

Reference Design for the Site Formation cum Marine Works

Explanatory Notes

1 Introduction

1.1 The scope of the Reference Design for the Site Formation cum Marine Works includes:

- (a) the Edge Structures;
- (b) the Northern Transition Edge Structures and the Southern Transition Edge Structures;
- (c) dredging works;
- (d) aids to navigation; and
- (e) relocation of existing marine facilities including Government Mooring Buoys (GMBs) and reconfiguration of Eastern Quarantine & Immigration Anchorage (EQIA).

1.2 In addition, an assessment has been carried out on the requirements of the Apron Facilities to facilitate the development of the subject Reference Design.

2 Design Standards

2.1 The Reference Design has been prepared with reference to the recommendations of the following codes of practice and standards:

- (a) the Building Ordinance and associated regulations and practice notes;
- (b) Code of Practice for the Structural Use of Concrete by Buildings Department;
- (c) Code of Practice for the Structural Use of Steel by Buildings Department;
- (d) Code of Practice for Foundations by Buildings Department;
- (e) Code of Practice for Precast Concrete Construction by Buildings Department;
- (f) Port Works Design Manual Part 1 – General Design Considerations for Marine Works by Civil Engineering Department (now Civil Engineering and Development Department);
- (g) Port Works Design Manual Part 2 – Guide to Design of Piers and Dolphins by Civil Engineering Department (now Civil Engineering and Development Department);
- (h) Port Works Design Manual Part 4 – Guide to Design of Seawalls and Breakwaters by Civil Engineering Department (now Civil Engineering and Development Department);
- (i) Structures Design Manual for Highways and Railways by Highways Department;
- (j) Geoguide 1: Guide to Retaining Wall Design;
- (k) Geoguide 2: Guide to Site Investigation;
- (l) Geoguide 3: Guide to Rock and Soil Descriptions;
- (m) GEO Publication No. 1/93 - Review of Granular and Geotextile Filters;
- (n) GEO Publication No. 1/2006 - Foundation Design and Construction;

- (o) GEO Ground Investigation Note No. 1/2005;
- (p) GEO Report No. 8 - Foundation Design of Caissons on Granitic and Volcanic Rocks;
- (q) GEO Report No. 21 - Horizontal Subgrade Reaction for Cantilevered Retaining Wall Analysis;
- (r) Stormwater Drainage Manual by Drainage Services Department;
- (s) Sewerage Manual by Drainage Services Department;
- (t) Environmental Protection Department's Practice Note for Professional Persons ProPECC PN 5/93;
- (u) Regulation 10 of the International Convention for the Prevention of Pollution from Ships Annex IV : Regulations for the Prevention of Pollution by Sewage from Ships;
- (v) Manual on Use of Rock in Coastal and Shoreline Engineering, CIRIA/CUR 1991;
- (w) Shore Protection Manual by US Army Corps of Engineers;
- (x) Coastal Engineering Manual by US Army Corps of Engineers;
- (y) BS 5950 : Part 1: Structural use of steelwork in building;
- (z) BS 6349: Maritime Structures;
- (aa) BS 8004 : Code of Practice for Foundations;
- (bb) BS 8110 : The Structural Use of Concrete; and
- (cc) other design codes and standards as appropriate.

2.2 The minimum design life of all marine structures adopted in this Reference Design is 50 years. For marine steel piles, a corrosion rate of 0.1mm per year has been assumed to reflect the anticipated ongoing use of this key facility in the long term.

2.3 All marine structures are designed to withstand environmental loads corresponding to a return period of 100 years in accordance with Clause 5.2.2 of Port Works Design Manual Part 1.

2.4 The Edge Structures, the Northern Transition Edge Structures and the Southern Transition Edge Structures have been designed to cater for dead loads, superimposed dead loads and live loads acting, as appropriate, on these Structures and the land retained by them. Key superimposed dead loads and live loads considered are listed in the table below:

Structures	Superimposed Dead Loads	Live Loads	Others
Edge Structures	due to apron facilities	40 kN/m ² and those due to apron facilities	localized effects of 45 units of type HB loading; load effects induced by planned developments on adjoining land
Southern Transition Edge Structures	25 kN/m ² (maximum)	20 kN/m ²	localized effects of landing and take-off of a helicopter (weight = 17,000kg); load effects induced by planned developments on adjoining land
Northern Transition Edge Structures	20 kN/m ²	20 kN/m ²	load effects induced by planned developments on adjoining land

2.5 The Edge Structures are also designed to cater for berthing of cruise vessels currently in service and those on order books as of the 3rd Quarter 2007 including but not limited to the Design Vessels as defined in the table below. Concurrent alongside berthing of two or more vessels in different combinations of vessel sizes have been considered in the design.

Type	Design Vessel 1 (Super Post-Panamax)	Design Vessel 2 (Post-Panamax)	Design Vessel 3 (Post-Panamax)	Design Vessel 4 (Panamax)	Design Vessel 5 (Panamax)
Passengers	5,400	4,000	3,000	2,000	1,100
Crew	2,000	1,500	1,200	750	250
Gross Tonnage (tonnes)	220,000	160,000	110,000	40,000	16,000
Displacement Tonnage (tonnes)	110,000	80,000	55,000	20,000	11,000
Length Overall (m)	360	350	290	180	150
Beam (m)	47	45	36	30	22
Max. Draft (m)	10	10	8.5	6.5	6

3 Edge Structures

3.1 The Edge Structures comprise a 25m wide piled quay deck structure for berthing and mooring of vessels alongside with an underlying sloping seawall and anti-scouring layer. The Edge Structures are to be implemented in two phases. The southern section (the Phase I Berth) is to be implemented first and is 450 m long whereas the Phase II Berth extends 400m further north.

3.2 The northern most 50m length of the Phase I Berth is to be used as a buffer area during the construction of the part of Edge Structures under Phase II Berth (the Phase II Edge Structures) and no berthing of vessels is allowed within this area until completion of the Phase II Edge Structures. In addition, no part of any vessel berthing at the Phase I Berth shall be within 25m of the southern end of the Phase I Berth in order to prevent the blockage of the coverage of the radar located at the southern tip of the Cruise Terminal. No vessel shall be berthed at or along the northern-most 50m seafront of the Phase II Berth.

3.3 The construction of the Edge Structures will require the removal of the existing sloping rock revetment seawall. A piled quay deck is used for providing the berthing edge for cruise vessels under the Reference Design. The Reference Design also incorporates a sloping seawall with rock revetment underlying the piled quay deck which has low wave reflection properties in compliance with the Port Works Design Manual Part 4 and provides the opportunity for substantial reuse of the existing seawall rock armour and rockfill materials. The top level of the piled quay deck is +4.2mPD at the copeline to suit the service door levels of most cruise vessels.

4 Northern Transition Edge Structures and Southern Transition Edge Structures

4.1 The Southern Transition Edge Structures includes a piled quay deck with a length of approximately 78m as part of a future heliport site. Whilst no provision for berthing and mooring of vessels alongside this structure has been allowed, the piled quay deck has been designed to resist accidental vessel loading, given its location. The Northern Transition Edge Structures includes a piled quay deck with a length of 50m which will be utilized as part of the future promenade and is also designed to resist accidental vessel loading.

4.2 The Southern Transition Edge Structures includes a sloping seawall underlying the piled quay deck which provides a navigable depth compatible with the Phase I Berth and adjacent vessel manoeuvring area, and merges into the existing sloping seawall at the southern end of the former runway.

4.3 Similarly, the Northern Transition Edge Structures includes a sloping seawall underlying the piled quay deck which provides a seabed depth compatible with the adjacent Phase II Berth and merges with the existing sloping seawall of the former runway further north.

4.4 The construction of the Southern Transition Edge Structures and the Northern Transition Edge Structures will both require the removal of the existing sloping rock revetment seawall. Under the Reference Design, the incorporation of a sloping seawall with rock revetment underlying the piled quay decks, with inherent low wave reflection properties in compliance with the Port Works Design Manual Part 4, provides further opportunity for reuse of the existing seawall rock armour and rockfill materials.

5 Dredging Works

5.1 An area has been identified to safely manoeuvre vessels approaching and departing from the Cruise Terminal berth. Dredging is to be staged to create the manoeuvring areas for the Phase I Berth and the Phase II Berth. For the Phase I Berth the manoeuvring area is positioned south of the Phase I Berth and immediately adjacent to both the Eastern Fairway boundary and the 100m wide reserve for the existing cross harbour submarine gas pipelines.

5.2 The required dredging level of the manoeuvring area (except the Fender Zone and the 50m strip along the Edge Structures) is -12mCD taking into account the following:

- (a) minimum navigable depth of water required for the manoeuvring area for vessels up to 10m draft, with sufficient underkeel clearance in accordance with Marine Department's Berthing Guidelines; and
- (b) allowance for maintenance dredging.

5.3 For the Fender Zone and the 50m strip along the Edge Structures, the required dredging level shall be -13mCD in order to allow for a long term increase in cruise vessel draft.

6 Aids to Navigation

6.1 Provision of aids to navigation is required to delineate the limit of vessel manoeuvring area.

6.2 Hong Kong adopts International Association of Marine Aids to Navigation and Lighthouse Authorities (IALA) Maritime Buoyage System (Region A). The provision of aids to navigation is subject to the local regulations and also the agreement of Marine Department.

6.3 Provisions for landside berthing lights to delineate the seaward extremities of the berth have been proposed. Such provision of landside berthing lights is subject to local regulations, including Regulation 40 of the Shipping and Port Control Regulations Cap. 313A, and also the agreement of Marine Department.

7 Relocation and Reconfiguration of Existing Marine Facilities

7.1 Relocation of the existing GMBs A43 and A17 is considered necessary to facilitate the operation of the Cruise Terminal. Similarly, reconfiguration of the existing EQIA through the relocation of an existing PHE buoy is also required. The above relocation works will be carried out by Marine Department.

8 Apron Area and Apron Facilities

8.1 According to the scheme adopted for the Reference Design, the Edge Structures will form part of the Apron Area where apron facilities will be housed. A broad assessment has been conducted to ascertain the key apron facilities and their bearing on the Reference Design. Apron facilities that have been considered include:

- (a) fender system and mooring system;
- (b) shore sewage reception facility to allow vessels to discharge sewage to the public sewerage system;
- (c) power feeder pits, electrical cable ducting and related provisions to allow for future on-shore power supply for vessels;
- (d) electricity connection points for single phase and three phase power sockets and related electrical cable ducting to be used for general maintenance;
- (e) water supply connection points and related pipes to allow potable water supply to vessels;
- (f) pit and trough system to accommodate the above facilities;
- (g) passenger gangways; and
- (h) circulation space and pick-up/drop-off points for vehicles.

8.2 Specifically, the Apron Area level has been checked to allow the passenger gangways to link the elevated walkway of the Cruise Terminal Building (which is assumed at an elevation of +14.5mPD) and the cruise vessel passenger door or main deck of elevation from +9.0mPD to +20.0mPD at a gradient of not more than 1 in 12.

9 Geotechnical Data

9.1 The Reference Design is based on soil parameters derived from the Ground Investigation (GI) data reports listed in **Tables 9.1** and **9.2** below:

Table 9.1 – Previous GI Data Reports

GIU Report No.	Report Title
3865	Borings Plan – New Airport – Kai Tak (Worked Under Messers Scott & Wilson Kirkpatrick, Kai Tak Airport)
4087	Borings – Proposed Kwun Tong Submarine Outfall
5590	EDD 9/GCO/83 Marine S.I. – Kai Tak Nullah Kowloon Bay Typhoon Shelter Q7/2/10.14
10807	GC/87/04 Marine S.I Kwun Tong Bypass Phase 2 W.O. PW7/2/21.12
19180	GE/93/06 S.I. Hong Kong International Airport, Additional Taxiway between A11 and A12. W.O. GE/93/4.70
21651	South East Kowloon Development Feasibility Study Phase I Marine Ground Investigation Factual Fieldwork Report Volume I Civil Engineering Department Contract No. GE/93/11 Ground Investigation – Marine
21651	Contract No. GE/93/11 W.O. No.:GE/93/11.53, South East Kowloon Development Feasibility Study Phase 1 Marine Ground Investigation Factual Fieldwork Report Volume 2
21659	South East Kowloon Development Feasibility Study Marine Ground Investigation Phase 1 SI (additional Works) Factual Field Report Volume I
21761	South East Kowloon Development Feasibility Study Phase 2 Marine Ground Investigation Factual Fieldwork Report Volume I
21761	Contract No. GE/95/08 W.O. No.:GE/95/08.10, South East Kowloon Development Feasibility Study Phase 2 Marine Ground Investigation Factual Fieldwork Report Volume 2
27345	Contract No. GE/95/08 W.O. No.:GE/95/08.14, South East Kowloon Development Feasibility Study Phase 3 Marine Ground Investigation Factual Fieldwork Report Volume 1
27345	Contract No. GE/95/08 W.O. No.:GE/95/08.14, South East Kowloon Development Feasibility Study Phase 3 Marine Ground Investigation Factual Fieldwork Report Volume 2
32520	Contract No. CV/99/14 Ground Investigation Works for Development near Choi Wan Road and Jordan Valley and Development at Anderson Road. Final Fieldwork Report for Site Investigation Works at Jordan Valley
35368	Contract No. GE/2001/29, W.O. No. GE/2001/29.10A, South East Kowloon Development, Kai Tak Approach Channel Reclamation, Marine Ground Investigation - Stage 1 (Factual Fieldwork Report)
44548	Works Order No. GE/2005/26.31, Agreement No. KDO 01/2006 "Site Investigation and Contamination Assessment at Remaining Area of Former Kai Tak Airport and Proposed Cruise Terminal", Geophysical Survey Work Geophysical Survey Report (Final)
44751	Works Order No. GE/2005/03.57, Agreement No. KDO 01/2006 "Site Investigation and Contamination Assessment at Remaining Area of Former Kai Tak Airport and Proposed Cruise Terminal" Final Factual Fieldwork Report

Table 9.1 – Previous GI Data Reports (Contd.)

GIU Report No.	Report Title
44898, 44899	Works Order No. GE/2005/12.12, Agreement No. KDO 01/2006 "Site Investigation and Contamination Assessment at Remaining Area of Former Kai Tak Airport and Proposed Cruise Terminal" Final Factual Fieldwork Report
44907	Works Order No. GE/2005/49.2A, Agreement No. KDO 01/2006 "Site Investigation and Contamination Assessment at Remaining Area of Former Kai Tak Airport and Proposed Cruise Terminal" Chemical Testing of Sediment (Phase A Testing) Final Report B
44909	Works Order No. GE/2005/49.2B, Agreement No. KDO 01/2006 "Site Investigation and Contamination Assessment at Remaining Area of Former Kai Tak Airport and Proposed Cruise Terminal" Chemical and Biological Testing of Sediment (Phase B Testing) Final Report A & D
45281	Works Order No. GE/2005/49.1, Agreement No. KDO 01/2006 "Site Investigation and Contamination Assessment at Remaining Area of Former Kai Tak Airport and Proposed Cruise Terminal" Laboratory Testing of Contaminated Soil and Groundwater Final Laboratory Test Report

Table 9.2 – GI Data Reports under Agreement No. 35/2006(CE)

GIU Report No.	Report Title
44864	Contract No. GE/2006/37, Kai Tak Engineering Study Advance Works G.I.W.O. No. GE/2007/03.9B, Laboratory Testing Service Order No. GE/2006/37.27 (1 Volume)
44890	G.I.W.O. No. GE/2007/03.9A , Testing Report for Agreement No. 35/2006(CE) Kai Tak Engineering Study Cruise Terminal Test Request No.: CLSOR0700028 (1 Volume)
44896, 44897	Contract No. GE/2007/03, Works Order No. GE/2007/03.9B, Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction, Advance Works Final Fieldwork Report (2 Volumes)
44913	Contract No. GE/2006/24, G.I.W.O. No. GE/2007/03.9B Kai Tak Engineering Study Cruise Terminal Laboratory Testing Service Order No. GE/2006/24.38 (1 Volume)
44914	Contract No. GE/2006/24, G.I.W.O. No. GE/2007/03.9B Kai Tak Engineering Study Advance Works Laboratory Testing Service Order No. GE/2006/24.37 (1 Volume)

Table 9.2 – GI Data Reports under Agreement No. 35/2006(CE) (Contd.)

GIU Report No.	Report Title
45244	G.I.W.O. No. GE/2007/03.9B, Testing Report for Agreement No. 35/2006(CE) Kai Tak Engineering Study Advance Works Test Request No.: CLSOR0700029 (1 Volume)
45253	G.I.W.O. No. GE/2007/03.9B, Testing Report for Agreement No. 35/2006(CE) Kai Tak Engineering Study Advance Works Test Request No.: CLSOR0700033 (1 Volume)
45254, 45255	Contract No. GE/2006/37, G.I.W.O. No. GE/2007/03.9A Kai Tak Engineering Study Cruise Terminal Laboratory Testing Service Order No. GE/2006/37.28 (2 Volumes)
45280	Contract No. GE/2005/49, Works Oder No. GE/2005/49.17 Chemical and Biological Testing of Sediment, Ambient Water and Elutriate Final Chemical Testing Report
45291, 45292	Contract No. GE/2006/24, G.I.W.O. No. GE/2007/03.9B Kai Tak Engineering Study Advance Works Laboratory Testing Schedule No. 3 Laboratory Testing Service Order No. GE/2006/24.47 (2 Volumes)
45301	Contract No. GE/2007/03, Works Order No. GE/2007/03.9A, Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction, Cruise Terminal Final Fieldwork Report (1 Volume)
45310, 45311	Contract No. GE/2007/05, G.I.W.O. No. GE/2007/28.14 Kai Tak Engineering Study Advance Works Laboratory Testing Service Order No. GE/2007/05.07 (2 Volumes)
45332	Contract No. GE/2005/28, Works Order No. GE/2005/28.14, Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction, Advance Works Outlined GI/Laboratories Testing Proposals for Advance Works Final Fieldwork Report (1 Volume)
45333	Contract No. GE/2005/28, Works Order No. GE/2005/28.14, Kai Tak Development Engineering Study cum Design and Construction of Advance Works – Investigation, Design and Construction, Advance Works Outlined GI/Laboratories Testing Proposals for Cruise Terminal Final Fieldwork Report (1 Volume)
45393	G.I.W.O. No. GE/2007/28.14, Testing Report for Agreement No. 35/2006(CE) Kai Tak Engineering Study Advance Works Test Request No.: CLSOR0700040 (1 Volume)