survey could be undertaken to refine the geological model, to gain additional information on significant geological features, identify sensitive receivers and to establish baseline conditions.

[Amd GG2/01/2017]

Boreholes should extend well below the anticipated depth of the tunnel and shafts to allow for any subsequent changes in the vertical alignment of the tunnel in the detailed design stage, *and because the zone of influence of the tunnel may be extended by the nature of the ground at a greater depth.* [Amd GG2/01/2017]

Long horizontal boreholes parallel to the proposed tunnel alignment are extremely useful, particularly where the location of the proposed tunnel is overlain by thick layers of deeply weathered rock (McFeat-Smith, 1987). [Amd GG2/01/2017]

Soil permeability tests and Lugeon tests at close spacings should be undertaken in the boreholes to assess the soil mass and rock mass permeability, respectively. It is important not to overlook areas of apparently strong bedrock, as the mass permeability of these areas may be high and may affect significantly construction of the tunnel works. The test results should be used for development of the hydrogeological model, defining the hydraulic boundary conditions for the design and for assessing the need to control groundwater inflow/drawdown during construction. [Amd GG2/01/2017]

10.9.2 Detailed Design Stage

[Amd GG2/01/2017]

In the detailed design stage, when the tunnel alignment has been fixed, the main aim of the ground investigation should be to obtain information for the reference design or detailed design of the tunnel works and the associated temporary works. The ground investigation should also identify conditions at likely problematic areas along the chosen alignment. The ground investigation data should be adequate for preparing the design of the ground support, ground treatment, groundwater control works and the risk mitigation measures. It should also be adequate for planning the inspection, testing and monitoring works during construction.

[Amd GG2/01/2017]

Where existing boreholes are found close to or intercepting the tunnel, the risk of these boreholes not properly grouted should be assessed and mitigation measures, where necessary, should be carried out to ensure that these boreholes would not form preferential flow paths that could jeopardize the tunnel construction. [Amd GG2/01/2017]

New boreholes along the chosen tunnel alignment and shaft locations should generally extend to a sufficient depth below the invert of the tunnel/shafts to obtain information for the assessment of possible failure mechanisms/limit states, and/or construction of the tunnel/shafts. For tunnels in rock, this should be a least 2.5 times the tunnel diameter (or the crown to invert dimension) below the invert. [Amd GG2/01/2017]

Directional coring along the tunnel alignment should be considered. If this is to be carried out, it should preferably be done immediately on commencement of the detailed design

stage, in order to yield early data to maximise its benefit for the design. Despite the cost, the directional coring together with pumped down packer tests could provide useful information on the geology and hydrogeology along the tunnel alignment which could not be obtained from vertical or inclined boreholes. The information along the tunnel alignment would help to enhance the management of ground risks in tunnel excavation. [Amd GG2/01/2017]

For ground investigation to support the design of shafts, particular attention should be given to identifying poor ground conditions, which could lead to collapse, excessive ground deformation/vibration or excessive groundwater inflow/drawdown. For deep shafts with a significant length in rock, the ground investigation should assess the hydrogeology and inflow into the unlined sections of the rock mass, and the need for ground treatment and groundwater control works to prevent excessive drawdown of piezometric pressures in the rock and the soil overburden. [Amd GG2/01/2017]

For significant temporary works to be designed by the contractor, e.g. major ground treatment, groundwater control and ground support works, the pre-tender site investigation should provide sufficient geological and hydrogeological data for the pre-tender reference designs of such works, which should be carried out to adequately define the scope of the works required to meet the safety standards and the performance criteria specified.

[Amd GG2/01/2017]

GEO Technical Guidance Note No. 24 (TGN 24)
Site Investigation for Tunnel Works

1. SCOPE

1.1 This Technical Guidance Note (TGN) provides guidance on site investigation (SI) for tunnel works in Hong Kong. It supplements guidance on site investigation given in Geoguide 2 (GEO, 1987) and Geoguide 4 (GEO, 1992). Any feedback on this TGN should be directed to the Chief Geotechnical Engineer/Mainland East.

2. TECHNICAL POLICY

2.1 The technical guidelines contained in this TGN were agreed by GEO's Geotechnical Control Conference (GCC) in December 2004.

3. RELATED DOCUMENTS

3.1 AGS (HK) (2004a). *Ground Investigation Guidelines 04.3 - Deep Excavations.* Association of Geotechnical and Geoenvironmental Specialists (Hong Kong).

3.2 AGS (HK) (2004b). *Ground Investigation Guidelines 04.4 - Rock Tunnels.* Association of Geotechnical and Geoenvironmental Specialists (Hong Kong).

3.3 AGS (HK) (2005). *Ground Investigation Guidelines 04.6 - Soft Ground Tunnelling.* Association of Geotechnical and Geoenvironmental Specialists (Hong Kong).

3.4 ETWB (2004). *Impossibility/Unforeseen Ground Conditions/Utility Interference (Environment, Transport and Works Bureau Technical Circular (Works) No. 17/2004).* Environment, Transport and Works Bureau, Government Secretariat, Hong Kong.

3.5 GCO (1987). *Guide to Site Investigation, Geoguide 2.* Geotechnical Control Office, Hong Kong, 362p.

3.6 GEO (1992). *Guide to Cavern Engineering, Geoguide 4.* Geotechnical Engineering Office, Hong Kong, 156p.

3.7 GEO (2009a). *GEO Technical Guidance Note No. 5, Geoguide 2 - Guide to Site Investigation Updated Appendix B: Sources of Information.* Geotechnical Engineering Office, Hong Kong, 23p.

3.8 GEO (2009b). *Catalogue of Hong Kong Tunnels (up to December 2008).* Geotechnical Engineering Office, Hong Kong. (http://www.cedd.gov.hk/eng/publications/reference/doc/HK%20Tunnel%20Cat.pdf)

3.9 IMMM (2003). *Ground Investigation Working Party - Final Report.* Institute of Materials, Minerals and Mining, Hong Kong Branch, 46p.

3.10 ITA (2009). *General Report on Conventional Tunnelling Method.* International Tunnelling and Underground Space Association. (http://www.ita-aites.org/cms/ita-aites-home/latest-news-detail/datum/2009/05/13/ita-report-online-copie-1.html)

3.11 Sewell, R.J., Campbell, S.D.G., Fletcher, C.J.N., Lai, K.W. & Kirk, P.A. (2000). *The Pre-Quaternary Geology of Hong Kong.* Geotechnical Engineering Office, Hong Kong, 181p.

3.12 USACE (1997). *Engineer Manual 1110-2-2901 Engineering and Design - Tunnels and Shafts in Rock.* US Army Corps of Engineers. (http://140.194.76.129/publications/eng-manuals/em1110-2-2901/toc.htm)

3.13 USACE (2001). *Engineer Manual 1110-1-1804 Geotechnical Investigations.* US Army Corps of Engineers. (http://140.194.76.129/publications/eng-manuals/em1110-1-1804/toc.htm)

4. DEFINITIONS

4.1 Tunnel works comprise tunnels, shafts, caverns and associated underground facilities, however constructed.

5. TECHNICAL RECOMMENDATIONS

5.1 GENERAL GUIDANCE

5.1.1 Pre-tender SI should be as comprehensive as possible to provide adequate information for the design of tunnel works and contract preparation. In addition to the geological and hydrogeological conditions, the SI should identify utilities and buried installations to ascertain whether they will interfere with or be affected by the tunnel works (see ETWB TC(W) No. 17/2004 for government projects)

5.1.2 There are inherent uncertainties in the subsurface geology and hydrogeology, regardless of the extent of SI. Also, physical constraints, e.g. existing buildings and subsurface installations could limit the pre-tender SI for particular sections of tunnel works. Therefore, it is essential to make provision for additional ground investigation (GI) in the works contract to check and monitor continuously the actual conditions against those assumed, and to take measures to deal with conditions not anticipated but having significant impact on the design, construction, or on life and property.

5.1.3 The US Army Corps of Engineers Manual (USACE, 1997) includes a practical guide to the relative cost of SI as a proportion of the estimated construction cost. Based on this guide, the typical cost of SI for a deep tunnel located in difficult ground conditions and in a dense urban area is about 3-4% of the estimated construction cost. Notwithstanding, the cost of SI for a particular project depends greatly on the quality, suitability and adequacy of available information, and the data needed for the design and risk management of the types of tunnel works involved. The client should include adequate funding for SI in the project cost estimate.

5.2 SITE INVESTIGATION STRATEGIES

5.2.1 General

5.2.1.1 SI for projects involving tunnel works should be phased. This approach is necessary as different phases of the project have different requirements. Also, the tunnel alignment and design requirements can change during route planning or design.

5.2.1.2 Using the data obtained at each phase, the impact of the proposed excavation method on the sensitive receivers identified and the geotechnical risks at each tunnel section should be assessed. The risk assessment should be reviewed when the tunnel alignment is fixed and as more information becomes available.

5.2.1.3 Some simple guidelines on SI for tunnelling are given in ITA (2009). An outline of the engineering considerations and SI techniques for rock tunnels, based on IMMM (2003), is given in Annex TGN 24A1. Supplementary information on ground investigation techniques is given in Annex TGN 24A2.

5.2.2 Planning Stage

5.2.2.1 In the project planning stage, alternative tunnel routes and potential shaft locations are typically considered. It is sufficient to have only a general picture of the subsurface geology and hdydrogeology, to define the preferred route corridor and to estimate the order of project cost. The SI should largely comprise desk studies and site reconnaissance, and include only limited GI, if any is needed. Reference should be made to information available from nearby tunnel projects (see, for example, the references given in GEO (2009b))

5.2.3 Preliminary Design Stage

5.2.3.1 In the preliminary design stage, recommendations are made on a preferred tunnel alignment and the scope of works, including risk mitigation measures based on assumed methods of excavation. GI with a geophysical survey could be undertaken to refine the geological model, to gain additional information on significant geological features, identify sensitive receivers and to establish baseline conditions.

5.2.3.2 Boreholes should extend well below the anticipated depth of the tunnel and shafts to allow for any subsequent changes in the vertical alignment of the tunnel in the detailed design stage.

5.2.3.3 Soil permeability tests and Lugeon tests at close spacings should be undertaken in the boreholes to assess the soil mass and rock mass permeability, respectively. It is important not to overlook areas of apparently strong bedrock, as the mass permeability of these areas may be high and may affect significantly construction of the tunnel works. The test results should be used for development of the hydrogeological model, defining the hydraulic boundary conditions for the design and for assessing the need to control groundwater inflow/drawdown during construction.

5.2.4 Detailed Design Stage

5.2.4.1 In the detailed design stage, when the tunnel alignment has been fixed, the main aim of the GI should be to obtain information for the reference design or detailed design of the tunnel works and the associated temporary works. The GI should also identify conditions at likely problematic areas along the chosen alignment. The GI data should be adequate for preparing the design of the ground support, ground treatment, groundwater control works and the risk mitigation measures. It should also be adequate for planning the inspection, testing and monitoring works during construction.

5.2.4.2 Where existing boreholes are found close to or intercepting the tunnel, the risk of these boreholes not properly grouted should be assessed and mitigation measures, where necessary, should be carried out to ensure that these boreholes would not form preferential flow paths that could jeopardize the tunnel construction.

5.2.4.3 New boreholes along the chosen tunnel alignment and shaft locations should generally extend to a sufficient depth below the invert of the tunnel/shafts to obtain information for the assessment of possible failure mechanisms/limit states, and/or construction of the tunnel/shafts. For tunnels in rock, this should be a least 2.5 times the tunnel diameter (or the crown to invert dimension) below the invert.

5.2.4.4 Directional coring along the tunnel alignment should be considered. If this is to be carried out, it should preferably be done immediately on commencement of the detailed design stage, in order to yield early data to maximise its benefit for the design. Despite the cost, the directional coring together with pumped down packer tests could provide useful information on the geology and hydrogeology along the tunnel alignment which could not be obtained from vertical or inclined boreholes. The information along the tunnel alignment would help to enhance the management of ground risks in tunnel excavation.

5.2.4.5 For GI to support the design of shafts, particular attention should be given to identifying poor ground conditions, which could lead to collapse, excessive ground deformation/vibration or excessive groundwater inflow/drawdown. For deep shafts with a significant length in rock, the GI should assess the hydrogeology and inflow into the unlined sections of the rock mass, and the need for ground treatment and groundwater control works to prevent excessive drawdown of piezometric pressures in the rock and the soil overburden.

5.2.4.6 For significant temporary works to be designed by the contractor, e.g. major ground treatment, groundwater control and ground support works, the pre-tender SI should provide sufficient geological and hydrogeological data for the pre-tender reference designs of such works, which should be carried out to adequately define the scope of the works required to meet the safety standards and the performance criteria specified.

5.2.5 Construction Stage

5.2.5.1 In the construction stage, further SI should be undertaken to obtain information to support the design review of the tunnels, caverns and shafts, in order to ensure that there is adequate safety margin and performance.

5.2.5.2 For the exposed faces in tunnel works, the SI should include geological and engineering geological mapping, and an assessment of the tunnel sections/shafts using a soil/rock mass classification scheme on which the design may be based. A proforma for recording the rock mass mapping and classification data in rock tunnels is available from the Hong Kong Slope Safety Website under the downloading area at http://hkss.cedd.gov.hk.

5.2.5.3 Depending on the tunnel excavation method and the risk assessment, probing ahead of the tunnel excavation may be carried out. The penetration rate, the quantity of water inflows, and the colour and nature of cuttings and flushing water returns should be recorded. This information should be used to assess the ground conditions ahead, in particular the soil/rock interfaces and sections with potentially high water inflow, and the need for implementation of robust mitigation measures before further tunnel excavation. In addition to probing, use of non-invasive techniques and coring during construction may be considered where cost effectiveness can be demonstrated. For TBM works, further GI may be necessary prior to or during the TBM drive to confirm the locations of permeable soils and soil/rock interfaces and the variations in groundwater pressures for design.

5.2.5.4 Sufficient time should be allowed in the construction programme for the results of additional GI and site inspection and monitoring to be fed back into the design and risk management processes, in order that modifications to the design can be implemented or other contingency measures undertaken in a timely manner.

5.3 SOURCES OF INFORMATION AND EXPERTISE

5.3.1 Reference should be made to Geoguide 2 (GCO, 1987), GEO Technical Guidance Note No. 5 (GEO, 2009a) and GEO (2009b) for general guidance on, and sources of information for SI and tunnels in Hong Kong. Reference should also be made to Geoguide 4 (GEO, 1992), which contains guidance on SI for cavern schemes, much of which is also applicable to tunnels and shaft construction.

5.3.2 Information on the pre-Quaternary geology of Hong Kong is given in Sewell et al (2000). The Hong Kong Geological Survey (HKGS) section of GEO/CEDD has the most detailed information on the geology of Hong Kong and offers an advisory service. HKGS should be consulted, especially at the planning stage of new projects involving tunnel works, in the formulation of geological models, anticipation of difficult areas, and the verification of significant geological features (faults, dykes, contact zones between geological units, etc.). This consultation process in actual projects also allows feedback of important geological information from the project to existing geological archives maintained by HKGS.

5.4 DOCUMENTATION

5.4.1 Factual engineering geological and hydrogeological data relating to the project should be fully documented including any field data obtained from the excavation faces or inferred from the equipment/processes adopted for the tunnel works.

5.4.2 Survey and monitoring reports should include factual data, details of the survey and monitoring methods, and equipment/system calibration.

5.4.3 Interpretative engineering geological and inspection and monitoring reports should be prepared using the data obtained during the various phases of the SI and from construction records. These reports should update any previous relevant interpretative reports and be presented in a form that will meet the needs of the professional users. They should incorporate information on the cavern/tunnel/shaft excavation method and working sequence, trends of key performance indicators and records of actual impacts observed during construction.

6 ANNEXES

Annex TGN 24A1 Outline of Engineering Considerations and SI Techniques for Rock Tunnels
Annex TGN 24A2 Supplementary Information on Ground Investigation Techniques

(R K S Chan)
Head, Geotechnical Engineering Office

Table 1: Outline of Engineering Considerations and SI Techniques for Rock Tunnels (based on IMMM, 2003)

MAJOR ENGINEERING CONSIDERATIONS	KEY POINTS FOR SI	APPROACH TO INVESTIGATION	TESTING	SURVEY / MONITORING
Blasting design Machineability (suitability for TBM) Soil and rock mass excavation and support design (possibility of presence of mixed face conditions, fractured ground, and weak, compressible and/or permeable zones) Water pressures acting on lining /retaining structures for their design Potential water inflow into the shafts and along the tunnels. Assessment of tunnels/shafts drainage and pumping requirements Effects of the tunnel works on land stability, e.g. ground collapse/landslide due to inadequate support, hydraulic failure, blow-out failure, etc. Ground settlement, heave and lateral movement and distortion of sensitive receivers as a result of construction-induced ground loss, ground deformation/vibration and groundwater inflow/drawdown Design of tunnel portal slopes Lining/retaining structure durability design Effects of blasting on surface/subsurface facilities and slopes	Nature of soil and/or rock at tunnel level (invert and crown) and around the tunnels, and around/within the shafts Rock mass weathering (including presence of corestones and mixed ground) and strength Distribution, orientation and characteristics of discontinuities Rock mass permeability Insitu stress Presence of fault zones, dykes, contact zones between geological units, etc. Hydrogeology, including permanent groundwater table, perched water tables, permeable zones feeding water to the tunnels, etc. Potential recharge in response to rainfall and the sea, and hydraulic boundary conditions Dewatering effects of the tunnels, and the tunnel works damming subsurface groundwater flow Nature of surface materials, in particular, strength, permeability, compressibility and consolidation and creep characteristics As-built records and site history, in particular, effects of past and on-going construction activities that could affect the tunnels/shafts and the sensitive receivers Ground and groundwater chemistry	**Investigation Methods** Geological mapping of surface rock exposures Aerial photograph interpretation to identify photolineaments Geophysical surveys to identify anomalies and low seismic velocity zones Boreholes – vertical holes needed for sampling and downhole tests. Unless surface materials need to be characterised for assessment of effects of the tunnel works, boreholes can be wash-bored down to the zone of interest Sub-horizontal/inclined holes from the tunnel portal and/or shaft locations to examine variations of ground conditions along the tunnel drive Inclined holes to intercept faults, dykes and contact zones at tunnel level Probing ahead during tunnelling operation Directional coring (for deep tunnels) **Sampling** Rock coring through proposed tunnel levels (including all alternative alignments) and covering sufficient ground above crown and below invert Undisturbed soil samples for near-surface materials, potentially affected by the tunnel and shaft construction	**Insitu Testing** Impression packer test, televiewer Packer permeability test and possibly pumping test Insitu stress measurement (e.g. by hydrofracturing) Soil permeability test and response test in piezometer **Laboratory Testing/Analysis** Unconfined Compressive Strength Young's Modulus Poisson's Ratio Point Load Strength Rock joint characteristics Abrasivity Hardness Geological thin sections Classification and consolidation creep tests for settlement-susceptible near-surface materials Salinity testing to assess the effects of groundwater on tunnelling equipment and lining	**Instrument Types** Piezometers for monitoring pore water pressures at various hydrogeological response zones Settlement gauges **Survey / Monitoring** Location survey of physical constraints and sensitive receivers Complete annual cycle needs to be monitored to indicate groundwater pressure response to rainfall and seasonal fluctuation, and to recharge from the sea Baseline ground movement and vibration survey and condition survey of sensitive receivers (e.g. cracks on existing structures) over a sufficiently long period to establish trends

NB: Reference should also be made to the ground investigation guidelines for deep excavations and rock tunnels produced by AGS (HK) (2004a & b; 2005).

SUPPLEMENTARY INFORMATION ON GROUND INVESTIGATION TECHNIQUES

1. GEOPHYSICS

1.1 Non-invasive surveying methods using geophysics techniques are comparatively inexpensive compared with invasive GI. Furthermore, they can often be completed within a short time, without major conflict over land use, and can cover large areas.

1.2 Magnetic surveys to identify faults have been successful in offshore areas in Hong Kong (Sewell et al., 2000 and references therein). Confirmatory boreholes and insitu testing should be carried out to verify the interpretation obtained from the survey.

1.3 Geophysical surveys do not provide direct measurement of engineering properties such as strength and permeability. They may not detect small-scale geological features. The interpretation and translation of the survey data into engineering geological information requires expertise and professional judgement.

2. VERTICAL AND INCLINED BOREHOLES

2.1 Although vertical boreholes are the most commonly used method of GI, the samples and logging obtained may only indicate very localised characteristics of the ground along a tunnel alignment.

2.2 Inclined boreholes may give comparatively more information along the tunnel alignment than vertical boreholes. Where the orientation of suspected subvertical fault zones or other significant geological features is known, targeting an inclined borehole in a direction roughly perpendicular to the feature may give a useful indication of the location, overall thickness and engineering properties of the feature.

2.3 The relative inclinations of the borehole and the feature being investigated govern the success of the inclined borehole. Faults in Hong Kong are commonly discontinuous and typically have variable dip, dip direction, width and weathering characteristics. These factors may affect the effectiveness of inclined boreholes.

3. HORIZONTAL BOREHOLES

3.1 Drilling of horizontal boreholes can be carried out either from the excavation face, an intermediate shaft or from the other end of the tunnel to investigate the ground conditions, in particular to check whether suspected features of poor ground are present and if so their nature and extent.

3.2 There are limitations to the maximum length that the horizontal borehole can be driven, depending on the ground conditions, the size of the hole and the power of the drilling rig. 'N' and 'H' size cores have been obtained from an 800 m long hole in Hong Kong.

3.3 Drilling of a horizontal borehole during the planning and design stage is often not feasible due to lack of access to the tunnel level; usually, for deep tunnels, the construction of vertical access shafts will not have commenced at this stage.

3.4 During the construction stage, drilling of horizontal boreholes from the tunnel face can affect the rate of progress of the excavation; hence alternative access points should be investigated and the cost-effectiveness of the operation needs to be carefully assessed in the light of the adequacy of ground data for the design and risk management.

4. DIRECTIONAL CORING TECHNIQUES

4.1 Directional coring techniques are now available to drill from ground level to great depth and then along a horizontal alignment. This method does not require provision of working space at the tunnel level and can be very useful for investigating deep tunnels.

4.2 These techniques could provide continuous information of the geological conditions along the alignment of a tunnel. Insitu tests could also be carried out for assessing the actual conditions of the ground to be excavated. The information along the alignment would minimize uncertainty of the tunnel works and enhance the management of risks for the project.

4.3 There may be limitations as to the maximum depth and length that a directional corehole can reach as well as the type of core samples that can be taken and the type of geotechnical tests that can be performed. These matters, as well as drilling location accuracy, cost, mobilisation considerations and drilling rate should be examined as early as possible in a tunnel project.

5. OTHER ASPECTS

5.1 To avoid creating preferential flow paths and obstructions in the ground that could pose hazards to the tunnel excavation, for boreholes that are close to or intercept the tunnel, the person supervising the GI should ensure that all metal casings are removed and the boreholes are properly grouted after completion of sampling and testing.

5.2 For long boreholes, probe holes and core holes, the position of which could impact on the design and construction, the specification should require the orientation (dip and dip direction) and the position of the holes to be checked regularly as drilling progresses to ensure that they follow the intended alignment.

CHAPTER 5

CONTRACT DOCUMENTS

The parts of the PAH shown in blue and bold should only be updated by Works Branch of Development Bureau.

Rev	Issue Date	Amendment Incorporated
First Issue	December 2016	NA
1	27 February 2017	Amd No. 1/2017
2	25 August 2017	Amd No. 3/2017
3	19 December 2017	Amd No. 5/2017
4	16 July 2017	Amd No. 2/2018

(h) General Specification (GS) (see Paragraph 6.1),

(i) Particular Specification (PS) (see Paragraph 6.2),

(j) Standard Method of Measurement (SMM),

(k) Particular Preambles (if any),

(l) Bills of Quantities (BQ) (see Paragraph 7.1)

(m) Drawings (see Paragraph 8.1), and

(n) Any relevant pre-contract correspondence with the Contractor (e.g. tender addendum, circular letters to tenderers) (see Paragraphs 5.2, 6.14.4, 7.2.1, 7.3, 7.6 & 8.1.1 of PAH Chapter 6).

Usually, only documents (d) to (n) listed above, the letter of acceptance of the tender and the Articles of Agreement form the contract documents (see Paragraph 8.1.1 of PAH Chapter 6).

The type or edition of document used shall be the current version as promulgated by DEVB TCWs or other appropriate circular. Reference should also be made to the current corrigenda issued to the GS and the SMM (see Paragraph 5.2 of PAH Chapter 6).

1.3 CONSISTENCY AMONGST DOCUMENTS

Care should be taken to avoid any ambiguities or discrepancies in the documents which form a contract as contractual claims and disputes are often caused by inconsistencies in or between the documents. If any ambiguities or discrepancies exist, it should be noted that the provisions of the SCC prevail over those of the GCC, which in turn prevail over the PS and the Drawings, which in turn prevail over the GS. GCC Clause 5(1) and GS Clause 1.01 are relevant in this aspect.

In the drafting of SCC or PS clauses, reference should be made whenever appropriate to the GCC and the GS, using phrases such as:

(a) "Pursuant to General Conditions of Contract Clause .....", or

(b) "GS Clause ..... is deleted and replaced by ....." etc.

1.4 COMMENTS ON DOCUMENTS BY CONTRACT ADVISERS

The responsibility for ensuring that tender documents are properly prepared rests with the professional officers handling the project. They may however seek advice from Contract Advisers on tender documents when genuine doubts emerge. When seeking such advice the officer concerned shall inform the Contract Adviser of the doubts he has and the aspects of the case on which he wants advice (see Paragraph 1.5.1 of this Chapter).

1.5 LEGAL VETTING OF TENDER DOCUMENTS

1.5.1 Contracts Estimated to Exceed $300M

All tender documents for contracts estimated to exceed $300M in value must be submitted through the appropriate Contract Adviser to the Legal Advisory Division (Works) of DEVB (LAD(Works)/DEVB) for legal vetting prior to calling for tenders. Before submission to LAD(Works)/DEVB, it is advisable to request the relevant Contract Adviser to comment on the documents. Comments made by the relevant Contract Adviser on the draft should be attached for LAD(Works)/DEVB's information.

The tender documents to be submitted shall include the following:

(a) Special Conditions of Tender,

(b) Form of Tender and Appendix thereto (if these have been altered from the standard version shown at Appendix 5.1),

(c) Articles of Agreement (if these have been altered from the standard printed version),

(d) Special Conditions of Contract,

(e) Particular Specification, and

(f) Bills of Quantities, including General and Particular Preambles.

A memo shall accompany the tender documents, drawing attention to the following:

(a) SCT clauses and SCC clauses together with reasons for their incorporation,

(b) alterations, if any, to the standard versions of the Articles of Agreement and the Form of Tender and Appendix thereto, and

(c) any clause in the PS, any item in the BQ, or any other matter relating to the tender documents or to the Contract which may have significant contractual or financial implications.

LAD(Works)/DEVB will consider these documents (retaining a copy for future reference) and may recommend amendments they consider advisable to the works division/regional office concerned, who should incorporate such amendments as necessary into the documents before calling for tenders. The vetting by LAD(Works)/DEVB will take at least three weeks and provision should be made in the programme for tender preparation.

If owing to urgency, or some other reasons, the documents cannot be submitted through Contract Adviser then the reason for the same should be explained in the covering memo to LAD(Works)/DEVB. However, action should then be taken to forward the comments made by Contract Adviser as soon as they are received.

1.5.2 Design and Build Contract

The Administrative Procedures issued under DEVB TCW No. 4/2015 should be followed as closely as possible. In particular, the procedures laid down in the "Guidance Notes on the Preparation of the Employer's Requirements" (Appendix C of the Administrative Procedures) should be followed in order to avoid any unnecessary design changes after the contract is awarded. Prior approval of DEVB shall be obtained if the Procedures are not to be followed because of special consideration given to individual cases. The legal vetting requirement as described in Paragraph 1.5.1 applies equally to design and build contracts. The Administrative Procedures can be found on the DEVB website (under Publications and Press Releases\Publications\Standard Contract Documents\).

516/70/03 dated 22.11.2013.

7.2 PREPARATION OF BILLS OF QUANTITIES

The rules for preparing BQ are contained in Part III of the SMM and they should be strictly followed. In accordance with the SMM, a BQ will comprise the following:

- General and Particular Preambles

- Bill No. 1 : Preliminaries
- Bill No. 2 :) for works items,
) see guidance below.
- Bill No. :)
- Bill No. : Site Safety and Environmental Management *(a)
- Bill No. : Daywork
- Bill No. : Prime Cost and Provisional Sums
- Grand Summary.

*(a) This Bill is to be provided for all appropriate tenders as required under ETWB TCW No. 19/2005, the Interim Guidance Note on Administration of Environmental Management and Pay for Safety and Environment Scheme for Public Works Contracts promulgated under SETW's memo ref. (014G7-01-1) in ETWB(W) 517/91/01 dated 19.6.2006.

Separate bills may be considered, at the discretion of the project engineer, for work items charged to different financial votes. When a lump sum form of contract is used, the provisional quantities are included in the Bills wherever it is appropriate and sensible to do so. Individual items to be remeasured can be mixed in with the "firm" items, or a whole section can be shown separately and described as provisional. The items in each bill should be grouped into the appropriate section of Part V of the SMM in the order shown. A sample for the Grand Summary is given at Appendix 5.5.

Copies of the SMM have been issued to all the approved contractors on the DEVB Lists and it needs not be reproduced in contract and tender documents.

Specimen BQ items provided in DEVB TCWs for various subjects such as site cleanliness and tidiness, preservation and protection of preserved trees, Professional Indemnity Insurance for the Works, etc. should be adopted where applicable.

All works items should be included in the BQ and omitted items should be minimized as far as practicable. The BQ should undergo a checking process to ensure the completeness and accuracy of the BQ and elimination of major errors. This would facilitate competitive tendering, reduce resources for valuation of omitted items and minimize the disputes arising from the valuation of omitted items. (Audit Report No. 53 Ch. 3 - http://www.aud.gov.hk/pdf_e/e53ch03.pdf)

7.3 PREAMBLES TO THE BQ

A set of standard clauses for the "General Preambles to the Bills of Quantities" is

CHAPTER 6

TENDER PROCEDURE

The parts of the PAH shown in blue and bold should only be updated by Works Branch of Development Bureau.

Rev	Issue Date	Amendment Incorporated
First Issue	December 2016	NA
1	29 May 2017	Amd No. 2/2017
2	19 December 2017	Amd No. 5/2017
3	16 May 2018	Amd No. 1/2018
4	16 July 2018	Amd No. 2/2018

3.8 LANGUAGES TO BE USED FOR TENDER SUBMISSIONS

Article 9 of the Basic Law stipulates that "in addition to the Chinese language, English may also be used as an official language by the executive authorities, legislature, and judiciary of the Hong Kong Special Administrative Region". It is therefore inappropriate to state in the tender notices and tender documents that tenders should be submitted in English.

3.9 MINIMUM WAGE REQUIREMENTS

The former S for Tsy in his memo ref. (6) in FT 53/88/2 dated 28.2.2000 announces that departments should not stipulate minimum wage requirements in their tender exercises. If departments would like to secure quality services, more effective means should be used, e.g. by specifying in detail the qualifications, experience, training and skills required of the personnel concerned; requesting tenderers to provide references from their previous clients; or using a marking scheme for tender evaluation. Nevertheless, if a department really considers it essential to stipulate minimum wage requirements in a particular tender exercise, it should make a submission with full justifications to the Central Tender Board for prior approval (i.e. before tendering). This will prevent the need to cancel the tender exercise if the Board is not satisfied with the justifications provided.

3.10 NOT USED

3.11 MAXIMUM NUMBER OF CONTRACTS TO BE UNDERTAKEN BY THE SAME CONTRACTOR

There are occasions when procuring bureaux/departments invite tenders for more than one contract in a tender exercise and impose a restriction on the maximum number of contracts each tenderer may secure. Some procuring bureaux/departments have also imposed a restriction on the maximum number of a particular type of contracts (which may be tendered out at one go in the same tender exercise or separately in different tender exercises) that a contractor can undertake simultaneously. SFST in his memo ref. FT 53/88 Pt. 3 dated 18.11.2004 required Controlling Officers to revisit the need and justification for setting such a restriction. In particular, for tendering of contracts covered by WTO GPA, the procuring bureaux/departments should ensure that such restriction is legally in order and seek legal advice when necessary if they wish to impose such a restriction.

3.12 CONTROL OF OMITTED ITEMS AND SUBSTANTIAL CHANGES IN QUANTITIES

To avoid the occurrence of omitted items and substantial changes in quantities during construction, the following quality assurance procedures should be adopted:-

(a) In general, the Standard Method of Measurement (SMM) should be followed in the preparation of the BQ. If it is necessary to amend the method of measurement, a Particular Preamble (PP) to that effect should be prepared and included in the BQ in accordance with Rule 10 in Part III of the SMM. Prior approval for the incorporation of the PP (for any method of measurement

which deviates from the SMM), as well as any drawings clarifying or defining the method of measurement, should be obtained from an officer at D1 rank or above administering the contract according to Section 7.1 of Chapter 5. Such request and approval must be properly minuted and documented in the project file for future reference. Besides, the project officer should confirm such modified method of measurement in writing with the officers responsible for the preparation of the BQ, in case the PP and the BQ are prepared by different officers. Close liaison between the design team and the taking-off team should be maintained to ensure mutual understanding of the documents and any changes made to the SMM.

(b) A pre-tender cross-checking procedure should be introduced in the preparation of BQ. An officer in the rank of engineer, quantity surveyor, senior engineer, senior quantity surveyor or other equivalent professional ranks, not being the officer who actually prepared the quantities, should make a bulk checking on the quantities of the cost-significant items (items which carry significant implication on contract expenditure) in the BQ against the tender drawings/specifications, or against the quantity of other related items (i.e. items with quantities comparable to or bearing a well recognized ratio to the quantities of the items being checked) to identify possible omitted items and problems arising out of substantial changes in quantities. Examples of 'bulk checking' are (i) volume of excavation against volume of soil disposal and deposition; (ii) area of formwork wall against area of wall tiles; and (iii) number of moving of piling rig against the total number of piles shown in the drawings, etc. When drawing up a list of the cost-significant items, the concerned officer should take into consideration the nature and size of the works, the value of the items and the likelihood of future changes to the relevant items. Sufficient time should be allowed to conduct the bulk checking. Any mistake/problem identified in the checking process should be rectified before the issue of tender documents.

(c) The above procedures have been prepared mainly for those projects administered by in-house project team. For those projects administered by Consultants, the Consultants shall be required to adopt similar procedures to ensure the quality of BQ and PP and submit their proposed procedures to the Director's Representative for agreement. Besides, if resources permit, project office should conduct spot-checking on the quantities of some selected cost significant items after the BQ has been prepared by the Consultants. Such spot-checking conducted by the project office should be properly documented.

(d) Apart from the above, an officer of the project office at a rank not lower than D1 should chair a meeting to vet the BQ and PP prepared and to ensure all the checking and cross-checking procedures have been duly completed and documented. For those projects administered by the Consultants, the Consultants shall assign one of their senior managers to attend the meeting.

No tender invitation should be carried out without undergoing the above procedures. Similar review and approval procedures should also be adopted for any subsequent changes made by tender addenda, subject to the need for a formal meeting required in (d) above to be decided by the chairman.

CHAPTER 5

CONTRACT DOCUMENTS

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SYNOPSIS

This Chapter provides a handy reference to the various standard documents, forms and information that are regularly used in the preparation of contract documents for civil engineering works. In some cases, standard forms and exact wording to be included in contract documents are reproduced in the Chapter. However, where a printed version of a standard document is available or where the information is contained in a well-known document, the Chapter makes reference to such documents or source rather than reproducing them. Standard documents referred to in this Chapter should be of the latest editions of the General Conditions of Contract for Civil Engineering Works, Standard Method of Measurement for Civil Engineering Works, General Specification for Civil Engineering Works, Sub-contract Articles of Agreement and Conditions for Civil Engineering Works, Contractor Management Handbook and Construction Site Safety Manual. The information in this Chapter would also be useful in the preparation of documents for term contracts.

A contract for civil engineering construction is a very complex legal document containing several inter-related documents each of which plays an important role in defining the obligations and responsibilities of the parties concerned or in providing information on the works to be constructed. It is therefore essential that the contract documents for each contract are prepared with great care and by an experienced professional who has thorough knowledge of the works to be constructed. The documents forming a contract must be scrutinized for comprehensive coverage, accuracy and consistency with one another before tenders are invited.

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Group : 2, 5, 6

1 December 2017

Development Bureau
Technical Circular (Works) No. 7/2017

Adoption of Building Information Modelling for Capital Works Projects in Hong Kong

Scope

This Circular sets out the policy and requirements on the adoption of Building Information Modelling (BIM) technology.

2. This Circular applies to works either by in-house government staff, consultants or contractors.

Effective Date

3. This Circular takes effect on **1 January 2018.**

Effect on Existing Circulars and Circular Memoranda

4. This Circular has no effect on existing circulars.

Background

5. In its meeting in April 2013, Works Policies Coordination Committee (WPCC) endorsed the proposal to adopt an incremental strategy in using BIM in public works projects. Pilot projects with relatively complex building and/or structural works, and of different nature (such as water/sewage treatment plant, various building projects, etc.) were to be selected for trial with a view to obtaining more information on the performance of the technology in public works projects in various aspects.

6. In 2014, WPCC endorsed the proposal to promote wider use of BIM in different stages of public works projects of any nature, scale or complexity and explore the use of BIM for asset management so as to enable staff of Works Departments (WDs) from senior management to frontline staff to appreciate the benefits of the technology and acquire the hands-on experience.

7. Under the endorsed proposal, WDs should continue to provide training to their staff from introductory level to advanced level for smooth delivery of pilot projects and to establish a pool of colleagues capable of building up and administering BIM models.

8. The Government is firmly committed to the promotion and adoption of BIM technology in capital works projects with a view to enhancing the design, construction, project management, asset management and improving the overall productivity of the construction industry. The 2017 Policy Address has stated that Government will actively seek to require consultants and contractors to use this modelling technology when undertaking design of major government capital works projects from 2018 onwards. This Circular sets out the details of this Policy Address initiative.

Policy

9. Capital works projects with project estimates more than **$30 Million**[1] shall use BIM technology. The policy is applicable for projects in the investigation, feasibility, planning, design or construction stages in the Capital Works Programme irrespective of the modes of delivery as detailed in the ensuing paragraphs. For entrustment works, subvented capital works projects and works that are undertaken by private parties but will be handed back to the Government for maintenance, the BIM adoption policy is covered in paragraph 16.

BIM Adoption for Government Projects

Investigation, Feasibility and Planning Stage

10. Sometimes a detail information model may not be required at the early stage of a project or has little reference value at subsequent stages. Thus the use of BIM is **optional** for projects in the investigation, feasibility study and planning stage. However WDs should critically review the project technical and information requirements, and if there is benefit of using BIM at this stage, it can be so used.

Design Stage

11. All projects to be designed under Design and Construction consultancy agreements (DC) or Investigation, Design and Construction consultancy agreements (IDC) with technical and fee proposals to be invited on or after 1 January 2018, and all in-house projects submitted in 2017 CWRAE at Cat B- status, the use of BIM technology is **mandatory**.

[1] Project estimate data recorded in the FSTB Capital Works Expenditure database.

12. Existing Cat B- projects with construction work tenders to be invited before 1 January 2019, the use of BIM is **optional** in the design stage. For other existing Cat B- projects, the use of BIM in the design stage is **mandatory**[2].

Construction Stage

13. All construction works contracts with tender to be invited on or after 1 January 2018 shall use BIM. For contracts that do not adopt BIM in the design, the use of BIM shall at least cover the requirement for an as built BIM model.

14. For the avoidance of doubt, this requirement applies also to Design-Build and Design-Build-Operate projects.

Asset Management

15. In addition to enhance productivity and reduce risks and costs of our capital works projects, BIM technology can also optimize operation and maintenance. The development of this branch of the technology is fast and handover of information models for operation and maintenance becomes standard practice. WDs should critically review their departmental asset management strategy in order to leverage the technology to enter into the digital built environment.

[2] If detail design for a project has commenced and change to adopt BIM uses may causes substantial delay, WDs may apply exemption from Heads of WDs.

BIM Adoption for Entrustment Projects, Subvented Projects and Private Projects to be Handed Over to Government

16. This BIM technology adoption policy is also applicable to entrusted project within Government departments. For projects entrusted to organizations outside Government (Airport Authority, MTR Corporation Limited, private developer etc.), subvented projects and private projects to be handed over to Government, the scope of BIM implementation should be aligned with the BIM adoption/implementation policy of the organisations. However, WDs shall encourage these organizations to use BIM technology as far as practicable.

Mandatory BIM Uses

17. A number of mature BIM uses have been identified and a list of mandatory and optional BIM uses in **Annex 1** should be implemented in capital works projects. To keep up with the fast BIM technology development, the BIM uses in works projects will be reviewed and updated from time to time.

Exemption

18. On exceptional grounds such as serious contractual implications, substantial impact on project delivery or projects of little technical content[3], the Heads of WDs may exempt the adoption of BIM technology as required under this Circular. WDs shall appropriately keep records on the approvals for exemptions with detailed justifications.

[3] Project's main scope of work has little technical content such as operation of public fill banks, paving and painting works, slope maintenance works, greening works, maintenance works under term contracts and procurement of vehicles.

Contractual Requirements

19. Contractual provisions adopted in pilot projects may continue to be used until advised otherwise. To cater for cases where small consultant or contractor firms may not be very well equipped with BIM expertise, provisions will be stipulated in the agreement or contract allowing the consultant or contractor to engage BIM sub-consultant or sub-contractor to assist them. The agreement or contract shall also contain terms requiring the consultant or contractor to train up a number of staff of the employer/their staff and their sub-consultant/sub-contractor staff during the assignment. As the Construction Industry Council (CIC) has reserved a total of about 380 BIM training places of different levels[4] in year 2018 for WDs to allocate to their consultants/contractors successfully awarded the Agreements/Contracts, the additional training requirement should also be included. Sample provisions for these requirements are enclosed in **Annex 2** for reference. CIC training provisions for 2019 and onwards will be updated separately by Circular Memoranda.

Enquiries

20. Enquiries on this Circular should be addressed to Chief Assistant Secretary (Works) 4.

(C K HON)
Permanent Secretary for Development (Works)

[4] The CIC will provide BIM basic modelling courses and BIM discipline-specific advanced modelling courses of about 380 training places in 2018. These training places will be allocated by WDs free of charge to a limited number of staff of the consultants and contractors and to be approved by the Director/Engineer.

Annex 1

BIM Uses

1. Works Departments shall adopt the stipulated mandatory BIM uses in respective stages of a project. Works Departments may adopt the optional BIM uses as and when necessary.

	BIM Use	**Investigation, Feasibility and Planning**	**Design**	**Construction**
1	Design Authoring	O	M	M
2	Design Reviews	O	M	M
3	Existing Conditions Modelling	O	O	M
4	Site Analysis	O	M	
5	3D Coordination		M	M
6	Cost Estimation	O	O	O
7	Engineering Analysis		O	O
8	Facility Energy Analysis		O	O
9	Sustainability Evaluation	O	O	O
10	Space Programming	O	O	
11	Phase Planning (4D Modelling)		O	M
12	Digital Fabrication		O	O
13	Site Utilization Planning			O
14	3D Control and Planning			O
15	As-Built Modelling			M
16	Project Systems Analysis			O
17	Maintenance Scheduling			O
18	Space Management and Tracking			O
19	Asset Management			O
20	Drawing Generation (Drawing Production)		M	M

Legend:

M – Mandatory BIM Use for the mentioned stage, including that carried forward from previous stage.

O – Optional BIM Use

2. Explanations of each of the above BIM use shall be referred to the latest version of the BIM Project Execution Plan of the Construction Industry Council or that of the Penn State (http://bim.psu.edu/uses/), if it cannot be found in the former document.

Annex 2

Organization, Training and Sub-contracting Requirements

BIM Team Structure

The Consultant/Contractor* shall propose and establish a BIM team that are appropriate for the scale and complexity of the Assignment/Contract*, highlighting key roles and responsibilities of each position, within [14] calendar days after commencement of Assignment/Contract*. The team shall be led by a BIM team leader who holds a key position in the Consultant/Contractor's* project team structure. The BIM team shall include sufficient and technically competent resources in order to complete all BIM tasks and deliverables specified in the Assignment/Contract*. Notwithstanding, the BIM team shall at least comprise [3] staff well trained in relevant disciplines. The BIM team leader shall either have corporate membership of an appropriate professional institution or shall have [5] years relevant post-qualification experience plus university degree or equivalent in an appropriate engineering discipline. The BIM team leader shall have a minimum of [3] years of practical experience in management of BIM projects or a professional member of the Hong Kong Institute of Building Information Modelling (HKIBIM) or equivalent. The disciplinary BIM coordinators shall have [3] years related construction project experience. The coordinators shall have a minimum of [1] year practical experience in BIM projects or an associate member of the HKIBIM or equivalent.

The BIM team leader shall be responsible for the overall BIM managements and process controls. The BIM team leader shall delegate BIM coordinator(s) for handling BIM tasks such as BIM modelling, collaborate information exchange amongst related stakeholders and maintain a drawing/information register to record the information to be incorporated in the model(s).

For any proposed staff movement or change in the BIM team, the Consultant/Contractor* shall provide a CV of the replacement personnel together with evidence of equivalent BIM competency to the Director/Engineer* within [7] calendar days for approval.

BIM Sub-Consultant/Sub-Contractor*

If the Consultant/Contractor* does not have the necessary expertise, the Consultant/Contractor* shall engage a sub-consultant/sub-contractor* with suitable expertise for the performance of BIM related tasks. If the Consultant/Contractor* intends to or is required to sub-contracts the BIM works to a BIM sub-consultant/sub-contractor*, the Consultant/Contractor* shall obtain approval from the Director/Engineer* before formal engagement and shall indicate this clearly in the project team structure. The positions of the staff members from the BIM sub-consultant/sub-contractor* shall also be indicated clearly in the BIM team organisation structure.

Additional BIM Training Requirements for Courses Offered by the Construction Industry Council

The Consultant/Contractor* is required to nominate his staff or sub-consultant/cub-contractor*'s staff to attend, within [6] months from the commencement of the Assignment/Contract*, training courses organised by the Construction Industry Council as follows:

- [4]#staff members to attend the Building Information Modelling Basic Modelling Courses and
- [4]#staff members to attend the Building Information Modelling discipline-specific Advanced Modelling Courses.

The Consultant/Contractor* shall liaise with the Construction Industry Council for the schedule of the above courses and shall obtain necessary approval of the nomination from the Director/Engineer* before the commencement of the training courses.

* Delete as appropriate

\# Number will depend on the actual number of assignments/contracts awarded in a year and is subject to change.

CONSULTANTS PERFORMANCE REPORT

Part II - Detailed Assessment of Performance

Item	Aspects of Performance	VG	G	S	P	VP	NA	Max. Score	Applicable Max. Score	Consultant's Score	Weighted Score
A.	**Stage Assessment**										
1	**Feasibility / Investigation Stage (EACSB) or Workstage 1/2 (AACSB)**										
1.1	**Recommendations**										
(a)	***Quality of recommendation***	○	○	○	○	○	◉	**8**	**0**	**0**	
(b)	Technical consideration	○	○	○	○	○	◉	**7**	**0**	**0**	
(c)	Consideration of environmental friendliness, energy efficiency, health & safety, and life cycle costs	○	○	○	○	○	◉	**5**	**0**	**0**	
(d)	Consideration of alternatives and innovative ideas	○	○	○	○	○	◉	**7**	**0**	**0**	
1.2	Consultation and public engagement	○	○	○	○	○	◉	**4**	**0**	**0**	
1.3	Cost estimates & quality of reports	○	○	○	○	○	◉	**9**	**0**	**0**	
	Stage period : [ ] **month(s)**							**40**	**0**	**0**	**0**
2	**Design and Contract Stage (EACSB) or Workstage 3/4 (AACSB)**										
2.1	**Design solutions**										
(a)	***Quality of design***	○	○	○	○	○	◉	**8**	**0**	**0**	
(b)	Technical consideration	○	○	○	○	○	◉	**6**	**0**	**0**	
(c)	Consideration of environmental friendliness, energy efficiency, health & safety, and life cycle costs	○	○	○	○	○	◉	**5**	**0**	**0**	
(d)	Consideration of alternatives and innovative ideas	○	○	○	○	○	◉	**3**	**0**	**0**	
2.2	Consultation and public engagement	○	○	○	○	○	◉	**3**	**0**	**0**	
2.3	Cost estimates & quality of tender documents/drawings (Note 5)	○	○	○	○	○	◉	**10**	**0**	**0**	
2.4	Tender assessment	○	○	○	○	○	◉	**5**	**0**	**0**	
	Stage period : [ ] **month(s)**							**40**	**0**	**0**	**0**
3	**Construction Stage (EACSB) or Workstage 5/6 (AACSB)**										
3.1	***Supervision of contractors***	○	○	○	○	○	◉	**10**	**0**	**0**	
3.2	Administration of contracts	○	○	○	○	○	◉	**6**	**0**	**0**	
3.3	Recruitment, supervision and administration of site staff	○	○	○	○	○	◉	**6**	**0**	**0**	
3.4	Financial control of contracts	○	○	○	○	○	◉	**5**	**0**	**0**	
3.5	Certification of interim payments/final accounts	○	○	○	○	○	◉	**5**	**0**	**0**	
3.6	Handling of contractor's claims	○	○	○	○	○	◉	**4**	**0**	**0**	
3.7	Provision of record drawings/manuals/other records	○	○	○	○	○	◉	**4**	**0**	**0**	
	Stage period : [ ] **month(s)**							**40**	**0**	**0**	**0**

Consultation materials	Consultation materials including presentation materials, models, animation, drawings, plans and figures which are legible, appealing to the readers, allowing the readers to visualize conceptual schemes proposed and in layman's terms which are also suitable for the general public

The assessment should be based on the consultants' performance in the process of consultation and public engagement, i.e. whether the consultant has diligently considered all stakeholders' views and come up with balanced recommendations/design solutions. The assessment on consultants' performance should not be based only on the end results.

(c) Cost estimates & quality of tender documents/drawings (*)[1]

Criteria	Description
Cost estimates	Comprehensive, realistic, up-to-date and accurate (excluding factors outside consultants' control) with sufficient details to support the recommendations & deliverables including any cost reduction and expenditure levelling
Contract arrangements	Select the most suitable contract packaging arrangements and types of contract for the works
Consultation	Consult and incorporate as appropriate comments from authorities, government departments and stakeholders
Quality	Contract documents and drawings which are complete, adequate and comprehensive for the works
Timeliness	Submit contract documents in time to meet the construction programme

(*)[1] Become a critical assessment item for Quantity Surveying consultancies.

(d) Tender assessment

Criteria	Description
Compliance	Comply with statutory requirements, tender assessment procedures, etc.
Technical support	Adequate technical support in facilitating a thorough tender assessment
Evaluation and recommendations	Thorough evaluation and sound recommendations with due regard to all relevant factors and considerations

CHAPTER 5

CONTRACT DOCUMENTS

The parts of the PAH shown in blue and bold should only be updated by Works Branch of Development Bureau.

Rev	Issue Date	Amendment Incorporated
First Issue	December 2016	NA
1	27 February 2017	Amd No. 1/2017
2	25 August 2017	Amd No. 3/2017
3	19 December 2017	Amd No. 5/2017
4	16 July 2017	Amd No. 2/2018

9. SPECIAL TOPICS

9.1 MULTI-CONTRACT AND SINGLE CONTRACT ARRANGEMENTS

Where the required financial and manpower resources are available, the contracts of a multi-contract project are normally carried out in parallel to enable the completion of the project in the shortest possible time.

Some of the issues that need to be considered and provided for in a multi-contract project would include:

(a) Site access,

(b) Facilities (provided by the Contractor) for other contractors,

(c) Works areas,

(d) Staged possession and handing over of site, and

(e) Consequence of delay in any one of the contracts on other contracts.

Suitable provisions should be made in the constituent contracts to cover these and other relevant issues. Such provisions should be made in the SCC, PS and Drawings, where appropriate.

For projects (i) involving sequential handling-over of the project site among contractors of concurrent contracts and/or (ii) in which the work progress of one contractor is dependent on that of another contractor in the same project, the compatibility of the multi-contract arrangement with the preferred contract forms of the project should be carefully assessed. For instance, before adopting the arrangement of implementing a conventional contract for civil works and a design-and-build contract for E&M works at the same time, the pros and cons of such arrangement should be thoroughly compared with that of combining the civil and the E&M works into a single contract.

For projects involving substantial underground works, and hence with a relatively high degree of uncertainty, consideration should be given to reducing risks by carrying out works at different locations under separate contracts to be undertaken by different contractors. However, before deciding on adopting this approach, its benefits would have to be balanced against possible demerits such as the reduction in economy of scale and the need for greater management effort to deal with contract interface problems.

For time-critical projects, whilst it may be desirable to adopt advance contracts to capture programming benefits, demerits of such arrangement such as introduction of additional contract interfaces should be carefully assessed (also see Paragraph 9.19 on time-critical projects).

It is important that all the merits and demerits of using multi-contract arrangement in a project should be thoroughly assessed before deciding on the most appropriate number and form of contracts in a project.

For multi-contract projects, those parts of tender documents delineating the split of the works, particularly the drawings and bills of quantities, should be carefully checked to ensure consistency and that there is no omission or duplication of works at the interface.

9.2 COMPLETION IN SECTIONS

For contracts to be completed in Sections, the tender documents, i.e. the Form of Tender, SCC, PS and Drawings, where appropriate, should explicitly define the extent of the various Sections and their respective time for completion. Separate amounts of liquidated damages and minimum amounts of liquidated damages, if any, should be set for each Section of the Works in the Appendix to the Form of Tender.

Each Section should preferably be a self-contained package of work. Great care should be taken in defining the extent of each Section to avoid any possibility of ambiguity. There should be no overlapping between Sections and all the Sections should add up to be the Works.

9.3 CONTRACTOR'S DESIGNS AND ALTERNATIVE DESIGNS

Departments shall invite alternative designs and specify in the tender documents the part of the Works for which alternative designs are invited in situations where there is potential for better value for money or for enhancing buildability. The justifications for not inviting tenderers to submit alternative designs should be properly documented for future reference and auditing purposes.

Departments may require tenderers to submit tenderer's design for part of the Works not covered by the Engineer/Architect's design in the following circumstances:

(a) Where the part of the Works is in a specialist or developing field;

(b) Where the part of the Works involves materials and construction methods, the design of which requires the specialist experience of contractors or suppliers;

(c) Exceptionally, where the detailed design of the part of the Works is insufficiently advanced and the completion of the Works is urgent;

(d) For piling works where several solutions are available; and

(e) For works of a short limited lifespan or temporary in nature.

For all tenders, departments shall include provisions to allow the Contractor to submit and the Employer to accept Cost Savings Designs to provide opportunities for achieving better value for money. The resultant saving in cost, if any, shall be shared between the Employer and the Contractor.

The contractual provisions to be incorporated into the tender documents for tenders inviting alternative designs and tenders requiring tenderer's designs are given in DEVB TCW No. 3/2014. Particular attention is drawn to the following requirements:

APPENDIX 5.57 SAMPLE CHECKLIST FOR SETTING CONTRACT PERIOD FOR MAJOR PUBLIC WORKS CONTRACTS

Department: _____ Date: _____
Contract No.: _____
Contract Title:: _____

A. Comparison with Reference Contracts

	Pretender Estimate	Proposed Contract Period: (months)	Contract Form
This contract			

Reference Contracts	Awarded Contract Sum:	Final Contract Sum	Original Contract Period: (months)	Actual / Latest Contract Period: (months)	Comparison Table in Annex
1.					
2.					
3.					

Remarks: Please refer to the Gantt Chart showing the breakdown of major works activities for details.

B. Contract Period - Time allowance for major works activities

√ / X	**Activities**	**Time allowance**
☐	Permits application	months
☐	Authorities' vetting and approval of submissions	months
☐	Critical construction activities	months
☐	Working period due to traffic / environment / other constraints	months
☐	Interfacing works by utility undertakings / others	months
☐	Testing and commissioning / defect rectification	months
☐	Other specific time-critical tasks: Please state: _____	months

C. Project Period in LegCo Submission

√ / X	**Project information**	**Time allowance**
☐	Project period stated in LegCo submission: From _____ to _____	months
☐	Programme contingency for Extension of Time (at least 2 months per year)	months
☐	Delay by other parties, e.g. site possession, interfacing works, etc	months
☐	Delay by the contractors, e.g. material and plant delivery, resources, etc	months
☐	Variation for change in design / additional works / unforeseen site conditions	months
☐	Inclement weather	months
☐	Other time allowance for employer's risks. Please state: _____	months
☐	For project with multiple contracts, check if project period stated in LegCo submission (e.g. PWSC paper) will be extended due to this contract? If yes, please state extended project completion date: _____	

D. Endorsement

Prepared by: (Professional)	Checked by: (Senior Professional)	Endorsed by: (D1 rank officer)
Date:	Date:	Date:

Guideline for Completing Checklist For Setting Contract Period for Major Public Works Contracts

1. This checklist is intended to give a summary of time allowance for critical activities and programme contingencies for a major public works contract of a Cat A project under public works programme. It is not only intended to provide a structured and aligned approach to assist project officers in devising the overall contract / project period but also enable the project leaders to take a quick check on the reasonableness of the time for construction.

2. The checklist is designed for major capital works contracts. Maintenance term contracts, service contracts, works contract under Cat D project and other entrusted and subvented works contracts are not applicable.

3. Project officers could add / delete items in Parts B and C of the checklist to suit particular circumstances of the contract.

4. The planned works programme in the form of a Gantt Chart shall be enclosed with the checklist.

5. For **Part A**, a systematic comparison with relevant and comparable past contracts is useful in assessing the reasonableness of the planned contract period. The comparison tables, which compare the contract forms, scope and quantity of works, complexity, site constraints and other peculiarities, etc of the proposed contract with the reference contracts, shall be included in the annexes.

6. For **Part B**, given some major works activities may be carried out simultaneously, the overall contract period is not necessarily the sum of time allowance for the major works activities in contract period as stated in the checklist

7. For **Part C**, the programme contingency for Extension of Time means the float between project period stated in Legislative Council (LegCo) submission and the contract period. As agreed in Works Policies Coordination Committee, a programme contingency of at least 2 months per year shall be allowed in the project period for public works projects. If the proposed works contract is one of the multiple works contracts under a public works project, the project officers shall check whether the project period stated in the LegCo submission will be expired due to this contract. If affirmative, the extended project completion date shall be stated.

8. For **Part D**, project officers shall complete the checklist and seek D1 officer's endorsement prior to inviting tender. Amd No. 2/2018