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

Outline of Processes in Pre-contract Stage in the Context of Fresh Water Supply System in Housing Authority's Public Housing Developments

PURPOSE

This paper informs Members about the outline of processes in pre-contract stage in the context of fresh water supply system in the 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 shows the outline of major processes in pre-contract stage.

OUTLINE OF MAJOR PROCESSES IN PRE-CONTRACT STAGE

- 3. During the pre-contract stage, six steps are relevant
 - Step 1 HD's Chief Architect serving the AP role of the public housing project submits Form no. WWO132 Part 1 to Water Supplies Department (WSD) to apply for confirmation / certificate regarding water supply availability and requests advice on water supply pressure head.

- Step 2 HD's project team prepares plumbing drawings and specifications to ensure compliance with statutory requirements.
- Step 3 Upon receipt of WSD's confirmation and reply pursuant to Step 1 above, HD's project team submits two sets of plumbing drawings to WSD for approval.
- Step 4 WSD approves plumbing proposal via memo, with comments, if any. (Disapproval by WSD would mean resubmission by HD's project team until approval is obtained before commencement of plumbing installations on site.)
- Step 5 HD's project team prepares tender drawings and specifications for tendering, covering both building contract and nominated subcontract for fire services and water pump installations.
- Step 6 HD's project team issues tenders for building contract and nominated subcontract for fire services and water pump installations, assess tenders upon tender return, and recommends approval for award of contract by the HA's Tender Committee or HD's Tender Board according to delegated financial authority.

4. Quality assurance of fresh water supply system through design and specifications is outlined as follows –

(a) The HA's fresh water supply system is designed in accordance with the requirements stipulated in the Waterworks Regulations (Cap 102A), WSD's handbooks and guidelines. In order to ensure consistency in compliance with these requirements, HD promulgates in-house design guidelines through (i) the Building Services Technical Guide on water pump and water services installation. and (ii) Technical Guide to Public Housing Developments for water services installation. Furthermore, HD's guidelines incorporate specific good practice features in the design on top of WSD's requirements, such as provision of night duty pump of smaller capacity for noise reduction, pump-set of more energy efficient performance, and twin water tanks at roof level for avoiding disturbance to residents and minimizing water wastage due to regular cleansing of water tanks.

(b) Plumbing design for buildings comprises both up-feed and down-feed system. Schematic fresh water up-feed system (comprising six major components) is illustrated in Annex 1, and Schematic fresh water down-feed system (comprising seven major components) is illustrated in Annex 2. These are installed by Registered Contractor (RC) and his domestic subcontractor, or by the HA's nominated subcontractor (NSC) for fire service and water pump installations as appropriate –

Up-feed :

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- (1) Master water meter room (by RC)
- (2) Underground water supply pipe (by RC)
- (3) Water meter chamber (by RC)
- (4) Fresh water up-feed pump room (be NSC)
- (5) Up-feed water pipe (by RC)
- (6) Twin roof water tanks (by RC)

Down-feed :

- (7) Down-feed water pipe (by RC)
- (8) Fresh water booster pump for top 5 to 6 floors (by NSC)
- (9) Pressure reducing valves on intermittent floors (by RC)
- (10) Water meter cupboards at each floor (by RC)
- (11) Fresh water pipe in corridors (by RC)
- (12) & (13) Plumbing installation in domestic flats (bathroom and kitchen) (by RC)
- (c) To facilitate easy maintenance for the life cycle of the HA's properties, all the HA's plumbing design adopts surface mounted (i.e. exposed) type of water supply pipes and does not allow the use of concealed type, as illustrated in **Annex 3**.
- (d) As regards the use of copper and copper alloy fittings, Clause 17 of Schedule 2 of the Waterworks Regulations (CAP 102A attached as Annex I to Paper No. RC 2/2015) stipulates "Capillary fittings or compression fittings shall comply with BS 864, Part 2...". This British Standard was obsolete, and is superseded by BS EN 1254-1: 1998, which states in its Table 6 that soldering alloys with lead are not permitted in installations for water for human consumption, whereas different extents of lead content are permissible according to the international standards governing the various components of equipment, such as pumps and valves, in the water supply chain.

HD duly incorporates all critical criteria for compliance in the (e) HA's Specification Library. The HA, being a procuring entity governed by the Agreement on Government Procurement of the World Trade Organisation, adopts performance based specifications that must be non-discriminatory. As such, no brand names or origin of materials shall be specified. Specifications for "Plumbing and Sanitary Fittings" (PLU1) and "Sanitary Appliances" (PLU2) 2014 Edition are attached in Annex 4 to Paper No. Specifications for "Water Pump Installation" are RC 3/2015. applicable to NSC for Fire Service and Water Pump Installation to assure quality along the water supply chain (Annex 4 refers).

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- (f) For materials used in the fresh water supply system, they shall fulfil one of the following as required by WSD-
 - (i) Category A Bearing the British Standard Institution Kitemark;
 - (ii) Category B Accepted by the Water Supply (Water Fittings) Regulations, United Kingdom (formerly known as the Water Byelaws);
 - (iii) Category C Accepted by the Water Authority in writing (to quote WSD reference number);
 - (iv) Category D Bearing the Water Authority Stamping.
- (g) The Specification Library is updated as and when necessary, and a major review is conducted at 4-yearly intervals. More frequent review at 2-yearly intervals would be applied if so warranted. The process for promulgation of new or revised specification follows a robust approach, comprising obtaining feedback from relevant stakeholders, updated statutory requirements and industry best practice, review, consultation and assessment, approval and promulgation (Annex 5 refers). The latest edition is promulgated vide Paper No. BC 91/2014; QH 6/2014 being "Promulgation of Housing Authority Specification Library 2014 Edition" (Annex 6 refers).
- (h) The structure of our Specifications generally comprises four aspects, namely, (i) General description, (ii) Materials, (iii) Workmanship, (iv) Testing. Meanwhile, we need to update our specification to require regular inspection of soldering materials at pipe joints of fresh water plumbing systems as well as intensifying spot checks on the same to ensure the material is lead-free.

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INFORMATION

5. This paper is for Members' information.

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		(Development and Construction Division)
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Fresh Water Pipe (Copper) by RC [For 2012 or later versions of specifications, copper pipe for up to 76.1mm, ductile iron for larger pipe size] **By NSC** By RC

By Nominated Sub-contractor

By Registered Contractor





External wall of bathroom and kitchen with surface mounted water supply pipes

Interior view of bathroom

Specification for Water Pump Installation

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	FWP311 GEN	NFR A L	3
	FWP3.1.1.010.5	SUITABILITY FOR PURPOSE	
	FWP3.1.1.020.5	CONFORMITY WITH SPECIFICATION	3
	FWP3.1.1.030.5	PIPE SIZES	3
	FWP3.1.2 PIP	EWORK	3
	FWP3.1.2.010.5	DUCTILE IRON PIPES AND FITTINGS	3
	FWP3.1.2.020.5	GALVANIZED STEEL PIPES AND FITTINGS	3
	FWP3.1.2.040.5	CARBON STEEL PIPES AND FITTINGS	3
	FWP3.1.2.050.5	PIPEWORK APPLICATION	3
	FWP3.1.3 PIP	E FITTINGS	4
	FWP3.1.3.010.5	STANDARD PIPE FITTINGS	4
	FWP3.1.3.020.5 FWP3.1.3.030.5	LOCALLY MANUFACTURED PIPE FITTINGS	4 /
	FWP3 1 3 040 5	TFFS	4 4
	FWP3.1.3.050.5	FLANGES	4
	FWP3.1.3.060.5	REDUCERS	4
	FWP3.1.3.070.5	PIPE BRACKETS	5
	FWP3.1.3.080.5	PROVISION OF SLEEVES	5
	FWP3.1.4 EXH	PANSION JOINTS AND FLEXIBLE CONNECTORS	5
	FWP3.1.4.010.5	STAINLESS STEEL TYPE EXPANSION JOINTS	5
	FWP3.1.4.020.5	RUBBER FLEXIBLE CONNECTORS	5
	FWP3.1.4.030.5	STAINLESS STEEL FLEXIBLE CONNECTORS	6
	FWP3.1.5 STR	AINERS	7
	FWP3.1.5.010.5	TYPE AND APERTURE	7
	FWP3.1.5.020.5	SIZE AND PERFORMANCE	/ 7
	FWP3 1 5 040 5	END CONNECTIONS	
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FWP3.1 MATERIALS

FWP3.1.1 GENERAL

FWP3.1.1.010.5 SUITABILITY FOR PURPOSE

All pipes and fittings shall be constructed of materials suitable for the required working and test pressures and temperatures of the fluid carried.

FWP3.1.1.020.5 CONFORMITY WITH SPECIFICATION

All pipes and fittings shall conform to the Specification. Alternative materials may be used only with prior Approval.

FWP3.1.1.030.5 PIPE SIZES

Pipe sizes indicated on the Drawings or in this Specification are nominal bores, with the exception of copper tube, for which the sizes indicated are nominal outside diameters.

FWP3.1.2 PIPEWORK

FWP3.1.2.010.5DUCTILE IRON PIPES AND FITTINGS

- 1. To BS 4772: 1988 or BS EN 545: 1995 thickness class K12;
- 2. Be cold bitumen coated externally and lined with cement mortar;
- 3. Be capable of withstanding the concerned working pressure and maximum static pressure that may arise upon failure of the associated pressure reducing devices;
- 4. Be approved by the office of the Water Supplies Department for the intended application. Produce type test certificate / report from an independent and reputable laboratory for the verification of compliance with this Specification upon request.

FWP3.1.2.020.5 GALVANIZED STEEL PIPES AND FITTINGS

- 1. Galvanised steel pipes to BS 1387: 1985(1990) of medium grade for aboveground installation and of heavy grade for below ground installation unless otherwise Specified or shown on the Drawings.
- 2. Galvanised malleable cast iron pipe fittings to BS 143 and 1256: 1986.
- 3. Galvanised wrought steel pipe fittings (screwed BS 21R series thread) to BS 1740: Part 1: 1971(1990).

FWP3.1.2.040.5 CARBON STEEL PIPES AND FITTINGS

- 1. Carbon steel pipes of ERW 320 to BS 3601: 1987(1993) for operation in high pressure from 1600 kPa to 2000 kPa with dimensions to BS 3600: 1976(1988).
- 2. Correlated fittings shall be butt welding type carbon steel for pressure purposes to BS 1965: Part 1: 1963(1983).

FWP3.1.2.050.5 PIPEWORK APPLICATION

Installations shall be carried out using the specifications indicated below unless otherwise specified elsewhere or shown on the Drawings:

	Application	Sizes	Material
1.	Fresh water pipe	≤ 65mm	Stainless steel pipe of grade 316 to BS 3605
		>65mm	Ductile iron pipe as FWP3.1.2.010
2.	Fire services pipe	≤ 150mm	Galvanized Steel pipe as FWP3.1.2.020
		>150mm	Ductile iron pipe as FWP3.1.2.010
3.	Flush water pipe	>65mm	Ductile iron pipe as FWP3.1.2.010
4.	Bore well water pipe	All	Medium grade steel pipe as FWP3.1.2.020
5.	High pressure pipes when specified	All	Carbon steel pipe as FWP3.1.2.040

FWP3.1.3 PIPE FITTINGS

FWP3.1.3.010.5 STANDARD PIPE FITTINGS

- 1. Unless otherwise specified or Approved, only standard fittings and pipe fittings in compliance with BS 143 and BS 1256:1986, BS 3605 and BS 4772:1988 as appropriate shall be used;
- 2. Pipe fittings shall be of the same size as the pipework connected to them;
- 3. Pipe fittings fabricated on site, reducing bush and locally manufactured pipe fittings will not be accepted.

FWP3.1.3.020.5 LOCALLY MANUFACTURED PIPE FITTINGS

- 1. Where restricted site condition does not permit the use of standard pipe fittings, purpose made local fittings may be used only with prior Approval.
- 2. Local fittings shall be internally and externally painted with two coats of anticorrosion materials and pressure tested as directed by the Contract Manager, prior to installation.

FWP3.1.3.030.5 BENDS

All bends shall be of long radius type unless otherwise Approved.

FWP3.1.3.040.5 TEES

All tees shall be of the pitcher or twin elbow type, unless otherwise indicated or Approved.

FWP3.1.3.050.5 FLANGES

All flanges shall conform to BS 4504: Part 3: 1989 and shall be of suitable pressure rating.

FWP3.1.3.060.5 REDUCERS

- 1. Pipe size changes shall be effected by reducers of appropriate length to minimize pressure loss or otherwise by reducing bends or tees.
- 2. In the case of suction lift, eccentric reducers shall be used at pump suction for air elimination.

FWP3.1.3.070.5 PIPE BRACKETS

- 1. Pipe brackets shall be of sufficient strength to take the load with no noticeable deflection with clips detachable without disturbing the fixing.
- 2. Samples or details of the pipe brackets shall be submitted for Approval prior to installation.

FWP3.1.3.080.5 PROVISION OF SLEEVES

All sleeves for openings in walls within a fire compartment shall be PVC. All sleeves for openings in walls and slab connecting the fire compartment with other fire compartments/public area shall be galvanized mild steel.

FWP3.1.4 EXPANSION JOINTS AND FLEXIBLE CONNECTORS

FWP3.1.4.010.5 STAINLESS STEEL TYPE EXPANSION JOINTS

Expansion joints shall be provided for all fresh and fire services pipework passing through any building expansion joint and where necessary as specified. They shall:

- 1. Be of axial pattern bellows type and able to withstand horizontal and vertical movement;
- 2. Have screwed or flanged ends as appropriate to facilitate replacement;
- 3. Incorporate internal liners if required;
- 4. Be manufactured from stainless steel of AISI type no. 304 or other Approved material appropriate to the system;
- 5. Be designed to withstand the test pressure of the system;
- 6. Be fitted with external protective sleeves only when the units are open to the environment and exposed to risk of damage;
- 7. Be securely held by guides on both sides with guide rod plates, guide rods, resilient neoprene sleeves, resilient neoprene washers and steel washers;
- 8. Submissions:
 - a. Type hydraulic test certificate/report from independent and reputable laboratories shall be produced upon request;
 - b. The installation length, material, rated movement (axial extension, axial compression, lateral deflection, angular rotation, or any combination thereof) and pressure ratings of the expansion joint shall be submitted for Approval upon request.

FWP3.1.4.020.5 RUBBER FLEXIBLE CONNECTORS

- 1. Rubber flexible connectors for flush and fire services water pipework shall:
 - a. Be of double or multiple arch/sphere type;
 - b. Have a working pressure of not less than 1,379kPa at 70℃, a minimum test pressure of 2,500kPa and a minimum burst pressure of 5,500kPa;
 - c. Be non-toxic, corrosion and abrasion resistant and of sufficient length for effective isolation of vibration and noise;
 - Be fitted with corrosion resistant steel or ductile iron floating flanges to BS 4504: Part 3 : 1989 PN16;

- e. Include a flexible tube made of multiple layers of high tensile fabric reinforcement with EPDM, neoprene or synthetic rubber cover and liner. Tube end shall be of locked bead construction with steel wire bead ring and raised face;
- f. Be equipped with control rod/cable assembly to prevent damage from excessive movement. The assembly shall consist of control rod/cable plates, control rods/cables, resilient neoprene sleeves, resilient neoprene washers and steel washers to prevent metal-to-metal contact between the rod/cable and the connector flange.
- 2. Submissions:
 - a. Type hydraulic test certificate/report from independent and reputable laboratories shall be produced upon request;
 - b. The installation length, material, rated movement (axial extension, axial compression, lateral deflection, angular rotation, or any combination thereof) and pressure ratings of the flexible connector shall be submitted for Approval upon request;
- 3. Rubber flexible connectors, when used in fresh water pump system, shall be certified by the Water Research Centre (WRc) of UK for use in such systems or certified by testing agents approved by Water Supplies Department for compliance with the requirements of the Waterworks Regulations. Documentary evidence shall be produced upon request to prove that this requirement has been met.

FWP3.1.4.030.5 STAINLESS STEEL FLEXIBLE CONNECTORS

- 1. Stainless steel flexible connector/pipeline vibration eliminator for fresh water pipework shall:
 - a. Be of omega-shape, close pitch annular corrugation, and fabricated from stainless steel plates/sheets/strips;
 - b. Have the working pressure compatible with the piping system with which they are connected. Unless otherwise specified, the working pressure shall not be less than 1,379kPa, a minimum test pressure of 150% of the working pressure and a minimum burst pressure of 4,000kPa;
 - c. Include a bellow which shall be non-toxic, corrosion and abrasion resistant and complete with braiding; should the convolution of the bellow not be gradually formed by continuous rolling in shape, appropriate heat treatment should be conducted to release the internal stress imposed on the bellow during the forming process;
 - d. Be of sufficient length for absorption of offset motion and effective isolation of vibration. Unless otherwise specified, the minimum rated lateral movement shall be as tabulated below:

Nominal size of braided bellow	Minimum rated lateral movement
Up to 100mm N.B.	4mm offset motion plus +1mm vibration
Above 100mm N.B.	6mm offset motion plus +1mm vibration

The total stress on bellow due to internal pressure, offset motion and vibration shall not exceed the design endurance limit.

- e. Comprise, unless otherwise specified, the following component material with inert gas arc welding to be used for the termination of bellow and braiding at the tube ends:
 - i. Bellow: austenitic chromium nickel or austenitic chromium nickel molybdenum stainless steel sheet to BS 1449 : Part 2 : 1983;

- ii. Braiding: stainless steel wires or plates;
- iii. Flange: corrosion resistant carbon steel.
- f. Have any part which is in contact with the water of the same material as the bellow;
- g. Unless otherwise specified, be of flanged end connection. Flanges shall comply with BS 4504: Part 3: 1989 PN16;
- h. Have identification markings for the brand name, model number, bellow material, braiding material, working pressure and bellow nominal diameter;
- i. Be equipped with control rod/cable assembly to prevent damage from excessive movement. The assembly shall consist of control rod/cable plates, control rods/cables, resilient neoprene sleeves, resilient neoprene washers and steel washers to prevent metal-to-metal contact between the rod/cable and the connector flange.
- 2. Submissions:
 - a. Type hydraulic test reports of the connector/eliminator from independent and reputable laboratories shall be produced to the Contract Manager upon request;
 - b. Rated movement, pressure rating, bellow length, and materials of the connector/eliminator shall be submitted for Approval prior to installation.

FWP3.1.5 STRAINERS

FWP3.1.5.010.5 TYPE AND APERTURE

Strainer shall be of Y-type unless otherwise specified. The minimum free flow area ratio shall be 2 and the maximum aperture size shall be of \emptyset 1.5 mm for strainers of nominal size 100 mm or below and of \emptyset 3.0 mm for strainers of nominal size 150 mm or above, unless otherwise specified.

FWP3.1.5.020.5 SIZE AND PERFORMANCE

Strainers shall have the same nominal sizes as the pipes in which they are connected and shall be suitable for both working and test pressures of the piping system in which they are installed. Unless otherwise specified all strainers shall have a working pressure of not less than 1370 kN/m² and testing pressure of not less than 2400 kN/m².

FWP3.1.5.030.5 CONSTRUCTION

Strainers shall be constructed of materials suitable for the required working and test pressures and temperature of the fluid carried. The material specified below indicate only the minimum standard required. Better or equivalent materials may be offered for Approval.

- 1. For nominal sizes 65mm and below (fresh water/fire services use):
 - a. Body and cover: bronze to BS 1400: 1985 LG2 or EN 1982 CuSn5Zn5Pb5;
 - b. Screen: austenitic chromium nickel stainless steel or austenitic chromium nickel molybdenum stainless steel, to BS 970 Grade 304 or 316 or BS EN10088-1 1.4301 or 1.4401.
- 2. For nominal sizes above 65mm (fresh water/fire services use) and all sizes (flush water use):
 - a. Body and cover: grey cast iron to BS 1452 grade 220 or BS EN 1561 EN-GJL-250, or spheroidal graphite cast iron to BS EN 1563 EN-GJS-400-15;

- b. Screen: austenitic chromium nickel stainless steel or austenitic chromium nickel molybdenum stainless steel, to BS 970 Grade 304 or 316 or BS EN10088-1 1.4301 or 1.4401;
- c. Drain Plug: malleable iron or copper alloy;
- d. Cast iron components shall be coated with an epoxy based material both on internal and external surfaces. The coating for use in fresh potable water shall comply with the requirement laid down in BS 6920 and be to the satisfaction of the Office of Water Authority.

FWP3.1.5.040.5 END CONNECTIONS

All bronze type strainers shall be of the screwed female end connection to BS 21 and all cast iron type strainers shall be of flanged end connection to BS 4504 or to BS EN 1092-2 PN16.

FWP3.1.5.050.5 CERTIFICATION

Type test certificates/report from independent and reputable laboratories confirming that the strainers have been tested conforming to this Specification shall be produced upon request.

FWP3.2 INSTALLATION

FWP3.2.1 SITE HANDLING

FWP3.2.1.010.5 STORAGE

Prior to installation, all materials shall be stored properly in accordance with the manufacturer's instructions to afford maximum protection against weather, corrosion, mechanical damage and other causes. All pipes shall be stored with closed ends. All damaged materials shall be removed from site immediately.

FWP3.2.1.020.5 CLEANLINESS

All pipes and fittings shall be cleaned before erection with all scale, burrs, furs, sand, slag etc. removed. Cleanliness shall be maintained throughout erection by covering the exposed ends of pipework with a metal or plastic cap.

FWP3.2.2 PIPEWORK LAYOUT

FWP3.2.2.010.5 CO-ORDINATION OF PIPEWORK

The Drawings are diagrammatic and indicate only the approximate location and manner in which the pipework is to be installed. The Sub-contractor shall allow for any diversion to avoid structural beams and other services etc., ascertain the actual work involved and co-ordinate his pipework installation with the work of other trades and services.

FWP3.2.2.020.5 ROUTING AND GRADING OF PIPEWORK

Pipework shall, where applicable, follow the lines of walls and be graded to ensure venting and draining. A minimum clearance of 25 mm shall be maintained between the pipework and the finished mounting surface.

FWP3.2.2.030.5 ARRANGEMENT OF PIPEWORK

All pipework shall, be neatly arranged and mounted. For a number of pipes running close to one another, they shall be grouped and mounted on steel framed racks arranged so that the number of cross-over is minimum. All vertical pipes shall be plumbed.

FWP3.2.2.040.5 VENTING

Air vents of automatic type must be provided at all high points wherever required.

FWP3.2.2.050.5 DRAINING

- 1. All water pipework, except those for fire services, shall be fitted with 13 mm diameter key operated cocks, with hose unions, at low points in the system to facilitate drain down.
- 2. A 25 mm diameter drain cock with hose bib shall be provided between the check valve and the gate valve at the pump discharge to facilitate draining of the riser pipe.

FWP3.2.2.060.5 PROVISION FOR DISMANTLING

- 1. Sufficient joints and fittings shall be provided to facilitate easy removal of pipes, valves, pumps, etc., for inspection and repair. Disconnecting flanges, or screwed unions as applicable, shall be provided at suitable locations and at valves, pumps, etc.
- 2. Pipes shall not be embedded in the concrete structure, or grouted in or otherwise installed in such a way as to make alterations difficult at a later date.

FWP3.2.2.070.5 LOCATION OF STRAINERS

Install strainers in positions shown on the Drawings.

FWP3.2.3 PIPEWORK JOINTING

FWP3.2.3.010.5 MANUFACTURERS INSTRUCTIONS

Installation, jointing, storage and handling of the pipes and fittings shall be in accordance with the manufacturer's recommendations.

FWP3.2.3.020.5 LOCATION OF PIPE JOINTS

Pipe joints shall not be made in the thickness of any wall, floor, ceiling or beam.

FWP3.2.3.030.5 JOINTING GALVANIZED STEEL PIPES

- 1. Unless otherwise Approved galvanized steel pipes of sizes up to and including 100 mm shall be jointed with screwed fittings. Screwed flanges shall be employed only for connection to flanged end valves or equipment.
- 2. Unless otherwise Approved, galvanized steel pipes of size of 150 mm upwards shall be jointed with screwed flanges or flanged fittings.
- 3. Jointing of steel pipes by welding shall only be used when Approved.
- 4. Screwed fittings shall have pipe threads complying with BS 21: 1985. Screwed joints shall have tapered threads and shall be made with Approved jointing material. Where the cutting of threads removes the galvanising, an anti-corrosive sealing compound shall be applied to restore the integrity of the protective finish.
- 5. Where pipes are supplied with internal UPVC lining cutting shall be done by band saw. Use of high speed grinding wheels and pipe cutters that generate high heat shall not be allowed.

FWP3.2.3.040.5 JOINTING DUCTILE IRON PIPES

Unless otherwise specified, all ductile iron pipes shall be jointed:

- 1. For above ground installation: with screwed flanges or flanged fittings, stainless steel bolts and nuts of grade 316 for fresh and flush water pipes and fittings inside water pump room;
- 2. For below ground installation: with flexible push-on type connection joints.

FWP3.2.3.050.5MECHANICAL COUPLINGS AND FITTING FOR FIRE SERVICES
SYSTEM

1. As an alternative to flanged and screwed joints, grooved end mechanical couplings may be employed subject to the approvals of the Contract Manager;

- 2. Mechanical couplings shall be self-centering, engaged and locked in place onto the grooved or shouldered pipe and pipe fitting ends. The result shall be in a positive watertight couple providing some allowance for angular pipe deflection, contraction and expansion. Coupling housing clamps shall consist of two or more malleable iron castings or rolled steel or ductile iron segment holdings with a composition water sealing gasket so designed that the internal water pressure increases in the water tightness of the seal. Sealing gasket shall be selected for the service and working temperature according to the manufacturer's recommendations. The coupling assembly shall be securely held together by two or more trackhead square or oval-neck heat-treated carbon steel bolts and nuts. All pipe fittings connected to mechanical pipe couplings shall have groove and shouldered ends. Flanged or threaded end valves may be used with grooved adapters;
- 3. Regarding material specification, specifications on components of mechanical couplings shall be as follows:
 - a. For coupling housing material:
 - i. Ductile iron shall be to ASTM A536 or to BS 4772;
 - ii. Malleable iron shall be to ASTM A47 or to BS 6681;
 - iii. Rolled steel shall be to BS 2994.
 - b. Rubber gaskets shall be tested to the following ASTM specifications:

i.	Hardness:	D2240;
ii.	Tensile testing:	D412;
iii.	Compression:	D395;
iv.	Heat aging:	D573.

- 4. Before couplings are assembled, pipe ends and outsides of gaskets shall be lightly coated with grease or graphite paste to facilitate installation;
- 5. Pipe grooving shall be carried out by using proprietary grooving machine and in accordance with the pipe coupling manufacturer's latest specifications. The grooving shall be roll-grooved without the removal of any metal. Zinc coating damaged during the grooving operation of galvanized steel pipe shall be rectified by scrubbing clean the affected area and coated with a zinc rich galvanizing paint approved by the Contract Manager;
- 6. Unless otherwise specified, all mechanical couplings and fittings shall have a minimum working pressure of not less than 1600kPa and the testing pressure shall not be less than 1.5 times the working pressure;
- 7. The mechanical couplings and fittings shall be approved by FSD for use in Hong Kong and by LPC;
- 8. The entire coupling installation shall be in accordance with the latest published selected manufacturers recommendation.

FWP3.2.4 PIPEWORK SUPPORTS

FWP3.2.4.010.5 FIRE SERVICES INSTALLATION

- 1. Pipe bracket for fire services installation shall be of fixed type.
- 2. Neoprene or rubber vibration isolation pad of 6mm thick shall be added between pipe and bracket for installation inside fire services pump room.

FWP3.2.4.020.5 WATER PUMP INSTALLATION

- 1. Pipe bracket for water feed pump/booster pump/pressure reducing valve installation inside water pump room and pressure reducing valve chamber shall be completed with vibration isolator in accordance with FWP3.2.4.060. Where it is impractical to provide vibration isolator in accordance with FWP3.2.4.060, 6mm thick neoprene or rubber isolation pad between pipework and bracket or other means of vibration isolation shall be provided subject to approval by the Contract Manager.
- 2. Fixed type pipe bracket shall be installed at anchor points of the pipework system to avoid pipe movement in critical areas such as at pump suction connecting to puddle flange of water tank, non-return valve at pump discharge side, etc. Means of vibration isolation such as neoprene/rubber pad between pipework and bracket has still to be provided.
- 3. The sub-contractor shall be responsible to select fixed type pipe brackets or brackets with vibration isolator, as appropriate, for the whole pipework system and fully in accordance with the pipe bracket manufacturer's recommendations to ensure that the vibration and noise generated from the pipework system would be isolated, in particular, to avoid causing nuisance to the tenants of the domestic flats.

FWP3.2.4.030.5 PERFORMANCE

All pipework shall be well supported so that it is free from excessive stress due to weight of its contents, its own dead weight, and dynamic forces due to liquid movement. Particular care should be taken with branches from vertical risers to ensure that the branch is not supporting the riser.

FWP3.2.4.040.5 PROVISION FOR MOVEMENT

Pipework shall be supported in such a manner as to allow adequate movement for expansion and contraction.

FWP3.2.4.050.5 FIXED TYPE BRACKET

For fixed type pipe bracket, it shall be in accordance with the following:

- 1. Pipework support brackets shall be arranged as close as possible to joints and changes of direction, with each bracket taking its share of the load;
- 2. Unless otherwise specified or approved by Contract Manager, pipe bracket shall be in accordance with BS 3974 wherever applicable. Pipe clip shall be made in halves and secured together by stainless steel bolts. Components of the pipe bracket shall be not less than 3 mm thick. Material of the pipe bracket shall be not less than those as specified below:
 - a. For those supporting FH/HR pipework system:
 - i. The whole pipe bracket including pipe clip and hanger shall be of stainless steel to BS 970.
 - b. For those supporting Sprinkler pipework system:
 - i. The pipe clip shall be of stainless steel to BS 970 whereas hanger shall be of mild steel galvanised.
 - c. For those supporting pipework inside water pump room and FS pump room:
 - i. The whole pipe bracket including pipe clip and hanger shall be of stainless steel to BS 970. I-beam and U-channel for further supporting pipe brackets shall be of steel with anti-corrosive painting.

(N.B. Pipe clip is the two halves components which are in direct contact with the pipework. Pipe hanger is those components connecting the pipe clip for fixing onto the mounting structure/supports.)

- 3. Pipe brackets shall be of sufficient strength to take the load with no noticeable deflection. Samples or details of the pipe brackets shall be submitted for approval prior to installation. Brackets fixing to structure shall be by at least two expanding plugs of adequate size;
- 4. Supports shall be spaced at intervals as specified on FWP3.2.4.070;
- 5. For pipe brackets of horizontal non-sprinkler medium grade galvanized steel pipework with upper and lower omega clip design, the minimum bolt size for the clips and the minimum anchor diameter for fixing the pipe hanger to the mounting structure/support at two or more points shall be as follows:

Nominal Pipe Size (mm)	Minimum Bolt Size for Pipe Clips (mm)	Minimum Anchor Diameter, Double Fixing (mm)
25 - 50	6	6
65 – 100	10	10
125 - 150	12	12

6. For pipe bracket and support interval designs other than those specified above, substantiation/calculation to demonstrate that the proposed bolt/anchor has sufficient strength to take up the load shall be submitted by the Sub-contractor for approval by the Contract Manager.

FWP3.2.4.060.5 PIPE BRACKET WITH VIBRATION ISOLATOR

- 1. Vibration isolator
 - a. Vibration isolator shall contain a steel spring with minimum 8mm pad of neoprene in series and enclosed in hanger box. The neoprene element shall be moulded with a rod isolation bushing that passes through the isolator hanger box. Spring diameter and isolator hanger box lower hole sizes shall be large enough to permit the hanger rod to swing through a 30 degree arc before contacting the edge of the hole and short circuiting the spring. The minimum static deflection of the spring shall be 20mm.
 - b. Unless otherwise Approved, vibration isolator shall be selected fully in accordance with manufacturer's guidelines and taken into account weight distribution of the pipework system, pipe anchor points, guide etc. to produce uniform deflections and to ensure that the vibration and noise generated from associated pipework system would be isolated and would not be transmitted to other parts of the building, in particular, to avoid causing nuisance to the tenants of the domestic flats.
 - c. The contractor shall be responsible for and submit calculation to verify the correctness of selection and overall suitability of every vibration isolator for the pipework system.
- 2. Pipe bracket

Details of the pipe clip and hanger shall be in accordance with those specified in FWP3.2.4.050 wherever applicable.

3. Connection between vibration isolator and pipe bracket

Unless Approved by the Contract Manager, pipe bracket shall be secured firmly to the vibration isolator in accordance with the manufacturer's guidelines of the vibration isolator.

FWP3.2.4.070.5 SUPPORT INTERVALS

- 1. Supports shall be spaced at intervals not exceeding those shown in the following tables for straight runs, as defined in Table 2 of BS 8000:Part 15:1990, with additional supports for bends and tees:
 - a. Ductile iron pipes:

Nominal pipe size (mm)	Spacing for horizontal runs	Spacing for vertical runs
75	2.7m	2.7m
100	2.7m	2.7m
150 & above	3.6m	3.6m

b. Galvanized steel pipes:

Nominal pipe size (mm)	Spacing for horizontal runs	Spacing for vertical runs
15	1.8m	2.4m
20 & 25	2.4m	3.0m
32	2.7m	3.0m
40 & 50	3.0m	3.6m
65 & 80	3.6m	4.5m
100	3.9m	4.5m
125	4.5m	5.0m
150	4.5m	5.0m

2. Supports on ground for pipework inside water pump room for fresh and flush water service shall be of stainless steel of grade 316.

FWP3.2.4.080.5 HANGERS FOR HORIZONTAL PIPEWORK

Unless otherwise specified, hangers for horizontal pipework at high level shall be supported from angle or channel irons, provided by the Sub-contractor, suitable for building-in or otherwise secured to the structure.

FWP3.2.5 INTEGRATION WITH STRUCTURE

FWP3.2.5.010.5 MARKING OUT

The Sub-contractor shall be responsible for marking the exact location of all holes/slots which will be cut by the Main Contractor where required and permitted.

FWP3.2.5.020.5 CLEARANCE OF HOLES

The holes, sleeves and slots reserved through walls/slabs/beams will be cleared and cleaned by the Main Contractor before handover to the Sub-contractor for use. The nails appertaining to concealed electrical boxes shall be cleared by the Sub-contractor subsequent to work completion and prior to execution of final painting work by the Main Contractor.

FWP3.2.5.030.5 FIXING PIPE SLEEVES

Where pipes pass through walls, beams, floors and ceiling, sleeves shall be provided. The Sub-contractor shall ascertain whether slots/holes are to be grouted later and shall fix galvanized steel/PVC sleeves with 2 to 12 mm clearance to allow for expansion and movement of pipe, as FWP3.1.3.080, immediately after pipe erection as follows:

- 1. Through walls and beams: fix sleeves flush with the finished surfaces;
- 2. Through floor slabs: fix sleeves in position with 100 mm projection above finished floor level and flush with the underside of the floor.

FWP3.2.5.040.5 CAULKING PIPE SLEEVES

Galvanised steel sleeves used in walls and slabs between fire compartments shall have the full length of annular space between the sleeve and the pipe filled with non-flammable mineral wool or Approved equivalent materials, pointed with Approved fire-rated sealant to maintain the required FRP of the walls / floor slabs, and are durable and effective in sound insulation.

FWP3.2.5.050.5 PIPE ENTRY TO BUILDINGS

Pipe entries into buildings shall be sealed and plugged with mastic compound after installation of pipework to prevent the ingress or egress of water or vermin.

FWP3.2.5.060.5 PROTECTION OF UNDERGROUND PIPES

- 1. Underground pipes shall be protected against corrosion and against mechanical damage.
- 2. Pipework shall be cleaned after jointing and treated with two coats of good quality bituminous paint and wrapped with petrolatum tape for protection against corrosion due to water, salts, soil organics, etc. before laying, and rested on sand or sieved soil before the trench is backfilled.
- 3. All underground pipework shall be pressure tested before the application of bituminous paint and the application of the petrolatum tape.

FWP3.2.5.070.5 PIPES PASSING THROUGH ASPHALT COVERED FLAT ROOFS

Where pipes pass through flat roofs covered with asphalt, the Sub-contractor shall, unless otherwise specified:

- 1. Cast or build in cast iron or galvanized mild steel sleeve, of internal diameter 20mm (minimum) larger than the external diameter of the pipe concerned, projecting minimum 150mm above roof finish.
- 2. Caulk space and fill both ends with fire-rated mastic sealant.
- 3. Cover tops of sleeves with lead collars or pre-fabricated 304 stainless steel collars of 1.5mm thick to fit the pipe size and sleeve.

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FWP4.1 VALVES - GENERAL

FWP4.1.010.5 PERFORMANCE

All valves shall be designed and constructed of materials suitable for both the working and test pressures of the piping system in which they are installed and the temperature of the fluid carried. Unless otherwise specified, all valves shall have a working pressure of not less than 16 bar.

FWP4.1.020.5 STANDARD

Valves shall comply with the following standards:

Standard	Type of Valve
BS 5163:1986(1991) or	Cast iron gate valves
BS5163-1: 2004 in conjunction with BS EN 1074-1 and -2	
BS 5152: 1974 (1991) or	Cast iron globe valves
BS EN 13789	
BS 5153: 1974 (1991) or	Cast iron check valves
BS EN 12334	
BS 5154: 1991	Bronze gate, globe and check valves

FWP4.1.030.5 TESTING

All valves shall be pressure tested in accordance with the relevant British Standards / European Standards or equivalent international / national standards by the valve manufacturer before leaving the factory. Valves of the same type shall be from the same manufacturer.

FWP4.1.040.5 CERTIFICATION

- 1. Be of the type approved by the Office of the Water Authority as required by the statute;
- 2. Type test Certificate/Report from independent and reputable laboratories confirming that the valves have been tested conforming to this Specification shall be produced;
- 3. The following type test Certificates/Reports shall be provided upon request of the Contract Manager, wherever appropriate:
 - a. Test certificates for valves in compliance with the Standards quoted in FWP4.1.020;
 - b. Test certificates on composition analysis, chemical, physical and mechanical properties of the metallic materials for valves;
 - c. Test certificates for resilient seating material and epoxy coating showing compliance with the physical property and thickness requirements of this Specification;
 - d. In case of valves in potable water application, test certificates for nonmetallic materials including resilient seating material and epoxy coating, showing compliance with the full tests of effect on water quality to BS 6920 and suitable for potable water usage issued by Water Research Centre of UK or an equivalent organisation.

FWP4.1.050.5 SIZE

All valves (except those for flow or pressure control such as modulating float valve and pressure reducing valve) shall have the same nominal size as the pipe in which they are installed unless otherwise specified.

FWP4.1.060.5 ROTATION

Manually operated valves shall be closed by turning the handwheel in a clockwise direction when facing the handwheel. All valves of cast iron body construction shall be provided with an indicator to show the open and shut position.

FWP4.1.070.5 LOCATION

All valves shall be located at convenient positions of operation from the floor.

FWP4.1.080.5 CONSTRUCTION

Valves shall be constructed to the following minimum specification; better or equivalent materials may be offered for Approval:

- 1. Specification A:
 - a. For nominal sizes up to and including 65 mm:
 - i. Body, bonnet and disc

Bronze to BS 1400 LG2 or BS EN 1982 CuSn5Zn5Pb5;

ii. Stem

Brass to high tensile brass or leaded brass to BS 2874 or BS EN 12163.

- b. For nominal sizes above 65 mm:
 - i. Body and bonnet

Grey cast iron to BS 1452 grade 220 or BS EN 1561 EN-GJL-250, or spheroidal graphite cast iron to BS EN 1563 EN-GJS-400-15;

- ii. Disc and Seat
 - Solid or trimmed with bronze to BS 1400 LG2 or BS EN 1982 CuSn5Zn5Pb5, or
 - Resilient material to BS EN 681-1:1996, Type WA, Hardness Category "70" with nominal thickness of minimum 1.5mm on the non-seating areas and 4.0mm on the seating areas, and in case for potable water application, showing compliance with full tests of effect on water quality to BS6920.
- iii. Stem

Brass to high tensile brass or leaded brass to BS 2874 or BS EN 12163, or stainless steel to BS 970 grade 304, 316, 410, 416, 420 or 431, or BS EN 10088-3 Number 1.4301, 1.4401, 1.4006, 1.4005, 1.4021 or 1.4057.

- 2. Specification B:
 - a. For nominal sizes 65mm or above:
 - i. Body and bonnet

Grey cast iron to BS 1452 grade 220 or BS EN 1561 EN-GJL-250, or spheroidal graphite cast iron to BS EN 1563 EN-GJS-400-15;

- ii. Disc and Seat
 - Solid or trimmed with zinc free bronze to BS 1400 or BS EN 1982 CuSn10 or trimmed with austenitic chromium nickel stainless steel or austenitic chromium nickel molybdenum stainless steel to BS 3100 grade 304 or 316, or

- Resilient material to BS EN 681-1:1996, Type WA, Hardness Category "70" with nominal thickness of minimum 1.5mm on the non-seating areas and 4.0mm on the seating areas.
- iii. Stem

Stainless steel to BS 970 grade 304, 316 or 431S29, or BS EN 10088-3 Number 1.4301 or 1.4401 or 1.4057.

FWP4.1.090.5 APPLICATION

	Purpose	Clause reference
1.	a. Fresh water (including potable water)	
	b. Fire services	
	c. Waste water	FWP4.1.080 Specification A
	d. Storm water	
	e. Bore well water - non-corrosive	
2.	a. Flush water	
	b. Sewage	FWP4.1.080 Specification B
	c. Bore well water - corrosive	

FWP4.1.100.5

COATING FOR CAST IRON PARTS OF VALVES

1. Cast iron parts of all valves shall be coated with an epoxy based material both on internal and external surfaces. The following minimum thickness of epoxy coating shall apply:

	Electrostatically Fusion Powder Coated (µm)	Airless Sprayed Application (µm)
Flat and Pressurised Parts	250	400
Convex Outer Edges	150	300

2. The coating for use in fresh potable water shall comply with the requirement laid down in BS 6920 and be to the satisfaction of the Office of Water Authority.

FWP4.2 GATE AND GLOBE VALVES

FWP4.2.010.5 TYPE

- 1. Gate valves shall be of the full way solid or split wedge disc type and globe valves shall be of the straight globe type.
- 2. Gate and globe valves shall be handwheel operated with rising or non-rising stem.

FWP4.2.020.5DESIGN AND CONSTRUCTION

- 1. The valve body shall be robust and capable of withstanding hard wear.
- 2. For valves of bronze body construction, the bonnet shall be of the screwed type with ample threads to ensure positive sealing to the body.
- 3. For valves of cast iron body construction, the body and bonnet shall be bolted together and the disc shall be guided.
- 4. The gland shall be fitted with non-asbestos packing and shall be bolted for valves of cast iron body construction.

FWP4.2.030.5 END CONNECTIONS

- 1. All bronze valves shall be of the screwed female end connection and all cast iron valves shall be of the flanged end connections.
- 2. Threads in screwed end connection shall comply with BS 21: 1985 and flanges of flanged end connection shall comply with BS 4504 or EN 1092-2.

FWP4.3 BUTTERFLY VALVES

FWP4.3.010.5 TYPE

Butterfly valves shall be of the wafer type with resilient seat suitable for tight shutoff purpose.

FWP4.3.020.5DESIGN AND CONSTRUCTION

- 1. Disc shall be concentric, rounded and hand-polished.
- 2. Shaft shall be one-piece throughout and valve seat shall be replaceable.
- 3. Unless otherwise specified, valves shall be operated by handwheel or wrench.

FWP4.3.030.5 END CONNECTIONS

The wafer body ends shall be capable of matching connecting flanges complying with the requirements of BS 4504: HS.

FWP4.4 NON-RETURN VALVES

FWP4.4.010.5 TYPE

- 1. Unless otherwise specified, non-return valves shall be of the hinged swing or the recoil type, suitable for both vertical and horizontal installations.
- 2. When the valve is installed vertically, the flow shall be in an upward direction.
- 3. When installed at the pump discharge with a water head exceeding 15 m, nonreturn valves shall be of the recoil or spring type to ensure silent shut-off operation.
- 4. Notwithstanding the requirements of clause FWP4.1.080, recoil or spring type check valve of cast iron body construction shall be acceptable for nominal size of 65mm or below.

FWP4.4.020.5 DESIGN AND CONSTRUCTION

- 1. Unless otherwise specified, non-return valves shall have a working pressure of not less than 1,000 kN/m².
- 2. The valve body shall be robust and capable of withstanding hard wear.
- 3. Bronze swing non-return valves shall have screwed type cap and cast iron swing non-return valves shall have the cap and body bolted together to ensure a strong, tight closure.
- 4. Hinge pins and springs shall be of stainless steel.
- 5. Recoil or spring type non-return valves shall have a flow area not less than the cross-sectional area of the connected pipework and shall be non-slam in operation.
- 6. The valves shall be designed to close before reversal of flow starts.

FWP4.4.030.5 END CONNECTIONS

- 1. End connections of non-return valves shall be as FWP4.2.030.
- 2. Wafer type spring non-return valves will be acceptable, provided the body ends are capable of matching connecting flanges complying with the requirements of BS 4504: HS.

FWP4.5 BALL FLOAT VALVES

FWP4.5.010.5 PERFORMANCE

Unless otherwise specified, ball float valves shall have a working pressure of not less than $1,000 \text{ kN/m}^2$ and be tested to $1,600 \text{ kN/m}^2$ on the body.

FWP4.5.020.5 TYPE

Ball float valves shall be of the slow closing type, unless otherwise specified.

FWP4.5.030.5 DESIGN AND CONSTRUCTION

- 1. General:
 - a. The valve body shall be robust and shaped to give a good flow pattern;
 - b. The valve piston shall close in the direction of flow such that the pressure in the main will tend to keep the valve closed and that the piston seal is afforded protection from the flow by the piston;
 - c. All internal parts shall be easily removable for maintenance with the face and piston seals easily replaced.
- 2. Fresh water application: cast iron body with gunmetal piston, seat and guide;
- 3. Flush water application: cast iron body with zinc free bronze trimmed piston, seat and guide.

FWP4.5.040.5 BALL FLOATS

Ball floats shall be spherical, comply with BS 1968: 1953 and be constructed of tinned copper for fresh water application and of neoprene coated copper for flush water application.

FWP4.5.050.5 LEVER ARMS

Lever arms for flush water application shall be of stainless steel and of direct mechanical linkage type.

FWP4.6PRESSURE REDUCING VALVESFOR FIRE SERVICES SYSTEM

FWP4.6.010.5 TYPE

The pressure reducing valve shall be diaphragm operated, single seated, pilot operated.

FWP4.6.020.5OPERATION AND PERFORMANCE

- 1. The operating range shall be suitable for the particular application.
- 2. The valve shall maintain a constant reduced downstream pressure regardless of changes in upstream pressure or flow rates.
- 3. The amount of pressure reduction against various flow rates and inlet pressures shall comply with the requirements as indicated on the Drawings.
- 4. Performance curves showing the above characteristics shall be submitted to the Contract Manager upon request.

FWP4.6.030.5 MATERIAL

Material composition of every component of the valve shall have the minimum standard as specified below for its intended purposes. Equivalent materials may be offered for Approval.

1. Body & bonnet

Cast iron to BS 1452 grade 220 or ductile iron to BS EN 1563. The body of the valve shall be epoxy or polyester coated both inside and outside.

2. Disc

Solid or trimmed with bronze to BS 1400 LG2 or ductile iron to BS EN 1563.

3. Seat

Bronze trimmed as disc or stainless steel.

4. Stem

High tensile brass or leaded brass to BS2874 or 13% chromium stainless steel to BS 970.

FWP4.6.040.5 TESTING

Each valve shall be hydraulic tested at 1.5 times the nominal pressure of the valve for a period of not less than 1 minute at the factory.

FWP4.6.050.5 CERTIFICATION

Type test certificate/report from independent and reputable laboratories for the verification of the hydraulic pressure requirements and material used shall be produced upon request.

FWP4.7 PRESSURE REDUCING VALVE AT FRESH AND FLUSH WATER SUMP TANK

FWP4.7.010.5 GENERAL

- 1. The pressure reducing valve shall be hydraulically operated, pilot-controlled and of diaphragm or piston-actuated type. The whole valve shall be assembled and tested by the manufacturer.
- 2. The pilot control system shall be provided with a strainer. The valve shall be flanged-end connection with flange to BS 4504 PN16. The main valve and its pilot control system shall contain no packing glands or stuffing boxes.
- 3. The valve shall reduce a higher inlet pressure to a steady downstream pressure regardless of fluctuations in flow rate and/or varying inlet pressure. The downstream pressure shall be adjustable and could be reduced down to a pressure suitable for the application. The valve shall be selected in such way that no cavitation shall occur within the anticipated flow and pressure ranges.
- 4. Means shall be provided for adjusting the response of the valve to changes in inlet pressure without the use of special tools.
- 5. The valve, when in operation, shall not cause any noise nuisance to the tenants of the domestic flats. Otherwise, a suitable acoustic enclosure shall be provided to cover the valve.

FWP4.7.020.5 MATERIAL

Material composition of every component of the valve shall be suitable for fresh or flush water use as in accordance with its application, and shall have the minimum standard as specified below for its intended purposes. Equivalent materials may be offered for Approval;

1. Body & bonnet:

Cast iron to BS 1452 grade 220 or ductile iron to BS EN 1563. The body of the valve shall be electrostatically applied epoxy, nylon, enamel or oven baked polyester coated both inside and outside;

- 2. Disc:
 - a. Solid or trimmed with bronze to BS 1400 LG2 or ductile iron to BS EN 1563 for fresh water use;
 - b. Solid or trimmed with zinc free bronze to BS 1400 or trimmed with austenitic chromium nickel stainless steel or austenitic chromium nickel molybdenum stainless steel to BS 3100 or ductile iron to BS EN 1563 with the same coating of body for flush water use;
- 3. Seat:
 - a. Bronze or stainless steel trimmed as disc for fresh water use;
 - b. Zinc free bronze or stainless steel trimmed as disc for flush water use;
- 4. Stem:
 - a. High tensile brass or leaded brass to BS 2874 or 13% chromium stainless steel to BS 970 for fresh water use;
 - b. Austenitic chromium nickel stainless steel or austenitic chromium nickel molybdenum stainless steel to BS 970 for flush water use.

FWP4.7.030.5 PRESSURE

The valve shall be suitable for both the working and test pressure of the piping system in which they are installed. Unless otherwise specified or approved, it shall have a working pressure of not less than 1370 kN/m².

FWP4.7.040.5 TEST CERTIFICATE

The valve shall be of the type approved by Water Supplies Department for fresh or flush water use as in accordance with its application. Type test certificate/report from an independent and reputable laboratory confirming that the valve has been tested conforming to this specification shall be produced upon request.

FWP4.8 MODULATING FLOAT VALVE AT FRESH AND FLUSH WATER SUMP TANK

FWP4.8.010.5 GENERAL

- 1. The modulating float valve shall be hydraulically operated, pilot-control and of diaphragm or piston-actuated type. The whole valve shall be assembled and tested by the manufacturer.
- 2. The pilot control system shall be provided with a strainer. The valve shall be flanged-end connection with flange to BS4504 PN16. The main valve and its pilot control system shall contain no packing glands or stuffing boxes. The ball float shall be spherical and comply with BS 1968. Lever arm /float connecting rod shall be of direct mechanical linkage type.
- 3. The valve shall be operated to modulate water flow into the tank in such way as to maintain predetermined water tank level within narrow limits. The valve shall be installed such that there is an air gap between the float and the pilot valve.
- 4. Means shall be provided for adjusting the response of the valve to changes in water tank level without the use of special tools.
- 5. The valve, when in operation, shall not cause any noise nuisance to the tenants of the domestic flats. Otherwise, a suitable acoustic enclosure shall be provided to cover the valve.

FWP4.8.020.5 MATERIAL

Material composition of every component of the valve shall be suitable for fresh or flush water use as in accordance with its application, and shall have the minimum standard as specified below for its intended purposes. Equivalent materials may be offered for Approval;

1. Body & bonnet:

Cast iron to BS 1452 grade 220 or ductile iron to BS EN 1563. The body of the valve shall be electrostatically applied epoxy, nylon, enamel or oven baked polyester coated both inside and outside;

- 2. Disc:
 - a. Solid or trimmed with bronze to BS 1400 LG2 or ductile iron to BS EN 1563 for fresh water use;
 - b. Solid or trimmed with zinc free bronze to BS 1400 or trimmed with austenitic chromium nickel stainless steel or austenitic chromium nickel molybdenum stainless steel to BS 3100 or ductile iron to BS EN 1563 with the same coating of body for flush water use;
- 3. Seat:
 - a. Bronze or stainless steel trimmed as disc for fresh water use;
 - b. Zinc free bronze or stainless steel trimmed as disc for flush water use;
- 4. Stem:
 - a. High tensile brass or leaded brass to BS 2874 or 13% chromium stainless steel to BS 970 for fresh water use;
 - b. Austenitic chromium nickel stainless steel or austenitic chromium nickel molybdenum stainless steel to BS 970 for flush water use;
- 5. Ball float:

- a. Spherical and comply with BS 1968: 1953;
- b. Constructed of tinned copper or stainless steel for fresh water application and of neoprene coated copper or stainless steel for flush water application;
- 6. Lever arm/float connecting rod for flush water application:

Stainless steel.

FWP4.8.030.5 PRESSURE

The valve shall be suitable for both the working and test pressure of the piping system in which they are installed. Unless otherwise specified or approved, it shall have a working pressure of not less than 1370 kN/m^2 .

FWP4.8.040.5 TEST CERTIFICATE

The valve shall be of the type approved by Water Supplies Department for fresh or flush water use as in accordance with its application. Type test certificate/report from an independent and reputable laboratory confirming that the valve has been tested conforming to this specification shall be produced upon request.

FWP4.9 BALL VALVES

FWP4.9.010.5 TYPE

Unless otherwise specified, the application of ball valves shall only be used for hose reel control valve in fire services installation. Ball valves shall be of spherical bore with PTFE seats and directly operated by a lever. Lever shall be so mounted that it is parallel to the valve axis when the valve is in the fully open position. When the valve is in the fully closed position, the lever shall be at 90° to the valve axis.

FWP4.9.020.5DESIGN AND CONSTRUCTION

- 1. Valves shall be robust and capable of withstanding hard wear;
- 2. Valves shall be constructed to the following minimum specification:
 - a. Body and stem

Carbon steel to BS 5159 : 1974 (1991) or brass to BS EN 12165 : 1998 CuZn40Pb2 with or without nickel/chromium plated

b. Seat bore

Carbon steel to BS 5159 : 1974 (1991) or brass to BS EN 12165 : 1998 CuZn40Pb2 with nickel/chromium plated;

c. Lever handle

Carbon steel or zinc plated steel with red plastic sleeve and open/close operating direction marking.

- 3. The lever retaining nut or screw of ball valves shall be permanently sealed with industrial type heavy duty threadlocking adhesive/sealant;
- 4. Valves shall have a working pressure of not less than 2000kPa. The test pressures of valve body and seat shall be 1.5 and 1.1 times the maximum permissible working pressure respectively.

FWP4.9.030.5 END CONNECTIONS

- 1. Ball valves shall be of the screwed female end connection;
- 2. Threads in screwed end connection shall comply with BS 21 : 1985.

FWP4.10 FLOAT VALVE AT BREAK TANK

FWP4.10.010.5 GENERAL

- 1. The float valve shall be hydraulically operated, on-off pilot-control and of diaphragm or piston-actuated type. The whole valve shall be assembled and tested by the manufacturer.
- 2. The pilot control system shall be provided with a strainer. The valve shall be flanged-end connection with flange to BS4504 PN16. The main valve and its pilot control system shall contain no packing glands or stuffing boxes.
- 3. The ball float shall be spherical or cylindrical and comply with BS 1968. The ball float shall be linked with the float pilot by means of a direct mechanical rod with adjustable upper and lower stops. There shall be an air gap between the ball float and the float pilot.
- 4. The float pilot shall be remotely connected by the control line tubing relaying the pilot's hydraulic signal to the main valve.
- 5. Means shall be provided to trigger an alarm signal in case of overflow condition. The alarm triggering device may be an integral part of the valve or may be provided separately.
- 6. Means shall be provided for adjusting the response of the valve to on-off demand due to changes in water tank level without the use of special tools.
- 7. The valve, when in operation, shall not cause any noise nuisance to the tenants of the domestic flats. Otherwise, a suitable acoustic enclosure shall be provided to cover the valve.

FWP4.10.020.5 MATERIAL

Material composition of every component of the valve shall be suitable for fresh or flush water use as in accordance with its application and shall be not less than those as specified below:

1. Body & bonnet

Cast Iron to BS 1452 grade 220 or ductile iron to BS EN 1563. The body of the valve shall be epoxy or polyester coated both inside and outside.

- 2. Disc
 - a. Solid or trimmed with bronze to BS 1400 LG2 or ductile iron to BS EN 1563 for fresh water use.
 - b. Solid or trimmed with zinc free bronze to BS1400 or trimmed with austenitic chromium nickel stainless steel or austenitic chromium nickel molybdenum stainless steel to BS970 or ductile iron to BS EN 1563 with epoxy/polyester coated for flush water use.
- 3. Seat
 - a. Bronze or stainless steel trimmed as disc for fresh water use.
 - b. Zinc free bronze or stainless steel trimmed as disc for flush water use.
- 4. Stem
 - a. High tensile brass or leaded brass to BS2874 or 13% chromium stainless steel to BS 970 for fresh water use.
 - b. Austenitic chromium nickel stainless steel or austenitic chromium nickel molybdenum stainless steel to BS970 for flush water use.
- 5. Ball float
 - a. Spherical or cylindrical and comply with BS 1968: 1953;

- b. Constructed of tinned copper or stainless steel for fresh water application and of neoprene coated copper or stainless steel for flush water application.
- 6. Lever arm/float connecting rod for flush water application

Stainless steel.

FWP4.10.030.5 PRESSURE

The valve shall be suitable for both the working and test pressure of the piping system in which they are installed. Unless otherwise specified or Approved, it shall have a working pressure of not less than 1370 kN/m^2 .

FWP4.10.040.5 TEST CERTIFICATE

The valve shall be of the type approved by the Water Supplies Department for fresh water or flush water use as in accordance with its application. Type test certificate/report from an independent and reputable laboratory confirming that the valve has been tested conforming to this specification shall be produced upon request.

FWP4.11 OTHER FITTINGS

FWP4.11.010.5 VORTEX INHIBITORS

Vortex inhibitors shall be LPC approved type with PN16 flanges to BS 4504 : Part 3 : 1989. They shall be used for operation under positive head conditions.

FWP4.11.020.5 ORIFICE PLATES

- 1. Orifice plates for system balancing, pump churning water circuits, where applicable, shall be provided as required for proper commissioning of the systems. Wherever necessary to suit the pump performance in respect of system balance, orifice plates shall be provided even if they are not indicated on drawings.
- 2. Orifice plates shall be generally constructed and installed according to LPC Sprinkler Rules Clause 24.1.3, Table 52. They shall be manufactured by factories producing LPC approved or U.L. Listed sprinkler equipment or others as approved by Contract Manager.

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FWP5.1 GENERAL

FWP5.1.010.5 COMPLIANCE WITH RULES/REGULATIONS

All water tank installations including gravity tank, pump suction tank and elevated private reservoir supplied and installed by the Contractor shall comply with the LPC Sprinkler Rules.

FWP5.2 STEEL WATER TANKS

FWP5.2.010.5 RESPONSIBILITY OF SUB-CONTRACTOR

Steel water tanks, where indicated, shall be provided and installed by the Subcontractor complete with all installation materials and all internal and external connections and fittings.

FWP5.2.020.5 STANDARDS

Tanks shall comply with BS 1564: 1975 (1983).

FWP5.2.030.5 CONSTRUCTION

Tanks shall be constructed from steel plate and properly treated to prevent corrosion after the completion of all drilling, fitting, and welding operations. Tanks shall be provided with covers to prevent mosquito breeding, properly constructed of steel and complete with access manhole.

FWP5.2.040.5 GRAVITY/PUMP SUCTION TANKS

Gravity tanks and pump suction tanks shall be of the sectional type and shall be installed upon bituminous felt sheeting or equivalent protective material.

FWP5.2.050.5 PRESSURE TANKS

- 1. Pressure tanks shall be designed and constructed for a working pressure not less than 1.5 times the normal working pressure of the system to which it is connected, with a minimum of 700 kPa.
- 2. Pressure tanks shall conform to the local statutory requirements for pressure vessels and shall be fitted with two safety valves, single air pressure gauge, level gauge glass, two access manholes, tank supports and all other necessary equipment.
- 3. Pressure shall be automatically maintained by Approved means and the associated control equipment shall be provided.
- 4. Alarm devices to give remote indication by electrical means of low or high air pressure of water level shall be provided and wired to suitable indicators located at the Fire Alarm and Control Panel or elsewhere as indicated.

FWP5.2.055.5PNEUMATIC PRESSURE VESSELS FOR BOOSTER FRESH WATER
PUMP SYSTEM

- 1. A group of pneumatic pressure vessels shall be provided and installed. The vessels shall be of adequate capacity so as to limit the pump start to be not more than 12 times per hour;
- 2. The vessels shall be constructed of welded mild steel to BS 5169 and lined internally with a resin of anti-corrosion material suitable for use with liquid being handled;
- 3. Gas and water space shall be separated by a balloon shaped membrane, which must be acceptable to and approved by the Water Supplies Department. There shall be no contact between the water and metal surface of the vessel;
- 4. Membrane shall be rugged, replaceable, seamless rubber which prevents water logging the cause of pump failure. Material of the membrane shall be flexible, non-porous, resist acids and alkalis, non-toxic, not impairing taste or odour;

- 5. The vessels shall be pre-charged with nitrogen at factory at a pressure to suit the systems. The pre-charge pressure shall be adjustable and charging port with non-return device shall be provided in each vessel. The pressure shall be set in accordance with that shown on the Drawings;
- 6. The vessels shall be provided with air bleed cock, pressure gauges, safety valve and drain cock with drain pipe extension to the nearest drain point;
- 7. A test certificate for the performance and test pressure of the pneumatic pressure vessel issued by the manufacturer shall be submitted to the Contractor Manage for approved.

FWP5.2.060.5BITUMEN BASED COATING

Where the Drawings indicate that the internal surfaces of a steel tank are to be bitumen coated this shall be a bitumen based coating for cold application suitable for use in contact with potable water as BS 3416: 1991 Type 2 applied in two coats as described at Appendix A of that standard.

FWP5.3 CONCRETE WATER TANKS

FWP5.3.010.5 RESPONSIBILITY OF MAIN CONTRACTOR

- 1. Water tanks forming part of the building construction, or of concrete, including overflow, drains and inlet piping will be supplied and installed by the Main Contractor.
- 2. Puddle flanges at the water tank for inlet and outlet pipes will be supplied and installed by the Main Contractor.

FWP5.3.020.5 RESPONSIBILITY OF SUB-CONTRACTOR

All other piping connections and valves shall be provided and installed by the Sub-contractor.

FWP5.3.030.5 VERIFICATION BY SUB-CONTRACTOR

The Sub-contractor shall check the construction drawings for concrete water tanks for fire service installations and water pump installations and verify their correctness for his installation purposes, or submit proposals for modification to the design, as necessary, and shall assist in the supervision of their construction, in order to ensure their suitability and proper functioning.

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FWP6.1 DESIGN AND SPECIFICATION

FWP6.1.010.5 COMPLIANCE WITH RULES/REGULATIONS

- 1. Pumps and pump installations for sprinkler systems shall comply with the detailed requirements of the LPC Sprinkler Rules.
- 2. Pumps and pump installations for hydrant/hosereel systems shall comply with Code of Practice for Minimum Fire Service Installations and Equipment published by Hong Kong Government and BS 5306: Part 1: 1976(1988) wherever applicable.

FWP6.1.020.5 TYPE

- 1. The type of pump(s) required for any particular application is detailed in FWP2.
- 2. Only the type specified should be listed in the tender documents; alternative proposals may be submitted separately, together with a list of advantages for Approval.
- 3. All pumps shall be electric motor driven centrifugal pumps, unless otherwise specified.

FWP6.1.030.5 DUTY

- 1. The pump(s) shall be selected to suit the design requirements for capacity as indicated in FWP2 or Drawings.
- 2. The pump heads stated in FWP2 or Drawings are only for the reference of tendering purposes.
- 3. The Sub-contractor shall calculate the actual pump heads required and carry out such alterations as may be necessary to achieve the specified duty.

FWP6.1.040.5 PUMP CURVES

- 1. Predicted total Head/Quantity, required NPSH/Quantity, Efficiency/ Quantity, and Power Absorbed/Quantity Curves shall be supplied with the tender.
- 2. The curves shall commence at zero flow and be extended to show the performance at heads lower than the minimum head.
- 3. In general, the pump shall be selected to operate near its best efficiency point shown on the performance curves.
- 4. Unless otherwise specified, fresh and flush feed pumps selected to operate below the best efficiency point by a figure of 10% or more (in efficiency) will normally be unacceptable.

FWP6.1.050.5 MAXIMUM PUMP SPEED

- 1. Maximum speed of fresh and flush water pumps shall not exceed 25r/s.
- 2. Maximum speed of booster fresh water pumps shall not exceed 25r/s.
- 3. Maximum speed of fire services feed pumps shall not exceed 50r/s.
- 4. Unless otherwise specified, maximum pump speed shall not exceed 50r/s.

FWP6.2 CONSTRUCTION

FWP6.2.010.5 GENERAL

All pump parts shall be constructed of materials suitable for the required working pressure, temperature and mechanical strength and also the liquid handled by the pump. The materials specified in this Section shall be of the minimum standard required. Better or equivalent materials may be offered for approval (including alternative international/national standards).

FWP6.2.020.5 FRESH WATER/FIRE SERVICES PUMPS

1. Casing:

Grey cast iron to EN 1561: 1997 EN-GJL-250, or JIS G5501FC250;

- 2. Impeller:
 - a. Bronze to EN 1982: 1998 CuSn5Zn5Pb5, or CuSn10; or
 - b. Bronze to JIS H5120-CAC406, JIS H5120-CAC502A;
- 3. Diffuser (detachable):
 - Grey cast iron to EN 1561: 1997 EN-GJL-250, or JIS G5501FC250;
- 4. Wearing ring:
 - a. Grey cast iron to EN 1561: 1997 EN-GJL-250, or JIS G5501FC250; or
 - b. Copper-tin alloy to EN 1982: 1998, or phosphor bronze to JIS 5120;
- 5. Shaft:

Stainless steel to EN 10088-3: 1995 - 1.4301, or JIS SUS 304;

6. Sleeve:

Stainless steel same as shaft or cast bronze;

7. Bearing bush (for vertical pump only):

Tungsten carbide or silicon carbide;

8. Lantern ring:

Non-ferrous or stainless steel;

9. Other parts which may be in contact with water: Stainless steel or bronze.

FWP6.2.025.5 BOOSTER FRESH WATER PUMPS

- 1. Casing
 - Grey cast iron to EN 1561: 1997 EN-GJL-250, or JIS G5501FC250.
- 2. Impeller
 - a. Bronze to EN 1982 : 1998 CuSn5Zn5Pb5, or CuSn10; or
 - b. Bronze to JIS H5120-CAC406, or JIS H5120-CAC502A.
- 3. Wearing ring
 - a. Grey cast iron to EN 1561: 1997 EN-GJL-250, or JIS G5501FC250; or
 - b. Copper-tin alloy to EN 1982 : 1998, or phosphor bronze to JIS 5120.
- 4. Shaft

Stainless steel to EN 10088-3 : 1995 - 1.4301, or JIS SUS 304.

5. Sleeve

Stainless steel same as shaft or cast bronze.

- Diffuser (detachable)
 Grey cast iron to EN 1561: 1997 EN-GJL- 250 or JIS G5501FC250 or Bronze to EN 1982 : 1998.
- Bearing bush for vertical pump Tungsten carbide or silicon carbide.
- 8. Lantern ring

Non-ferrous or stainless steel.

9. Other parts which may be in contact with water Stainless steel or bronze.

FWP6.2.030.5 FLUSH WATER PUMPS

1. Casing

Stainless steel to BS 3100 : 1991 grade 316 C16, or JIS SCS14 or SCS14A.

2. Impeller

Stainless steel to BS 3100 : 1991 grade 316 C16, or JIS SCS14 or SCS14A.

- Wearing ring Stainless steel of grade 316
 - Stainless steel of grade 316
- 4. Shaft

Stainless steel to EN10088-3 : 1995 – 1.4401, or JIS SUS316.

5. Sleeve

Stainless steel of grade 316.

6. Diffuser (detachable)

Stainless steel to BS 3100 : 1991 grade 316 C16, or JIS SCS14 or SCS14A.

7. Bearing for horizontal pump

Stainless Steel.

8. Bearing bush for vertical pump

Tungsten carbide or silicon carbide.

9. Lantern ring

Stainless steel of grade 316

10. Parts which may be in contact with water Stainless steel of grade 316.

11. No external painting is allowed for the pump body.

FWP6.2.040.5 SEWAGE/WASTE WATER/STORM WATER PUMPS

Sewage, waste water or storm water pumps shall be constructed of:

- Casing Grey cast iron to EN 1561: 1997 EN-GJL-250 or JIS G5501FC250.
- Impeller Grey cast iron to EN 1561: 1997 EN-GJL-250 or JIS G5501FC250.
- 3. Shaft

- a. Stainless steel to EN 10088-3 : 1995 1.4301, or JIS SUS 304 for waste/storm water;
- b. Stainless steel to EN10088-3 : 1995 1.4401, or JIS SUS316 for sewage.

FWP6.2.050.5 BORE WELL PUMPS

- 1. Bore well pumps for use with corrosive water shall be constructed of the same material specification as FWP6.2.030.
- 2. Bore well pumps for use with non-corrosive water shall be constructed of:
 - a. Casing

Grey cast iron to EN 1561: 1997 EN-GJL-250, or JIS G5501FC250.

b. Impeller

Bronze to EN 1982 : 1998 CuSn5Zn5Pb5, or JIS H5120-CAC406.

c. Shaft

Stainless steel to EN 10088-3 : 1995 - 1.4301, or JIS SUS 304.

FWP6.3 PUMP TYPES

FWP6.3.010.5

HORIZONTAL SPLIT CASING PUMPS

- 1. Casing:
 - a. The casing shall be of the volute type, of robust construction, split axially, accurately machined, with the suction and delivery connections mounting feet, bearing pedestals cast integrally in the lower half of the casing;
 - b. The water passage ways shall be smooth, free from blow holes, sand pockets and other detrimental defects, to permit maximum efficiency;
 - c. Means shall be provided to drain the casing;
 - d. An air bleed cock at the upper most point of the casing shall also be provided;
 - e. Flanges shall conform to BS 4504: HS PN16;
 - f. The casing bolts shall be of corrosion resistant high strength steel.
- 2. Impeller:
 - a. The impeller shall have sufficient strength at the boss to withstand all possible stresses that may be imposed by the drive;
 - b. The impeller shall be machined to close limits, hand finished and balanced dynamically;
 - c. The impeller is to be keyed to the shaft, and fixed in an axial position by corrosion resistant fixing nuts of the same material as the shaft, threaded opposite to rotation and secured by set screws or other means;
 - d. Renewable guide rings are to be provided in the casing, keyed to prevent rotation by stainless steel pin;
 - e. Wearing ring shall be straight type with close tolerance to permit minimum re-circulation.
- 3. Shaft:
 - a. The shaft shall be of sufficient size and strength to withstand the impeller weight, the torque to be transmitted as well as the axial and radial load developed in operation;
 - b. Shaft sleeves, if used, shall be keyed to prevent rotation and secured against axial movement.
- 4. Shaft Seal:
 - a. Stuffing boxes shall be provided and shall be of ample length to accommodate pump packings specified at FWP6.4.020;
 - b. Lantern rings shall be provided for water seal and gland leakage shall be piped to drain.

FWP6.3.020.5END SUCTION PUMPS

- 1. Casing:
 - a. The casing shall be of the volute type and of robust construction;
 - b. Suction and delivery flanges shall conform to BS 4504: HS PN16;
 - c. Means shall be provided to bleed the air and drain the casing;
 - d. The water passage ways shall be smooth, free from blow holes, sand pockets, and other detrimental defects to permit maximum efficiency;
 - e. The casing bolts shall be of corrosion resistant high strength steel.

- 2. Impeller:
 - a. The impeller shall have sufficient strength to withstand all possible stress that may be imposed by the drive;
 - b. The impeller shall be of the shrouded type, dynamically balanced to ensure vibration free operation;
 - c. The impeller is to be keyed to the shaft, and fixed in an axial position by corrosion resistant fixing nuts of same material as the shaft, threaded opposite to rotation and secured by set screws or other means;
 - d. Renewable guide rings are to be provided in the casing, keyed to prevent rotation by stainless steel pin;
 - e. Wearing ring shall be straight type with close tolerance to permit minimum re-circulation.
- 3. Shaft:
 - a. The shaft shall be of sufficient size and strength to withstand the impeller weight, the torque to be transmitted as well as the axial and radial load developed in operation;
 - b. Shaft sleeves, if used, shall be keyed to prevent rotation and secured against axial movement.
- 4. Shaft Seal:
 - a. Stuffing boxes shall be provided and shall be of ample length to accommodate pump packings specified at FWP6.4.020;
 - b. Lantern rings shall be provided for water seal and gland leakage shall be piped to drain.
- 5. Close-coupled Pump:

For installation with motor rating not exceeding 2.2 kW, close-coupled pumps may be acceptable, subject to the Approval of the Contract Manager.

FWP6.3.030.5 MULTI-STAGE PUMPS

- 1. Casing:
 - a. Unless otherwise specified, multi-stage pumps shall be of the radially split casing type, with all casing parts kept together by external tie bolts and sealed against each other by gaskets or O-rings, suction and discharge flanges shall conform to BS 4504 PN16;
 - b. Wearing/split ring shall be provided between impeller, detachable diffuser, pump packing and pump casing;
 - c. Means shall be provided to bleed the air and drain the casing;
 - d. Screw or recess should be integral of the casing to prevent rotation of detachable diffuser. Detachable pin for location fixing of the diffuser onto the casing is not allowed;
 - e. Pumps shall be vertically or horizontally mounted as specified in FWP2. For vertically mounted pump, the bearing bush shall be made of tungsten carbide, silicon carbide or equal material & Approved to minimise wear. Besides, stainless steel motor stool should be provided for vertically mounted stainless steel flush water pump;
- 2. Impeller:
 - a. The impellers shall have sufficient strength to withstand all possible stress that may be imposed by the drive;
 - b. The impellers shall be of the shrouded type, dynamically balanced using grinding machine to ensure vibration free operation;

- c. The impellers shall be keyed to the shaft and fixed in an axial position by corrosion resistant fixing nuts of same material as the shaft, threaded opposite to rotation and secured by setscrews or other means;
- 3. Diffuser (detachable):

Unless otherwise specified in FWP6.2, the diffuser should be the same material as casing with sufficient strength. It should be so designed to have even water passage to avoid turbulence;

- 4. Shaft:
 - a. The shaft shall be of sufficient size and strength to withstand the impeller weight, the torque to be transmitted as well as the axial and radial load developed in operation;
 - b. Shaft sleeves, if used, shall be keyed to prevent rotation and secured against axial movement;
- 5. Shaft seal:
 - a. Stuffing boxes shall be provided and shall be of ample length to accommodate pump packing specified at FWP6.4.020;
 - b. Lantern rings shall be provided for water seal and gland leakage shall be piped to drain.

FWP6.3.040.5 SUBMERSIBLE SUMP PUMPS

1. Stage:

Pump shall be of single stage end suction centrifugal type.

- 2. Casing:
 - a. The casing shall be of the volute type and robust construction;
 - b. The water passage ways shall be smooth and free from blow holes and sand pockets;
 - c. Casing bolts shall be of stainless steel.
- 3. Impeller:
 - a. For sewage pumps, the impeller shall be of the non-clog type with minimum solid passage of 50 mm diameter, unless otherwise specified;
 - b. For waste or storm water pumps, smaller solid passage impeller with suction strainer will be acceptable;
 - c. The impeller shall be dynamically balanced for all hydraulic loads within the pumps operating range and shall be keyed to the shaft and secured in an axial position by corrosion resistant fixing nuts;
 - d. Renewable wear rings shall be provided and shall be keyed to prevent rotation by stainless steel pin.
- 4. Shaft:
 - a. The pump shall be of mono-block type with the impeller keyed to the motor shaft;
 - b. The shaft shall be of sufficient size and strength to withstand the impeller weight, the torque to be transmitted as well as the axial and radial load developed in operation.
- 5. Shaft seal:
 - a. Double mechanical seal lubricated by an oil chamber shall be provided;
 - b. Lower seal faces shall be of tungsten carbide or other Approved hard metal;
 - All components shall be of corrosion resistant materials with high quality stainless steel spring;

- d. Lower seal shall be protected from ingress of grits;
- e. One spare set of seals shall be provided for each pump.
- 6. Bearing:
 - a. The bearings shall be of the ball or roller type, oil or grease lubricated;
 - b. Bearings shall have a minimum re-grease interval of 5000 hours.
- 7. Motor:
 - a. Motor shall be of the submersible type and conform to FWP11 of this Specification;
 - b. Built-in thermal protection to BS 4999 Part 111: 1987 shall be provided for motor of rating exceeding 7.5 kW;
 - c. Thermal protection shall be self re-settable with cable connection for external tripping and indication;
 - d. Cooling system shall be provided for motor above 7.5 kW to enable continuously running without damage even with the motor above liquid level.
- 8. Cable:
 - a. The cable used inside sump shall be multi-core submersible cable and shall be of sufficient length without connections inside the sump;
 - b. Cable entry to the junction chamber of the motor shall be provided with strain relief clamp and seal gland.
- 9. Installation and accessories:
 - a. The pump shall be capable of being raised from or fixed back to the sump without the need to enter or drain the sump;
 - b. For installation with motor rating exceeding 0.75 kW, the pump shall be provided with slide rails, lifting chain and quick discharge connection;
 - c. For smaller installations, lifting chain and flexible hose-coupling connection will be acceptable.
- 10. Surface treatment:

All surfaces of pump and motor in contact with the fluid handled shall be treated with anti-corrosion primer or paint for additional protection.

FWP6.3.050.5 MULTI-STAGE SUBMERSIBLE PUMPS

- 1. Construction:
 - a. The pump and motor shall be of small diameter profile to suit the bore well size specified; arranged vertically with the discharge connection on top, followed by the pump, the suction port with strainer and the motor at the bottom.
 - b. The assembly is to be submerged below the lowest pumping level and suspended in the well by the discharge pipe.
 - c. Pump shall also be suitable for horizontal installation if specified in FWP2.
- 2. Casing:
 - a. Pump shall be made up of independent stage casing bowls, complete with diffuser vanes or inter-stage piece and sleeve bearing for the pump shaft and easily removable for servicing.
 - b. The water passage way shall be smooth to provide best efficiency.
- 3. Impeller:
 - a. Impeller shall be of axial, enclosed radial or mixed flow type, machined to close limit with smooth water passage and dynamically balanced.

- b. The impellers shall be secured to the shaft by taper lock bushes or keys and fixed in the correct axial position by distance sleeve, shaft sleeves or the extended boss of the impeller, all keyed to prevent rotation.
- c. Renewable guide rings shall be provided in the pump casing.
- d. Guide rings shall be of straight type providing close radial running clearance.
- 4. Shaft and sleeve bearings:
 - a. Pump shaft shall be carried by sleeve bearings at both ends and intermediate stage positions, all lubricated by the fluid handled.
 - b. Downthrust shall be transmitted to and carried by the motor shaft, however, the pump shall be designed to carry momentary upthrust encountered under normal operation.
- 5. Motor:
 - a. The submersible motor shall be a water-fitted squirrel cage induction motor and conform to FWP11.
 - b. The motor shaft shall be connected to the pump shaft by a keyed sleeve coupling.
 - c. A thrust bearing shall be located at the bottom end of the motor to absorb the axial thrust generated by the pump.
- 6. Cable:
 - a. The cable inside the bore well shall be multi-core submersible cable and shall be of sufficient length without connections inside the well.
 - b. The cable shall be secured to the discharge riser by corrosion resistant clips.
- 7. Accessories:
 - a. Each pump shall be provided with a non-return valve immediately connected to the discharge of the pump.
 - b. A pipe support clamp shall be provided at the top of the bore well for holding the discharge pipe and the pump.

FWP6.4 BEARINGS AND PACKINGS

FWP6.4.010.5 PUMP BEARINGS

- 1. All bearings shall be of types readily obtainable.
- 2. For horizontal mounted pumps, the bearings shall be of the sealed ball or roller type, oil or grease lubricated.
- 3. Means shall be provided to protect the bearing from ingress of dust and water.
- 4. Appropriate lubrication nipple/connections or oiler sump with drain plug shall be provided for maintenance purpose.
- 5. For fresh water pumps, the bearing housings shall be cast iron. For flush water pumps, the bearing housing and cover shall be stainless steel to BS3100 : 1991 grade 316 C16, or JIS SCS14 or SCS14A. The bearing housing and covers shall be easily removable for service.
- 6. The bearing cover shall provide a labyrinth seal to contain grease/oil in the housing.
- 7. For vertical pumps, the bearing bush (thrust bearing) shall be made of tungsten carbide or silicon carbide.

FWP6.4.020.5 PUMP PACKING

- 1. All pump packing shall be in square plait braided construction and shall contain no asbestos. Sleeves shall be provided to prevent the packing rubbing against the shaft.
- 2. The braids shall not be liable to become loose or peel off throughout their life.
- 3. The packing shall be suitable for use in fresh water or flush water application.
- 4. Size of the packing shall be commensurate with the size of the pump.
- 5. The packing shall be made from any one of the following materials: aramid fibre, carbon yarn, PTFE or other non-asbestos fibres. It shall be impregnated with PTFE and/or heat resistant lubricants. Any coating that will lead to the particles being rubbed off is not acceptable.
- 6. The packing shall also satisfy the following requirements:
 - a. Rated pH value: 5-9
 - b. Rated maximum operating speed : not less than 10 m/s
 - c. Rated maximum operating temperature: not less than 150°C

FWP6.4.030.5 PUMP SEALS

- 1. Unless otherwise specified, mechanical seals shall not be acceptable for flush water, or non-fresh water application.
- 2. Pump seals for flush water pumps, sewage pumps shall be of the stuffing box gland type of appropriate depth to prevent leakage. Low pressure stuffing boxes shall be water sealed to prevent air leakage. Glands shall be of stainless steel to BS 3100 : 1991 grade 316 C16, or JIS SCS14 or SCS14A.
- 3. If gland packing is used for fresh water pumps, pump seals shall be of the stuffing box gland type of appropriate depth to prevent leakage. Low pressure stuffing boxes shall be water sealed to prevent air leakage. Glands shall be of cast iron or bronze.

FWP6.5 FITTINGS AND ACCESSORIES

FWP6.5.010.5 FITTINGS

Each pump shall be fitted with:

- 1. Valves: suction and discharge valves, strainer, and non-return valves as shown on the Drawings;
- 2. Cocks: suction and discharge gauge cocks of 10 mm BSP female thread;
- 3. Pressure gauges: pressure gauge as FWP11.6.060 complete with cock and coiled connector as sub-clause (2) above at the suction and discharge side of each pump;
- 4. Gland drain: 25 mm or larger uPVC gland drain pipe which shall discharge to the nearest drain or waste pipe.

FWP6.5.020.5 COUPLINGS

- 1. Each pump, except "close-coupled" type, shall be fitted with a secure coupling and shaft guard. Mild steel coupling shall be provided for stainless steel flush water pumps;
- 2. The coupling shall be of semi-flexible steel pin and rubber bush type, accurately aligned on site;
- 3. The Sub-contractor shall be required to demonstrate correct alignment prior to handover of the installation;
- 4. The couplings shall be totally enclosed by stainless steel see-through guard to prevent any direct contact of bodily parts.

FWP6.5.030.5 LUBRICATION FITTINGS

Each pump shall be fitted with appropriate lubrication fittings.

FWP6.5.040.5 AIR BLEED COCKS

Each pump shall be equipped with test and/or air bleed cocks of the high pressure type.

FWP6.5.050.5 LIFTING EYES

Vertical pumps shall be provided with lifting eyes to facilitate maintenance and future replacement.

FWP6.5.060.5 IDENTIFICATION

A serial number for identification purpose should be indelibly marked or label fixed on the pump casing. An arrow indicating the normal direction of rotation shall be cast clearly on the pump casing or a brass arrow and plate engraved with the words "Direction of Rotation" shall be screwed to the pump casing near the coupling.

FWP6.5.070.5 MOTORS AND WIRING

Electrical motors and wiring shall comply with FWP11 and the relevant sections of the HKHA Electrical Installation Specification.

FWP6.6 INSTALLATION

FWP6.6.010.5 GENERAL

All pumps shall be installed as per manufacturers' recommendations and instructions and shall be carefully levelled and aligned by competent specialist before start-up.

FWP6.6.020.5 BASEPLATE

- 1. The pump and motor for all horizontal pumpset shall be mounted on a single baseplate constructed of stainless steel of grade 316; vertical pumpset shall be provided with integral base suitable for direct mounting onto the pump plinth;
- 2. The pump and motor of horizontal pumpset with motor rating exceeding 22kW shall be secured with jack bolts or dowel pins as recommended by the motor manufacturer;
- 3. The baseplate shall be a stainless steel plate welded on a stainless steel channel base frame. The stainless steel plate shall be machined to a true horizontal surface after welding;
- 4. The baseplate shall be sufficiently rigid and properly supported such that it will not deflect under the weight of the pump and motor. The pump set and baseplate shall be fixed in place by sufficient number of suitably sized anchor bolts cast or grouted in the concrete inertia block or pump base.

FWP6.6.030.5 VI

VIBRATION ISOLATION

- 1. Pumpsets shall be provided with Approved vibration isolators to prevent the transmission of vibration to the building structure.
- 2. Vibration isolators shall be carefully selected and installed in accordance with manufacturers' recommendations and instructions.
- 3. For horizontal pumpsets, isolation cork will be acceptable for installations with motor rating up to and including 22 kW unless otherwise specified. For larger installations, spring isolators shall be provided.
- 4. For vertical pumpsets, isolation cork will be acceptable for all installations.
- 5. Isolation cork shall be in the form of cork panels installed under and around the whole concrete pump base. Cork panels shall be at least 50 mm thick and shall have a density suitable for the load they carry. Cork panels shall be covered entirely by plywood or galvanized steel sheets with all joints sealed by waterproof paper prior to pouring of concrete for the pump base and after the pump base is formed, all exposed cork shall be sealed by mastic or bitumen.
- 6. Anti-vibration spring isolators shall have a rated deflection of not less than 38 mm unless otherwise specified. Each spring isolator shall consist of one or multiple steel helical coil springs, seated inside a robust cast iron or steel housing with an external-accessible adjustment bolt and lockout for levelling.
- 7. Spring isolators shall be laterally stable. Spring diameter shall be no less than 0.8 of the compressed height of the spring at rated load. Spring isolators shall have a minimum additional travel to solid equal to 25% of rated deflection. They shall have identification markings/colour codes for identification of rated load.
- 8. Spring isolators shall be integral with unadjustable neoprene sponge inserts between the projections of the upper and lower housing. Non-skid neoprene acoustical isolation pad of no less than 6 mm thick shall be properly bonded to the underside of the lower housing of the isolator.
- 9. Information as required in Clause 4.2 of BS 6414: 1983 (1990) shall be submitted for Approval.

10.

- a. A fabricated steel framed reinforced concrete inertia base shall be provided to decrease the vibrational motion.
- b. The inertia base shall have a minimum thickness of 150 mm and weight $1\frac{1}{2}$ times that of the pump set.
- c. Inertia bases for horizontal split casing pumps shall be large enough to provide support for suction and discharge bends rigidly connected to the pumps.
- d. Each pump shall be connected to its pipework with Approved flexible connectors to prevent the transmission of vibration to the pipework.
- e. Supports for piping between the pump and the flexible connectors shall be mounted on the inertia base whilst supports for piping after the flexible connectors shall be attached to structural members such as beams and columns in preference to floor slabs or walls and shall be provided with rubber or neoprene pads for vibration isolation.
- 11. The completed pump installation, when in operation, shall cause no noticeable or objectionable vibration transmission to any part of the building structure. In the event that undue vibration occurs, the Sub-contractor shall rectify the installation or replace the equipment as necessary at his own expenses to the satisfaction of the Contract Manager.

FWP6.7 TESTING AND CERTIFICATION

FWP6.7.010.5 TEST

The pumps shall be tested to ISO 2548.

FWP6.7.015.5PROVISION OF TEST PIECE FOR STAINLESS STEEL FLUSH WATER
PUMP AND ATTENDANCE FOR INSPECTION AND TESTING

- 1. A test piece, forming an integral part of the pump casing shall be provided for each stainless steel flush water pump. The size and shape of the test piece shall not be smaller than 25mm diameter x 150mm length. The test piece shall be suitable for conducting the following local tests:
 - a. Tensile test;
 - b. Test for the material composition.
- 2. The Sub-contractor shall provide assistance, instruments, machines, labour and other facilities necessary for cutting the test piece, open-up inspection and examining the quality of pump. The pump shall be randomly selected by the Contract Manager. The Sub-contractor shall arrange such inspection in his workshop or unless elsewhere approved;
- 3. The expense of complying with the above requirements, including any transportation costs, tests etc. shall be borne by the Sub-contractor;
- 4. The Sub-contractor shall cut the test piece in the presence of the Contract Manager or his representatives and send it to a local designated laboratory for carrying out the material composition analysis and tensile testing;
- 5. The pumps shall be free from blow holes, sand pockets, cracks, welding, pitting, hammering marks, excessive machining / wearing and other detrimental defects;
- 6. If the selected pump fails either the tensile test or material composition test as mentioned in sub-clause (1) above or the open-up inspection, the entire batch of stainless steel flush water pumps shall be rejected. The Contract Manager or his representatives may at his discretion to call for further open-up inspection and material test on another pump as appropriate. The cost so arisen will be borne by the Sub-contractor;
- 7. For the rejected pumps, the Sub-contractor shall arrange free replacement of them in accordance with the Conditions of Contract, and no extension of time to the Contract period will be allowed.

FWP6.7.020.5 PUMP CERTIFICATES

- 1. Each pump shall be provided with a certificate issued and signed by the manufacturer. The certificate shall clearly record the pump model, serial number and the materials of the casing, shaft and impeller.
- 2. Each pump or each batch of pumps shall also be provided with a certificate on their place of manufacture. The certificate shall be issued by a recognized Chamber of Commerce of the place of manufacture concerned.

FWP6.8.010.5

FWP6.8 DOCUMENTATION

IN-SERVICE RECORDS FOR STAINLESS STEEL FLUSH WATER PUMPS

- 1. When instructed by the Contract Manager, the Sub-contractor shall submit full details and particular of in-service records established in local application for the pump offered to substantiate conformance with the Specification. Failure to submit full and complete details and particulars of in-service records or failure to allow sufficient time for site inspection may result in rejection of the pump offered;
- 2. The in-service records shall contain the following information:
 - a. Place of manufacture of the materials and parts of the pump;
 - b. Rated capacity of the pump, which shall not be less than 6 l/s and 70m at 1450 rpm unless otherwise accepted by the Contract Manager;
 - c. Period of continuous and satisfactory operation and maintenance which shall be at least six months prior to the time of tender submission; and
 - d. Provision of a test piece for materials composition and tensile test and openup inspection.

FWP6.8.020.5 WARRANTY FOR STAINLESS STEEL FLUSH WATER PUMPS

- 1. The stainless steel pump shall be warranted against inferior materials, faulty workmanship and design for a period of five years from the date of completion certified by the Contract Manager in the certificate of completion for a Section or a part of the Works within the scope of which the pump is installed. Any replacement of parts, components or the pump as a whole incurred within the warranty period shall be replaced free of charge by the supplier/manufacturer;
- 2. The supplier shall in writing, undertake to supply and install free replacement parts and components for all defective items excluding consumable items such as bearings, soft packings, wearing rings and sleeves found during the warranty period;
- 3. Each pump must be shipped with a warranty certificate endorsed by the manufacturer covering the five years warranty period. Material specification and chemical composition for each pump casing, impeller, shaft and diffuser etc. shall be issued and certified by the manufacturer at the time of shipment. Each pump shall be provided with a nameplate showing the manufacturer's name, serial number, head and flow rate, speed, rated power absorbed, material used and warranty expiry date. The Sub-contractor shall bear all cost for providing, punching the information on and re-fixing the nameplate;
- 4. The Sub-contractor shall submit the contents and format of the warranty to the Contract Manager or his representatives for approval before the shipment of pump;
- 5. The supplier/manufacturer should also give free on site technical support during the testing and commissioning period of the stainless steel pump and for the duration of the five years warranty period when requested by the Contract Manager or his appointed representatives.

Process for Promulgation of New/Revised Specification



BC 91/2014 Paper no. <u>QH 6/2014</u>

Memorandum for the Building Committee of the Hong Kong Housing Authority

QUALITY HOUSING: PARTNERING FOR CHANGE

Promulgation of Housing Authority Specification Library 2014 Edition

PURPOSE

This paper informs Members of the promulgation of the Housing Authority (HA) Specification Library 2014 Edition (SL2014).

BACKGROUND

2. Since the issue of Specification Library 2012 Edition (SL2012) in December 2012 (Paper No. **BC 86/2012 QH 11/2012** refers), we have been reviewing and updating its technical contents continuously to improve productivity, buildability, sustainability and built quality, to address stakeholders' feedback, to adopt updated standards and initiatives arising from advancement in technology and changes in HA's policy. We have been keeping Members of the HA and its Committees informed of the major enhancements to the Specification Library (SL), and have promulgated the new / revised specification clauses for implementation. A summary of the significant changes to SL2012 is at **Annex 1**. These changes have all been incorporated in SL2014.

3. We generally issue a new edition of SL every four years. It has been necessary to promulgate SL2014 less than two years after SL2012 to incorporate revisions to conform to HA's new standard Conditions of Contract 2013 Edition (HAGCC 2013) to facilitate its implementation in HA's capital works contracts ^{Note 1}.

Note 1 Including building, foundation, civil engineering and miscellaneous works contracts and building services sub-contracts, for which tenders are called in or after May 2014 (Paper No. BC 88/2013, TC 90/2013, QH 6/2013 refers).

SPECIFICATION LIBRARY 2014 EDITION (SL2014)

4. We have compiled all the revisions since SL2012 that had been promulgated via 26 divisional instructions and the revisions due to the implementation of HAGCC 2013. A total of 931 new or revised specification clauses have been incorporated in the new SL2014 out of a total of 9,374 specification clauses. The changes in SL cover the following aspects as summarized in <u>Annex 1</u> -

(a)	Changing in SL Enhancing the Quality System and Services by	No. of clauses 547
	implementing HAGCC 2013	
(b)	Revisiting our Quality Resources Management	3
(c)	Fostering Partnering with the Industry	21
(u) (e)	Enhancing Site Safety Environment and Hygiene	44
(C) (f)	Enhancing Quality Products and Productivity	16
(g)	Others (general minor updating)	281
	Total	931

5. We will use SL2014 in new capital works contracts for which tenders are called in or after October 2014. We will upload SL2014 to the intranet-based Specification Library Information System (SLIS) and will upgrade it to perform search, browse and navigate functions for both SL2012 and SL2014.

EFFECTS ON QUALITY, PUBLICITY AND PUBLIC REACTION

6. In the continuous review of the technical contents of the SL, we have taken into account HAGCC 2013, stakeholders' feedback, HA's quality initiatives and industry practices in pursuit of continuous improvement. Stakeholders and the public would welcome this new edition of the SL for enhancing productivity and built quality for our public housing developments.

7. We have now incorporated all these revisions in the new SL2014. We have consulted all stakeholders, including Hong Kong Construction Association Limited (HKCA), the Hong Kong Federation of Electrical & Mechanical Contractors Limited (HKFEMC) and in-house users of all disciplines.

FINANCIAL IMPLICATIONS

8. The financial implications arising from the revisions to the SL have been reflected in the June 2014 cost yardsticks (Paper No. **BC 57/2014** refers).

INFORMATION

9. This paper is for Members' information.

Miss Angie AU YEUNG Secretary, Building Committee Tel. No. 2761 7465 Fax. No. 2761 0019

c.c. Members of Tender Committee

ANNEX

Annex 1 Summary of Significant Changes in Specification Library 2012

File Ref.	:	HD(ST) 1/8/2
		(Development and Construction Division)
Date of Issue	:	21 November 2014

Annex 1 (Page 1 of 4)

Summary of Significant Changes to Specification Library 2012

	Item	BC or TC Papers	No. of Clauses involved
(a)	Enhancing the Quality System and Services		
	 (i) Implement the new standard Conditions of Contract (2013 Edition) in all new capital works contracts Revisions to conform with the new GCC, e.g. Date for commencement of Sections are not necessary the same as the notified date for commencement of the Works; Re-number of PRE clauses; and Update references in Nominated Sub-contracts for building services installation 	BC 88/2013, TC 90/2013, QH 6/2013 Standard Conditions of Contract for Housing Authority's Capital Works Contracts (2013 Edition)	547
	mstandtom	Sub-total	547
(b)	Revisiting our Quality Resource	ces Management	
	 (i) Implement overhaul requirements on major construction plant on HA sites. 	BC 72/2013 Progress Report on the Implementation of the HA Site Safety Strategy in 2012 QH 57/2014 June 2014 Construction Cost Yardsticks	3
		Sub-total	3
(c)	Fostering Partnering with the	Industry	
	 (i) Enhance wage monitoring system to secure and monitor wage payment to workers Terms of the employment contract shall not be less favourable to those provided in the "Specimen Employment Contract" published by DEVB from time to time. 	BC 24/2006, TC 32/2006 Improvement Measures to Secure Wages Payment to Workers in the HA Construction Contracts TC 107/2013 Programme of Activities for Procurement for 2014/15	21
		Sub-total	21

Annex 1 (Page 2 of 4)

Summary of Significant Changes to Specification Library 2012

	Item	BC or TC Papers	No. of Clauses involved
(d)	Implementing Green Design and Construction		
	 Use 6-litre single flush and dual flush close-coupled water closet suites; 	BC 27/2011, QH 3/2011 Planning and Designing for Green and Healthy Living in New Estates	3
		BC 106/2013 Programme of Activities for Development & Construction and Building Control in 2014/15	
	(ii) Implement the measurement of indoor air quality;	BC 27/2011, QH 3/2011 Planning and Designing for Green and Healthy Living in New Estates	3
		BC 106/2013 Programme of Activities for Development & Construction and Building Control in 2014/15	
	(iii) Revise cooking bench design for new public housing developments; and	BC 62/2012 Revised Cooking Bench Design for New Public Housing Developments	12
	 (iv) Adopt rainwater harvesting system and provide pre-settlement tank in 	BC 27/2011, QH 3/2011 Planning and Designing for Green and Healthy Living in New Estates	1
	domestic block.	BC 106/2013 Programme of Activities for Development & Construction and Building Control in 2014/15	
		Sub-total	19
(e)	Enhancing Site Safety, Environ	ment and Hygiene	
	 (i) Implement caring programme for new workers, probationers and new comers; 	BC 72/2013 Progress Report on the Implementation of the Housing Authority site Safety Strategy in 2012	3
	 (ii) Implement surprise safety inspection programme in HA new capital works contracts; 	BC 72/2013 Progress Report on the Implementation of the Housing Authority site Safety Strategy in 2012	2
	(iii) Implement caring measures for protection of workers from heat stroke on Site;	BC 72/2013 Progress Report on the Implementation of the Housing Authority site Safety Strategy in 2012	3

Annex 1 (Page 3 of 4)

Summary of Significant Changes to Specification Library 2012

	Item	BC or TC Papers	No. of Clauses involved
	 (iv) Employ Environmental Manager on Site to oversee the submission and updating of Environmental Management Plan; 	TC 4/2012 Review of Integrated Pay for safety Environment and Hygiene Scheme	13
	 (v) Provide safety equipment for personal protection of operatives, CM's representatives and visitors; 	TC 4/2012 Review of Integrated Pay for safety Environment and Hygiene Scheme	5
	 (vi) Implement green initiatives including temporary site greening, electrical/solar hot water heater system for showers, food waste composter and electric vehicle; and 	BC57/2014 June 2014 Construction Cost Yardsticks	11
	(vii) Implement enhanced requirements on design, storage and maintenance of large panel formwork.	BC57/2014 June 2014 Construction Cost Yardsticks	7
		Sub-total	44
(f)	Enhancing Quality Products and	d Productivity	
	 (i) Implement enhanced specification for timber doorsets to accord with the Code of Practice for Fire Safety in Buildings 2011 and other environmental initiatives Adopt BS EN 1634 as well as BS 476 standards; Initiate requirement for testing the endurance of smoke seal; and Incorporate specification allowing the use of finger and composite joints in timber door construction. 	BC57/2014 June 2014 Construction Cost Yardsticks	16
	1	Sub-total	16

Annex 1 (Page 4 of 4)

	Item	BC or TC Papers	No. of Clauses involved
(g)	Others (General minor updating	g)	
	 Incorporate illustration drawings e.g. sketches showing the proposed location of RFID tags of precast façade, aluminium window, timber door and metal gateset; Delete obsolete guidance notes and specification clauses; and Update terminologies, Code of Practice and relevant standards. 	N.A.	281
		Total	931