Memorandum for the Review Committee on Quality Assurance Issues Relating to Fresh Water Supply of Public Housing Estates of the Hong Kong Housing Authority

Site Supervision for Installation of Fresh Water Supply System in Housing Authority's Public Housing Developments

PURPOSE

This paper informs Members about the major processes in site supervision for installation of Fresh Water Supply System in Housing Authority (HA)'s Public Housing Developments.

BACKGROUND

2. **Paper No. RC 6/2015** informs Members about the major processes shown in a Flow Chart for Design, Construction and Completion of Fresh Water Supply System in the HA's Public Housing Developments, to facilitate Members' understanding of the existing mechanism as described in **Paper No. RC 3/2015**, and to enable them to make informed decisions. Further details for each job stage would be presented in greater details by supplementary information under separate cover. This paper outlines the major processes in the site supervision for installation of Fresh Water Supply System in post contract stage (**Step 13 in Annex 1 of Paper No. RC 6/2015** refers).

3. For capital works new works building contracts, HA enters into a contractual relationship with the main contractor (Registered Contractor (RC)) by direct written contract under which the main contractor is fully responsible for carrying out of the works required. RC (with his domestic subcontractor and NSC) proceeds with plumbing installation works on site (**Step 11 in Annex 1 of Paper No. RC 6/2015** refers), and gives continuous supervision, provide all necessary superintendence by providing a management team during currency of the Works, and name a competent and authorized agent who shall be constantly on the Site on a full time basis dedicated to the superintendence of the Works (**Step 12 in Annex 1 of Paper No. RC 6/2015** refers).

4. After submission and approval of materials for installation of Fresh Water Supply System in post contract stage (**Step 9 in Annex 1 of Paper No. RC 6/2015** refers) and WSD has given approval to proceed with the installation of Fresh Water Supply System (**Step 10 in Annex 1 of Paper No. RC 6/2015** refers), RC shall execute the plumbing installation work in strict accordance with the Contract to the satisfaction of the CM.

OUTLINE OF MAJOR PROCESSES IN SITE SUPERVISION

5. The Chief Architect is the Contract Manager (CM) for the Building Contract, underpinned by professionals of various disciplines who are delegated with the authority under the Contract as CM's Representatives. The CM serving as APs in HD gives periodic supervision while the Registered Contractor is to give continuous supervision and all necessary superintendence for proper fulfillment of obligations under the Contract (**Step 12 in Annex 1 of Paper No. RC 6/2015 refers**). The responsibilities of the Contract Team in site inspection are outlined in Master Process Manual (DCMP). The CM maintains an adequate level of inspection to carry out the checks, inspections and tests according to the provisions under the contract. Inspection percentages are determined from time to time by the Contract Coordinator (the Project Architect) and endorsed by the Assistant Contract Manager (the Senior Architect). Inspection percentages of nominated subcontract are recommended by Senior Building Services Inspector and approved by the Senior Building Services Engineer.

6. RC inspects the works to ensure that they meet HA's specified requirements, before CM's SIT inspect them periodically. RCs employed by HA are certified to ISO 9000 for quality systems, ISO 14000 for Environmental management, and OHSAS 18000 for safety management. RC's supervisory staff identifies non-conformance, if any, and rectifies it immediately during the course of contract, out of his own volition and at his own cost. RC sets up his Contractor's Management Team according to contract requirements, comprising Project Manager, Quantity Surveyors' Quality Control Manager, Architectural Quality Control Coordinator, Structural Quality Control Coordinator; Environmental Manager, Environmental Supervisor, Site Agent; General Foremen, Block Foremen, Technical Director, Authorized Signatory, Building Services Engineer, Safety Officer & Supervisors etc. HA's Contract specifications, however, do not stipulate the roles and duties of the Licensed Plumber (LP) on the premise that these are all prescribed under the Waterworks Ordinance (Cap. 102). Arising from recent incidents, we are actively

considering enhancing our specifications to stipulate the involvement of LP's supervision of plumbing installations.

7. The CM's Site Inspection Team (SIT) conducts periodic and sample checks on materials and workmanship for conformance to Specifications and the progress of the MC's works (**Annex 2** refers). For inspection of plumbing installations, SIT comprises two disciplines with various ranks of Site Staff as follows –

(a) Building Works stream (comprising Senior Clerk of Works, Clerk of Works, Assistant Clerk of Works and Works Supervisor) inspects Building Works including builder's work requirements for building services works.

(b) Building Services stream (comprising Senior Building Services Inspector, Building Services Inspector, Assistant Building Services Inspector, Work Supervisor (Building Services)) inspects building services elements or other specialist works outside the scope of the Building Works.

8. The following types of inspection are generally conducted during the construction period –

(a) Inspection of Workmanship by trades;

(b) Inspection of Components;

(c) Inspection of Materials; and

(d) Inspection of Other Miscellaneous Works and Other Obligations not covered above.

9. For the fresh water supply system under the domestic plumbing sub-contractor, in addition to routine inspections, inspection officers of SIT are allotted with specific duties at different works stages, such as during construction of finishing trade at sample flats and wings/sample panel/construction mock-up; finishing stage; pre-completion stage; final inspection and maintenance period.

10. Site supervision of fresh water supply system is outlined as follows –

(I) Material Deliveries

(a) RC submits to CC the Material Delivery Forecast with quantities. The Quality Control Manager (QCM) employed by the RC checks every batch of materials against Approved samples and documents. The RC shall submit written confirmation, certified true copy of certificate of origin, and delivery note, etc. as specified for checking by CM's representative. Major materials to be checked are specified in DASM-202 and DASM-F6210 (**Annex 3&4** refers). Related to plumbing installation include close-coupled WC suit, wash hand basin, mixer and shower handset. Soldering /brazing alloys for copper pipes and fittings are not included. After this incident, we would include soldering/brazing alloys, stainless steel pipes, copper pipes and fittings in the On-site Delivery Verification.

(b) SIT checks building services materials as described in **Annex 5**. For water pump installation undertaken by the Fire Services and Water Pump (FSWP) Nominated Sub-contractor (NSC), SIT will check MC/NSC's submission according to HD's Building Services Site Administration & Inspection Guide (**Annex 6** refers).

(c) SIT asks MC to submit documentary evidences for verification when there is doubt on the authenticity of any materials.

(d) SIT regularly checks material storage on site for fresh water supply system from the Main Contractor/domestic plumbing subcontractor with the use of the form of Storage of Materials, DASM-5003 at **Annex 7** refers.

(II) In-process Checking of Materials

(e) In-process checking of materials forms part of site works checking as described in the ensuing sub-paragraphs (i) to (k).

(f) On top of inspections on project team level, material surveillance on selected major components supplied by the FSWP NSC is be conducted by Material Building Services Engineer (BSE) independent of the project team and the results are reported to the Joint Material Group (Building Services) (JMG(BS)) of HD, includes :

(i) Check completeness of submitted documents for compliance with the specification requirements; and

(ii) Visual inspection on appearance, construction, dimensions, defects, etc. against approved catalogue and certificates.

(g) If non-compliance is found during surveillance, the Material BSE forwards an advance copy of the surveillance report to project BSEs for immediate action as needed, and submit the report to JTG(BS) and JMG(BS) for endorsement [Note 1]. The results will be uploaded to the BS Material Database and Material Alert will be issued for project teams' attention. The process is details in a flow chart in **Annex 8**.

(h) Surveillance tests on the performance of mixer products are conducted by the Component and Materials (C&M) Team. One full surveillance test will be conducted for 1 of every 5 projects with the same brand of mixer products. Components which fail to meet the performance requirement will be removed from site.

(III) Checking of Site Works

(i) SIT checks that workmanship of the works is in compliance with contract requirements and as shown on shop drawings and sample installations approved by the Contract Manager (CM). For the works executed by the domestic plumbing subcontractor, SIT records the inspection results for any materials, components or trades using Daily Inspection Form, DASM-F0001 at **Annex 9** refers.

Note 1 A total of 16 material alerts on building services materials have been issued in the past 5 years, among which 6 arose from material surveillance carried out at sites.

(j) A number of inspection guides were developed to assist SIT to carry out the inspection [Note 2]. The inspection of water supply system including water pipes and fittings, water pumps and associated installation includes in-process inspection, final inspection and witness test. SIT checks the installation against the approved drawings and approved material record. For the works executed by the domestic plumbing subcontractor, SIT conducts recommended percentage checks on the above items. Inspection percentages in DASM are for guidance only. For plumbing above ground water supply pipes, it is specified that 100% checking is required for pipe testing and cleaning of water tank/pipeline. While 10% check is applied to pipe sleeve, materials, type and dimensions, pipe joint, pipework installation, valves, taps, strainers, pipe bracket and caulking pipe sleeves. **DASM-202 at Annex 3** refers. However, soldering material was not covered in the inspections. Since then, we will conduct check to soldering/brazing joints.

(k) For the works executed by the FSWP NSC, the Project Inspection Plan specifies the minimum percentage of installation to be inspected (in **Annex 15** refers). Besides functional tests, the major inspection items include verifying that materials installed are the same as approved, and that they are installed according to approved drawings.

(l) The Housing Authority operates a Performance Assessment Scoring System (PASS) to quantitatively measure the performance of contractors' performances including compliance of materials and workmanship with contract requirements as described in **Paper No. RC 15/2015**. In so far as fresh water supply system is concerned, contractor's performance on type and size of pipes, pipe brackets, pipe sleeve, soundness, plumb, level/fall will be assessed. Compliance of materials with specified requirements is

---

Note 2 The guides include: Inspection Guide Book, Site Inspection Guide for Building Works (DSAM Guide Book in **Annex 10**), Guidelines for In-Process Inspection – Water Pump (in **Annex 11**), Guidelines for Final Acceptance Inspection – Water Pump (in **Annex 12**) and Guidelines for Witness Test – Water Pump (in **Annex 13**). The Checklist (Visual Check / Witness Test) for Water Pump Installation is in **Annex 14**.

assessed under the component of Management Input. Similar to Building PASS, BSPASS assessments are also carried out for water pump installations undertaken by FSWP NSC.

(IV) Handling of Non-conforming Materials

(m) During the course of construction, RC adopts the following procedures for the identification and control of non-conforming materials and work on site –

i. Positively identify and segregate non-conforming materials and works;

ii. Keep records of all non-conforming materials and works and of the subsequent corrective actions taken;

iii. Notify all personnel concerned that a non-conformance exists;

iv. Inspect reworked/rectified items in accordance with documented procedures.

(n) When non-conforming materials and work are identified at site, SIT takes the following action(s) where applicable:

i. to issue site directions to instruct contractors to check and report the status together with quantity of non-conforming materials found and/or set aside the not installed non-conforming materials;

ii. to monitor contractors to remove the not installed non-conforming materials off site within specified time;

iii. to monitor contractors to provide appropriate measures such as post warning notices to prevent inadvertent use of the non-conforming materials; and

iv. to monitor the progress of agreed corrective actions taken by contractors on the installed non-conforming materials.

(o) On top of taking action at site level, SIT reports to CM and depending on the severity of the case(s), escalates actions, disseminates information and report untoward events to Deputy Director and Assistant Directors on a weekly basis.

INSPECTION AND TESTING OF WORKS ON COMPLETION

11. We will issue a separate paper on inspection and testing of works on completion.

INFORMATION

12. This paper is for Members' information.

Miss Michelle LAU
Secretary, Review Committee
Tel. No.: 2761 7928
Fax No.: 2761 0019

File Ref. : HD (C) DS 624/1
Date of Issue : 17 August 2015

FLOW CHART FOR DESIGN, CONSTRUCTION AND COMPLETION OF FRESH WATER SUPPLY SYSTEM IN HOUSING AUTHORITY'S PUBLIC HOUSING DEVELOPMENTS

ANNEX 1
Third Issue

Pre-Contract

Design Stage

Appoint Chief Architect as equivalent AP (also as Project Manager, Design Manager, Contract Manager)
By **HA** (HA Paper No. RC3/2015 Para.5)

Submit Scheme Design for Client's Approval
By **PT**

Prepare GBP based on
By **AP**

Submit GBP
By **AP**

Disapproved

Approve GBP
By **ICU** (HA Paper No. RC3/2015 Para.3)

1

Apply for Certificate regarding Water Supply Availability
- WWO 132 Part I by **AP** (HA Paper No. RC3/2015 Para.8)

Issue Certificate regarding Water Supply Availability
- WWO 1004 by **WSD**

Q1
On top of compliance with the statutory requirements, HD incorporates the assessment criteria for water quality survey under BEAM Plus version 1.2 in the 2012 version of specifications. (HA Paper No. RC3/2015 Para.20)

Apply for Water Supply by Consumer
- WWO 542 by **HA**

2
Prepare Plumbing Drawings & Specifications
By **PT**

3
Submit Plumbing Proposal
By **PT**
Disapproved

4
Approve Plumbing Proposal
By **WSD**

Tender Stage

5
Prepare Building Tender Drawings and Specification
By **PT** (HA Paper No. RC3/2015 Para.12)

Arrange Tender Out→ Tender Return → Tender Assessment (Two-Envelope System with Technical and Price Proposals) → Contract Award
6
By **PT** (HA Paper No. RC3/2015 Para.7)

Post-Contract

Construction Stage

Notify Appointment of RC & Commencement of Works
By **AP**

7
Employ a Domestic Plumbing Sub-contractor who appoints a LP for Execution of Plumbing Installation
By **RC** (HA Paper No. RC3/2015 Para.10)

8
Notify WSD of the Commencement Date and Scope of Plumbing Works to be carried out
- WWO 46 Part I by **AP** & **LP,** Part II by **Consumer** (HA Paper No. RC3/2015 Para.10)

9
Submit Plumbing Material to AP (including copper pipe & fittings, sink & shower & basin mixers, valves, water pump etc.)
By **RC** (HA Paper No. RC3/2015 Para.11)

Disapproved
Approved

10
Note Commencement Date/Permit to proceed with the plumbing installation
- WWO 46 Part III by **WSD** to **LP** for commencement of works

11
Construct and Install on site
By **RC**

12
Give Continuous Supervision
By **RC** and **TCP**s (HA Paper No. RC3/2015 Para.6 & 14)

13
Give Periodic Supervision
By **AP** and **TCP**s (HA Paper No. RC3/2015 Para.5 & 14)

O2
On top of compliance with the statutory requirements, HD conducts quarterly PASS assessments. (HA Paper No. RC3/2015 Para.14)

Completion Stage

14
Cleanse & Disinfect Fresh Water Inside Service
By Plumbing Sub-contractor of **RC**

15
Apply for Connection of Water Supply & Confirm Compliance with Waterworks Requirements
- WWO 132 Part II by **AP** (HA Paper No. RC3/2015 Para.17)

16
Notify Completion & Request for Inspection & Approval by WSD
- WWO 46 Part IV by **AP** & **LP** (HA Paper No. RC3/2015 Para.17)

17
Inspect Plumbing Installation by **WSD**
Satisfactory
Unsatisfactory

Approve Plumbing Installation
- WWO 46 Part V by **WSD**

Issue defect lists
- WWO 1008 by **WSD**

Test Water Samples
By WSD & by Accredited Laboratory arranged by **RC**

Unsatisfactory
Satisfactory

18
Issue Certificate Regarding Water Supply Connection
- WWO 1005 by **WSD** (HA Paper No. RC3/2015 Para.18)

O3
On top of compliance with the statutory requirements, to address the risk of Legionnaires' disease, since 2012, HD has also required the water supply system of newly completed public rental estates to be disinfected with chlorinated water. (HA Paper No. RC3/2015 Para.21)

O2
On top of compliance with the statutory requirements, HD conducts PASS assessment at completion stage. (HA Paper No. RC3/2015 Para.14)

Conduct flat to flat final inspection/Testing & Commissioning
By **RC** then **PT**

Report Completion to AP
By **RC**

Certify Completion and Apply for
By **AP** (HA Paper No. RC3/2015 Para.18)

Issue Occupation Permit
By **ICU**

1) HA has been specifying the use of lead-free solder materials for jointing of copper pipes. (BS EN 1254-1:1998)

2) HA has checked submission of lead-free solder materials and approved for use on site.

3) HA has identified the major cause of the incident is the use of non-conforming solder materials for the jointing of copper pipes, which has escaped unnoticed, at the project stages highlighted with a "star" ★ .

4) HA has been / will be implementing improvement measures to address this problem -

   a) the latest additional water sample testing requirements, published under WSD's Circular Letter No. 1/2015 on 13 July 2015, to be incorporated in HA specifications and implemented to all on-going HA contracts with immediate effect. The four new test parameters and acceptance criteria required under this Circular Letter are: lead (≤10μg/L), cadmium (≤3μg/L), chromium (≤50μg/L) and nickel (≤70μg/L);

   b) ask contractors to declare the application of solder materials on site is lead free;

   c) include solder materials in on-site delivery verification; and

   d) strengthen inspection on soldering materials, ensuring compliance with contract requirements, i.e., explore the use of hand-held equipment in speedy on-site checks for lead content in soldering materials.

Legend

No. — Key steps from Design to Completion Stage of Fresh Water Supply System

Q — Current HD's practice on top of compliance with statutory requirements

Processes related to Buildings Ordinance (Chapter 123 & 123a) (BO) **under exemption** (enforced by ICU to exercise independent administrative building control over HA buildings in line with the BO and related requirements)

Processes related to Waterworks Ordinance (Chapter 102 & 102a) **without exemption** (enforced by Water Supplies Department)

HA's Practice on top of statutory requirements

Colour Legend of Activities

- By HA
- By AP
- By PT
- By RC
- By LP
- By WSD
- By ICU

Abbreviations

AP	Authorized Person
ICU	Independent Checking Unit
GBP	General Building Plans
LP	Licensed Plumber
PT	Project Team
RC	Registered Contractor
TCP	Technically Competent Person
WSD	Water Supplies Department

ROLES AND RESPONSIBILITIES

1. The production and quality of the Building Works is the responsibility of the Contractor. Development & Construction Division is responsible for controlling the design, selecting suitable contractors, sub-contractors and suppliers, specifying the work required, administering the contract and inspecting the work during construction, with all reasonable skill and care, to ensure that the Contractor fulfills his obligations under the Contract.

2. The Chief Architect is the Contract Manager (CM) for the Building Contract. The Senior Architect is the Assistant Contract Manager (ACM), and the Project Architect is the Contract Coordinator (CC). Selected members of the Contract Team are delegated with the authority under the Contract as CM's Representatives. The responsibilities of the Contract Team in site inspection are outlined in DCMP.

3. The CM is required to maintain an adequate level of inspection to carry out checks, inspections and tests according to the provisions under the Contract. Inspection percentages are determined from time to time by the CC and endorsed by the ACM (see DASM-202).

4. The Site Inspection Team comprises various ranks of Site Staff (namely Senior Clerk of Works, Clerk of Works, Assistant Clerk of Works and Works Supervisor) and is responsible for the day to day inspection of Building Works, including builder's work requirements for building services works, but excluding building services elements. Each rank of site staff is responsible for the inspection of specified items of work which are categorized with respect to their degree of importance. The items of work and the inspection officer responsible are detailed in the Inspection Guide Book. The inspection officer will conduct inspection with reference to the recommended inspection percentages endorsed by the ACM and to perform duties according to their respective roles (see DASM-103). CC will undertake the duties of SCOW in consultant projects. They are required to perform the following tasks :

   (a) inspection of the works;

   (b) maintenance of inspection records and other site records; and

   (c) reporting to the CM, ACM, and the relevant CM's Representatives.

5. To establish an acceptable standard of material and workmanship for the project and for training purpose, a system of briefing from supervisory staff is established on the following basis -

Activities	Frequency	Participants
1. Project Based Joint Site Inspection and Briefing	Bi-weekly	PCOW, all ACW and WS of the project
2. Project Based Joint Site Inspection	Monthly	CC & SCOW to attend Bi-weekly Project Based Joint Site Inspection & Briefing held by PCOW with all ACW and WS of the project.
3. Sectional Briefing and Site Visit	Quarterly	CTO(BW), all SCOW, COW and ACW of Section, and WS of Project to be inspected

6. The inspection of building services elements of the Building Works are carried out by the site inspection team of the Building Services discipline. Inspection of specialist works outside the scope of the Building Works (e.g. landscape work) is carried out by other appropriate site inspection teams. All these site inspection teams are required to work in collaboration with one another.

7. The Contractor is required to execute the Works in strict accordance with the Contract, and to comply with Site Instructions, Site Directions on any matters related to the Contract whether mentioned in the Contract or not (GCC 15). The CM's Representatives and Site Inspection Team under the direction of the CM, have a responsibility for ensuring, so far as it is within their capabilities, that the Contractor carries out his obligations. They take necessary steps to examine and check the Contractor's work and to keep the CM closely informed in order to enable him to take action as provided in the Contract when the Contractor fails to meet the required standards. Failure of the CM's Representatives and the Site Inspection Team to disapprove any work or material does not prejudice the power of the CM thereafter to disapprove such work or material (GCC 2).

8. It is the responsibility of the Contractor to provide continuous supervision and all necessary superintendence for proper fulfilment of his obligations under the Contract. The role of the Site Inspection Team is to generally oversee the Contractor's works in the following aspects :

(a) conformance of Materials;

(b) conformance of Workmanship;

(c) conformance with Other Obligations; and

(d) progress of Works.

Any non-conformities found in site inspections are recorded by the Site Inspection Team in the relevant forms. The Site Inspection Team issues a Site Direction to inform the Contractor of the non-conformities. Procedures to deal with non-conformities are detailed in DASM-201

10. In the process of site inspection, the Site Inspection Team should not approve or endorse the Contractor's work. The onus is on the Contractor to ensure all works done and materials provided are to the specified or required standard under the Contract.

11. Through site inspections and reports of defects during maintenance period, the Contract Team provides feedback in accordance with DCMP.

INSPECTION IN CASE OF TYPHOONS AND RAINSTORMS

12. The Contractor is obliged to provide adequate safety and protective measures throughout the contract period in accordance with the conditions of contract. The contractor's site agent and safety officers are required to ensure that the precautionary measures put up are adequate.

13. Immediately after lowering of typhoon signals no. 8 or above or cancelling of black rainstorm warning, the Site Inspection Team inspects the site works immediately and promptly records any damage found.

14. The Project Clerk of Works (PCOW) reports by phone on damage to the CC (ACM or CM if CC is not available) after lowering of typhoon signals no. 8 or above or cancelling of black rainstorm warning. In case of serious damage CC reports to ACM / CM immediately.

15. Subsequent to lowering of typhoon signals no. 8 or black rainstorm warning, PCOW prepares written report to the CC, copied to CTO(BW). Form no. 7004 is used for report after lowering of typhoon signal No. 8 or above or cancelling of black rainstorm warning signal.

16. On receipt of the reports from the PCOWs, CTO(BW) in each section is to submit a consolidated report (Form No. 7001) for all projects in the section to the Contract Manager by facsimile transmission, with copy to the Project Director.

17. In the event of damage which renders the works site unsafe for construction, jeopardizes public safety or leads to consequential effects on time and cost to the Contract, the CC and the other relevant project team members visit the site as soon as possible.

18. Under certain situations, the CM may require the Contractor to carry out remedial works or preventive measures to ensure stability and protection of life, which may be beyond the normal contractual obligation.

19. The Contractor expedites the completion of the remedial works or preventive measures and arranges inspection by the CM and the Site Inspection Team. The PCOW records works done in the Site Record Book or Site Diary in HOMES.

REPORT IN CASE OF FIRE AND ACCIDENT

20. Contractor shall complete the 'Housing Authority Accident / Incident Report Form (DCMP-F787)' and submit to CM via site staff on each "reportable accident" where injury is resulted and sick-leave granted for 3 days or more.

21. In the event of serious fire and fatal accident, PCOW reports to the CC (ACM or CM if CC is not available) in writing.

HOUSING CONSTRUCTION MANAGEMENT ENTERPRISE SYSTEM (HOMES)

22. The Site Inspection Team uses the functions in HOMES after its implementation. In case the HOMES is out of service, the Site Inspection Team should adopt the paper mode of communication and record keeping, and upload these records in HOMES after its resumption.

CATEGORIES OF INSPECTION

1. The three main categories of inspection are as follows :-

Category	Recommended Inspection %
'A'	100%
'B'	10%
'C'	Random (at least 3 times per Block or 3 times per item or trade for external works)

See para. 11 for detail.

INSPECTION PERCENTAGE

2. The inspection percentages as set out in Para. 1 above are based on what is normally required to fulfill the role of the Site Inspection Team as described in this Guide (see DASM-103), with due recognition of the actual strength of the site staff establishment.

3. The recommended inspection percentages may vary according to the nature and scope of the Contract, site conditions and stage of work.

4. The inspection percentages are determined by the CC and are to be reviewed from time to time. At the commencement of the contract, PCOW prepares Forms Nos. 7006 and 7007 via the SCOW, CC to the ACM for endorsement. PCOW reports monthly using Form No. 7008 whether the endorsed inspection percentages have been achieved or not and if required, proposes revised percentage using Report Forms Nos. 7006 and 7007 via the SCOW, CC to the ACM for endorsement.

5. For inspection of domestic and non-domestic blocks, the recommended inspection percentages are applied on a floor-to-floor basis for both common area and domestic flat to avoid uneven distribution of inspection. For inspection of external works, the recommended inspection percentages are to be spread evenly on area basis.

6. The recommended inspection percentage of category 'C' inspection for domestic and non-domestic blocks is at the rate of at least 3 times per block which are to be spread evenly; whereas the same for external works is at the rate of at least 3 times per item or trade.

7. The Inspection Officer, assisted by Inspection Guide Book, completes Daily Inspection Form No. 0001 and Monthly Report on Inspection Status Form No. 7008 to PCOW for checking/endorsement.

8. The PCOW endorses Form No. 7008 before submission to CC with copies to SCOW and ACM.

9. The PCOW enters in Form No. 7008 the reason for non-compliances with the inspection percentages (if any), and the follow-up actions to rectify such non-compliances as directed by CC, ACM and CM.

10. Where major non-conformities are found, PCOW should consult CC and SCOW and increase the inspection percentage of those items to ensure compliance for works done as well as works to be completed. Changes to inspection percentage should be recorded on Form No. 7006 or 7007.

PROJECT SPECIFIC WORKS, SPECIALIST WORKS

11. The standard inspection guidelines do not cover project specific works, specialist works or special proprietary products. The PCOW prepares additional project inspection guidelines for these items, in consultation with the SCOW and CC for endorsement by the ACM. The inspection guideline proforma (Reference no. MIS.01) on "Project Specific Works / Specialist Works / Special Proprietary Products / Miscellaneous Works" is to be used for this purpose.

Inspection Guideline Ref. No.	Trade	(A) 100%	(B) 10% Check	(C) Random Check (at least 3 times)
		Item No./Description	Item No./Description	Item No./Description
COM9.01	Cooking Bench / Sink Units	(1) Shop Drawing (2) Prototype / Sample Work		(3) Materials, Type & Dimensions (4) Installation (5) Protection (6) Lines & Levels (7) Soundness / Finish (8) Equipotential Bonding
COM10.01	Glass Panel Balustrade	(1) Shop Drawing (2) Method Statement / Construction Process Control (3) Prototype / Sample Work	(4) Materials, Type & Dimensions of Metalworks (5) Burrs & Arrises of Metalworks (6) Defects of Weld (7) Welded Surface (9) Fixing of Metal Works (11) Alignment of Metalworks (12) Materials, Type & Thickness Of Glazing (13) Fixing Glass (14) Setting Blocks / Distance Pieces (15) Sealant (16) Broken / Damaged Glazing (17) Finish of Metalworks (18) Equipotential Bonding	(8) Galvanized Coating (10) Soundness of Metal Works
CLA1.01	Metal Profiled Sheet Roofing	(1) Shop Drawing (2) Method Statement (3) Prototype / Sample Work	(4) Materials, Type & Dimensions (5) Fixing (6) Movement Joints (7) Setting Blocks / Gaskets (8) Sealant (9) Protection (11) Soundness / Finish (12) Equipotential Bonding	(10) Defects
CLA2.01	Chinese Tiling	(1) Method Statement / Construction Process Control	(2) Materials, Type & Dimensions (3) Mortar, Chunam Mortar (4) Fixing (5) Soundness and Finish	
PLU1.01	Plumbing – Underground Water Supply Pipes	(3) Expansion Joint (8) Water Pressure Test (9) Connection to Existing In-service Mains	(1) Materials, Type & Dimensions (2) Pipe Joint (4) Pipework Installation (5) Valves & Strainers (6) Pipe Support (7) Protection to Pipe	
PLU1.02	Plumbing – Above Ground Water Supply Pipes	(8) Pipe Testing (10) Cleaning of Water Tank / Pipeline	(1) Pipe Sleeve (2) Materials, Type & Dimensions (3) Pipe Joint (4) Expansion Joint (5) Pipework Installation (6) Valves / Taps / Strainers (7) Pipe Bracket (9) Caulking Pipe Sleeves	
DRA1.01	Drainage Pipe Above Ground	(10) Pipe Testing (11) RFT for Common W-trap System (12) MFT for Common W-trap System	(1) Pipe Sleeve (2) Materials, Type & Dimensions (3) Bracket and Fixing (4) Jointing Pipe and Fitting (5) Level, Alignment & Plumb (6) Floor Drain and Grating (7) Pointing to Pipe Sleeve (8) Protection (9) Equipotential Bonding	

5120	On-site Verification for Common W-Trap System – Multiple Flushing Test Record	All items		
6207	Final Inspection - Watertightness Test - Bathroom	All Items		
6208	Final Inspection - Watertightness Test - Kitchen/ Refuse Room/Others	2, 3, 4, 5, 6	1	
6209	Final Inspection - Watertightness Test - Windows/Precast Facade	* All Items		

* DASM F6209 item 3 (precast façade) inspection % to be agreed by CM at project base.

Inspection/ Record Form No.	Trade	100%	10% Check	Random Check (at least 3 times)
		Item No./Description	Item No./Description	Item No./Description
5004	Thickness of Anodised Coating of Aluminium Elements			All Items
5005	Thickness of Galvanized/ Zinc Sprayed Coating of Metalwork			All Items
5006	Guideline & Checklist for Installation of Floor Spring System at Construction Stage / Maintenance Period Stage	All items		
5101	Final Inspection - Trx. Rm./Main Switch Room/ Generator Room	All Items		
5102	Final Inspection - Pump Rm./TBE Rm./Lift machine Rm./Lift Pit	All Items		
5103	Final Inspection - Utilities/Services Rm.	All Items		
5104	Final Inspection - Water Tanks	All Items		
5108	Final Inspection - Watertightness Test - Plumbing and Drainage Installation Above Ground	All Items		
5109	Final Inspection - Flats	All Items		
5110	Final Inspection - Common Area	All Items		
5111	Final Inspection - Miscellaneous Works	All Items		
5112	Final Inspection - Cleaning of Water Tanks and Supply Pipeworks	All Items		
5113	Final Inspection - External Works Covered Walkway/Pavilion	All Items		
5114	Final Inspection - External Works Fencing/Planter Wall	All Items		
5115	Final Inspection - External Works Paving/Emergency Vehicular Access	All Items		
5116	Final Inspection - External Works Ball Court/Play Area	All Items		
5117	Final Inspection - External Works Refuse Storage Area/ Refuse Collection Point	All Items		
5118	Final Inspection - Connection to Underground Drainage Pipe and Manholes / BIGTs	All Items		
5119	On-site Verification for Common W-Trap System – Repetitive Flushing Test Record	All items		

HOUSING DEPARTMENT
DEVELOPMENT & CONSTRUCTION DIVISION

RECORD FORM **No. 6210**

On-Site Delivery Verification

Type of Material : _____

Relevant S.L. Clause No. : _____

PROJECT (Contract No.) : _____ (/)

Item	Description	Compliance* Yes (v) / No (x)	Remark / Details of non- conformity
1	Document Check		
	i) written confirmation		
	ii) certified true copy of certificate of origin		
	iii) delivery note		
2	Material Check		
	i) dimension check		
	ii) surface quality		

See overleaf for guideline

Remarks by PCOW : _____

_____

Checked & Verified by :

_____

( )

Contractor's Representative

Date : _____

Witnessed by :

_____

( )

PCOW/ACW/WS

Date : _____

* enter ' NA' if not applicable

RECORD FORM No. 6210

GUIDELINE

1. Document check
   - The contractor shall submit written confirmation, certified true copy of certificate of origin, and delivery note, etc. as Specified for checking by CM's representative.

2. Materials check
   - The contractor shall carry out checking of dimension, surface quality and other accessories, etc. in the presence of CM's Representatives. The details of checking shall be referred to relevant Specification Clauses. Alternative record forms are also acceptable, provided that all information as stated in the relevant Specification Clauses for the On Site Delivery Verification is included.

3. Major materials to be checked are as follows and / or as Specified in the contract.

	Description of materials	S.L.Clause ref. no.
a.	Window	COM2.M005
b.	UPVC window	COM3.M010
c.	Timber doorset	COM5.M040
d.	Gateset	COM7.M010
e.	Cooking bench / sink units	COM9.M010
f.	Cement	FIN1.M010
g.	Lime	FIN1.M020
h.	Ready-mixed mortar & Ready-to-used mortar	FIN1.M460, FIN3.M170, FIN4.M140 & MAS3.M330
i.	Glazed ceramic wall tile	FIN5.M210
j.	Non-slip homogeneous floor tile	FIN5.M170
k.	Homogeneous wall tile	FIN5.M220
l.	External facing tile	FIN5.M230
m.	Homogeneous coved skirting tile	FIN5.M240
n	Unglazed vitreous mosaic wall tile	FIN5.M320
o.	Glass mosaic tile	FIN5.M330
p.	Tile adhesive and tile grout	FIN5.M1010
q.	Emulsion paint	FIN7.M340
r.	Synthetic paint	FIN7.M570
s.	Multi-layer acrylic paint	FIN7.M580
t.	Overhead door closer	IRO1.M530
u.	Mortice dead lock	IRO1.M740
v.	Cylinder rim drawback lock	IRO1.M730
w.	Lever handle furniture & lock	IRO1.M760
x.	Panel wall	MAS1.M210
y.	Close-coupled WC suit	PLU2.M110
z.	Wall hung or counter top or semi-recessed wash hand basin	PLU2.M310
aa.	Porcelain enamelled cast iron bath	PLU.2.M410
ab.	Acrylic shower cubicle / shower tray & sliding shower door	PLU.2.M430
ac.	Mixer & shower handset	PLU2.M510
ad.	Cold liquid applied flexible waterproofing system	WAT6.M010
ae.	Sheet or liquid membrane waterproofing systems	WAT6.M220
af.	UPVC pipe & fitting	DRA1.M150

		REFERENCE	CAT.
OBJECTIVES			
1.	To monitor progress of material submissions by contractors.		
2.	To provide comments on materials submitted by contractors.		
3.	To check the materials stored/installed at site in order to verify that there are no non-compliance with contract requirements/same as approved by PBSE.		
PROCEDURES			
4.	**SIT** monitors the progress of material submissions by contractors with reference to the approved/agreed material submission schedules.		M
	Material Samples Submission		
5.	**SIT** provides comments to PBSE and, when requested, on the technical information submitted by contractors.		M
6.	**SIT** provides comments to PBSE on the material samples and associate catalogues (if any) submitted by contractors.	DBSP-F28	M
7.	**SIT** compares the material samples submitted by contractors with the samples (if available) kept in HD's Building Services Materials Sample Room/Virtual Material Gallery.		A
8.	**SIT** maintains records of materials including technical information and material samples approved by PBSE.		M
9.	**SIT** monitors contractors to provide adequate protection to the approved material samples kept on site.		M
10.	**SIT** maintains records of materials which are agreed by PBSE for concessionary use by contractors.		M
11.	**SIT** arranges to upload the materials approval record to the Knowledge Management Portal of e-Housing upon project completion.		M
	Material Deliveries		
12.	**SIT** takes the following action(s) regarding materials delivered to site:		M
	(1) to keep records of the Building Services Material Delivery Inventory Records submitted by contractors;		
	(2) to sample check materials delivered to site against the information of approved materials or samples;		

	REFERENCE	CAT.

(3) to ask contractors to submit documentary evidences to PBSE for verification when in doubt on the authenticity of any materials or when requested by PBSE.

Material Inspections

13. **SIT** checks the materials at site (stored/installed) are in compliance with contract requirements / same as approved by PBSE. M

14. **SIT** checks the materials stored on site are well protected against damage, vandalism, weathering, contamination and theft. M

Non-conforming Materials

15. When non-conforming materials at site (stored/installed) are identified, **SIT** takes the following action(s) where applicable: M

(1) to issue site directions to instruct contractors to:
- check and report the status together with quantity of non-conforming materials found; and/or
- set aside the not installed non-conforming materials.

(2) to monitor contractors to remove the not installed non-conforming materials off site within the time specified by PBSE;

(3) to monitor contractors to provide appropriate measures such as post warning notices to prevent inadvertent use of the non-conforming materials;

(4) to report the case to PBSE for advice;

(5) to monitor the progress of agreed corrective actions taken by contractors on the installed non-conforming materials; and

(6) to take any other appropriate measures agreed by PBSE.

REFERENCE **CAT.**

OBJECTIVES

1. To monitor progress and quality of contractors' submissions.

2. To provide comments on contractors' submissions.

PROCEDURES

Contractors' Submissions

3. **SIT** monitors contractors to submit, but not limited to, the following where applicable: M

   (1) Organization charts;

   (2) Programmes of work;

   (3) Installation and builder's work drawings;

   (4) Submission schedules for installation and builder's work drawings;

   (5) Materials (sample/technical information);

   (6) Submission schedules for materials; and

   (7) Material delivery schedules.

Organization Charts

4. **SIT** checks that the representatives of contractors as specified in contract are included in the organization charts. M

Programmes of Work

5. **SIT** provides comments to PBSE on the programmes of work. DBSI-206 M

Submission Schedules

6. **SIT** provides comments to PBSE on the following submission schedules: A

   (1) Installation drawings;

   (2) Builder's work drawings; and

   (3) Materials (sample/technical information).

HOUSING DEPARTMENT

DEVELOPMENT & CONSTRUCTION DIVISION

INSPECTION FORM No. 5003

Serial No. : _____

STORAGE OF MATERIALS

PROJECT (Contract No.) : _____ (/)

CONTRACTOR : _____

Item	Description of Materials	Location	As Approved Sample	No Damage	No over-Loading	Stacking	Protection	Safety Custody

Inspected by : Jointly Inspected by :

( ) ( )

PCOW / ACW* PA / SCOW / PCOW*

Date: Date :

See overleaf for inspection guideline and notes.

Approved storage area layout plan to be provided if necessary.

* Delete as appropriate

INSPECTION FORM No. 5003

INSPECTION GUIDELINE (Details refer to Contract Specifications)

(1) Overloading

- the structural members are not overloaded by the imposed loading from storage materials.

(2) Stacking and Protection

a. Steel Reinforcement
- store steel reinforcement off the ground in a manner which will not result in damage, deformation or contamination.
- store different types and sizes separately and horizontally.

b. Other Metal Work
- store metal work off the ground in a manner which will not result in damage, deformation or contamination.
- store different types and sizes separately and horizontally.

c. Timber
- store formwork off the ground on level supports and in a manner which will not result in damage, deformation or contamination.
- store timber in dry, well ventilation place, off the ground in a manner which will not result in damage, deformation or contamination and protect from the weather.

d. Precast Concrete Unit
- store precast concrete units in a manner which will not result in damage or contamination.

e. Ironmongeries
- store ironmongeries in locked store rooms, under safe custody.

f. Pipes and Fittings
- store pipes and fittings in a manner which will not result in damage, deformation or contamination.
- store rubber jointing rings in protective bags and protect from the weather.
- do not rest pipes on their sockets.

g. Glass Panes and Plastic Sheets
- store glass panes and plastic sheets verticially in well ventilated area, and protected from condensation and moisture.

h. Paints
- store paints in cool, well ventilated, covered area, fitted with "NO SMOKING" sign and suitable fire extinguisher immediately outside the entrance door.

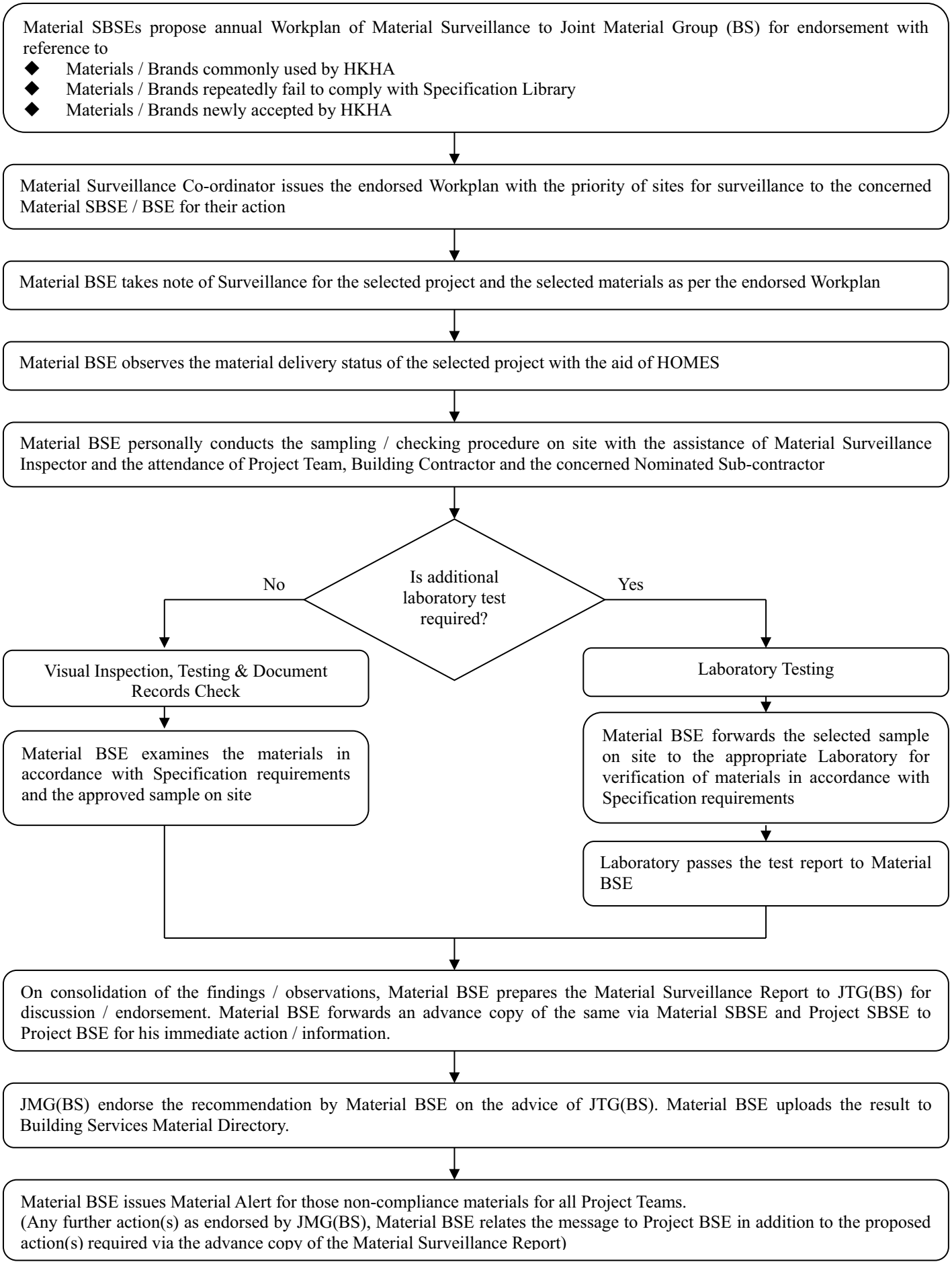
j. Other Materials
- store materials off the ground, or on a raised platform, or on a hard stand, or as Specified in a manner which will not result in damage, deformation or contamination.
- protect from weather.
- store different types and sizes seperately, or as Specified.
- store materials in a secure manner.

Remarks : All items to be inspected by ACW or above.

NOTES

1. Record all inspections by marking : -
   (X Date) to denote a **Fail**
   (*v* Date) to denote a **Pass**
   (- Date) to denote the work which has been **covered up** or completed at an earlier stage and cannot be checked at time of inspection.
   (NA) to denote those item of works **not applicable** in the contract / location.
2. Do not mark anything in the boxes against the items which are to be checked later on.
3. Do not use any other symbols except those mentioned above.
4. Put down the name and post of the Inspection Officer, sign and record the date of each inspection.
5. Put "J" next to the record at para 1 for a joint inspection.

Flow Chart of Surveillance for Building Services Materials



HOUSING DEPARTMENT
DEVELOPMENT & CONSTRUCTION DIVISION

INSPECTION FORM

No. 0001

Serial No. : _____

Daily Inspection Form

Date : _____

PROJECT (Contract No.) : _____ (/)

BLOCK NO. (Block Type) : _____ ( )

Ref. No.	Location	Works Items Inspected #			Site Direction No. Refer
		Pass	Covered up (not check)	Fail	

Refer Guide book for details

Remarks : _____

Inspected by

_____
( )
*PCOW / ACW / WS

Jointly Inspected by

_____
( )
*PA /SCOW /PCOW / ACW

Jointly Inspected by

_____
( )
*PA /SCOW /PCOW / ACW

Form Checked by

_____
( )
PCOW

c.c. Joint Inspection Officer

Date : _____

* Delete as appropriate

See overleaf for guideline

INSPECTION FORM No. 0001

NOTES

1. Record the inspected item no(s) in the "Works Items Inspected" column.
2. Identify the defects by marking on the spots with appropriate method.
3. Sign and record the date of each inspection.
4. Put "J" to record the joint inspected item.

Example :

Date : 19. 06. 01

Ref. No.	Location	Works Items Inspected #			Site Direction No. Refer
		Pass	Covered up (not check)	Fail	
MAS1.01	Flat No.2302	2J, 3J, 5J			
MAS1.01	F23,Corridor Wing A	2J		3J	38
FIN1.03	Flat No.1011	3, 4, 5, 6	1, 2		
FIN3.01	Flat No.1001	4, 5, 6			
WAT6.04	Flat No.1002	4J, 5J, 6J			
FIN5.01	F5, Wing A Corridor	2, 3, 7, 8			

Refer Guide book for details

Inspected by

Abc

(A B CHAN)

*~~PCOW / ACW~~ / WS

Jointly Inspected by

Def

(D E FONG)

*~~PA~~ /SCOW /~~PCOW /ACW~~

Jointly Inspected by

Lmn

(L M NG)

*PA /~~SCOW /PCOW /ACW~~

Form Checked by

Rst

(R S TO)

PCOW

Date : 21. 06. 01

* Delete as appropriate

Inspection Guide Book
Site Inspection Guide
for Building Works
(DASM)

Development and Construction Division

HOUSING DEPARTMENT

November 2005

DASM Site Inspection Guidebook

1. Introduction

This Site Inspection Guidebook is prepared for the purpose of giving the Inspection Team a quick reference when carries out inspection of general architectural works on site. Where there are discrepancies / arguments, the Inspection Team should always refer to relevant Contract Particular Specification, Approved Shop Drawings/Method Statement, Manufacturer's Recommendations/ Design & Built Specification for proprietary product installation, Specification Library & Manuals.

For easy reference, some relevant Specification Library clauses are added to the inspection items in the guideline, site staff can make reference to the relevant Specification Clause in the electronic copy of Specification Library before carries out inspection on site.

There are three categories of recommended inspection percentage (%):-

- A (100%)

Applicable to shop drawings and method statement /construction process control submission, construction mock-up and prototype, critical items and critical stage of works as directed by Contract Manager.

- B (10%)
- C

Random check based on project basis (at least 3 times per block or 3 times per item or trade for external works)**.**

DASM - Introduction (18/11/05)

The recommended inspection % may vary according to the nature and scope of the Contract, site conditions and stage of work. Where major non-conformities are found, PCOW shall consult CC & SCOW and increase the percentage of inspection of these items to ensure compliance for works done as well as works to be completed.

This Site Inspection Guidebook does not cover inspection guidelines for project specific works / specialist works / special proprietary products / miscellaneous works, e.g.

- Curtain Wall
- COM3 uPVC Windows;
- CLA4 Sheet Metal Coverings.

Project Clerk of Works prepares additional project inspection guidelines for these items based on relevant Specification Library clauses, Contract Particular Specification, proprietary products specification and method statement and submits via SCOW and CC to ACM for approval.

DASM - Introduction (18/11/05)

Ref. No.	Title of Guidelines
CLA1.01	Metal Profiled Sheet Roofing
CLA2.0-1	Chinese Tiling
PLU1.01	Plumbing – Underground Water Supply Pipes
PLU1.02	Plumbing – Above Ground Water Supply Pipes
DRA1.01	Drainage Pipe above Ground
DRA2.01	Drainage Pipe below Ground
DRA2.02	Manhole
DRA2.03	Channel / Gully
EXT1.01	Bituminious Roadway
EXT2.01	Concrete Carriageways
EXT3.01	Pavement – Paving Block
MIS.01	Project Specific Works / Specialist Works / Special Proprietary Products / Miscellaneous Works

DASM - Content (04/01/08)

Ref. No. PLU1.01

Title : Plumbing - Underground Water Supply Pipes Guidelines (1/3)

Item No.	Description	Reference	Recommended Inspection %	Inspection Officer
1	**Materials, Type & Dimensions** - materials, type & dimensions as Approved & Specified	PLU1.M010 PLU1.M120 PLU1.M130 PLU1.M170 PLU1.M180 PLU1.M190 PLU1.M200	10	WS or above
2	**Pipe Joint** - joint pipes & fittings as Approved & Specified, and as manufacturer's recommendations	PLU1.W030 PLU1.W040 PLU1.W210 PLU1.W220 PLU1.W230 PLU1.W240 PLU1.W250 PLU1.W260 PLU1.W270 PLU1.W280	10	WS or above
3	**Expansion Joint** - expansion joints provided as Approved and Specified	PLU1.M210 PLU1.M220 PLU1.M230	100	WS or above
4	**Pipework Installation** - fix pipes in parallel run and to specified level and as WSD's Approved drawings. - paint colour identification as Specified	PLU1.W030 PLU1.W040 PLU1.W090 PLU1.G010 PLU1.G020 PLU1.G030 PLU1.W060 PLU1.W070 FIN7.W2490 FIN7.W2510	10	WS or above
5	**Valves & Strainers** - valves provided as Specified - type & size of valve as Approved and Specified - valve for nominal sizes 65mm & above provided with open / shut indicator.	PLU1.M510 PLU1.M610 PLU1.M620 PLU1.M630 PLU1.M640 PLU1.M650 PLU1.M1040	10	WS or above

Ref. No. PLU1.01

Title : Plumbing - Underground Water Supply Pipes Guidelines (2/3)

Item No.	Description	Reference	Recommended Inspection %	Inspection Officer
6	**Pipe Support** - bedding / concrete thrust block provided as Specified	DRA2.W810 DRA2.W820 DRA2.W830 PLU1.W310	10	WS or above
7	**Protection to Pipe** - provide 2 coats of bituminous paint & wrap with petroleum tape - concrete surround for pipe less than 900mm from finish floor level under roads	PLU1.W1030 PLU1.W1040	10	WS or above
8	**Water Pressure Test** - carry out pressure test as Specified before covered up - testing pressure is min. 10 bar or 1.5 times of working pressure whichever is greater - no leakage for 1 hour duration - take record photo	PLU1.T030 PLU1.T040 PLU1.T050	100	WS or above

Ref. No. PLU1.01

Title : Plumbing - Underground Water Supply Pipes Guidelines (3/3)

Item No.	Description	Reference	Recommended Inspection %	Inspection Officer
9	**Connection to Existing In-service Mains** - follow mandatory procedures before connection as Specified - carry out turbidity test before connection	PLU1.W1210 PLU1.W1220 PLU1.T110 PLU1.T120	100	WS or above

Note :

Concrete slump test and cube test for in-situ concrete work shall be carried out in accordance with CON1.T510 to CON1.T670, and relevant DEI Forms are to be used.

Ref. No. PLU1.02

Title : Plumbing - Above Ground Water Supply Pipes Guidelines (1/4)

Item No.	Description	Reference	Recommended Inspection %	Inspection Officer
1	**Pipe Sleeve** - materials as Specified - PVC sleeve for Non FRP structure - G.I. sleeve for FRP structure - flush with wall finish / ceiling - project 100mm above finish floor level - pipe sleeve is provided to floating slab - no direct contact of sleeve & pipework	PLU1.M430 PLU1.W410	10	WS or above
2	**Materials, Type & Dimensions** - materials, type & dimensions as Approved and Specified	PLU1.M010 PLU1.M120 PLU1.M130 PLU1.M170 PLU1.M180 PLU1.M190 PLU1.M200	10	WS or above
3	**Pipe Joint** - joint pipes & fittings as Approved and as manufacturer's recommendations. - cut uPVC lined G.I. P. with bandsaw - apply sealant as Specified	PLU1.W210 PLU1.W220 PLU1.W230 PLU1.W240 PLU1.W250 PLU1.W260 PLU1.W270 PLU1.W280	10	WS or above

Ref. No. PLU1.02

Title : Plumbing - Above Ground Water Supply Pipes Guidelines (2/4)

Item No.	Description	Reference	Recommended Inspection %	Inspection Officer
4	**Expansion Joint** - provide expansion joints as Approved and Specified - in line with structural expansion joint - flexible connector and tie rod with neoprene washer are provided as specified	PLU1.M210 PLU1.M220 PLU1.M230	10	WS or above
5	**Pipework Installation** - fix pipes in parallel run, vertical & as Specified fall - fix pipes in routing as WSD's Approved drawings - seal off ends to prevent foreign matter - duck foot bend with base plate of adequate size is provided at bottom of pipe riser - neoprene washer bushing is provided to fixing bolt of duck foot resting on neoprene base pad - tee-off for connection of water hammer arrestor is provided, exact location to be agreed with BSI	PLU1.G010 PLU1.G020 PLU1.G030 PLU1.W030 PLU1.W040 PLU1.W070 PLU1.W080 PLU1.W1010	10	WS or above

Ref. No. PLU1.02

Title : Plumbing - Above Ground Water Supply Pipes Guidelines (3/4)

Item No.	Description	Reference	Recommended Inspection %	Inspection Officer
6	**Valves / Taps / Strainers** - fix non return valve, gate valve, stop valve and PRV properly as Approved and Specified - valve for Φ65mm & above provided with open / shut indicator	PLU1.M510 PLU1.M610 PLU1.M620 PLU1.M630 PLU1.M640 PLU1.M650 PLU1.M660 PLU1.M710 PLU1.M810 PLU1.M910 PLU1.M920 PLU1.M1010 PLU1.M1020 PLU1.M1030 PLU1.M1040 PLU1.W610 PLU1.W620	10	WS or above
7	**Pipe Bracket** - stainless steel to Grade 304 or as Approved - lined with plastic for uPVC pipe and copper pipe - type of bracket to suit surface to be fixed - correct spacing for vertical / horizontal pipe support provided as Specified - provide vibrator isolator as Approved and Specified - support pipes on roof as Specified - rubber/neoprene pad between pipe and bracket is provided as specified	PLU1.M410 PLU1.M420 PLU1.W100 PLU1.W310 PLU1.W320	10	WS or above

Ref. No. PLU1.02

Title : Plumbing - Above Ground Water Supply Pipes Guidelines (4/4)

Item No.	Description	Reference	Recommended Inspection %	Inspection Officer
8	**Pipe Testing** - carry out pressure test as Specified - min. 10 bar or 1.5 times of working pressure - no leakage for 1 hour duration. - test to concealed pipes before covering up	PLU1.T040 PLU1.T050	100	WS or above
9	**Caulking Pipe Sleeves** - void to be free of debris - caulking material as Specified - void pointed with sealant as Approved and Specified - fire collar for uPVC pipe - void filled with mineral wool / sealant for G.I. sleeve	PLU1.M430 PLU1.W410	10	WS or above
10	**Cleaning of Water Tank / Pipeline** - clean & sterilize as Specified - arrange WSD for sampling & testing	PLU1.W910 PLU1.W920 PLU1.W930 PLU1.W940 PLU1.W950	100	WS or above

Building Services Section

Development & Construction Division

Housing Department

GUIDELINES

FOR

IN-PROCESS INSPECTION

WATER PUMP

INSTALLATION

CONTENTS

NOTES:

1. The guideline is prepared in accordance with requirement as specified in Specification Library 2012 (Batch 1) (for common installations only).
2. Items, but not limited to, in the guideline are for reference by site staff in carrying out in-process inspection.
3. For installations not included in the guideline, site staff shall prepare check items (agreed with PBSE) for carrying out in-process inspection to verify that the installations are installed in compliance with contract requirement.

GENERAL

Material / Equipment

1. Material / equipment is same as approved.

MECHANICAL WORK

Pumpsets and Accessories

2. Certificate for pump is submitted.
3. Serial number of pump is indelibly marked / label fixed on the pump casing.
4. Normal direction of rotation of pump is indicated :

4a. By an arrow cast clearly on the pump casing; or

4b. By a brass arrow and plate engraved with “Direction of Rotation” screwed to the pump casing near the coupling.

5. Designation of pump and motor is provided. (recommended)
6. Pump and motor are mounted on a single baseplate. (for horizontal pump only)
7. Baseplate for horizontal pump and motor set is a steel plate welded on steel channel base frame.
8. Min.Ø25mm uPVC pipe is used to discharge gland water to the nearest drain point.
9. Cork panel for vibration isolation is :

9a. Installed under and around the whole pump inertia block;

9b. Covered entirely by plywood or galvanized steel sheet;

9c. All joints of plywood / galvanized steel sheet covering the cork panel are sealed by waterproof paper.

10. Spring isolator of correct type is installed at position as approved for anti-vibration isolation.
11. Priming facilities of pumpset is provided.
12. Purging facilities of pumpset is provided.

Pipework and Fittings

13. Layout of the pipeline is same as shown on approved drawing.
14. Exposed thread at pipework is painted with anti-corrosive paint.
15. Ø25 mm drain cock with hose bib is :

15a. Provided at pipe between the check valve and gate valve at the pump discharge;

15b. Plugged up by nipple / pipe cap.

16. Long radius bend is used unless otherwise approved.
17. Strainer is easily serviceable.
18. In case of suction lift, eccentric reducer is installed at pump suction side.
19. Pipework passing through slab / wall is :

19a. Maintained with 2 to 12mm annular space between pipe and sleeve;

19b. Provided with sleeve of length same as thickness of wall / beam.

20. Pipe bracket components including pipe clip, bolt, nut, washer, hanger and anchor bolt are stainless steel materials.

21. Pipe Joint is :

21a. Not located inside wall, slab or beam;

21b. Jointed by screwed fitting for galvanized steel pipe of size 100mm and below;

21c. Jointed by screwed flange or flanged fitting for galvanized steel pipe of size 150mm upwards.

22. Pipe Support is :

22a. Provided as close as possible to pipe joint and change of direction.

22b. With correct spacing;

22c. Provided with 6mm thick neoprene / rubber pad between pipe and pipe clip of fixed type pipe support;

22d. Mounted on the pump inertia base for supporting pipework between the pump and the flexible connector.

23. Pressure Gauge is :

23a. Provided at pump discharge side;

23b. Provided at pump suction side;

23c. Provided with isolating valve / cock;

23d. With dial not less than Ø100 mm;

23e. With full scale deflection not less than 1-1/3 times and not more than 2 times the system operating pressure.

Valves

24. Valve is :

24a. Installed at the correct position of the pipeline;

24b. Installed with its handwheel not blocking the access.

25. For cast iron valve, open and close position indicator is provided.

26. Non-return valve is installed in correct direction.

27. Pressure reducing valve is installed in correct direction.

Fresh Water Booster Pumps

28. Pressure switch is installed in correct position of pipeline.

29. Pneumatic pressure vessel is provided with :

29a. Air bleed cock;

29b. Pressure gauge;

29c. Safety valve;

29d. Drain cock and drain pipe lead to the nearest drain point.

Automatic self-cleaning strainer

30. Automatic self-cleaning strainer is provided with :

30a. Control panel;

30b. Differential pressure switch (DPS);

30c. Timer;

30d. Manual control switch;

30e. Back-flush valve with automatic actuator;

Hammer Arrestors

31. Installation of hammer arrestor is correct.

ELECTRICAL WORK

Pump Control Panels and Switchgears

32. Position of control panel is correct.
33. Position of switchgear is correct.
34. Individual isolator is provided to each pump.
35. Power supply switch is provided with positive “ON” and “OFF” indication.
36. Layout of the control panel is correct.
37. Door of control panel can be widely opened without obstruction.
38. Colour of indication lights is correct.
39. The ammeter is :

39a. With 75mm dial;

39b. With full scale deflection about 200% rated current.

40. Current transformer is :

40a. Of encapsulated type;

40b. With correct ratio.

41. Current rating of contactor is correct.
42. Utilization category of contactor is correct.
43. Current rating of overload device used fro motor starting circuit is correct.
44. Cable is :

44a. With correct size of incoming and outgoing power cable;

44b. With correct phase identification for power cable;

44c. With control cable of not less than 1.5 mm^2;

44d. With sleeve type cable marker provided at both ends of control cable.

45. Fuse is :

45a. With correct current rating.

45b. Bears the marking of Approved Quality Surveillance Scheme.

46. Insulating sheet is provided at the rear side of the pump control panel.

Motors

47. Emergency stop switch is provided for each pumpset.
48. Serial number of motor is indelibly marked.
49. Power (kW) rating of motor is correct.
50. Index of protection of motor is correct.
51. Certificate for motor is submitted.

Alarm Panels Outside Pump Rooms

52. Number of panel installed is correct.
53. Buzzer is provided.
54. Colour of indication light is correct.

Surface Steel Conduits

55. Size of conduit is correct.
56. Part of conduit with protective coating damaged is painted with anti-rust paint.
57. Separate circuit protective conductor is provided for flexible conduit, except ELV circuit.
58. Adaptable box is provided near to the control panel for interfacing with Fresh water booster pump control.

Steel Trunkings / Cable Trays

59. Unused hole at cable trunking is plugged.
60. Sufficient bracket is provided.
61. Copper tape is provided at the connection point.
62. Butt joint is used for connecting adjacent length of cable tray, tee or angle piece.
63. Part of cable trunking / tray with protective coating damaged is painted with anti-rust paint.

Level Control Switches

64. Weatherproof box is :
64a. Provided for housing the level control switch;
64b. Securely fixed;
64c. Provided with locking facility.

BUILDER'S WORK

1. Pump inertia block is positioned with sufficient space for access and maintenance.
2. Filler block around floating platform is properly sealed up.
3. Drain point is provided at pump room.
4. Wash-out and overflow water pipe is diverted outside pump room.
5. Cat ladder is installed at correct position.

Building Services Section
Development & Construction Division
Housing Department

GUIDELINES

FOR

FINAL ACCEPTANCE INSPECTION

WATER PUMP

INSTALLATION

CONTENTS

Page

NOTES:

1. The guideline is prepared in accordance with requirement as specified in Specification Library 2012 (Batch 1) (for common installations only).
2. Items, but not limited to, in the guideline are for reference by site staff in carrying out final acceptance inspection.
3. For installations not included in the guideline, site staff shall prepare check items (agreed with PBSE) for carrying out final acceptance inspection to verify that the installations are installed in compliance with contract requirement.

GENERAL

Material / Equipment

1. Equipment is clean.
2. Pressure switch is installed in the correction position.

Labels / Notices

3. Label / notice is :
   a. Provided for all equipment where required;
   b. Warning notices with content below are fixed in conspicuous position
      "DANGER 危險
      THIS MOTOR IS AUTOMATICALLY CONTROLLED AND MAY START WITHOUT WARNING - ISOLATE BEFORE INSPECTION" 此機乃自動操作 - 維修前請先關掣";
   c. With correct inscription;
   d. With correct fixing method.
4. Danger notice for DANGER-PLANT ON AUTOMATIC START is provided.
5. Warning notice for automatic self cleaning strainer with following characters is fixed in conspicuous position:

   注意 Attention

   如用手動模式，請先啓動沖厠水泵

   For manual mode operation, please start flush water pump first.

Painting

6. Painting :
   a. Pipework is thoroughly cleaned before painting;
   b. Pipework is painted in correct colour;
   c. Water flow direction arrows on pipe are painted;
   d. Equipment is thoroughly cleaned before painting;
   e. Equipment is painted in correct colour.

Provisions

7. Schematic piping diagram is :
   a. Treated properly to prevent deterioration;
   b. Framed up in the conspicuous position in pump room.
8. Schematic wiring diagram is :
   a. Treated properly against deterioration;
   b. Framed up in the conspicuous position.

9. One complete set spare fuse (for the Fuse combination unit installed by FWP NSC) is provided for each pump room.
10. Acknowledgement receipt for handing over of items as specified in contract document to Estate Management Branch is received.

MECHANICAL WORK

Pumpsets and Accessories

11. Data on the nameplate are easily read.
12. Pump shaft can be turned easily by hand.
13. Non-ferrous cover is provided to gland seal.
14. Bearing is lubricated.
15. Coupling is totally enclosed by see-through guard.
16. Exposed cork panel for anti-vibration at pump inertia block is sealed by mastic or bitumen.
17. Spring isolator for vibration isolation is correctly adjusted.
18. No distortion, compression or elongation is found on flexible connector.
19. Control rod / cable assembly of flexible connector is :
    a. Provided with resilient neoprene sleeve;
    b. Provided with resilient neoprene washer;
    c. Provided with steel washer;
    d. Correctly adjusted.

Pipework and Fittings

20. Water flow direction arrow is painted on two visible sides of pipework.
21. Pipework passing through slab / wall is :
    a. With a sleeve provided at a projection of 100mm above finished floor level;
    b. With annular space between pipework and sleeve sealed;
    c. With correct sealing method for the annular space between pipework and sleeve.
22. Excess thread sealant / gasket of pipe joint is removed.
23. No distortion, compression or elongation is found on expansion joint.
24. Hanger rod of spring type pipe support is not in contact with spring.

Valves

25. Valve is :
    a. Maintained at fully open position during operation unless otherwise specified;
    b. Provided with indication or locking device for valve opened partially.
26. Standby pressure reducing valve is shut off when it is not in use.
27. Handle of valve is painted red regardless of service.
28. Valve is painted in colour same as pipework.
29. Painting :
    a. Pipework is thoroughly cleaned before painting;
    b. Pipework is painted in correct colour;
    c. Water flow direction arrows on pipe are painted.
30. Schematic piping diagram is :
    a. Treated properly to prevent deterioration;
    b. Framed up in the conspicuous position in pump room.

ELECTRICAL WORK

Pump Control Panels and Switchgears

31. Gasket is provided at panel door.
32. Time switch is correctly set.
33. Cables in panel are neatly bunched.
34. Spare fuse for control circuit is fixed inside the control panel.

Motors

35. Cable is securely fixed at motor cable terminal.
36. Cable is with correct phase identification.

Surface Steel Conduits

37. Spacing of support is correct.
38. Adaptable box is covered.
39. Exposed conduit thread is painted with anti-rust painting.

Steel Trunkings / Cable Trays

40. Cables in the trunking are neatly bunched.
41. Cable trunking is covered.
42. Part of cable trunking / tray with protective coating damaged is painted with anti-rust paint.
43. Cable on cable tray is tied properly.

Equipotential Bonding

44. 25 mm^2 bonding conductor is provided to connect the cable termination gland of the main incoming fuse combination unit and the pump discharge pipes.
45. Equipotential bonding is :
    a. Provided with correct cable size;
    b. With correct bonding method;
    c. Provided to control panel and door of enclosure;
    d. Provided for pipe bracket with neoprene / rubber isolation pad;
    e. Provided across rubber flexible connector;
    f. Provided with label of correct wording for every main equipotential bonding point;
    g. Provided for surface conduit system;
    h. Provided for connecting the earth of primary side of the auto transformer and the extraneous or exposed conductive part.

Level Control Switches

46. Mercury switch is freely operated.
47. Ball float is free to move.
48. Weight of the float is free to move.

BUILDER'S WORK

1. Pump room is clean and with no surplus material.
2. No water is trapped inside pump room.
3. No water leakage is found from pipework system.
4. Anti-turbulence shield pipe in water tank is properly installed.
5. Wash-out and overflow water pipe is diverted outside pump room.
6. Lettering / Label is provided for :

a. Pump room;
b. Capacity of tank;
c. Usage of tank;
d. SWL of hoisting beam.

Building Services Section
Development & Construction Division
Housing Department

GUIDELINES

FOR

WITNESS TEST

WATER PUMP

INSTALLATION

CONTENTS

Page

NOTES:

1. The guideline is prepared in accordance with requirement as specified in Specification Library 2012 (Batch 1) (for common installations only).
2. Methods, procedures and items of test, but not limited to, in the guideline are for reference by site staff in carrying out witness test.
3. For installations not included in the guideline, site staff shall follow the methods, procedures and tests (approved by PBSE) to verify that the installations are installed in compliance with contract requirement.

INSULATION RESISTANCE TEST

1. Measure the insulation resistance of motor for the following pumps :
   a. Fresh Water Pump;
   b. Night Duty Fresh Water Pump;
   c. Flush Water Pump;
   d. Fire Services Feed Pump;
   e. Fresh Water Booster Pump.
2. Check that the test results are acceptable.

EARTH FAULT LOOP IMPEDANCE TEST

3. Measure the earth fault loop impedance for :
   a. Control Cubicle Casing of Fresh Water Pump, Flush Water Pump, Fire Services Feed Pump and Fresh Water Booster Pump;
   b. Motor of Fresh Water Pump, Night Duty Fresh Water Pump, Flush Water Pump, Fire Services Feed Pump and Fresh Water Booster Pump;
   c. Steel trunking;
   d. Steel conduit.

CONTINUITY OF PROTECTIVE CONDUCTOR

Exposed Conductor Parts

4. Measure the continuity of the exposed conductive parts of the installation.
5. Measure the continuity between the earthing terminal at circuit supply source and the following exposed conductive parts :
   a. Steel trunking;
   b. Surface steel conduits and accessories;
   c. Metal cable tray;
   d. Control cubicle case;
   e. Pump set casing;
   f. Other exposed conductive parts;
   g. Record on a layout plan showing exact location of exposed conductive parts.

Extraneous Conductive Parts

6. Measure the continuity of the extraneous conductive parts of the installation.
   a. If local “cross-bonding” is provided, measure the resistance between the two connections at the conductive parts;
   b. If local “cross-bonding” is not provided, measure the resistance between the extraneous conductive part and main earthing terminal;

c. Record on a layout plan showing exact location of exposed conductive parts.

PUMP ALIGNMENT TEST (for horizontal pump only)

7. Measurement alignment of coupling of the following pumpsets :
   a. Fresh Water Pump;
   b. Night Duty Fresh Water Pump;
   c. Flush Water Pump;
   d. Fire Services Feed Pump;
   e. Fresh Water Booster Pump;
8. Conduct the following checks of the coupling of all pumpsets :
   a. Rim Check and Face Check for the top, bottom, left and right side of the coupler.
9. The max. allowable misalignment is ± 0.125 mm.

HYDRAULIC TEST

10. Conduct hydraulic test to the completed pipework of the following systems :
    a. Fresh Water Pump;
    b. Flush Water Pump;
    c. F.S. Feed Pump;
    d. Fresh Water Booster Pump.
11. Apply at the highest point of the system a minimum pressure of 1000 kPa or 1.5 times of the working pressure whichever is higher to the pipework system.
12. Record the following data at the beginning and end of the test :
    a. Date/Time for testing;
    b. Ambient temperature;
    c. Sustained pressure;
    d. Duration of the test.
13. Check visually for leaks at the system for not less than 24 hours period.

FUNCTIONAL TEST FOR SYSTEMS

14. Test the functions of the following water pump systems :
    a. Fresh Water Pump;
    b. Night Duty Fresh Water Pump;
    c. Flush Water Pump;
    d. Fire Services Feed Pump;
    e. Fresh Water Booster Pump;

NOISE LEVEL

15. Measure the following in a domestic flat that is immediately above or adjacent to the pump room :
    a. For structural borne noise – measure inside the domestic flat at 1.2m above the floor with all windows closed;
    b. For air borne noise measurement – measure at 1m (approx.) away from outside of the domestic flat at 1.2m above the floor with all windows opened.
16. During measurement :
    a. Keep the pump room doors closed;
    b. Keep all tank covers closed;
    c. Keep all ventilation fans of pump room in operation.
17. Elapsed time of the measurements is 1 minute.

Building Services Section
Development & Construction Division
Housing Department

Checklist (Visual Check / Witness Test)
Water Pump Installation

I. Project Information

Project : _____

Sub-contract to Contract No. : _____

FS & WP Sub-contractor : _____

II. Inspection Location

_____

(Attach sketch to show the location if necessary)

III. Specimen Initial of Officer

Name	Post	Initial

IV. Vetted / Seen by Project Officer

	Name	Post	Signature	Date
Vetted by PBSI :		BSI/C		
Seen by PBSE :		BSE/C		

Remark(s) :

Site Inspection Team shall :

1. note that items prepared in this checklist are based on requirement of SL 2012 (Batch 1) only; and
2. note that words importing the singular only also include the plural vice versa where the context requires; and
3. make adjustment to the items in this checklist by
   (a) adding item based on requirement of Project Specific Specification and/or Site Instruction;
   (b) deleting item that is not applicable for the project; and
4. record the results of visual check / witness test in this checklist at various stages of project; and
5. request Contractor to certify the test results recorded in Section 2 by signing on the page - Test Record Certification of this checklist; and
6. submit the checklist to PBSE for his perusal; and
7. incorporate all incomplete / unsatisfactory items recorded in this checklist into form DBSSF-F03-DL (BS Outstanding / Defect list); and
8. record the results of re-inspection of all incomplete / unsatisfactory items in form DBSSF-F03-DL (no need to record the result of re-inspection of all incomplete / unsatisfactory items recorded in this checklist).

CONTENTS

SECTION 1 : VISUAL CHECK

Note(s) :

V - Satisfactory Work X - Incomplete / Unsatisfactory Work

NA - Not Applicable * - Delete whichever is inapplicable

		Results	
		V / X / NA	Initial / Date
GENERAL			
1.	All materials are of approved type.	1.	
2.	Whole installation is in “as-new” condition.	2.	
3.	Equipment is painted in correct colour.	3.	
4.	Label and/or notice is provided for all equipment as specified and whenever their provision will facilitate operation and maintenance of the installation.	4.	
5.	Label is made of sandwich plastic material with black outer layer and white inner layer.	5.	
6.	Label is fixed by screws or as approved.	6.	
7.	Schematic diagram of the pipe installation is fixed adjacent to the pump control cubicle.	7.	
8.	Schematic wiring diagram for water pump control system is fixed adjacent to the pump control cubicle.	8.	
9.	Schematic piping and wiring diagram is of A2 size minimum or as approved.	9.	
10.	Schematic piping and wiring diagram are treated to prevent deterioration.	10.	
11.	Schematic piping and wiring diagram is mounted in an anodized aluminium frame with transparent plastic front plate of 3mm minimum thickness and wooden backing board of 5 mm minimum thickness.	11.	
12.	One complete set of spare fuses for each rating of fuse-switches or switch fuses installed is provided for each pump room.	12.	
13.	Wooden board painted as approved with brass hooks and other device for holding the spare fuses in provided on wall inside pump room.	13.	
14.	One set of spare fuses for control circuit is fixed inside the pump control cubicle.	14.	
15.	Certificate issued and signed by manufacturer for each pump is submitted.	15.	
16.	Each pump or batch of pumps is provided with a certificate issued by a recognized Chamber of Commerce of the place of manufacture concerned.	16.	
17.	For each stainless steel flush water pump, a certificate of warranty issued by the manufacturer is submitted.	17.	
18.	For each stainless steel flush water pump, a certificate issued by the manufacturer stating the chemical composition for the materials used for the pump casing, impeller, shaft and diffuser, etc. is submitted.	18.	
19.	For each stainless steel flush water pump, an undertaking issued by the local supplier of the pump guaranteeing to provide free labour and material for servicing, and 5-year warranty period is submitted.	19.	
20.	Test certificate for the performance and test pressure of mild steel /stainless steel pneumatic pressure vessel issued by the manufacturer is submitted.	20.	
21.	Manufacturer’s factory test certificate of automatic self-cleaning strainer is submitted.	21.	
22.	User manual for VSD unit of fresh water booster pump system is properly bound in plastic folder and kept in a durable wall hanging box inside fresh water booster pump room.	22.	

		Results	
		V / X / NA	Initial / Date
23.	As-fitted drawings submitted consist of 3 print copies, 3 electronic copy in AutoCad and Adobe Portable Document format and 1 sepia of size as approved.	23.	
24.	Pump room noise level measurement report endorsed by an independent consultant employed by sub-contractor is submitted.	24.	
25.	Instruction manual is submitted.	25.	
26.	Electronic copy (in compact disc) of testing and commissioning reports in Adobe Portable Document Format are submitted.	26.	
27.	Price list of “Recommended Spares” is submitted.	27.	
28.	Acknowledgement Receipt for item handed over to EMD is submitted to PBSE with copies to PBSI.	28.	
MECHANICAL WORK			
Pumpsets & Accessories			
29.	Vale, check valve, flexible connector, etc. are installed at location as shown on approved drawing.	29.	
30.	The name plate is clean and the data are easily read.	30.	
31.	Serial no. of pump is indelibly marked or label fixed on the pump casing.	31.	
32.	Arrow indicating the normal direction of rotation is cast clearly on the pump casing or a brass arrow and plate engraved with the words “Direction of Rotation” is screwed to the pump casing near the coupling.	32.	
33.	Each stainless steel flush water pump is fixed with a metal nameplate showing the manufacturer’s name, serial number, pump head, flow rate, speed, rated power absorbed, material used and warranty expiry date.	33.	
34.	Motor with rating exceeding 22kW is secured with jack bolt or dowel pin as recommended by the motor manufacturer.	34.	
35.	Pump and motor of horizontal pumpset are mounted on a stainless base plate weld on a stainless steel channel base frame.	35.	
36.	Vertical pump of more than 200Kg in weight is provided with lifting eye.	36.	
37.	Bearing is lubricated.	37.	
38.	Pump coupling is enclosed by stainless steel see-through guard.	38.	
39.	Spring isolator mounting for pumpset is adjusted with proper deflection.	39.	
40.	Rubber flexible connector is installed in flush water pipework at pump room.	40.	
41.	Stainless steel flexible connector is installed in fresh water pipework at pump room.	41.	
42.	Guide rod of the flexible connector is correctly adjusted.	42.	
43.	Neoprene sleeve, resilient neoprene washer is provided on at least one side of the guide rod assembly for flexible connector.	43.	
44.	No sight of distortion or elongation is found at flexible connector.	44.	
45.	Gland drain where applicable, is piped to a suitable drain through uPVC pipe of min. 25mm dia.	45.	
46.	In case of suction lift, eccentric reducer is used at pump suction side.	46.	
47.	Exposed isolation cork at pump base of horizontal pump is sealed by mastic or bitumen.	47.	
Pipework and Fitting			
48.	Directional arrow indicating water flow direction in appropriate colour is painted on two sides of piping (except drain).	48.	
49.	Pipeline is arranged to keep minimum obstruction to the maintenance access.	49.	
50.	No water pipe is installed above control cubicle and switchgear.	50.	

		Results		
			V / X / NA	Initial / Date
51.	Valve is installed at convenient position of operation from the floor.	51.		
52.	Valve of cast iron body construction is provided with indicator to show the open and shut position.	52.		
53.	Valve to be opened partially during system in operation is provided with indication or locking device.	53.		
54.	25 mm dia. drain cock with hose bib is provided at pump discharge pipe between check valve and gate valve.	54.		
55.	Non-return valve installed at pump discharge with water head exceeding 15m is of recoil or spring type.	55.		
56.	Bend used is of long radius type unless otherwise approved, short radius bend is used for pipe size up to 50mm dia. and for pipes installed in limited spaces.	56.		
57.	Pipework is securely fixed.	57.		
58.	Support for piping between the pump and flexible connector is mounted on inertia base.	58.		
59.	For fix type bracket, neoprene/rubber pad of 6 mm thick is provided between pipe and pipe bracket.	59.		
60.	No short circuiting is found between spring and hanger rod of bracket with spring isolator.	60.		
61.	Spring isolator of bracket with spring isolator is adjusted to allow rated deflection	61.		
62.	Pipe bracket components including pipe clip, bolt, nut, washer, hanger and anchor bolt are stainless steel materials.	62.		
63.	No excess thread sealant / gasket is found at pipe joint.	63.		
64.	Bolt and nut used for pipe jointing are of appropriate size and length.	64.		
65.	Strainer is easily serviceable.	65.		
66.	Pressure gauge connects to sensing point by coiled connecter.	66.		
67.	Each pressure gauge is provided with an isolating valve/cock.	67.		
68.	Casing of pressure gauge is made of brass.	68.		
69.	Dial of pressure gauge is not less than 100mm diameter.	69.		
70.	Pressure gauge is provided at position as shown on approved drawing.	70.		
71.	Scale of the pressure gauge is in kPa to a maximum of not less than 1-1/3 times and not more than 2 times the system operating pressure.	71.		
72.	Division scale of pressure gauge is complied with requirement.	72.		
73.	Sleeve is provided for pipe pass through partition wall / slab.	73.		
74.	Annular space of 2 to 12 mm is allowed between pipeline and sleeve.	74.		
75.	Annular space between pipeline and sleeve is filled with non-flammable mineral wool or approved equivalent material pointed with approved fire-rated sealant having thickness as recommended by manufacturer.	75.		
76.	Modulating float valve installed at water tank, when in operation, does not cause any noise nuisance to the tenant of domestic flat.	76.		
77.	Pressure reducing valve is properly adjusted to reduce downstream pressure to a pressure suitable for the application.	77.		
78.	Standby pressure reducing valve not in use is shut off.	78.		
Others				
79.	Level control switch is securely installed.	79.		
80.	Mercury switch of level control switch can operate freely.	80.		

		Results		
		V / X / NA		Initial / Date
81.	Ball and weight of level control switch can move freely	81.		
82.	Each level control switch at roof tank is housed in a weatherproof type box with locking facility.	82.		
83.	Mild steel pneumatic pressure vessel for fresh water booster pump system is provided with air bleed cock, pressure gauge and drain cock with drain pipe lead to the nearest drain point.	83.		
84.	Stainless steel pneumatic pressure vessel is provided with drain cock with drain pipe lead to the nearest drain point.	84.		
85.	Mild steel pneumatic pressure vessel is recharged to a pressure suitable for the application after its open-up inspection.	85.		
86.	Warning notice of prominent red on white ground for motor under automatic control is displayed adjacent to each pumpset or each pair of pumpsets.	86.		
87.	Size of warning notice for motor under automatic control is NOT less than 300 x 300mm.	87.		
88.	English and Chinese characters of warning notice for motor under automatic control are as follows:	88.		
	DANGER 危險			
	THIS MOTOR IS AUTOMATICALLY CONTROLLED AND MAY START WITHOUT WARNING - ISOLATE BEFORE INSPECTION			
	此機乃自動操作 - 維修前請先關掣			
89	Lettering of warning notice for motor under automatic control is at least 25mm high.	89.		
90.	Automatic self-cleaning strainer is completed with control panel, differential pressure switch (DPS), timer and manual control switch, back-flush valve with automatic actuator, and other necessary components.	90.		
91.	Rinse cycle of automatic self-cleaning strainer is initiated by the control system based on the preset pressure differential, or by adjustable timer, or by manual action. The timer is adjustable within timing control range of at least 7 days.	91.		
92.	Duration of the rinse cycle of automatic self-cleaning strainer is adjustable.	92.		
93.	Alarm is initiated upon a pre-determined number of consecutive rinse cycles of automatic self-cleaning strainer.	93.		
94.	Number of consecutive rinse cycles of automatic self-cleaning strainer before initiation of alarm is adjustable.	94.		
95	Warning notice for automatic self cleaning strainer with following characters is fixed in conspicuous position:	95.		
	注意 Attention			
	如用手動模式，請先啓動沖厠水泵			
	For manual mode operation, please start flush water pump first.			
96.	When a master multi-pump display and control unit of fresh water booster pump system is necessary to fulfil the multi-pump control functions, an identical duplicate is provided in parallel with selector knob for easy changeover.	96.		
97.	Master and duplicate multi-pump display and control unit of fresh water booster pump system are installed in either the pump control cubicle or a separate metal panel board.	97.		

		Results	
		V / X / NA	Initial / Date
98.	VSD units of fresh water booster pump system are mounted individually on wall or enclosed collectively in a fan-ventilated metal cubicle mounted on wall unless the VSD unit and the pump motor forms an integrated design at factory.	98.	
99.	All non-armoured cables connecting from VSD unit to unit and from pressure transducer to VSD unit are enclosed in watertight flexible conduits and terminated in rigid box with glands and nuts.	99.	
100.	Control cables connecting to the VSD units of fresh water booster pump system are separated from power supply cables.	100.	
101.	Power supply cables connecting to the VSD units of fresh water booster pump system are kept as short as possible and not be installed in parallel to the control cables.	101.	
102.	When feedback signal is grouped from one common pressure transducer for all fresh water booster pumps, a duplicate transducer capable of automatic changeover is provided.	102.	
ELECTRICAL WORK			
Pump Control Cubicle (cubicle) and Switchgear			
103	Layout of cubicle and switchgear is same as approved.	103.	
104.	Front panel of cubicle is of double-door construction.	104.	
105.	Outer doors of front panel of cubicle permits at least 110° opening of the doors.	105.	
106.	Durable clear transparent panel sealed by rubber gasket is provided on outer doors of front panel of cubicle.	106.	
107.	Multi-point swing handles latches of watertight zinc alloy bodies with cam levers and locking bars but with no lock is installed on outer doors of front panel of cubicle.	107.	
108.	When the outers doors are at closing position, neoprene rubber gaskets fitted on their edges is tightly rested on curled edge of cubicle opening.	108.	
109.	Inner doors of front panel of cubicle permits at least 90° opening of the doors.	109.	
110.	Inner doors of front panel are recessed in the cubicle.	110.	
111.	Hinge of inner doors of front panel of cubicle is fastened on the cubicle by stainless steel screws when at closing position.	111.	
112.	Back side of the inner panel of cubicle is fitted with insulation board to prevent direct exposure of live parts when opened.	112.	
113.	Ventilation louvre is provided at lateral panel of the cubicle.	113.	
114.	Indication lights are of built in transformer complete with 6V LED lamp and a plastic lens of suitable colour.	114.	
115.	Dial of ammeter for indicating motor running current is of 75mm.	115.	
116.	Full scale deflection of ammeter is about 200% of rated current of motor.	116.	
117.	Internal component of the cubicle is clearly labeled.	117.	
118.	Contactor is of correct current rating.	118.	
119.	Each pump is provided with a triple pole Isolating switch with removable link.	119.	
120.	Size of control cable is not less than 1.5 mm^2.	120.	
121.	Sleeve type cable marker is provided at both ends of each cable.	121.	
122.	Size of cable from supply switch to pump control cubicle matches with current rating of protection device.	122.	
123.	Power supply cable to motor is tightly terminated.	123.	
124.	Colour identification of power supply cable to motor is correct.	124.	

	Results	
	V / X / NA	Initial / Date
125. Fuse installed is with correct current rating.	125.	
126. Fuse installed bears the marking of 'ASTA 20 CERT' or Approved Equivalent Quality Surveillance Scheme.	126.	
Conduit / Trunking / Tray Installation		
127. Adaptable box is covered.	127.	
128. Separate circuit protective conductor is provided for flexible conduit, except ELV circuit.	128.	
129. Internal of trunking is cleaned.	129.	
130. Cables inside trunking are neatly bunched.	130.	
131. Part with coating damaged is treated / repainted by anti-rust paint.	131.	
132. Two adjacent ends of trunking / tray are connected by 25 x 3 mm copper link.	132.	
133. All unnecessary hole at cable trunking is plugged off.	133.	
134. Trunking is covered.	134.	
135. Cable tray is securely supported by means of mild steel hanger or bracket of adequate mechanical strength.	135.	
136. Butt joint is provided at connection point between adjacent length of cable tray, tee and bend piece.	136.	
Earthing & Bonding		
137. Discharge pipes and the termination gland at the main incoming fuse combination unit is bonded by 25mm^2 PVC insulated copper conductor with approved clamp.	137.	
138. Equipotential bonding conductor is provided to rubber flexible connector.	138.	
139. Water pipe is bonded to pipe bracket with neoprene / rubber isolation pad.	139.	
140. Warning label with wording - "安全接地終端 — 切勿移去"and 'SAFETY ELECTRICAL CONNECTION — DO NOT REMOVE' is provided to earthing and main equipotential bonding point.	140.	

	Results	
	V / X / NA	Initial / Date
BUILDER'S WORK		
1. Pump room is clean and without surplus material.	1.	
2. No water is trapped inside pump room.	2.	
3. No water leakage is found from pipework installed by builder.	3.	
4. Safe working load of hoisting beam is painted.	4.	
5. Wash-out and overflow water pipes are diverted to outside pump room.	5.	
6. Guide pipe for level control switch at water tank is properly installed.	6.	
7. Silent pipe for modulating valve / ball float valve is properly installed.	7.	
8. Water tank is clean.	8.	
9. Isolation cork for floating platform is properly sealed up.	9.	

SECTION 2 : WITNESS TEST

PUMP DATA

Fresh Water Pump

Description		No. 1	No. 2	Night Duty Pump
Make				
Type (e.g. split casing, end suction, others)				
Model				
Serial No.				
No. of Stage				
Discharge Pressure (kPa)				
Suction Pressure (kPa)				
Flow rate (L/s)	Design			
	Actual			
Material of Impeller / Diffuser / Shaft				
Impeller Diameter (mm)				
Material of Bearing Bush (Vertical Pump Only)				
Type of Pump Seal				

Flush Water Pump

Description		No. 1	No. 2	
Make				
Type (e.g. split casing, end suction, others)				
Model				
Serial No.				
No. of Stage				
Discharge Pressure (kPa)				
Suction Pressure (kPa)				
Flow rate (L/s)	Design			
	Actual			
Material of Impeller / Diffuser / Shaft				
Impeller Diameter (mm)				
Material of Bearing Bush (Vertical Pump Only)				
Type of Pump Seal				

Fire Services Feed Pump

Description		No. 1	No. 2	
Make				
Type (e.g. split casing, end suction, others)				
Model				
Serial No.				
No. of Stage				
Discharge Pressure (kPa)				
Suction Pressure (kPa)				
Flow rate (L/s)	Design			
	Actual			
Material of Impeller / Diffuser / Shaft				
Impeller Diameter (mm)				
Material of Bearing Bush (Vertical Pump Only)				
Type of Pump Seal				

Fresh Water Booster Pump

Description		No. 1	No. 2	No. 3
Make				
Type (e.g. split casing, end suction, others)				
Model				
Serial No.				
No. of Stage				
Discharge Pressure (kPa)				
Suction Pressure (kPa)				
Flow rate (L/s)	Design			
	Actual			
Material of Impeller / Diffuser / Shaft				
Impeller Diameter (mm)				
Material of Bearing Bush (Vertical Pump Only)				
Type of Pump Seal				

MOTOR DATA

Fresh Water Pump Motor

Description	No. 1	No. 2	Night Duty Pump
Make			
Type			
Model			
Serial No.			
Phase			
Voltage (V)			
Frequency (Hz)			
Rated Power (kW)			
Starting Current (A)			
Operating Current (A)			
Full Load Current (A)			
Overload Setting (115% of Full Load Current)			
Speed (rpm)			
Class of Insulation			

Flush Water Pump Motor

Description	No. 1	No. 2	
Make			
Type			
Model			
Serial No.			
Phase			
Voltage (V)			
Frequency (Hz)			
Rated Power (kW)			
Starting Current (A)			
Operating Current (A)			
Full Load Current (A)			
Overload Setting (115% of Full Load Current)			
Speed (rpm)			
Class of Insulation			

Fire Services Feed Pump Motor

Description	No. 1	No. 2	
Make			
Type			
Model			
Serial No.			
Phase			
Voltage (V)			
Frequency (Hz)			
Rated Power (kW)			
Starting Current (A)			
Operating Current (A)			
Full Load Current (A)			
Overload Setting (115% of Full Load Current)			
Speed (rpm)			
Class of Insulation			

Fresh Water Booster Pump Motor

Description	No. 1	No. 2	No. 3
Make			
Type			
Model			
Serial No.			
Phase			
Voltage (V)			
Frequency (Hz)			
Rated Power (kW)			
Starting Current (A)			
Operating Current (A)			
Full Load Current (A)			
Overload Setting (115% of Full Load Current)			
Speed (rpm)			
Class of Insulation			

INSULATION RESISTANCE (IR) TEST

Date of Test : _____ **Witnessed by (Initial):** _____

Instrument(s)

Type : _____ **Brand :** _____

Serial No. : _____ **Model :** _____

Note(s): 1. L1 = Phase 1, L2 = Phase 2, L3 = Phase 3, E = Earth

2. Apply 500 / 1000V DC at motor terminals or cables (to motor) connection terminals at control panel.

Fresh Water Pump Motor					
Poles	**IR (MΩ)**	**Poles**	**IR (MΩ)**	**Poles**	**IR (MΩ)**
No. 1		**No. 2**		**Night Duty**	
L1 – E		L1 – E		L1 – E	
L2 – E		L2 – E		L2 – E	
L3 – E		L3 – E		L3 – E	
L1 – L2		L1 – L2		L1 – L2	
L1 – L3		L1 – L3		L1 – L3	
L2 – L3		L2 – L3		L2 – L3	
Flush Water Pump Motor					
No. 1		**No. 2**			
L1 – E		L1 – E			
L2 – E		L2 – E			
L3 – E		L3 – E			
L1 – L2		L1 – L2			
L1 – L3		L1 – L3			
L2 – L3		L2 – L3			
Fire Services Feed Pump Motor					
No. 1		**No. 2**			
L1 – E		L1 – E			
L2 – E		L2 – E			
L3 – E		L3 – E			
L1 – L2		L1 – L2			
L1 – L3		L1 – L3			
L2 – L3		L2 – L3			
Fresh Water Booster Pump Motor					
No. 1		**No. 2**		**No. 3**	
L1 – E		L1 – E		L1 – E	
L2 – E		L2 – E		L2 – E	
L3 – E		L3 – E		L3 – E	
L1 – L2		L1 – L2		L1 – L2	
L1 – L3		L1 – L3		L1 – L3	
L2 – L3		L2 – L3		L2 – L3	

EARTH FAULT LOOP IMPEDANCE TEST

Date of Test : _____ **Witnessed by (Initial):** _____

Instrument(s)

Type : _____ **Brand :** _____

Serial No. : _____ **Model :** _____

Note(s):

Control Panel of Pumps

Control Panels	Earth Fault Loop Impedance (Ω)	Initial / Date
Fresh Water Pump		
Flush Water Pump		
Fire Services Feed Pump		
Fresh Water Booster Pump		

Motor / Pump Set

Pumps	Nos.	Earth Fault Loop Impedance (Ω)	Initial / Date
Fresh Water Pump	No. 1		
	No. 2		
	Nigh Duty		
Flush Water Pump	No. 1		
	No. 2		
Fire Services Feed Pump	No. 1		
	No. 2		
Fresh Water Booster Pump	No. 1		
	No. 2		
	No. 3		

Others Metal Items

Items	Earth Fault Loop Impedance (Ω)	Initial / Date
Cable Trunkings		
Surface Steel Conduits And Accessories		

CONTINUITY OF PROTECTIVE CONDUCTORS

Exposed Conductive Parts

Instrument(s)

Type : _____ **Brand :** _____

Serial No. : _____ **Model :** _____

Note(s): Measure the continuity between the earthing terminal at circuit supply source and items to be tested

Location	Type	Resistance (Ω)	Initial / Date
	Steel Trunkings		
	Surface Steel Conduits		
	Cable Trays		
	Control Cubicle Case		
	Pump Set Casing		
	(Other Exposed Conductive Parts)		

Extraneous Conductive Parts

Instrument(s)

Type : _____ **Brand :** _____

Serial No. : _____ **Model :** _____

Note(s): Local “cross-bonding” is provided

- Measure the resistance between the two connections at the conductive parts.

If local “cross-bonding” is not provided

- Measure the resistance between the extraneous conductive part and main earthing terminal.

Location	Type	Resistance (Ω)	Initial / Date

PUMP ALIGNMENT TEST (FOR HORIZONTALLY INSTALLED PUMPSET ONLY)

Date of Test : _____ **Witnessed by (Initial):** _____

Instrument(s)

Type : _____ **Brand :** _____

Serial No. : _____ **Model :** _____

Note(s): Top = Top Reading Left = Left Hand Side Reading

Bottom = Bottom Reading Right = Right Hand Side Reading

The max. allowable mis-alignment is ± 0.125 mm

Pump Set		Rim Check Reading (mm)				Face Check Reading (mm)			
		Top	Bottom	Left	Right	Top	Bottom	Left	Right
Fresh Water	No. 1								
	No. 2								
Night Duty									
Flush Water	No. 1								
	No. 2								
Fire Services Feed	No. 1								
	No. 2								
Fresh Water Booster	No. 1								
	No. 2								
	No. 3								

HYDRAULIC TEST

Date of Test : _____ **Witnessed by (Initial):** _____

Instrument(s)

Type : _____ **Brand :** _____

Serial No. : _____ **Model :** _____

Note(s): 1. Apply 1000 kPa (min.) or 1.5 times of the system working pressure whichever is higher.

2. Pressure to be measured at the highest point of the system.

3. No water leakage occurs after pressure is held for not less than 24 hours.

Pump Set	Beginning of Test			End of Test			Duration
	Date / Time	Ambient Temp.(℃)	Pressure (kPa)	Date / Time	Ambient Temp.(℃)	Pressure (kPa)	of Test (minutes)
Fresh Water System							
Flush Water System							
F.S. Feed System							
Fresh Water Booster System							

FUNCTIONAL & SEQUENTIAL TEST

Date of Test : _____ **Witnessed by (Initial):** _____

Note(s): 1. V = Satisfactory Work, X = Incomplete / Unsatisfactory Work, NA = Not Applicable
2. * = Delete whichever is inapplicable
3. The following tests are used for general guidance, particular details please refer to contract requirement.

Fresh & Flush Water Pump

Mode	Action / Condition	Expected Response		Results (V / X / NA)			
				Fresh		Flush	
Auto	System Normal	Pump 1 and 2 operate alternatively when level control switch at roof tank is actuated.					
	Sump tank is empty	Nil pump operates					
	Roof tank is full	Nil pump operates					
	Pump 1 Fault			Case 1	Case 2	Case 1	Case 2
		Pump 1 at running stops					
	Case 1	Pump 1 failure light at control cubicle turns ON					
	Overload	Audio and visual alarm outside	Fault light turns ON				
	protection device	pump room	Buzzer turns ON				
	operated	Pump 2 starts upon preset time (_____ s) expires					
	Case 2 Under Current Relay operated						
	Press the mute button at control cubicle	Pump 1 failure light at control cubicle turns ON					
		Audio and visual alarm outside pump room	Fault light keeps ON				
			Buzzer goes OFF				
	After fault is cleared, press the Pump reset button at control cubicle	Pump 1 failure light at control cubicle goes OFF					
		Audio and visual alarm outside pump room	Fault light goes OFF				
			Buzzer goes OFF				

Fresh & Flush Water Pump (Cont'd)

Date of Test : _____ **Witnessed by (Initial):** _____

Mode	Action / Condition	Expected Response		Results (V / X / NA)			
				Fresh		Flush	
				Case 1	Case 2	Case 1	Case 2
Auto	Pump 2 Fault Case 1 Overload protection device operated	Pump 2 at running stops					
		Pump 2 failure light at control cubicle turns ON					
		Audio and visual alarm outside pump room	Fault light turns ON				
			Buzzer turns ON				
	Case 2 Under Current Relay operated	Pump 1 starts upon preset time (_____ s) expires					
	Press the mute button at control cubicle	Pump 2 failure light at control cubicle turns ON					
		Audio and visual alarm outside pump room	Fault light keeps ON				
			Buzzer goes OFF				
	With fault is cleared, press the Pump reset button at control cubicle	Pump 2 failure light at control cubicle goes OFF					
		Audio and visual alarm outside pump room	Fault light goes OFF				
			Buzzer goes OFF				
	Isolate pump 1	Pump 2 operates					
	Isolate pump 2	Pump 1 operates					
	Set 24 hour timer switch	A pump starts at the preset time until level control switch at roof tank actuates					
Manual	Push pump 1 start button	Pump 1 starts					
	Push pump 1 stop button	Pump 1 at running stops					
	Push pump 2 start button	Pump 2 starts					
	Push pump 2 stop button	Pump 2 at running stops					
	Low level control switch at roof tank actuated	Nil pump starts automatically					
Auto and Manual	Press the emergency stop push button at control cubicle	All running pumps stop and no pump starts					
	Press the emergency stop push button adjacent to pump	The respective pump stops					

Fresh & Flush Water Pump (Cont'd)

Date of Test : _____ **Witnessed by (Initial):** _____

Mode	Action / Condition	Expected Response		Results (V / X / NA)	
				Fresh	Flush
Selector switch for pressure switch at normal position	Close the gate valve at the two inlets of twin tank	Pump in operation stops			
		No flow indication light at control cubicle turns ON			
		Pump failure light at control cubicle turns ON			
		Buzzer – ON (if provided)			
		Audio and visual alarm outside pump room	Fault light turns ON		
			Buzzer turns ON		
	Press the mute button at control cubicle	Pump failure light at Control Cubicle keeps ON			
		Buzzer-OFF (if provided)			
		Audio and visual alarm outside pump room	Fault light keeps ON		
			Buzzer goes OFF		
	Open the gate valves at two inlets of the twin tank and press no flow reset button	No flow light at control panel is OFF			
		Pump failure light at control cubicle, fault light at alarm panel outside pump room OFF subsequent to pump reset button being pressed			
Selector switch for pressure switch at isolated position		Pressure switch by-pass light ON			
Corresponding roof tank level float switch at isolated position		Pump does not operate automatically even corresponding roof tank is calling for water			
		Functions of level float switch of alternate roof tank are not affected			
		Corresponding roof tank level float switch by-pass light ON			

Fresh Water Night Duty Pump

Date of Test : _____ **Witnessed by (Initial):** _____

Mode	Action / Condition	Expected Response		Results (V / X / NA)
Auto	Normal	1.	Night duty pump operates when roof tank calling for water at the preset period (11p.m. to 7a.m.).	
	Sump tank empty	2.	Pump does not operate	
	Roof tank full	3.	Nil pump operates	
	Pump Overloaded	4.	Pump stops	
		5.	Pump failure light on	
		6.	Audio & visual alarm at alarm panel operate	
		7.	Duty pump operates after preset time	
		8.	Audio alarm mute by pushing muting button	
		9.	Reset overload and pump failure reset button, visual signals at alarm panel and control cubicle off	
Manual	Roof tank low level	10.	Nil pump starts	
	Press pump start button at control cubicle	11.	Pump starts	
	Press pump stop button at control cubicle	12.	The running pump stops	
Auto and Manual	Press emergency stop push button at control cubicle	13.	Running pump stops and nil pump starts	
	Press emergency stop push button adjacent to pump	14.	The running pump stops	

Fire Services Feed Pump

Date of Test : _____ **Witnessed by (Initial):** _____

Mode	Action / Condition	Expected Response		Results (V / X / NA)	
Auto	System Normal	1. Pump 1 & 2 on alternative operation when roof tank calling for water			
		2. Pump does not operate when :			
		a. Sump tank is empty			
		b. Roof tank is full			
	Pump Fault Case 1 Overload protection device operated Case 2 Under Current Relay operated			Case 1	Case 2
		1. Pump 1 stops			
		2. Alarm status are :			
		Control cubicle	Pump 1 failure light - ON		
			Buzzer-ON (if provided)		
		Audio and visual alarm outside pump room	Fault light - ON		
			Buzzer-ON		
		3. Pump 2 operates after preset time (s)			
		4. To press the muting button at control cubicle, alarm status are :			
		Control cubicle	Pump 1 failure light - ON		
			Buzzer-OFF (if provided)		
		Audio and visual alarm outside pump room	Fault light - ON		
			Buzzer-OFF		
		5. To clear the fault and press the Pump reset button at control cubicle, alarm status are :			
		Control cubicle	Pump 1 failure light - OFF		
			Buzzer-OFF (if provided)		
		Audio and visual alarm outside pump room	Fault light - OFF		
			Buzzer-OFF		

Fire Services Feed Pump

Date of Test : _____ **Witnessed by (Initial):** _____

Mode	Action / Condition	Expected Response		Results (V / X / NA)	
				Case 1	Case 2
Auto	Pump 2 Fault : (Case 1 – Overload & Case 2 – Under current relay operated)	1. Pump 2 stops			
		2. Alarm status are :			
		Control cubicle	Pump 1 failure light - ON		
			Buzzer-ON (if provided)		
		Alarm panel out-side pump room	Fault light - ON		
			Buzzer-ON		
		3. Pump 1 operates after preset time (s)			
		4. To press the muting button at control cubicle, alarm status are :			
		Control cubicle	Pump 2 failure light - ON		
			Buzzer-OFF (if provided)		
		Audio and visual alarm outside pump room	Fault light - ON		
			Buzzer-OFF		
		5. To clear the fault and press the Pump reset button at control cubicle, alarm status are :			
		Control cubicle	Pump 2 failure light - OFF		
			Buzzer-OFF (if provided)		
		Audio and visual alarm outside pump room	Fault light - OFF		
			Buzzer-OFF		
	Pump 1 or 2 isolated	Pump 2 or 1 operates			
Manual	System Normal	Pump does not operate automatically even roof tank is calling for water			
		Pump 1 or 2 can be started or stopped by push button			
Emergency Stop Push Button Operates		All pumps are stopped			

Fresh Water Booster Pump

Date of Test : _____ **Witnessed by (Initial):** _____

Mode	Action / Condition	Expected Response		Results (V / X / NA)
Auto	Switch on power supply	1. Control circuit supply healthy indication light turns ON		
	System at cut-in pressure	2. Pumps operate automatically in sequence		
	System at cut-out pressure	3. Pump stops		
	Roof fresh water tank empty	4. Pumps do not operate		
	Pump Fault	1. The faulty pump shall be switched off automatically. The other one next to the pump set in sequential operation shall be actuated in a pre-determined period (s).		
		Booster Pump control cubicle	Visual light - ON	
			Buzzer turns ON	
		Audio and visual alarm outside Fresh water booster pump room	Visual light - ON	
			Buzzer - ON	
		Audio and visual alarm outside G/F water pump room	Visual light - ON	
			Buzzer - ON	
		2. To press the muting button at booster pump control panel, alarm status are :		
		Booster Pump control panel	Visual light - ON	
			Buzzer-OFF (if provided)	
		Audio and visual alarm outside R/F pump room	Visual light - ON	
			Buzzer-OFF	
		Audio and visual alarm outside G/F water pump room	Visual light - ON	
			Buzzer- OFF	
		3. The alarm system shall be automatically reset on clearance of the fault		
	Control System Failure / System Pressure has dropped to or below the pre-set pressure	1. Alarm status are :		
		Booster Pump control panel	Visual light - ON	
			Buzzer – ON (if provided)	
		Audio and visual alarm outside R/F pump room	Visual light - ON	
			Buzzer - ON	
		Audio and visual alarm outside G/F water pump room	Visual light - ON	
			Buzzer - ON	
		2. To press the muting button at booster pump control panel, alarm status are :		
		Booster Pump control panel	Visual light - ON	
			Buzzer-OFF (if provided)	
		Audio and visual alarm outside R/F pump room	Visual light - ON	
			Buzzer-OFF	
		Audio and visual alarm outside G/F water pump room	Visual light - ON	
			Buzzer-OFF	
		3. The alarm system shall be automatically reset on clearance of the fault.		
Manual	System Normal	Corresponding pumpset can be started or stopped by push button		
Emergency Stop Push Button Operates		All pumps are stopped		

Fresh Water Booster Pump

Function check on VSD units

Date of Test : _____ **Witnessed by (Initial):** _____

Expected Condition	**Results** (V / X / NA)
The unit contains buttons for switching on/off and allow manual operating mode for individual pump.	
The unit contains buttons to input settings with password protection.	
The unit contains LCD panel to display pump control parameters as follows:	
i. Discharge pressure value setting;	
ii. Operating frequency setting;	
iii. Switch interval for cyclic changeover setting;	
iv. Power on, run and fault indication;	
v. Running pressure value indication;	
vi. Running frequency indication;	
vii. Hours of operation log indication;	
viii. Error messages indication.	
The unit is provided with automatic protections to the booster pump system as follows:	
i. Shut off all pumps at zero suction, high pressure overshoot and loss of pressure at discharge;	
ii. Protect pump motor from over-voltage, under-voltage, over-current, overload, overheat and loss of phase;	
iii. Protect frequency inverter from overheat and	
iv. Conduct automatic test-run at adjustable periods.	
The unit activates audio and visual alarm for the following faults:	
i. Low suction pressure;	
ii. Pump motor failure;	
iii. Frequency inverter failure;	
iv. Pressure transducer failure;	
v. System failure.	
The unit provides dry contacts for the following remote monitoring outputs:	
i. Pump running status;	
ii. Common fault signal.	
The unit keeps record of at least 5 nos. of last fault events for retrieval.	
The unit is able to recover automatically after power failure.	
Input parameters on any VSD unit is capable to synchronize to other VSD units automatically.	

OPEN-UP INSPECTION FOR STAINLESS STEEL FLUSH WATER PUMP

Project : _____

Sub-contract to Contract No.: _____

FS & WP Sub-contractor : _____

Date of Inspection : _____ **Witnessed by (Name, Post and Initial) :** _____

Local Agent : _____ **Name of Contractor's Representative :** _____

Place of Inspection : _____

Flush Water Pump Data

Description			
Location of Pump Installation			
Make			
Place of Origin			
Type			
Model			
Serial No.			

Items		**Results (V / X / NA)**
1. Test Piece:		
1a	Form an integral part of the pump casing.	
1b	Minimum size is 25mm diameter x 150mm length.	
2. Pump Construction:		
2a	Wearing/split ring between respective impeller, detachable diffuser, pump packing and pump casing is provided.	
2b	Means is provided to bleed the air and drain the casing.	
2c	Screw or recess is integral of the casing to prevent rotation of detachable diffusers.	
2d	Bearing bush for vertical pump is made of tungsten carbide, silicon carbide or equal material & approved to minimize wear.	
2e	Stainless steel motor stool is provided for vertical stainless steel pump.	
2f	Arrow indicating the normal direction of rotation is cast clearly on the pump casing or a brass arrow and plate engraved with the words “Direction of Rotation” is screwed to the pump casing near the coupling.	
2g	The impellers are dynamically balanced using grinding machine.	
2h	Impellers are keyed to the shaft and fixed in an axial position by nuts. The nuts are threaded opposite to rotation and secured by setscrews or other means.	
2i	Mechanical seal is provided for multi-stage pump.	
2j	Nameplate with details is provided as required in the specification.	

OPEN-UP INSPECTION FOR STAINLESS STEEL FLUSH WATER PUMP (Cont'd)

Witnessed by

Date of Inspection : _____ **(Name, Post and Initial) :** _____

	Items	Results (V / X / NA)
3. Pump Bearing:		
3a	Bearing is sealed ball/roller type, with oil or grease lubricated.	
3b	Lubrication nipple/connections or oiler sump with drain plug is provided.	
3c	Bearing housing and cover are stainless steel and easily removable for service.	
3d	Labyrinth seal bearing cover to contain grease in the housing is provided.	
4. Workmanship:		
4a	Casing	
4b	Diffuser	
4c	Impeller	
4d	Tie Bar	
4e	Shaft	
4f	Bearing	
5. Documents		
5a.	Report of the tensile and material composition test for test piece is submitted.	
5b.	Certificate issued by the manufacturer stating the chemical composition for the materials used for the pump casing, impeller, shaft and diffuser, etc. is submitted.	
5c	Undertaking letter issued by the local supplier of the pump guaranteeing to provide free labour and material for servicing, and 5-year warranty period is submitted.	

6. Observations :

_____

_____

_____

_____

Remark: Photos to be attached if required

VISUAL CHECK OF MISCELLANEOUS ITEMS

Date of Test : _____ **Witnessed by (Initial):** _____

Note(s) :

V - Satisfactory Work
X - Incomplete / Unsatisfactory Work
NA - Not Applicable
* - Delete whichever is inapplicable

		Results (V / X / NA)
1.	Pressure reducing valves are properly adjusted :	
1a.	The downstream pressure;	1a.
1b.	The response time to avoid valve hunting.	1b.
2.	The modulating type ball float valve, the response time is properly adjusted to avoid causing water hammer when shut off.	2.
3.	No water hammer occurs when pump stop :	
3a.	Bends connecting long horizontal pipe runs at roof level;	3a.
3b.	Up-feed vertical riser.	3b.
4.	Water hammer arrestor is properly installed if provided.	4.
5.	Audio alarm at the alarm panel outside pump room should be a buzzer rated for continuous operation.	5.
6.	Flush water P.R.V. fault indication panel:	
6a.	P.R.V. fault signal and corresponding indication light at designated floor is tested.	6a.
6b.	Flush water P.R.V. fault indication panel is tested.	6b.

MEASUREMENT OF NOISE LEVEL

Date of test : _____ **Witnessed by (Initial):** _____

Instrument(s)

Type : _____ **Brand :** _____

Serial No. : _____ **Model :** _____

Note(s) :

1. Select the domestic flat which immediately above or adjacent to the pump room for testing.
2. The assessment shall be carried out
   i. Inside the domestic flat with all windows closed;
   ii. 1m outside the window of the domestic flat.
3. The assessment point shall be at a position 1.2m above the floor of the domestic flat.
4. When taking the measurement :
   i. Keep the pump room doors closed;
   ii. Keep all tank covers closed;
   iiii. Keep all ventilation fans of pump room in operation.
5. Elapsed time to be 1 minute.

Assessment		Fresh Water Sump Tank Filling		Flush Water Sump Tank Filling		Fresh Water Pump Running				Flush Water Pump Running				Ventilation Fan Running	
Time	Location					No. 1		No. 2		No. 1		No. 2			
		BNL	TNL	BNL	TNL	BNL	TNL	BNL	TNL	BNL	TNL	BNL	TNL	BNL	TNL

Time	Assessment Location No: (Flat No :)	Fresh Water Pump No. _____ Flush Water Pump No. _____ & Ventilation Fan Running with All Sump Tank Filling	
		BNL	TNL
	1m outside domestic flat with all windows opened (air borne)		
	Inside domestic flat with all windows closed (structure borne)		

BNL : Background Noise Level to the nearest 0.1 dB(A)

TNL : Total Noise Level to the nearest 0.1 dB(A)

Annex 14

TEST RECORD CERTIFICATION

I certify that the test results recorded in Section 2 of this Checklist are true.

Remark(s) :

Name of Contractor	:
Signature of Contractor's Representative	:
Full Name of Contractor's Representative	:
Designation of Contractor's Representative	:
Date	:

Building Services Section
Development & Construction Division
Housing Department

Issue No: _____

PROJECT INSPECTION PLAN

PROJECT : _____ **Contract No.** _____

FREQUENCY OF INSPECTION

Refer to DBSI Guide

EXTENT OF IN-PROCESS INSPECTION

1. The extent of inspection proposed in this PIP would be applied for the whole contract period.
2. Project team is required to review and revise (if required) the proposed extent of inspection quarterly.
3. Project team is required to select the installations and items shown in this PIP that are applicable to the project and plan the extent of inspection for individual items to cope with project condition.
4. When preparing the Project Inspection Plan (PIP), Project team should refer to the respective Guidelines for In-process, Final Acceptable Inspection and Witness Test for details of individual items to be inspected before proposing the extent of inspection.
5. The BS installations and the items included in this PIP is not exhaustive, project team is required to add the BS installation(s) and items that is/are not covered in this PIP.
6. The installation(s) or item(s) that are not applicable to the project should be deleted.
7. The minimum % (or otherwise as specified) of inspection should be achieved as far as practicable.
8. For item(s) with extent of inspection not of 100%, the location(s) / item(s) selected for inspection should be spread evenly over the installation work as representative as practicable.

Summary of Changes in this Issue

Prepared by:	**Recommended by:**	**Endorsed by:**	**Approved by:**
(BSI/)	**(SBSI/)**	**(BSE/)**	**(SBSE/)**
Date:	**Date:**	**Date:**	**Date:**

CONTENTS

Page

ITEM	Extend of Inspection	
	Minimum %	Proposed
4. Builder's Work - Provision and Location	100	
SECURITY SYSTEM INSTALLATION (IP)		
1. Material / Equipment	100	
2. Equipment Racks -Construction	100	
3. Cables and Accessories		
a. Cable	50	
b. Dry Contract Enclosure (Interfacing with the Central Security System)	100	
4. Panels		
a. Visitor Panel / Doorphone Control Unit	100	
b. Local Indicating Panel	100	
WATER PUMP INSTALLATION (IP)		
1. Material / Equipment	100	
2. Mechanical Work		
a. Pumpset and Accessory	50	
b. Pipework and Fitting	30	
c. Valve	50	
d. Fresh Water Booster Pump	50	
e. Hammer Arrestor	100	
3. Electrical Work		
a. Pump Control Panels and Switchgear	100	
b. Motor	50	
c. Alarm Panel Outside Pump Room	50	
d. Surface Steel Conduit	30	
e. Steel Trunking / Cable Tray	30	
f. Level Control Switch	50	
4. Builder's Work - Provision and Location	30	

ITEM	Extend of Inspection	
	Minimum %	Proposed
2. Panels	100	
Security Alarm System Installation (FI) - Cont'd		
3. Equipment installation	100	
4. Cables and Accessories	100	
5. Software Function of Central Station	100	
6. Second Tier Security System - Provision of Equipment	100	
7. Builder's Work - Provision and Location	100	
WATER PUMP INSTALLATION (FI)		
1. Materials / Equipment	50	
2. Label / Notice	50	
3. Painting	50	
4. Provision	100	
5. Mechanical Work		
a. Pumpsets and Accessory	50	
b. Pipework and Fitting	30	
c. Valve	50	
6. Electrical Work		
a. Pump Control Panel and Switchgear	100	
b. Motor	50	
c. Surface Steel Conduit	30	
d. Steel Trunkings / Cable Tray	30	
e. Equipotential Bonding	50	
f. Level Control Switch	50	
7. Builder's Work - Provision and Location	30	

ITEM	Extend of Inspection	
	Minimum %	Proposed
REFUSE HANDLING SYSTEM INSTALLATION (WT)		
1. Compactor / Container Assembly	100	
2. Bin Cleansing Machine(BCM)	100	
3. Electric Battery Operated Truck (EBOT)	100	
4. Volume Control and Storage Device (VCSD) in Domestic Block	100	
5. Refuse Storage Bin(RSB)	100	
6. Others	100	
7. Builder's Work	100	
ROOM COOLER (WINDOW TYPE / SPLIT TYPE) INSTALLATION (WT)		
1. Functional Test		
a. Temperature measurement	100	
b. Starting and Running Current	100	
2. Water Tightness Test		
a. Periphery sealing of room cooler (unit per model)	3 nos.	
SECURITY ALARM SYSTEM INSTALLATION (WT)		
1. Functional Test	100	
SECURITY SYSTEM INSTALLATION (WT)		
1. Functional Test of Doorphone System (except handset in domestic flats)	100	
a. Handset in Domestic Flat	20	
2. Functional Test of Local Closed Circuit Television Monitoring System	100	
3. Functional Test of Central Alarm and Door Monitoring System	100	
4. Functional Test of Central Station in Security Control Room at EMO	100	
5. G/F Meter Room / Equipment Rack	100	
6. Functional Test of Central CCTV System for Entrance and Guard Counter	100	
WATER PUMP INSTALLATION (WT)		
1. Insulation Resistance Test for Motor	100	
2. Earth Fault Loop Impedance Test	100	
3. Continuity Test of Protective Conductor of Exposed Conductive Parts	100	
4. Continuity Test of Protective Conductor of Extraneous Conductive Parts	100	
5. Measurement of Pump / Motor Coupling Alignment	100	
6. Hydraulic Test	100	
7. Control Functional and Sequential Test	100	
8. Other Functional Test	100	
9. Open-up Inspection for Stainless Steel Flush Water Pump	100	
10. Flush Water P.R.V. Fault Indication Panel	100	
11. Measurement of Noise Level	100	