Particular Specification

for Building Maintenance Works in Residential Buildings

Notes

1. This Particular Specification is published by the Hong Kong Building Rehabilitation Facilitation Services Limited (HKBRFSL) (a wholly owned subsidiary of the Urban Renewal Authority) for the use of stakeholders in the field of building repair and rehabilitation.

2. This Particular Specification is developed with reference to the General Specification for Building Maintenance Works in Residential Buildings published by the Hong Kong Institute of Surveyors (HKIS GS). This Particular Specification aims to supplement or modify relevant requirements in the HKIS GS.

3. This Particular Specification should be read in conjunction with the HKIS GS. Users are also recommended to adopt and adapt this Particular Specifcation if other versions of general specifications are used.

4. The following terms shall have the same meaning and shall be interchangeable in the General Specification and this Particular Specification.

Contractor	contractor
Contract	contract
Site	site
Works	works

Disclaimer

1. This Particular Specification is for reference only. Amendments or additions in the form of other particular specification to be prepared by the Contract Administrator may be required to suit the specific requirements of individual projects. Users are recommended to consult professional about the use of this Particular Specification for their building repair and rehabilitation projects.

2. The information contained in this Particular Specification is designed to provide helpful information on the subject of building repair and rehabilitation. It is not meant to be an authoritative document replacing professional advice. The HKBRFSL does not guarantee the accuracy or reliability of any information in this Particular Specification, and shall not be liable for any loss or damages as a result of reliance on the information provided.

3. The contents of this Particular Specification will be regularly updated. Users are recommended to adopt the latest version published by the HKBRFSL, which can be downloaded from the Building Rehabilitation Platform website (www.brplatform.org.hk).

Edition / Date

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Contents

A1 Preliminaries

A1 PRELIMINARIES

A1.1 GENERAL

Replace HKIS GS Clause A1.1 11 as follows:

11 SITE SAFETY

All Ordinances and Regulations concerning safety on the Site shall be complied with. Notice board shall be erected and relevant safety guidelines and posters, emergency contacts shall be displayed prominently on the Site throughout the construction period and removed on completion.

The Contractor shall conduct risk assessment to the whole of the Site including but not limited to confined space before the commencement of the Works and submit risk assessment report to the Contract Administrator for approval.

Attendance by Registered Safety Officer and Safety Supervisor shall be provided in accordance with relevant regulations.

Sufficient safety helmets, rubber boots, safety shoes, umbrella, protective and waterproof clothing, personal protective devices such as ear mufflers and glasses and other safety equipment where appropriate shall be provided for the use of workers, the Contract Administrator, the Contract Administrator's representatives, and other authorized persons visiting the Site.

One set of the latest site supervision plan, safety manuals and relevant method statements shall be provided on the Site for the use of the Contract Administrator for the duration of the Contract.

Suitable site safety training shall be provided to all workers and supervisors periodically.

Before the commencement and at various stages of the Works, the Contractor shall arrange their site safety supervisor of the project to prepare bilingual safety awareness leaflet/notice to all building occupiers highlighting the general and particular safety issues which may affect them.

Add the following clause after HKIS GS Clause A1.1 21

22 ANTI-MOSQUITO TARGETS

Site staff shall be vigilant in eliminating potential mosquito breeding niches on the Site. Reference shall be made to the mosquito prevention and control measures uploaded in the website of the Food and Environmental Hygiene Department. Should there be a situation that warrants or in the event that the Contractor is summoned for mosquito-related offences, immediate and thorough auditing of his anti-mosquito measures shall be conducted and any necessary enhancement measures shall be proposed.

A1.4 ADMINISTRATION AND ATTENDANCE

Replace HKIS GS Clause A1.4 01 as follows:

01 INSURANCES

Before starting work on site, documentary evidence and/or policies and receipts for the insurances required by the Conditions of Contract shall be submitted to the Contract Administrator for checking and verification.

The Contractor shall secure the following types of basic insurance before the commencement of the Works:

(i) Contractors' All Risks (CAR) (including Property All Risks Insurance and Public Liability Insurance); and
(ii) Employee's Compensation Insurance (ECI).

Add the following clause after HKIS GS Clause A1.4 04

05 ATTENDANCE RECORD OF WORKERS

Attendance recording system such as attendance sheet, punch card machine, etc. to record the name of the workers and their entry and leaving time to and from the Site shall be established.

A1.5 MATERIALS AND WORKMANSHIP

Replace HKIS GS Clause A1.5 08 as follows:

08 SAMPLE OF MATERIALS

The Contractor shall, within 6 weeks after the date of issue of letter of acceptance, submit to the Contract Administrator for approval the samples of all materials proposed to be used in the Contract, unless otherwise approved by the Contract Administrator.

The Contractor shall not confirm orders of materials until approval of the samples has been obtained. Approved samples shall be kept on the Site for comparison with materials used in the Works. The Contract Administrator has the right to reject the materials if they do not tally with the samples. When there is a choice of material, colour or texture, samples shall be submitted for approval.

Replace HKIS GS Clause A1.5 11 as follows:

11 CLEANLINESS

Materials and plant shall be stored neatly, rubbish and debris shall be removed as they accumulate, and the Site and the Works shall be kept clean and tidy. The mixing of materials or any other construction activity shall not be allowed in the public areas and must be confined to the area allocated to the Contractor for such purposes.

The Contractor shall remove all rubbish, debris, construction waste generated from the Works and all unused construction materials from the Site and provide final cleaning to all work areas upon completion of the Works.

Replace HKIS GS Clause A1.5 12 paragraph 2 as follows:

12 STORAGE AND DUMPING AREAS

Any storage and dumping areas allocated shall be confined with a suitable hoarding, constructed with materials of good quality and of adequate strength and stability, with lockable doors, and maintained in good condition throughout the period of the Contract. The location of the temporary storage area shall be agreed with the Contract Administrator. All materials arising from demolition and other waste materials shall be removed from public areas, i.e. corridors, staircases, etc. to an external central storage area at the end of each working day.

The proposed location of storage and dumping areas and the proposed quantity of materials to be stored shall also be agreed with the Contract Administrator in accordance with site situation.

Add the following clauses after HKIS GS Clause A1.5 17

18 TREATMENT OF SUSPECTED UNAUTHORIZED BUILDING WORKS (UBWs)

Should suspected UBWs be discovered on the Site and their existence and required treatment are not mentioned in the Contract, the Contractor shall inform the Contract Administrator in writing. Suitable means of access shall be provided by the Contractor upon instruction from the Contract Administrator to enable inspection of the suspected UBWs by the Contract Administrator. In any case, no works related to the UBWs shall be carried out until the Contract Administrator has given a written instruction for the works.

19 PROTECTION WORKS

The following items shall be prepared and submitted by the Contractor prior to the commencement of actual works on the Site:

(i) Proper records of the conditions of all existing properties, including air conditioning units and their supporting frames, pipeworks, etc., at the works area;
(ii) Plan for any protection from damages of existing properties during the Works, for comment and approval of the Contract Administrator; and
(iii) Plan for temporary relocation or diversion of any utilities services, which will be disturbed by the Works, for approval of the Contract Administrator.

A1.6 ORGANISATION & SUPERVISION

Replace HKIS GS Clause A1.6 01 as follows:

01 WORKING HOURS

The working hours shall be as follows unless specifically required by the Contract Administrator under the Contract.

Working Hours:	Monday - Saturday	:	8:30 a.m. - 5:00 p.m.
	Holidays	:	Follows the current Government practice

Add the following clause after HKIS GS Clause A1.6 08

09 RECORD OF INSPECTION

All inspections as required under the Contract or by the Contract Administrator shall be properly recorded. These records, to be kept on site, shall include but not limited to records for:

(i) quality compliance control;
(ii) temporary works checking;
(iii) examination of work before covering up; and
(iv) approval of the Contract Administrator before further construction.

B2

Demolition / Site Clearance and Shoring

B2 DEMOLITION/SITE CLEARANCE AND SHORING

B2.1 DEMOLITION/SITE CLEARANCE

Replace HKIS GS Clause B2.1 01 as follows:

01 ORDINANCES, REGULATIONS, CODES OF PRACTICE AND PRACTICE NOTES

All relevant legislation, Codes of Practice and Practice Notes in connection with demolition works shall be complied with. Particular attention is drawn to the following:

(i) Buildings Ordinance (Cap. 123);
(ii) Noise Control Ordinance (Cap. 400);
(iii) Air Pollution Control (Amendment) Ordinance;
(iv) Building (Demolition Works) Regulations (Cap. 123C);
(v) Construction Sites (Safety) Regulations (Cap. 59I);
(vi) Building (Planning) Regulations (Cap. 123F);
(vii) Factories and Industrial Undertakings Ordinance (Cap. 59);
(viii) Factories and Industrial Undertakings (Lifting Appliances and Lifting Gear) Regulations (Cap. 59J);
(ix) Factories and Industrial Undertakings (Noise at Work) Regulations (Cap. 59T);
(x) Factories and Industrial Undertakings (Safety Officers and Safety Supervisors) Regulations (Cap. 59Z);
(xi) Air Pollution Control (Construction Dust) Regulation (Cap. 311R);
(xii) Code of Practice for Demolition of Buildings, issued by the Buildings Department;
(xiii) The British Standard Code of Practice for Demolition: BS 6187;
(xiv) The prevailing Buildings Department Practice Notes for Authorized Persons and Registered Structural Engineers; and
(xv) The prevailing Buildings Department Practice Notes for Registered Contractors.

Add HKIS GS Clause B2.1 02 (v), (vi) & (vii) as follows:

02 SURVEY

(v) Sequence of demolition works;
(vi) Precautionary measures to be taken during demolition works, especially on protection of adjacent occupied areas; and
(vii) A logistic plan indicating the location for placing construction debris, equipment and plants, showing their anticipated weight and the frequency and route of construction debris removal.

Replace HKIS GS Clause B2.1 08 as follows:

08 DRAINS IN USE

Drains and fittings still in use shall be protected and kept free of debris at all times. Any damage arising from demolition work shall be made good and left clean and in working order at completion.

Sand trap shall be provided before the final discharge point at areas with demolition works to avoid any blockage of the drainage system by construction debris. Detail of sand trap shall be submitted to the Contract Administrator for approval prior to the commencement of the demolition works.

Replace HKIS GS Clause B2.1 11 as follows:

11 PRECAUTIONARY MEASURES

When specified, the demolition works and/or alteration works shall be enclosed with closed boarding or fine mesh screen of sufficient strength to protect the adjoining areas from disturbance and falling debris, etc.

Inconvenience to occupants, adjoining owners and the public shall be as little as possible. Approved dust control methods shall be carried out to prevent dust arising from the works.

Catch fan/hoarding/covered walkway shall be provided for any demolition or major concrete repair works next to or above public passage. Detailed proposal and structural calculation of the precautionary works shall be submitted to the Contract Administrator for approval prior to their erection on the Site.

B2.2 ASBESTOS-CONTAINING MATERIALS (ACM)

Replace HKIS GS Clause B2.2 02 as follows:

02 ASBESTOS REMOVAL

Asbestos-containing materials shall be removed by an approved registered asbestos contractor prior to commencement of general demolition works to avoid contamination of debris arising from the demolitions.

Written notice shall be given to the Environmental Protection Department not less than 28 days prior to the commencement of the asbestos abatement works or works involving the use or handling of asbestos containing materials.

B3

Concrete for Minor Work and Concrete Repair

B3 CONCRETE FOR MINOR WORK AND CONCRETE REPAIR

B3.2.3 IN-SITU CONCRETE

Replace HKIS GS Clause B3.2.3 01 as follows:

01 SUBSTITUTION OF STANDARD FOR DESIGNATED MIXES

Where appropriate, Standard mix(es) to BS EN 206-1:2000 may be permitted in substitution for specified Designated mixes in accordance with BS EN 206-1:2000 in each case subject to approval.

If Standard mixes are made on site, it shall comply with BS 8000: Section 2.1, Subsections 2, 3 and 4.

When site mixing of concrete or pre-bagged concrete is proposed by the Contractor, the Contractor shall be responsible for the submission, for approval of the Contract Administrator, of proposed quality system for production and supply of structural concrete, with the contents and format stipulated in the Technical Circular (Works) Number 57/2002 issued by the Environment, Transport and Works Bureau.

B3.2.5 DESIGNED JOINTS IN IN-SITU CONCRETE

Replace HKIS GS Clause B3.2.5 02 as follows:

02 CONSTRUCTION/MOVEMENT JOINTS

Joints shall be formed accurately to detail and in locations shown on the drawings. If modifications to any joint design or location are necessary on site, revisions shall be agreed with Contract Administrator before proceeding.

Concrete shall not be allowed to enter any gaps or voids in the formwork or to render the movement joints ineffective.

Concrete shall not be allowed to impregnate or penetrate any materials used as compressible joint fillers.

Concrete shall not be placed simultaneously on both sides of movement joints.

Non-water absorbing compressible material as approved by the Contract Administrator shall be adopted as the joint filler for all newly formed expansion/movement joints.

B3.3.2 WORKMANSHIP

Replace HKIS GS Clause B3.3.2 02 as follows:

02 APPROVAL OF THE PROPOSED RMS

Notwithstanding that any RMS has been approved by the Contract Administrator, if at any time after the approval, the Contract Administrator is of the opinion that such approved RMS shall no longer comply with the Specifications due to any reasons whatsoever, the Contract Administrator shall have the right to withdraw his approval and such RMS shall not be used again under the Contract without the written consent of the Contract Administrator. Any claim due to the above withdrawal of approval shall be assessed according to the contract provisions.

When instructed by the Contract Administrator, the Contractor shall carry out the field trial tests within 7 days. The Contract Administrator shall approve or reject each RMS proposed within 35 days after the execution of the relevant field trial tests. Otherwise, the RMS shall be deemed to be approved.

Replace HKIS GS Clause B3.3.2 03 as follows:

03 THE CONTRACTOR SHALL MARK OUT THE AREAS OF REPAIR FOR THE CONTRACT ADMINISTRATOR'S APPROVAL

The Contractor shall provide and complete all necessary scaffolding or temporary working platform for the hammer tapping works and subsequent repair works. The Contractor shall identify the areas of delamination and mark out the repair areas. 14 days advance notice shall be given to the Contract Administrator for his on-site verification and confirmation.

The Contractor shall record all locations and extent of defects as identified within the common areas including external walls of buildings and submit such record for the Contract Administrator's approval prior to the commencement of respective repair works.

Apart from the areas marked out and approved by the Contract Administrator as aforesaid, no other areas shall be repaired/breakout without the written consent of the Contract Administrator.

Replace HKIS GS Clause B3.3.2 05 as follows:

05 SAMPLES FOR STANDARD OF BREAKOUT AND CLEANING

The breaking out shall be confined to the marked area and prior approval has to be obtained from the Contract Administrator for breaking out which enlarges the marked area.

When directed by the Contract Administrator, the perimeter of the marked area shall be cut back by 10 mm by saw cutting into the surface of reinforced concrete to avoid potential spread of the delamination to adjacent non-defective area and damage to the reinforced concrete layer.

Subject to the restriction and requirements shown on the Drawings, the concrete shall be hacked back, within the marked area, with light mechanical plant or hammer and chisel, to the standards as shown in Table A and to leave a gap of between 10 mm and 20 mm behind the reinforcement.

Table A - Standards for Breakout of Concrete

Option	Extent of Breakout
A	Cut back all loose or severely cracked concrete until all remaining appears solidly boned together and cannot be pried off the element by hand
B	Cut back all loose, visibly cracked or delaminated concrete and any concrete attached to heavily corroded steel.
C	Cut back concrete until the reinforcement exposed is no more corroded than light coloured light rust
D	Cut back concrete until the reinforcement exposed is uncorroded and the surrounding concrete is alkaline as indicated by an alcoholic solution of phenolphthalein used in accordance with the test method to BRE IP6/81
E	Cut back concrete until the reinforcement exposed is not corroded and all concrete within 20 mm of the bar is not contaminated by chlorides. The chloride ion content by weight of dust samples shall be determined in accordance with BS 1881
F	Cut back all concrete with honey–comb until a solidly bonded surface is exposed

Where cementitious repair materials are used, the Contractor shall ensure that the concrete is hacked back to allow a minimum of 10 mm thick repair materials. Edges at the perimeter of the patch area shall be cut back perpendicular to the concrete surfaces as directed by the Contract Administrator to avoid feather edges.

Replace HKIS GS Clause B3.3.2 07 as follows:

07 PREPARATION OF REINFORCEMENT

Replacement reinforcement shall be clean to the same standard as specified for the remaining reinforcement unless otherwise directed by the Contract Administrator.

Where the reinforcement is corroded seriously (i.e. loss of sectional area greater than 10%), it shall be replaced by new reinforcement of the same type and diameter with adequate lapped length to the remained existing reinforcement. The reinforcement shall be primed after cleaning so as to enhance protection against corrosion.

All weld slag shall be removed by hammer and chisel.

After breaking out and preparation of reinforcement, the reinforcement and concrete substrate shall be brushed with a dry brush to remove all loose dust and dirt.

Add the following clauses after HKIS GS Clause B3.3.2 16

17 HAMMER TAPPING TEST AND REPORT (APPICABLE TO PATCH REPAIR OF PLASTER/RENDER AND CONCRETE)

The Contractor shall carry out comprehensive hammer tapping test upon availability of access, with proper and safe scaffolding erected in accordance with the statutory requirements for works at high level or along external wall of the building.

(i) **Hammer Tapping Test**

(a) Conducted by an independent hammer tapping agent

In the event of an independent hammer tapping agent engaged by the Employer and instructed by the Contract Administrator to carry out the hammer tapping test to the existing surfaces of the entire internal and external common areas of the building, the Contractor shall provide necessary attendance and coordinate properly with the independent hammer tapping agent for their safe access to the works area and execution of the hammer tapping test within the period specified by the Contract Administrator.

After completion of test by the independent hammer tapping agent, the Contractor shall carry out the works as specified in paragraph B3.3.2 17(ii) as instructed by the Contract Administrator.

or

(b) Conducted by the Contractor

In the event of no independent hammer tapping agent engaged by the Employer, the Contractor shall carry out comprehensive hammer tapping test to the existing surfaces of the entire internal and external common areas of the building.

The Contractor shall submit detailed programme/schedule of the aforesaid procedures 7 days before commencement of scaffolding works for the approval of the Contract Administrator.

After completion of the hammer tapping test, the Contractor shall prepare the hammer tapping test report showing all areas of delamination identified, with location, dimension and quantity of the de-bonding plaster/render clearly marked on-site and recorded by photos showing unique reference number with building identifying code for verification and confirmation by the Contract Administrator. All records including the mark-up location plans, elevation plans and photos shall be kept properly for the submission of report.

The Contractor shall keep copy of all reports described in this section in the Contractor's site office for the Employer or Contract Administrator's inspection.

(ii) **Removal of defective plaster/render and concrete by the Contractor**

The Contractor shall remove all plaster/render within the marked areas approved by the Contract Administrator with light mechanical plant or hammer and chisel. Hammer tapping or other approved methods on the exposed concrete surface shall be carried out to confirm whether defective concrete really exists before breaking out of concrete for subsequent repair works. The Contractor shall prepare the spalling concrete report showing areas of defective concrete including cracks marked clearly on-site with dimension and unique reference number with building identifying code in accordance with the procedures of preparation of hammer tapping test report as aforesaid for subsequent verification and confirmation by the Contract Administrator. Breakout of non-defective concrete shall be strictly prohibited.

18 HAMMER TAPPING TEST AND REPORT (APPICABLE TO RE-PLASTERING/RE-RENDERING AND PATCH REPAIR OF CONCRETE)

(i) **Removal of plaster/render by the Contractor**

The Contractor shall remove all plaster/render within the works areas with light mechanical plant or hammer and chisel upon availability of access, with proper and safe scaffolding erected in accordance with the statutory requirements for works at high level or along external wall of the building. The Contractor shall submit detailed programme/schedule of the procedures of removal of plaster/render and hammer tapping test (if to be conducted by the Contractor) 7 days before commencement of scaffolding works for the approval of the Contract Administrator.

After completion of works aforementioned, the Contractor shall carry out the hammer tapping test as specified in paragraph B3.3.2 18(ii)(a) or B3.3.2 18(ii)(b) as instructed by the Contract Administrator.

(ii) **Hammer Tapping Test**

(a) Conducted by an independent hammer tapping agent

In the event of an independent hammer tapping agent engaged by the Employer, the Contract Administrator shall instruct the independent hammer tapping agent to carry out the hammer tapping test to the surfaces of the exposed concrete, and/or the surfaces of the areas with plaster/render that cannot be removed, of the entire internal and external common areas of the building. The Contractor shall provide necessary attendance and coordinate properly with the independent hammer tapping agent for their safe access to the works area and execution of the hammer tapping test within the period specified by the Contract Administrator.

or

(b) Conducted by the Contractor

In the event of no independent hammer tapping agent engaged by the Employer, the Contractor shall carry out comprehensive hammer tapping test to the surfaces of the exposed concrete, and/or the surfaces of the areas with plaster/render that cannot be removed, of the entire internal and external common areas of the building.

The Contractor shall prepare the spalling concrete report showing all areas of delamination identified, with location, dimension and quantity of the de-bonding plaster/render clearly marked on-site and recorded by photos showing unique reference number with building identifying code for verification and confirmation by the Contract Administrator. All records including the mark-up location plans, elevation plans and photos shall be kept properly for the submission of report.

The Contractor shall keep copy of all reports described in this section in the Contractor's site office for the Employer or Contract Administrator's inspection.

19 REPAIR RECORD REPORT

The Contractor shall prepare the repair record report with reference to the requirements of the hammer tapping test report. The report shall include mark-up location plans and elevation plans, photos of respective repair works with dimensions and building identifying code of different stages of each location and a summary of total repair quantity for different type of defects (e.g. patch repair and crack repairs).

20 REPAIR OF CRACKS

Before commencement of repairs to cracks, the Contractor shall submit a method statement detailing the materials and methods to be used for the approval of the Contract Administrator.

The Contractor shall adopt the permissible methods listed in Table A for rectifying cracks as appropriate according to the treatment method indicated in Table B.

Table A - Crack repair method

Concrete repair – crack repair method	Description
1	Simply seal the crack with waterproofing coatings
2	Fill the crack by brushing dry cement and moistening
3	Seal the crack with cement grout
4	Cut V-groove and fill up with concrete repair mortar
5	Fill the crack with polymer resin by gravity or injection
6	Inject epoxy resin
7	Inject epoxy resin and seal the crack with waterproof coatings

The Contractor shall carry out crack repair according to the treatment method in Table B unless otherwise instructed by the Contract Administrator.

Table B – Treatment method

Concrete repair – crack repair element	Crack width	Through/non-through crack	Repair method
Underground	≤ 0.3 mm	Through and non-through	1
	> 0.3 mm	Through and non-through	7
Slabs	≤ 0.3 mm	Non-through	2
	≤ 0.3 mm	Through	5
Slabs (Soffit only)	≤ 0.3 mm	Non-through	3
Slabs	> 0.3 mm	Non-through	3
	> 0.3 mm	Through	5 or 6
Beams	≤ 0.3 mm	Non-through	3
	≤ 0.3 mm	Through	5
	> 0.3 mm	Non-through	4
	> 0.3 mm	Through	5 or 6

Wall/columns	≤ 0.3 mm	Non-through	3
	≤ 0.3 mm	Through	5
	> 0.3 mm	Non-through	4
	> 0.3 mm	Through	5 or 6

21 SEALING OF UNPLUGGED TIE HOLES

Seal all tie holes left in walls by formwork ties and components in accordance with the manufacturer's recommendations and as approved by the Contract Administrator.

(i) Procedures for external walls:
- (a) After removal of the wall finishes, if polyvinyl chloride (PVC) tubing is found inside a tie hole and firmly attached to the external wall, it shall not be removed to avoid damage to the external wall. If the PVC tubing inside the tie hole is loosen and not firmly attached to the external wall, it shall be removed;
- (b) Drive in and secure a piece of cork of minimum 30 mm thick or of dimension approved by the Contract Administrator, to a depth of 40 mm from the external side of the wall, or from the internal side of the wall whichever it is accessible;
- (c) Where appropriate, wet thoroughly to achieve saturation and clean concrete surfaces inside the hole to remove dust and loose materials prior to applying mortar (and bond coat if required by the mortar manufacturer);
- (d) Using the cork as a backing, apply and completely fill the hole ends by pre-bagged non-shrink cementitious mortar approved by the Contract Administrator; and
- (e) Cure the mortar in accordance with the mortar manufacturer's recommendations.

(ii) Procedures for internal walls:
- (a) After removal of the wall finishes, if PVC tubing is found inside a tie hole and firmly attached to the internal wall, it shall not be removed to avoid damage to the internal wall. If the PVC tubing inside the tie hole is loosen and not firmly attached to the internal wall, it shall be removed;
- (b) Where appropriate, wet thoroughly to achieve saturation and clean concrete surfaces inside the hole to remove dust and loose materials prior to applying mortar (and bond coat if required by the mortar manufacturer);
- (c) Apply and completely fill the hole by pre-bagged non-shrink cementitious mortar approved by the Contract Administrator; and
- (d) Cure the mortar in accordance with the manufacturer's recommendations.

Replace HKIS GS Clause B3.3.3 01-08 as follows:

B3.3.3 QUALITY TEST

01 TESTS ON PATCH REPAIR

(i) Pull-off test (adhesion strength)
After completion of patch repair, pull-off test shall be carried out by a Hong Kong Laboratory Accreditation Scheme (HOKLAS) laboratory at 7 days after repair as follows:

- (a) The bond between the repair mortar and the concrete substrate, aided by any bond coat, shall be sufficiently strong so that pull-off test fracture shall be at least half in the concrete substrate.
- (b) The repair area shall be cored to produce a core containing the full thickness of the repair and well into the concrete substrate. The coring operation shall minimize damage to the repair material and the concrete substrate.
- (c) A suitable metal plate shall be glued to the cored surface and a shallow core shall be drilled perpendicularly into the cored surface. Such attachment shall be pulled with increasing tensile force using a specially calibrated device until failure occurs. The force needed to cause failure shall be recorded and reported. The failure surface shall be examined and the mode of failure shall be reported as either adhesive (at the concrete/repair mortar interface) or cohesive (within the concrete substrate or repair

mortar). Where both forms of failure occur in a core, an estimate of the percentage of each shall be made. The core shall be immediately colour photographed to show the core and failure surface in close up against a contrasting background all to the approval of the Contract Administrator.

(d) The proposed wall adhesive used to glue the metal plate to the cored surface as described in item (c) above shall be able to meet the minimum standard of performance (adhesion strength of 0.5 N/mm^2 minimum for concrete/rendering interface) after application on the Site. Such performance shall be proven by pull-off tests to be conducted on the Site by the HOKLAS laboratory in accordance with an endorsed procedure with reference to the relevant BS standards. All test results shall be presented in HOKLAS endorsed tests report.

(e) Pull-off tests shall be carried out at a rate of one per 25 m² of patch repair surface area, in positions selected by the Contract Administrator to check compliance with the specification.

(f) If any pull-off test fails, the Contract Administrator may order further tests in accordance with the following formula:
Number of further tests = (n² - 2n + 3)
Where n = total number of unsuccessful tests.
Should any of the pull-off tests fail, the formula will be re-applied until all tests are successful.

(g) All further tests and subsequent reinstatement works regardless of the results shall be at the Contractor's own expense and without time extension.

(h) If the pull-off tests fail to meet the specification after further pull-off tests, the whole 25 m² of patch repair area represented by the test shall be deemed not to comply with the specification. All failed patch repair areas are to be redone by the Contractor at their own costs and supervised by the Contract Administrator.

(ii) Open-up inspection

(a) When directed by the Contract Administrator, open-up inspection shall be carried out by the Contractor at the rate of one per 25m^2 of patch repair surface area in positions selected by the Contract Administrator to check compliance with the specification.

(b) If any open-up inspection fails, the Contract Administrator may order further open-up inspections, the number of which is calculated according to the following formula:
Number of further tests = (n² - 2n + 3)
Where n = total number of unsuccessful tests.
Should any of the open-up inspections fail, the formula will be re-applied until all tests are successful.

(c) All further open-up inspections and subsequent reinstatement regardless of the result of the inspection shall be at the Contractor's own expense and without time extension.

02 TESTS ON RECASTING

Rebound hammer test or other suitable proof tests as instructed by the Contract Administrator shall be carried out to ascertain the quality of the recast concrete works.

Add the following clauses after HKIS GS Clause B3.3.3

B3.3.4 TESTING OF STEEL REINFORCEMENT

For replacement of steel reinforcement, Construction Standard CS2, PNAP APP45 and Code of Practice for Mandatory Building Inspection Scheme and Mandatory Window Inspection Scheme of Buildings Department shall be followed for verification tests of steel reinforcement irrespective of the quantity of new steel reinforcement used. The Contractor shall provide the mill certificate and provide report for "purchaser's test" as specified in Construction Standard CS2 if directed by the Contract Administrator.

B4

Brickwork and Blockwork

B4 BRICKWORK AND BLOCKWORK

B4.1 MATERIALS

Replace HKIS GS Clause B4.1 06 as follows:

06 SAMPLES AND SUBMITTALS

Prior to the commencement of site works, the following documents shall be submitted for the review and approval of the Contract Administrator:

(i) Samples of each type of bricks or blocks and associated accessories shall be submitted for obtaining approval by the Contract Administrator before placing orders with suppliers;
(ii) Compression test report for the bricks/blocks to demonstrate compliance with technical specifications;
(iii) Design and supporting method of lintel beam for various types of opening size; and
(iv) Proposed method statement of sample checking and installation.

Replace HKIS GS Clause B4.1 07 as follows:

07 BRICKWORK AND BLOCKWORK REINFORCEMENT

Expanded metal or mild steel rods of specific size, galvanized or painted with 2 coats of bituminous paint shall be provided as brickwork and blockwork reinforcement.

Galvanized expanded metal strip or other materials to the Contract Administrator's approval, shall be provided to brickwork and blockwork at every 3 courses of the following widths:

(i) For 100 mm – 105 mm walls, 60 mm; and
(ii) For 299 mm – 225 mm walls, 110 mm.

Different sheet of expanded metal strip shall be overlapped with each other by minimum 225 mm.

Add HKIS GS Clause B4.1 15 (iii) as follows:

15 USE OF MORTARS

(iii) Mortar shall be used within one hour of discharge from the mixer.

Add the following clauses after HKIS GS Clause B4.1 15

16 GYPSUM PANELS

(i) Made of solid gypsum;
(ii) Strength and robust test up to heavy duty grade of BS 5234-1;
(iii) Compressive Strength test up to BS EN 772-1;
(iv) Compressive strength: not less than 5 MPa;
(v) Dimensional tolerance in width of panel: ±1 mm for each panel; and
(vi) Installation in accordance with supplier's recommendations.

17 RECYCLED GLASS BRICKS

(i) Concrete grade:
  (a) Blocks used in footways and cycle tracks: Grade 30/10; and
  (b) Blocks used in areas subject to vehicular access: Grade 45/10.
(ii) Aggregates:
  (a) The aggregates shall contain not less than 70 % by weight of recycled aggregates;

(b) The recycled fine aggregates shall constitute not less than 40 % by weight of the total recycled aggregates. The recycled glass cullet shall be included as recycled fine aggregates and shall constitute 20 % to 25 % by weight of the total aggregates;
(c) The recycled glass cullet shall all pass a 3.35 mm BS test sieve and shall be integrated with other constituents in such a manner that there is no sharp edge nor burr exposed to put the pedestrian at risk when the paving unit surface is eroded;
(d) Coarse recycled aggregates shall be retained on a 5 mm BS test sieve;
(e) Fine recycled aggregates shall all pass a 5 mm BS test sieve;
(f) The recycled aggregates shall contain no more than 0.5 % of wood and other materials less dense than water by using the manual sorting test method in accordance with BRE Digest 433;
(g) The recycled aggregates shall contain no more than 1 % of other foreign materials (e.g. metals, plastics, clay lumps, asphalt and tar etc.) by using the manual sorting test method in accordance with BRE Digest 433;
(h) The recycled aggregates, except recycled glass cullet, shall be recycled from inert construction and demolition materials sourced from the public fill banks managed by the Civil Engineering and Development Department or other sources approved by the Contract Administrator.
(i) The recycled glass cullet shall be produced from glass waste generated from local sources approved by the Contract Administrator; and
(j) The nominal maximum aggregate size for concrete in precast units shall be 10 mm.

(iii) Dimensions:
(a) Size: as shown on submission drawings approved by the Contract Administrator; and
(b) Chamfers: not to exceed 5 mm unless otherwise approved by the Contract Administrator.

(iv) Shape: Rectangular;

(v) Vertical nibs:
(a) Provide at least one nib on one of the stretcher faces and one nib on one of the header faces;
(b) Depth of nib to be less than the width of the joint; and
(c) Do not include nibs into working dimensions.

(vi) Colour:
(a) As shown on submission drawings and consistent over the paved area, stable and fade resistant under any outdoor climate situations; and
(b) Colour pigments for Grade A paving units shall comply with the following requirements unless otherwise approved by the Contract Administrator:
(1) To BS EN 12878;
(2) Be UV-stable; and
(3) Be composed of iron oxides, chrome oxide, titanium oxide or cobalt aluminum oxide.

(vii) Abrasion resistance for Grade A paving units: not more than 23 mm to BS EN 1338;

(viii) Each precast unit shall bear an inscribed mark for the identification purpose that the unit contains recycled glass cullet of 20 % to 25 % by weight of the total aggregates;

(ix) Notwithstanding sub-clause (ii) above,
(a) the Contractor may propose for the Contract Administrator's approval the use of recycled fine aggregates without recycled glass cullet in the concrete where there is shortage of supply of recycled glass cullet; and/or
(b) the Contractor may propose for the Contract Administrator's approval the use of virgin aggregates in lieu of recycled aggregates in the concrete when there is a shortage of supply of recycled aggregates.

(x) Notwithstanding B4.1.17(ii), subject to the Contract Administrator's approval, the Contractor may use recycled fine aggregates without recycled glass cullet in the concrete for the minor repair works to existing concrete pavers;

(xi) Meeting the test requirements specified; and

(xii) For tactile blocks, slip-resistant tested to ASTM C1028-07e1 of minimum coefficient of friction 0.67 under wet condition.

18 FIRE BRICKS

Fire bricks to be fire clay refractory bricks of specified class of the best quality, light in colour, uniform in texture and of standard sizes to BS 3056-1. Testing, if specified, shall be to BS 1902-3.13, ISO 12678-2.

19 AUTOCLAVED AERATED CONCRETE BLOCKS

Autoclaved aerated concrete (AAC) blocks shall be generally to BS EN 771-4 unless otherwise specified as below:

(i) AAC blocks shall be maximum 750 kg/m³ dry density to BS EN 678 or BS EN 772-13 and minimum 3.5 MPa mean compressive strength to BS EN 679 or BS EN 772-1 and minimum two hours fire resistance period to BS 476-22; and

(ii) AAC mortar for bonding AAC blocks shall, subject to the approval of the Contract Administrator, be either:
  (a) Lightweight mortar with maximum 1300 kg/m³ dry hardened density; or
  (b) Thin layer mortar with maximum 3 mm total thickness, unless otherwise specified; or
  (c) Proprietary material as recommended by manufacturer.

B4.2 WORKMANSHIP

Replace GS Clause B4.2 08 as follows:

08 TOLERANCES

Brickwork and blockwork shall be built to comply with the following tolerances:

Position on plan	15 mm
Length	15 mm
Height	10 mm
Level of bed joints (in any 5 m)	10 mm
Straightness (in any 5 m)	15 mm
Verticality (in any 3 m)	10 mm

If the length or width of wall is greater than 2 m, the alignment of wall shall be checked by wiring or laser beam. If the length or height of wall is equal to or less than 2 m, the alignment shall be checked by edge rule.

Replace HKIS GS Clause B4.2 10 as follows:

10 TIES TO CONCRETE STRUCTURE

At junctions of walls with concrete structure, tie shall be cast in, cut and pin or shot fire to concrete at 320 mm centres vertically to project 250 mm into brick or block walls.

For brickwork or blockwork built against the face of concrete structure, ties shall be cast in or cut and pin to concrete at 900 mm centres horizontally, 300 mm centres vertically and staggered, to project 75 mm into brick or block walls.

Double layer of ties shall be provided for wall thickness over 150 mm.

Replace HKIS GS Clause B4.2 14 as follows:

14 BUILDING IN

Lintels shall be built in and solid door and window frames and the like shall be bedded with mortar similar to that of adjacent walls.

All precast lintel beams shall be free of crack and properly and securely stored on the Site prior to installation.

Precast lintels shall be in concrete Grade 35/20, unless otherwise specified.

Except where unusual or exceptional loading conditions apply or specified elsewhere, lintels shall be constructed as shown below:

Lintels		
Clear span (metres)	**Depth of lintel (mm)**	**Number and diameter of mild steel bars per 105 mm (or part) in width**
0 - 1	150	one 12 mm
1 – 2	225	one 16 mm
2 - 3	300	one 20 mm

No timber shall be built into the thickness of any brick, concrete or masonry walls.

Replace HKIS GS Clause B4.2 15 as follows:

15 HOLES AND CHASES

Chases, holes, recesses and reveals shall be left, formed or cut in walls to receive frames, rainwater or other pipes, conduits, electric cables, sleeve and the like as required and subsequently be made good with mortar similar to that of adjacent walls.

Concealed conduit within brick/block wall shall run vertically and horizontally and not diagonally to minimize cutting of bricks.

Where blockwork and brickwork bonding is discontinued by conduit installation, 2 layers of tie rods with bitumen paint applied shall be installed at every 3 courses of brick works, projecting 250 mm on both sides of the point of discontinuity, so as to maintain the strength and stability of the brick and block wall.

All gaps being left after conduit and rebar installation shall be fully filled with cement mortar.

Add the following clauses after HKIS GS Clause B4.2 16

17 LAYING OF NEW BRICK AND BLOCK WALLS

For laying of new brick and block wall taller than 3 m, it shall be laid in minimum 2 days' time with the maximum height of first day installation at 2 m.

For laying of new fire resisting brick and block walls, manufacturer's recommendation and installation detail in compliance with the fire certificate of the wall system shall be strictly adhered to.

For laying of concrete hollow block walls, the bottom-most row of block wall shall be in solid blocks.

18 SOAKING OF CLAY BRICKS

All clay bricks for brick wall erection shall be soaked in water overnight in advance of their use.

Should there be site constraint, the Contractor shall arrange soaking of clay bricks to be done off-site or in other feasible location within the common area approved by the Contract Administrator.

B5

Plastering and Rendering

B5 PLASTERING AND RENDERING

B5.1 MATERIALS

Replace HKIS GS Clause B5.1 06 as follows:

06 METAL LATHING

Metal lath shall be austenitic stainless steel for works at external area or at locations constantly exposed to moisture. Galvanized steel metal lath or zinc coated metal lath from an approved manufacturer is only suitable for limited areas in sheltered locations as specified by the Contract Administrator. Metal lathing shall, where appropriate, comply with the following standards:

(i) Stainless steel or galvanized steel metal lath to BS EN 13658-1 or BS EN 13658-2
  (a) Stainless steel expanded flat metal lath with nominal thickness not less than 0.3 mm and minimum clear aperture 13 mm x 13 mm for internal application;
  (b) Stainless steel welded wire mesh with minimum 2.5 mm diameter wire welded into mesh size of approximately 50 mm x 50 mm for external application; or
  (c) Galvanized steel expanded flat metal lath with thickness and size as specified in B5.1.6(i)(a) or galvanized steel welded wire mesh with thickness and size as specified in B5.1.6(i)(b), for internal and external applications respectively, for fixing to steelwork.

(ii) Zinc coated metal lath to BS EN 13658-1
  (a) Plain expanded metal lath, L3 and G275 zinc coating, with minimum 5 mm short way mesh and 1.61 kg/m^2 ± 15 %; or
  (b) Ribbed expanded metal lath, RL5 and G275 zinc coating, with minimum 5 mm short way mesh and 2.22 kg/m^2 ± 15 %.

B5.2 WORKMANSHIP

Replace HKIS GS Clause B5.2 01 as follows:

01 GENERAL

Plastering and rendering shall generally be in accordance with BS 5492 and BS 5262 respectively. The following precautionary measures shall be taken during repair works for external walls:

(i) All construction debris shall not be stored on the scaffolding. It shall be cleared regularly and removed by the end of each working day through a securely fixed temporary refuse chute at location approved by the Contract Administrator;

(ii) Sufficient temporary protection shall be provided to all external face of window to avoid damage of the window frame and glazing. All glazing to be covered by suitable protection material approved by the Contract Administrator;

(iii) Rain protection scaffolding to protect the external wall shall be provided during rendering removal stage to minimize risk of rainwater infiltration; and

(iv) All openings, e.g. heater vent, exhaust fan and exhaust pipe shall be sealed off from the occupied area before commencing work.

Replace HKIS GS Clause B5.2 02 as follows:

02 BACKGROUND PREPARATION FOR PLASTERING AND RENDERING

Removal of existing plaster/render:

(i) Removal of all existing plaster/render or plaster/render within the areas marked out by the hammer tapping test shall be carried out by hand held mechanical tools with due care to avoid damage to existing concrete or brick wall. Any damages on the existing wall caused by the Contractor shall be rectified by the Contractor and verified by the Contract Administrator/the Contract Administrator's representative prior to any subsequent works on top and no time or cost claim resulted from the rectification works will be entertained.

(ii) For external wall:
All defects of the substrate (e.g. spalling concrete/honeycomb/cracks, etc.) shall be identified and rectified. All unplugged tie hole of external concrete wall discovered after removal of existing plaster/render shall be sealed up. All loose particles, dirt, dust and grease shall be removed by way of high pressure water jet cleaning.

When external wall is constructed in bricks or blocks, the surface exposed after removal of existing plaster/render shall be verified by the Contract Administrator and manufacturer of external plastering/rendering (when proprietary product is used) before applying any subsequent plaster/render on top.

Background for plastering and rendering shall comply with the following:
(i) BS 5385-1 for ceramic, natural stone and mosaic wall tiling in normal internal conditions;
(ii) BS 5385-2 for external ceramic, natural stone and mosaic wall tiling in normal conditions;
(iii) BS 5385-4 for wall of ceramic and mosaic tiling in specific conditions;
(iv) BS 5385-5 for wall of terrazzo, natural stone and agglomerated stone tile; and
(v) BS 8000-0 for workmanship on construction sites.

Replace HKIS GS Clause B5.2 03 as follows:

03 APPLYING SPATTERDASH TO NEW CONCRETE

(i) Apply spatterdash to new concrete vertical surfaces and soffits within 24 hours after striking off formwork. If spatterdash is to be applied to existing concrete surface, the surface shall be thoroughly cleaned and free of dust, grease and loose concrete. Approved bonding agent or equivalent product for the spatterdash shall be adopted and submitted for the approval of the Contract Administrator.
(ii) Prior to application of spatterdash, the concrete surface shall be checked without defects (honeycomb, crack, spalling, etc.) and thoroughly wetted one hour in advance of the application.
(iii) Throw on spatterdash to give an overall thin coating (not exceeding 6 mm thick) with coverage of at least 60 % of the area that is to be plastered or rendered with rough texture, such that:
  (a) Uncovered area does not exceed 0.01 m².
  (b) Spacing between strokes is less than 50 mm.
  (c) Uncovered area at wall edges is less than 50 mm.
(iv) Allow to harden for at least 2 days and spray water to wet the surface regularly before applying subsequent finishing coat.
(v) Test the adhesion of the spatterdash coat by brushing with a stiff wire brush after curing and where the spatterdash can be easily removed or of low strength:
  (a) Remove completely the loosened spatterdash;
  (b) Prepare concrete substrate with bonding agent in accordance with the manufacturer's recommendations; and
  (c) Re-apply and re-test the spatterdash.

Replace HKIS GS Clause B5.2 18 as follows:

18 CORNICES

Coved or moulded cornices shall be either:
(i) Formed with a backing of cement and sand 1:3 with finishing coat of same plaster used for adjacent surfaces, finished with a steel template to a smooth finish.
(ii) Preformed cornices from an approved manufacturer fixed in accordance with manufacturer's recommendations.

External cornice is a form of cladding and the design for installation shall be submitted to the Buildings Department for approval or submitted under the Minor Works Control System. All external cornices shall be supported behind by stainless steel brackets of sufficient strength.

Replace HKIS GS Clause B5.2 21 as follows:

21 MOVEMENT JOINTS

Movement joints shall be constructed at a maximum 4 m centres in each direction equally spaced or as directed by the Contract Administrator to accord with dimensioned requirements.

The Contractor shall ensure the movement joints extend through the combined depth of the tiles, tile bedding and plaster/render surface to allow effective movement.

Add the following clauses after HKIS GS Clause B5.2 22

23 EXTERNAL RENDER

Cement render with finishing coat:

(i) The substrate shall be cleaned until it is free from dust, oil and grease prior to the application of bonding agent;
(ii) Prepare and apply the bonding agent strictly in accordance with the manufacturer's technical specification and recommendations;
(iii) An approved bonding coat shall be applied to the substrate;
(iv) If the exposed substrate is applied to external brick wall/block wall, a bonding coat with waterproofing property compatible with the substrate and the subsequent approved render shall be applied to the exposed brick wall/block wall surface prior to render/plaster application. The pull-off test requirement in item (ix) below shall be achieved;
(v) External render shall consist of cement and sand or granite fines in the proportion 1:3 by volume. External render with a specified finished thickness of 10 mm or less shall be applied in one layer. Render exceeding 10 mm but not exceeding 20 mm shall be applied in two layers of equal thickness, with finishing coat 5 mm thick;
(vi) In case of render so applied are uneven or excessive in thickness, incorporation of expanded metal lathing anchored to the concrete substrate shall be considered. The thickness of each layer and the total thickness of render shall follow the manufacturer's recommendation;
(vii) For render at soffit or inclined surface of ceiling, the thickness shall not exceed 10 mm unless stainless steel mesh reinforcement is installed where thick plaster/render is applied;
(viii) For render on horizontal surface of all external wall features (e.g. AC hood, bay window, architectural fins, etc.), sufficient fall of at least 1:100 shall be provided;
(ix) Pull-off test in the rendered external wall shall be conducted 28 days after render to ensure that the adhesion strength is not less than 0.5 Nmm^2 for subsequent finishing works;
(x) For drip line, form 20 mm width x 10 mm depth water drip along the edge of all window projection, fins, canopy, balcony, etc. unless other type of water drip is specified in the contract;
(xi) Plaster/render shall not be applied along expansion joint where it would impair the normal expansion of finishing. Flexible backer rod and UV resistant sealant shall be applied along the joint with minimum width 15 mm through to the concrete substrate, with sealant depth of 10 mm minimum or half the joint width, whichever is greater, unless otherwise specified in the drawings; and
(xii) Pulverised fly ash (PFA) shall not be used for external rendering.

24 DIVIDING STRIP

When junction between dissimilar types of plastering/rendering exists, dividing strip with types to separate the different materials shall be provided by the Contractor for the approval of the Contract Administrator. The dividing strip shall be embedded through the whole thickness of the finishing coat from top of finish to concrete surface.

B5.3 REPAIRING

Add the following clauses after HKIS GS Clause B5.3 03

04 MARKING OUT SURVEY

(i) After plastering or rendering work, conduct a void detection survey/hammer tapping test to the repaired areas as instructed and witnessed by the Contract Administrator; (plastering/rendering shall meet BS EN 13914-1 and BS EN 13914-2)
(ii) Mark out on the defective surfaces; and
(iii) Result of the void detection survey/hammer tapping test shall be properly recorded on a report to be submitted to the Contract Administrator.

Add the following clauses after HKIS GS Clause B5.3

B5.4 TESTING AND QUALITY CONTROL

Pull-off tests for repaired tiling and rendering:
(i) Arrange on-site pull-off tests to the repaired areas at 28 days after completion or as directed by the Contract Administrator;
(ii) The frequency of tests shall be one pull-off test per 25 m^2 repaired surface area for each type of wall tiles and at least one pull-off test for each building elevation repaired, or as directed by the Contract Administrator. For complete re-tiling/re-rendering, the pull-off test shall be conducted at a minimum rate of one number per storey;
(iii) For the test failed to reach the minimum acceptable field tensile adhesion strength of 0.5 N/mm^2, further tests shall be conducted in accordance with the following formula, until all tests are successful:

Number of further tests = $(n^2 - 2n + 3)$
where n = total number of unsuccessful tests.
All defective repair shall be made good to comply with the requisite requirements;
(iv) If any one of further tests as required in item (iii) above fails to reach the minimum acceptable field tensile strength, all the repaired areas at the same floor shall be redone by the Contractor; and
(v) All tests, further tests and subsequent reinstatement regardless of the result of the further test shall be at the Contractor's own expense and without any claims for extension of time.

B5.5 GUARANTEE FOR EXTERNAL WALL WATERPROOFING

For the case of complete replacement of external wall plastering/rendering by proprietary premixed plaster/render with waterproofing property, 10 years guarantee period from the date of practical completion including material and workmanship for external wall waterproofing shall be jointly provided by the Contractor and waterproofing material supplier, or otherwise as specified by the Contract Administrator.

B6 Tiling and Cladding

B6 TILING AND CLADDING

B6.1 MATERIALS

Add the following clause before GS Clause B6.1 01

01 GENERAL

Regardless of the height of external wall tiles installation, tiles with size larger than 0.1 m^2 shall be secured by mechanical means.

Each batch of tiles delivered to the Site shall be jointly sample checked on the Site by the Contractor and representative of the Contract Administrator to ensure that their size, colour, thickness, flatness, warpage, etc. are fabricated according to the contract requirements.

Sample panels of tiling works are to be erected on the Site for approval of the workmanship prior to commencement of tiling works. The size and locations of the panel are to be agreed with the Contract Administrator.

Shop drawings showing the installation detail and setting out of all tiling and cladding works shall be submitted to the Contract Administrator for approval prior to site installation.

Replace HKIS GS Clause B6.1 05 as follows:

05 HOMOGENOUS WALL TILES

Homogenous wall tiles shall comply with BS EN ISO 10545-2:1997, BS EN ISO 10545-3:1997, BS EN ISO 10545-6:1997, BS EN ISO 10545-8:1996, BS EN ISO 10545-13:1997.

Homogenous wall tiles shall not be used at external wall unless otherwise approved by the Contract Administrator with approved type of tile adhesive.

Add the following clause after HKIS GS Clause B6.1 12

13 STONE TILES

(i) Stone tiles such as marble and granite shall be of the quality, size, thickness and colour specified by the Contract Administrator;
(ii) Range samples shall be submitted to the Contract Administrator for review and approval unless otherwise specified. For each type of stone with noticeable variation of natural pattern or colour tone, minimum 5 sets of samples shall be submitted for the Contract Administrator's determination of acceptable range for supply from quarry or stone factory. The approved range of stone sample shall be kept on the Site for regular inspection by the Employer, the Contract Administrator or their representatives. Any stone supplied beyond the acceptable range shall be rejected and shall not be installed on the Site;
(iii) For dry fixing and mechanical fixing of wall stone, test report of physical property and structural calculation of the fixing detail shall be submitted for the approval of the Contract Administrator;
(iv) All sealant to be used along stone joint shall be non-epoxy based and non-stain/stain resistant type; and
(v) Mortar for wet fixing of stone shall be 1:2 cement: sand by volume.

B6.2 WORKMANSHIP

Replace HKIS GS Clause B6.2 02 as follows:

02 EXISTING BACKGROUNDS/BASES

Efflorescence, laitance, dirt and other loose materials shall be thoroughly removed by dry brushing.

Substances incompatible with the bedding shall be removed by using suitable emulsion cleaner then washed with clean water.

Hammer tapping test shall be carried out to the entire wall area to ensure no delamination or de-bonding of plastering from the base substrate exists. All defects identified shall be rectified prior to the commencement of tiling works.

All loose or defective areas shall be removed and repaired with materials compatible with the background/base and bedding.

Plaster primer shall be applied if recommended by the adhesive manufacturer and it shall be allowed to dry before tiling.

Tiling works for external wall shall be carried out at least 14 days after the completion of plastering on the substrate.

Prior to tiling works, the substrate shall be fully wetted one day in advance and the surface shall remain damp during the tile installation.

Replace HKIS GS Clause B6.2 04 as follows:

04 SETTING OUT

Joints shall be true to line, continuous and without steps.

Joints on walls shall be truly horizontal, vertical and in alignment round corners.

Cut tiles shall be kept to the minimum, as large as possible and in unobtrusive locations.

Deviation in flatness of tiled surface shall not exceed 3 mm in every 1.8 m when tested by ruler.

All cut edge of tile shall be avoided along external corner as far as practicable.

Replace HKIS GS Clause B6.2 05 as follows:

05 FIXING WALL TILES

Tiles shall be fixed to wall render as follows:

(i) Thick bed method:
- (a) Sort and remove tiles with uneven colour or dimensions. Soak tiles in clean water for 30 minutes (minimum). Stack to drain and fix as soon as the surface water has drained off.
- (b) Damp the wall render with clean water sufficiently to prevent it absorbing water from the bedding mortar.
- (c) Butter the back of each tile with cement slurry and tap firmly into position so that the bed is solid throughout. Thickness of finished bed shall be 5 to maximum 15 mm.
- (d) Joints shall be 2 mm (minimum) wide, and maximum 3.5 mm wide unless specified otherwise.
- (e) Make any adjustment to tiles within 10 minutes of fixing.
- (f) Clean tiles and joints before bedding hardens.

(g) Grout up joints 24 hours (minimum) after fixing tiles. Clean off surplus grout as work proceeds.
(h) Clean tiles at completion.

Thick bed method shall not be used for fixing wall tiles with water absorption value lower than 0.5 %.

For thick bed method, tile shall be laid from bottom to top using spacers to control the width of grout joint.

(ii) Thin bed method:
(a) Apply wall render of cement:sand (1:3) to the concrete or substrate surface. Build up the render to the required thickness of 15 mm in layers. Thickness of each layer shall not exceed 10 mm. Allow the wall render to dry off thoroughly.
(b) Fix wall tiles, mixed from six boxes, to the wall render using an approved proprietary adhesive to BS EN 12004:2007 in accordance with the manufacturer's recommendations.
(c) Grout up joints using an approved grout or a proprietary grout to BS EN 13888:2009.

Replace HKIS GS Clause B6.2 06 as follows:

06 FIXING EXTERNAL WALL TILES

External wall tiles shall be fixed by thin bed method as follows:
(i) Apply wall render of cement:sand (1:3) to the substrate surface. Build up the render to the required thickness of 15 mm in layers. Thickness of each layer shall not exceed 10 mm. Allow the wall render to dry off thoroughly.
(ii) Fix wall tiles, mixed from six boxes, to the wall render using an approved proprietary adhesive to BS EN 12004:2007 in accordance with the manufacturer's recommendations. Width of joints shall be as specified.
(iii) Grout up joints using an approved grout or a proprietary grout to BS EN 13888:2007.

The width of tile joint shall be determined by the Contract Administrator but shall not be less than 3 mm or exceed 10 mm. Joint widths shall be consistent throughout the installation unless otherwise specified.

Upon completion of the tiling works, appropriate test methods, such as in-situ pull-off tests by specialist contractor and hammer tapping, shall be carried out to ensure that the external facing tiles have been applied properly to achieve the required adhesion to the building structure or substrate surface according to the approved proprietary tile adhesive.

Infra-red thermographic scanning shall be carried out by an approved specialist and the report shall be submitted within 4 months upon completion of external tiling. Should the report indicate that any part of the wall tiling has not been affixed properly, the Contractor shall carry out approved remedial measures at his own expense and carry out further infra-red thermographic scanning to the satisfaction of the Contract Administrator.

Replace HKIS GS Clause B6.2 12 as follows:

12 MOVEMENT/EXPANSION JOINT

All mortar shall be thoroughly raked from joints so that the joints are entirely open from the surface of the tiles.

The joints shall be filled with a form plastic or filler, stripped to a depth of 12 mm or the width of the joint below the surface of the tiles, and neatly pointed flush with sealant of approved type and colour.

The whole sealant installation work shall be supplied and installed complete at the contractor's expense by the manufacturer's agent.

Movement/expansion joint for every 10 m^2 tiling works with aspect ratio (width x height) no more than 2:1 shall be proposed by the Contractor for approval by the Contract Administrator, unless otherwise specified in the drawings.

The joints shall be with its depth extended to the bottom of plastering/rendering/screed and filled with approved backer rod, and neatly pointed flush with sealant of approved type and colour. The thickness of the sealant along the joint shall not exceed 10 mm along the centre line of the joint such that the expansion joint will remain flexible after setting of the sealant when tested by finger pressing.

Add the following clause after HKIS GS Clause B6.2 12:

13 FIXING STONE TILES

(i) Mechanical fixing of stone tiles or cladding shall be adopted for the external area;
(ii) Wet fixing of stone tiles or cladding shall only be allowed to be applied at the internal area;
(iii) Stone tiles with size larger than 0.1 m^2 at the internal area shall be installed with mechanical means;
(iv) Stone tiles to be fixed to the soffit of beam or ceiling at the internal area shall be installed with mechanical means;
(v) Wet fixing of stone tiles by mean of proprietary epoxy adhesive may also be adopted if approved by the Contract Administrator and fixed strictly in accordance with the manufacturer's recommendations;
(vi) Design and installation of natural stone cladding and lining or other types of cladding shall comply with BS 8298-1, BS 8298-2, BS 8298-3, BS 8298-4 and PNAP APP 16 issued by the Buildings Department;
(vii) For mechanical fixing of external wall stone or other cladding, the surface behind the cladding shall be applied with an approved type of waterproofing membrane prior to panel installation;
(viii) Unless otherwise approved, the wall stone panel shall be installed in the direction from bottom upwards, and start from external corner as far as possible;
(ix) All temporary protective tape applied along the edge of panel joint for sealant application shall be removed right after the sealant is properly applied; and
(x) For stone panel with flamed/honed finishes or porous surfaces, sealer shall be applied on the exposed face prior to installation.

Replace HKIS GS Clause B6.3 as follows:

B6.3 PULL-OFF TEST

The adhesion strength of the re-tiled surface shall be determined by pull-off testing at 7 days after tiling as follows and/or referred to approved adhesive manufacturer's recommendations.

A suitable metal plate shall be glued to the cored surface and this attachment shall be pulled with increasing tensile force using a specially calibrated device until failure occurs. The force needed to cause failure shall be recorded and the equivalent stress at failure calculated and reported. The failure surface shall be examined and the mode of failure reported as either adhesive (at the concrete/rendering interface and rendering/tiles interface) or cohesive (within the parent concrete or rendering). The core shall be immediately colour photographed to show the core and failure surface in close up against a contrasting background all to the approval of the Contract Administrator.

Any rendering/tiled surface where cores indicate delaminating voids or other imperfections or the adhesion strength do not come up to the standard as pre-determined by the adhesive admixture manufacturer, it shall be opened up and rendered/re-tile again or further tested at the discretion of the Contract Administrator. The costs of such tests or of the removal of the rejected rendering/re-tiled surfaces and its replacements and associated costs shall be borne by the contractor and no extension of time shall be granted in this respect.

The proposed wall adhesive shall be able to meet the minimum standard of performance (adhesion strength of 0.5 N/mm^2 minimum for concrete/rendering interface and 0.5 N/mm^2 for rendering/tile

adhesive and tile adhesive/tile interfaces) after application on site. Such performance shall be proved by pull-off tests to be conducted on site by an approved independent laboratory in accordance with an endorsed procedure with reference to the relevant BS standards.

Pull-off tests shall be carried out to the tiled surfaces in accordance with PNRC 67 and Code of Practice for the Mandatory Building Inspection Scheme and the Mandatory Window Inspection Scheme issued by the Buildings Department, whenever is the more stringent. The exact location of pull-off tests shall be determined on site at the discretion of the Contract Administrator.

B7 Painting

B7 PAINTING

B7.1 GENERAL

Replace HKIS GS Clause B7.1 01 as follows:

01 SELECTION OF COLOURS FOR PAINTWORK

The colours of paintwork shall be provisionally selected by the Contract Administrator from a catalogue showing the range of colours offered by the manufacturers.

Trial panels shall be painted in each of the colours provisionally selected by the Contract Administrator. Each trial panel shall be 1 m x 1 m and shall be painted with the complete paintwork system.

Trial panels shall be protected from damage and shall be left in position until the Contract Administrator instructs their removal.

The trial panel shall be erected at a location close-by the intended location of paint application or as approved by the Contract Administrator. The colours of paintwork at the trial panel shall be approved by the Contract Administrator prior to material ordering.

Replace HKIS GS Clause B7.1 02 as follows:

02 STORAGE AND DISPOSAL OF MATERIALS

Paint and associated materials shall be stored in a dry weatherproof and covered store. The store shall be maintained in a cool and well-ventilated condition.

Tins of paint shall be labelled as being for external use, internal use, undercoating and finishing, as appropriate, and shall be protected from exposure to conditions that may adversely affect the material. Paint and associated materials shall be stored in accordance with the manufacturers' recommendations and shall not be used after the recommended shelf life has been exceeded.

No smoking shall be permitted where flammable paints or solvents are used. Appropriate signs should be displayed at conspicuous place as appropriate.

All paint shall not be stored prematurely on site and not to be delivered to the Site more than one week before their application unless otherwise agreed by the Contract Administrator.

Sufficient fire extinguishers of appropriate type shall be put right next to the entrance of the storage space/room where the paint is stored.

Residual paint and organic solvent are classified as chemical waste in the Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C). They shall be collected by a licensed chemical waste collector. Empty painting containers shall be disposed or destroyed with record and witnessed by the Contract Administrator or the Employer.

B7.2 MATERIALS

Replace HKIS GS Clause B7.2 02 as follows:

02 PRIMING PAINTS

For synthetic finishing paints on internal and external woodwork, aluminium primer to BS 4756:1988, Type 1 shall be used.

For synthetic finishing paints on internal and external metalwork, zinc phosphate primer or metallic zinc-rich primer to BS 4652:1995 Type 2, as specified shall be used.

For synthetic or non-toxic paints on galvanized metal surfaces, an approved epoxy based zinc rich primer to ASTM D7396 – 14 shall be used.

For polyurethane paint on internal and external metalwork, polyurethane red lead primer shall be used.

Add the following clauses after HKIS GS Clause B7.2 23

24 CEMENTITIOUS SURFACE CONDITIONER (TILE FILLERS)

(i) General
Tile fillers shall cover skim coats.

(ii) Materials
Tile fillers shall be a proprietary product in compliance with the following requirements:
- (a) No less than 1 MPa of bond strength with either glazed mosaic tile surface or glazed ceramic tile surface at 28 days, tested to ASTM D4541;
- (b) No less than 12 MPa of compressive strength at 28 days, tested to BS 6319-2;
- (c) No less than 3 MPa of flexural strength at 28 days, tested to BS 6319-3;
- (d) Less than 0.2 % in linear shrinkage when tested to ASTM C596;
- (e) Compatible with both the background and the finish; and
- (f) Designated for internal and external use.

25 FIRE PROOF PAINT

When specified, provide fire protection to structural steel by one of the following materials or systems:
(i) Sprayed mineral coating to BS 8202-1; or
(ii) Intumescent coating system to BS EN 16623.

The fire proof painting system, including its construction, shall have been tested and assessed to the requirements of BS 476-20 and BS 476-21 as capable of resisting fire for the specified periods. The tests and assessments shall be carried out by a laboratory accredited by HOKLAS. The assessment report shall be within its validity period.

Details of application of the materials such as surface preparation, application of primer, fixing details etc. shall be strictly in accordance with the approved tests and assessment report; no deviation is allowed except for specific situations where some minor variations are necessary. Such variations shall be tested or assessed by a laboratory accredited by HOKLAS.

B7.3 WORKMANSHIP

Replace HKIS GS Clause B7.3 01 as follows:

01 GENERAL

Surfaces, fittings, furniture and the like shall be protected by suitable and approved means.

"Wet Paint" signs in Chinese and English shall be exhibited and protective barrier shall be provided where necessary.

All surfaces shall be kept clean and free from dust during coating and drying.

All splashes shall be removed and cleaned off while works is in progress. Damage shall be made good, and work, and all areas in which works is executed, shall be left clean and perfect on completion.

Painting generally shall be in accordance with BS 6150 and BS 8000-0.

(i) Works shall not be carried out in wet humid or foggy weather, direct sunlight, or on surfaces which are not thoroughly dry, or if there is excessive dust in the air.
(ii) All holes, cracks and other defects in surfaces shall be made good prior to painting.
(iii) Each coat shall be brushed well into the surface so that every part, including joints, junctions, angles, etc., is adequately covered. Excessive or uneven thickness of paint film, particularly at edges, angles and junction shall be avoided.
(iv) Before applying coatings, moisture content of the substrate shall be checked to avoid adversely affecting the completed works. Coatings shall only be applied to clean, dry surfaces after any previous coatings have hardened, and have been rubbed down smooth with fine glass paper.
(v) Successive coats of paint shall be of slightly differing tints, and the intercoating time shall not exceed the limits recommended by the paint manufacturers.
(vi) Coatings shall be applied with approved bristle brushes of suitable size. Flat wall brushes shall not be less than 150 mm wide.
(vii) Rollers, cloths or gloves shall not be used unless ordered or approved by the Contract Administrator.
(viii) Mechanical spraying machines shall not be used unless ordered or approved by the Contract Administrator. When mechanical spray painting is ordered or permitted, the priming coat (or first undercoat, if no priming coat) shall be applied by brush.
(ix) Where required, surfaces which become inaccessible shall be primed and painted prior to fixing.
(x) All articles of ironmongery, hardware, etc. shall be removed before painting and replaced with matching screws (and plugs, if required,) of suitable size, after completion. Everything shall be left clean and completely free from all paint stains, splashes, etc.
(xi) Weather stripping on metal windows or doors shall not be painted.
(xii) Coated surfaces shall be touched up on completion, when ordered.
(xiii) Paint sample panels shall be prepared if necessary for Contract Administrator's approval before carrying out work.

Each layer of coating shall be properly inspected and accepted by competent person authorized by the Contract Administrator before application of subsequent layer of coating on top. Each of the inspection shall be recorded with indication on the area inspected with endorsement by the Contract Administrator.

The Contractor shall liaise with the paint manufacturers to carry out audit check on the Site if so required by warranty conditions.

Duly executed warranty shall be submitted by the Contractor in accordance with the contract for all areas of external wall with new painting system applied to. The painting works shall be guaranteed against defects of materials and workmanship by the Contractor and supplier for a period of not less than 5 years from the date of completion stated in the certificate of completion.

Replace HKIS GS Clause B7.3.2 as follows:

B7.3.2 PREPARATION OF EXISTING DECORATED SURFACES

All dust, dirt, stains, efflorescence, grease and loose materials shall be removed; all cracks and water leakage shall be fixed.

All defects on the existing surface shall be fixed prior to subsequent re-finishing works (e.g. efflorescence, water leakage, cracks, etc.)

The Contractor shall submit method statement for removal of all the loose paints for the Contract Administrator's approval before applying painting.

Unless otherwise specified, existing decorated surfaces shall be prepared for decoration as follows:

(i) Lime washed or whitened surfaces shall be scraped, broomed down, stopped, applied and brought forward bare spots with new material.
(ii) Chinese distempered washable sealer or non-washable distempered surfaces shall be stripped off completely, washed down, stopped, sealed and prepared to receive emulsion paint or other paint as specified.
(iii) Emulsion or textured emulsion painted surfaces shall be scraped, washed down, stopped, and brought forward bare spots with new material.
(iv) Cement painted and external textured painted surfaces shall be scraped, washed down, stopped, brought forward bare spots with new material and surface shall be dampened immediately prior to painting.
(v) Synthetic painted surfaces other than metal or wood shall be scraped, washed down, stopped, rubbed down and applied with primer to and brought forward bare spots with undercoat.
(vi) Black bituminous coated surfaces shall be spot primed bare areas with black bituminous coating.

B7.3.3 TREATMENT OF METALWORK

Replace HKIS GS Clause B7.3.3 02 as follows:

02 PAINTED ZINC-SPRAYED OR GALVANIZED IRON AND STEEL

Painted zinc-sprayed or galvanized iron and steel surfaces shall be washed down, scraped and removed from all scale and rust, then rubbed down and applied with galvanized iron primers or equivalent material approved by the Contract Administrator and brought forward bare spots with undercoat.

Add the following clause after HKIS GS Clause B7.3.15

B7.3.16 CEMENTITIOUS SURFACE CONDITIONER (TILE FILLERS)

All loose/de-bonded materials, together with stained or other suspicious materials shall be carefully removed to provide a clean surface which shall be checked and accepted by the Contract Administrator/Contract Administrator's representative prior to the application of tile filler.

Mix and apply tile filler in accordance with the manufacturer's recommendations.

Replace HKIS GS Clause B7.4 as follows:

B7.4 PAINTING TO PIPE WORKS

The Contractor shall submit proposal of painting system including type of paint coat/primer, painting procedures etc., to the Contract Administrator for approval prior to commencement of works. All paints shall be prepared and applied in accordance with the manufacturer's recommendations.

Painting to pipe works shall strictly follow the specified or approved painting system, which is compatible with the existing coating. The colour of the finishing coat should match the surrounding surface with distinguishing colour code bands and flow arrows in the specified colour scheme as directed.

All galvanized metal surfaces shall be properly etch-primed to ensure correct adhesion of the paint to the surface. Material shall be as recommended by the paint manufacturers. Painting to galvanized surfaces shall be one coat of primer, one undercoat and two finishing coats of synthetic paint or other paint system subject to the Contract Administrator's approval.

All damaged galvanized surfaces shall be painted with zinc-rich primer prior to subsequent paint applications.

Prior to painting, all metallic surfaces except galvanized surfaces shall be thoroughly scraped and wire brushed as necessary to remove scale, rust and swarf.

All unplasticised polyvinyl chloride (uPVC) surfaces shall be solvent cleaned to remove all oil, grease, dirt and visible signs of organic growth. The Contractor shall ensure the surface is free from any contaminants or anything that may affect the adhesion of the materials to be applied. The Contractor shall remove loose and failure materials by scraping or brushing with a stiff bristle brush to a sound edge and feather sound edges with a fine grade abrasive paper.

Painting to uPVC surface shall be:
(i) One coat of galvanized iron primer with approved top coat; or
(ii) Two layers of polyurethane paint.

B8

Roofing, Waterproofing and Leakage Repair

B8 ROOFING, WATERPROOFING AND LEAKAGE REPAIR

Add the following clause before HKIS GS Clause B8.1

B8.1 GENERAL

For re-roofing or patch repair of waterproofing works, sufficient verification of existing waterproofing system shall be conducted. Proposed method statement for application of new waterproofing system with due consideration of existing finishes and waterproofing layer shall be submitted for the Contract Administrator's approval prior to commencement of related works on the Site.

For re-roofing works:

(i) The existing finishing, floor screed and waterproofing layer shall be removed with the consent of the new waterproofing system supplier;

(ii) Prior to application of the new waterproofing layer, the substrate of new waterproofing layer shall be checked to be smooth without defects and with sufficient fall towards drains (not less than 1:100). The surface and any movement joint shall also be prepared according to recommendation of the waterproofing system supplier;

(iii) Waterproofing sheet or liquid membrane shall extend to form continued upstands at vertical abutments and tugged-in at a recessed groove with detail and skirting height in strict accordance with the supplier's recommendation. In any case, the height of skirting shall be 300 mm or more above the finished floor level;

(iv) For sheet membrane type waterproofing system, the overlapping dimension between layers, plinths, kerb, etc. shall be in strict accordance with the recommendation of the waterproofing system supplier; and

(v) When localised or patch repair of waterproofing layer is involved, the Contractor shall submit written confirmation from the new waterproofing system supplier that the new waterproofing layer is compatible with the existing waterproofing layer. The existing waterproofing layer shall be exposed and thoroughly cleaned prior to lapping with the new one. Minimum 150 mm wide overlapping shall be provided unless otherwise approved by the Contract Administrator.

For all types of waterproofing layer repair works, water tests shall cover the joint area between the new and old waterproofing layer.

For waterproofing works at all bathroom, the waterproofing layer shall cover the entire floor, 300 mm above the finished floor level and 1800 mm above the wall abutting the bathtub and shower area unless otherwise specified by the Contract Administrator.

B8.2.4 COMPLETION

Replace HKIS GS Clause B8.2.4 06 (iv) as follows:

06 MAINTENANCE REQUIREMENTS

(iv) An executed guarantee shall be provided by the contractor. The completed installation shall be guaranteed against defects of materials and workmanship by the contractor and supplier for a period of 10 years, beginning at the date of practical completion of the project. The warranty shall cover the waterproofing system in its entirety. The warranty shall cover all areas with new waterproofing system applied and the interfacing area between old and new waterproofing layer when patch repair is involved.

B8.3 PROPRIETARY FLEXIBLE SHEET MEMBRANE AND LIQUID APPLIED MEMBRANE – WORKMANSHIP

B8.3.1 PREPARATION, APPLICATION AND PROTECTION

Replace HKIS GS Clause B8.3.1 01 as follows:

01 GENERAL

The work shall be carried out in accordance with BS 8102:1990 and BS 8000:Pt. 4:1989 and manufacturer's recommendations. Particular attention shall be drawn to the following before installation:

(i) The Works shall be supervised by a competent representative from the Contractor/manufacturer. Inspection shall be carried out and written approval shall be given by this representative for each and every stage of work, from the surface preparation to the completion of the protection coating. Formal approval for each and every stage of work as mentioned shall be carried out by the Contract Administrator.

(ii) The Works shall only be carried out after the concrete or repaired concrete has been properly cured for at least 7 days.

(iii) Shop drawings shall be produced by the Contractor/manufacturer showing construction details including those at angles, corners, construction joints, pipe intrusions etc. for approval and all Works shall be carried out as per the approved shop drawings.

Replace HKIS GS Clause B8.3.1 02 as follows:

02 EXISTING MEMBRANE

For repair or maintenance work, existing tiles, existing layers of felt or other protective covering shall be taken up and removed to expose existing asphalt or roof membrane. Cement and sand screed, minimum 25 mm thick or self-leveling screed shall be laid to produce an even surface to approved falls to receive the new roofing system. The Contractor shall take the responsibility for repairing and making good the existing roof slab, and avoiding built-up of excessive roof finish load to the structure.

Replace HKIS GS Clause B8.3.1 03 as follows:

03 SURFACE PREPARATION FOR SHEET MEMBRANE

Surfaces to which tanking is to be applied shall be level and free from irregularities such as ridges, dips, fins and concrete or mortar droppings. The horizontal surfaces of the concrete shall be given a wood-floated finish and be laid flat and true to allow the specified thickness of sheet membrane to be applied uniformly. Where vertical concrete is very smooth and in order to provide a satisfactory key for the sheet membrane, the Contractor shall remove the surface laitance by wire brushing and apply an approved proprietary high bond primer. Excessive mould oil shall not be used in the vertical form.

B8.3.2 TESTING

Replace HKIS GS Clause B8.3.2 02 as follows:

02 MOISTURE TEST

Approved moisture testing equipment shall be available on Site to monitor the moisture content of the roof structure and the various elements of the roof system. Calibration certificate of moisture meter issued by HOKLAS accredited laboratory within one year from the site moisture test shall be made available on the Site for the Contract Administrator's checking upon request. All necessary precaution shall be taken to ensure the full integrity of the roofing system.

For avoidance of doubt, reading of moisture meter above 35 shall be regarded as evidence of existence of moisture and the Contractor shall find out and rectify the problem for re-testing at the soonest at their own cost and time.

Replace HKIS GS Clause B8.3.2 03 as follows:

03 FLOODING TEST

The test shall include sealing all outlets and if necessary constructing dams to compartmentalize large roofs. The roof shall be flooded for 48 hours. After flooding, all outlet blockages and dams shall be removed to drain the roof. Debris shall not be permitted to enter into the drainage pipework. At a period between 24 and 48 hours from release of the water, an infra-red scan shall be carried out by an independent specialist contractor at the contractor's expense to establish if there has been penetration through the membrane.

Infra-red scanning report shall be sent directly by the specialist contractor to the Contract Administrator. In the event of failure, repairs and subsequent infra-red scanning tests shall be carried out at the contractor's expense until the waterproofing area is shown to be watertight.

Replace HKIS GS Clause B8.3.2 04 as follows:

04 WARRANTY

Duly executed warranty shall be submitted by the Contractor in accordance with the Contract. The completed installation shall be guaranteed against defects of materials and workmanship by the Contractor and supplier for a period of 10 years from the date of completion stated in the certificate of completion with respect to the Works for use as an exposed roof membrane in Hong Kong. The system shall be designed to withstand the conditions of the Hong Kong climate, which includes typhoons, monsoons and rainstorms. The warranty shall cover the roofing system in its entirety. The warranty shall be extended to cover all aspects of the roofing project executed by the Contractor including adhesion and structural integrity of materials used. The warranty shall cover all areas with new waterproofing system applied and the interfacing area between old and new waterproofing layer when patch repair is involved.

Replace HKIS GS Clause B8.4 as follows:

B8.4 WATERTIGHTNESS TESTS TO OTHER BUILDING INSTALLATIONS

01 TESTING METHOD/PROCEDURES/REQUIREMENT

The watertightness tests consist of eleven tests applied mainly to the following areas:
(i) Tests number 1 to 3 apply to bathroom with bath tub installation;
(ii) Tests number 4 and 5 apply to bathroom with shower tray installation;
(iii) Test number 6 applies to bathroom with shower area design;
(iv) Test number 7 applies to the general wall and floor in the bathroom or washroom;
(v) Test number 8 applies to floor in balcony or kitchen;
(vi) Test number 9 applies to windows; and
(vii) Test number 10 applies to external wall.

The water for the watertightness tests shall be applied by a type of shower head/water jet approved by the Contract Administrator and it shall be fitted to 13 mm (1/2") pipe at a water pressure of 0.20 - 0.24 N/mm^2 (30 - 35 p.s.i). The pressure gauge shall be located at a distance not exceeding 1.5 m from the shower head.

For watertightness test to external wall after repair works (for cracks, honeycomb, joint area of pipe works penetration into external wall after pipe replacement, etc.), the distance between the water jet and the area of testing shall be within 300 mm to 500 mm.

The water supply for the watertightness tests in domestic units shall be from the water point in public area. No water shall be collected from any other existing available course within the domestic units.

All seepage inspection mentioned in this section regarding watertightness test shall be carried out in the presence of the Contract Administrator's representative with the aid of calibrated moisture meter (same calibration standard as B8.4.2.2) to be provided by the Contractor. Moisture meter, conducted after 30 minutes, reading of above 35 shall be regarded as failed and appropriate rectification measures and re-testing shall be carried out by the Contractor again at their soonest and at their own time and cost.

02 WATERTIGHTNESS TEST FOR BATHROOM WITH BATH TUB INSTALLATION

Location	Area to be tested	Testing method	Inspection requirements
Bathroom (Bath tub)	Test no.1 Overflow of bath tub.	Plug the waste outlet, spray water to the overflow for 30 seconds.	Inspect through the inspection panel to check: ▪ No seepage at the overflow and its connectors.
	Test no.2 Trap and waste outlet of bath tub.	Fill the bath tub with water to a minimum depth of 150 mm, then unplug to drain off the water.	Inspect through the inspection panel to check: ▪ No seepage at the trap, connectors and outlet joints.
	Test no.3 Walls and/or ledge above bath tub.	Spray water evenly to the three sides of the wall up to a height of 1,800 mm above the base of bath tub, at portion of panel wall with cut out slot for concealed conduits, ledge, and at junction between wall and bath tub for 5 minutes. (note: allow 2 minutes spraying time for the panel walls abutting the bath tub)	Inspect through the inspection panel to check: ▪ No seepage at the walls below the bath tub. Inspect at the other side of walls to check: ▪ No seepage through the walls.

03 WATERTIGHTNESS TEST FOR BATHROOM WITH SHOWER TRAY INSTALLATION

Location	Area to be tested	Testing method	Inspection requirements
Bathroom (Shower tray)	Test no.4 Trap and waste outlet of shower tray.	Spray water directly to the waste outlet for 30 seconds.	Inspect through the inspection panel (if provided) or the floor below to check: ▪ No seepage at the connector.
	Test no.5 Walls and/or ledge above shower tray.	Spray water evenly to the three sides of the wall up to a height of 1,800 mm above the base of shower tray, at portion of panel wall with cut out slot for concealed conduits, ledge, and at junction between wall and shower tray for 5 minutes. (note: allow 2 minutes spraying time for the panel walls abutting the shower tray)	Inspect through the inspection panel (if provided) or the floor below to check: ▪ No seepage at the wall/floor opening below the shower tray. Inspect at the other side of the walls to check: ▪ No seepage through the walls.

04 WATERTIGHTNESS TEST FOR BATHROOM WITH SHOWER AREA DESIGN

Location	Area to be tested	Testing method	Inspection requirements
Bathroom (Shower area)	Test no.6 Walls and floor at shower area.	Spray water evenly to the three sides of the wall up to a height of 1,800 mm above the shower base, at portion of panel wall conduits, at junction of wall and shower kerb with the shower base, and at vertical grating for 5 minutes and then plug the waste outlet and let the water to be built up to a height of approx. 25 mm over the shower area for 60 minutes. (note : allow 2 minutes spraying time for the panel walls abutting the shower tray)	Inspect the floor to check: ▪ No ponding on floor. ▪ Falls on floor to the vertical grating. Inspect at the other side of the walls to check: ▪ No seepage through the walls. Inspect at the other side of shower kerb to check: ▪ No seepage at the connector of vertical grating. Inspect at one floor below to check: ▪ No seepage at the soffit.

05 WATERTIGHTNESS TEST FOR GENERAL WALL AND FLOOR

Location	Area to be tested	Testing method	Inspection requirements
Bathroom/ washroom (wall, floor and skirting)	Test no.7 Floor, floor drain and pipe sleeves, and bottom edge of shower tray (sit-on-floor type without concrete plinth).	Spray water to the panel walls at a height of 300 mm above finished floor level, over the entire floor, floor drain and pipe sleeves and bottom edge of shower tray (without concrete plinth) for 5 minutes and then plug the floor drain and let the water to be built up to a height of approx. 25 mm for 60 minutes.	Inspect the floor to check: ▪ No ponding. ▪ Falls to the floor drain. Inspect at one floor below to check: ▪ No seepage at the pipe sleeves. ▪ No seepage at the trap and connectors. ▪ No seepage at the soffit.

06 WATERTIGHTNESS TEST FOR BALCONY/KITCHEN

Location	Area to be tested	Testing method	Inspection requirements
Balcony/ kitchen	Test no.8 Floor, floor drain and pipe sleeves.	Spray water over the floor, floor drain and pipe sleeves for 5 minutes and then plug the floor drain and let the water to be built up to a height of approx. 25 mm for 60 minutes.	Inspect the floor to check: ▪ No ponding. ▪ Falls to the floor drain. Inspect at one floor below to check: ▪ No seepage at the pipe sleeves. ▪ No seepage at the trap and connectors. ▪ No seepage at the soffit.

07 WATER TESTING FOLLOWING THE REPAIR OF WATER SEEPAGE TO WINDOWS

Location	Area to be Tested	Testing Method	Inspection Requirements
External Windows	Test no.9 Window surround and junction of windows and window openings	Spray water evenly to the junction of windows and window openings and the three sides of the wall up to a height of 150 mm above the top of the window opening and allow to continue for a period of 10 minutes.	Inspect the window surround on the internal side of the window to check for any water seepage. Ensure that no water has entered throughout the window from the junction with the surrounding window opening, to either side or sill to opening.

08 WATER TESTING FOLLOWING THE REPAIR OF EXTERNAL WALL

Location	Area to be Tested	Testing Method	Inspection Requirements
External Wall	Test no.10 Exterior side of external wall.	Spray water evenly to the exterior side of external wall for a period of 10 minutes.	Inspect the interior side of external wall to check for any water seepage.

If water seepage is determined after tests no. 1 to 8 but the source cannot be ascertained, liquid dye test shall be conducted as per instruction of the Contract Administrator. The application procedures of liquid dye test shall be in accordance with Appendix 7.3 and 7.4 of the Professional Guide to Water Seepage Investigation, Diagnosis, Testing and Reporting in Residential Buildings issued by the Hong Kong Institute of Surveyors.

Replace HKIS GS Clause B8.5 as follows:

B8.5 CHEMICAL INJECTION/GROUTING

The repair materials shall be of a single or low number of components. The contractor shall submit evidence of previous track records, test reports and manufacturers' recommendations in relation to his proposed repair materials for approval. All chemical injection works along external wall shall be carried out from the exterior side of the building unless otherwise approved by the Contract Administrator.

Adequate and proper precaution shall be taken to ensure that carrying out of the entire water seepage repair work is under strict procedural steps as recommended by the manufacturer. Proper protective clothing and device for eyes protection shall be used and the safety procedures as laid down by the Labour Department shall also be followed.

Repair of water leakage to external wall by chemical injection shall be in the following sequences and manners:

(i) Identify the wet patches and potential infiltration areas;
(ii) Submit a method statement for the sealing infiltration including surface preparation and touching/ painting finishes for approval prior to commencement of work;
(iii) Clean the affected areas contaminated by deposits of dirt, dust, lime, salt or other contaminants;
(iv) Flush the affected area with water and/or brush with wire brush prior to chemical injection/grouting;
(v) The cracks shall be fully filled with injection. Drill injection nipples at intervals shall be not less than the thickness of the external wall along the crack. Secure and cover the nipples and the crack between the nipples with epoxy putty;
(vi) Inject approved materials into nipples by injection pump strictly in accordance with the manufacturer's recommendation; and
(vii) Upon completion of grouting/injection, remove the nipples and re-paint the repaired and affected areas to match with existing.

The approved injection/grouting materials by the Contract Administrator shall have the following properties:

(i) A polyurethane resin or foam/gel chemical waterproofing grout or equivalent;
(ii) Be capable to react with potable water and/or seawater to form a polyurethane foam to fill-up cracks for waterproofing;
(iii) Be capable to resist weathering, abrasion and chemicals (i.e. organic solvents, mild acids, alkali and micro-organisms);
(iv) The polyurethane resin shall be able to penetrate the width of hairline crack/joint of smaller than 0.5 mm with high-pressure and width of greater than 0.5 mm with low-pressure;
(v) It shall have an approximate pH value between 3 to 12;
(vi) It shall be non-flammable;

(vii) The resin shall be of light colour transparent liquid and can be painted upon;
(viii) Having a density of approximate 1 kg/litre;
(ix) Insoluble in water;
(x) Stable and good for storage in the original resealable container at room temperature for one year;
(xi) Not be affected by freezing and thawing;
(xii) High Flash Point at approximate 166 ^{o}C;
(xiii) Non-Toxic.

The approved injection/grouting materials shall have at least 5-year warranty.

Add the following clause before HKIS GS Clause B8.6 01

B8.6 RETANKING WORKS FOR POTABLE WATER TANK

01 GENERAL

Should any of the waterproofing, rendering or finishing system be a proposal made by the Contractor, the re-tanking works shall be subjected to the requirement of water sample test to be carried out by a HOKLAS laboratory regardless of whether the proposed system has been approved by the Contract Administrator or not. Should the result of the water sample test fail to fulfill the Hong Kong Drinking Water Standard (HKDWS) set out by the Water Supplies Department, the Contractor shall be responsible for counter proposing another complete re-tanking system, securing approval from the Contract Administrator, and carrying out the approved re-tanking works again for further water sample test. All cost and time incurred due to failure of the water sample test and further re-tanking works will be responsible by the Contractor.

Under the General Acceptance (GA) scheme of the Water Supplies Department with effect from 1 July 2020, licensed plumbers shall report to Water Supplies Department the details of 4 types of lining materials (tile grout, ceramic tile, paint/coating, cementitious products) to be used in re-tanking works for portable water tanks.

Add the following clause after HKIS GS Clause B8.7 04

B8.7 WATERPROOFING WORKS TO FLOWER BED

05 ROOT RESISTANT WATER WATERPROOFING LAYER

For root resistant waterproofing layer applied to walls and floors of a planter box or flower bed, the component liquid or sheet applied membrane shall be a proprietary product. It shall be root resistant with high mechanical strength and strong resistance to common atmospheric chemicals. If the Contractor proposes the waterproofing system, he shall provide substantiation to the Contract Administrator to prove that the proposed waterproofing system is a root resistant type.

B9 Floor Finishes

B9 FLOOR FINISHES

Add the following clause before HKIS GS Clause B9.1

B9.1 GENERAL

All floor finishes repaving works shall comply with the Design Manual - Barrier Free Access issued by the Buildings Department unless otherwise approved by the Contract Administrator.

For finishing on newly cast reinforced concrete slab, a concrete setting period of 6 weeks shall be allowed prior to floor finishing works.

For re-flooring, existing floor finishes shall be removed unless otherwise mentioned in the tender. The Contractor shall submit method statement for removal of existing floor finishes to the Contract Administrator for approval prior to commencement of the works. The following shall be included:

(i) Plant and equipment to be used with their operating weight to be indicated for checking against the floor loading;
(ii) Any chemical solution to be applied for removal of finishes;
(iii) Sequence of works;
(iv) Safety precautionary measures to minimize impact to the existing structure and adjoining areas to upkeep occupational health and safety of workers; and
(v) Duration of noisy period expected.

Should there be any potential risk of damages to existing waterproofing layer expected, the same shall be reported to the Contract Administrator.

After removal of existing floor finishes, all defects of the exposed substrate surface, e.g. spalling, cracks, honeycomb, water leakage, etc. shall be reported and made good to the satisfaction of the Contract Administrator prior to application of new floor finishes.

Prior to application of floor finishes, the surface shall be sufficiently cleaned by high pressure water jet and free of loose particles, dirt, grease.

Should laying of floor finishes be allowed to be carried out without removal of existing floor finishes and screed, the new flooring system and the expected weight shall be submitted according to the Code of Practice for Dead and Imposed Loads issued by the Buildings Department for the Contract Administrator's approval prior to commencement of the works.

All floor finishes at accessible wet area, external area or semi-outdoor area, unless otherwise specified, shall be non-slip type with static coefficient of friction of not less than 0.6 and 0.8 for generally flat area and sloping area with gradient more than 1:10 respectively. Test certificate from manufacturer or applicator shall be submitted for the Contract Administrator's record prior to works commencement on the Site. The finishing shall be laid with gradient and fall towards the nearby floor drain.

All floor finishing materials to be applied on driveway and emergency vehicular access shall be submitted for the Contract Administrator's approval prior to material ordering together with test certificates showing the technical data with regards to their loading capacity, compressive strength and abrasion resistance.

Samples of all proprietary floor finish materials and mock up sample of minimum 300 mm x 300 mm size shall be submitted for approval by the Contract Administrator prior to material ordering and application.

All method statement and shop drawings showing setting out method, arrangement of joints and interfacing detail with any adjacent finishing material shall be submitted for the Contract Administrator's approval prior to commencement of the related works on site.

All cleansing water for the floor finishing works shall be filtered to remove debris before discharging into public drain.

All newly completed floor finishes shall be properly fenced off with clear signage to protect them from stepping by passer-by within the setting period.

B9.1 SCREEDS

B9.1.1 MATERIALS

Add the following clauses after HKIS GS Clause B9.1.1 05

06 SELF-LEVELLING SCREED

Self-levelling screed shall be approved proprietary pre-mix cementitious single component mortar to be mixed with clean water on site and comply with BS 6319 or BS EN 13813. Linear shrinkage at 28 days shall be less than 0.1 %. Compressive strength at 28 days shall not be less than 30 Mpa and flexural strength at 28 days shall not be less than 7 MPa. Adhesion strength to concrete shall not be less than 1.3 N/mm^2. It shall not contain casein or other protein bearing additives.

07 STONE SLABS/TILES

Stone slabs/tiles for paving shall be of the quality and colours specified by the Contract Administrator and free from flaws and defects throughout.

Unless otherwise specified, the slabs shall be 20 mm thick.

08 RESILIENT FLOOR COVERING

(i) Semi-flexible PVC tile:
Semi-flexible PVC tiles shall be to BS EN ISO 10595, size 225 mm x 225 mm or 300 x 300 mm and 2.5 mm thick.

(ii) Vinyl tiles:
Unbacked flexible PVC (vinyl) tiles shall be to BS EN ISO 10581, size 225 mm x 225 mm or 300 x 300 mm and 2 mm thick.

(iii) Unbacked flexible PVC (vinyl) sheet:
Unbacked flexible PVC (vinyl) sheet shall be to BS EN ISO 10581, 2 mm thick to floors.

(iv) Foam backed PVC (vinyl) sheet:
Foam backed PVC (vinyl) sheet shall be to BS EN 651 and 3 mm thick overall. The wearing layer shall be PVC (vinyl) sheet to BS EN ISO 10581 and 1.5 mm thick.

09 ROOF TILE

(i) Canton roofing tiles:
Canton roofing tiles shall be hard, sound, square, well burnt, free from twists, cracks or other defects, 30 mm to 35 mm thick and from 300 mm square to 400 mm square.

(ii) Concrete roofing tiles:
Concrete roof tiles shall be of precast vibrated concrete flat tiles, 30 mm thick and 300 mm square or 35 mm thick and 400 mm square, in the following proportions by volume:
(a) 1 part of Portland cement;
(b) 2 part of clean washed sand; and
(c) 4 part of 10 mm to 5 mm granite aggregate, free from dust.

(iii) Insulating roofing tiles:
Insulating roofing tiles shall be:
(a) 40 mm thick and 300 mm square or 400 mm square;
(b) Possessing a density of 1,250 kg/m^3 ± 10 %; and
(c) Having hard upper surfaces suitable for pedestrian traffic.

Five legged tiles shall not be permitted.

B9.1.2 WORKMANSHIP

Replace HKIS GS Clause B9.1.2 01 as follows:

01 PREPARATION FOR SCREEDS

Concrete surfaces shall be cleaned to remove dirt, dust, oil and other deleterious material. Neat cement slurry shall be brushed onto the existing surface immediately before applying the finish. A proprietary type of bonding agent approved by the Contract Administrator may be used instead of cement slurry.

At the works area, all drainage outlets shall be properly plugged off and door frame shall be protected prior to screeding works.

Replace HKIS GS Clause B9.1.2 03 as follows:

03 LAYING FLOOR SCREEDS

Floor screeds which are to be laid monolithically with the base shall be applied in one coat within 3 hours after laying the base.

Screeds shall be laid in bays separated between timber battens and each bay shall not exceed 15 m^2. The length of each bay shall not exceed 1.5 times the width of the bay and the top surface shall be set to the required level with fall-gradient towards drainage if the floor is at external or wet area.

Screeds shall be compacted to a uniform density throughout.

Add the following clauses after HKIS GS Clause B9.1.2 05

06 SELF-LEVELLING SCREED

Substrate preparations:
The concrete substrate shall be hard, sound, even, clean and free from loose particles, grease and any unwanted surface contamination. All dust and contaminants shall be vacuum-cleaned prior to installation. Contraction joints, construction joints and cracks in the substrate which may be subject to movement after installation of self-levelling screed shall be maintained as joints in the new surface. Any cracks in the substrate shall be repaired and made good. Concrete laitance and old coatings shall be removed mechanically by mechanical tools approved by the Contract Administrator.

Application, storage and health and safety precautionary measures shall be in strict accordance with manufacturer’s recommendations.

07 WATERPROOF CEMENT SAND SCREED

50 kg of cement to 150 kg of sand to 5 kg of waterproofing water resisting admixture, or in such ratio as may be recommended by the admixture manufacturer.

Manufacturer’s written confirmation shall be submitted by the Contractor to declare that the waterproof cement mortar is safe for use for construction of components in contact with potable water.

B9.2 IN-SITU FLOOR FINISHES

B9.2.2 WORKMANSHIP

Replace HKIS GS Clause B9.2.2 05 as follows:

05 TERRAZZO

Terrazzo shall be applied in two coats and the minimum thickness of each coat shall be as follows:

Location	First coat	Finishing coat
Floors	10 mm	15 mm
Walls and dadoes	10 mm	10 mm
Treads	-	20 mm
Risers	-	15 mm

The first coat shall consist of cement and sand or granite fines in the proportions 1:3 by volume. The finishing coat shall consist of white or coloured cement and marble aggregate in the proportions 1:2½ by volume. The finishing coat shall be applied before the first coat has set.

Terrazzo shall be laid in bays not exceeding 12 m^2. The length of each bay shall not exceed 1½ times the width of the bay. Bays shall be laid in a chequer board pattern and 24 hours shall be allowed between laying adjacent bays. Bays shall be separated by stainless steel strips (on top of brass strips) from other bays and from adjacent finishes to the complete depth of both coats by 3 mm thick brass strips. Terrazzo shall be compacted to a uniform density throughout.

After curing has been completed for at least 7 days, the surface of terrazzo shall be ground to a smooth finish and to expose the aggregate. Voids in the surface shall be filled with matching cement.

One coat of wax polish shall be applied to the surface of wall finishes. Floor finishes shall not be highly polished or wax polished.

B9.3 TILING FINISHES

B9.3.1 MATERIALS

Replace HKIS GS Clause B9.3.1 05 as follows:

05 ADHESIVE

Adhesive for tiles or mosaics shall be compatible with background and finish and shall be an approved proprietary brand. Adhesives for tiles shall comply BS EN 12004:2007. The approved proprietary adhesive shall be used in strict accordance with the manufacturer's technical specifications and recommendations, including and not limited to the valid shelf life and the setting time of the product.

Adhesive for fixing tactile synthetic rubber floor tile shall be epoxy-resin-base bonding system, confirmed by the manufacturer for the rubber tactile tiles that it is compatible with the tile material; and it shall comply with ASTM C 881/C881M.

The expiry date and the setting time shall be clearly indicated with label and stamp for necessary inspection by the Contract Administrator.

Add the following clauses after HKIS GS Clause B9.3.1 07

08 NON-SLIP TACTILE HOMOGENEOUS FLOOR TILES

Submission requirements:

(i) At sample submission and approval stage, submit a sample of the proposed material for the Contract Administrator's approval together with all the following substantiation for the Contract Administrator's information:
  (a) Catalogue, brand name/model name and job reference of the product;
  (b) Name, address and contact person of the local supplier; and
  (c) Name, address and contact person of the manufacturer.

Quality requirements:

(i) Tiles with raised profiles and suitably embossed to provide a distinctively textured walking surface easily detected by foot and cane for guidance of the visually impaired;
(ii) To Group BIa or Group BIb of BS EN 14411, matt finish with anti-stain coating;
(iii) Types: three types of tactile tiles to be used at location as shown on the drawings:
  (a) Hazard warning tiles with raised dots arranged in square grid for indication of hazard;
  (b) Directional tiles with raised strips for indication of direction; and
  (c) Positional tiles with raised dots arranged in staggered position for indication of change of direction.
(iv) Nominal size: as shown on the drawings;
(v) Colour: Contrasting colour against floor background as shown on the drawings or to approval; and
(vi) Slip-resistant tested to ASTM C1028-07E1:
  (a) Minimum static coefficient of friction of 0.8 under dry condition; and
  (b) Minimum static coefficient of friction 0.67 under wet condition.

09 NON-SLIP TACTILE SYNTHETIC RUBBER FLOOR TILES

Tiles with raised profiles to provide a distinctively textured walking surface easy detectable by foot and cane for guidance of the visually impaired.

(i) Type: Two types of tactile tiles to be used as shown or scheduled on the drawings:
  (a) Tiles with raised dots for indication of hazard or orientation; and
  (b) Tiles with raised strips for indication of direction.
(ii) Size, thickness, profile and location: as shown or scheduled on the drawings;
(iii) Colour: to approval;
(iv) To be slip-resistant; and
(v) Fire rating: BS 476-7: Class 2.

B9.3.2 WORKMANSHIP

Replace HKIS GS Clause B9.3.2 01 as follows:

01 LAYING FLOOR TILES

Floor tiles shall be fixed as follows:

(i) Using semi dry method direct to concrete base:
  (a) Soak tiles in clean water for minimum of 30 minutes and stacked to drain off the surface water immediately before tiling.
  (b) The substrate of surface to be tiled shall be sprayed with water and sufficiently wetted prior to tile installation.
  (c) Lay semi-dry mix cement and sand 1:4 bed thoroughly compacted to the required thickness (20 mm minimum) finished to the required levels, falls and currents.
  (d) Pour cement and sand slurry over bedding and spread and trowel to minimum 3 mm thick.
  (e) Lay tiles, mixed from six boxes, and tamp firmly into bed with straight and even joints and minimum 3 mm wide.
  (f) Allow bedding to set.

(g) Grout up joints and clean surplus grout face of tiles as work proceeds.

(ii) Using thick bed method to screed:
- (a) Soak tiles in clean water for minimum of 30 minutes and stacked to drain off the surface water immediately before tiling.
- (b) The substrate of surface to be tiled shall be sprayed with water and sufficiently wetted prior to tile installation.
- (c) Damp the screed with clean water to reduce suction if required.
- (d) Lay cement and sand 1:3 bed generally 15 mm thick but never thicker than the tiles.
- (e) Coat back of tiles with slurry immediately before fixing.
- (f) Lay tiles mixed from six boxes and tamp firmly into bed with straight and even joints and minimum 3 mm wide.
- (g) Allow bedding to set.
- (h) Grout up joints and clean surplus grout from face of tiles as work proceeds.

(iii) Using thin bed method:
If approved, floor tiles shall be fixed using a bed of proprietary tile adhesive to BS EN 12004 in accordance with manufacturer's recommendations.

Replace HKIS GS Clause B9.3.2 02 as follows:

02 EXPANSION JOINTS

Expansion shall be allowed with a 75 mm space around perimeter and 25 mm joints per 9 m^2 cut through joints and filled with cold bitumen or approved sealant.

(i) Expansion joint shall be full depth extending to the base substrate or the protection screed of waterproofing layer, if any; and
(ii) Flexible backer rod shall be installed prior to sealant application along the joint.

Add the following clauses after HKIS GS Clause B9.3.2 03

04 LAYING TACTILE HOMOGENEOUS FLOOR TILES

(i) Cutting of tiles shall be avoided as much as practicable;
(ii) Normal tile to tile joints to be the same as that for adjacent general flooring; and
(iii) In order not to cause any disruption to the tactile guide path, keep away accessories such as metal grating and manhole covers which will cause a disruption to the floor pattern.

05 FIXING TACTILE SYNTHETIC RUBBER FLOOR TILES

Fix the rubber tiles with adhesive in accordance with the following:

(i) Preparation of laying surface:
Thoroughly clean the screed or wall rendering or concrete surfaces and:
- (a) Ensure that it is free from all loose particles, laitance, traces of grease, oil, paint, wax, dirt or dust; and
- (b) Fill all cracks, minor holes or crevices with a suitable filler recommended by the manufacturer of the material to be laid.

(ii) Mix and apply the adhesive all in accordance with the manufacturer's recommendations.

B10 | Woodwork

B10 WOODWORK

B10.1 MATERIALS

Add the following clauses after HKIS GS Clause B10.1 33

34 SKIRTING

Skirting shall be selected and approved hardwood, made to specified size and with arrised top edge.

35 BAY WINDOW BOARD

Bay window board shall be selected and approved hardwood with minimum 20 mm finished thickness. All the drawings with dimensions, material sample and fixing method shall be submitted for the Contract Administrator's approval prior to installation.

36 WINDOW SILL

Window sill shall be selected and approved hardwood boarding with minimum 20 mm finished thickness. All the drawings with dimensions, material sample and fixing method shall be submitted for the Contract Administrator's approval prior to installation.

B10.2 WORKMANSHIP

Replace HKIS GS Clause B10.2 31 as follows:

31 SMOKE AND INTUMESCENT SEALS

Folding or swing fire doors shall incorporate proprietary smoke seals and intumescent strips where necessary to attain the requirements of the Code of Practice for Fire Safety in Buildings issued by the Buildings Department.

Add the following clauses after HKIS GS Clause B10.2 36

37 SKIRTING

Skirting shall be secured to walls on sawn hardwood grounds. All the drawings with dimensions, material sample and fixing method shall be submitted for the Contract Administrator's approval prior to installation.

38 CORNICE

Coved or moulded cornices shall be performed cornices from an approved manufacturer fixed in accordance with the manufacturer's recommendations. All the drawings with dimensions, material sample and fixing method shall be submitted for the Contract Administrator's approval prior to installation.

B11 | Metalwork

B11 METALWORK

B11.1 MATERIALS

Replace HKIS GS Clause B11.1 01 as follows:

01 STEEL

Steel shall be hot-rolled or hot-finished steel complying with BS EN 10025:2005 or BS EN 10210:2006 respectively. All steel shall be Grade S275 or S355JR, except that hot-finished hollow sections shall be Grade S275J0H, S275J2H, S355J0H or S355J2H complying with BS EN 10210-1:2006.

For structural steel works, they shall comply with Code of Practice for the Structural Use of Steel issued by Buildings Department.

Replace HKIS GS Clause B11.1 03 as follows:

03 STEEL MESH

Welded wire mesh shall be steel wire of the specified diameter welded to form a square or oblong mesh as specified and shall be hot dip galvanized after manufacture as specified.

Expanded steel mesh shall comply with BS 405:1987.

For external wall steel mesh reinforcement for plastering, it shall be austenitic stainless steel wire.

Add the following clause after HKIS GS Clause B11.1 12

13 CAT LADDERS, HANDRAILS AND RAILINGS

(i) Shop drawings and fixing methods of new cat ladders, handrails and railings shall be submitted by the Contractor at least 14 days before fabrication starts for the approval of the Contract Administrator.
(ii) Railing shall be capable of withstanding a horizontal loading of 0.75 kN/m or otherwise specified by the Contract Administrator.
(iii) Handrail shall be so installed as to resist a load of not less than 1.3 kN or otherwise specified by the Contract Administrator, applied vertically or horizontally.
(iv) Steel for railings, handrails and ladders shall comply with the following:
  (a) Steel tubes and tubulars suitable for screwing to BS EN 10226-1, BS EN 10226-2, BS EN 10226-3 pipe threads shall comply with BS EN 10255;
  (b) Hot rolled sections: BS EN 10034, BS EN 10365;
  (c) Hot rolled structural steel sections:
    (1) Equal and unequal angles: BS EN 10056-1;
    (2) Hollow sections: BS 4848-2; and
    (3) Weldable structural steels: BS EN 10025-1, BS EN 10025-2, BS EN ISO 18286, BS 7668, BS EN 10210-1, BS EN 10025-3, BS EN 10025-4.
(v) Stainless steel for railings, handrails and ladders shall be Grade 1.4301 complying with BS EN ISO 18286, BS EN 10048:1997, BS EN 10051, BS EN 10095 and BS EN ISO 9445-1, BS EN ISO 9445-2. Stainless steel tubes shall be longitudinally welded tubes complying with BS EN 10296-2. Tubes for handrails shall be polished.

B11.2 WORKMANSHIP

Replace HKIS GS Clause B11.2 07 as follows:

07 FINISHING TO STEEL

Finishes to steel shall be as follows:
(i) Bare to receive painted finish.
(ii) Electroplated coating of zinc shall comply with BS EN ISO 2081:2008, BS EN ISO 2082:2008 Class A, 0.025 mm thick.
(iii) Zinc sprayed coating shall comply with BS EN ISO 2063:2005 - nominal thickness 0.2 mm unless otherwise specified.
(iv) Galvanizing shall be hot-dip galvanizing complying with BS EN ISO 1461:2009 with a minimum thickness of 85 μm. Components shall be galvanized after fabrication, if required.

No zinc sprayed coated or hot-dip galvanized items shall be welded, cut or drilled, and any subsequent cutting is defined as damage and shall be made good by treatment with two coats of metallic zinc-rich priming paint to BS 4652 Type 2, rust inhibitor or equivalent product approved by the Contract Administrator.

Add the following clause after HKIS GS Clause B11.2 17

18 REPAIR TO EXISTING CAT LADDERS, HANDRAILS AND RAILINGS

Repair works to existing cat ladders, handrails and railings shall include:
(i) Checking of the points of support;
(ii) De-rusting;
(iii) Stripping off of existing loose paint finishes;
(iv) Touching up of any suspected damaged galvanized surface, then apply primer and top coat in accordance with the specification and the paint supplier's recommendation; and
(v) Earthing bonding wire connection.

19 REINSTATEMENT ON ZINC COATING WITH POST-GALVANIZING WELDING

Where post-galvanizing welding is necessary, the zinc coating shall be ground off the mating surfaces directly before welding. Immediately after welding, the surface of the weld area shall be prepared by removal of slag with the chipping hammer followed by vigorous wire brushing.

The zinc coating shall then be restored by either:
(i) Applying two coats of an organic zinc rich paint (zinc content at least 95 %) to an overall dry film thickness greater than 100 μm. (ref. BS EN ISO 12944); or
(ii) Pre-heating to 315 ^{o}C and application of proprietary metallic repair stick or powder to a thickness greater than 100 μm.

If re-coating does not take place within 4 hours of welding, the weld areas shall be vacuum-grit blasted to BS EN ISO 8501-1, BS EN ISO 8501-2, BS 7079-A2, BS EN ISO 8501-3, BS 7079-A3, BS EN ISO 8501-4, BS EN 10346 “first quality” and hot-zinc spray coated. Work shall be in accordance with BS EN ISO 2063-1, BS EN ISO 2063-2 and to a minimum coating thickness of 100 μm.

After reinstatement of the zinc coating, a complete paint system as specified in the contract shall be applied to the repaired area in such a manner that the new paint overlaps the existing coats by at least 50 mm all around the affected part.

20 MARKINGS

Clearly mark all steelwork in an approved manner. Individual pieces shall have positive identification at all stages of fabrication. All marking shall be removed by the Contractor upon completion of installation works.

21 BOLTING

Washer shall be provided when the members being connected have a finished surface protective treatment which may be damaged by the rotation of the nut or bolt head.

22 EARTHING LUG

(i) Unless otherwise specified on the drawings, provide earthing lug(s) to extraneous conducive parts including the following which are not exhaustive:
   (a) Burglar bars;
   (b) Grilles;
   (c) Railing;
   (d) Handrail; and
   (e) Cat ladder.

(ii) Earthing lug shall be of minimum 1.5 mm thick steel plates electroplated zinc galvanized to BS EN 10346, Coating Designation Z200 and 14 μm. The cut edges of earthing lug shall be painted with zinc-rich primer to BS 4652.

B12 | Windows

B12 WINDOWS

Replace HKIS GS Clause B12.1 as follows:

B12.1 GENERAL

01 ALUMINIUM WINDOW

(i) All structural members of a window section shall have a minimum aluminium thickness of 2 mm.
(ii) All new mullion section shall not be less than 38 mm thick.
(iii) Maximum width of openable sash shall be 700 mm.
(iv) Top member of a window frame shall have a built-in projecting fin with a drip nose to prevent water ingress.
(v) Earth bonding wire shall be provided to all windows.

02 STEEL WINDOW

Steel windows shall be obtained from an approved manufacturer and constructed to BS 6510:2005 and in accordance with the following:

(i) When fixed in position, windows shall be designed to withstand a wind load calculated in accordance with the Code of Practice on Wind Effects in Hong Kong with a minimum pressure of 3 kPa and a permissible maximum deflection of 1/180th of the length of the member under consideration. Calculations shall be submitted for approval.
(ii) Frames shall be square and flat with mitred, welded corners and with glazing bars machine tenoned and/or welded to frames.
(iii) When weather bars are specified, they shall be welded to the frames for the complete width of the windows.
(iv) All slotted adjustable lugs and screws necessary for building in the windows shall be provided and lugs shall project minimum 60 mm beyond the metal frames.
(v) Loose mullions and transomes of total length to suit window openings together with additional 75 mm at each end for building in shall be provided.
(vi) Sufficient mastic and bolts for assembly of all composite units shall be provided and be assembled at Site, including bedding mullions and transomes in mastic with all interstices completely filled.
(vii) Windows shall be suitable for internal glazing unless otherwise specified. Windows shall be provided with rolled steel heavy channel section glazing beads size as specified, be mitred at corners and be fixed with galvanized mild steel flat headed countersunk screws at maximum 225 mm centres and frames shall be tapped to receive screws.
(viii) All members shall be hot-dip galvanized or zinc sprayed.
(ix) When specified, an approved chloroprene rubber or polyvinyl chloride weatherstrip shall be provided and securely fixed into the dovetail groove in the section to provide a continuous contact between the opening casement and the fixed frame.
(x) Window fittings and furniture shall be approved and as follows:
    (a) Steel hinges with brass pins and welded or riveted to frames.
    Projecting hinges to side-hung casements where windows shall be cleaned from the inside.
    (b) All fittings including friction grip pivots, casement fasteners, spring catches, brackets, slide arms, shoes, slip bolts, cabin hooks and eyes and handles, all of manganese brass with bronze finish. All to retain the opening parts rigidly in both the open and closed positions.
    (c) Handle plates, round headed stay brackets welded to the fixed frames with interchangeable handles and stays.
(xi) Windows shall be hung to open as indicated and fitted with the following fittings and furniture:
    (a) Side-hung casement and vertically centre-hung ventilator – a two-point nose fastener or a two throw casement fastener with mild steel adjustable connecting rod and a 250 mm peg stay or bronze sliding stay, as specified.
    (b) Projecting casement - bronze sliding shoes, pivots and friction side arms and one spring catch with ring for hand or pole operation and two square-shank barrel bolts.

(c) Top-hung ventilator - 200 mm peg stay with round-headed stay bracket welded to the fixed frame and with a second peg to secure the stay firmly and horizontally against the first peg when the ventilator is closed.
(d) Bottom-hung ventilator - a spring catch and fanlight roller stay to limit opening and to permit the ventilator to swing free for cleaning.
(e) Horizontally centre-hung ventilator with a spring catch, with ring and eye for cord or pole operation.

(xii) When specified, extruded aluminium flyscreens having plastic covered fibre-glass mosquito gauze with 7 x 7 mesh per 10 mm^2 shall be provided. Where flyscreens are provided, side hung casements shall have a locking handle and an opening and closing mechanism consisting of a bronze cam handle and bronze roto operator, and top hung casements to have bronze "through-the-frame" type stays.
(xiii) When specified, high openable windows in inaccessible locations shall be fitted with remote control gear.
(xiv) Temporary steel clamps at the top and bottom of all opening lights of casements shall be provided prior to transportation from factory till fixed in position.

03 ALUMINIUM LOUVRE

Aluminium louvre shall be in accordance with the following:
(i) Louvres shall consist of extruded or roll formed aluminium perimeter frames and blades. Frame corners and blade ends shall be welded or fastened with 300 series stainless steel screws. Provide concealed extruded aluminium stiffeners for blades, such that vector sum of blade deflections parallel to blade principal axes does not exceed 1/175 times span at design pressure. Assume that pressure acts perpendicular to the plane formed by the corners of the perimeter frame, and that the tributary area for one blade equals its projected area on the same plane.
(ii) Louvres in external walls are to comply with the water resistance requirements of American National Standards Institute/Air Movement and Control Association International (ANSI/AMCA) Standard 500-L. Coordinate free area of louvres with mechanical requirements.
(iii) Inactive louvres shall be closed by aluminium sheet with minimum 3 mm nominal thickness, fastened and sealed to the indoor louvre surfaces. External face of sheet is to be finished with an approved factory applied architectural finish.

04 SUBMISSION

If a rehabilitation project involves replacement of windows, the following submission shall be made by the Contractor for the review and approval by the Contract Administrator:
(i) Proposed method statement for removal of existing windows and installation of new windows.
(ii) Shop drawings showing the window elevations, sections and installation detail.
(iii) Structural calculation prepared by registered professional engineer for the new windows. The loading onto the parent structure with a method statement of water test to demonstrate compliance of wind load requirements and water tightness performance.
(iv) Material sample of all window components, accessories and glazing.
(v) Proposed waterproofing cement mortar, waterproofing membrane around outer frame of window and sealant between the frame and adjacent external wall finishing.
(vi) Colour charts for all exposed window frame and materials.

For a rehabilitation project involves erection, alteration, repair or removal of windows, the Contractor shall be responsible for submission of the works to Buildings Department according to Minor Works Control System/Mandatory Window Inspection Scheme of Buildings Department.

05 CLEANING AGENT

All cleaning agent for the window frame shall be approved by the Contract Administrator. It shall not be acidic to avoid damage to the coating system.

06 WATERPROOFING

The waterproofing layer applied around the external face of window frame (i.e. 150 mm width) shall be compatible with the waterproof cement mortar between the new window frame and the structural

opening, and shall be different colours to facilitate site checking. The Contractor shall submit shop drawings for the approval of the Contract Administrator prior to commencement of works.

07 SEALANT

All sealant applied shall be UV and mould resistant unless otherwise specified.

B12.2 WORKMANSHIP

01 ALUMINIUM WINDOWS

Replace HKIS GS Clause B12.2 01 (iv) as follows:

(iv) Galvanized steel fixing lug spaces at 300 mm centres (maximum) shall be provided for outer frames of each unit. Where specified, lugs shall be fixed with rag-bolts or approved proprietary stud anchors fixing bolts. All steel fixing lugs shall have a minimum thickness of 1.5 mm.

Add the following clause after HKIS GS Clause B12.2 02 (xi)

02 FIXING METAL WINDOWS

(xii) If the existing wall where the window located is brick or block wall, the wall conditions shall be properly recorded for the Contract Administrator's information. Fixing detail with structural calculation and site testing to verify the pull-out strength of the fixing method shall be submitted by the Contractor for the approval of the Contract Administrator prior to window installation.

Replace HKIS GS Clause B12.2 05 as follows:

05 FIRE RESISTING SHUTTERS

The construction and installation of the fire resisting shutter shall comply with the requirements of the Code of Practice for Fire Safety in Buildings issued by the Buildings Department. The activation devices shall be constructed according to the requirements of Fire Services Department. The operation of the fire shutter and the activation devices shall be tested according to the requirements of the Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment, Fire Services Department and the Building Services Branch Testing and Commissioning Procedure Number 3 for Fire Service Installation in Government Buildings, Architectural Services Department.

The fire resistance rating (FRR) of the fire shutters shall satisfy the criteria of integrity and/or insulation relating to the method of exposure on each side separately when tested in accordance with BS 476-20, BS 476-21, BS 476-22, BS 476-23, BS 476-24, ISO 6944 according to Code of Practice for Fire Safety in Buildings issued by the Buildings Department.

A test report prepared by a laboratory accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) or Building Authority shall be provided to certify that the fire resisting shutter is capable of resisting the action of fire for the specified period.

The fire resisting shutters shall be provided with smoke detector(s) and manual control devise(s) on both side of the wall openings for automatic and manual operation respectively. The detectors installed shall comply with the requirements of the General Specification for Fire Service Installation in Government Buildings of the Hong Kong Special Administrative Region, Architectural Services Department.

Add the following clause after HKIS GS Clause B12.2 05

06 FIRE DAMPER

Fire dampers shall be provided at locations and constructed to standards as required by the Fire Services Department and Buildings Department to comply with the Building Regulations for compartments and openings.

Where specified, fire dampers shall also be designed and constructed to comply with UL555S Class I, or equivalent approved international standard for smoke dampers, to restrict the spread of smoke. The combined fire and smoke damper shall be complete with electric motor actuator enclosed with suitable fire rated enclosure and shall be able to close completely at design air pressure and flow during fire.

Apart from meeting the fire resistance requirements in the Code of Practice for Fire Safety in Buildings issued by the Buildings Department, damper manufacturer shall certify that the assembled fire and smoke dampers, including all accessories and controls, can withstand 250 ^{o}C for the duration of 1 hour without distortion, buckling, damage to seals, bearings, or any deleterious effect.

In addition to the fusible link, the fire and smoke dampers shall be operated by the building fire alarm system provided in the same building zone which includes manual fire alarm, flow switches in sprinkler system and detectors in the ventilation/ air conditioning control system.

An inspection door shall be provided for each damper and associated fusible link for regular inspection and for each automatic actuating devices for maintenance purpose.

Fire dampers in ventilation ducts shall be tested in accordance with BS EN 1366-2, BS ISO 21925-1 and BS ISO 10294-5 according to Code of Practice for Fire Safety in Buildings.

07 FIXED LIGHT

The fire resistance rating (FRR) of fixed light shall satisfy the criteria of integrity and insulation relating to the method of exposure on each side separately when tested in accordance with BS 476-20, BS 476-21, BS 476-22, BS 476-23, BS 476-24, ISO 6944 according to Code of Practice for Fire Safety in Buildings issued by the Buildings Department.

08 REMOVAL OF EXISTING WINDOW

(i) In removing of existing windows, care shall be paid to avoid damage of the existing openings.
(ii) All frame, fixing lugs, waterproof cement mortar shall be removed with the structural opening exposed.
(iii) All defects discovered after abovementioned removal works (cracks, spall concrete, honeycomb, etc.) shall be made good in accordance with Section of Concrete for Minor Work and Concrete Repair and Section of Brickwork and Blockwork in the specification prior to installation of new windows.

Add the following clause after HKIS GS Clause B12.2

B12.3 TESTING

(i) Field water test for the waterproof cement mortar installed between the window frame and the structural opening shall be performed after 48 hours of the sealing works.
(ii) Field water test shall be performed on all newly installed windows to ensure water tightness and quality of the completed window unit with reference to PNAP APP-116 issued by the Buildings Department.
(iii) Method of water test to windows shall be in accordance with Section of Roofing, Waterproofing and Leakage Repair in the specification.

B13

Doors and Ironmongery

B13 DOORS AND IRONMONGERY

Replace HKIS GS Clause B13.1 as follows:

B13.1 GENERAL

Ironmongery shall be supplied in accordance with the Contract documents. All ironmongery shall be approved before orders are placed and shall be obtained from an approved manufacturer for that item and for the use intended.

Ironmongery shall be fixed carefully using fastenings with matching finish supplied by ironmongery manufacturer to prevent damage to ironmongery and adjacent surfaces.

Ironmongery shall be fitted and fixed in accordance with the manufacturer's recommendations and instruction, where applicable, manufacturer's fixing templates shall be used.

Exposed hardware shall have the finish specified and unless otherwise specified all hardware on each item shall have identical or similar finish.

Screws shall match the finish of the article to be fixed and to be round, flat headed or countersunk as required and in accordance with BS 1494-1:1964.

One complete set of manufacturer's fixing and maintenance instructions for the ironmongery shall be provided prior to delivery.

All new doors and associated ironmongery and fittings at the common area of a building shall comply with the obligatory design requirements stipulated in the Design Manual - Barrier Free Access issued by the Buildings Department unless otherwise specified by the Contract Administrator.

Replace HKIS GS Clause B13.1 01 as follows:

01 CERTIFICATION

Fully detailed catalogues, certificates of compliance or other documentary evidence from recognised testing laboratories accredited by UKAS or HKAS under the HOKLAS, or equivalent accreditation schemes, of the specified proprietary products shall be supplied to the satisfaction of the Contract Administrator that the ironmongery complies with the specified requirements.

The following shall be submitted for the Contract Administrator's approval prior to ordering of materials:

(i) All exposed timber;
(ii) Proposed low volatile organic compound and non-toxic preserver/anti-termite oil for concealed timber (tested to BS EN 1122 and Environmental Protection Agency test);
(iii) All types of door leave and door frame finishing;
(iv) All ironmongeries;
(v) Sample certificate of fire rated doors and associated compatible ironmongeries for all fire rated doors; and
(vi) Shop drawings and door schedule showing the door elevations (both two faces), size, finishes, door frames, architraves, fish tails/bolts and fixing details.

B13.2 MATERIALS

Replace HKIS GS Clause B13.2 04 as follows:

04 HINGES AND PIVOTS

Hinges and pivots shall be to BS EN 1935:2002 of the appropriate class for the door size, weight and duty, with heavy-duty, maintenance free, concealed bearings.

Where door closers incorporating hold-open devices or a backcheck facility, hinges with a minimum Grade 12, 13 or 14 to BS EN 1935:2002 shall be used.

Hinges shall be stainless steel, all finished to match other hardware on the door face, including plating to match brass, bronze or other finishes, where required.

Hinges with nylon bearings shall not be permitted in fire-resisting door assemblies. Hinges shall be countersunk drilled, fixed with matching screws and of the following types:

For timber doors and frames: Jig drilled, with staggered drilling pattern and 12SG x 32 mm wood screws.

For pressed steel doors and frames: ANSI template drilled with M5 or M6 x 12.5 mm machine threaded screws.

For timber doors with steel frames: Different drilling patterns for leaf and frame as appropriate to timber and metal substrate.

Outward opening external and/or security doors shall be provided with hinges with integral security studs.

Unless otherwise specified, minimum 3 hinges shall be provided per leaf of solid core door, steel door or fire-rated door up to 1800 mm high and one extra hinge for each additional 450 mm height (or part thereof)

Conductor hinges or concealed fixing, flexible metal cable loops shall be provided to transfer wiring for electromagnetic fire hold closers, solenoid locks and the like between frame and door leaf.

Replace HKIS GS Clause B13.2 07 as follows:

07 BARRIER FREE ACCESS

Door closing devices shall be designed to allow exterior and interior doors to be opened with forces of not more than 30 N and 22 N respectively. Closers for interior doors shall have a closing period of at least 3 seconds measured from an open position of 70 degrees to a point 75 mm from the closed position measured from the leading edge of the door. Door closing devices include door closers and floor spring.

At common areas of building, any double-action self-closing doors shall have a check mechanism to prevent the door swing beyond the closed position and a transparent vision panel with a bottom edge not more than 1000 mm and top edge not less than 1500 mm above finished floor level to meet the requirement of the Design Manual - Barrier Free Access issued by the Buildings Department.

The Contractor shall provide drawings showing details of members and position of fixing lugs and obtain the approval of the Contract Administrator prior to commencement of manufacture.

Add the following clauses after HKIS GS Clause B13.2 17

18 ELECTRONIC DOOR AND GATE LOCK

All electronic door locks for rooms shall be fail-safe and be readily openable from inside of the room without using any keys or pass code.

When electronic door locks/smart locks/biometric locks are used at fire rated door, fire certificate issued by laboratories of HOLKAS to demonstrate that the door locks are compatible, and without adverse impact to the fire performance of the fire door at which the locks are installed, shall be submitted to the Contract Administrator for approval prior to material ordering.

All electromagnetic door locks shall be releasable in case of fire when fire signal of the building is triggered or when the power supply is suspended. Unless otherwise specified, break glass unit shall be installed adjacent to the door at the inside direction of escape.

19 METAL GATE

All metal gates shall be stainless steel, aluminum or galvanized mild steel (GMS) with minimum 85 μm thick of galvanization protection unless otherwise specified.

Unless otherwise specified, all GMS to be adopted for metal gate shall be coated with paint system as specified in Section of Painting in the specification and with zinc phosphating or equivalent paint adhesion enhancement treatment approved by the Contract Administrator prior to coating.

Unless otherwise specified, all leaves of metal gates shall be installed with three hinges.

Unless otherwise specified, the design, submission and installation of all metal gates shall comply with the standard set out in PNAP APP-146 by Buildings Department.

Maintenance manual outlining the requirement of routine maintenance and inspection of the metal gate shall be submitted upon completion of the project for client’s compliance.

Unless otherwise specified, the design and installation of all metal gates shall be submitted to Buildings Department according to the Buildings Ordinance and requirements stipulated in PNAP APP-146 and APP-147 by the Contractor and the record of which shall be copied to the Contract Administrator for record.

The equipotential bonding to metal door shall comply with BS 7671.

B14

Internal Fittings and Furnishings

B14 INTERNAL FITTINGS AND FURNISHINGS

B14.3 SUSPENDED CEILINGS

B14.3.1 MATERIALS

Replace HKIS GS Clause B14.3.1 01 as follows:

01 GENERAL

Fire resistance of complete ceiling assembly shall comply with BS 476:Part 21, 22 and/or 23 as relevant.

The suspended ceiling system shall be manufactured from one of the following materials:
(i) Galvanized mild steel;
(ii) Aluminium; or
(iii) A combination of galvanized mild steel and aluminium.

Aluminium sections shall be anodized where exposed. The panel grid shall be constructed of exposed tee or concealed 'T', 'Z' or other approved sections. Hangers shall be steel wires not less than 2 mm diameter, or straps, rods or combination of sections designed to facilitate the adjustment of grid levels, support the weight of the ceiling and all fittings and attachments.

Suspension system shall include all hangers, fixings, main runners, cross members, primary channels, perimeter trims, splines, noggings, clips, bracing, bridging, etc., which are necessary to complete the installation and achieve the performance specified.

Fixing to soffits shall be by means of approved sockets, anchors or other fixing devices cast into the slab or approved proprietary plugs or drill-anchors.

The system shall be so designed to facilitate the removal of at least 10 % of the tiles without disturbing the remainder. Matching edge trim shall be provided to the perimeter of suspended ceilings. Samples of the panel grid complete with acoustic ceiling tiles shall be submitted for approval.

All suspended ceilings and corresponding parts, fixing, etc. in required staircase and/or protected area within the walls having the required Fire Resisting Rating (FRR) shall be non-combustible in accordance with the Code of Practice for Fire Safety in Buildings issued by the Buildings Department.

B14.3.2 WORKMANSHIP

Replace HKIS GS Clause B14.3.2 08 as follows:

08 SETTING OUT

Unless shown otherwise, the ceiling shall be set out as follows:
(i) All cutting of tiles shall be done at the perimeter unless otherwise specified.
(ii) Edge tiles/sheets shall never less than half in width or length. Grid shall be positioned to suit board/tile size(s), allowing for permitted deviations from nominal size(s).
(iii) All lines and joints shall be straight and parallel to walls unless specified otherwise.
(iv) Instruction on setting out shall be obtained where surrounding walls or other building elements and features to which the suspended ceilings relate are not square, straight or level.

B15 | Glazing

B15 GLAZING

Add the following clause before HKIS GS Clause B15.1

New GENERAL

01 ORDINANCES, REGULATIONS, CODES AND STANDARDS

This section shall be read in conjunction with Section of Windows in the specification when windows are the subject of glazing requirement.

When the Contractor is responsible for the design, repair, installation, removal, manufacturing and installation of glazing works, relevant statutory submission shall be made including but not limited to Minor Works Control System and/or prior approval and consent by the Buildings Department. Structural calculation shall be provided in accordance with relevant codes of practice including but not limited to Code of Practice for Structural Use of Glass and/or Code of Practice on Wind Effects in Hong Kong issued by the Buildings Department.

Structural sealant of glazing works shall comply with PNAP APP-37 and PNAP APP-53 by the Buildings Department. It shall be applied in accordance to BS 6262-6, BS EN 13022-1 and BS EN 13022-2. Only structural sealant recommended by manufacturer shall be used.

B15.1 MATERIALS

Replace HKIS GS Clause B15.1 18 as follows:

18 FIRE RATED GLASS

Wired and other specialist glasses shall have been successfully tested in accordance with the relevant clauses of BS 476.

(i) Wired cast glass and wired polished glass shall have a square mesh wire 13 mm square electrically welded at each intersection that is embedded into the glass to a depth equivalent to half the glass thickness.
(ii) Wired glass is not considered a safety glass and can only be used in a non-fire rated installation with express permission.
(iii) Non insulating fire rated glass, other than wired soda lime glass shall be bora silicate glass.
(iv) Insulating fire rated glass can be of any composition if the relevant fire certificate can be provided. Fire certificate and test report shall be provided upon completion of works to satisfy the relevant requirement of the Government.
(v) Sample of fire certificate for fire rated glass shall be submitted for approval of the Contract Administrator prior to material ordering.

Replace HKIS GS Clause B15.1 19 as follows:

19 HEAT STRENGTHENED GLASS

(i) Heat strengthened glass shall be glass that has been heat treated to give increased strength, in accordance with the requirements of ASTM C 1046, to approximately twice the strength and impact resistance of untreated float glass.
(ii) To be defined as heat strengthened glass, the residual surface compression shall be between 24 and 52 MPa.
(iii) Tempered glass with a surface compression in excess of 45 MPa is to be subjected to heat soak testing in accordance with the relevant procedures set out in BS EN 14179-1. The compliance certificate shall be submitted for the glass delivered to the Site for approval of the Contract Administrator. The compliance certificate shall include the following information:
    (a) Identification of the batch;
    (b) Quantity and configuration of thermocouples used to measure the glass surface

temperatures in the oven;
(c) Graphs of the heat soak process cycle associated with each of the thermocouples indicating the glass surface temperatures at representative glass locations and time duration of the heating phase, holding phase and cooling phase of the process;
(d) Name of the glass manufacturer;
(e) Location of the oven;
(f) Calibration report of the oven;
(g) Date of carrying out the heat soaking process;
(h) Quantity and size of glass subject to the heat soaking process and records of breakages of panels in the tests; and
(i) Minimum dimension of glass separation in the oven.

(iv) Heat strengthened glass shall not be considered a safety glass.

Replace HKIS GS Clause B15.1 20 as follows:

20 FULLY TEMPERED GLASS

(i) Fully tempered glass shall be glass that has been heat treated to give increased strength, in accordance with the requirements of ASTM C 1046, to approximately four times the strength and impact resistance of untreated float glass.
(ii) To be defined as fully tempered glass, the residual surface compression shall be a minimum of 69 MPa, however it is recommended that the glass supplied as fully tempered shall have a minimum of 75 MPa.
(iii) Under PNAP APP-37, APP-53 and APP-110 by the Buildings Department, heat soak testing following the relevant procedures set out in BS EN 14179-1 shall be required for glass supplied as fully tempered. As applicable, the Contractor shall submit the following items for approval unless otherwise approved by the Contract Administrator:
(a) A quality supervision plan for the quality supervision of the manufacturer's heat soak process of the tempered glass to be used;
(b) The name, experience and qualification of the technically competent person (TCP) who shall be appointed by the Contractor to provide full time continuous supervision of the heat soak process of all tempered glass panes in the factory; and
(c) The compliance certificate for the glass delivered to the Site.
(iv) Fully tempered glass shall be considered a safety glass as it should break into small fragments upon fracture.

Add the following clauses after HKIS GS Clause B15.1 25

26 SELECTION OF COLOURS FOR GLAZING

The colours of glazing shall be provisionally selected by the Contract Administrator from a catalogue showing the range of colours offered by the manufacturers.

Sample of glazing shall be provided for all types of glass in each of the colours provisionally selected by the Contract Administrator. Each sample shall be 0.3 m x 0.3 m and shall be with the complete coating system. It is recognized that provision of samples of heat treated glass may not be possible due to size constraints. The amount of roller wave distortion shall therefore be confirmed prior to the production of the glass.

27 GASKETS AT STRUCTURAL SEALANT

Gaskets at structural sealant glazing shall be as follows:
(i) Glazing gaskets, sealant backers within glazing pockets and continuous glass spacer pads at structural sealant shall be black heat cured silicone rubber.
(ii) In recognition of the reliance on the resistance to compression for the performance of gaskets, the maximum in service compression set is limited to 25 % over a time period equivalent to 1.15 times of the design life of the building.
(iii) Gaskets which maintain glass face clearance while serving as a backer for a silicone weather

seal may have a friction fit. All other gaskets and weather strips, including backers for structural sealant, shall have a continuous spline or a continuous groove which engages a matching groove or leg on the aluminum frame.

(iv) Double side tape is acceptable as a glass spacer pad when used in conjunction with structural sealant, subject to the verification of compatibility.

28 MIRROR GLASS

Mirror glass shall be selected float suitable for silvering and a minimum Q2 quality in accordance with ASTM C 1036.

Mirrors shall have square or bevelled edges. Exposed edges shall be grounded or polished smooth with an arissed edge.

29 PLASTIC GLAZING

All plastic glazing installations are subject to the same test and certification requirements as for conventional glass.

(i) Plastic sheet glazing material shall be an approved proprietary product of one of the following types:
   (a) Polycarbonate;
   (b) Polycarbonate with surface hardened treatment; or
   (c) Other plastics as specified in the Particular Specification#.

(ii) All plastic materials shall be suitable for outdoor exposure and UV resistant.

(iii) All materials used at ground level or other areas of high traffic or exposure to damage shall be "mar resistant".

(iv) Plastics shall be cut in conformance with the manufacturer's requirements, including the removal of protective tapes and papers. All surfaces shall be free from irregularities and defects.

30 SETTING BLOCKS

Setting blocks shall be heat cured silicone, ethylene propylene diene monomer (EPDM) or neoprene. Setting blocks are to support the glass for a minimum of 80 % of the glass thickness and are to be 80 - 90 Shore A hardness. They shall have a length equivalent to 25 mm for every 1 m^2 glass area, with a minimum length of 100 mm, and a minimum width suitable to the glass thickness, a minimum of 80 % of the glass width shall be fully supported.

Locating blocks shall be heat cured silicone, EPDM or neoprene. Locating blocks shall cover a minimum of 80 % of the glass thickness and shall be 60 - 70 Shore A hardness.

Thermoplastic elastomers, such as santoprene and PVC or similar materials are not permitted.

Add the following clauses after HKIS GS Clause B15.2 22

B15.2 WORKMANSHIP

23 GLASS BALUSTRADE

Glass balustrade shall be in accordance with the Code of Practice for Structural Use of Glass issued by the Buildings Department.

24 LOCATION OF SETTING BLOCKS

Glazing pocket shall be thoroughly cleaned before setting glass. Solvents shall be compatible with finished aluminum, glass and glazing materials. Setting blocks shall be equidistant from the glass centre-line. Location of setting blocks at glass quarter points is acceptable. The distance from the vertical glass edge to the nearest edge of the setting block shall not be less than 150 mm, or 0.125

times glass width, whichever is greater. Side blocks shall be located between the mid-height and top corner of the glass. Side blocks, setting blocks and chairs shall be positively retained in position.

Setting blocks are to be used for all glass panes and are to be located at quarter points of the bottom edge of the glass. To minimize bending of the transom under dead load, the setting blocks may be moved to eighth points but shall not be closer than that recommended by GANA.

25 FASTENERS IN GLAZING POCKET

Fasteners shall not penetrate glazing pockets.

Add the following clauses after HKIS GS Clause B15.2

B15.3 TESTING

01 OBSERVATION BY NAKED EYE

For any new glazing installation, no scratch mark shall be observable by naked eye at 1 m distance away from the glass surface. Otherwise, the whole piece of glass shall be replaced at the Contractor's own cost and time until new glass is installed to the satisfaction of the Contract Administrator.

02 HEAT SOAK PROCESS

Heat soak process is a widely recognized quality control procedure of tempered glass for minimizing risk of spontaneous breakage in tempered glass by the glass manufacturer. It accelerates the expansion of nickel sulphide intrusions in tempered glass. The heat soak process conformed to BS EN 14179-1 standard shall be carried out to all tempered glass panes to be used.

03 FRAGMENTATION TEST

Fragmentation test for verifying the surface compressive stress of tempered glass shall be carried out to each batch of tempered glass in accordance with Section 10 of BS EN 14179-1 after the heat soak process by the glass manufacturer from representative batch of glass as quality control record during glass production.

The particle count of each test specimen over 50 x 50 mm square area shall not be less than 40 individual particles for glass thickness less than 15 mm and 30 individual particles for glass thickness equal to 15 mm or above. The length of the longest particle shall not exceed 100 mm.

04 SURFACE COMPRESSIVE STRESS

Surface compressive stress of heat strengthened and tempered glass panes shall be measured by grazing angle surface polarimeter (GASP) with valid calibration certificate in accordance with ASTM C1279. Compliance of the glass shall be assessed based on ASTM C1048. This is a nondestructive method to measure the surface compressive stress in flat glass. Each of these measurements shall be obtained by averaging ten individual measurements – five locations with two orthogonal measurements at each location.

The surface compressive stress of heat strengthened glass shall be greater than 24 MPa but less than 52 MPa. The surface compressive stress of tempered glass shall be greater than 69 MPa. The surface compressive stress shall be measured by the glass manufacturer from representative batch of glass as quality control record during glass production.

Test report by the manufacturer with the site address indicated shall be submitted for the Contract Administrator's approval upon the material delivery.

05 THICKNESS AND FLATNESS

The manufactured thickness of glass may vary from the specified nominal thickness resulting in a difference between the design strength and actual strength. Therefore, the glass thickness shall comply with the manufacturing specification and shall not be less than the minimum thickness adopted in calculation.

For laminated glass, each measurement shall be separated into the thicknesses of the individual glass panes and interlayers. Similarly, for insulated glass units (IGUs), each measurement shall be separated into the thicknesses of the individual glass panes and voids. The overall thickness of laminated glass can be measured by caliper, but not the interlayer. The thickness of individual glass panes and the air space of IGUs can be measured by optical/laser equipment.

Glass thickness, flatness and roller waves in glass panes shall be checked in accordance with ASTM C1036, C1048 and C1651 by the glass manufacturer from representative batch of glass as quality control record during glass production.

Test report by the manufacturer with the site address indicated shall be submitted for the Contract Administrator's approval upon the material delivery.

06 BLEMISH INSPECTION

Blemish is imperfection in the body or on the surface of a glass pane. Blemish shall be detected but it is seldom a structural problem. General requirements and inspection method as stated in the ASTM C1036 shall be adopted.

07 BOIL TEST

The purpose of the boil test is to examine the lamination quality of the laminated glass subjected to exposure to high temperature and humidity conditions for 2 hours. Boil test shall be carried out by the glass manufacturer before the production of laminated glass to ensure the lamination quality and minimize the risk of delamination. Details of boil test refers to Code of Practice for Structural Use of Glass issued by the Buildings Department.

Test report by the manufacturer with the site address indicated shall be submitted for the Contract Administrator's approval upon the material delivery.

08 IMPACT TEST

Impact test shall be carried out to BS EN 12600 for glass barriers and glass balustrades functioning as protective barrier by the glass manufacturer.

If the test specimen is made of asymmetric materials (e.g. laminated glass of different pane thicknesses or IGUs of different types of glass panes), the number of test specimen shall be doubled for impact test on both faces unless they are solely intended for installation in situations where the risk of impact is from one side only.

Acceptance criteria shall satisfy the Class 1 requirements as specified in BS EN 12600 without glass breakage. The test specimen shall be selected from representative batch of glass to be used as glass barrier in the project.

Test report by the manufacturer with the site address indicated shall be submitted for the Contract Administrator's approval upon the material delivery.

09 BENDING TEST

Standard four point bending test on flat glass to BS EN 1288-3 under room temperature shall be carried out to verify the minimum bending strength of decoratively treated glass and fritted glass such as ceramic fritted and enamelled painted glass.

Bending test shall be carried out by an independent laboratory accredited under the Hong Kong Laboratory Accreditation Scheme (HOKLAS) within its scope of accreditation. The characteristic value of bending strength at breakage of at least 5 test specimens of surface treated glass shall not be less than the reduced glass design strength with safety factor of 2.

A modified four point bending test at elevated temperature (50 °C) aims to verify the composite action of laminated glass with interlayer materials. Bending test procedures and requirements are given in Code of Practice for Structural Use of Glass issued by the Buildings Department. The effects of various factors (e.g. stiffness, thickness, inter-layer materials and temperature) on the degree of composite action under bending test shall be reviewed and assessed before adopting in design and requirements.

B15.4 SAFETY REQUIREMENT FOR GLASS BREAKAGE

01 SAFETY REQUIREMENT AGAINST GLASS BREAKAGE

(i) Laminated glass shall be used in glass elements resisting long-term load, such as roof, canopy, skylight, sloped glazing, staircase, floor, beam, column, etc., and glass balustrade.
(ii) Tempered glass or laminated glass shall be used in the parts of building exterior façade also serving as protective barrier.
(iii) Where tempered glass is used in building exterior façade, the glass shall be in the form of laminated glass if it meets the following conditions:
  (a) The size of glass pane exceeds 2.5 m^2; and
  (b) Any point of the glass pane installed is at a height 5m or more above the finished floor level of the accessible area on either side of the pane.
(iv) Where IGU is used in building exterior façade, the requirement in item (iii) above applies to the outermost pane of the IGU only.

02 SAFETY REQUIREMENT AGAINST FAILURE OF GLASS ELEMENTS

Glass roofs, accessible canopies and skylights, staircases, and floors subject to medium or long term loads shall be constructed with multi-layered glass panes and designed for ultimate design loads. These elements shall also be provided with structural redundancy such that in case of failure of any single glass pane, the remaining glass pane(s) shall be able to support the unfactored characteristic loads without failure.

B16

Plumbing and Sanitary Fitments

B16 PLUMBING AND SANITARY FITMENTS

B16.1 WATER SUPPLY PIPE WORK, INCLUDING EXTERNAL WATER MAINS

B16.1.1 MATERIALS

Replace HKIS GS Clause B16.1.1 01 as follows:

01 GENERAL

This section shall be read in conjunction with Section of Drainage in the specification.

The Contractor shall appoint a licensed plumber to proceed submission to the Water Supplies Department for approval of proposed plumbing installations as applicable and ensure the proper completion of the works in accordance with the Employer's and government's requirements.

The water usage for all products shall not be inferior to Grade 3 water efficiency rating (i.e. Grade 3 or above) for all water taps, showers for bathing, water closets and urinal equipment under the Voluntary Water Efficiency Labelling Scheme.

AII products shall not contain heavy metals like lead, cadmium, mercury or hexavalent chromium and organically bound halogens. The Contractor with the attendance of the licensed plumber shall arrange a laboratory accredited by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) to conduct the water sample test in accordance with the Circular Letters by the Water Services Department as required.

lf accessible toilets are to be provided, the Contractor shall ensure the installation of plumbing and sanitary fitments, pipes and drains complying with the Design Manual - Barrier Free Access issued by the Buildings Department. The Contractor shall submit samples and shop drawings for accessible toilets to the Contract Administrator for approval before commencement of works.

All sanitary appliances shall be new. Re-use of old appliances is strictly prohibited unless otherwise permitted by the Contract Administrator.

All plumbing works shall comply with the requirements of Water Authority and Waterworks Regulations.

Pipe work under this section shall include:
(i) External water mains and fire service mains within the site boundary.
(ii) Rising water and fire service mains.
(iii) Internal water distribution pipe work.
(iv) Washouts, overflows and all connections to tanks.

Dry risers and fire service distribution pipes and fittings from the roof tank or the rising main to the individual discharge points shall be included in the fire service installation part of the Works.

For cold and hot potable water supply systems, copper pipes or any alternative materials which are acceptable to Water Authority and incorporated into Schedule 2 of Waterworks Regulations for use in fresh water inside service shall be used.

For make-up water supply system of air conditioning system or fountain system, steel pipe or UPVC pipe shall be used where specified.

For flushing water supply systems, ductile iron or plastic pipes as specified shall be used. Ductile iron pipe riser shall be used when booster/transfer pumping system or deep bore well is adopted.

Replace HKIS GS Clause B16.1.1 06 as follows:

6 CISTERNS

Cistern for cold water storage may be made of glass fibre reinforced plastic complying with BS EN 13280 or other material approved by the Water Authority.

Flushing cisterns shall be provided with a ball valve so arranged as to re-fill the cistern within 2 minutes.

Add the following clauses after HKIS GS Clause B16.1.2 17

B16.1.2 Workmanship

18 PIPE PENETRATING EXTERNAL WALL

When replacement of pipes with penetration through external wall is involved, all existing cast iron pipe sleeves, if any, concealed into the external wall shall be removed and replaced the same with uPVC sleeves to BS EN ISO 1452-1, BS EN ISO 1452-2, BS EN ISO 1452-3, BS EN ISO 1452-4, BS EN ISO 1452-5 or other material approved by the Contract Administrator.

B16.2 SANITARY FITMENTS

Replace HKIS GS Clause B16.2.1 01 as follows:

B16.2.1 MATERIALS

01 GENERAL

Certain standard sanitary fitments may be supplied by the Employer, as scheduled on the drawings. These may include brackets, waste fittings, traps, taps, valves, chains and plugs & all fittings which relate to fixtures.

All sanitary appliances supplied to the project shall be new. Re-use of old appliances is strictly prohibited unless otherwise permitted by the Contract Administrator.

All other sanitary fitments as specified shall be provided. Samples of all sanitary fittings shall be submitted for approval.

(i) All sanitary fittings unless specified otherwise shall be white, from an approved manufacturer, generally ensuite and completed with all necessary fittings.
(ii) For waste outlets and overflows, exposed surfaces shall be either chromium plated or other non-chromium plated alternatives complying with BS EN 274-1, BS EN 274-2, BS EN 274-3 subject to approval by the Contract Administrator. Cr-Ni coating shall comply with BS EN 248.
(iii) For taps and combination tap assemblies, exposed surfaces shall be either chromium plated or other non-chromium plated alternatives complying with BS EN 200 subject to approval by the Contract Administrator.

Replace HKIS GS Clause B16.2.1 03 as follows:

03 SHOWER TRAYS

Shower trays shall be prefabricated from glazed ceramic or resin-stone with solid surface complying with BS EN 251 and BS EN 14527. Any solid surface shall comply with BS EN ISO 19712-1, BS EN ISO 19712-2 and BS EN ISO 19712-3.

Replace HKIS GS Clause B16.2.1 15 as follows:

15 SILICONE SEALANT

Silicone sealants shall comply with BS EN ISO 11600 Type F Class 25 in white colour or match sanitary fixtures complying with BS EN ISO 846 as specified in the contract.

All sealants shall comply with volatile organic compound content stipulated in the Air Pollutions Control (VOC) Regulation of Hong Kong and shall not contain the substances regulated in Montreal Protocol on Substances that Deplete the Ozone Layer particularly CFCs, HCFCs, 1,1,1-trichloroethane and carbon tetrachloride. The products shall contain no more than 0.01 % by wet weight of formaldehyde and no more than 0.5 % by wet weight of the sum total of aromatic compounds, which include benzene, toluene, xylenes, and ethylbenzene.

Add the following clauses after HKIS GS Clause B16.1.2 15

16 SOLID SURFACING WASH BASIN

Solid surfacing wash basin shall comply with BS ISO 19712-1, BS ISO 19712-2 and BS ISO 19712-3 with drain, with or without overflow as specified and to the size and configuration shown on the drawings as approved by the Contract Administrator.

17 KITCHEN SINKS

Sinks shall be fabricated to the size and configuration shown on the drawings with overflow and sound deadening pads under the sink and drainers complying with BS EN 695 and BS EN 13310.

Sinks shall be provided with a bonding conductor and its location is reachable for installation and maintenance by the electrician.

18 CLOSE-COUPLED SUITS, ONE PIECE AND INDEPENDENT WATER CLOSET (W.C.)

Close-coupled suits, one-piece and independent W.C. pans with integral trap shall be vitreous china complying with BS 3402 and with horizontal outlet complying with BS EN 997, white plastic single ring seat and cover with plastic fixing bolts complying with BS 1254.

B16.2.2 WORKMANSHIP

Add the following clauses after HKIS GS Clause B16.2.2 08

09 TEMPORARY PROTECTION DURING INSTALLATION

After removal of existing sanitary fitments and pipes, cover shall be temporarily provided at the open end pipes to prevent smell exhausting from the pipes and debris falling into the pipes.

After installation and before handover of sanitary fitments, the Contractor shall cover the sanitary fitments by suitable protective material approved by the Contract Administrator to avoid damage or people using the fitments.

B17 | Drainage

B17 DRAINAGE

Add the following clauses after HKIS GS Clause B17.1

GENERAL

01 ORDINANCES, REGULATIONS, CODES OF PRACTICE AND STANDARDS

Unless otherwise specified in this section or by the Contract Administrator, the General Specification for Drainage Installation in Government Buildings of HKSAR issued by the Architectural Services Department shall be complied with.

The Contractor shall be responsible for all relevant statutory submissions for removal, replacement, repair and installation of drainage (both above or below ground drainage) as required. This includes but not limited to all submissions related to Minor Works Control System and/or drainage works requiring prior approval and consent by the Building Authority.

02 SELECTION OF MATERIAL FOR DRAINAGE

The materials of drainage shall be selected by the Contract Administrator, and as described in the drawings and/or written instructions. If not specified, the material shall be the same as the existing.

Within 6 weeks of the acceptance of the Contractor's tender and prior to the commencement of the installations, the Contractor shall submit to the Contract Administrator for approval a sample board of essential components proposed to be used in the Contract. However, the Contractor may request the Contract Administrator in writing for a longer period for submission if 6 weeks are practically insufficient.

Items displayed shall be deemed to be adequate for the installations unless otherwise clearly indicated. Each sample, with clear numbering and labelling, shall be firmly fixed onto a rigid wooden or metal board. A list shall also be affixed on the sample board to show the item description, make and brand, country of origin and locations of installation (if not generally used). The Contractor shall provide mock-up in typical installation with approval by the Contract Administrator. Samples rejected by the Contract Administrator shall be replaced as soon as possible. Upon approval of all items, the Contract Administrator will endorse the list on the sample board and the Contractor shall deliver the board to the site office of the Contract Administrator's representative for reference.

The board shall contain samples of all (both above/below ground drainage) "compact" sized materials and accessories to be used in the installations. Written approval of all samples and technical details shall be obtained from the Contract Administrator before commencement of any installation work.

In the context of the specification the term "compact" means any item that will fit into a 300 mm^3.

The following items shall be included in the sample board as a minimum:
(i) Pipework, fitting and their support complete with fixing accessories; and
(ii) Valves.

Additional items may be required by the Contract Administrator and/or specified in the Particular Specification#.

03 STORAGE OF MATERIALS

Drainage fittings shall be kept dry and clean during delivery and stored vertically in a well vented location, carefully protected from condensation and other moisture and direct sunshine.

04 CLOSED CIRCUIT TELEVISION (CCTV) SURVEY

(i) Scope:
This method covers the inspection of the internal condition of drainage pipelines by means of closed circuit television. The Contractor shall carry out CCTV inspection to the pipelines as ordered by the Contract Administrator under certain situations including:

(a) Before and after rehabilitation of horizontal underground pipelines using in-situ internal lining;
(b) Before and/or after carrying out of high pressure water jetting and/or mechanical cleaning of horizontal underground pipelines; and
(c) Immediately before completion/handover of new pipes to confirm that the pipes are properly cleaned and constructed.

It is essential that CCTV surveys are conducted during low flow conditions. If the flow quantity is large, the drain upstream shall be temporarily blocked and the flow diverted.

All other associated works, including the provision of all labour, materials, plant, temporary works, any disposal from the drainage and sewage systems and everything, whether of a temporary or permanent nature, required in and for such execution, so far as the necessity for providing the same is specified in or reasonably inferred from the Contract.

(ii) Equipment:
Provide the following equipment:
(a) A CCTV colour camera equipped with integral lighting unit. The camera shall be of a type designed and constructed for the specified purpose, capable of operating in 100 % relative humidity and fitted with a rotating mirror for complete circumferential viewing. The camera shall be transported in a stable condition through the pipelines under inspection and maintained at the location on or near to the central axis of the drain;
(b) The system shall be capable of producing an accurate, clear, high quality picture of the entire periphery of the pipe on the monitor screen and recording tape. The camera and lighting unit shall be mounted on a self-propelled crawler or on skids linked to a manual or power operated winch so that the recorded image is not rotated;
(c) A monitor screen which displays the camera view during the inspection and which is housed in covered accommodation with facilities for inspection by the Contract Administrator and others;
(d) A screen writer which displays, on the monitor screen, details of the inspection, including the date, location, pipe material, pipe diameter, and direction of view on the condition of the pipe;
(e) A measuring device which displays the camera location or chainage automatically on the monitor screen and is capable of measuring to within an accuracy of 0.1 % of the length of the pipeline or to ± 0.3 m, whichever is the greater;
(f) A control unit which controls the camera movement, lighting intensity, focusing and recording;
(g) A video recording system approved by the Contract Administrator to record the inspection and information displayed on the monitor screen; and
(h) A digital or analogue camera capable of producing photographs with a superimposed date.

(iii) Recording results:
Keep a record of the inspections on the Site and submit 3 copies of the report to the Contract Administrator within 7 days of the completion of the inspection and same for the re-inspection, containing the following details:
(a) A key map showing the pipelines inspected and associated manholes, chambers and structures;
(b) Tables listing details of inspection, including date, location, pipe material, pipe diameter, chainage, manholes, junctions and other features and the condition of the pipes and joints, illustrated by a coding system in accordance with the Manual of Sewer Condition Classification and Sewerage Rehabilitation Manual published by the Water Research Centre; and
(c) A summary showing the number, position and type of defects in each pipeline inspected. The summary shall include photographs to illustrate degree of mortar loss, size of a crack/fracture, size of a void or any other quantifiable defect. A suitable metric scale shall be included and be clearly visible and in focus within the photograph.

(iv) Video and photographs:
Submit 3 hard copies and one soft copy of video and photographs to the Contract Administrator with video providing a continuous record of the inspection and information on the monitor screen. The media shall be of high quality, new and unused before recording and shall be of a digital format (DVD+/-R or CD-R) or other format subject to approval of the Contract Administrator. All photos shall be clear colour image with minimum size in 3R and minimum quality in 1024 x 768 pixels with the date and the chainage clearly shown in the file name.

05 ON SITE VERIFICATION

Before commencing any work, verify all measurements of the drawings on the Site. Any discrepancies being found shall be brought immediately to the attention of the Contract Administrator.

The Contractor shall report to the Contract Administrator immediately if the site conditions might cause non-compliance with relevant regulations, including but not limited to:
(i) After installation of drainage fittings, headroom of exit routes is less than 2000 mm; and
(ii) Proposed drainage routings are obstructed, for example by unauthorized building works or within private area.

06 COOPERATION WITH LANDLORD, TENANT, MANAGEMENT OFFICE

The Contractor shall co-operate fully with the landlord, tenants and management office with other tenants for carrying out the drainage works in the building, temporary isolation valves, vent pipes, and drainage pipes connected to manholes might be needed.

Unless otherwise specified, the Contractor shall maintain the functions of the drainage systems during construction works. If, temporary suspension of drainage systems is unavoidable, the suspension period shall not be more than 12 hours unless further instruction and notice given by the Contract Administrator. The Contractor shall report to the Contract Administrator if the abovementioned arrangement is not feasible due to site constraints.

07 TEMPORARY DIVERSION PROPOSAL

When the wholescale replacement of drainage system is involved, or the carrying out of the rehabilitation works is technically not feasible without the existing pipe works and their support or fittings temporarily relocated, the Contractor is responsible for submission of temporary diversion proposal with the following items clearly indicated for approval by the Contract Administrator prior to commencement of relevant work on the Site:
(i) Drawings showing the generic method and sequence of diversion works;
(ii) Method of temporary support for the diversion works;
(iii) List of materials to be adopted for the diversion works with their respective technical information and catalogue; and
(iv) Anticipated duration of drainage suspension required for the diversion works and the units that will be affected.

All time and cost for preparation, submission and carrying out of such diversion proposal approved by the Contract Administrator are deemed to be included in the tender sum and contract period.

08 TEMPORARY PROTECTION DURING INSTALLATION

After removal of existing drainage pipes, cover shall be temporarily provided at the open end pipes to prevent smell exhausting from the pipes and debris falling into the pipes.

Furthermore, debris dumping to the pipes is strictly prohibited.

09 BRACKET OR HOLDERBAT FOR FIXING PIPEWORKS

Pipe brackets shall be of stainless steel to BS EN 10088-3 number 1.4301 or SAE Grade 304 or other approved material. The embedment length of stem into the structure shall not be less than 60 mm with stainless steel stem diameter not less than 9 mm, unless otherwise approved by the Contract

Administrator. Test certificate issued by laboratories accredited by HOKLAS to demonstrate that each anchor point could adhere to the structure under a pull out force of 700 kg after 24 hours curing of the adhesive mixture.

10 PIPE ALIGNMENT

In relocation of pipeworks along external wall, all pipe riser shall be installed vertically with plumb line properly set out before installation works, no noticeable undulation of pipe riser from the bottom part of the riser is allowed. All plastic/PVC pipes except for AC condensation drain pipes shall not be located within 500 mm from any flue aperture or air conditioner condenser to avoid distortion of pipeworks due to overheating.

11 PIPE PENETRATION THROUGH EXTERNAL WALL AND PIPEDUCT

(i) Pipes through walls and floors
Where pipes pass through walls or floors:
- (a) Cast or build in uPVC sleeves to BS EN ISO 1452-1, BS EN ISO 1452-2, BS EN ISO 1452-3, BS EN ISO 1452-4, BS EN ISO 1452-5 with 2 to 12 mm clearance to allow for expansion and movement of pipe.
- (b) Finish sleeves flush with finished face of walls and ceilings and projecting 100 mm above finished floor level.
- (c) Provide loose plastic or chromium plated cover plates, when specified, to ends of sleeves visible in completed work. Plates shall be 50 mm larger than the external diameter of pipe and either clipped to the pipe or screwed or plugged and screwed to the adjacent surfaces.
- (d) Point with approved mastic sealant to ensure watertightness.
- (e) No split PVC sleeves shall be permitted.

(ii) Pipes through fire barriers
- (a) For metal pipes passing through fire barriers, the installation shall be as Clause B17.1.11 (i) but:
  - (1) Cast or built in fire rated pipe sleeve with 2 to 25mm clearance.
  - (2) Firmly fix sealing system around the pipes to properly seal up the gaps between the pipes and the fire barriers to maintain the required FRR of the fire barriers and in compliance with the Code of Practice for Fire Safety in Buildings issued by the Buildings Department. The sealing system shall be tested to BS EN 1366-3 or BS 476-20 and the installation of which shall be in accordance with the manufacturer's recommendations.
- (b) For non-metal or plastic pipes passing through fire barriers, suitable fire collars shall be used. The fire collars shall be tested to BS EN 1366-3 or BS 476-20 with integrity not less than that of the fire barriers as prescribed under the relevant Building Regulations and the Code of Practice for Fire Safety in Buildings issued by the Buildings Department. The fire collars shall be fixed at underneath of fire barriers or other locations around the pipes in accordance with the manufacturer's recommendations.

If replacement of drainage works related to pipe penetration through external wall or pipe duct, the Contractor shall ensure the joint, pipe sleeve, pipe duct opening and the like shall be watertight and airtight. In this connection, water test stipulated in Section of Roofing, Waterproofing and Leakage Repair in the specification shall be complied with.

B17.1 SURFACE WATER DRAINAGE ABOVE GROUND

Replace HKIS GS Clause B17.1.1 02 as follows:

B17.1.1 MATERIALS

2 CAST IRON RAINWATER PIPES

Cast iron rainwater pipes shall be as follows:

(i) Rainwater pipes gutters and fittings for use externally shall comply with BS 460. Rainwater pipes shall have Type A or B sockets without ears.
Holderbats, fixing brackets, pipe-hangers, screws, bolts and washers shall be grade 316 stainless steel comply with BS EN 10088-1 Grade 1.4401 (Grade 316).
Gutters shall be half round or ogee section or as specified, with galvanized mild steel brackets.

(ii) Cast iron rainwater pipes and fittings for use internally shall comply with BS 416-1, BS EN 877 with Type A or B sockets without ears.
Holderbats, fixing brackets, pipe-hangers, screws, bolts and washers shall be grade 316 stainless steel comply with BS EN 10088-1 Grade 1.4401 (Grade 316).
Cast iron roof outlets shall comply with BS 416 Table 20, 21, 22 and 23. Domical gratings shall be provided if specified.

(iii) Coating to cast iron pipe shall comply with BS 3416 or equivalent approved standard. External coating shall contain anti-corrosion inhibitors normally used on metallic structures.

B17.1.2 WORKMANSHIP

Replace HKIS GS Clause B17.1.2 01 as follows:

01 FIXING GUTTERS

Stainless steel wire mesh cover shall be installed to the drainage outlet and domed grating to the gutter outlet to prevent accumulation of debris and blockage of outlet and drainage pipework. Gutters shall generally be laid to falls of 1:100.

B17.2 FOUL WATER DRAINAGE ABOVE AND BELOW GROUND LEVEL

Replace HKIS GS Clause B17.2.1 02 as follows:

B17.2.1 MATERIALS

02 DUCTILE IRON PIPES

Ductile iron pipes and fittings shall comply with BS EN 598 and BS EN 545, metallic zinc coated.

Replace HKIS GS Clause B17.2.1 03 as follows:

03 CAST IRON PIPES

Cast iron soil, waste and ventilating pipes and fittings shall be:

(i) In accordance with BS 416-1 or BS EN 877 for above ground drains; BS 437 or BS 4622 for underground system and above ground drains larger than 150 mm in diameter.

(ii) All spigot spun pipes from an approved manufacturer with flexible joints to BS EN 877.

(iii) Coating to cast iron pipe shall comply with BS 3416 or equivalent approved standard. External coating shall contain anti-corrosion inhibitors, normally used on metallic structures.

Holderbats, fixing brackets, pipe-hangers, screws, bolts and washers shall be Grade 316 stainless steel comply with BS EN 10088-1 Grade 1.4401 (Grade 316).

Replace HKIS GS Clause B17.2.1 09 as follows:

09 MORTAR

Mortar for bedding covers or for rendering shall consist of one part cement and three parts clean well graded sand with just enough water to give plastic consistency, or pre-bagged material approved by the Contract Administrator.

Replace HKIS GS Clause B17.2.1 10 as follows:

10 CAST IRON DRAINAGE GOODS

Manhole cover shall be in suitable category of loading test, where light duty for footpath, medium duty for pedestrian areas and car parking decks, heavy duty for emergency vehicles access area and ultra-heavy duty for emergency vehicles access area and car park area for all types of fast-moving vehicles.

When merging cover is required, the finishes at the merging cover shall match with the surrounding materials. The supply and installation of material shall be included.

Add the following clauses after HKIS GS Clause B17.2.1 11

12 RAINWATER OUTLETS

Cast iron rainwater outlets shall comply with BS 416-1 with removable dome shape strainer or flat grating to stainless steel BS EN 10088-2 number 1.4401 or SAE Grade 316. The strainer or flat grating shall be screwed onto a cast iron collar fitted into the cast iron rainwater outlet body. Assembly of the collar to the rainwater outlet body shall be by stainless steel bolts and nuts. The slots or holes in drain outlet grating shall be less than 13 mm.

Cast iron rainwater two-way side outlets shall comply with BS EN 1561 Grade 150 with removable stainless steel to BS EN 10088-2 number 1.4401 or SAE Grade 316 elbow grating. The grating shall be screwed onto a cast iron clamping collar fitted into the cast iron rainwater outlet body. Assembly of the collar to the rainwater outlet body shall be by stainless steel screws.

uPVC rainwater outlet shall comply with BS EN 12200-1. It shall be an approved proprietary type complete with sealing flange and screw fixed flat or domed grating.

Stainless steel rainwater outlet shall be of flat removable grating type. The body and base frame shall comply with BS EN 10088-3 number 1.4301 or SAE Grade 304.

13 SURFACE CHANNELS

Cast iron channel gratings shall comply with BS EN 1561 Grade EN-GJL-150.

The slots in the channel cover gratings as well as the gap between grating segments shall be less than 13 mm wide so as to avoid trapping wheelchairs and canes.

B17.2.2 WORKMANSHIP

Add the following clauses after HKIS GS Clause B17.2.2 28

29 BENDS IN SOIL AND WASTE PIPES

Soil pipes and waste pipes shall not have bends, except where unavoidable. Whenever a bend is unavoidable, the bends shall have an obtuse angle, have the largest practicable radius of curvature and have not changed in any way the cross section of pipe. It provides a cleaning eye or other suitable means of access at or near the bend.

30 ANTI-SYPHONAGE PIPES

Anti-syphonage pipe shall be provided where:
(i) More than one trap of a watercloset fitment, urinal, slop sink or waste fitment is connected with one soil pipe; or
(ii) More than one trap of a waste fitment is connected with one waste pipe.

Every anti-syphonage pipe shall be connected with:
(i) The trap, if the connection with the anti-syphonage pipe is an integral part of the trap; or
(ii) The branch soil pipe or branch waste pipe
  (a) On the side of the water seal nearest the main soil pipe or waste pipe; and
  (b) At a point not more than 300 mm from the trap outlet.

The internal diameter of every anti-syphonage pipe shall:
(i) If the diameter of the soil pipe or waste pipe to which it is connected is 80 mm or more, be not less than 50 mm;
(ii) If the diameter of such soil pipe or waste pipe is less than 80 mm, be not less than
  (a) Two-thirds of the internal diameter of such soil pipe or waste pipe; or
  (b) 32 mm,
whichever is the greater.

The main anti-syphonage pipe may be connected to a soil pipe which is acting as a ventilating pipe.

Every such connection shall be made at a point above the flood level of the highest fitment connected to the soil pipe.

31 VENTILATING PIPE

Every ventilating pipe for any drain or sewer shall be carried up to a height not less than 1 m above the roof of the building with suitable grating at end of pipe.

The internal diameter of every ventilating pipe and of every soil pipe or waste pipe which is acting as a ventilating pipe shall be not less than 80 mm.

Ventilating pipes shall not be used for the carriage of surface water.

32 FALLS OF DRAINS

Every drain or private sewer shall be laid with a minimum fall from its highest inlet to its connection with a public sewer or other outlet in accordance with the following table:

Diameter of pipe	Fall
100 mm	1 in 40
150 mm	1 in 70
225 mm	1 in 100
300 mm	1 in 150

B17.3 A/C DRAIN PIPE INSTALLATION

Replace HKIS GS Clause B17.3.3 as follows:

B17.3.3 WORKMANSHIP

All jointing of uPVC pipes shall be executed in accordance with the manufacturer's recommendations. For jointing between uPVC pipes which will need to be disconnected and for jointing between uPVC pipes and metal pipes etc. tapered gunmetal union joints shall be used.

The laying and fixing of uPVC pipes shall be carefully executed by skilled workmen and the work shall be carried out with skilled supervision and in strict accordance with the manufacturer's recommendations. Any pipe which in the opinion of the Contract Administrator is not properly laid, fixed or jointed shall be removed and replaced at the contractor's expense.

All uPVC pipes laid horizontally and exposed shall be held in position by approved saddles or supports, packed with felt or other approved soft material. Vertical pipes shall be supported with approved stainless steel pipe clips, packed with felt or other approved soft material. Heavy parts shall be supported so that their weight shall not stress the pipe line.

Special precautions shall be taken that the uPVC pipes shall not be subjected to impact or shock.

All pipe work shall be free from burrs, rust and scale and shall be thoroughly cleaned before erection. Open ends during the progress of work shall be blanked-off with purpose-made metal or plastic caps and the use of wooden plugs is forbidden. Should any stoppage in the flow occur after the various systems have been put into operations, owing to non-compliance with this requirement, the contractor shall rectify the fault at his own expense.

Pipes shall be installed with correct falls for venting, and drainage and attention shall be paid to neatness of installation. Groups of pipers shall be accurately spaced and valves, joints, etc. symmetrically arranged.

All pipe work, fittings, connections, etc. shall be sufficiently supported with bracket. All pipe work shall be supported by brackets at intervals not exceeding those shown in the following table for straight runs, and with not less than one bracket per standard length of pipe. All brackets shall be equally spaced and additional supports shall be provided at bends, etc.

Nominal Size of uPVC Pipe (mm)	Maximum Interval (mm)	
	Vertical Pipes	Horizontal Pipes
Up to 25	1,500	750
32	1,800	900
40 and 50	2,000	1,000
65 to 150	2,500	1,200

Positioning of pipeworks shall be in accordance with the following requirements:

(i) All exposed pipework shall be parallel to the building grid, diagonal pipe runs shall not be accepted.
(ii) Where required the contractor shall mark, free of charge the exact position of the pipes on site before installation commences.
(iii) Pipe runs, where exposed, shall be positioned at least 38 mm from the finished surface or hard against the finished surfaces as directed by the Contract Administrator.

The contractor shall clean the entire A/C drain pipes after installation and keep them in a new condition.

After installation of the uPVC A/C drain pipes, the Contractor shall provide UV resistant soft plastic pipes to connect the existing A/C units and the new A/C drain pipes.

Removable plastic pipe cap/cover shall be placed at every branch pipe inlets when such inlets are not connected to drain outlet of A/C units.

All pipes etc. shall be flushed through with water, rodding where necessary to ensure the system is not blocked by debris.

Cleaning and flushing shall be carried out in sections as installations are completed.

Piping shall be flushed and cleaned after installation and prior to running water test. Temporary water and drainage connections shall be made where necessary to facilitate flushing.

Add the following clauses after HKIS GS Clause B17.3.3

B17.4 PIPE REPAIR BY LINER

Liner is a pipe repair method which involves the insertion of a close-fit pipe liner into the pipeline to be repaired through a manhole. The liner is expanded after insertion, then cured, grouted. There are cured-in-place liners and machine spirally wound liners. The Contractor shall provide a method statement of liner for approval by the Contract Administrator prior to commencement of works.

B18 External Works

B18 EXTERNAL WORKS

B18.1 ROAD, CAR PARK AND PAVED AREAS

Replace HKIS GS Clause B18.1 01 as follows:

01 GENERAL

The clauses under this sub-heading relate to pedestrian ways, cycle paths, playgrounds and other pedestrian paved areas and also include work in small areas, additional areas and the reinstatement and maintenance of existing surfaces.

Generally, unless otherwise specified in Drawings or otherwise approved by the Contract Administrator, the construction of road, car-parks and paved areas shall comply with the requirement in Highways Department Standard Drawings.

All floor finishes shall be in accordance with Section of Floor Finishes.

Replace HKIS GS Clause B18.1 02 as follows:

02 IN-SITU CONCRETE PAVING

In-situ concrete paving, channels and kerbs shall be constructed, if so specified, in accordance with Section of Concrete for Minor Work and Concrete Repair.

Where specified by the Contract Administrator, floor hardener shall be applied along carriageway or car park in accordance with the manufacturer's recommendations.

Add the following clauses after HKIS GS Clause B18.1 23

24 RECYCLED PAVING BLOCKS MADE OF RECYCLED AGGREGATES

(i) Concrete for recycled paving blocks in footways and cycle tracks shall be Grade 30; concrete for recycled paving blocks in carriageways or areas to which vehicles will have access shall be Grade 45.

(ii) Aggregates for concrete shall comply with the following requirements:
   - (a) The aggregates shall contain not less than 70 % by weight of recycled aggregates;
   - (b) The recycled fine aggregates shall constitute not less than 40 % by weight of the total recycled aggregates;
   - (c) Coarse recycled aggregates shall be retained on a 5 mm BS test sieve;
   - (d) Fine recycled aggregates shall all pass a 5 mm BS test sieve;
   - (e) The recycled aggregates shall contain not more than 0.5 % of wood and other materials less dense than water by using the manual sorting test method in accordance with BRE Digest 433;
   - (f) The recycled aggregates shall contain not more than 1 % of other foreign materials (e.g. metals, plastics, clay lumps, asphalt and tar, glass, etc.) by using the manual sorting test method in accordance with BRE Digest 433;
   - (g) The recycled aggregates shall be the crushed inert construction and demolition materials produced from the crushing plant of the Civil Engineering and Development Department or other local sources approved by the Contract Administrator; and
   - (h) The nominal maximum aggregate size of aggregates shall be 10 mm.

Add the following clauses after HKIS GS Clause B18.3.2

B18.4 RAMP AND DROPPED KERB

Ramps and dropped kerbs shall comply with the requirement as stipulated in Divisions 5 and 6 of Design Manual - Barrier Free Access issued by the Buildings Department.

B19 | Sundry Items

B19 SUNDRY ITEMS

B19.2 MORTARS

Replace HKIS GS Clause B19.2 01 as follows:

01 MORTAR MIX PROPORTIONS

Mortar mix proportions and other particular requirements are specified elsewhere.

Detailed requirements shall be in accordance with Section of Plastering and Rendering in the specification.

Replace HKIS GS Clause B19.2 02 as follows:

02 SAND FOR MORTAR

Sand and mortar shall comply with BS EN 13139:2002 unless specified otherwise.

Sand for facework mortar shall be from one source, different loads to be mixed if necessary to ensure consistency of colour and texture.

When a range is specified (e.g. 1:1:5-6) lower proportion of sand for Grade G sands and higher proportion for Grade S shall be used.

Detailed requirements shall be in accordance with Section of Plastering and Rendering in the specification .

Replace HKIS GS Clause B19.2 05 as follows:

05 CEMENT FOR MORTAR

When not specified otherwise, cement shall be Portland cement or Portland blastfurnace cement, complying with class 42.5 or 52.5, manufactured and supplied under the BSI Kitemark scheme for cement. All cements shall comply with BS EN 197-1 unless otherwise specified.

B19.4 POWDER COATINGS

Replace HKIS GS Clause B19.4 04 as follows:

04 CONTROL SAMPLES

Prior to ordering materials for the works, approval for the following shall be obtained:
Uncoated and powder coated samples of the various grades and forms of background metal to be used.

Fabrication samples showing joint assembly, how powder coating is affected and how any cut metal edges are protected.

Thickness gauge for powder coating with brands approved by the Contract Administrator shall be provided by the Contractor on site for verification of coating thickness of the control sample and any other related site installation by the Contract Administrator or the Contract Administrator's representative.

Replace HKIS GS Clause B19.4 16 as follows:

16 SITE DAMAGE REPAIR/REPLACEMENT

Any damage to powder coatings caused during handling and installation, or by subsequent site operations, shall be rectified immediately. Approval shall be obtained before commencing extensive repairs or replacements.

Components with minor damage shall be repaired by cleaning, abrading and coating with matching repair paint system applied in accordance with the powder coating manufacturer's recommendations.

Components with major damage considered unacceptable for repair shall be replaced.

Replace HKIS GS Clause B19.5 as follows:

B19.5 REPLACEMENT OF EXPANSION JOINT SEALANT

Expansion joint shall be repaired strictly in accordance with the following specification:

(i) Thoroughly rake out and cart away existing backing rod/joint filler and sealant of expansion joints in wall (one or both sides of the wall where appropriate).
(ii) Carefully saw-cut, take down and remove defective wall tiles/mortar or internal plaster on both sides of the expansion joint and fix new wall tiles or plaster and finished to flush with existing wall surfaces to match.
(iii) All cracks, spalling and other defect of expansion joint shall be rectified by approved method and material before installation of new materials for expansion joints.
(iv) Concrete surface of expansion joints shall be smooth and primed and must be dry, free of debris, dust, dirt, grease, oil and other contaminants.
(v) Clean the joint surface by mechanical grinding followed by a high air pressure blasting.
(vi) Clean the joint surfaces again with approved degreasing solvent.
(vii) Place backing rod/joint filler at the required depth and place masking tape to both sides of joint to assure neat sealant line.
(viii) Installation of new silicone building sealant at a width to depth ratio of 2:1 to the joint or strictly in accordance with the manufacturer's recommendation.
(ix) Tool the installed sealant with light pressure to spread the material against the back-up material and the joint surface.
(x) All masking tape adjacent to the sealant joint shall be removed after the sealant is properly applied to avoid damage to the sealant joint when the same is removed after curing of sealant.

The sealant for expansion joints repair shall be approved by Contract Administrator.

The colour of new applied expansion joint shall match with the surroundings or be subject to the approval of Contract Administrator. The contractor shall submit sample of sealant of expansion joint, backing rod, joint filler and primer to the Contract Administrator for approval in advance of work commencement.

The contractor shall upon instruction by the Contract Administrator carry out random follow-up inspection as a final check for adhesion of the installed sealant. A hand pull test shall be carried out on Site after the sealant is fully cured (approximate 7-14 days). The hand pull test procedures shall be as follows:

(i) Make a knife cut horizontally across the joint.
(ii) Make two vertical cuts approximately 50 mm long at the sides of the joint, meeting the horizontal cut at the top of two 50 mm cuts.
(iii) Grasp the 50 mm piece of sealant firmly between the fingers and pull down at 90 degree angle or more, and try to pull the uncut sealant out of the joint.
(iv) If adhesion is acceptable, the sealant shall tear cohesively in itself before releasing adhesively from the substrate.
(iv) Sealant cut in adhesion test is to be replaced by applying sealant in the same manner as originally installed.

B19.7 SEEDING

Add the following clauses after HKIS GS Clause B19.7 05

06 PROTECTION FROM BIRDS

Mulch laying, burlap sheets installation, or other preventive measures approved by the Contract Administrator shall be applied for preventing seeding. All burlap sheet installed shall be removed and disposed by the Contractor after seeds germination.

C20 Water Supply System

C20 WATER SUPPLY SYSTEM

Replace HKIS GS Clause C20.1 as follows:

C20.1 GENERAL

All materials, and equipment to be incorporated in the water supply system at the Contractor's works, shall comply with the requirements of this Section. These requirements shall be minimum requirements for general purposes and they shall not relieve the Contractor from ensuring that his designs are sound, and that all materials and equipment incorporated in the works shall be suitable for their intended purposes and environment.

Unless otherwise specified, the installation shall comply with the following:

(i) Waterworks Ordinance (Cap. 102), and other subsidiary legislation made under the Ordinance;
(ii) Buildings Ordinance (Cap. 123), and other subsidiary legislation made under the Ordinance;
(iii) Electricity Ordinance (Cap. 406), and other subsidiary legislation made under the Ordinance;
(iv) Fire Safety (Buildings) Ordinance (Cap. 572), and other subsidiary legislation made under the Ordinances;
(v) Fire Service (Installation and Equipment) Regulations (Cap. 95B), Fire Services Ordinance (Cap. 95), and other subsidiary legislation made under the Ordinance;
(vi) Code of Practice for the Electricity (Wiring) Regulations issued by the Electrical and Mechanical Services Department; and
(vii) Technical Requirement for Plumbing Works in Buildings and all the circular letters issued by the Water Supplies Department.

Add the following clauses after HKIS GS Clause C20.1

RATED VOLTAGE OF EQUIPMENT UNDER THIS SPECIFICATION

Unless otherwise specified, all apparatus, equipment, materials, and wiring shall be suitable for use with a 3-phase and neutral, 4-wire or 1-phase and neutral, 2 wire, 380/220 V ± 6 %, 50 Hz ± 2 %.

GENERAL SCOPE OF WORKS

The water supply system shall include the complete water supply installation for fresh water and flushing water pipe work as shown on the drawings or as specified, including but not limited to:

(i) Fresh and flushing water supply systems, pumps and pipe work installations connecting from the Government mains at the entry of site boundary to individual sanitary fixtures, gas water heater, and taps (including connection to sanitary fixtures and associated taps and water heaters installed by others) where shown on the drawings or as specified; and
(ii) Hot water pipe work installation (including connection to sanitary fixtures and associated taps at water heaters installed by others) where shown on the drawings or as specified. The Contractor shall make all necessary application to the Water Supplies Department and attend upon their representative for the purpose of test and inspection for the water supply installation.

C20.2 MATERIALS AND EQUIPMENT

Replace HKIS GS Clause C20.2 01 as follows:

01 FRESH WATER PUMPS FOR POTABLE APPLICATION

(i) Types
Pumps for potable application unless otherwise specified, shall be of one of the following types:
(a) Vertical multi-stage centrifugal type
The pump set shall be packaged type with close-coupled pump motor integrated as a single unit. The pump unit shall be a proprietary product. The pump motor shall be able

to dismantle from the pump unit without disruption of the pipework nor dismounting the pump unit from the plinth; or

(b) End suction centrifugal type
The pump set shall be installed with spacer type coupling so that the pump impeller can be dismantled from the motor side for servicing without disruption of the pipework nor dismounting the motor. Where large static heads have to be pumped against, multi-stage configurations shall be used.

(ii) Materials of construction
Unless otherwise specified, the materials of construction of the pumps shall be as follows whenever applicable:

(a)	Casing	:	Stainless steel (*cast iron or bronze)
(b)	Impeller	:	Stainless steel (*bronze)
(c)	Shaft	:	Stainless steel
(d)	Sleeves	:	Stainless steel (*bronze)
(e)	Casing rings	:	Stainless steel (*bronze)
(f)	Shaft nuts	:	Stainless steel (*bronze)
(g)	Stuffing box housing	:	Gunmetal (*cast iron)
(h)	Glands	:	Bronze
(i)	Lantern rings	:	Bronze

* Alternative materials subject to the approval of the Contract Administrator.

(iii) Standards:

(a) Casing material
Unless otherwise specified for the above types of pumps, casing shall be of stainless steel to AISI 316.

(b) Impellers and guide rings
The impeller shall be of the enclosed type and be of stainless steel to AISI 316. Renewable guide rings shall be bronze and shall be provided in the casing, keyed to prevent rotation.

(c) Shaft, sleeves and glands
Stainless steel shall be to BS EN 10095, BS EN ISO 683-3 and BS EN ISO 683-4, ground and polished. The sleeves shall be keyed to prevent rotation and secured against axial movement.

(d) Stuffing boxes and drain piping
Gunmetal stuffing boxes housing shall comply with BS EN 1982 or ISO 197-4 and shall be of ample length with bronze lined gland and neck bush, fitted with approved packing and lantern ring water seal. Drain piping to the nearest builder's drain to remove gland leakage shall be provided. Alternatively, a mechanical seal may be offered. Mechanical seals shall be of leak free operation. The mechanical seal shall be the product of specialist proprietor and the materials used shall be suitable for the pumped liquid.

02 FRESH WATER PUMPS FOR NON-POTABLE APPLICATION

(i) Types
Pumps for non-potable application unless otherwise specified, shall be of one of the following types:

(a) Centrifugal type with volute casing split on the centreline of the shaft with suction and delivery connections flanged and fitted to the non-removable half of the casing; or

(b) End suction type, the pump set shall be installed with spacer type coupling so that the pump impeller can be dismantled from the motor side for servicing without disruption of the pipework nor dismounting the motor; or

(c) Vertical spindle type centrifugal pump installed on pump plinth or supported by pipework.

Where large static heads have to be pumped against, type (b) or (c) above shall be used in multi-stage configurations. Generally, the type of pump required will be specified in the Particular Specification# and/or in the drawings. However, if this is not so, the type as detailed in (b) above shall be installed if suitable.

(ii) Materials of construction
Unless otherwise specified, the materials of construction of the pumps shall be as follows:

(a)	Casing	:	Cast iron
(b)	Impeller	:	Zinc free bronze (*cast iron or stainless steel)
(c)	Shaft	:	Carbon steel (*stainless steel)
(d)	Sleeves	:	Bronze (*stainless steel)
(e)	Casing rings	:	Bronze (*stainless or cast iron)
(f)	Shaft nuts	:	Bronze
(g)	Stuffing box housing	:	Cast iron
(h)	Glands	:	Carbon steel
(i)	Lantern rings	:	Bronze

* Alternative materials subject to the approval of the Contract Administrator. Stainless steel shall be used for water with temperature >28 ^{o}C.

(iii) Standards
(a) Casing material
Unless otherwise specified for the above types of pumps, cast iron shall comply with BS EN 1561 or ISO 185.
(b) Impellers and guide rings
The impeller shall be of the enclosed type and be of gunmetal to BS EN 1982 or ISO 197-4, keyed to the shaft. Renewable guide rings shall be bronze and shall be provided in the casing, keyed to prevent rotation.
(c) Shaft, sleeves and glands
Stainless steel shall be to BS EN 10095, BS EN ISO 683-3 and BS EN ISO 683-4, ground and polished.
Bronze sleeves shall comply with BS EN 1982 or ISO 197-4 and shall be provided through the sealing glands to protect the shaft from wear. The sleeves shall be keyed to prevent rotation and secured against axial movement.
(d) Stuffing boxes and drain piping
Cast iron stuffing boxes housing shall comply with BS EN 1561 or ISO 185 and shall be of ample length with bronze lined gland and neck bush, fitted with approved packing and lantern ring water seal. Drain piping to the nearest builder's drain to remove gland leakage shall be provided. Alternatively, a mechanical seal may be offered. Mechanical seals shall be of leak free operation. The mechanical seal shall be the product of specialist proprietor and the materials used shall be suitable for the pumped liquid.

03 FLUSHING WATER PUMPS

(i) Types
These pumps shall be utilised for pumping seawater, harvested rainwater wherever these applications apply. Unless otherwise specified, the configuration of flushing water pumps inside a building plant rooms shall be of the split casing type as specified in C20.2.2(i)(a).

(ii) Materials of construction:
Unless otherwise specified, the materials of construction for saline water pump shall be as follows:

(a)	Casing	:	Cast iron
(b)	Impeller	:	Zinc free bronze (*Stainless steel)
(c)	Shaft	:	Stainless steel
(d)	Sleeves	:	Bronze (*Stainless steel)
(e)	Casing rings	:	Stainless steel
(f)	Shaft nuts	:	Bronze
(g)	Stuffing box housing	:	Cast iron
(h)	Glands	:	Carbon steel
(i)	Lantern rings	:	Bronze

* Alternative materials subject to the approval of the Contract Administrator. Stainless steel shall be used for water with temperature >28 ^{o}C.

(iii) Standards:

(a) Casing
Unless otherwise specified, the casing shall be of cast iron to BS EN 1561 or ISO 185 or other standard approved by the Contract Administrator.

(b) Impeller and shaft sleeve
Impeller and shaft sleeve of saline water pumps shall be of one of the materials as below:
(1) Zinc-free bronze to BS EN 1982 CuSn11 or CuSn10; or ISO 197-4;
(2) Austenitic cast iron to BS EN 13835 Number 5.1500; or ISO 2892 Ed2; or
(3) Stainless steel to BS EN 10095, AISI 316.

(c) For pumping seawater in harbour area, items (b)(1) and (b)(2) above shall not be used.

(d) The shaft shall be of stainless steel to BS EN 10095, BS EN ISO 683-3 and BS EN ISO 683-4, AISI 316, ground and polished.

(e) Stuffing boxes and drain piping:
Stuffing boxes shall be of cast iron housing and ample length completed with bronze lined gland and necks bushes, fitted with approved packing and bronze lantern ring water seal. Drain piping to the nearest builder's drain for gland leakage shall be provided. Alternatively, a mechanical seal may be offered. Mechanical seals shall be of leak free operation. The mechanical seal shall be the product of specialist proprietor and the materials used shall be suitable for the pumped liquid.

04 SUMP PUMPS

(i) Materials of construction of dry pit pumps:
Unless otherwise specified, the materials for dry pit non-clog pumps areas shall be as follows:

(a)	Pump casing	:	Cast iron
(b)	Impeller	:	Cast iron (*Stainless steel)
(c)	Shaft	:	Stainless steel
(d)	Shaft sleeve	:	Stainless steel (*Bronze)
(e)	Packing gland	:	Ductile iron (*Bronze)
(f)	Casing bolts	:	Steel
(g)	Cap screw and washer, impeller	:	Stainless steel
(h)	Key, impeller	:	Steel

* Alternative materials subject to the approval of the Contract Administrator.

(ii) Materials of construction of submersible pumps:
Unless otherwise specified, the materials for dry pit non-clog pumps areas shall be as follows:

(a)	Pump casing	:	Cast iron
(b)	Impeller	:	Cast iron (*Stainless steel)
(c)	Motor casing	:	Cast iron
(d)	Shaft	:	Stainless steel
(e)	Impeller screw	:	Stainless steel
(f)	Mechanical seals	:	Carbon (*Ceramic faces)
(g)	Base plate	:	Steel
(h)	Discharge elbow	:	Cast iron
(i)	O-ring seal	:	Neoprene

* Alternative materials subject to the approval of the Contract Administrator.

(iii) Standards:

(a) All bolts, nuts and fasteners shall be of stainless steel and electric cable entry shall be of watertight construction.

(b) Sump pumps for rainwater application shall generally be of materials complying with the standards as specified in C20.2.2(iii). Sump pumps for pumping other fluids shall be of materials compatible with the fluid that are being handled. If sea water is pumped, the pump materials shall comply with standards as specified in C20.2.3(iii). The sump pumps shall operate automatically by float level control.

(c) The guide bars and brackets for wet sump installation shall be of stainless steel to AISI 316.

(d) Cable supports shall be of stainless steel. A safety provision shall be incorporated for automatic electrical disconnection of the supply in case of cable entry seal failure.
(e) Pumps for flammable zones shall be equipped with flameproof submersible motor in compliance with BS EN IEC 60079-0, BS EN 60079-1 and BS EN 60079-2.

Add the following clauses after HKIS GS Clause C20.2 05

06 OTHER MATERIALS AND EQUIPMENT

Water supply pipe work, joints, fittings, valves and cisterns shall be constructed in accordance with Section of Plumbing and Sanitary Fitments in the specification .

C21

Fire Service Installation System

C21 FIRE SERVICES INSTALLATION SYSTEM

Replace HKIS GS Clause C21.1 as follows:

C21.1 GENERAL

All materials, and equipment to be incorporated in the fire services installation at the Contractor's works, shall comply with the requirements of this Section. These requirements shall be minimum requirements for general purposes and they shall not relieve the Contractor from ensuring that his designs are sound, and that all materials and equipment incorporated in the works are suitable for their intended purposes and environment.

Unless otherwise specified, the installation shall comply with the following documents:

(i) Electricity Ordinance, Chapter 406, and other subsidiary legislation made under the Ordinance;
(ii) Fire Service (Installation and Equipment) Regulations, Fire Services Ordinance, Chapter 95, and other subsidiary legislation made under the Ordinance;
(iii) Fire Safety (Buildings) Ordinance, Chapter 572, and other subsidiary legislation made under the Ordinance;
(iv) Waterworks Ordinance, Chapter 102, and other subsidiary legislation made under the Ordinance;
(v) Code of Practice for the Electricity (Wiring) Regulations published by the Electrical and Mechanical Services Department;
(vi) Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment published by Fire Services Department (hereinafter referred as FSDCoP);
(vii) Code of Practice for Fire Safety in Buildings issued by the Buildings Department;
(viii) All requirements of the FSD including FSD Circular Letters and Fire Protection Notices of the Fire Services Department (hereinafter referred collectively as FSD Requirements and Circular Letters);
(ix) Loss Prevention Council Rules for Automatic Sprinkler Installations (including all the LPC Technical Bulletins, Notes, Commentary, and Recommendation) incorporating BS EN 12845:2004, FSD Circular Letter Number 3/2006, and all the subsequent amendments by the FSD (hereinafter referred collectively as LPC Rules for Sprinkler Installations);
(x) Technical Requirements for Plumbing Works in Buildings and Guide to Application for Water Supply issued by the Water Supplies Department.

No substitutions to these standards will be permitted without the endorsement of the Contract Administrator.

C21.2.2 HYDRANT AND HOSE REEL SYSTEM

Replace HKIS GS Clause C21.2.2 01 as follows:

01 GENERAL

The hydrant and hose reel system and the individual equipment installations shall comply with FSDCoP, FSD Requirements and Circular Letters.

The fire service inlets, hydrant outlet valves and hose reels shall be FSD approved type. This equipment shall be stamped with relevant British Standard Mark or accompanied with a valid letter of approval issued by the Water Supplies Department.

C21.2.9 TANKS AND PUMPS

Replace HKIS GS Clause C21.2.9 01 as follows:

01 WATER TANKS

Water tanks shall be constructed in compliance with FSDCoP, LPC Rules for Sprinkler Installations, FSD Requirements and Circular Letters, and the requirements of Water Supplies Department.

Puddle flanges for inlet and outlet pipes and all other piping connections and valves shall be supplied and installed by the Contractor.

C22

Electrical Installation System

C22 ELECTRICAL INSTALLATION SYSTEM

Add the following clauses after HKIS GS Clause C22.1

C22.1 GENERAL REQUIREMENTS

BUILDER' S WORKS

The Contractor shall carry out all builder's work including openings or holes through building structure or partition walls; trenches, ducts and cutting; and all plinths, concrete base, supports, ducts, etc. required for the installation and submit full details of such requirements within a reasonable time to the Contract Administrator for approval.

All "cutting away" and "making good" as required shall be carried out by the Contractor.

The Contractor shall ensure that the works are essential for the execution of the installation at its subsequent servicing. In the event that any of such works is proved to be non-essential, unnecessary and/or abortive, the Contractor shall bear the full cost of such works including but not limited to any unnecessary or incorrect "cutting away" and making-good and all cost incurred in this connection are recoverable by the Employer from the Contractor as a debt under the contract.

CO-ORDINATION OF INSTALLATIONS

The Contractor shall co-ordinate the installations with those works of any other contractors e.g. specialist contractors and sub-contractors of the Contractor.

The Contractor shall note that the drawings supplied to him only indicate the approximate locations of the installation. He shall make any modification reasonably required of his programme, work sequence and physical deployment of his works to suit the outcome of work co-ordination or as necessary and ensure that all cleaning, adjustment, test and control points are readily accessible while keeping the number of loops, cross-overs and the like to a minimum.

Any significant problems encountered during the co-ordination work which are beyond the Contractor's control shall promptly be reported to the Contract Administrator.

SITE SUPERVISION

The Contractor shall keep on the Site a competent and technically qualified site supervisor to control, supervise and manage all his works on the Site. The site supervisor shall be vested with suitable power to receive instruction from the Contract Administrator and his representative.

The site supervisor shall be technically competent and have adequate site experience for the installation. The qualified and competent site supervisor shall have minimum 5 years on site experience for similar type of installation works. The Contractor shall also refer to the Particular Specification# for other specific requirement, if any, of the site supervisor.

Approval by the Contract Administrator shall be obtained prior to the posting of the site supervisor on the Site. The Contractor shall immediately replace the site supervisor whose experience, skill or competency is found by the Contract Administrator to be inadequate for the particular work.

All tradesmen shall be experienced in the trade and the works carried out shall be consistent with good practice in Hong Kong and to the satisfaction of the Contract Administrator.

A copy of the certificate of registration of contractor issued by the Director of Electrical and Mechanical Services Department (EMSD) shall be submitted for record. The Contractor shall also employ a full time competent foreman who is a registered electrical worker of the appropriate grade in accordance with the Electricity Ordinance (Cap. 406) on the Site for all electrical installation.

C22.2 MATERIALS AND EQUIPMENT SPECIFICATION

Replace HKIS GS Clause C22.2.3 as follows:

C22.2.3 PAINT FOR CONDUIT AND DUCT SYSTEMS

All paint shall be submitted for the approval of the Contract Administrator. The volatile organic compound (VOC) content in grams per liter of all paint and primer shall not exceed the prescribed limit under the Air Pollution Control (VOC) Regulation (Cap.311W) or the limit set by Environment Protection Department (EPD) whichever is more stringent.

VOC content of paint shall be determined by methods stipulated in Air Pollution Control (VOC) Regulation (Cap.311W) and other methods acceptable to EPD.

Bituminous paint for steel conduits and steel cable ducts shall comply with BS 3416, type 1:1991.

Anti-rust paint for concealed electrical conduit systems shall be of a proprietary type approved by the Contract Administrator.

Zinc chromate primer for cable duct systems shall comply with BS 4652:1995.

Galvanizing paint for cable duct systems shall be of a proprietary type approved by the Contract Administrator.

Replace HKIS GS Clause C22.2.8 as follows:

C22.2.8 CEILING/EXPOSED CABLE TRUNKINGS/WIRE MESH BASKET

Steel trunking and fittings shall be fabricated with sheet steel having a minimum thickness as indicated in the following table and shall comply with the requirements specified in BS EN 50085-1 and BS EN 50085-2-1 or equivalent.

Nominal size (mm x mm)	Minimum thickness of body material (in mm)
50 x 50	1
75 x 50	1.2
75 x 75	1.2
100 x 75	1.2
150 x 100	1.4
150 x 150	1.6

Underfloor trunking shall be compatible with the requirements laid down in BS 4678-2 or equivalent and shall be fabricated with sheet steel of:
(i) Not less than 1.2 mm thickness for compartment width up to and including 100 mm;
(ii) Not less than 1.6 mm thickness for compartment width over 100 mm; and
(iii) Not less than 1 mm thickness for the partitions and connector material.

PVC conduit and trunking shall only be allowed when they have been specified in the Particular Specification[#] Conduits and fittings shall comply with BS 4607-1 and BS EN 61386-21. A PVC insulated cable with adequate size shall be used to serve as the circuit protective conductor.

Conduit entries to trunking shall be made with couplings and brass male bushes. Knockouts will not be required and trunking may be drilled on site.

Trunking shall not contain more cable than allowed as the space factors described in the I.E.E. Wiring Regulations.

Wire mesh basket and cable ladders shall comply with all electrical wiring regulations. The contractor shall only use these items inside the IT equipment room.

Replace HKIS GS Clause C22.2.9 as follows:

C22.2.9 POWER CABLES AND CABLE TRAY

Cable tray shall be perforated formed from 1.2 mm thick plain steel sheet and hot-dipped galvanized to BS 1449-1.1 and BS EN 50085-1, BS EN 50085-2-1.

Cable tray shall be fixed on walls by means of mild steel bracket or hanger fabricated by 40 mm mild steel angle with thickness 4.7 mm.

Cable on tray shall be fixed by means of saddles of PVC covered metal strip.

Power cables are mainly for electricity supply and distribution. They shall be manufactured under a recognised quality surveillance scheme (e.g. British Approvals Service for Cables (BASEC) licence or the HAR (Harmonised) scheme recognised by the European Committee for Electrotechnical Standardization (CENELEC), etc.) and bear the appropriate marking (e.g. BASEC mark or HAR mark, etc.) of the quality surveillance scheme.

Cables in the wiring system shall be one or a combination of the following types:

(i) Non-sheathed cables
Non-sheathed cables shall be to:
- (a) 450/750 V PVC insulated, single-core, non-sheathed copper cables, with solid or stranded conductor for general purpose, suitable for conductor operating temperature not exceeding 70 °C - code designation 60227 IEC 01 of EEC 60227-3;
- (b) 450/750 V PVC insulated, single-core, non-sheathed copper cables with flexible conductor for general purpose, suitable for conductor operating temperature not exceeding 70 °C - code designation 60227 IEC 02 of EEC 60227-3;
- (c) 300/500 V heat resistant ethylene-vinyl acetate rubber or other equivalent synthetic elastomer insulated, single-core, non-sheathed copper cable, with solid conductor, suitable for conductor operating temperature not exceeding 110 °C – code designation 60245 IEC 06 of IEC 60245-7;
- (d) 450/750 V heat resistant ethylene-vinyl acetate rubber or other equivalent synthetic elastomer insulated, single-core, non-sheathed copper cable, with solid or stranded conductor, suitable for conductor operating temperature not exceeding 110 °C – code designation 60245 IEC 04 of IEC 60245-7;
- (e) 450/750 V thermosetting insulated, single-core non-sheathed, copper cable, with solid or stranded conductor, with low emission of smoke and corrosive gases when affected by fire, suitable for conductor operating temperature not exceeding 90 °C - code designation H07Z-U and H07Z-R of BS EN 50525-3-41; or
- (f) 450/750 V, fire resistant, thermosetting insulated, single core, non-sheathed copper cable, with solid or stranded conductor, with low emission of smoke and corrosive gases when affected by fire, suitable for conductor operating temperature not exceeding 90 °C. The cable shall also comply with the fire performance requirement specified in item (v) below.

(ii) Sheathed cables
Sheathed cables shall be to:
- (a) 600/1,000 V PVC insulated, single-core or multi-core, PVC sheathed, with or without armour, copper cables with solid or stranded conductor, suitable for conductor operating temperature not exceeding 70 °C - IEC 60502-1;
- (b) 600/1,000 V PVC insulated, single-core or multi-core, thermoplastic polyethylene (PE) sheathed, with or without armour, copper cables with solid or stranded conductor, suitable for conductor operating temperature not exceeding 70 °C - IEC 60502-1;
- (c) 600/1,000 V cross-linked polyethylene (XLPE) insulated, single-core or multi-core, PVC

sheathed, with or without armour, copper cables with solid or stranded conductor, suitable for conductor operating temperature not exceeding 90 °C - IEC 60502-1;

(d) 600/1,000 V ethylene propylene rubber (EPR) insulated, single-core or multi-core, PVC sheathed, with or without armour, copper cables with solid or stranded conductor, suitable for conductor operating temperature not exceeding 90 °C – IEC 60502-1;

(e) 300/500V light PVC insulated, multi-core, PVC sheathed copper cable with solid or stranded conductor, suitable for conductor operating temperature not exceeding 70 °C – code designation 60227 IEC 10 of IEC 60227-4;

(f) 300/500 V PVC insulated, single-core, flat twin or 3-core, PVC sheathed copper cable with solid or stranded conductor, suitable for conductor operating temperature not exceeding 70 °C - national type (Table 3) of BS 6004;

(g) 300/500 V PVC insulated, single-core, flat twin or 3-core, PVC sheathed copper cable with solid or stranded conductor and circuit protective conductor, suitable for conductor operating temperature not exceeding 70 °C - national type (Table 4) of BS 6004;

(h) 300/500 V PVC insulated, single-core or flat twin, PVC sheathed copper cable with stranded conductor and with or without circuit protective conductor, suitable for conductor operating temperature not exceeding 70 °C - national type (Table 5) of BS 6004;

(i) 450/750 V thermosetting insulated, twin, 3-core, 4-core or 5-core, sheathed copper cable with solid or stranded conductor, with low emission of smoke and corrosive gases when affected by fire, suitable for conductor operating temperature not exceeding 90 °C – national type (Table 4) of BS 7211;

(j) 300/500 V thermosetting insulated, single-core, flat twin or flat 3-core, sheathed copper cable with solid or stranded conductor and circuit protective conductor, with low emission of smoke and corrosive gases when affected by fire, suitable for conductor operating temperature not exceeding 90 ^{o}C – national type (Table 5) of BS 7211;

(k) 300/500 V fire resistant, thermosetting insulated, twin, a-core or 4-core, sheathed copper cable with solid or stranded conductor, metallic layer, un-insulated fill size circuit protective conductor, with low emission of smoke and corrosive gases when affected by fire, suitable for conductor operating temperature not exceeding 90 °C - BS 7629-1. The cable shall be of Category Standard 30 as a minimum. Cable of Standard 60 or Enhanced 120 shall be provided as specified or as required to comply with the Fire Services Department's requirement. In addition, the cable shall also comply with the fire performance requirement specified in Section C22.2.9 (v);

(l) 600/1,000 V cross-linked polyethylene (XLPE) insulated, single-core or multi-core, sheathed with or without armour, copper cables with solid or stranded conductor and with low emission of smoke and corrosive gases when affected by fire, suitable for conductor operating temperature not exceeding 90 °C – IEC 60502-1; or

(m) 450/750 V, fire resistant, thermosetting insulated, single-core or multi-core, sheathed with or without armour copper cables, with solid or stranded conductor and with low emission of smoke and corrosive gases when affected by fire, suitable for conductor operating temperature not exceeding 90 °C. The cable shall also comply with the fire performance requirement specified in item (v) below.

(iii) Flexible cables

Flexible cables shall be:

(a) 300/500 V ordinary PVC insulated, multi-core, PVC sheathed flexible copper cable, suitable for conductor operating temperature not exceeding 70 °C - code designation 60227 IEC 53 of IEC 60227-5;

(b) 300/500 V ordinary tough rubber insulated, multi-core, rubber sheathed flexible copper cable, suitable for conductor operating temperature not exceeding 60 °C – code designation 60245 IEC 53 of IEC 60245-4;

(c) 450/750 V rubber insulated, single-core or multi-core, heavy polychloroprene or other equivalent synthetic elastomer sheathed flexible copper cable, suitable for conductor operating temperature not exceeding 60 °C - code designation 60245 IEC 66 of IEC 60245-4;

(d) 300/500 V PVC insulated, single-core or twisted twin, non-sheathed flexible copper cable, suitable for internal wiring and conductor operating temperature not exceeding 70 °C code designation H05V-K of BS EN 50525-2-31;

(e) 300/500 V PVC insulated, single-core or twisted twin, non-sheathed heat resisting flexible copper cable, suitable for internal wiring and conductor operating temperature not exceeding 90 °C - code designation H05V2-K of BS EN 505252-31;

(f) 300/500 V braided, silicone rubber insulated, single core, non-sheathed flexible copper cable, suitable for conductor operating temperature not exceeding 180 °C – code designation H05SJ-K of BS EN 50525-2-41;
(g) 300/500 V flexible copper cable, suitable for use with appliance and equipment intended for domestic, office and similar environments to BS EN 50525-2-11.

(iv) Conductor
Conductors of wiring cables shall be of high-conductivity copper and all meet the requirements of IEC 60228.
The cross sectional area of the neutral conductor shall not be less than that of the phase conductors, unless otherwise specified.

(v) Fire performance of fire resistant cables
The materials for insulation and outer covering, if any, of fire resistant cable shall emit low level of smoke and corrosive gases when affected by fire. The cable shall be type tested to the following fire performance requirement:
(a) Circuit integrity : BS 6387, BS 8491, or BS EN 50200
(b) Flame propagation : BS EN 60332-1-2, or BS EN 60332-3-24
(c) Smoke emission : BS EN 61034-2; and
(d) Acid gas emission : BS EN 60754-1 or BS EN 60754-2.

The current carrying capacity shall be in accordance with the regulations and shall be limited to the specified voltage drop. Minimum size of copper cables shall be as follows:

(i) Lighting - 1.5 mm
(ii) Power - 2.5 mm

All wiring shall be carried out on the loop-in system and the wires shall be drawn into the conduit after the whole of this installation has been completed. No joints or connectors will be allowed in any such cable, except that connectors may be used in accessible position within light fittings.

Colour for identification of conductors in fixed electrical installations shall be as shown below:

Function	**Colour code**	**Letter code**
Phase of single phase circuit	Brown	L
Phase 1 of 3-phase circuit	Brown	L1
Phase 2 of 3-phase circuit	Black	L2
Phase 3 of 3-phase circuit	Grey	L3
Neutral	Blue	N
Protective conductor	Green and yellow	-

Replace HKIS GS Clause C22.2.14 as follows:

C22.2.14 DISTRIBUTION BOARD

All distribution board shall contain a main switch.

All wiring, bus-bar etc. within the distribution board shall be adequately shrouded and an insulating front shield of 3 mm thickness shall be provided to completely screen the distribution unit interior. Only the MCB, RCCB and MCCB operation dolly and insulated surround shall project through the shield.

Neutral bars shall be of adequate cross section, mounted on insulator, and drilled to receive circuit wiring. The distribution board shall be completed with circuit record card, suitably roofed and finishes, giving the total number of points served by each MCB, total load per way and the area served.

The sheet metal for the MCB Board shall be not less than 1.2 mm and 1.5 mm for MCCB Board.

The design and construction of distribution boards shall comply with BS EN 61439-1, BS EN 61439-2, BS EN 61439-5 and BS EN 61439-6. Boards shall be fitted with neutral terminal block.

Engraved labels shall be fixed to all MCB, RCCB and MCCB etc., showing the circuit numbers and purpose.
Engraved labels to identify the purpose of distribution boards shall also be fixed to the panel door/cover.

IP rating for the distribution boards shall be submitted to the Contract Administrator prior to installation for approval.

C22.3 INSPECTION, TESTING AND COMMISSIONING

Replace HKIS GS Clause C22.3 02 & 03 as follows:

02 TESTING

Concealed electrical conduit systems shall be tested to determine the earthing continuity. The system shall be tested:
(i) Before the system is cast in concrete or covered up,
(ii) After the system is cast in concrete or covered up, and
(iii) After electrical wiring that is installed by the Contractor is complete.

Unless otherwise approved by the Contract Administrator the method of testing shall be in accordance with Code of Practice for Electricity (Wiring) Regulations issued by the EMSD.

The results of tests for earthing continuity shall comply with Code of Practice for Electricity (Wiring) Regulations issued by the EMSD.

The Contractor shall carry out all the inspection and test listed below but not limited to the following:
(i) Visual inspection of low voltage installation.
(ii) Continuity of right final circuit conductors test.
(iii) Continuity of protective conductors tests, including main and supplementary equipotential bonding test.
(iv) Insulation resistance test.
(v) Polarity test.
(vi) Earth fault loop impedance test.
(vii) Functions of all protective devices test.
(viii) Functions of all items of equipment test.

03 WORK COMPLETION CERTIFICATE

In respect of the Electricity (Wiring) Regulations made under the Electricity Ordinance, the contractor shall be responsible for submitting work completion Certificates (Form WR1) with associated drawings for the new electrical installation and modification of this project to the Contract Administrator. The forms shall be duly signed by a Registered Electrical Worker and a Registered Electrical Contractor. Copy of the form shall be submitted to electricity supply company.

The contractor shall note that they are completing the whole form including Part 1 & Part 2 (for certification of the design, installation, inspection and testing) and Part 3.

The contractor shall also be responsible for collection of all completed WR1(A) forms from other specialists/contractors and then submit to the Contract Administrator together with this WR1 forms.

Testing and commissioning shall be performed on newly installed devices and equipment.

Working drawings, as-fitted drawings, operating instructions and maintenance manuals shall be provided.

12 months operational maintenance and breakdown services during defects liability period shall be provided.

C23 Gas Supply System

C23 GAS SUPPLY SYSTEM

Replace HKIS GS Clause C23.1 as follows:

C23.1 GENERAL REQUIREMENTS

The Contractor shall provide all materials, labour, equipment and plant for the complete installation, setting to work and testing of the following systems and works as shown on the drawings. All works shall be executed by a registered gas installer registered to the appropriate class and employed by a registered gas contractor under the Gas Safety (Registration of Gas Installers and Gas Contractors) Regulations (Cap. 51D) and comply with the relevant by-laws, regulations of the Buildings Department and other statutory authorities and to the satisfaction of The Hong Kong and China Gas Company Limited (Towngas) and the Contract Administrator.

The design and construction of gas appliances/fittings shall not affect adversely the safety of persons or structures in the event of failure of their control system

The Contractor is deemed to have checked that the physical sizes of all plants and equipment they provided are compact enough to be delivered and installed onto the space allocated to accommodate these installations. In addition, sufficient rooms have been allowed for future access and maintenance.

The Contractor is responsible to check and ensure at all times that all the builder's works, openings etc. are correctly provided during the installation period.

All completed equipment, pipework and materials shall be painted and labelled.

Arrangement for joint inspections are required with Towngas and any Government Authorities during installation period and for obtaining the necessary permits/certificates.

The Contractor shall seal all gaps and openings around all sleeve free services pipes/ducts/cables and outer surface of sleeves with approved fire-resisting mastic. Whilst, the gaps between the inner surface of pipes sleeves and the services pipes/ducts/cables shall be sealed up with approved fire resisting and/or waterproof mastic.

Provision of fire-rated enclosures shall comply with BS 476 to cover up the services passing through /inside the protected areas.

Equipotential bonding terminals shall be provided to all gas installation.

The Works shall be carried out in a manner consistent with good practice in Hong Kong and to the satisfaction of the Contract Administrator.

Any area adjacent to any gas appliance shall be kept free of combustible materials and of any obstruction which might interfere with safe maintenance and operation of the gas appliances.

Underground town gas mains should be done by Towngas, the Contractor shall allow all necessary charges for laying, provision and connection of the underground gas incoming mains in the contract sum.

Replace HKIS GS Clause C23.1 01 as follows:

01 STANDARD AND STATUTORY REGULATIONS

The gas installation work carried out in Hong Kong shall comply with all relevant current statutory provisions under the laws of the Hong Kong Special Administrative Region, with particular reference to the Gas Safety Ordinance (Cap. 51) and its subsidiary regulations, and other related statutory provisions depicted below.

This specification shall be read in conjunction with the manufacturer's recommendations unless the latter conflict with statutory provisions. Reference shall also be made to the current edition of the undernoted ordinances, regulations, codes of practice, etc.:

Ordinances and regulations:
(i) Buildings Ordinance (Cap. 123);
(ii) Public Health and Municipal Services Ordinance (Cap. 132);
(iii) Electricity Ordinance (Cap. 406);
(iv) Electricity (Wiring) Regulations (Cap. 406E); and
(v) Waterworks Regulations (Cap. 102A).

Codes of practice:
(i) Code of Practice for the Electricity (Wiring) Regulations;
(ii) Code of Practice (GU01) – Approval of Flexible Gas Tubing for Low Pressure Applications;
(iii) Code of Practice (GU03) – Installation Requirements for Domestic Gas Water Heaters (Rated Heat Input Up to 70 kW);
(iv) Code of Practice (GU06) – LPG Installations for Catering Purposes in Commercial Premises;
(v) Code of Practice (GU12) – Installation of Mechanical Exhaust System for Gas Appliances (Rated Heat Input Up to 70kW);
(vi) Code of Practice (GU15) – Flexible Gas Tubing for Commercial Applications (Not Including Flexible Gas Tubing for Low Pressure Applications);
(vii) Guidance Note (GU14) – Enclosed Type of Gas-Fired Meat Roaster;
(viii) Code of Practice on Control of Air Impurities (Chemical Substances) in the Workplace issued by the Labour Department; and
(ix) Guidance Notes on Ventilation and Maintenance of Ventilation Systems issued by the Labour Department.

Standards:
(i) BS EN 10226-1 – Pipe threads where pressure tight joints are made on the threads. Taper external threads and parallel internal threads. Dimensions, tolerances and designation;
(ii) BS EN 10226-2 – Pipe threads where pressure tight joints are made on the threads. Taper external threads and taper internal threads. Dimensions, tolerances and designation;
(iii) BS EN 10226-3 – Pipes threads where pressure-tight joints are made on the threads. Verification by means of limit gauges;
(iv) BS 476-3 – Fire tests on building materials and structures. Classification and method of test for external fire exposure to roofs;
(v) BS 476-4 – Fire tests on building materials and structures. Non-combustibility test for materials;
(vi) BS 476-6 – Fire tests on building materials and structures. Methods of test for fire propagation for products;
(vii) BS 476-7 – Fire tests on building materials and structures. Method of test to determine the classification of the surface spread of flame of products;
(viii) BS 476-12 – Fire tests on building materials and structures. Method of test for ignitability of products by direct flame impingement;
(ix) BS 4800 – Schedule of paint colours for building purposes;
(x) BS 5440-2 – Flueing and ventilation for gas appliances of rated input not exceeding 70 kW net (1st, 2nd and 3rd family gases). Specification for the installation and maintenance of ventilation provision for gas appliances;
(xi) BS 6173 – Specification for installation and maintenance of gas-fired catering appliances for use in all types of catering establishments (2nd and 3rd family gases);
(xii) BS 6644 – Specification for installation of gas-fired hot water boilers of rated inputs between 70kW (net) and 1.8MW (net) (2nd and 3rd family gases);
(xiii) BS EN 1057 – Copper and copper alloys, seamless, round copper tubes for water and gas in sanitary and heating applications; and
(xiv) BS EN 10255 – Non-alloy steel tubes suitable for welding and threading. Technical delivery conditions.

The works carried out by the Contractor shall be approved by the relevant authority and Towngas for each particular classification of work. All material, workmanship and testing and commissioning shall conform to the specifications and technical requirements issued by Towngas.

C23.2 MATERIALS AND EQUIPMENT SPECIFICATION

Replace HKIS GS Clause C23.2 02 as follows:

02 PIPEWORK

The material of pipeworks shall be submitted to and approved by the Contract Administrator and complied with BS EN 10255:2004 and BS EN 10216-1:2002.

(i) Gas pipes and fittings installed shall be compatible and properly protected against corrosion as well as mechanical damage so as to avoid undue risk of accidental damage.
(ii) Gas pipes shall be fitted with convenient pressure test points and purge points at relevant locations along the pipeline so as to facilitate pressure testing and de-commissioning during operation.
(iii) Gas pipes shall not be installed in an unventilated duct, void and any places without adequate ventilation to ensure that any gas leakage shall not cause any accumulation of flammable gas.
(iv) Gas pipes installed within premises shall be readily identified by attaching to the pipe a yellow tape/stripe/label indicating “Town Gas” or painting with an appropriate colour to BS 4800 where practicable.
(v) Gas pipes within premises shall be kept to a minimum and separated from any other service such as electrical conduit or cable by at least 25 mm.
(vi) Gas pipes excluding installation pipes shall be installed in a safe and workmanlike manner in accordance with Regulations 17, 18 and 19 of the Gas Safety (Gas Supply) Regulations (Cap. 51B).
(vii) Installation pipes shall be installed in a safe and workmanlike manner in accordance with Regulations 16, 17, 18 and 19 of the Gas Safety (Installation and Use) Regulations (Cap. 51C).
(viii) Pressure regulating installations for the inlet gas supply shall comply with requirements for general safety and location specified in Regulations 21 and 22 of the Gas Safety (Gas Supply) Regulations (Cap. 51B).
(ix) Gas supply pipework inside premises shall operate at pressures not exceeding low pressure 7.5 kPa (760 mm water gauge), while installation pipes downstream of gas meters shall normally operate at pressure not greater than 2 kPa (200 mm water gauge) wherever possible. A convenient pressure test point shall be installed.
(x) Installation pipes shall be protected against over-pressurisation in accordance with Regulation 12(1)(b) of the Gas Safety (Installation and Use) Regulations (Cap. 51C).
(xi) Pipework shall be installed in accordance with Regulation 22 of the Gas Safety (Installation and Use) Regulations (Cap. 51C) in the event of high gas consumption

Add the following clauses after HKIS GS Clause C23.2 10

11 GAS METERS

For premises having more than one occupier, gas meters shall not be installed in any protected lobby or in any common area that is designated as the only means of escape in case of fire. For meters installed in such locations prior to 1 April 1991, future replacements shall be in accordance with Regulation 10(1) of the Gas Safety (Installation and Use) Regulations (Cap. 51C).

Primary gas meters shall be installed as close as practical to the point of service entry into the premises and be suitably labeled in accordance with Regulation 13 of the Gas Safety (Installation and Use) Regulations (Cap. 51C).

A notice in permanent form, in English and Chinese, shall be prominently displayed on or near a gas meter which is installed in the premises at a distance of more than 2 m from, or out of sight of, the nearest upstream emergency control in the premises indicating the position of such emergency control.

The number and location of secondary meters installed downstream of the primary meters (if any) shall be indicated by prominently displaying a notice in permanent form in English and Chinese on or near the primary meter.

12 EMERGENCY CONTROLS

An emergency control shall be installed as near, so far as practicable, to the point of gas service entry into the premises in an accessible location. The construction, location and labeling of the emergency control shall be in accordance with Regulation 8 of the Gas Safety (Installation and Use) Regulations (Cap. 51C).

13 SAFETY CONTROLS

All gas and flow controls employed shall be designed and constructed to relevant national and/or international safety standards.

For those gas appliances which have enclosed combustion chambers, or of a type which prevents burner flame(s) from being easily observed by the user, a flame failure device shall be incorporated and mounted adjacent to the burners securely and conveniently. A flame failure device shall be manufactured to relevant national and/or international standards.

The gas supply to gas appliances which incorporate gas/pressurised air pre-mix systems shall be protected by the installation of a non-return valve in the inlet supply pipework.

It is recommended that open burners of an appliance shall be fitted with a flame failure device.

All newly installed interlocks shall not be fitted with an override function.

C23.3 INSPECTION, TESTING AND COMMISSIONING

Replace HKIS GS Clause C23.3 03 as follows:

03 COMPETENT PERSONNEL

The Contractor shall carry out this work using trained, experienced commissioning engineers and Registered Gas Installers with appropriate class qualifications under the Gas Safety (Registration of Gas Installers and Gas Contractors) Regulations (Cap. 51 D). The commissioning supervising engineer shall have several years' experience in the testing and commissioning of similar installations.

The Contractor's commissioning engineer shall ensure that all commissioning work carried out by such specialist manufactures is carried out to his satisfaction and in such a way that it does not prevent his proceeding with the overall commissioning of the installation.

C24 Lift Installation System

C24 LIFT INSTALLATION SYSTEM

Replace HKIS GS C24 as follows:

Specifications for lift modernisation works, replacement works and lift maintenance services shall refer to the Tender Document and Contract for Lift Works prepared by the Hong Kong Building Rehabilitation Facilitation Services Limited (HKBRFSL).

The latest Tender Document and Contract for Lift Works could be downloaded from the Building Rehabilitation Platform website:
(https://brplatform.org.hk/f/upload/10555/Contract_for_Lift_Works_EN.pdf)

C25

Broadcast Reception Installation System

C25 BROADCAST RECEPTION INSTALLATION SYSTEM

C25.1 GENERAL REQUIREMENT

Replace HKIS GS Clause C25.1 02 as follows:

02 PROTECTION OF MATERIALS AND EQUIPMENT

Unless the responsibility is clearly defined in the Contract that the protection on Site for delivered equipment, materials and installation is solely by other contractors, the Contractor shall be responsible for the safe custody of all materials and equipment as stored or installed by him until finally inspected, tested and accepted. In addition, the Contractor shall protect all work against theft, fire, damage or inclement weather and carefully store all materials and equipment received on Site but not yet installed in a safe and secure place unless otherwise specified.

All cases of theft and fire must immediately be reported to the police, the Contract Administrator and the Contract Administrator's representatives on Site with full details.

Where necessary the Contractor shall provide lockable steel container or other equally secure enclosures placed within a securely fenced-in compound on Site for the storage of materials and equipment.

The Contractor shall provide clean, reasonably finished and lockable secure accommodation for the storage of sensitive and/or expensive items before installation.

All the storage facilities and spaces shall be provided by the Contractor.

Add the following clauses after HKIS GS Clause C25.1 02

03 STATUTORY OBLIGATIONS AND OTHER REQUIREMENTS

The installations shall comply with the following:

Ordinances and regulations:

(i) Telecommunications Ordinance (Cap. 106), and other subsidiary legislation made under the Ordinance;
(ii) Electricity Ordinance (Cap. 406), and other subsidiary legislation made under the Ordinance;
(iii) Fire Service (Installations and Equipment) Regulations, Fire Services Ordinance (Cap. 95), and other subsidiary legislation made under the Ordinance;
(iv) Electrical Products (Safety) Regulation of the Electricity Ordinance (Cap. 406), and other subsidiary legislation made under the Ordinance;
(v) Waste Disposal Ordinance (Cap. 354), and other subsidiary legislation made under the Ordinance;
(vi) Environmental Impact Assessment Ordinance (Cap. 499), and other subsidiary legislation made under the Ordinance;
(vii) Occupational Safety and Health Ordinance (Cap. 509), and other subsidiary legislation made under the Ordinance;
(viii) Factories and Industrial Undertakings Ordinance (Cap. 59), and other subsidiary legislation made under the Ordinance;
(ix) Public Health and Municipal Services Ordinance (Cap. 132), and other subsidiary legislation made under the Ordinance; and
(x) Construction Sites (Safety) Regulations (Cap. 591);

Codes of practice:

(i) Code of Practice for the Electricity (Wiring) Regulations issued by the Electrical and Mechanical Services Department;
(ii) Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment issued by the Fire Services Department;
(iii) Code of Practice for the Provision of Access Facilities in Buildings for the Supply of

Telecommunications and Broadcasting Services issued by the Office of the Communications Authority; and

(iv) Code of Practice for Energy Efficiency of Building Services Installation, issued by the Electrical and Mechanical Services Department;

Hong Kong Communications Authority (HKCA) specifications:

(i) Specification Number HKCA 1103 “Performance Requirements of Television Signals Input to the Head End of Subscription Television System” issued by the Office of the Communications Authority;

(ii) Specification Number HKCA 1104 “Performance Requirements for In-Building Coaxial Cable Distribution System (IBCCDS)” issued by the Office of the Communications Authority (hereinafter referred to as the Performance Specification);

(iii) Specification Number HKCA 1105 “Technical Information for Frequency Planning of In-Building Coaxial Cable Distribution System (IBCCDS)” issued by the Office of the Communications Authority;

(iv) Specification Number HKCA 1108 “Technical Information for Digital Terrestrial Television Baseline Receiver Requirements” issued by the Office of the Communications Authority;

(v) Specification Number HKCA 1101 “Performance and Safety Requirements for Subscription Television System” issued by the Office of the Communications Authority; and

(vi) Specification Number HKCA 1102 “Radiation Limits and Measurement Methods for In-Building Coaxial Cable Distribution System” issued by the Office of the Communications Authority;

Guidelines, manuals, circular letters by Government authorities:

(i) Testing and Commissioning Procedure for Broadcast Reception Installation in Government Buildings, Hong Kong, issued by the Architectural Services Department;

(ii) Requirements and circular letters of Fire Services Department; and

(iii) Construction Site Safety Manual issued by the Development Bureau.

International Standards:

(i) IEC 60950-1; and

(ii) BS EN 62368-1.

04 SIGNAL LEVEL AT FM/TV/DATA OUTLET

(i) SIGNAL LEVELS

The root mean square (r.m.s.) voltage of each carrier at the peak of the modulation envelope when measured at the user’s outlet across a non-inductive 75 ohm resistor (or referred to 75 ohm) shall be:

Minimum level	60 dBμV for analogue TV signal (30 MHz to 300 MHz)
	63 dBμV for analogue TV signal (300 MHz to 1 GHz)
	50 dBμV for digital TV signal (470 MHz to 862 MHz)
	40 dBμV for FM signal (mono)
	54 dBμV for FM signal (stereo)

Maximum level	80 dBμV for analogue TV signal (30 MHz to 300 MHz)
	80 dBμV for analogue TV signal (300 MHz to 1 GHz)
	74 dBμV for digital TV signal (470 MHz to 862 MHz)
	74 dBμV for FM signal (mono)
	74 dBμV for FM signal (stereo)

(ii) PERMISSIBLE DIFFERENT SIGNAL LEVELS IN AN OUTLET

The difference in carrier levels when both TV signals are either in the VHF range or the UHF range shall not exceed the followings:

Frequency range	Interval	Maximum level difference (dB)
30 MHz to 300 MHz	Entire range 60 MHz range Adjacent channel	12 8 3
300 MHz to 1 GHz	Entire range 100 MHz range Adjacent channel	15 9 3

Where adjacent channels are used, the signal level of a distributed digital terrestrial TV broadcast channel shall be at least 5 dB lower than of a wanted adjacent analogue TV channel.

(iii) **CARRIER TO NOISE RATIO**

At any outlet, the level of any unwanted signal generated in the system in any channel shall be:

The carrier to noise ratio shall be not less than : 43 dB for analogue TV signal
: 34 dB for digital TV signal
: 25 dB for FM signal (mono)
: 45 dB for FM signal (stereo)

For distributing digital television signals, the bit error rate (BER) of the signal after error correction shall be better than 3×10^{-6} and the modulation error ratio (MER) shall be not less than 30 dB.

(iv) **MUTUAL ISOLATION BETWEEN OUTLETS**

To minimize the local oscillator energy from one receiver causing interference to other receivers on the same cable system, the mutual isolation between outlets connected separately to a spur feeder shall not be less than 33 dB for analogue TV signal, 33 dB for digital TV signal and 42 dB for FM signal.

(v) **SYSTEM PERFORMANCE WITH RETURN PATH**

With a QPSK 1,544 Mbits/s injected into any system outlets, the signal received at the headend shall be:

Carrier to noise ratio	$\geqq$ 22 dB
Amplitude response variation	$\leqq$ 8 dB

C25.2 MATERIALS AND EQUIPMENT SPECIFICATION

Replace HKIS GS Clause C25.2 01 as follows:

01 GENERAL

A broadcast reception system is designed with an aim to convey the best receivable signal at a particular site to individual users sharing the same system. The BR system performance shall comply with BS EN 60728-1 and BS EN 60728-10.

To maximise signal to noise ratio and to achieve good directivity, the gain of TV and FM aerials shall be chosen to be as high as possible and in compliance with other requirements when specified in the Particular Specification# for the installations.

For systems design, which involves the use of amplifiers in the headend to drive the TV channel amplifiers and/or FM channel amplifier, the first amplifiers to be used for the TV and/or FM signal path shall be a TV bandpass preamplifier and/or a FM band preamplifier respectively. Alternatively, a TV bandpass filter shall be used for the TV signal path and shall be connected to the input of the first

wideband amplifier, notwithstanding that it is a preamplifier or a distribution amplifier. Such design practice shall ensure that the amplifiers of the system shall not be overloaded by strong out-of-band signals.

A 3 dB attenuation factor shall be included in the calculation of system level to account for practical installation losses such as cable joints.

The headend circuit components shall be enclosed in a well-ventilated enclosure fitted with lock. The equipment shall be adequately screened from radio interference caused by lift equipment, starters, etc. The case shall be properly secured against the wall and have sufficient space for cable routing and bending.

The system shall include all equipment and accessories necessary for the successful connection to the signal adaptors/set top boxes/digital terrestrial television baseline receivers for the distribution of digital television signals.

As specified in HKCA 1104, the distribution of digital television signals shall not affect or interference with other services, such as telecommunications and security services. The wanted and unwanted signal levels and the spurious emissions outside the 8 MHz channel bandwidth shall be controlled such that other signals and services will not be affected.

All apparatus, equipment, materials and wiring shall be suitable for use on 220 V ± 6 %, 50 Hz ± 2 Hz, single phase a.c. system at the following services conditions:

(i) Climate: Hong Kong (tropical);
(ii) Ambient temperature:
Peak -5 °C to + 40 °C (continuously 4 hours) Average 0 °C to + 35 °C (over 24 hours);
(iii) Altitude: up to 2,000 m above sea level; and
(iv) Relative humidity: 98 % maximum.

It shall be noted that the supply voltage may be interrupted such that its frequency or voltage value may fluctuate outside the above acceptable range. It is advisable that the equipment shall be able to ride through or function properly due to any unavoidable disturbance illustrated in the BS EN 50160:1999 and if not, the Contractor shall state the performance of the equipment being complied with the specification requirements.

The Contractor shall also make reference to the international practices of voltage dip ride-through capability, such as Semiconductor Equipment and Materials International (SEMI) F47 and IEC 61000-4-11:2004 and IEC 61000-4-34:2005.

Replace HKIS GS Clause C25.2.1 as follows:

C25.2.1 TERRESTRIAL MASTER ANTENNA TELEVISION SYSTEM

01 TERRESTRIAL AERIALS

The mast or poles and the aerials shall be of heavy duty construction and be designed to be able to operate normally under a loading pressure associated with a sustained wind speed of up to 170 km/hr and gusts up to 240 km/hr. The Contractor shall submit detailed builder's work required within 2 months after the award of the Contract prior to commencement of the installations. The Contractor shall ensure the support structure is adequate for the aerials installation and also be responsible for checking the positions of the builder's work on the Site where reception is at its best before any concrete work is carried out.

If the FM aerial is required to be mounted on the same mast for the TV aerial, the two aerials shall be separated by at least 1.8 m apart so as to achieve the minimum interference.

The aerial system shall be adequately earthed and protected against lightning in accordance with IEC 62305-1 and relevant current parts by mean of bonding the aerial masts or supporting frames of antenna to the air termination for the lightning protection system with at least 25 mm x 3 mm copper tape or an acceptable equivalent.

Separate downleads shall be employed for the TV and FM aerials. The TV and FM signals shall not be combined in front of the channel amplifiers.

The terrestrial aerials shall be suitable for both analogue and digital terrestrial television and shall comply with the following:

(i) TV aerial shall have a gain of at least 13 dB and a front to back ratio of at least 28 dB;
(ii) The aerial shall be of the type to minimize ghost image;
(iii) FM aerial shall have a gain of at least 6 dB;
(iv) The impedance of the aerial shall be 75 ohm unbalanced;
(v) The aerial system shall be provided with a durable protective coating;
(vi) The aerial mast shall be made of stainless steel; and
(vii) The aerial shall be capable of receiving analogue and digital signals.

02 PREAMPLIFIERS AND FILTERS

TV bandpass preamplifiers shall be used in weak TV field strength areas. Similarly, FM band preamplifiers shall be used in weak FM field areas.

Alternatively, TV/FM bandpass filters shall be incorporated if wideband preamplifier is used.

The performance of the preamplifiers, TV bandpass preamplifiers, FM bandpass preamplifiers, TV bandpass filters and FM bandpass filters shall be suitable for both analogue and digital terrestrial television and shall comply with the following:

Preamplifiers

Television standard	PAL I system
Frequency	FM : 87 to 108 MHz TV : 70 to 862 MHz
Gain	$\geqq$ 20 dB
Input	Split input configuration
Output level	$\geqq$ 90 dB μ V
Noise figure	$<$ 5.5 dB
Impedance (Input and output)	75 ohms
Housing	Weatherproof housing suitable for outdoor mounting

TV bandpass preamplifiers

Frequency range	Within CH 21 – CH 62
Passband	Select the frequency range to suit the analogue receptions and digital receptions required for any one free TV programme channel group as required by the location of reception in accordance with the frequency plans allocated for TV and FM receptions by OFCA
Gain within passband	$\geqq$ 20 dB
Input	Split input configuration
Output level	$\geqq$ 90 dB μ V
Noise figure	$<$ 5.5 dB
Impedance (Input and output)	75 ohm
Housing	Weatherproof housing suitable for outdoor mounting

FM bandpass preamplifiers

Frequency range	87 to 108 MHz
Gain	$\geqq$ 20 dB
Input	Split input configuration
Output level	$\geqq$ 90 dB μV
Noise figure	$<$ 5.5 dB
Impedance (Input and output)	75 ohm
Housing	Weatherproof housing suitable for outdoor mounting

TV bandpass filters

Frequency range	Within CH 21 – CH 62
Passband	Select the frequency range to suit the analogue receptions and digital receptions required for any one free TV programme channel group as required by the location of reception in accordance with the frequency plans allocated for TV and FM receptions by OFCA
Loss within passband	$\leqq$ 5 dB
Impedance (Input and output)	75 ohm

FM bandpass filters

Frequency range	87 to 108 MHz
Loss within passband	$\leqq$ 5 dB
Impedance (Input and output)	75 hm

03 AMPLIFIERS

Signal amplification within the system shall be provided with channel amplifiers at the headend for signal processing and wideband distribution amplifiers.

At sites where the aerial is not in direct line-of-sight with the transmitter, the channel amplifier shall be equipped with automatic gain control circuitry.

When channel amplifiers are required, this shall include one channel for FM reception, one channel for closed circuit TV reception, two channel spacings for other paid TV receptions and the numbers of analogue channels and digital channels required for reception of any one free TV programme channel group as required by the location of reception in accordance with the frequency plans allocated for TV and FM receptions, which are announced by OFCA. Only one TV channel group transmitted by any one transmitter location/station shall be relayed.

The design levels used for the output of all amplifiers shall be 4 dB lower than their respective maximum allowable output with the exception of channel amplifiers equipped with automatic gain control (AGC) and all amplifiers following these AGC channel amplifiers. The maximum allowable output is the output level at which the specification limit for unwanted signal detailed in the wideband amplifiers, FM channel amplifiers and TV channel amplifiers and AGC channel amplifiers etc. can no longer be met with further increase in outputs.

A lockable well-ventilated metal enclosure shall be installed to house all headend circuit components. The case shall be properly secured against the wall and have sufficient space for cable routing and bending.

The headend equipment of each system shall be installed in the telecommunication and broadcasting equipment (TBE) Room or in the location of headend equipment room as shown on the drawings.

Cable routing shall be as short as possible from antenna to the channel amplifiers/modulator.

The performances of the wideband amplifiers, FM channel amplifiers and TV channel amplifiers with AGC modules shall be suitable for both analogue and digital terrestrial television and shall comply with the following:

Wideband amplifiers

Television standard	PAL I system
Frequency range	54 to 862 MHz
Passive return path	5 to 42 MHz
Gain and return path gain	≧ 25 dB and ≧ 10 dB
Output level and return path Output level	≧ 100 dB μ V and ≧ 90 dB μ V
Noise figure	＜ 8.5 dB
Nominal impedance (Input and output)	75 ohms
Return loss (Input and output)	≧ 10 dB
Housing	Either internally or externally fully screened metal box complete with suitable mounting legs for vertical mounting
Earthing	All metal parts to be properly earthed
Identification	Clearly mark ‘IN’ and ‘OUT’ signal sockets
Accessories	All necessary coaxial cable plug and accessories

FM channel amplifiers with processor

Frequency band	FM
Input frequency range	87 to 108 MHz
Gain	≧ 20 dB
Automatic gain control range	≧ 20 dB
Noise figure	＜ 7 dB
Input level	40 - 80 dBμV
Output level	≧ 70 dB μ V
Output frequency range	Convert to the frequency range within 87 to 108 MHz
Impedance (Input and output)	75 ohms
Return loss (Input and output)	≧ 10 dB
Weather proofing	Indoor application
Housing	Modular type construction of robust and attractively designed plug - in units with connecting links between TV channel amplifier outputs. Fully internally metal-screened. Earthing on metal chasis.
Identification	Clearly marked ‘IN’ and ‘OUT’ signal sockets

TV channel amplifiers with processor and automatic gain control (AGC) modules

The TV channel amplifiers with processor shall be suitable for working with a group of adjacent channels.

Television standard	PAL I system
Input frequency range	470 to 862 MHz
Gain	≧ 40 dB
Automatic gain control range	≧ 20 dB
Input level	55 - 85 dBμV
Output level	≧ 80 dBμV
Noise figure	＜ 9 dB

AGC facility	＞ + 1 dB output variation for a full range change of at least + 10 dB of the nominal input
Impedance (Input and output)	75 ohm
Output frequency range	Convert to the frequency range within 54 to 862
	MHz
Return loss (Input and output)	≧ 10 dB
Weather proofing	Indoor application
Housing	Modular type construction of robust and attractively designed plug-in with connecting links between amplifiers outputs. Fully internally metal-screened. Earthing on metal chasis.
Identification	Clearly mark ‘IN’ and ‘OUT’ signal sockets
Accessories	All necessary coaxial cable plugs and accessories

04 FREQUENCY CONVERTERS

Television signals shall be conveyed at the received signal frequencies. If frequency conversion is required, the outlet frequencies shall be in the frequencies 470 to 862 MHz for television reception.

The frequency converters shall comply with the following:

Frequency range	470 to 862 MHz
Gain	≧ 20 dB
Automatic gain control range	≧ 20 dB
Input level	55 - 85 dBμV
Output level	≧ 60 dBμV
Output RF bandwidth	＜ 8MHz
AGC facility	＞ + 1 dB output variation for a full range change of at least + 10 dB of the nominal input
Impedance (Input and output)	75 ohm
Weather proofing	Indoor application
Housing	Modular type construction of robust and attractively designed plug-in with connecting links between amplifiers outputs. Fully internally metal-screened. Earthing on metal chasis.
Identification	Clearly mark ‘IN’ and ‘OUT’ signal sockets
Accessories	All necessary coaxial cable plugs and accessories

05 UHF MODULATORS

If closed circuit television system camera signals are to be included in the broadcast and reception system, the video signals shall be modulated to UHF range channels and combined at the headend of the system.

The UHF modulators shall comply with the following:

Video input level	1 + 0.3 Vpp
Video input impedance	75 ohm
Video bandwidth	0.020 – 5 MHz
Output frequency range Output impedance	470 to 862 MHz fixed channel or channel selectable 75 ohm
Output RF bandwidth	＜ 8 MHz
Output level (without integrated channel amp) (with integrated channel amp)	 ＞ 80 dBμV ＞ 110 dBμV

06 SPLITTERS/TEE-UNITS

All splitters and tee units shall have a wide bandwidth to allow for cascaded mode of operation. The maximum number of tee units in cascade shall be limited to 6. Mock-up tests may be required to assess the design prior to installation, if in the opinion of the Contract Administrator, the cascaded chain is too long as to create unacceptable signal strength.

All splitters and tee units shall have a wide bandwidth to allow for cascaded mode of operation, shall have return path and shall comply with the following:

Splitters

Frequency range	5 to 862 MHz
Distribution loss	≦ 8 dB
Mutual attenuation between outputs	≧ 13 dB for splitters at all in-band frequencies
Impedance	75 ohm
Return loss (Input and output)	≧ 14 dB

Tee units

Frequency range	5 to 862 MHz
Thru loss	≦ 6 dB
Side loss	≦ 16.5 dB
Mutual attenuation between outputs	≧ 28 dB for tee units at all in-band frequencies
Impedance	75 ohm
Return loss (Input and output)	≧ 18 dB

07 COAXIAL CABLES

All coaxial cables used shall be of 75 ohm type copper cables designed for transmitting 5 to 2150 MHz signals and shall have thermosetting insulated, with low emission of smoke and corrosive gases when affected by fire.
The fire performance of the insulated material with low emission of smoke and corrosive gases when affected by fire shall comply with the following requirements:
(i) Flame propagation: IEC 60332-1-1;
(ii) Smoke emission: IEC 61034-2; and
(iii) Acid gas emission: IEC 60754-1.

The coaxial cables for feeder shall conform to cable designation 8 or above of IEC 61196-5, IEC 61196-6 and the coaxial cables for trunk feeder shall conform to cable designation 6 or above of IEC 61196-5, IEC 61196-6.

Underground coaxial cables shall be with polyethylene outer sheath, copper foil outer conductor, and PVC insulation. The cable shall conform to cable designation 6 or above of IEC 61196-5, IEC 61196-6.

All coaxial cables shall have distinctive labels/brand name along its length.

08 FM/TV/DATA TRIPLEX OUTLETS

Outlets shall be triplex socket type for data (5 to 862 MHz) signal and for FM/TV (54 to 862 MHz) signals complete with frequency dividing network and the respective socket shall be identified with labels embossed on the front plate. The outlet shall be suitable for analogue and digital signals.

The triplex outlets shall be suitable for flush mounting on 47 mm deep IEC 60670-1 and relevant current parts box.

Unless otherwise specified, the triplex outlets shall be white or ivory in colour.

The FM/TV/Data triplex outlet shall have a return path and shall comply with the following:

Frequency range	54 to 862 MHz
Return path frequency	5 to 42 MHz
Features	Triplex outlets configuration one for data and two for FM/TV, flush mounting type complete with cover, connected from tap output of tee unit.
Distribution loss	FM (87 to108 MHz) $<$ 10 dB TV and Data (5 to 862 MHz) $<$ 9 dB
Mutual isolation	Between FM, TV and Data not less than 40 dB from 5 to 862 MHz
Impedance	75 ohm

09 FIBER OPTICAL TRANSMITTER

The fiber optical transmitter shall be of modular design and shall comply with the following:

Frequency	54 to 862 MHz
Input impedance	75 ohm
Optical wavelength	1310 nm ± 10 nm
Optical output power	$\geqq$ 6 dBm
Optical return loss	$\geqq$ 55 dB
RF input level per channel	$\geqq$ 60 dBμV
Number of TV channels	42
Light source – LED	$<$ 2 km
– Laser diode	$<$ 40 km

The fiber optical return path transmitter shall be of modular design and shall comply with the following:

Return path frequency	5 to 42 MHz
Input impedance	75 ohm
Optical wavelength	1310 nm ± 10 nm
Optical output power	$\geqq$ 6 dBm
Optical return loss	$\geqq$ 55 dB
RF input level per channel	$\geqq$ 60 dBμV
Number of TV channels	42
Light source – LED	$<$ 2 km
– Laser diode	$<$ 40 km

10 FIBER OPTICAL SPLITTER

The fiber optical splitter shall be of modular design and shall comply with the following:

Optical wavelength	1310 nm ± 10 nm
Optical return loss	≧ 55 dB

11 FIBER OPTICAL CABLE

The fiber optical cable shall be flame retardant type. The cable shall be single mode (1,310 nm) and shall be suitable for 5 to 2,050 MHz applications. The maximum attenuation shall be 0.45 dB/km.

12 FIBER OPTICAL TRANSCEIVER WITH RETURN PATH

The fiber optical transceiver shall be of modular design and shall comply with the following:

Frequency and return path frequency	54 to 862 MHz 5 to 42 MHz or as specified
Optical wavelength	1310 nm ± 10 nm
Optical return loss	≧ 55 dB
RF output level per channel	＞ 80 dBμV
Return path loss	＞ 14 dB
Light source – LED – Laser diode	＜ 2 km ＜ 40 km

25.2.2 SATELLITE MASTER ANTENNA TELEVISION SYSTEM

Replace HKIS GS Clause C25.2.2 01 as follows:

01 SYSTEM REQUIREMENTS

The Contractor shall be a licence holder or employ the licence holder on the List of SMATV licence holders registered by the OFCA to carry out the SMATV system installation.

The Contractor shall make application to the OFCA for the installations.

The system shall enable simultaneous viewing different TV programs from the terrestrial master antenna television system as well as from satellites. Signals from the satellite master antenna television system shall be fed to the satellite receivers installed in the headend equipment room, via necessary signal splitting equipment, satellite amplifiers and cabling. The video and audio signals from the satellite receivers shall be modulated to SMATV channels and shall be combined to the broadcast reception installation headend equipment installed in the headend equipment room for distribution to FM/TV/Data triplex outlets.

Replace HKIS GS Clause C25.2.2 02 as follows:

02 THE SMATV SYSTEM REQUIREMENTS

(i) Antenna location
The SMATV system shall be installed in the location such that:
(a) It has a clear, unobstructed view of the target satellite;
(b) It has no condensation in its vicinity; and
(c) It is at least 3 m clear of fences or enclosure.

(ii) Support for the dish antenna
The steel framework and mounting of the dish antenna shall be capable to withstand the loading pressure associated with sustained wind speed up to 170 km/hour and gusts up to 240 km/hour

without any physical damage. The Contractor shall ensure that the support structure is adequate for the antenna installation and also be responsible for checking the positions of the builder's work on the Site where reception is at its best before any concrete work is carried out.

(iii) Antenna installation

The antenna shall be of heavy duty construction and be designed to be able to operate normally under a loading pressure associated with a sustained wind speed of up to 170 km/hour and gusts up to 240 km/hour and shall be installed in such a way that it shall not warp. The antenna shall be smooth, not rough or bumpy. The antenna shall not twist or rock under stress.

Rubber grommets shall be inserted between the steel supports and the aluminium dish antenna to prevent electrolysis action.

Both the antenna and its supports shall be adequately earthed and protected against lightning in accordance with IEC 62305-1 and relevant current parts by mean of bonding the antenna and its supporting frames to the air termination of the lightning protection system with at least 25 mm x 3 mm copper tape or product having equivalent functions or performance. The Contractor shall carry out the earth bonding.

The antenna and its supporting structure shall be provided with a durable protective coating.

(iv) The SMATV system shall comply with the following:

Environmental operating requirements

The antenna system shall comply with all performance specifications under the following special environmental conditions:

Rain	Up to 100 mm/hour.
Wind operational	Gusts up to 240 km/hour.
Wind survival	Wind loading up to 170 km/hour. in any position of operation
Atmospheric conditions	Capable to withstand salt, hydrogen sulphide and corrosive contaminants

Electrical specification

Frequency	C-band (3.7 to 4.2 GHz)	Ku-band (10.75 to 12.75 GHz)
Wideband antenna gain	≧ 38 dB	≧ 48 dB
Polarisation	Match with the target satellite	Match with the target satellite
Focus/diameter ratio	≦ 0.4	≦ 0.4
Beam width	≦ 1.7 degrees	≦ 1.7 degrees
Noise temperature	＜20 dB at 60° elevation	＜20 dB at 60° elevation

Mechanical specification

Antenna type	Solid aluminum plate
Antenna diameter	≧ 3 m

Feedhorn

The feedhorn shall be strictly installed in accordance with manufacturer's recommendation. The Contractor shall submit the manufacturer's recommended installation method to the Contract Administrator for approval within 2 months after award of the Contract. The feedhorn shall be positioned in the focus point of the satellite TV antenna and adequately supported. Gaskets recommended by the manufacturer shall be used between the feedhorn and the low noise amplifier (LNA)/low noise block converter (LNB) to avoid leakage of signal.

The sealant between the gaskets shall be in accordance with the manufacturer's recommendation to ensure that the waveguide is in good metal-to-metal contact.

The feedhorn shall be suitable for circular and linear C-band and Ku-band reception. The feedhorn shall be designed for use with prime-focus reflector. Polarizers shall be provided for selection of the received signals of different polarization modes. The technical specifications of the feedhorns, including the polarizers, are as follows:

Frequency	C - band (3.7 to 4.2 GHz)	Ku - band (10.75 to 12.75 GHz)
Focus/diameter ratio	0.33 to 0.45	0.33 to 0.45
Polarization	Circular and linear	Circular and linear
Cross polarity isolation	≧ 25 dB	≧ 25 dB
Voltage standing wave ratio (VSWR)	≦ 1.4 : 1	≦ 1.4 : 1

Low Noise Amplifier (LNA)/Low Noise Block Down Converter (LNB)

Input frequency	C - band (3.7 to 4.2 GHz)	Ku - band (10.75 to 12.75 GHz)
Minimum input level	≦ -100 dBm	≦ -100 dBm
Gain	≧ 55 dB	≧ 55 dB
Input VSWR	≦ 2.5 : 1	≦ 2.5 : 1
Image rejection ratio	≧ 40 dB	≧ 40 dB
Output frequency	950 - 2050 MHz	950 - 2050 MHz
Output VSWR	≦ 1.5 : 1	≦ 1.5 : 1

Replace HKIS GS Clause C25.2.2 03 as follows:

03 SATELLITE RECEIVERS

The satellite receivers shall be earthed in accordance with Section of Electrical Installation System in the specification.

The satellite receivers shall be multi-system compatible and shall comply with the following:

RF signal

Input frequency	950 – 2050 MHz
Input signal level	- 60 dBm to - 30 dBm
IF bandwidth	18 MHz, 27 MHz
FM threshold	8 dB C/N

Video parameters

Video de-emphasis	ITU-R 405 -1 525, 625 lines
Video frequency response	+ 3 dB at 20 Hz to 5 MHz
Video output level	1 Volt peak-to-peak, 75 ohm
Baseband de-emphasis	Flat

Audio parameters

Audio subcarrier tuning	4.5 to 8.8 MHz
Audio response	20 Hz to 20 kHz, + 0.5 dB
Audio de-emphasis	50 μs, J17
Audio distortion	less than 2 % THD

Replace HKIS GS Clause C25.2.3 as follows:

C25.2.3 ANCILLARY SYSTEM

01 CABLE TRUNKING, CONDUIT AND ACCESSORIES

Cable trunking, conduit and accessories shall be in accordance with the Section of Electrical Installation System in the specification.

The Contractor shall install the equipment, cabling, etc. in location as indicated on the drawings accompanied with the specification. All cables and wiring shall be run and terminated inside conduits/trunkings and 47 mm deep IEC 60670-1 box, etc.

The Contractor shall supply and install 25 mm dia. steel conduit terminating at the headend equipment cabinet in the headend equipment room to enclose the down leads all the way from the antenna.

02 POWER SUPPLY

Power cable shall be in accordance with the Section of Electrical Installation System in the specification.

Power supply for the amplifier/receivers shall be taken from the 13A fused spur units c/w pilot light at positions as shown on the drawings. The sub-contractor shall be responsible for all the wiring from this location to the power supply unit, amplifier, etc. If additional 13A fused spur units c/w pilot light are required, the Contractor shall be responsible for the supply and installation. The Contractor shall also supply and install the automatic voltage regulators and/or uninterruptible power supply, where required in the Particular Specification#, for proper functioning of the whole broadcast reception system.

C25.3 INSPECTION, TESTING & COMMISSIONING

Replace HKIS GS Clause C25.3 03 as follows:

03 TESTING AND COMMISSIONING PROCEDURES

The Contractor shall carry out the testing and commissioning works in accordance with the Testing and Commissioning Procedure for Broadcast Reception Installation in Government Building.

The Contractor shall submit proposed testing and commissioning programmes, testing and commissioning methods, procedures and formats of test records to the Contract Administrator for approval. The submission shall be submitted together with a list of major equipment with their crucial information such as brand names, model numbers, types, capacities and locations.

The Contractor shall check and ensure that all related building items such as false ceiling, partitions, windows, louvers, etc. that will affect proper operation of the system have been provided and ready for carrying out of the commissioning before starting commissioning works.

The Contractor shall appoint a competent and experienced testing and commissioning engineer responsible for overall planning, organizing, coordinating, supervising and monitoring of the testing and commissioning works and also certifying all results and reports from the testing and commissioning works. Such personnel shall collaborate closely with the Contract Administrator's representative on the Site, who will witness the tests carried out under the Contract.

C26 Security System

C26 SECURITY SYSTEM

C26.1 GENERAL REQUIREMENT

Replace HKIS GS Clause C26.1 02 as follows:

02 PROTECTION OF MATERIALS AND EQUIPMENT

Unless the responsibility is clearly defined in the Contract that the protection on Site for delivered equipment, materials and installation is solely by other contractors, the Contractor shall be responsible for the safe custody of all materials and equipment as stored or installed by him until finally inspected, tested and accepted. In addition, the Contractor shall protect all work against theft, fire, damage or inclement weather and carefully store all materials and equipment received on Site but not yet installed in a safe and secure place unless otherwise specified.

All cases of theft and fire must immediately be reported to the police, the Contract Administrator and the Contract Administrator's representatives on the Site with full details.

Where necessary the Contractor shall provide lockable steel container or other equally secure enclosures placed within a securely fenced-in compound on the Site for the storage of materials and equipment.

The Contractor shall provide clean, reasonably finished and lockable secure accommodation for the storage of sensitive and/or expensive items before installation.

All the storage facilities and spaces shall be provided by the Contractor.

Add the following clauses after HKIS GS Clause C26.1 02

03 STATUTORY OBLIGATIONS AND OTHER REQUIREMENTS

The installations shall comply with the following:

(i) Electricity Ordinance (Cap.406), and other subsidiary legislation made under the Ordinance;
(ii) Fire Service (Installations and Equipment) Regulations (Cap. 95B), Fire Services Ordinance (Cap. 95), and other subsidiary legislation made under the Ordinance;
(iii) Building (Planning) Regulations (Cap. 123F), Building (Construction) Regulations (Cap. 123B), Buildings Ordinance (Cap.123), and other subsidiary legislation made under the Ordinance;
(iv) Code of Practice for Fire Safety in Buildings issued by the Building Authority;
(v) Code of Practice for the Electricity (Wiring) Regulations issued by the Electrical and Mechanical Services Department;
(vi) Codes of Practice for Minimum Fire Service Installations and Equipment and Inspection, Testing and Maintenance of Installations and Equipment issued by the Fire Services Department;
(vii) General Requirements for Electronic Contracts, (Specification Number ESG01) – Electronic Division, Electrical and Mechanical Services Department;
(viii) General Specification for Monochrome and Colour Closed Circuit Television System, (Specification Number ESG14) - Electronic Division, Electrical and Mechanical Services Department;
(ix) Relevant electricity supply company's regulations and requirements.

C26.2 MATERIALS AND EQUIPMENT SPECIFICATION

Replace HKIS GS Clause C26.2 01 as follows:

01 SECURITY SYSTEM

The Contractor shall supply and install a security system consisting of alarm bells, key switches, magnetic door contacts, motion detectors, alarm indicator panels and system control panel as shown on the Drawings.

The entire security system including all its hardware, peripherals, software and software user licenses shall be supplied and provided as part of the Contract.

The security system shall operate in the following mode:

The security system shall operate on a 12V or 24V DC supply and shall be backed up by emergency power supply. To meet this requirement, the security system shall be provided with secondary battery supply, uninterrupted power supply, or an approved source of backup power supply accepted by the Contract Administrator even when they are connected to the emergency generator.

All equipment within the security system shall continue to operate for at least 2 hours in the event of main AC power failure.

Batteries shall be suitable for continuous standby duty and batteries shall be sealed lead acid type.

Batteries shall be labelled with the installation date.

Battery chargers shall be capable of restoring batteries from a fully discharged state to a fully charged state within a period of 16 hours after restoration of power supply and at the same time maintain the installation in a fully operation state.

The security system shall be of “fail-safe” design, e.g. alarm shall raise upon the power supply fails.

All electric and electromagnetic door locking devices shall release upon receiving a fire signal from the automatic fire alarm system to maintain means of escape in case of fire.

Upon the key switch is switched to “On” position at the main security control panel, the system is enabled.

If any detection device in the protected areas of the security system as indicated on the Drawings is activated while its key switch outside the corresponding location is at “On” position, alarm shall be activated.

The magnetic door contact shall raise an alarm, whenever the door is opened in an “Enable” mode. The motion detector shall raise an alarm whenever it detects an intruder in the “Enable” mode.

The alarm shall cause the followings to operate:

(i) The corresponding alarm bell(s) mounted outside the rooms/locations as shown on the drawings to operate.
(ii) The buzzer and the corresponding alarm indicator(s) on the security system main control panel installed inside the General Office.
(iii) The buzzer and the corresponding alarm indicator(s) on the security system repeated panel installed inside the staff quarters.

When the key switch installed at the position outside the rooms/locations as shown on the Drawings where the alarm signal is activated is switched to the “Off” position, the alarm shall be reset.

The key switch shall be made of stainless steel plate. It shall have “On” and “Off” position with LED indicators. The key switch shall have an engraved label bearing the word “On” and “Off” in both Chinese and English characters. 3 number keys i.e. one for the Employer/property manager, two keys for the responsible persons to enable/disable the system shall be provided.

The magnetic door contact shall be of heavy duty and shall be cylindrical recessed inserted into the door/door frame. The magnetic switch shall be suitable for use with 25 mm gap.

The motion detector shall be installed as shown on the Drawings for detection of any intruder entering through the door or through the louvre.

The motion detectors shall be of passive infrared microwave verified type which shall detect movement by passive infrared technology and also by microwave technology. An alarm signal shall be sent to the control panel if both the passive infrared and microwave components of the sensor have been activated within a specified time. For the passive infrared component, the detectors shall keep constant monitoring of the "thermal pattern" of the protected area. Any rapid alteration of the infrared energy within the protected area shall trigger the alarm of the passive infrared component. However, a slow and gradual temperature change shall not cause an alarm. The infrared beam shall not penetrate glass, thin wall or plastics. The microwave component shall keep constant monitoring of the protected area by detecting the doppler shift of microwave emitted from the detector. The detector shall generate "K" band microwave frequency of around 24 GHz and emit it as unmodulated electromagnetic field to the protected area or volume. The range of detection shall be adjustable up to 18 m, the pattern of detection shall be 90^{o} adjustable ± 45^{o} horizontally and -7^{o} vertically. The velocity of the target to be detected shall be 150 – 3,000 mm per second. The sensitivity of the passive infrared components shall be 2 ^{o}C at a target velocity of 600 mm per second. The electronic circuit of the detectors shall be protected against high level radio frequency interference, and shall be insensitive to thermal and optical source of interference. A LED indicating trouble shall be lit when:

(i) excessive temperature;
(ii) fall in input voltage below the correct performance of the detector is assured; and
(iii) interruption of microwave operation (e.g. due to masking or failure of the microwave component. A LED shall be provided to indicate On/Off status of the "walk test" mode. The detector shall be one piece and shall be housed in a tamper-proof housing with tampering switch, alarm signal shall be sent to the control panel when the housing is tampered.

The alarm bell shall have a different sound from the other bell systems employed in the building. It shall be operated on 12V or 24V DC. The loudness of the bell shall not be less than 85 decibels at a distance of 3 m in front of the bell. Tamper switch shall be provided in the alarm units.

The security system main control panel installed inside the property management office and shall have, but not limited to the followings:

(i) Alarm indications for the areas specified as shown on the drawing.
Indications showing power on and off, security system on and off, circuit healthy status and battery low.
(ii) Buzzer muting switch. Alarm/system reset key switch.
(iii) Buzzer and lamp test button.
(iv) 220V A.C./12V or 24V DC step down transformer.
(v) Battery charger and batteries shall be supplied, installed and tested in accordance of the specification laid down in the Particular Specification.
(vi) The control panel shall be engraved in both Chinese and English characters. The layout shall be submitted for approval prior to installation.

Vandal-proof micro-switches shall be provided for the key switches, alarm bells, control panel and repeater panels to prevent vandalism.

The Contractor shall provide training to representatives of the end-user. The course shall include introduction to the burglar alarm and security system installed and on how to effectively operate the system.

Replace HKIS GS Clause C26.2 03 as follows:

03 BUILDER'S WORK

The Contractor is responsible for the builder's work as detailed on the Drawings under building work. The Contractor shall ensure that the arrangement, routing, number and sizes of all wall openings and concrete plinths for the installation are suitable. The Contractor shall provide detailed information for such builder's work requirement for obtaining Contract Administrator's approval.

The Contractor shall submit all detail drawings & fixing details to the Contract Administrator for approval prior to fabrication & installation.

The Contractor shall mark on site details of works to be executed in accordance with the approved drawings.

Replace HKIS GS Clause C26.2 04 as follows:

04 IDENTIFICATION OF SERVICES

Labels and notices shall be supplied and installed as according to General Specification for Electrical Installation in Government Buildings issued by the Architectural Services Department.

All equipment and electrical accessories installed shall be identified to give clear indication of the function and purpose of each item. Identification may be effected by suitable labels and/or markings.

Isolators, double pole (D.P.) switches, spur boxes etc. shall be engraved, on the front plates, with the appropriate words to denote the appliance or equipment they are controlling. The wordings shall be submitted to the Contract Administrator for approval.

Duplication of equipment/device identities shall not be accepted.

Samples of labels and marking for identification purposes shall be submitted to the Contract Administrator for approval.

C26.3 INSPECTION, TESTING & COMMISSIONING

Replace HKIS GS Clause C26.3 03 as follows:

03 TESTING AND COMMISSIONING PROCEDURES

The Contractor shall submit proposed testing and commissioning programmes, testing and commissioning methods, procedures and formats of test records to the Contract Administrator for approval. The submission shall be submitted together with a list of major equipment with their crucial information such as brand names, model numbers, types, capacities and locations.

The Contractor shall check and ensure that all related building items such as false ceiling, partitions, windows, louvers, etc. that will affect proper operation of the system have been provided and ready for carrying out of the commissioning before starting commissioning works.