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

Quality Control of the Fresh Water Supply System in Hong Kong

PURPOSE

This paper aims to brief members on the prevailing control measures, including statutory and other related requirements, which the Government has put in place to ensure the quality of fresh water supply for buildings in Hong Kong.

STATUTORY REQUIREMENTS UNDER BUILDING ORDINANCE AND OTHER RELATED REQUIREMENTS

2. Statutory control of building works[1] is stipulated in the Buildings Ordinance (BO) (Cap.123), and its subsidiary regulations. BO specifies that person(s) for whom building works are carried out shall appoint -

(a) Authorized Person[2] (AP) to coordinate and supervise the building works (Section 4 of BO (**Annex A**) refers); and

(b) Registered General Building Contractor (RGBC) to carry out and continuously supervise the building works (Section 9 of BO (**Annex B**) refers).

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1 Building works include any kind of building construction, site formation works, ground investigation in scheduled areas, foundation works, repairs, demolition, alteration, addition and every kind of building operation, and include drainage works (BO Section 2 refers).

2 A registered architect / a registered professional engineer in civil or structural engineering discipline / a registered professional surveyor can be qualified by Building Authority (BA) to perform the duties and functions of authorized person in accordance with the BO.

Duties of AP and RGBC under BO

3. Regulations 37 and 41 of Building (Administration) Regulations (Cap.123A) (**Annexes C and D**) stipulate respectively that AP shall give periodical supervision and make such inspections as may be necessary, and RGBC shall give continuous supervision, to ensure the building works are carried out in accordance with –

(a) the provisions of the BO and its regulations;

(b) the plans approved by the Building Authority (BA);

(c) the supervision plan prepared in compliance with the Technical Memorandum issued under section 39A of the BO (**Annex E**); and

(d) any order made or condition imposed by the BA.

4. AP and RGBC shall appoint Technically Competent Persons (TCPs) to give supervision as required under the supervision plan on each site. The Code of Practice for Site Supervision gives guidance on the frequency level of site inspection by TCPs on quality and safety in relation to the scale and complexity of the works, as well as the qualification and experience requirements of each grade of TCP.

Precast Concrete Construction

5. For precast concrete elements not fabricated on the building site, the Buildings Department stipulates in "Practice Notes for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers" (PNAP) No. APP 143 (**Annex F**), the requirements on quality assurance and supervision of precast concrete construction.

Certification of Completion under BO

6. Upon completion, Regulation 25 of Building (Administration) Regulations (Cap.123A) (**Annex G**) stipulates that AP and RGBC shall certify that the building works have been carried out in accordance with the provisions of the BO and its regulations, and in accordance with the plans approved in

respect of the building works.

STATUTORY REQUIREMENTS UNDER WATERWORKS ORDINANCE AND OTHER RELATED REQUIREMENTS

7. Statutory requirements relating to the water supply system are stipulated in the Waterworks Ordinance (WO) (Cap.102) and the Waterworks Regulations (Cap. 102A) (**Annexes H and I** refer).

8. For the purposes of administering WO and controlling the quality of water supply, the Water Authority (WA) has issued various forms, guidelines, handbooks, circular letters, etc. (see **Annex J**).

Responsibility of a Licensed Plumber

9. In accordance with section 14 of WO –

(a) the construction or installation of plumbing system, and the nature, size and quality of pipes and fittings shall be as prescribed by WO and Waterworks Regulations; and

(b) Any person who contravenes item (a) above shall be guilty of an offence.

10. In accordance with section 15 of WO, only a licensed plumber (LP) is permitted to construct and install the pipes and fittings used for water supply (except a public officer authorized by the WA). Engagement of LP by the Registered Consumer[3] shall be made via Form WWO 46 (**Appendix 2**).

Control of Pipes and Fittings

11. Regulation 19 of the Waterworks Regulations stipulates that any pipe or fitting installed shall follow Schedule 2 of the Regulations, which set out the

3 According to Section 7 of WO, WA may approve, as the consumer, any person who (a) occupies the premises; or (b) is responsible for the management of the premises; and (c) gives an undertaking to pay any charge due and accept the responsibility for the custody and maintenance of the service.

detailed requirements and specifications relating to the pipes and fittings, taps and valves, etc.

12. Regulation 20 of the Waterworks Regulations stipulates that the size, nature, materials, strength, test requirements and workmanship of any pipe or fitting shall be of the British Standard.

Control of Soldering materials

13. The connection method of water supply pipes varies according to the size and material of the pipes. Soldering is one of the methods for copper pipe connections. The soldering materials have to comply with relevant international standards as stipulated in Regulation 19, 20 and Schedule 2 of the Waterworks Regulations. Soldering alloys with lead are not permitted in installations for water for human consumption[4].

Certification by AP and LP under WO

14. Upon approval by the WA on all pipes and fittings intended to be installed, the LP shall notify the WA of the commencement date and the scope of plumbing works to be carried out in accordance with the plumbing drawings approved by the Water Supplies Department (WSD) (Part I of Form WWO 46 (**Appendix 2**) refers). In this form, AP and LP shall jointly certify that the pipes and fittings are in compliance with Waterworks Regulations.

15. Regulation 6 of the Waterworks Regulations specifies that, upon completion of works –

(a) LP shall apply to the WA for inspection and approval of the plumbing installation (Part IV of Form WWO 46 (**Appendix 2**) refers); and

(b) AP shall apply to the WA for connection of water supply and confirm

4 Clause 17 of Schedule 2 to the Waterworks Regulations stipulates compliance with BS864 Part 2. This British Standard was superseded by BS EN 1254-1: 1998, which states in 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.

that the plumbing is in full compliance with Waterworks standards and requirements (Part II of Form WWO 132 (**Appendix 1**) refers).

Cleansing and Disinfection of Fresh Water Inside Service

16. WSD Circular Letter No. 2/2012 issued on 10 August 2012 specifies guidelines on cleansing and disinfection of fresh water inside service (**Appendix 4**). For newly completed buildings, contractors have to arrange for cleansing and disinfection of the water supply system within each building. WSD will collect water samples from water connection points for testing and analysis. Quality of water samples shall comply with WSD's requirements (testing parameters include: pH, colour, turbidity, conductivity, free residual chlorine, E.Coli, total Coliform and Heterotrophic plate count) before connection of water supply and issuing the certificate for permanent water connection to the building, which is a pre-requisite for application of Occupation Permit.

Prohibition of Using Leaded Solder at Fresh Water Inside Services and New Parameters for Testing of Water Sample

17. WSD Circular Letter No. 1/2015 on 13 July 2015 specifies the prohibition of using leaded solder at fresh water inside services and new parameters for testing of water samples (**Appendix 5** refers). For all applications for new water supply submitted on or after 13 July 2015, if soldering is used in the connection between water pipes, a supporting document of lead free grade soft solder or filler metal used in soldering, brazing and/or welding construction methods is required.

Quality of drinking water

18. WSD also administers a voluntary "Quality Water Supply Schemes for Buildings – Fresh Water" (the Scheme). The objective is to encourage proper maintenance and repair of the building water supply system. Under the Scheme, fresh water tanks have to be cleaned at least once every three months, while random water samples have to be collected regularly for testing. Testing parameters include pH, colour, turbidity, conductivity, iron, E. Coli and total Coliform.

INFORMATION

19. This paper is issued for Members' information.

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Annex A

Contents of Section

Chapter:	123	Title:	**Buildings Ordinance**	Gazette Number:	E.R. 1 of 2012
Section:	4	Heading:	**Appointment and duties of authorized person, registered structural engineer or registered geotechnical engineer**	Version Date:	09/02/2012

(1) Subject to subsection (1A), every person for whom building works or street works are to be carried out shall appoint— (Amended 20 of 2008 s. 6)

(a) an authorized person as the co-ordinator of such building works or street works; (Amended 15 of 2004 s. 5)
(b) a registered structural engineer for the structural elements of such building works or street works if so required under this Ordinance; and (Amended 54 of 1996 s. 5; 15 of 2004 s. 5)
(c) a registered geotechnical engineer for the geotechnical elements of such building works or street works if so required under this Ordinance. (Added 15 of 2004 s. 5)

(1A) Subsection (1) does not apply in respect of minor works commenced under the simplified requirements. (Added 20 of 2008 s. 6)
(2) If an authorized person, a registered structural engineer or a registered geotechnical engineer so appointed becomes unwilling to act or unable, whether by reason of the termination of his appointment or for any other reason, to act, the person for whom the building works or street works are to be or are being carried out shall appoint another authorized person, registered structural engineer or registered geotechnical engineer, as the case may be, in his stead:

Provided that, where an authorized person, a registered structural engineer or a registered geotechnical engineer, is temporarily unable to act by reason of his illness or absence from Hong Kong, he may nominate another authorized person, registered structural engineer or registered geotechnical engineer to act in his stead for the period of such illness or absence. (Amended 15 of 2004 s. 5)

(3) Any authorized person, any registered structural engineer and any registered geotechnical engineer appointed or nominated under subsection (1) or (2) shall— (Amended 15 of 2004 s. 5)

(a) supervise the carrying out of the building works or street works, as the case may be, in accordance with the supervision plan; (Amended 54 of 1996 s. 5)
(b) notify the Building Authority of any contravention of the regulations which would result from the carrying out of any work shown in any plan approved by the Building Authority in respect of the building works or street works; and
(c) comply generally with this Ordinance.

(4) A structural engineer may not be appointed under subsection (1)(b) unless he is registered in the structural engineers' register. (Amended 54 of 1996 s. 5)
(5) A geotechnical engineer may not be appointed under subsection (1)(c) unless he is registered in the geotechnical engineers' register. (Added 15 of 2004 s. 5)

(Replaced 52 of 1974 s. 4)

Annex B

Contents of Section

Chapter:	123	Title:	**Buildings Ordinance**	Gazette Number:	E.R. 1 of 2012
Section:	9	Heading:	**Appointment and duties of registered contractors**	Version Date:	09/02/2012

(1) A person is required to appoint a registered general building contractor to carry out for him building works or street works other than— (Amended 20 of 2008 s. 12)

(a) specialized works; and
(b) minor works. (Amended 20 of 2008 s. 12)

(2) A person is required to appoint a registered specialist contractor to carry out for him specialized works (other than the specialized works designated as minor works) of the category for which the contractor is registered. (Amended 20 of 2008 s. 12)
(3) A person is required to appoint another registered general building contractor to continue to carry out for him building works or street works other than specialized works if the appointed registered general building contractor for the works is unwilling or unable to act.
(4) A person is required to appoint another registered specialist contractor to continue to carry out for him specialized works of the category for which the contractor is registered if the appointed registered specialist contractor for the works is unwilling or unable to act.
(5) A registered general building contractor appointed to carry out building works or street works other than specialized works is required to—

(a) provide continuous supervision to the carrying out of the works in accordance with his supervision plan;
(b) notify the Building Authority of any contravention of the regulations that would result from carrying out the works shown in the plan approved by the Building Authority for the works; and
(c) comply generally with this Ordinance.

(6) A registered specialist contractor appointed to carry out specialized works is required to—

(a) provide continuous supervision to the carrying out of the works in accordance with his supervision plan;
(b) notify the Building Authority of any contravention of the regulations that would result from carrying out the works shown in the plan approved by the Building Authority for the works; and
(c) comply generally with this Ordinance.

(7) (Repealed 15 of 2004 s. 15)

(Replaced 54 of 1996 s. 10)

Annex C

Contents of Section

Chapter:	123A	Title:	**Building (Administration) Regulations**	Gazette Number:	E.R. 1 of 2012
Regulation:	37	Heading:	**Duty of authorized person, registered structural engineer or registered geotechnical engineer**	Version Date:	09/02/2012

(1) The authorized person appointed in respect of any building works or street works shall give such periodical supervision and make such inspections as may be necessary to ensure that the building works or street works are being carried out in general accordance with the provisions of the Ordinance and regulations, the plans approved in respect thereof by the Building Authority, the supervision plan prepared in compliance with the technical memorandum issued under section 39A of the Ordinance (if required) and any order made or condition imposed, pursuant to any provision of the Ordinance or regulations in that behalf, by the Building Authority.

(2) The registered structural engineer or the registered geotechnical engineer appointed in respect of any building works or street works shall give such periodical supervision and make such inspections as may be necessary to ensure that the structural works or geotechnical works, as the case may be, are being carried out in general accordance with the provisions of the Ordinance and regulations, the plans approved in respect thereof by the Building Authority, the supervision plan prepared in compliance with the technical memorandum issued under section 39A of the Ordinance (if required) and any order made or condition imposed, pursuant to any provision of the Ordinance or regulations in that behalf, by the Building Authority. (15 of 2004 s. 54)

(3) Where a supervision plan is required, the authorized person, the registered structural engineer and the registered geotechnical engineer are each required to appoint such number of technically competent persons as appropriate to give such supervision as may be required under the supervision plan on each site for which the authorized person, the registered structural engineer and the registered geotechnical engineer are appointed under section 4 of the Ordinance. (15 of 2004 s. 54)

(4) The Building Authority has the power to reject or revoke the appointment of any person as a technically competent person appointed under paragraph (3) if the Building Authority is not satisfied that the qualifications or experience of the person appointed are sufficient for him to carry out the duties required of him.

(L.N. 514 of 1997)

Annex D

Contents of Section

Chapter:	123A	Title:	**Building (Administration) Regulations**	Gazette Number:	E.R. 1 of 2012
Regulation:	41	Heading:	**Duty of registered contractor to supervise**	Version Date:	09/02/2012

(1) The registered general building contractor, registered specialist contractor and registered minor works contractor appointed in respect of building works or street works shall, during the carrying out thereof, give continuous supervision thereto to ensure that the building works or street works, as the case may be, are carried out in accordance with the provisions of the Ordinance and regulations and with the plans approved in respect thereof and with any order made or condition imposed, pursuant to any provision of the Ordinance or regulations in that behalf, by the Building Authority and the supervision plan prepared in compliance with the technical memorandum issued under section 39A of the Ordinance (if required). (L.N. 514 of 1997)

(2) Where a supervision plan is required, the registered general building contractor, registered specialist contractor and registered minor works contractor are each required to appoint such number of technically competent persons as appropriate to give such supervision as may be required under the supervision plan on each site for which the registered general building contractor, registered specialist contractor and registered minor works contractor are appointed under section 9 or 9AA of the Ordinance. (L.N. 514 of 1997)

(3) The Building Authority has the power to reject or revoke the appointment of any person as a technically competent person appointed under paragraph (2) if the Building Authority is not satisfied that the qualifications or experience of the person appointed are sufficient for him to carry out the duties required of him. (L.N. 514 of 1997)

(4) A registered general building contractor, registered specialist contractor and registered minor works contractor are required to keep records of activities and information relevant to the supervision of the building works or street works of any site for which they are appointed. (L.N. 514 of 1997)

(5) The Building Authority may inspect the records and information required to be kept under paragraph (4) at any reasonable time. (L.N. 514 of 1997)

(6) The registered general building contractor, registered specialist contractor and registered minor works contractor are required to retain the records and information required to be kept under paragraph (4) for at least 12 months after the submission of the certificate on completion of the final stage of the building works or street works of the site. (L.N. 514 of 1997)

(20 of 2008 s. 42)

Annex E

Contents of Section

Chapter:	123	Title:	**Buildings Ordinance**	Gazette Number:	L.N. 82 of 2012
Section:	39A	Heading:	**Technical memorandum**	Version Date:	30/06/2012

(1) The Secretary may issue a technical memorandum dealing with— (Amended L.N. 330 of 1999; L.N. 106 of 2002; L.N. 130 of 2007; 20 of 2008 s. 26)

(a) the circumstances in which a supervision plan is not required for building works or street works;
(b) the classes of supervision that the Building Authority identifies as appropriate to various types of building works and street works having regard to the complexity of the building works or street works, the manpower required and level of supervision required for each of the classes of supervision;
(c) detailed supervision requirements for various types of building works and street works including the management structure required to ensure site safety, the manpower required for each element of the management structure, the qualifications and experience of the personnel involved and the specific tasks to be associated in each element of the management structure;
(d) the method statement of various types of building works and street works, the types of precautionary and protective measures required to be undertaken for the safety of the site, the workers and the public, and such other details relating to site safety as the Building Authority may consider necessary;
(e) the qualifications and experience required for technically competent persons to be appointed for supervisory work under supervision plans;
(f) the circumstances in which an authorized person, registered structural engineer, registered geotechnical engineer, registered inspector, registered general building contractor, registered specialist contractor or registered minor works contractor is permitted to notify in retrospect for minor deviations from a supervision plan; (Amended 15 of 2004 s. 29; 20 of 2008 s. 26; 16 of 2011 s. 25)
(g) the method and timing of notification of, and the amendment procedures for, a proposed or actual deviation from a supervision plan, including deviations caused by an emergency;
(h) the form and content of a supervision plan;
(i) the general responsibilities of the site supervision personnel for the various types of building works and street works;
(j) the procedure, timing and sequence for the submission of supervision plans.

(2) The Secretary must publish a technical memorandum issued under this Ordinance in the Gazette and cause it to be laid on the table of the Legislative Council at the next sitting after publication.
(3) Where the Secretary has caused a technical memorandum to be laid on the table of the Legislative Council, the Legislative Council may, by resolution passed at a sitting of the Legislative Council held before the expiry of a period of 28 days after the sitting at which it was laid, provide that the technical memorandum be amended in any manner consistent with the power to issue the technical memorandum.
(4) If the period for passing a resolution would, but for this subsection, expire—

(a) after the end of a session of the Legislative Council or after a dissolution of the Legislative Council; but
(b) on or before the day of the second sitting of the Legislative Council in the next following session of the Legislative Council,
the period is deemed to extend to and expire on the day after that second sitting.

(5) Before the expiry of the period referred to in subsection (3) or that period as extended by virtue of subsection (4), the Legislative Council may by resolution in relation to a technical memorandum specified therein—

(a) in the case of the period referred to in subsection (3), extend that period to the first sitting of the Legislative Council held not earlier than the twenty-first day after the day of its expiry;
(b) in the case where the period referred to in subsection (3) has been extended by virtue of subsection (4), extend that period as so extended to the first sitting of the Legislative Council held not earlier than the twenty-first day after the day of the second sitting in that next following session. (Replaced 8 of 2002 s. 7)

(6) A resolution passed by the Legislative Council under this section must be published in the Gazette not later than 14 days after the resolution is passed or within such further period as the Secretary may allow in any particular case.
(7) A technical memorandum issued under subsection (1) is not subsidiary legislation.
(8) In this section, ***sitting*** (立法會會議), when used to calculate time, means the day on which the sitting commences and only includes a sitting at which subsidiary legislation is included on the order paper. (Amended 62 of 2000 s. 3)
(9) Unless the Secretary appoints a later date either in the memorandum or by notice in the Gazette, a technical memorandum commences to have effect—

(a) if the Legislative Council does not pass a resolution amending the technical memorandum, upon the expiry of the period, or the period as extended, as the case may be, for passing an amending resolution; and
(b) if the Legislative Council passes a resolution amending the technical memorandum, at the beginning of the day of the publication in the Gazette of the resolution.

(10) If the Secretary issues a technical memorandum under this Ordinance, he must make available a copy of the technical memorandum for inspection by the public free of charge at such offices of the Government as the Secretary directs during business hours.

(Added 54 of 1996 s. 21)

Buildings Department	Practice Note for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers	APP-143

Quality Control and Supervision of Precast Concrete Construction

Introduction

In recent years, the use of precast concrete in private building developments in Hong Kong has increased. To ensure that the precast concrete elements are of good quality, proper supervision and adequate quality control are necessary during the production, erection and inspection processes of the concrete elements. This practice note sets out the requirements for the quality control and supervision of key precast concrete elements not fabricated on the building site. The requirements stipulated in this practice note do not apply to minor elements such as non-structural precast concrete block work, architectural features and planters.

Duties of the Authorized Person, Registered Structural Engineer and Registered Contractor

2. The Authorized Person (AP), Registered Structural Engineer (RSE) and Registered Contractor (RC) have the responsibilities under the Buildings Ordinance (BO) to ensure that the precast concrete works comply with the provisions and standards of the BO and the approved plans. In accordance with Section 4(3)(a) of the BO and Regulation 37 of the Building (Administration) Regulations (B(A)R), adequate supervision has to be provided by the AP and RSE for the carrying out of the precast concrete works, whereas the RC has to provide continuous supervision, as required under Section 9(5)(a) and 9(6)(a) of the BO and Regulation 41 of the B(A)R, for the carrying out of such works.

Quality Assurance

3. Under item 6 in Section 17(1) of the BO, a condition will be imposed, when giving approval of plans, that precast concrete elements should be manufactured by a factory with ISO 9000 quality assurance certification.

4. Under Regulation 10 of the B(A)R, a requirement will be imposed, when giving approval of plans, that a copy of the Quality Assurance Scheme of the manufacturer should be submitted prior to the application for consent to the commencement of the works. Such submission should be appended with a statement signed by the RSE to confirm that the scheme has adequate provisions in ensuring the quality of production complying with the provisions of the BO and the approved plans.

5. The Quality Assurance Scheme should cover the following items:

(a) Quality control tests of materials;

(b) Calibration of laboratory equipment for quality control tests;

/(c) .....

(c) Efficiency and proper operation of equipment at the casting yard;

(d) Production process;

(e) Testing procedures and requirements;

(f) Frequency and extent of inspection by in-house staff and independent parties; and

(g) Frequency and extent of audit by in-house staff and independent parties.

Qualified Supervision

6. Under item 6 in Section 17(1) of the BO, a condition will be imposed, when giving approval of plans, that qualified supervision should be provided by the RSE and the RC for the fabrication, erection and examination of precast concrete elements.

7. The RSE should assign a structural quality control supervisor to supervise the precast concrete production works. The RSE should determine the necessary frequency of supervision, which should be no less than once a week. The minimum qualifications and experience of the quality control supervisor are to be the same as grade T3 technically competent person (TCP) under the RSE's stream, as stipulated in the Code of Practice for Site Supervision.

8. The RC should assign a quality control co-ordinator to provide continuous supervision of the precast concrete production works in the factory. The minimum qualifications and experience of the quality control co-ordinator are to be the same as grade T1 TCP under the RC's stream, as stipulated in the Code of Practice for Site Supervision.

9. The names and qualifications of the supervisory personnel assigned by the RSE and RC respectively should be recorded in an inspection log book. The details of precast concrete production, inspection, auditing and testing should be recorded in the log book by the supervisory personnel. The log book should be kept in the factory and a copy of it should be kept at the building site office and, when required, produced to officers of the Buildings Department for inspection.

10. In addition, the RSE and the Authorized Signatory (AS) of the RC should inspect and carry out audit checks to the precast concrete factory at least once every month. Under Regulation 10 of the B(A)R, a requirement will be imposed, when giving approval of plans, that a copy of the RSE's audit reports of the precast concrete factory and a copy of the AS's audit reports of the precast concrete factory duly endorsed by the RSE should be submitted to the Buildings Department for record purpose. The RSE and AS's audit reports should respectively also cover the qualified supervisions by the structural quality control supervisor of RSE's stream and the quality control co-ordinator of AS's stream. Minimum requirements of the audit checks are detailed in Appendix A.

/11. .....

11. As an alternative to the requirement for the RSE's qualified supervision at the precast concrete factory specified in paragraph 10 above, the RSE may consider carrying out on-site audit checks to the quality of the precast concrete elements delivered to the building site. In such situation, the RSE is required to notify the Building Authority in writing before commencement of works, and to submit a copy of on-site audit reports on the quality of the precast concrete elements delivered to the building site to the Buildings Department for record purpose, covering the qualified supervisions by the structural quality control supervisor. Minimum requirements of the on-site audit checks by the RSE are detailed in Appendix B.

12. For good practices in the design, construction and quality control of precast concrete works, reference should be made to the recommendations and guidelines given in the Code of Practice for Precast Concrete Construction issued by the Buildings Department.

Separate Registered Structural Engineer

13. For precast concrete elements not affecting the stability of the parent structure, such as the precast concrete façade or staircase, a separate RSE may be appointed to prepare the design and to supervise the production and erection of such precast concrete elements. In such situation, the specified Forms BA4 and BA5 notifying the appointment of a separate RSE and the scope of works for which he/she is responsible are required to be submitted together with the plans for approval. The project RSE shall also notify the Building Authority in writing that he/she is fully aware of the appointment of a separate RSE and the demarcation of responsibilities. Upon completion of the precast concrete construction works, the separate RSE so appointed is required to certify the satisfactory completion of the works in accordance with Regulation 25(3) of the B(A)R.

14. The separate RSE's submission should be accompanied by an assessment report prepared by him/her giving an account of the effect of the proposed precast concrete works on the parent structure. The assessment report shall be appended with a statement of the project RSE to confirm that he/she is fully aware of the connection details and their effects on the parent structure.

15. The separate RSE shall be responsible for the supervision of the production and erection of the precast concrete elements, including the connection between the precast concrete elements and the parent structure, i.e. ties, anchor plates, cast-in embeds etc., except in the event where such associated works have been installed in the parent structure prior to his/her appointment. For such cases, the structural details and layout of the pre-installed parts should be given in the superstructure plans submitted for approval by the project RSE who shall then be responsible for the supervision of the installation of such parts. The separate RSE should refer to the pre-installed connection details when designing the precast concrete elements and should co-ordinate with the project RSE for any necessary amendment if different connection details are to be used.

16. The separate RSE shall ensure that the conditions and requirements of the quality assurance and qualified supervision as stipulated in paragraphs 3 to 5 and 6 to 11 above respectively are complied with. He/she shall also be responsible for the submission of the documents required in paragraph 4 above.

/17. .....

17. A similar practice note is issued to registered contractors.

(AU Choi-kai)
Building Authority

Ref. : BD GR/1-125/54

This PNAP is previously known as PNAP 299
First issue August 2006
Last revision April 2010
This revision July 2012 (AD/NB2) (para. 3, 4, 6, 8 & 10 amended; and para. 11, Appendix A & B added)

Appendix A
(PNAP APP-143)

Minimum Requirements of the RSE and AS's Audit Check at Precast Concrete Factory

The audit checks carried out by the RSE and the AS at the precast concrete factory should include the following works items:.

Works Item		Scope
1	Formworks	• Smoothness, cleanliness and dimensions of steel mould • Application of mould releasing agents
2	Steel reinforcing bars	• Size, pattern, fixing and layout of the steel reinforcing bars • Spacers • Concrete covers • Material testing reports
3	Concrete	• Placing and compaction • Curing • Material testing reports
4	Finished products	• Concrete surface • Sizes and dimensions • Starter steel reinforcing bars
5	Inspection records	• Log books of the structural quality control supervisor/quality control co-ordinator
6	Others	• Any other items considered essential by the RSE/AS for the project.

Appendix B
(PNAP APP-143)

Minimum Requirements of the RSE's On-site Audit Check on Precast Concrete Elements delivered to the Building Site

The audit checks on the precast concrete elements delivered to the building site carried out by the RSE as an alternative to the audit check on precast concrete elements at the precast concrete factory as specified in Appendix A should comply with the requirements specified in paragraph 2 below.

2. The rate of sampling for the audit checks shall be at least 1% of the precast concrete elements with a minimum of one per every 20 batches of delivery to the building site. The audit check for each sample of the precast concrete element should include the following works items

Works Item		Scope
1	Steel reinforcing bars	• Opening-up of the concrete surface at 3 locations, each with an area of 100mm x 300mm, to check the size, pattern and layout of the steel reinforcing bars; and the concrete covers • Measurement of the concrete cover to steel reinforcing bars by covermeter at 6 locations, each with 6 readings taken in an area of 450mm x 450mm • Material testing reports
2	Concrete	• Concrete coring at 3 locations tested for verification of concrete strength • Material testing reports
3	Finished products	• Concrete surface • Sizes and dimensions • Starter steel reinforcing bars
4	Inspection records	• Log books of the structural quality control supervisor
5	Others	• Any other items considered essential by the RSE for the project.

Remarks :
Tests for compressive strength of concrete cores should be carried out in accordance with the method specified in CS1:2010, by a laboratory accredited under HOKLAS for the particular test concerned. Test results should be reported on a HOKLAS Endorsed Certificate and submitted within 60 days of the delivery of the precast concrete elements to the building site.

(07/2012)

Annex G

Contents of Section

Chapter:	123A	Title:	**Building (Administration) Regulations**	Gazette Number:	E.R. 1 of 2012
Regulation:	25	Heading:	**Certificate to be given by registered contractor and authorized person on completion of building works**	Version Date:	09/02/2012

(1) Within 7 days of the completion of any building works in respect of which he has been appointed, the registered general building contractor, registered specialist contractor or registered minor works contractor shall, in the form specified for building works resulting in a new building or not so resulting, as the case may be, certify that the new building has been erected or the building works carried out in accordance with the provisions of the Ordinance and regulations, and the plans approved in respect of the new building and the building works by the Building Authority, and shall, within the said 7 days, deliver such certificate to the authorized person, registered structural engineer or registered geotechnical engineer, as the case may be, appointed in respect of the building works. (15 of 2004 s. 47)

(2) Within 14 days of the completion of any building works, other than demolition works, in respect of which he has been appointed, the authorized person shall, in the form specified for building works resulting in a new building or not so resulting, as the case may be, delivered to him, in accordance with the provisions of paragraph (1), by the registered general building contractor, registered specialist contractor and registered minor works contractor appointed in respect thereof, certify that the new building has been erected or the building works carried out in accordance with the provisions of the Ordinance and regulations, and the plans approved in respect of the new building and the building works by the Building Authority, and that the new building or such building works, as the case may be, are in his opinion structurally safe and shall, within the said 14 days, send such certificate to the Building Authority.

(3) Where the form specified for building works, other than demolition works, resulting in a new building or not so resulting, as the case may be, is delivered to the registered structural engineer or registered geotechnical engineer appointed in respect of the building works, in accordance with the provisions of paragraph (1), by the registered general building contractor, registered specialist contractor and registered minor works contractor appointed in respect thereof, the registered structural engineer or registered geotechnical engineer shall within 7 days of the receipt thereof certify that the new building has been erected or the building works carried out in accordance with the provisions of the Ordinance and regulations, and the plans approved in respect of the new building and the building works by the Building Authority, and that the new building or such building works, as the case may be, are in his opinion structurally or geotechnically (as the case may be) safe, and shall deliver such certificate to the authorized person who shall within 7 days of the receipt thereof send the same to the Building Authority. (L.N. 188 of 1974; 15 of 2004 s. 47)

(4) Within 14 days of the completion of any demolition works in respect of which he has been appointed, the authorized person, registered structural engineer and registered geotechnical engineer shall, in the form specified for demolition works, certify to the Building Authority that- (15 of 2004 s. 47)

(a) the demolition works have been completed in accordance with the approved plans;
(b) any structure or building remaining on the site is, in his opinion, structurally safe; and
(c) any land or street affected by the demolition works has an adequate margin of safety. (L.N. 514 of 1997)

(L.N. 188 of 1974; L.N. 347 of 1993; L.N. 514 of 1997; 20 of 2008 s. 37)

Chapter:	102	**WATERWORKS ORDINANCE**	Gazette Number	Version Date

		Long title		30/06/1997

To repeal and replace the Waterworks Ordinance 1938.

[1 January 1975] *L.N. 271 of 1974*

(Originally 44 of 1974)

Part:	I	**PRELIMINARY**		30/06/1997

Section:	1	**Short title**		30/06/1997

This Ordinance may be cited as the Waterworks Ordinance.

Section:	2	**Interpretation**	29 of 1998	01/07/1997

Remarks:
Adaptation amendments retroactively made - see 29 of 1998 ss. 23 & 105

In this Ordinance, unless the context otherwise requires-

"agent" (代理人) means a person who is approved under section 7 as an agent of a communal service;

"charge" (收費) means any charge for water, any fee, the cost of repairs or other works carried out by the Water Authority under section 17, and any other charge, including a surcharge, which is payable under this Ordinance;

"communal service" (公用供水系統) means that part of a fire service or inside service which is used in common by more than one consumer in the same premises;

"connection to the main" (總水管接駁裝配) means the pipe between the main and the control valve which is nearest to the main and which regulates the flow of a supply from the main into a fire service or inside service, such control valve and all fittings between such control valve and the main;

"consumer" (用戶) means a person who is approved under section 7 as a consumer of a fire service or inside service;

"consumption" (用水量) means the supply obtained;

"deposit" (按金) means a deposit under section 19;

"domestic purpose" (住宅用途) means a purpose connected solely with the occupation of a dwelling-house and does not include a purpose connected with a garden, lawn, playground or swimming pool appurtenant to a dwelling-house;

"fire service" (消防供水系統) means the pipes and fittings in premises, and any pipes and fittings between the premises and a connection to the main, which are used or are intended to be used for a supply solely for the purposes of fire fighting;

"fitting" (裝置) means-

(a) any apparatus, cistern, cock, equipment, machinery, material, tank, tap and valve; and

(b) any appliance or device other than a meter,

which is installed or used in a fire service or inside service;

"gathering ground" (集水區) means any surface of land-

(a) in or by which rain or other water is collected and from which water is, or is intended to be, drawn for the purposes of a supply; and

(b) which is mapped as a gathering ground under section 23;

"inside service" (內部供水系統) means the pipes and fittings in premises, and any pipes and fittings between the premises and a connection to the main, (other than the pipes and fittings forming part of a fire service) which are used or are intended to be used for the purposes of a supply;

"land held by the Government" (政府持有的土地) means land which is not-

(a) leased land; or

(b) occupied under-

(i) a licence issued under section 5 of the Land (Miscellaneous Provisions) Ordinance (Cap 28);

(ii) a licence or permit granted or issued under any other Ordinance; or

(iii) a deed or memorandum of appropriation; (Amended 29 of 1998 s. 23)

"leased land" (已批租土地) means land which is-

(a) held under a Government lease; or (Amended 29 of 1998 s. 105)

(b) vested in a person by an Ordinance;

"licensed plumber" (持牌水喉匠) means a person licensed under this Ordinance to construct, install, maintain, alter, repair or remove fire services or inside services; (Amended 81 of 1992 s. 2)

"main" (總水管) includes a connection to the main and any pipe owned by the Government and maintained by the Water Authority for the purposes of a supply;

"meter" (水錶) means an appliance or device owned by the Government and maintained by the Water Authority for the purpose of measuring consumption;

"premises" (處所) means any building or structure or any part thereof and any place-

(a) in which there is a fire service, inside service or any part of the waterworks; or

(b) in which a fire service or inside service is intended to be constructed or installed;

"public standpipe" (公眾街喉) means a standpipe owned by the Government and established by the Water Authority under section 13;

"supply" (供水) means a supply of water provided by the Water Authority from the waterworks;

"Water Authority" (水務監督) means the Director of Water Supplies; (Amended L.N. 76 of 1982)

"waterworks" (水務設施) means any property occupied, used or maintained by the Water Authority for the purposes of this Ordinance and any gathering ground.

Part:	II	**DUTIES AND POWERS OF WATER AUTHORITY**		30/06/1997

Section:	3	**Control of waterworks**		30/06/1997

(1) Subject to subsection (2), the Water Authority shall have the custody and control of the waterworks and of all water therein.

(2) Subsection (1) shall not apply to leased land within a gathering ground.

Section:	4	**Duties of the Water Authority**	29 of 1998	01/07/1997

Remarks:
Adaptation amendments retroactively made - see 29 of 1998 s. 105

(1) The duties of the Water Authority shall be-

(a) to supply water from the waterworks in accordance with this Ordinance;

(b) to acquire and conserve water;

(c) to supervise and regulate consumption;

(d) to ensure the proper administration and management of the waterworks, and to make due provision for the security thereof;

(e) to require payment of any charge and take such steps as may be necessary to enforce such payment; and

(f) generally to administer the provisions of this Ordinance.

(2) The Water Authority may do all things necessary or convenient to be done for and in connection with or incidental to the due discharge of his duties under this Ordinance and in particular may construct, install, inspect, test, regulate, alter, repair or remove any part of the waterworks in, under or over any street or land held by the Government. (Amended 29 of 1998 s. 105)

Section:	5	**Delegation by the Water Authority**		30/06/1997

(1) The Water Authority may, either generally or in any particular case, delegate any public officer to exercise or perform on his behalf any of the powers conferred or duties imposed upon him under this Ordinance.

(2) Where any power conferred or duty imposed upon the Water Authority is exercised or performed by a public officer, the Water Authority shall, unless the contrary is proved, be deemed to have delegated the public officer under subsection (1) to exercise the power or perform the duty.

Section:	6	**Power of Chief Executive to give directions**	57 of 1999	01/07/1997

Remarks:
Adaptation amendments retroactively made - see 57 of 1999 s. 3

(1) The Chief Executive may give to the Water Authority and to any public officer, other than a judge, a district judge or a magistrate, such directions as he thinks fit with respect to the exercise or performance of their respective powers or duties under this Ordinance, either generally or in any particular case.

(2) A person to whom a direction is given by the Chief Executive under subsection (1) shall, in the exercise or performance of his powers or duties under this Ordinance, comply with that direction.

(Amended 57 of 1999 s. 3)

Section:	7	**Approval of consumer and agent**		30/06/1997

(1) The Water Authority may approve, as the consumer of a fire service or inside service in any premises, any person who-

(a) occupies the premises; or

(b) is responsible for the management of the premises or any part thereof; and

(c) gives an undertaking, in such form as the Water Authority may specify,-

(i) to pay any charge due in respect of the fire service or inside service; and

(ii) to accept responsibility for the custody and maintenance of the fire service or inside service and the custody of any meter pertaining to the fire service or inside service. (Amended 81 of 1992 s. 3)

(2) The Water Authority may approve, as the agent of a communal service in any premises, any person who-

(a) occupies the premises; or

(b) is responsible for the management of the premises or any part thereof; and

(c) gives an undertaking, in such form as the Water Authority may specify,-

(i) to pay any charge due in respect of the communal service; and

(ii) to accept responsibility for the custody and maintenance of the communal service. (Amended 81 of 1992 s. 3)

(3) A consumer or agent may at any time apply to the Water Authority for cancellation of an undertaking given by him under this section and the Water Authority shall, if all charges due from the consumer or agent have been paid, cancel the undertaking whereupon he shall cease to be the consumer or agent.

Section:	8	**Refusal of a connection or reconnection**		30/06/1997

(1) The Water Authority may refuse to connect or reconnect a fire service or inside service to the main if-

(a) the fire service or inside service, or any alteration thereto, is not approved by the Water Authority; or

(b) there is no consumer for the fire service or inside service or, if there is a communal service, no agent for the communal service.

(2) Where the Water Authority refuses to connect or reconnect a fire service or inside service to the main he shall serve on the applicant for the connection or reconnection notice of such refusal and the notice shall specify the reasons for the refusal.

Section:	9	**Restriction or suspension of a supply**		30/06/1997

The Water Authority may restrict or suspend a supply, for such time as he thinks fit, if he is satisfied that this is necessary or expedient-

(a) to conserve water;
(b) to prevent waste of water;
(c) to construct, install, inspect, test, regulate, alter, repair or remove any part of the waterworks or any fire service or inside service;
(d) to avoid damage to, or a breakdown in, the waterworks or any fire service or inside service, whether from fire, pollution, waste or otherwise; or
(e) for the protection of life or property.

Section:	10	**Disconnection of a fire service or inside service**		30/06/1997

The Water Authority may disconnect a fire service or inside service if-

(a) any charge in respect of the fire service or inside service is not paid;
(b) there is no consumer for the fire service or inside service or, if there is a communal service, no agent for the communal service;
(c) the fire service or inside service does not, in the opinion of the Water Authority, comply with the provisions of this Ordinance;
(d) the fire service or inside service is constructed, installed, or altered without his permission;
(e) the consumer or agent, on receipt of a notice under section 16, fails to carry out the repairs or other works specified in the notice;
(f) the Water Authority, or any person authorized by him in writing, is obstructed from entering the premises or carrying out any function under section 12;
(g) the Water Authority is satisfied that waste, misuse or pollution of the supply has occurred or is likely to occur; or
(h) the occupier (if any) of the premises and the consumer, on receipt of a notice in writing from the Water Authority requiring them to make reasonable arrangements to enable the Water Authority or any person authorized by him in writing to enter the premises or carry out any function under section 12, fail to make such arrangements within a reasonable time. (Added 81 of 1992 s. 4)

Section:	11	**Notice of restriction, suspension or disconnection**		30/06/1997

(1) Except in the case of an unforeseen emergency, prior notice of any restriction or suspension of a supply under section 9, or of disconnection of a fire service or inside service under section 10, shall be served on the consumer and agent by the Water Authority and the notice shall specify the reasons for the restriction, suspension or disconnection.

(2) Notice under subsection (1) shall, where there is no consumer or agent, be served on the occupier of the premises or left at the premises.

Section:	12	**Power of entry into premises**		30/06/1997

(1) Subject to subsection (2), the Water Authority, and any person authorized by him in writing, may enter at any reasonable time, or in case of urgency at any time, any premises to-

(a) ascertain consumption;
(b) restrict or suspend a supply under section 9;
(c) disconnect a fire service or inside service under section 10 or 19(2);
(d) ascertain whether there is in respect of a fire service or inside service on the premises any contravention of this Ordinance;
(e) install, inspect, test, regulate, alter, repair or remove any part of the waterworks or any fire service or inside service therein.

(2) Except in case of urgency, neither the Water Authority nor a person authorized by him may enter any premises under subsection (1) unless he-

(a) first obtains the consent of the occupier of such premises; or
(b) first obtains a warrant under subsection (3).

(3) If it is shown to the satisfaction of a magistrate on sworn information in writing that-
(a) admission to any premises has been refused, or refusal is apprehended, or the premises are unoccupied, or the occupier is temporarily absent, or an application for admission would defeat the object of the entry;
(b) there is reasonable ground for entry into the premises for any purpose specified in subsection (1); and
(c) notice of the intention to apply for the warrant has been served on the occupier of the premises, or such notice cannot be served because the premises are unoccupied or the occupier is temporarily absent, or the serving of such notice would defeat the object of the entry,

the magistrate may by warrant authorize the Water Authority, or any person authorized by the Water Authority in writing, to enter the premises, if need be by force. (Amended 47 of 1997 s. 10)

(4) The Water Authority, or any person authorized by him, entering any premises under this section may take with him such persons as may be necessary, and on leaving any unoccupied premises which he has entered shall leave them as effectually secured against trespassers as he found them to be at the time of entry.

(5) Every warrant issued under subsection (3) shall continue in force until the purpose of which the entry is necessary has been satisfied.

Section:	13	**Public standpipes**		30/06/1997

(1) The Water Authority may establish public standpipes in any place to supply water to the public free of charge.

(2) Except with the permission in writing of the Water Authority, no person shall take water from a public standpipe for any purpose other than a domestic purpose.

(3) Any person who contravenes subsection (2) shall be guilty of an offence.

Part:	III	**FIRE SERVICES AND INSIDE SERVICES**		30/06/1997

Section:	14	**Construction, etc., of fire services and inside services**		30/06/1997

(1) Subject to subsection (2), no person shall, except with the permission in writing of the Water Authority, construct, install, alter or remove a fire service or inside service.

(2) The Water Authority may waive the requirement of permission under subsection (1) in the case of alterations to a fire service or inside service which are, in his opinion, of a minor nature.

(3) The construction or installation of a fire service or inside service shall be carried out in such manner as may be prescribed and the nature, size and quality of the pipes and fittings of the fire service or inside service shall be as prescribed.

(4) Any person who contravenes subsection (1) or (3) shall be guilty of an offence.

Section:	15	**Construction, etc. by licensed plumbers**		30/06/1997

(1) Subject to subsection (2), no fire service or inside service shall be constructed, installed, maintained, altered, repaired or removed by a person other than a licensed plumber or a public officer authorized by the Water Authority.

(2) Alterations or repairs to a fire service or inside service which are, in the opinion of the Water Authority, of a minor nature, or the rewashering of a tap, may be carried out by a person other than a licensed plumber or a public officer authorized by the Water Authority.

(3) Subject to subsection (2), any person who-
(a) contravenes subsection (1); or
(b) employs or permits a person other than a licensed plumber or a public officer authorized by the Water Authority to construct, install, maintain, alter, repair or remove a fire service or inside service,

shall be guilty of an offence.

Section:	16	**Water Authority may require repairs to be carried out**		30/06/1997

(1) The Water Authority may, if he is satisfied that a fire service or inside service-

(a) is in such a condition that waste or pollution of a supply has occurred or is likely to be caused thereby;

(b) has been altered without his permission; or

(c) does not comply with the provisions of this Ordinance,

by notice require the consumer to carry out the repairs or other works specified in the notice to the fire service or inside service.

(2) If under subsection (1) repairs or other works are to be carried out to a communal service, the notice requiring the repairs or other works shall be served on the agent.

Section:	17	**Cost of constructing, etc., fire services and inside services**	29 of 1998	01/07/1997

Remarks:
Adaptation amendments retroactively made - see 29 of 1998 s. 105

(1) Subject to subsection (2), a consumer shall bear the cost of constructing, installing, maintaining, altering, repairing or removing a fire service or inside service.

(2) The cost of maintaining, altering, repairing or removing-

(a) a communal service shall be borne by the agent;

(b) any part of a fire service or inside service which is on land held by the Government shall be borne by the Water Authority. (Amended 29 of 1998 s. 105)

(3) The Water Authority may alter or repair a fire service or inside service at the request of a consumer, or a communal service at the request of an agent, and the cost thereof shall, subject to subsection (2)(b), be payable by the person at whose request such alteration or repair is carried out.

(4) If a consumer or agent, on receipt of a notice under section 16, fails to carry out the repairs or other works specified in the notice, the Water Authority may carry out the repairs or other works and the cost thereof shall be payable by the consumer or agent.

Section:	18	**Supply to be metered**		30/06/1997

Except where this Ordinance otherwise provides, a supply shall be measured by meter or in such other manner as the Water Authority may determine.

Part:	IV	**DEPOSITS AND CHARGES**		30/06/1997

Section:	19	**Deposits**		30/06/1997

(1) The Water Authority may fix the amount of, and require the payment of, a deposit by a consumer to cover any charge due or which may become due.

(2) If payment of a deposit is required from a consumer of an existing fire service or inside service, the Water Authority may disconnect the fire service or inside service if the deposit is not paid within 14 days after the date of service of the notice requiring the payment.

(3) If payment of a deposit is required from a consumer of a new fire service or inside service, the Water Authority may refuse to connect the fire service or inside service to the main until the deposit is paid.

(4) A deposit paid under this section-

(a) shall not bear interest;

(b) shall not be transferable; and

(c) may, without prejudice to the exercise of any other power under this Ordinance, be applied by the Water Authority at any time to the payment of any charge.

(5) Subject to subsection (4)(c), a deposit shall be refunded to a consumer if-

(a) another consumer is approved by the Water Authority in his place;

(b) an undertaking given by him under section 7 is cancelled by the Water Authority; or

(c) the Water Authority is of the opinion that the deposit is no longer required.

Section:	20	**Liability for charges**		30/06/1997

(1) Unless otherwise expressly provided in this Ordinance, all charges arising in connection with or in consequence of a supply, including the charges for making a connection to the main and installing a meter, shall be payable by the consumer or, in the case of a communal service, the agent. (Amended 81 of 1992 s. 5)

(2) The liability of a consumer and agent under an undertaking given under section 7 shall continue until-

(a) another consumer or agent is approved by the Water Authority in his place; or

(b) the undertaking is cancelled by the Water Authority,

notwithstanding that-

(i) he ceases to occupy the premises;

(ii) he ceases to be responsible for the management of the premises or any part thereof; or

(iii) the Water Authority exercises any power under section 8, 9, 10 or 19(2).

Section:	21	**Unpaid charges**	57 of 1999	01/07/1997

Remarks:
Adaptation amendments retroactively made - see 57 of 1999 s. 3

(1) A charge which is not paid shall be a debt due to the Government. (Amended 57 of 1999 s. 3)

(2) Where a charge is not paid on or before the date specified in a notice of demand, a surcharge on the unpaid charge may be levied in accordance with regulations made under this Ordinance.

Section:	22	**Reduction etc., of charges**		30/06/1997

The Water Authority may in any particular case reduce, waive or refund, in whole or in part, a charge.

Part:	V	**GATHERING GROUNDS**		30/06/1997

Section:	23	**Mapping of gathering grounds**	L.N. 197 of 2004	12/02/2005

(1) The Water Authority shall prepare maps showing all gathering grounds existing at the commencement of this Ordinance.

(2) Where a new gathering ground, or an extension of a gathering ground mapped under this section, is required for the purpose of extending or augmenting a supply, the Water Authority shall, after giving consideration to the preservation of traditional rights of any person to take water for agricultural and domestic purposes-

(a) mark the limits or area of the new gathering ground on any map prepared under this section;

(b) prepare a new map for the new gathering ground; or

(c) alter the limits or area of the gathering ground on any map prepared under this section.

(3) Where there has been a reduction in the area of any gathering ground, the Water Authority shall accordingly alter the limits or area of that gathering ground on any map prepared under this section.

(4) Any map prepared, or any additions or alterations made thereto, under this section shall be signed and dated by the Water Authority.

(5) A map of a gathering ground prepared under this section shall be deposited in the Land Registry. (Replaced 20 of 2002 s. 5)

(6) A notice of a map prepared under this section and of any additions or alterations made thereto shall be published in the Gazette together with the address of the Land Registry in which the map is deposited under subsection (5). (Amended 8 of 1993 s. 2)

Section:	24	**Control of leased land in gathering grounds**	57 of 1999	01/07/1997

Remarks:

Adaptation amendments retroactively made - see 57 of 1999 s. 3

(1) The Chief Executive may by notice in writing require a lessee of land within a gathering ground to drain, treat, or develop his leased land, in such manner as the Chief Executive may specify, for any purpose connected with the waterworks, including the prevention, control or rectification of contamination or damage to the waterworks. (Amended 57 of 1999 s. 3)

(2) Where the lessee carries out any work in compliance with a notice under subsection (1), the reasonable cost of the work shall be paid by the Water Authority.

(3) No payment under subsection (2) shall be made unless the work is carried out to the satisfaction of the Water Authority.

Section:	25	**Carrying out of work by Water Authority**	57 of 1999	01/07/1997

Remarks:
Adaptation amendments retroactively made - see 57 of 1999 s. 3

(1) If a lessee fails to comply with a notice under section 24(1), or requests the Water Authority in writing to carry out the work specified in the notice, the Chief Executive may require the Water Authority to comply with the notice. (Amended 57 of 1999 s. 3)

(2) The Water Authority, and any person authorized by him in writing, may enter any leased land to comply with a requirement under subsection (1) on giving the lessee 14 days' notice of the intention to so enter.

(3) Where the Water Authority carries out any work under this section, the cost of the work shall be borne by the Water Authority.

Section:	26	**Compensation**	25 of 1998; 57 of 1999	01/07/1997

Remarks:
Adaptation amendments retroactively made - see 25 of 1998 s. 2; 57 of 1999 s. 3

(1) A lessee who suffers damage or loss as a result of compliance with a notice under section 24(1), whether the work is carried out by the lessee or the Water Authority, and who claims compensation in respect thereof, shall deliver to the Water Authority particulars in writing of such damage or loss and of his claim for compensation, and the Chief Executive may, if he thinks fit, negotiate with the lessee for the settlement or compromise of the claim. (Amended 57 of 1999 s. 3)

(2) If the Chief Executive and the lessee do not agree on the settlement or compromise of the claim within 3 months of the delivery of particulars, the lessee may notify the Water Authority that he desires a reference to a tribunal; and the Chief Executive shall thereupon refer the claim with the particulars thereof to a tribunal, consisting of a District Judge nominated by the Chief Justice for the purpose. (Amended 57 of 1999 s. 3)

(3) The tribunal shall hear any evidence which the Water Authority or the lessee may wish to tender and, if so desired, hear counsel on behalf of the Government and the lessee, and shall determine the amount of compensation, if any, to be paid to the lessee.

(4) For the purposes of subsection (3), the tribunal shall have powers similar to those vested in the Court of First Instance for hearing evidence, determining claims for damages and awarding costs. (Amended 92 of 1975 s. 59; 25 of 1998 s. 2)

(5) The practice and procedure in connection with any proceedings before a tribunal under this section shall be such as the tribunal may determine.

(6) Any award or decision of a tribunal under this section shall be final:

Provided that any party dissatisfied with the decision as being erroneous in point of law, may, within 1 month after the decision, require the tribunal to state and sign a case for the decision of the Court of Appeal. (Amended 92 of 1975 s. 59)

Section:	27	**Compensation to be paid from funds provided by the Legislative Council**		30/06/1997

Compensation awarded under section 26 shall be paid from such money as may be provided from time to time by the Legislative Council.

Part:	VI	**MISCELLANEOUS**		30/06/1997

Section:	28	**Waste or misuse of a supply**		30/06/1997

Any person who wastes or misuses, or causes or permits to be wasted or misused, a supply shall be guilty of an offence.

Section:	29	**Unlawful taking of water**		30/06/1997

(1) Except with the permission of the Water Authority, no person shall-

(a) take water from the waterworks other than through a fire service, inside service or public standpipe;

(b) take water through a fire service for any purpose other than for fire fighting;

(c) take water through an inside service for any purpose other than that for which the water is supplied;

(d) subject to section 18, take through a fire service or inside service water which is not measured by a meter; or

(e) divert water from the waterworks.

(2) Any person who contravenes this section shall be guilty of an offence and shall be liable to pay a charge for the water so taken or diverted as if there had been a supply of that water to him as a consumer. (Amended 81 of 1992 s. 6)

Section:	30	**Pollution**	L.N. 266 of 2006	01/12/2006

(1) Any person who deposits, or causes or permits to be deposited, any solid or liquid matter in such a manner or place that it may fall or be washed or carried into water forming part of the waterworks shall be guilty of an offence.

(2) Any person who-

(a) enters, or bathes or washes in, water forming part of the waterworks;

(b) washes or causes or permits any animal to enter therein; or

(c) throws or places any thing therein,

shall be guilty of an offence.

(3) No act shall be an offence under this section if it is done with the permission in writing of the Water Authority.

(4) Any person guilty of an offence under this section shall be liable on summary conviction to a fine at level 5 and to imprisonment for 2 years. (Amended 27 of 1983 s. 2; L.N. 266 of 2006)

Section:	31	**Damage, etc., to waterworks**		30/06/1997

Any person who, without the permission in writing of the Water Authority, alters, interferes with, damages or destroys any part of the waterworks shall be guilty of an offence.

Section:	32	**Obstruction**	L.N. 266 of 2006	01/12/2006

Any person who obstructs the Water Authority, or any person authorized by him in writing, exercising any power, performing any duty, or carrying out any function, under this Ordinance shall be guilty of an offence and shall be liable on conviction to a fine at level 4 and to imprisonment for 6 months.

(Amended L.N. 266 of 2006)

Section:	33	**Cost of repairing damage and recovery of damages or loss**		30/06/1997

(1) The Water Authority may carry out repairs or other works to any fire service, inside service or any part of the waterworks which is altered, interfered with, damaged, or destroyed as a result of the commission of an offence, and the cost of such repairs or other works may, upon an order of a magistrate, be recovered from the person convicted of the offence in the same manner as if it were a fine imposed by a magistrate under the Magistrates Ordinance (Cap 227).

(2) If the Water Authority suffers any damage or loss as a result of the commission of any offence referred to in subsection (1), such damage or loss may, upon an order of a magistrate, be recovered from the person convicted of the offence in the same manner as if it were a fine imposed by a magistrate under the Magistrates Ordinance (Cap 227).

Section:	34	**Presumptions and evidence in writing**		30/06/1997

(1) In any civil or criminal proceedings it shall be presumed, until the contrary is proved, that-

(a) in the case of any alteration or repairs to a fire service or inside service (other than a communal service), the consumer has caused or permitted the alteration or repairs;

(b) in the case of any alteration or repairs to a communal service, the agent has caused or permitted the alteration or repairs.

(2) In any civil or criminal proceedings a document, purporting to be signed by the Water Authority, or other person authorized by him, stating-

(a) the name of a consumer of a fire service or inside service, or the name of an agent of a communal service;

(b) the location of the fire service, inside service or communal service;

(c) in the case of proceedings for the recovery of an unpaid charge,-

(i) the name of the person liable to pay the charge;

(ii) the amount of the charge;

(iii) the nature and other particulars of the charge; and

(iv) that the charge remains unpaid;

(d) in the case of proceedings in respect of alterations or repairs to a fire service, inside service or communal service, the nature and other particulars of the alterations or repairs,

shall be admitted in evidence without further proof.

(3) When a document is admitted in evidence under subsection (2)-

(a) until the contrary is proved, it shall be presumed that the document is so signed;

(b) the document shall be prima facie evidence of the facts stated therein.

Section:	35	**Penalties**	L.N. 266 of 2006	01/12/2006

(1) Any person who is guilty of an offence under this Ordinance shall, unless a penalty is otherwise expressly provided, be liable on summary conviction to a fine at level 4.

(2) Any person convicted of an offence under section 29 or section 30(1) or (2) shall, if the offence is a continuing one, be liable to a further fine of $1000 for every day or part of a day during which the offence continues.

(Amended L.N. 266 of 2006)

Section:	36	**Power of arrest**		30/06/1997

(1) Any public officer, authorized in writing in that behalf by the Water Authority, may arrest any person whom he reasonably suspects of having committed an offence under section 29(1)(e), 30, 31 or 32.

(2) Where a public officer arrests a person under subsection (1) he shall forthwith take that person to the nearest police station and hand him over to the custody of a police officer, and thereupon section 52 of the Police Force Ordinance (Cap 232) shall apply.

Section:	37	**Regulations**	L.N. 266 of 2006	01/12/2006

(1) The Chief Executive in Council may make regulations for all or any of the following matters- (Amended

57 of 1999 s. 3)

(a) the quality and type of a supply;
(b) the construction, installation, maintenance, cleanliness, alteration, repair or removal of a fire service or inside service;
(c) the connexion or reconnexion of a fire service or inside service to the main and the conditions subject to which such connexion or reconnexion may be made;
(d) the method of measuring or assessing consumption;
(e) the provision, number, size, installation, maintenance, repair, removal and custody of meters in premises;
(f) the use of a supply for any particular purpose;
(g) the prevention of waste or misuse of a supply;
(h) the control of consumption from public standpipes;
(i) the restriction or suspension of a supply or the disconnexion of a fire service or inside service;
(j) the charges payable under this Ordinance;
(k) the deposits to be paid by consumers;
(l) the surcharge which may be levied on an unpaid charge;
(m) the licensing of plumbers for the purposes of this Ordinance and control of licensed plumbers;
(n) the taking of fish in waters forming part of the waterworks and the arrest by an officer empowered under such regulations of any person who he has reason to believe has contravened any specified regulation made under this paragraph;
(o) the prohibition and control of access to gathering grounds;
(p) the provision and control of burial grounds, camping sites and recreational facilities in gathering grounds;
(q) the control over the use of gathering grounds for any purpose other than those specified in paragraph (p);
(r) the service of any notice, form or other document under this Ordinance;
(s) the signature on any notice, form or other document under this Ordinance or the printing of a name in lieu of the signature;
(t) prescribing anything which under this Ordinance is to be or may be prescribed; and
(u) generally for the better carrying out of this Ordinance.

(2) A regulation made under this section may provide that a contravention thereof shall be an offence and may prescribe a penalty for such offence not exceeding a fine at level 3. (Amended 27 of 1983 s. 3; L.N. 266 of 2006)

(3) Regulations made under subsection (1)(o), (p) or (q) shall not apply to leased land within a gathering ground.

Section:	38	**Water Authority may specify notices and forms**		30/06/1997

(1) A notice under this Ordinance shall be in writing and shall be in such form as may be specified by the Water Authority.

(2) The Water Authority may specify any forms required for the purposes of this Ordinance.

(3) The Water Authority may publish in the Gazette any forms specified by him under subsection (2).

Section:	39	**Transitional and saving provisions**		30/06/1997

(1) Any notice served, or map of a gathering ground prepared, under the repealed Waterworks Ordinance (Cap 102 1964 Ed.)(hereinafter referred to as the repealed Ordinance), and in force at the commencement of this Ordinance, shall be deemed to have been served or prepared under this Ordinance.

(2) Any person who is a consumer under the repealed Ordinance shall be deemed to be a consumer under this Ordinance and an undertaking given or a deposit paid by a consumer under the repealed Ordinance shall be deemed to be an undertaking given or a deposit paid under this Ordinance.

Chapter:	102A	**Waterworks Regulations**	Gazette Number	Version Date
		Empowering section	E.R. 2 of 2012	02/08/2012

(Cap 102, section 37)

[1 January 1975]

(Originally L.N. 251 of 1974)

(*Format changes—E.R. 2 of 2012)

Note:
*** The format of the Regulations has been updated to the current legislative styles.**

Part:	1	**Preliminary**	E.R. 2 of 2012	02/08/2012

Regulation:	1	**Citation**	E.R. 2 of 2012	02/08/2012

These regulations may be cited as the Waterworks Regulations.

Regulation:	2	**Interpretation**	E.R. 2 of 2012	02/08/2012

In these regulations, unless the context otherwise requires-

BS means the latest revised edition of a specification issued by the British Standards Institution; (L.N. 252 of 1977)

Building Authority (建築事務監督) means the Building Authority under the Buildings Ordinance (Cap 123);

construction purpose (建造用途), in relation to a supply, means water supplied for use for any purpose connected with the construction of a building or substantial repairs or alterations to a building;

Director (署長) means the Director of Water Supplies;

plumber's licence (水喉匠牌照) means a plumber's licence issued under regulation 34;

shipping purpose (船舶用途), in relation to supply, means water supplied-

(a) (i) to or for use on any vessel other than a vessel to which paragraph (b)(i) of this definition applies;
(ii) to any pier for use on any vessel to which subparagraph (i) applies; or
(iii) to or for use on any vessel employed for the conveyance of water to any vessel to which subparagraph (i) applies;
(b) (i) to or for use on any vessel to which the Merchant Shipping (Local Vessels) Ordinance (Cap 548) applies; or (24 of 2005 s. 55)
(ii) to any pier for use on such pier; (L.N. 219 of 1983)

trade purpose (工商業用途), in relation to a supply, means water supplied for use-

(a) for any purpose connected with a trade, manufacture or business, other than a construction purpose or shipping purpose; or
(b) for any purpose other than a domestic purpose, construction purpose or shipping purpose.

Part:	2	**Fire Services and Inside Services**	E.R. 2 of 2012	02/08/2012

Regulation:	3	**Permission to construct, etc., a fire service**	E.R. 2 of 2012	02/08/2012

(1) Where permission is required under the Ordinance to construct, install, alter or remove a fire service, application for such permission shall be made to the Water Authority in such form as may be specified and the application shall be accompanied by such plans, specifications and other information as the Water Authority may require.
(2) Before submitting an application under subregulation (1), the applicant-
(a) (Repealed L.N. 673 of 1994)

(b) if a new fire service requires a direct connection to the main, shall-
  (i) obtain from the Water Authority such information as is relevant to the design of the fire service; and
  (ii) submit to the Water Authority for approval, in such form as he may require, plumbing proposals in respect of the fire service.

(3) (Repealed L.N. 673 of 1994)

(4) The Water Authority shall decide the size and position of a connection to the main in respect of a fire service.

(5) The Water Authority shall, if he refuses to grant permission to carry out any works specified in an application under subregulation (1), return the application to the applicant and state the reasons for such refusal.

Regulation:	4	**Fees for fire service**	E.R. 2 of 2012	02/08/2012

(1)-(2) (Repealed L.N. 78 of 1987)

(3) If a seal fixed on a fire service by the Water Authority is broken by any person other than the Water Authority, or a person authorized by him, it shall be replaced by the Water Authority and the consumer responsible for the custody of the fire service shall be liable to pay the charge prescribed in Part 1 of Schedule 1.

(E.R. 2 of 2012)

Regulation:	5	**Permission to construct, etc., an inside service**	E.R. 2 of 2012	02/08/2012

(1) Where permission is required under the Ordinance to construct, install, alter or remove an inside service, application for such permission shall be made to the Water Authority in such form as may be specified and the application shall be accompanied by such plans, specifications and other information as the Water Authority may require.

(2) If a new inside service is to be constructed or installed, the applicant shall, before submitting an application under subregulation (1),-
  (a) obtain from the Water Authority such information as is relevant to the design of the inside service; and
  (b) submit to the Water Authority for approval, in such form as he may require, plumbing proposals in respect of the inside service.

(3) (Repealed L.N. 673 of 1994)

(4) The Water Authority shall decide the size and position of a connection to the main in respect of an inside service.

(5) The Water Authority shall, if he refuses to grant permission to carry out any works specified in an application under subregulation (1), return the application to the applicant and state the reasons for such refusal.

Regulation:	6	**Inspection and approval of works**	E.R. 2 of 2012	02/08/2012

(1) A person who constructs or installs a fire service or inside service shall apply to the Water Authority in such form as may be specified for-
  (a) inspection and approval of the fire service or inside service; and
  (b) a connection to the main and, it necessary, the installation of the part of the fire service or inside service on land held by the Government. (29 of 1998 s. 105)

(2) A person who makes any alterations to a fire service or inside service shall apply to the Water Authority in such form as may be specified for inspection and approval of the alterations.

(3) No pipe or fitting forming part of a fire service or inside service shall be used or covered up until it has been inspected and approved by the Water Authority.

(4) Approval of a fire service or inside service or any alterations thereto may be withheld until any requirement of the Water Authority is complied with.

(5) If a fire service or inside service is approved by the Water Authority he shall, on payment of the charge prescribed in Part 1 of Schedule 1, make the connection to the main and, if necessary, install the part of the fire service or inside service on land held by the Government. (29 of 1998 s. 105)

(E.R. 2 of 2012)

Regulation:	7	**Responsibility to keep inside service clean**	E.R. 2 of 2012	02/08/2012

(1) Subject to subregulation (2), a consumer shall be responsible for keeping an inside service clean.
(2) The responsibility for keeping clean any part of an inside service which is-
  (a) a communal service shall be that of the agent; and
  (b) on land held by the Government shall be that of the Water Authority. (29 of 1998 s. 105)

Regulation:	8	**Repairs etc., by Water Authority**	E.R. 2 of 2012	02/08/2012

(1) Where the Water Authority carries out any repairs or other works under section 17(3) or (4) of the Ordinance or makes a connection to the main under regulation 6(5) or makes such a connection and installs the part of the fire service or inside service under that regulation or tests any pipe or fitting under regulation 21, the cost thereof shall include- (L.N. 320 of 1992; L.N. 176 of 1996)
  (a) the cost of materials used;
  (b) the cost of labour;
  (c) any other expenses incurred in connection therewith; and
  (d) the supervision charge prescribed in Part 2 of Schedule 1.
(2) This regulation shall not apply where a charge is prescribed in Part 1 of Schedule 1.

(E.R. 2 of 2012)

Regulation:	9	**Use of inside service**	E.R. 2 of 2012	02/08/2012

Except with the permission in writing of the Water Authority, no person shall use an inside service for the reception or conveyance of any water other than water from the waterworks in respect of which the inside service is approved.

Regulation:	10	**Draw-off points in gardens, etc.**	E.R. 2 of 2012	02/08/2012

Except with the permission in writing of the Water Authority, no person shall-
  (a) install draw-off points in, or draw water from, any part of an inside service for the supply of fresh water for use in any-
    (i) garden,
    (ii) lawn,
    (iii) playground of any kind,
    (iv) garage or car park, or
    (v) other place where the supply is not used for a domestic purpose or other purpose approved by the Water Authority; or
  (b) extend or alter an inside service for the supply of fresh water for any purpose referred to in paragraph (a).

Regulation:	11	**Hosepipe not to be connected to an inside service**	E.R. 2 of 2012	02/08/2012

(1) No person shall draw fresh water from an inside service by means of a hosepipe or similar apparatus.
(2) Subregulation (1) shall not apply where fresh water is drawn by means of a hosepipe or similar apparatus-
  (a) from a cold water storage cistern approved by the Water Authority for that purpose; or
  (b) for use in any type of domestic appliance or apparatus approved by the Water Authority.

Regulation:	12	**Use of fresh water for flushing**	E.R. 2 of 2012	02/08/2012

(1) If in any premises fresh water from the waterworks is, without the permission in writing of the Water Authority, used for flushing water-closets, latrines or urinals, the occupier and the owner of such premises shall be guilty of an offence.
(2) Where a contravention of subregulation (1) is committed, it shall be a good defence-
  (a) for the occupier to prove that the contravention was committed without his knowledge or that he had taken reasonable steps to prevent it;
  (b) for the owner to prove that he has provided, or has taken reasonable steps to provide, water (other than fresh

water from the waterworks) for flushing water-closets, latrines or urinals.

(3) For the purposes of this regulation and regulation 15(3)-

owner (業主) includes any person holding the premises direct from the Government whether under lease, licence or otherwise, any mortgagee in possession and any person receiving rent of the premises, solely or with another, on his own behalf or that of any person, or who would receive the same if such premises were let to a tenant, and the agent of an owner. (29 of 1998 s. 105)

Regulation:	13	**Use of water for air-conditioning plants, etc.**	E.R. 2 of 2012	02/08/2012

Except with the permission in writing of the Water Authority, no person shall use water from the waterworks for-

(a) any heating, cooling or humidification plant; or

(b) any swimming pool.

Regulation:	14	**(Repealed L.N. 252 of 1977)**		30/06/1997

Regulation:	15	**Use of salt water for flushing**	E.R. 2 of 2012	02/08/2012

(1) The Water Authority may require the use of salt water for flushing water-closets, latrines and urinals, and may supply salt water for such purpose.

(2) The pipes and fittings of water-closets, latrines and urinals in which salt water is used for flushing shall be constructed of material that is suitable for the use of salt water.

(3) Where under subregulation (1) the Water Authority requires the use of salt water for flushing an existing water-closet, latrine or urinal in which water other than salt water is used, the pipes and fittings of such water-closet, latrine or urinal shall, if necessary, be replaced by the owner of the premises to comply with subregulation (2).

Regulation:	16	**(Repealed L.N. 85 of 1979)**		30/06/1997

Regulation:	17	**Disconnection or reconnection of supply at consumer's request**	E.R. 2 of 2012	02/08/2012

(1) A consumer who wants a fire service or inside service to be disconnected shall apply to the Water Authority in such form as may be specified giving not less than 14 days' notice of the date on which the disconnection is to be made.

(2) A consumer who wants a fire service or inside service, which has been disconnected under subregulation (1), to be reconnected shall apply to the Water Authority in such form as may be specified giving not less than 14 days' notice of the date on which the reconnection is to be made.

(L.N. 320 of 1992)

Regulation:	18	**Method of disconnection**	E.R. 2 of 2012	02/08/2012

(1) Disconnection of a fire service or inside service under section 10 or 19 of the Ordinance or regulation 17(1) or 28(1) may be effected by severing the fire service or inside service from the main or by any other means as the Water Authority thinks fit.

(2) A fire service or inside service which is disconnected under subregulation (1) may be reconnected by the Water Authority-

(a) on compliance by the consumer or agent with any requirement of the Water Authority relating to the reason for the disconnection; and

(b) on payment of the charge for reconnecting a fire service or inside service prescribed in Part 1 of Schedule 1.

(E.R. 2 of 2012)

Part:	3	**Pipes and Fittings**	E.R. 2 of 2012	02/08/2012

Regulation:	19	**Pipes and fittings**	E.R. 2 of 2012	02/08/2012

(1) Subject to subregulations (2), (3), (4), (5) and (6), this Part and Schedule 2 shall apply to any pipe or fitting installed or intended to be installed in any fire service or inside service. (L.N. 320 of 1992; L.N. 673 of 1994; L.N. 106 of 1999)

(2) This Part and Schedule 2 shall not apply to any pipe or fitting installed before the commencement of these regulations in accordance with any enactment then in force and no person shall be required to alter or renew any such pipe or fitting unless such pipe or fitting is in the opinion of the Water Authority so defective or in such condition as to cause, or be likely to cause, waste, undue consumption or pollution of the supply.

(3) The amendments to this Part and to Schedule 2 effected by the Waterworks (Amendment) (No. 2) Regulation 1992 (L.N. 320 of 1992) shall not apply to any pipe or fitting installed before the commencement of that Regulation, and no person shall be required to alter or renew any such pipe or fitting by virtue of those amendments unless such pipe or fitting is in the opinion of the Water Authority so defective or in such condition as to cause, or be likely to cause, waste, undue consumption or pollution of the supply. (L.N. 320 of 1992)

(4) The amendment to Schedule 2 effected by section 4 of the Waterworks (Amendment) Regulation 1994 (L.N. 673 of 1994) shall not apply to any pipe or fitting installed before the commencement of that section, and no person shall be required to alter or renew any such pipe or fitting by virtue of the amendment unless such pipe or fitting is in the opinion of the Water Authority so defective or in such condition as to cause, or be likely to cause, waste, undue consumption or pollution of the supply. (L.N. 673 of 1994)

(5) The amendment to Schedule 2 effected by section 4 of the Waterworks (Amendment) Regulation 1994 (L.N. 673 of 1994) shall not apply to alterations or repairs which-

(a) are made to a pipe or fitting installed before the commencement of that section; and

(b) are, in the opinion of the Water Authority, of a minor nature. (L.N. 673 of 1994)

(6) The amendments to Schedule 2 effected by section 3 of the Waterworks (Amendment) Regulation 1999 (L.N. 106 of 1999) shall not apply to any water heater installed before the commencement of that section, and no person shall be required to alter or renew any such water heater by virtue of those amendments unless such water heater is in the opinion of the Water Authority so defective or in such condition as to cause, or be likely to cause, waste, undue consumption or pollution of the supply. (L.N. 106 of 1999; 32 of 2000 s. 48)

Regulation:	20	**Pipes and fittings to be of British Standard**	E.R. 2 of 2012	02/08/2012

(1) Subject to regulation 25, every pipe or fitting shall be of the British Standard.

(2) Subregulation (1) shall apply only to so much of any British Standard as relates to the size, nature, materials, strength, test requirements and workmanship of any pipe or fitting and shall be deemed to be satisfied notwithstanding any departure from such British Standard if that departure does not in the opinion of the Water Authority adversely affect the efficiency or suitability of the pipe or fitting for the purposes of these regulations.

(3) The Water Authority may at any time weigh, measure or otherwise test any pipe or fitting to ascertain that it complies with the British Standard.

Regulation:	21	**Testing of pipes and fittings**	E.R. 2 of 2012	02/08/2012

(1) The Water Authority may require any pipe or fitting, before it is installed or used, to be tested.

(2) A pipe or fitting which is required to be tested under subregulation (1) shall be delivered to the place specified by the Water Authority and the cost of the testing shall be payable by the person by whom, or on whose behalf, the pipe or fitting is so delivered.

(L.N. 320 of 1992)

Regulation:	22	**Protection of pipes**	E.R. 2 of 2012	02/08/2012

A pipe made of steel if laid under the ground shall be installed in such a manner that it does not come into contact with concrete, cement mortar, lime mortar or plaster and shall be protected against such contact by wrapping it with hessian

or other suitable material and coating it with bitumen or where such pipe passes through a wall or suspended floor it may be protected against such contact by being carried through a sleeve or by some other suitable means.

(L.N. 320 of 1992)

Regulation:	23	**Booster pumps**	E.R. 2 of 2012	02/08/2012

(1) Except with the permission in writing of the Water Authority, no person shall install or use a booster pump on a fire service or inside service.

(2) A booster pump shall not pump water direct from a main but from a sump installed at a level at which it can be supplied with water from a main by gravity. (L.N. 252 of 1977)

Regulation:	24	**Other water using apparatus**	E.R. 2 of 2012	02/08/2012

An apparatus using water in respect of which no express provision is made in these regulations or an apparatus for the treatment or filtration of water shall not be installed or used without the permission in writing of the Water Authority and he may require any such apparatus to be supplied with water from a separate storage cistern.

Regulation:	25	**Power to relax regulations**	E.R. 2 of 2012	02/08/2012

(1) The Water Authority may, either generally or in any particular case, relax the provisions of these regulations regarding the size, nature, materials or disposition of any pipe or fitting.

(2) The Water Authority may approve any pipe or fitting which is not of the British Standard.

(3) Where water is-

(a) supplied through a meter;

(b) discharged into a cistern from a point not less than 150 mm above the overflowing level thereof; and (L.N. 252 of 1977)

(c) conveyed therefrom for use in some industrial or research process and is used solely in connection therewith,

the Water Authority may exercise his powers under subregulation (1) with regard to any pipe or fitting installed or used for such purpose.

Part:	4	**Meters**	E.R. 2 of 2012	02/08/2012

Regulation:	26	**Installation of meters**	E.R. 2 of 2012	02/08/2012

(1) The Water Authority shall determine the size and the number of meters which shall be installed on any fire service or inside service.

(2) Subject to subregulation (2A), all meters shall be provided by the Water Authority. (L.N. 320 of 1992)

(2A) Where a meter is to be installed on a fire service or inside service, the Water Authority-

(a) if he wishes to do so, may, on payment of the charge prescribed in Part 1 of Schedule 1, provide and install a meter; or

(b) if he does not so wish, shall, on payment of the charge prescribed in Part 1 of Schedule 1, provide a meter and allow it to be installed by a licensed plumber in such manner as the Water Authority may specify. (L.N. 320 of 1992)

(2B) Where a meter is installed otherwise than by the Water Authority, he may refuse to connect the supply until the installation has been inspected and approved by him. (L.N. 320 of 1992)

(3) If the seal fixed on a meter by the Water Authority is broken by any person other than the Water Authority or any person authorized by him it shall be replaced by the Water Authority and the consumer responsible for the custody of the meter shall be liable to pay the charge prescribed in Part 1 of Schedule 1.

(4) No consumer shall permit any meter to be removed from a fire service or inside service unless the person seeking to remove such meter presents to the consumer a written authority from the Water Authority authorizing him to remove such meter.

(5) The Water Authority may change a meter at any time.

(E.R. 2 of 2012)

Regulation:	27	**Site of meters**	E.R. 2 of 2012	02/08/2012

(1) The siting of a meter shall be determined by the Water Authority and he may install the meter at a point most convenient to him on any wall (internally or externally) of a building in which there is a fire service or inside service.

(2) If access to a meter by the Water Authority is persistently obstructed or denied, the Water Authority may, after consulting the consumer, by notice in writing served on the consumer determine another siting of the meter on any wall (internally or externally) of the building.

(3) If another siting is so determined, the consumer shall, at his own cost, cause such works to be carried out as will enable the Water Authority to install a meter at the other site and, until such works are carried out, the service shall be regarded as not complying with the Ordinance.

(L.N. 320 of 1992)

Regulation:	28	**Damage to meters**	E.R. 2 of 2012	02/08/2012

(1) Where a meter is-

(a) opened up whilst in the custody of the consumer other than by the Water Authority or any person authorized by him;

(b) so used that water can be wasted, misused or unduly consumed;

(c) damaged by breaking the seal or lock on it or otherwise; or

(d) interfered with so that it impairs or falsifies the measurement of consumption,

the Water Authority may immediately disconnect the supply and repair the meter.

(2) Where a meter is damaged and the Water Authority is of the opinion that such damage is not the result of fair wear and tear, or where a meter is interfered with, the consumer responsible for the custody of the meter shall, without prejudice to any penalty provided for the offence, be liable to pay-

(a) the charge prescribed in Part 1 of Schedule 1 for testing the meter;

(b) the cost of repairing the meter;

(c) any damage or loss suffered thereby by the Water Authority; and

(d) the charge prescribed in Part 1 of Schedule 1 for reconnecting the fire service or inside service.

(E.R. 2 of 2012)

Regulation:	29	**Reading of meters**	E.R. 2 of 2012	02/08/2012

(1) Meters shall be read at such intervals as the Water Authority may direct.

(2) The reading taken as the last reading for any period shall be used as the first reading for the period next following.

Regulation:	30	**Testing of meters**	E.R. 2 of 2012	02/08/2012

(1) A consumer who doubts the accuracy of a meter which measures his consumption may apply to the Water Authority in such form as may be specified to have the meter tested and the Water Authority shall test the meter in such manner as he thinks fit and the results of the test shall be binding on the Water Authority and the consumer.

(2) A meter shall be deemed to register correctly if its inaccuracy does not exceed 3 per cent above or below the correct amount.

(3) If a meter is found to register correctly the consumer shall pay the charge prescribed in Part 1 of Schedule 1 for testing the meter, but no charge shall be payable if the meter is found to over-register or to under-register. (L.N. 219 of 1983)

(E.R. 2 of 2012)

Regulation:	31	**Consumption where supply is not measured by meter**	E.R. 2 of 2012	02/08/2012

The consumption for any period during which a meter is known or suspected to be out of order, has been removed or is missing or inaccessible shall be calculated-

(a) according to the average daily rate of consumption obtained between any successive readings before that period; or

(b) at the discretion of the Water Authority, according to the average daily rate of consumption between any successive readings following the repairing or replacement of a meter that was out of order; or

(c) where it would be inappropriate to calculate the consumption in the manner specified in paragraph (a) or (b), whether by reason of fluctuations in consumption or otherwise, in such manner as may be agreed between the Water Authority and the consumer.

(L.N. 320 of 1992)

Regulation:	32	**Private check meter**	E.R. 2 of 2012	02/08/2012

(1) A private check meter may, with the permission in writing of the Water Authority, be installed on any part of an inside service.

(2) The Water Authority may at any time require a private check meter installed under subregulation (1) to be tested, and the consumer shall, on payment of the charge prescribed in Part 1 of Schedule 1, get the meter tested by the Water Authority.

(3) The Water Authority shall, in assessing consumption at any inside service, take no account of the readings of a private check meter.

(4) The Water Authority shall not be responsible for the accuracy of a private check meter and where such meter is found to be operating unsatisfactorily or restricting the supply to any premises the consumer shall, if so required by the Water Authority, remove the meter.

(E.R. 2 of 2012)

Part:	5	**Licensing of Plumbers**	E.R. 2 of 2012	02/08/2012

Regulation:	32A	**Authority for grant of plumber's licence**	E.R. 2 of 2012	02/08/2012

(1) Plumber's licences may be issued by an officer designated for the purpose by the Water Authority.

(2) The officer designated under subregulation (1) is referred to in this Part as ***the licensing authority***.

(3) The licensing authority shall be assisted by an advisory board appointed by the Water Authority and which shall have such members and be appointed on such terms as the Water Authority may direct.

(4) In exercising his functions under this Part the licensing authority shall consult the board appointed under subregulation (3).

(L.N. 219 of 1983)

Regulation:	33	**Application for plumber's licence**	E.R. 2 of 2012	02/08/2012

(1) Any person who-

(a) holds a Craft Certificate in Plumbing and Pipefitting issued by the Vocational Training Council after 1987; or (57 of 1999 s. 3)

(b) (Repealed 57 of 1999 s. 3)

(c) holds an equivalent qualification,

and who holds a Certificate in Plumbing Services (Hong Kong) issued by the Vocational Training Council or an equivalent qualification may apply for a plumber's licence.

(2) Application for a plumber's licence shall be made in such form as may be specified.

(3) In this regulation-

equivalent (相等) means equivalent in the opinion of the Water Authority.

(L.N. 320 of 1992)

Regulation:	34	**Issue of plumber's licence**	E.R. 2 of 2012	02/08/2012

(1) On receipt of an application under regulation 33(1) and the fee prescribed in Part 1 of Schedule 1 the licensing authority shall, subject to subregulation (2), issue a plumber's licence. (L.N. 320 of 1992)

(2) If an applicant for a plumber's licence relies in his application on any qualification referred to in regulation 33(1) that he obtained 5 or more years before the date of his application, the licensing authority shall not issue a plumber's licence unless he is satisfied that the applicant has adequate knowledge of-

(a) the type of work involved in respect of a plumber's licence; and

(b) the provisions of the Ordinance relating to such work. (L.N. 320 of 1992)

(2A)-(2B) (Repealed L.N. 320 of 1992)

(3) Subject to subregulation (3A), the licensing authority shall renew a plumber's licence, even if that licence has expired, on receipt of an application in such form as may be specified and the fee prescribed in Part 1 of Schedule 1. (L.N. 320 of 1992)

(3A) If a licensed plumber fails to renew his licence for 5 or more years, the licensing authority shall not renew his licence unless the licensing authority is satisfied that the applicant for renewal has adequate knowledge of-

(a) the type of work involved in respect of the licence which is sought to be renewed; and

(b) the provisions of the Ordinance relating to such work. (L.N. 320 of 1992)

(3B) Without prejudice to any other steps which the licensing authority may take for the purpose of satisfying himself that an applicant has the knowledge required by subregulation (2) or (3A), the licensing authority may require the applicant to pass an examination held for the purposes of this regulation. (L.N. 320 of 1992)

(3C) An applicant for a plumber's licence who is required to undergo an examination pursuant to subregulation (3B) shall pay the examination fee prescribed in Part 1 of Schedule 1. (L.N. 320 OF 1992)

(3D) The licensing authority may require an applicant for a plumber's licence or for the renewal of a plumber's licence to attend in person at a specified office of the Water Authority in order to collect the licence or renewed licence and may, if the applicant fails to do so, refuse to issue or renew the licence. (L.N. 320 of 1992)

(4) An applicant for a plumber's licence who is aggrieved by the refusal of the licensing authority to issue or renew a plumber's licence or by any limitation or condition imposed by the licensing authority on the issue of a plumber's licence may, within 14 days after the receipt of a notice of such refusal or the imposition of the limitation or condition, appeal to the Water Authority whose decision shall be final.

(E.R. 2 of 2012)

Regulation:	35	**Grades of plumbers' licences**	E.R. 2 of 2012	02/08/2012

(1) A plumber's licence issued under regulation 34 pursuant to an application received before the commencement of the Waterworks (Amendment) (No. 2) Regulation 1992 (L.N. 320 of 1992) may be of either of the following grades and shall be valid for the type of work indicated in the licence-

(a) Grade I- For the construction, installation, maintenance, alteration, repair or removal of a fire service or inside service of any type.

(b) Grade II- (i) For the maintenance and repair of a fire service or inside service; and

(ii) for the installation, maintenance, repair or removal of water appliances.

(2) A plumber's licence issued under regulation 34 pursuant to an application received after the date referred to in subregulation (1) shall, subject to subregulation (3), be a Grade I licence, valid for the construction, installation, maintenance, alteration, repair or removal of a fire service or inside service of any type.

(3) The licensing authority may impose any limitation or condition as he thinks fit on the type of work which may be carried out by a holder of a plumber's licence.

(L.N. 320 of 1992)

Regulation:	36	**Plumber's licence**	E.R. 2 of 2012	02/08/2012

(1) A plumber's licence shall be in such form as may be specified.

(2) Subject to regulation 37, a plumber's licence shall be valid up till and including 31 December in the year in which it is issued and may be renewed annually under regulation 34(3) for a further period of 12 months from the date of expiry.

Regulation:	37	**Power to cancel plumber's licence**	E.R. 2 of 2012	02/08/2012

(1) The licensing authority may cancel a plumber's licence at any time if-
  (a) he is satisfied that the plumber's licence was obtained by misrepresentation or fraud; or
  (b) the holder contravenes any of the provisions of the Ordinance in respect of the construction, installation, maintenance, alteration, repair or removal of a fire service or inside service.

(2) The licensing authority may suspend a plumber's licence for any period not exceeding 6 months for any contravention specified in subregulation (1)(b).

(3) Any person who is aggrieved by the cancellation or suspension of a plumber's licence may, within 14 days after the receipt of the notice of cancellation or suspension, appeal to the Water Authority whose decision shall be final.

Regulation:	38	**(Repealed L.N. 320 of 1992)**		30/06/1997

Part:	6	**Public Standpipes**	E.R. 2 of 2012	02/08/2012

Regulation:	39	**Use of public standpipes**	E.R. 2 of 2012	02/08/2012

(1) Fresh water from a public standpipe shall be taken away only in a bucket or any other suitable receptacle and in such a manner as to prevent waste.

(2) No person shall draw water from a public standpipe by means of a hosepipe or similar apparatus.

(3) No person, other than the Water Authority or a person authorized by him, shall prevent any other person from taking water from a public standpipe.

Part:	7	**Fishing**	E.R. 2 of 2012	02/08/2012

Regulation:	40	**Interpretation**	E.R. 2 of 2012	02/08/2012

For the purposes of this Part-

authorized officer (獲授權人員) means-

  (a) a police officer;
  (b) (Repealed 47 of 1997 s. 10)
  (c) a nature warden or honorary nature warden appointed under the Wild Animals Protection Ordinance (Cap 170);
  (d) an authorized officer under the Forests and Countryside Ordinance (Cap 96);
  (e) an authorized officer or a fisheries inspector under the Fisheries Protection Ordinance (Cap 171); or
  (f) a person authorized in writing by the Water Authority; (Replaced 14 of 1993 s. 15)

fishing licence (釣魚牌照) means a licence issued under regulation 42;

toxic substance (有毒物質) means any substance specified in Schedule 1 to the Fisheries Protection Ordinance (Cap 171). (13 of 2012 s. 19)

Regulation:	41	**Fishing under licence**	E.R. 2 of 2012	02/08/2012

(1) No person shall fish in waters forming part of the waterworks except under and in accordance with the terms of a fishing licence.

(2) No person shall catch fish in waters forming part of the waterworks by any means other than by rod and line.

(3) No person shall use any explosive or toxic substance to catch or destroy fish in waters forming part of the waterworks.

Regulation:	42	**Issue of fishing licence**	E.R. 2 of 2012	02/08/2012

(1) The Water Authority may, on payment of the fee prescribed in Part 1 of Schedule 1, issue a licence to fish in waters forming part of the waterworks.
(2) A fishing licence shall-
  (a) be in such form as may be specified;
  (b) be valid for the period of time stated therein;
  (c) be for the use of one rod and line;
  (d) not be transferable; and
  (e) be subject to any other condition stated therein.

(E.R. 2 of 2012)

Regulation:	43	**Powers of inspection and arrest**	E.R. 2 of 2012	02/08/2012

(1) If an authorized officer finds a person fishing or has reasonable grounds for believing that a person has been fishing or is about to fish in waters forming part of the waterworks he may require such person to produce for inspection his fishing licence.
(2) If an authorized officer has reasonable grounds for believing that a person has committed an offence under regulation 44, he may-
  (a) arrest such person;
  (b) seize any fish in his possession; and
  (c) seize any net or other appliance or thing for catching or destroying fish, whether in the possession of such person or not, in respect of which he has reason to believe the offence has been committed.
(3) Where an authorized officer arrests a person under subregulation (2) he shall forthwith take such person to the nearest police station and shall there hand him over to the custody of a police officer and thereupon the provisions of section 52 of the Police Force Ordinance (Cap 232) shall apply.

Regulation:	44	**Offences**	E.R. 2 of 2012	02/08/2012

Any person who-
  (a) contravenes regulation 41;
  (b) contravenes any condition of a fishing licence;
  (c) without lawful excuse fails to comply with a requirement of an authorized officer under regulation 43(1); or
  (d) wilfully resists or obstructs an authorized officer in the exercise of his powers under regulation 43(2) and (3),

shall be guilty of an offence and shall be liable on summary conviction to a fine at level 3.

(L.N. 219 of 1983; L.N. 266 of 2006)

Regulation:	45	**Revocation or suspension of fishing licence**	E.R. 2 of 2012	02/08/2012

If any condition of a fishing licence is contravened, the Water Authority may, without prejudice to the liability of any person for the contravention, revoke or suspend the fishing licence.

Part:	8	**Miscellaneous**	E.R. 2 of 2012	02/08/2012

Regulation:	46	**Charges for water**	E.R. 2 of 2012	02/08/2012

The Water Authority shall charge the rates specified in Part 3 of Schedule 1 for fresh water supplied under the Ordinance.

(L.N. 85 of 1979; E.R. 2 of 2012)

Notes:

1. The operation of this regulation is affected by the transitional provision contained in section 6 of L.N.

176 of 1996 which is reproduced below-

"6. Transitional

Notwithstanding anything in this Regulation the charges in force under regulation 46 of the principal Regulations immediately before 1 July 1996 shall apply in relation to any bill of charges for a period of supply which includes 30 June 1996.".

2. The amount of charge payable for the supply of fresh water pursuant to this regulation shall be reduced in respect of-

(a) the period commencing on 1 April 2002 and ending 31 March 2003 (please see sections 2(2) and 4 of the Revenue (Variation and Reduction of Fees and Charges) Order 2002 (Cap 2 sub. leg. R):

(b) bills scheduled to be issued within the period commencing on 1 August 2003 and ending on 30 November 2003 (please see the Waterworks (Reduction of Water Charge) Regulation 2003 (L.N. 130 of 2003)).

Regulation:	46A	**(Expired on 1.4.1984)**		30/06/1997

(Expired on 1.4.84)

Regulation:	46B	**Examination of water sample**	E.R. 2 of 2012	02/08/2012

(1) The Water Authority shall, upon being requested to do so and upon payment of the fee prescribed in Part 4 of Schedule 1, carry out an examination of a water sample from any supply and shall issue to the person who requested the examination a report of the results of such examination.

(2) An additional copy of any report issued under subregulation (1) may be issued to any person requesting the same upon payment of the fee prescribed in Part 4 of Schedule 1.

(L.N. 40 of 1985; E.R. 2 of 2012)

Regulation:	47	**Prohibition of sale of water**	E.R. 2 of 2012	02/08/2012

(1) Subject to subregulation (2), no person shall, without the permission in writing of the Water Authority, sell or offer for sale water from the waterworks.

(2) Subregulation (1) shall not apply to a consumer of an inside service who recovers the cost of water from any person-

(a) who occupies the premises in which the inside service exists; and

(b) who uses in such premises water which is supplied through the inside service.

Regulation:	48	**Validity of notices**	E.R. 2 of 2012	02/08/2012

Any notice, form or other document under the Ordinance may bear the name of the Water Authority or other person authorized by him and every such notice, form or other document shall be valid if the name of the Water Authority or such authorized person is printed thereon.

Regulation:	49	**Service of notice, etc.**	E.R. 2 of 2012	02/08/2012

(1) Any notice, form or other document under the Ordinance may be served-

(a) by delivering it personally to the person on whom it is to be served;

(b) by sending it by post to the last known address of the person on whom it is to be served;

(c) by leaving it at the residence or place of business of the person on whom it is to be served; or

(d) by posting it in a conspicuous place upon the premises to which it relates.

(2) Notwithstanding subregulation (1), where a notice is of general application to consumers or agents the notice may be published in such English and Chinese language newspapers circulating in Hong Kong as may be approved for the purpose by the Water Authority.

Regulation:	50	**Time limit for payment of charges and levy of surcharge**	E.R. 2 of 2012	02/08/2012

(1) Payment of a charge due shall be made on or before the date specified in the notice of demand. (L.N. 118 of 1988)

(2) Where a charge remains unpaid for a period of 6 months, or less, from the date specified in the notice of demand, the Water Authority or Director of Accounting Services may add to the unpaid charge a surcharge not exceeding 5% of the unpaid charge and recover the total amount of the unpaid charge and surcharge. (L.N. 16 of 1977)

(3) Where a charge remains unpaid for a period exceeding 6 months from the date specified in the notice of demand, the Water Authority or Director of Accounting Services may add to the total amount of- (L.N. 16 of 1977)

(a) the unpaid charge; and

(b) any surcharge added thereto under subregulation (2), a further surcharge not exceeding 10% of the total amount and recover the total amount and further surcharge.

Regulation:	51	**Penalty**	E.R. 2 of 2012	02/08/2012

(1) Any person who contravenes regulation 9, 10, 11, 13, 15(2) or (3), 23, 24, 26(4), 39 or 47 or any requirement of the Water Authority under regulation 15(1), 21, or 32(2) or (4) shall be guilty of an offence. (L.N. 320 of 1992)

(2) Any person who is guilty of an offence under these regulations shall be liable on summary conviction to a fine at level 3. (L.N. 219 of 1983; L.N. 266 of 2006)

Regulation:	52	**Saving**	E.R. 2 of 2012	02/08/2012

Any-

(a) notice or account;

(b) permission; or

(c) plumber's licence or fishing licence,

given, granted or issued by the Water Authority under the revoked Waterworks Regulations (Cap 102 sub. leg. 1964), and in force at the commencement of these regulations, shall be deemed to have been given, granted or issued under these regulations.

Regulation:	53	**(Omitted as spent—E.R. 2 of 2012)**	E.R. 2 of 2012	02/08/2012

Schedule:	1		L.N. 126 of 2014	01/01/2015

[regulations 4, 6, 8, 18, 21, 26, 28, 30, 32, 34, 42 & 46]

Part 1

Fees and Charges

Fees and charges payable under the regulations shall be-

1. Under regulation 6(5)-

Making a connection to the main and installing (including reinstatement of the ground surface) the part of a fire service or inside service on land held by the Government- (29 of 1998 s. 105)

	For any length of 100 metres	For each metre or part of a metre in excess of

		and below	100 metres
(a)	Pipes of any size up to and including 20 mm in diameter	$2260	$ 95
		For any length of 30 metres and below	For each metre or part of a metre in excess of 30 metres
(b)	Pipes above 20 mm in diameter up to and including 25 mm in diameter	$3510	$ 145
(c)	Pipes above 25 mm in diameter up to and including 40 mm in diameter	$4610	$ 185

2. Under regulations 18(2) and 28(2)-
   Reconnecting a fire service or inside service ..... $ 380

3. Under regulation 26(2A)-
   (a) Providing and installing a meter ..... $ 420
   (b) Providing a meter ..... $ 110

4. Under regulations 4(3) and 26(3)-
   Resealing a fire service or meter ..... $ 255

5. Under regulations 28(2), 30(3) and 32(2)-
   Testing a meter or a private check meter (including removal and refixing)-
   (a) any size up to and including 80 mm in diameter ..... $ 735
   (b) above 80 mm in diameter up to and including 100 mm in diameter $1650
   (c) above 100 mm in diameter up to and including 150 mm in diameter $2880
   (d) above 150 mm in diameter up to and including 200 mm in diameter $3600

6. Under regulation 34(1) and (2)-
   Plumber's licence ..... $ 98

7. Under regulation 34(3)-
   Renewal of plumber's licence ..... $ 73

8. Under regulation 34(3C)-
   Plumber's licence examination $1190

9. Under regulation 42-
   Fishing licence ..... $ 30

(L.N. 176 of 1996; L.N. 358 of 2000; L.N. 41 of 2001; L.N. 129 of 2010; L.N. 89 of 2012; L.N. 121 of 2013; L.N. 126 of 2014)

Part 2

Supervision Charge

(Regulation 8)

The charge for supervision of work carried out by the Water Authority, other than work for which a fee is prescribed in this Schedule, shall be 20% of the actual cost of such work.

Part 3

Charge for Fresh Water

(Regulation 46)

1. The charge for fresh water, filtered or unfiltered, per unit of 1 cubic metre (1000 litres) shall be-

		Charge per unit
(a)	for construction purposes	$ 7.11
(b)	for domestic purposes (other than flushing), per 4 month period-	
	(i) for the first 12 units	$ NIL
	(ii) for the next 31 units	$ 4.16
	(iii) for the next 19 units	$ 6.45
	(iv) for the remainder	$ 9.05
(c)	for flushing purposes, per 4 month period-	
	(i) for the first 30 units	$ NIL
	(ii) for the remainder	$ 4.58
(d)	for shipping purposes referred to in paragraph (a) of the definition of ***shipping purpose***	$10.93
(e)	for shipping purposes referred to in paragraph (b) of the definition of ***shipping purpose***	$ 4.58
(f)	for trade purposes	$ 4.58
(g)	for any purpose (other than shipping purposes referred to in paragraph (a) of the definition of ***shipping purpose***) where payment is made against a prepaid ticket issued by the Director of Accounting Services .	$ 4.58

(L.N. 291 of 1996; L.N. 292 of 1996)

2. Where a charge under item 1(b) or (c) of this Part is calculated on a computerized basis, a reference in that item to "4 month period" shall be read as a reference to 121.64 days.

(L.N. 176 of 1996)

Part 4

Charges for Examination of Water

(Regulation 46B)

1. The charge for examination of a water sample shall be-

		Charge where sample delivered to Water Authority
(a)	for a general chemical analysis (comprising all standard tests*) ...	$3250
(b)	for an individual standard test*	$ 285
(c)	for a non-standard test (other than a non-standard test referred to in paragraph (d) or (e))	$ 555

(d)	for a British Pharmaceutical test for water for injection purposes	$1290
(e)	for a general bacteriological examination	$ 655

2. Charge for each attendance to collect any sample or samples $1130

3. Charge for additional copy of examination report ..... $ 1.10

* For the purpose of this Part, ***standard test*** (標準測試) means a test to determine any one of the following-

Turbidity;	Nitrite nitrogen;	Total alkalinity;
Ortho-phosphate;	pH value;	Nitrate nitrogen;
Total hardness;	Fluorides;	Colour;
Oxygen absorbed value;	Calcium;	Iron;
Conductivity;	Suspended solids;	Magnesium;
Manganese;	Ammoniacal nitrogen;	Dissolved solids;
Chlorides;	Aluminium;	Albuminoid nitrogen;
Residual chlorine;	Sulphates;	Silica.

(L.N. 176 of 1996; L.N. 129 of 2010; L.N. 89 of 2012; L.N. 121 of 2013; L.N. 126 of 2014)

Schedule:	2		E.R. 2 of 2012	02/08/2012

[regulation 19]

Part 1

Pipes and Fittings

1. (1) Pipes on a fresh water fire service shall be made of cast iron, steel or copper.
   (2) Pipes and fittings on a salt water fire service shall be made of such material as the Water Authority, in consultation with the Director of Fire Services, thinks fit.
   (3) Pipes on a fresh water inside service shall be made of cast iron, unplasticized P.V.C., polybutylene, steel, copper, polyethylene, crosslinked polyethylene or chlorinated polyvinyl chloride. (L.N. 673 of 1994)
   (4) Pipes on a salt water inside service shall be made of cast iron or unplasticized P.V.C. (L.N. 320 of 1992)

2. No pipe shall be less than 20 mm diameter, except that a branch pipe may be 15 mm diameter if the pipe run is short and the pipe supplies only one draw-off point.

3. No bend or curve shall be made in any pipe so as to diminish the waterway or alter the internal diameter of the pipe in any part.

4. Changes of direction for a pipe of less than 40 mm diameter shall be effected by slow bends and no elbows shall be used.

5. (a) Cast iron pipes shall comply with BS 4622 for grey iron pipe and with BS 4772 for ductile iron pipe, except that they may incorporate a mechanical or automatic joint of approved design.
   (b) Cast iron pipes to BS 4622 and ductile iron pipes to BS 4772 shall be of a class appropriate to the duty required.

6. (Repealed L.N. 320 of 1992)

7. Cast iron fittings for use with cast iron pipes shall comply with BS 4622 for grey iron fittings and with BS 4772 for ductile iron fittings, except that they may incorporate a mechanical joint of approved design. Fittings shall be of a class appropriate to the duty required. (L.N. 320 of 1992)

8. (Repealed L.N. 252 of 1977)

9. Steel pipes shall-
   (a) be galvanized;
   (b) comply with BS 1387 for 'Medium' tubes and tubulars; and
   (c) if on a fresh water inside service, be lined with internal unplasticized polyvinyl chloride or polyethylene lining approved by the Water Authority. (L.N. 673 of 1994)

10. Malleable cast iron fittings for use with steel pipes shall be galvanized and shall comply with BS 143 and 1256 for malleable cast iron and cast copper alloy pipe fittings. (L.N. 320 of 1992)

11. Wrought fittings of iron or steel for use with steel pipes shall be galvanized and shall comply with BS 1740, Part 1 for wrought iron pipe fittings. (L.N. 320 of 1992)

12. Unplasticized P.V.C. pipes and fittings shall comply with BS 3505 for Class 'D' tubes or equivalent.

13. Copper pipes incorporating screw joints shall comply with BS 2871, Part 2, for copper tubes (heavy gauge) for general purposes and screw thereof shall comply with BS 61, for screw threads for copper tubes.

14. (Repealed L.N. 320 of 1992)

15. Cast copper alloy fittings, for copper pipes screwed in accordance with Table 1 of BS 61, shall comply with the relevant requirements of BS 143 and 1256 for malleable cast iron and cast copper alloy pipe fittings. (L.N. 320 of 1992)

16. Copper pipes to be jointed with compression fittings or capillary fittings or by bronze or autogenous welding shall comply with BS 2871, Part 1.

17. Capillary fittings or compression fittings shall comply with BS 864, Parts 2 for capillary and compression fittings of copper and copper alloy and compression fittings for pipes laid under the ground shall be Type B. (L.N. 320 of 1992)

18. Polybutylene pipes and fittings shall comply with BS 7291 Parts 1 and 2. (L.N. 673 of 1994)

19. Polyethylene pipes shall comply with BS 6730 and BS 6572. (L.N. 673 of 1994)

20. Crosslinked polyethylene pipes and fittings shall comply with BS 7291 Parts 1 and 3. (L.N. 673 of 1994)

21. Chlorinated polyvinyl chloride pipes and fittings shall comply with BS 7291 Parts 1 and 4. (L.N. 673 of 1994)
(L.N. 252 of 1977)

Part 2

Taps and Valves

1. Draw-off taps and stop valves of the ordinary screw-down pattern and of nominal size not exceeding 50 mm shall comply with BS 1010, Part 2 for draw-off taps and stop valves.

2. Draw-off taps and stop valves not being of the ordinary screw-down pattern, shall be capable of resisting a pressure of at least 2000 kPa, and every valve, spindle, and other internal part and, where the nominal size of the tap or valve does not exceed 50 mm, the body thereof, shall be made of a corrosion resisting alloy.

3. Sluice valves of nominal size of 50 mm or more shall comply with BS 5163 for sluice valves for waterworks purposes of PN 10 or PN 16 according to the pressure to which the valve will be liable to be subjected under working conditions.

4. (1) Ball valves of the "Piston" type and of a nominal size not exceeding 50 mm shall comply with BS 1212, Part 1 for ball valves and shall comply with the following requirements-
   (a) valves shall be provided with a washer of suitable vulcanized rubber or some other equally suitable material and the washer shall be enclosed in an internally flanged cap screwed to the piston;
   (b) the body and piston shall be of a corrosion-resisting alloy, and the lever shall be of a corrosion-resisting alloy or of copper and shall be of sufficient rigidity not to bend permanently under working conditions. (L.N. 320 of 1992)

   (2) Ball valves not being of the "Piston" type shall be sound and suitable and comply with the following requirements-
   (a) high pressure valves shall close against a test pressure of 1400 kPa, medium pressure valves against a test pressure of 700 kPa, low pressure valves against a test pressure of 300 kPa; and the valves, not being valves having an interchangeable orifice seating, shall have the letters "H.P.", "M.P." or "L.P." respectively cast or stamped on the body of the fitting, and shall, while held in a closed position, be capable of resisting a pressure of 2000 kPa;
   (b)-(c) (Repealed L.N. 320 of 1992)
   (d) valves of ferrous metal of a nominal size exceeding 50 mm shall be provided with a flange on their inlets complying with BS 4504, Part 1, Table 16, shall be protected against corrosion by dipping in accordance with the requirements of BS 4164 or by galvanizing in accordance with the requirements of BS 1387 and shall have all their working surfaces lined or faced with, and its orifice seating of, a corrosion-resisting alloy.

   (3) Ball valve floats of a nominal outside diameter not exceeding 300 mm shall comply with BS 1968 for copper floats or with BS 2456 for plastic floats.

   (4) Ball valves when fixed to a cistern shall have the size of the orifice, the size of the float and the length of the lever so proportioned to one another that, when the float is immersed to an extent not exceeding half its volume, the ball valves shall be watertight against the highest pressure at which it may be required to work.

5. Ball valves or float-operated valves fitted to storage cisterns shall be securely and rigidly fixed thereto above the water-line, and shall be supported independently of the inlet pipe (unless such inlet pipe is itself rigid and rigidly fixed to the cistern), in such a position that no part of the body of the valve will be submerged when the cistern is charged to overflowing level.

6. Where a ball valve or float-operated valve provided with a pipe so arranged as to discharge water into a cistern below its overflowing level, an air hole shall be provided in the outlet chamber of the valve above such level of a size sufficient to prevent siphonage of water back through the valve.

7. No ball valve shall be fitted to a storage cistern to contain heated water.

8. Gate valves shall comply with BS 5154 for copper alloy gate valves for general purposes.

9. Fitting with threaded outlets, or any device facilitating the connecting of rubber or other type flexible hose, shall not be permitted, except with the written permission of the Water Authority.

10. Draw-off taps, valves and valve floats for use with salt water shall, where applicable, comply with the British Standard and other requirements for such fittings for use with fresh water and shall, in addition, be manufactured from materials capable of withstanding the corrosive effect of salt water.

11. No draw-off tap or valve shall be installed or used unless it has been tested in accordance with regulation 21 or otherwise approved by the Water Authority. (L.N. 320 of 1992)

(L.N. 252 of 1977)

Part 3

Cold Water Storage Cisterns

1. No cistern for the storage of cold water shall be installed or used except with the permission in writing of the

Water Authority who shall specify the maximum permitted capacity.

2. Every cistern shall be watertight, of adequate strength, properly supported and shall be constructed of concrete, galvanized mild steel or other approved material. (L.N. 320 of 1992)

3. A cistern of mild steel not exceeding 5000 litres capacity shall comply with BS 417, Part 2 for galvanized mild steel cisterns.

4. (a) Every cistern shall be located so as to minimize the risk of contamination of the stored water and shall be fitted with suitable close fitting lockable covers which shall not be air-tight. Covers shall be positioned so as to facilitate inspection and cleaning.
(b) Where a storage cistern for non-potable water is placed adjoining to a storage cistern for potable water there shall be an air space between such storage cisterns.

5. Cisterns shall be fitted with a ball valve controlled inlet in the case of a gravity supply or with an automatic control switch in the case of a pumped supply. The ball valve or control switch shall shut off the supply when the water level is 25 mm below the invert of the overflow pipe. The invert 25 mm above of the inlet pipe or the face of the outlet nose of the ball valve shall be not less the top of the overflow pipe.

6. An overflow pipe of one commercial size larger than the inlet pipe, and in no case less than 25 mm diameter, shall be fitted to each cistern and shall be extended to terminate in a conspicuous position. No overflow pipe shall be connected to a drain, sewer or to the overflow pipe from any other cistern.

7. A stop valve shall be provided on the outlet of every cistern and provision shall be made for a drain-off pipe to enable the cistern to be emptied.

8. No cistern for the storage of fresh water supplied from the waterworks shall, without the written permission of the Water Authority, be so connected that it can be used for the storage of any water other than that supplied from the waterworks.

9. Every cistern shall be installed so that it is easily accessible for cleaning or repair. Where a cistern is installed inside a building and, due to limited headroom available, it is fixed with limited clearance from the ceiling or underside of the roof, a quickly detachable fitting must be used to enable it to be easily removed for cleansing and repair.

10. Safe access shall be provided to all cisterns by means of a secure permanent ladder or readily available portable ladder.

(L.N. 252 of 1977)

Part 4

Water Heaters

1. (1) Subject to subparagraph (2), a water heater shall be supplied with water from a cold water storage cistern.
(2) The following type of water heaters may, with the written permission of the Water Authority, be connected direct to a main-
(a) non-pressure type water heaters where no restriction of flow can be effected beyond the inlet control valve;
(b) cistern type water heaters;
(c) instantaneous water heaters where the guaranteed test pressure of the water heater is at least 1 1/2 times the static head available at the water heater;
(d) unvented thermal storage type electric water heaters which comply with the safety requirements under the Electrical Products (Safety) Regulation (Cap 406 sub. leg. G). (L.N. 106 of 1999)
(3) Where a water heater is connected direct to a main-
(a) every draw-off point of the water heater shall be not less than 15 mm above the lowest part of the top

edge of the receptacle supplied from the water heater;

(b) if it is a water heater burning gas, the construction of the water heater shall be such that no leakage of gas into the water can occur;

(c) if it is a water heater using electricity, the construction of the water heater shall be according to the relevant British Standards.

2. Where mixing valves, showers or water blenders are installed, the cold water supply to these fittings shall be from the same cold water storage cistern or main that supplies the water heater and the installation shall be such that the hot water flow will stop before that of the cold water in the event of a failure in the water supply.

3. Every water heater of the thermal storage type, other than an electric water heater of the type specified in paragraph 1(2)(d), shall be provided with an individual expansion pipe taken from its highest point and shall continuously rise without obstruction until it discharges to atmosphere above the storage cistern at a sufficient height to prevent a constant out-flow of hot water therefrom. (L.N. 286 of 1990)

4. No tap or other means of drawing off water (other than a screwed plug with a removable key for emptying the system for cleansing or repair) shall be connected to any part of the hot water system below the top of the hot water cylinder in such a way that the level of the water in the cylinder can be lowered.

5. No tap used for the purpose of drawing hot water shall be fixed at a greater distance (measure along the axis of the pipe by which the tap is supplied) from a water heater or hot water cistern, cylinder or tank, or from a flow and return system, than the distance appropriate to the largest internal diameter of any part of the said pipe as shown in the following table-

Table

Largest internal diameter of pipe	Distance in metres
(a) Not exceeding 20 mm	12
(b) Exceeding 20 mm but not exceeding 25 mm	8
(c) Exceeding 25 mm	3

6. A loose jumper type valve shall be fitted on the inlet of every water heater if a non-return valve is not incorporated in such water heater; but this requirement does not apply to an electric water heater of the thermal storage type that is not provided with an individual expansion pipe. (L.N. 286 of 1990)

7. Pipes used for conveying hot water shall be of galvanized steel, copper, or of some corrosion-resisting alloy: Provided that cast iron pipes of not less than 50 mm internal diameter may be used if suitable provision for their expansion is made. (L.N. 320 of 1992)

8. Every hot water cylinder or tank of a capacity of not less than 100 litres shall-

(a) if made of mild steel, comply with the requirements for cylinders or tanks, as the case may be, of BS 417, Part 2 for galvanized mild steel cisterns, tanks and cylinders; and (L.N. 106 of 1999)

(b) if made of copper, comply with BS 699 for copper cylinders for domestic purposes or with BS 1566, Parts 1 and 2 for copper indirect cylinders.

9. Every water heater of thermal storage type or the calorifier type shall comply with the requirements of BS 3456, Part 102, Section 102.21 for stationary non-instantaneous electric water heater or with BS 853 for hot water calorifiers respectively. (L.N. 106 of 1999)

10. (Repealed L.N. 320 of 1992)

11. (Repealed L.N. 106 of 1999)

12. Every system incorporating an electric water heater of the thermal storage type shall be provided with-

(a) a supply pipe that branches off from the feed pipe at a point above the top of the water heater, or some

other device to prevent the water from draining down from the water heater if there is a failure at the source of water supply;

(b) an anti-vacuum valve complying with BS 6282 or some other device to prevent heated water from being syphoned back to the supply pipe; and

(c) a vessel to accommodate the expansion of heated water where that expansion is constrained by a non-return valve, or a similar device, incorporated at the inlet of the water heater. (L.N. 286 of 1990)

(L.N. 252 of 1977)

Part 5

Flushing Apparatus

1. Every flushing cistern shall be of the valveless syphonic type unless otherwise approved by the Water Authority. A stop valve shall be fixed in a readily accessible position so as to control the supply to the cistern.

2. Flushing cisterns for water-closet fitments and slop sinks shall be capable of giving a flush of not less than 7.5 litres and not more than 15 litres of water on each occasion such fitment is used. (L.N. 106 of 1999)

3. The capacity of the flushing cistern in the case of trough water-closets and urinals shall be approved by the Water Authority subject to the discharge in the case of trough water-closets being not less than 9 litres of water for every metre of the channel and the discharge in the case of urinals being not less than 4.5 litres of water for every basin or stall, or in the case of a trough urinal, every metre thereof.

4. The internal diameter of flushing pipes shall-
   (a) in the case of water-closet fitments, trough water-closets and slop sinks, be not less than 30 mm;
   (b) in the case of urinals (other than trough urinals), be not less than 15 mm for each basin and stall; and
   (c) in the case of trough urinals, be not less than 15 mm for every metre thereof.

5. Every flushing apparatus shall be operated by hand, except in cases where written permission from the Water Authority has been granted for the installation of automatic flushing. In such cases the method of control and the amount and frequency of the flushes shall be decided by the Water Authority.

6. Every flushing cistern operated by hand shall be provided with a ball valve so arranged as to refill the cistern within 2 minutes.

7. Flushing cisterns shall in all cases be supplied from storage cisterns and such storage cisterns shall not be used to supply any other apparatus, appliance or fitting. Every such cistern shall be fitted with a suitable close fitting cover and provided with adequate access to enable the cistern to be entered and cleaned.

8. Every flushing cistern shall have an overflow which shall discharge in a conspicuous position.

9. Flushing apparatus without flushing cisterns shall not be used.

(L.N. 252 of 1977)

Part 6

Baths, Lavatory Basins and Sinks

1. Every inlet to a bath, lavatory basin or sink shall be distinct from, and unconnected with, any outlet therefrom and every outlet for emptying such bath, lavatory basin or sink shall be provided with a well-fitting and easily accessible watertight plug or some other equally suitable apparatus.

2. The level of the point of discharge of hot or cold water to a bath, lavatory basin or sink shall be above the level of the overflow, or if there be no overflow, of the top edge of the bath, basin or sink.

3. The water supply to any bidet, sitz bath, slop or sluicing sink or similar apparatus, shall, if the inlet is liable to be submerged, be provided by-
    (a) a storage cistern supplying water to such apparatus only;
    (b) a storage cistern for flushing purposes only; or
    (c) a hot water distribution system supplying such apparatus only.

4. All taps supplying baths, lavatory basins, sinks or similar apparatus shall have a stop valve fixed in a readily accessible position to control the supply to each fitting or branch pipe supplying a range of fittings.

Annex J

Documents issued for administering the Waterworks Ordinance

Forms

(a) Application for certificate regarding water supply availability / connection (Form WWO 132, **Appendix 1** refers);

(b) Notification / Application for constructing, installing, altering or removing an inside service or fire service (Form WWO 46, **Appendix 2** refers); and

(c) Application for water supply/ Request for work to be carried out by the Water Authority (WWO 542, **Appendix 3** refers).

Water Supplies Department Circular Letters

(a) WSD Circular Letter No. 2/2012 on 10 August 2012, which specifies guidelines on cleansing and disinfection of fresh water inside service (**Appendix 4** refers); and

(b) WSD Circular Letter No. 1/2015 on 13 July 2015, which specifies prohibition of using leaded solder at fresh water inside services and new parameters for testing of water sample (**Appendix 5** refers).

Handbook and Guidelines

(a) Hong Kong Waterworks Standard Requirements for Plumbing Installation in Buildings (HKWSR) (**Appendix 6** refers);

(b) Handbook on Plumbing Installation for Buildings (**Appendix 7** refers);

(c) Guideline on Application for Approval of Water Supply Pipes and Fittings (**Appendix 8** refers);

(d) General Information on the Use of Different Types of Corrosion Resistant Pipe Materials as Inside Service in Buildings (**Appendix 9** refers); and

(e) Installation Notes of Different Types of Corrosion Resistant Pipe Materials as Inside Service in Buildings (**Appendix 10** refers).

To : The Water Authority
43/F, Immigration Tower, 7 Gloucester Road, Hong Kong
Tel. 2824 5000 Fax. 2802 7333
Email: wsdinfo@wsd.gov.hk

APPLICATION FOR CERTIFICATE REGARDING WATER SUPPLY AVAILABILITY/CONNECTION*

BUILDING (STANDARDS OF SANITARY FITMENTS, PLUMBING, DRAINAGE WORKS & LATRINES) REGULATIONS

Lot No.: Date:
Address:

Please supply the following certificate:

***I - Availability of Water Supply:**

1. Potable Water ☐
2. Flushing Water ☐

(a) Anticipated Completion Date _____

(b) Proposed development: _____ Estimated daily demand _____ litres

☐ Residential: No. of flats _____ Anticipated Population _____

☐ Commercial: No. of units _____ Nature _____

☐ Industrial No. of units _____ Nature _____

* (c) Attached is a copy of the water supply clause(s) in conditions set for this land.

* (d) This development is a Section 16 application case under the Tower Planning Ordinance and approved on _____ with
*(i) no comment on water supply issue from the Town Planning Board, or
*(ii) comment(s) on water supply issue from the Town Planning Board as shown in the attached copy.

* (e) This is a redevelopment case without any need for Section 16 application under the Town Planning Ordinance.

***II - Connection of Water Supply:**

1. Potable Water ☐
2. Flushing Water ☐

Please quote ASN: _____

I serve this notice on the period of availability of site under safe condition for connection works (3 months advance notice normally required) and undertake to make the inside service ready for connection:

_____

I confirm that the plumbing fittings and pipes used in the captioned project are in full compliance with Waterworks standards and requirements.

I fully understand the purpose and agree to the Water Authority using data collected from me for the purpose of or directly related to applying for new water supply. If I do not provide sufficient data, the Water Authority may not be able to process my application. I agree that these data and other related information may be transferred to other Government bureaux and departments. I understand that I can request the Departmental Secretary of the Water Supplies Department at 48/F., Immigration Tower, 7 Gloucester Road, Hong Kong for access to and correction of personal data.

Authorized Person's Signature _____
Name (in Block Letters) _____
HKID No. _____
Company Name _____
Business Registration No. _____
Preferred contact method: *by mail/e-mail/fax
Mailing Address _____
E-mail _____
Fax No. _____
Tel No. _____

☐ Tick as appropriate
* Delete as appropriate

SAVE WATER – SAVE MONEY

W The Water Authority
43/F Immigration Tower, 7 Gloucester Road, Hong Kong.
Tel : 2824 5000 Fax : 2802 7333 email : wsdinfo@wsd.gov.hk

Form Serial No. …….
(for official use)

*NOTIFICATION / APPLICATION FOR CONSTRUCTING, INSTALLING, ALTERING OR REMOVING AN INSIDE SERVICE OR FIRE SERVICE

Part I (To be completed by the Licensed Plumber* and the Authorized Person) ***(See Note 1)***

To the Water Authority,

Plumbing Installation for the Premises at

---

*I/We am/are engaged by the *Registered Consumer / Registered Agent / Applicant for new water supply in Part II to *construct / install / alter / remove a/an *inside service / fire service at the above premises, which has been approved by the Water Authority. Details are as follows:-

WSD approval letter reference : _____ dated _____ ASN _____

Plumbing covered by this Form: *Whole of the Works / Part of the Works (please specify : _____

_____) covered by the WSD approval letter.

Approved drawing no. (if no drawing has been required, describe briefly the plumbing works): _____

_____

Size and no. of water meters involved/required : _____

Anticipated date when water supply is required : _____ *(see Note 4)*

Remarks : _____

A set of duly completed Annex to this Form is attached to show details of pipes and fittings installed/intended to be installed at the above premises.

2. PURPOSE OF SUBMISSION *(please check one box only) (See Note 2):-*

☐ *I/We hereby notify that the plumbing works detailed above *were/will be commenced on _____.
*I/We CERTIFY that the pipes and fittings installed / intended to be installed, including those as listed on the attached Annex to this Form and those not listed, are as prescribed by the Waterworks Regulations.

☐ Your permission is sought for *me/us to *construct / install / alter / remove a/an *inside service / fire service at the above premises. As some pipes and fittings intended to be installed have not been approved by the Water Authority, *I/we understand that prior approval from the Water Authority must be obtained before commencement of the plumbing works.

3. *I/We fully understand the purpose and agree to the Water Authority using data collected from *me/us for the purpose of or directly related to applying for constructing, installing, altering or removing an inside service or fire service. If *I/we do not provide sufficient data, the Water Authority may not be able to process my/our application. *I/We agree that these data and other related information may be transferred to other Government bureaux and departments. *I/We understand that *I/we can request the Departmental Secretary of the Water Supplies Department at 48/F, Immigration Tower, 7 Gloucester Road, Hong Kong for access to and correction of personal data.

Licensed Plumber	**Authorized Person**
Plumber's Licence No: _____	(only applicable to a new buildings project)
Signature : _____	Signature : _____
Date : _____	Date : _____
Tel No : _____	Tel No : _____
Fax No : _____	Fax No : _____ E-mail : _____
E-mail : _____	Name: _____
Name: _____	*HKID/Passport/Business Registration No. : _____
	Address: _____
Preferred Contact Method : * by mail/e-mail/fax	Preferred Contact Method : * by mail/e-mail/fax

*delete whichever is not applicable

W The Water Authority
43/F Immigration Tower, 7 Gloucester Road, Hong Kong.
Tel : 2824 5000 Fax : 2802 7333 email : wsdinfo@wsd.gov.hk

Form Serial No. …….
(for official use)

Part II (To be completed by the Registered Consumer / Registered Agent / Applicant for new water supply) ***(See Note 1)***

To the Water Authority,

I endorse the information submitted by my Licensed Plumber *and the Authorized Person in Part I.

I fully understand the purpose and agree to the Water Authority using data collected from me for the purpose of or directly related to my Licensed Plumber's application for constructing, installing, altering or removing an inside service or fire service. If I do not provide sufficient data, the Water Authority may not be able to process my Licensed Plumber's application. I agree that these data and other related information may be transferred to other Government bureaux and departments. I understand that I can request the Department Secretary of the Water Supplies Department at 48/F, Immigration Tower, 7 Gloucester Road, Hong Kong for access to and correction of personal data.

Signature : _____

(* Registered Consumer / Registered Agent / Applicant for new water supply)

Name : _____

Tel No : _____

Fax No : _____

Date : _____

*delete whichever is not applicable

W The Water Authority
43/F Immigration Tower, 7 Gloucester Road, Hong Kong.
Tel : 2824 5000 Fax : 2802 7333 email : wsdinfo@wsd.gov.hk

Form Serial No. …….
(for official use)

Part III (To be completed by the Water Authority)

To the Licensed Plumber,
Licensed Plumber Mailing Address

1. ☐ Plumbing detailed in Part I and at the Annex is accepted.
   ☐ Plumbing detailed in Part I and at the Annex is not accepted for the following reasons:

   _____

   _____
2. ☐ Commencement date of the plumbing works as detailed in Part I is noted.
   ☐ Permission is given for you to proceed with the plumbing detailed in Part I and at the Annex.
3. ☐ Other remarks: _____

   _____

_____ Name : _____
(Signed for the Water Authority) Post : _____
Tel No : _____
Date : _____ Fax No : _____

*delete whichever is not applicable

W The Water Authority
43/F Immigration Tower, 7 Gloucester Road, Hong Kong.
Tel : 2824 5000 Fax : 2802 7333 email : wsdinfo@wsd.gov.hk

Form Serial No. …….
(for official use)

Part IV (To be completed by the Licensed Plumber) *(see Note 6)*

(For new building project, also to be signed by the Applicant and the Authorized Person)

To the Water Authority,

ASN : ……

* Whole of the plumbing / Part of the plumbing (please specify and submit relevant drawings : _____) covered by this Form was completed on _____.

Your inspection and approval of the plumbing is requested. * I also undertake the correctness of the meter positions of the *whole of the plumbing / part of the plumbing mentioned above.

_____ Date : _____

(Signature of the Licensed Plumber in Part I)

* I am satisfied with the correctness of the meter positions indicated above by the Licensed Plumber.

_____ Date : _____

(Signature of the Applicant of new building project)

* I am satisfied with the correctness of the meter positions indicated above by the Licensed Plumber.

_____ Date : _____

(Signature of the Authorized Person)

*delete whichever is not applicable

W The Water Authority
43/F Immigration Tower, 7 Gloucester Road, Hong Kong.
Tel : 2824 5000 Fax : 2802 7333 email : wsdinfo@wsd.gov.hk

Form Serial No. …….
(for official use)

Part V (To be completed by the Water Authority)

To the Licensed Plumber,
Licensed Plumber Mailing Address

Plumbing detailed in Part IV are last inspected on _____. Pursuant to the Waterworks Ordinance and Regulations, no irregularities were found and the plumbing detailed in Part IV is approved.

_____ Name : _____
(Signed for the Water Authority) Post : _____
Tel No : _____
Date : _____ Fax No : _____

*delete whichever is not applicable

Form Serial No……

(For official use)

Premises Address…….

PIPES AND FITTINGS INSTALLED/INTENDED TO BE INSTALLED:-

Description of Pipes and Fittings	Size	Manufacturer	Country of Origin	Standards of Compliance (Note 7(i))	Category of Compliance (Note 7 (ii))	FOR OFFICIAL USE					
						Receipt of Samples		Testing of Samples		Return of Samples	
						Serial No.	Date Received	Date	Result	Notified on	Collected on

Please use additional sheet(s) if required

Please see notes overleaf

Notes :-

1. The Form is applicable to premises supplied or to be supplied with water from the Waterworks. Parts I and IV of the Form and the Annex are to be completed by the Licensed Plumber. For a new building project, the Authorized Person is required to sign in Part I also. Part II is to be completed by the Registered Consumer/Agent/Applicant of new water supply. Omission of any details in the Form and the Annex may cause delay to your application.

2. Provided that all pipes and fittings intended to be installed are approved by the Water Authority, Parts I and II of this Form shall be submitted to notify the Water Authority of the details and commencement date of plumbing works. If any of the pipes and fittings used/to be used have not yet been approved by the Water Authority, prior approval must be obtained from the Water Authority before the commencement of plumbing works.

3. The Form with the Annex shall be mailed/faxed to the Water Authority.

4. Different sets of Forms are required for different phases of the plumbing that require water supply at different dates. **The Registered Consumer/Agent/Applicant of new water supply in Part II and/or the Licensed Plumber/Authorized Person in Part I shall inform the Water Authority in writing whenever there is any change to the 'anticipated date when water supply is required' in Part I of the Form.**

5. A copy of the form will be returned to the Licensed Plumber with signature of staff of the Water Authority in Part III and/or Part V or where appropriate.

6. Reporting completion of part of the plumbing, (including water pipe to be concealed) shall be made in Part IV of the Form.

7. All pipes used/intended to be used are required to be reported in the Annex. For fittings, only draw-off taps, stop valves, gate valves, ball valves and combination fittings need to be reported. A directory of pipes and fittings approved by the Water Authority can be found in the website http://www.wsd.gov.hk/p&f.html. For pipes and fittings not yet approved by the Water Authority, submission of details and samples of such pipes and fittings listed in the Annex may be required.

   (i) British Standards for pipes and fittings are as follows:-

Copper tubes	BS EN 1057
Chlorinated polyvinyl chloride pipes and fittings	BS 7291, Parts 1 & 4
Crosslinked polyethylene pipes and fittings	BS 7291, Parts 1 & 3
Ductile iron pipes	BS 4772
Galvanized steel tubes (metallic components)	BS 1387
Grey iron pipes	BS 4622
Polybutylene pipes and fittings	BS 7291, Parts 1 & 2
Polyethylene pipes	BS 6730 & BS 6572
Stainless steel tubes	BS 4127
Unplasticised polyvinyl chloride pipes	BS 3505
Ball valves	BS 1212, Part 1
Copper alloy gate valves	BS 5154
Draw-off taps and stop valves	BS 1010, Part 2
Mixing valves	BS 1415, Part 1 or 2
Sluice valves	BS 5163

   (ii) Categories of compliance of fittings are as follows:-

   Category A – Bearing the British Standard Institution Kitemark

   Category B – Accepted by the Water Supply (Water Fittings) Regulations, United Kingdom (formerly known as the Water Byelaws)

   Category C - Accepted by the Water Authority in writing (to quote WSD reference number)

   Category D - Bearing the Water Authority Stamping

8. Licensed Plumber should always be aware of the anti-corruption laws and avoid to contravene them during their course of works. For details, please refer to the website of Independent Commission Against Corruption at http://www.icac.org.hk/

Guidance Notes to Licensed Plumber for Submission of Form WWO 46

(I) Commencement of Plumbing Works

(i) Licensed Plumber should submit Parts I and II of the Form and the Annex to notify the Water Authority of the details and commencement date of the plumbing works. Parts IV and V of the Form are to be used for reporting completion of plumbing works and are NOT required to be submitted by Licensed Plumber at this time.

(ii) Information on Parts I and II of the Form will be input to the computer and the notification will be assessed.

(iii) On completion of the processing, Licensed Plumber will receive Part III of the Form with a Form Serial No. printed on it. A copy of Parts I and II of the Form will also be returned to Licensed Plumber.

(II) Completion of Plumbing Works

(i) Licensed Plumber should submit Parts IV and V of the Form together with a copy of Parts I, II and III of the Form to report completion of whole or part of the plumbing, including water pipe to be concealed. **Please quote Form Serial No. and ASN on Part IV.**

(ii) Information on the submitted forms will be input to the computer and the application will be assessed.

(iii) On completion of the inspection of plumbing works, Licensed Plumber will receive Part V of the Form. A copy of Parts I, II, III and IV of the Form will also be returned to Licensed Plumber.

To: The Water Authority
43/F Immigration Tower, 7 Gloucester Road, Hong Kong
Tel. : 2824 5000 Fax : 2802 7333
E-mail : wsdinfo@wsd.gov.hk

For official use only	ASN:_____	Consumer account no.	

APPLICATION FOR WATER SUPPLY *(Note 1)* / REQUEST FOR WORK TO BE CARRIED OUT BY THE WATER AUTHORITY

(You only need to complete Form WWO 1 if you are applying for change of consumership of an existing water account)

Purpose of Submission *(PLEASE READ THE NOTES OVERLEAF BEFORE COMPLETING THIS FORM)*

#☐ To apply to become a consumer of a *fire service/inside service

#☐ To apply to become an agent of a communal service

#☐ To request for work to be carried out by the Water Authority

Service Address

Flat/Room Floor Block Name of Building/Lot No./Demarcation District No.

Number and Name of Street/Estate or Village Name

*HK/Kln/NT

District

Types of Water Supply Applied for **(Please tick (√) at most one box)**

(a)	☐ New Building ☐ Village Type House [for *potable / flushing / fire service water supply]	**(e)**	☐	Conversion to Salt Water for Flushing
		(f)	☐	Portable Meter
(b)	☐ Separate metering – for premises currently sharing a meter with other premises	**(g)**	☐	Replumbing
(c)	☐ Reconnection of meter – for premises with inside service previously installed	**(h)**	☐	*Relocate/Enlarge Meter
(d)	☐ Temporary water supply for a construction site	**(i)**	☐	Others (please specify)……..

Request for Work to be Carried Out by the Water Authority

I/We request the Water Authority to carry out the work specified below:

☐ *Install new meter / Install separate meter / Reconnect meter

Classification Code *(Note 2)*	Description	Number of Meters
	Total Number of Meters =	

(1) The Gross Floor Area (for **domestic supply** only): about _____ m^2 ($1m^2 \sim 10.8\ ft^2$).

(2) The estimated daily water consumption (for **non-domestic supply** only): _____ m^3/day

(3) The number of business hours in a day (for **non-domestic supply** only): _____ hrs/day

(4) Have you modified / Would you modify the existing inside service (for **reconnecting business water meters** only)? *Yes / No

☐ Others (please specify) : .....

THE NAME OF CONSUMER :

(IN ENGLISH, Surname first) *Mr/Mrs/Miss/Ms _____

(IN CHINESE) _____

Chinese commercial code in identity card (if applicable)

*Identity Card Number/Business Registration Number of Consumer (Note 3): _____

Preferred Contact Method : *By mail/E-mail/fax

Service Address Tel. No.: _____ Day-time Tel. No.: _____ Mobile Phone No.: _____

Fax No.: _____ E-mail: _____

Mailing Address (if different from Service Address above)

Flat/Room Floor Block Name of Building/Lot No./Demarcation District No.

Number and Name of Street/Estate or Village Name

*HK/Kln/NT

District

Please tick (√) in the appropriate box (es). You may tick (√) more than one box. * Delete where inappropriate

I/We wish to receive the Water and Sewage Charges Bill in *Chinese / English.

I/We, the undersigned, being the occupier(s)/person(s) responsible for the management of the premises at the above service address hereby undertake and agree to the terms and conditions (a)-(d) set out below.

Date: _____ *Consumer's signature / Signature of authorized person and company's chop: _____

.

* Delete where inappropriate

For official use only	ASN:		Consumer account no.													
Date received:												ID/BR verified by:				
Approved by:												Estimated cost:				
D/N No:												Cash receipt date:				
File No.																
Connection(s) from government main: Yes / No																

UNDERTAKING AND AGREEMENT

(a) The applicant(s) undertake(s):-

— **(for application to become a consumer of a fire service/inside service)**

to pay as the consumer(s) at such period as the Water Authority may in any case determine, to the Government of the Hong Kong Special Administrative Region any charges and deposit *(Note 4)* due as provided in accordance with the Waterworks Ordinance and Regulations (Cap. 102) in respect of the fire service/inside service in the premises and the Sewage Services Ordinance and Regulations (Cap.463), including sewage charges and trade effluent surcharges (if applicable). The applicant(s) undertake(s) to be responsible for the custody and maintenance of the above-mentioned service and the custody of any meter pertaining to the service in the same premises *(Note 5)*.

— **(for application to become an agent of a communal service)**

as the agent(s) to be responsible for the custody and maintenance of the communal service to the premises and the applicant(s) further undertake(s) to pay to the Government of the Hong Kong Special Administrative Region any charges due as provided in accordance with the Waterworks Ordinance and Regulations (Cap.102) in respect of the above mentioned communal service to the premises *(Note 5)*.

(b) The applicant(s) agree(s) to comply with all the provisions of the Waterworks Ordinance and Regulations (Cap.102) and the Sewage Services Ordinance and Regulations (Cap.463).

(c) The applicant(s) agree(s) to pay to the Government of the Hong Kong Special Administrative Region the cost of the work involved including all costs, fees, required to be paid by reason of any enactment or regulation or bye-law in relation to or for the execution of the works and including prescribed fees and economic costs referred to in Schedule 3 of the Land (Miscellaneous Provisions) Ordinance Cap 28 ("the Ordinance") for an extension in respect of an excavation permit made under the Ordinance for the execution of the works, labour, materials and supervision charges within 14 days of the presentation of the account to be rendered by the Water Authority.

(d) The data collected from the applicant(s) will be used by the Water Authority for the purpose of applying to become a consumer and/or an agent and for work to be carried out by the Water Authority. The applicant(s) fully understand(s) the purpose and agree(s) to the Water Authority using the data collected. If the applicant(s) do(es) not provide sufficient data, the Water Authority may not be able to process the application. The applicant(s) agree(s) that these data and other related information may be transferred to other Government bureaux and departments. The applicant(s) understand(s) that he/she/they can request the Departmental Secretary of the Water Supplies Department at 48/F Immigration Tower, 7 Gloucester Road Hong Kong for access to and correction of the personal data.

NOTES:

1. This application includes among other things the undertaking referred to in Section 7 of the Waterworks Ordinance and Section 5 of the Sewage Services Ordinance. It must be properly completed by the consumer/agent in respect of a fire service/inside service/communal service and lodged with the Water Authority in connection with an application for water supply. Sewage charges and trade effluent surcharges (if applicable) are payable by the consumer/agent whose premises are connected to public sewers.

2. Please refer to the booklet 'Classification of Water Consumer Accounts'. For more entries, please insert additional sheets. Each additional page should be duly signed. If discrepancies exist between the stated classification code and description, the classification code shall prevail. Should there be subsequent changes to the classification code, the consumer should notify the Office of the Drainage Authority at G/F Western Magistracy, 2A Pok Fu Lam Road, Hong Kong of the new code and description.

3. For a firm/company, a photocopy of the Business Registration Certificate should be attached to your application. If an individual applicant applies for a non-domestic supply, he should attach a photocopy of his identity card for our checking of the name and ID card number. This photocopy of identity card will be destroyed immediately after the checking process.

4. The deposit paid under this undertaking is **not transferable** and may be applied by the Water Authority at any time to the payment of any charges.

5. **The liability of the consumer/agent under this undertaking shall continue until**
   - ***(a)*** **another consumer/agent is approved by the Water Authority in his/her place; or**
   - ***(b)*** **the undertaking is cancelled by the Water Authority.**

Should there be any change in consumership/management of the premises, the consumer/agent should notify the Water Authority to discharge his/her liability.

W 水 務 署
Water Supplies Department
香港灣仔告士打道七號入境事務大樓
Immigration Tower, 7 Gloucester Road, Hong Kong

電子郵遞 *e-mail* wsdinfo@wsd.gov.hk
電 話 *Telephone* 2829 4367 圖文傳真 *Facsimile* 2824 0578
檔 號 *Reference* (11) in WSD 3318/50 Pt.4 T/J(7) 10 August 2012

Distribution : To all Licensed Plumbers and Authorised Persons

Dear Sirs,

WSD Circular Letter No. 2/2012
Cleansing and Disinfection of Fresh Water Inside Service

I attach a copy of the guidelines on cleansing and disinfection of fresh water inside service for your reference.

Should you have any enquiries, please contact our Engineer Mr. Angus FAN at tel. no. 2829 4726.

This Circular Letter is to supersede Circular Letter No. 6/2002 issued on 26 August 2002.

Yours faithfully,

Original signed

(CHIN Chu Sum)
for Water Authority

Encl.

(with Chinese translation)

c.c. Housing Department
Buildings Department
Architectural Services Department
Fire Services Department
The Hong Kong Housing Society
The Hong Kong Institute of Architects
The Hong Kong Institution of Engineers
The Hong Kong Institute of Surveyors
Hong Kong Federation of Plumbing & Drainage Ltd.
The Institute of Plumbing and Heating Engineering – Hong Kong Council
Hong Kong Plumbing and Sanitary Ware Trade Association Ltd.
Hong Kong Licensed Plumbers Association Ltd.
Hong Kong Plumbing General Union
Hong Kong Water Works Professional Association Ltd.
The Hong Kong Institution of Plumbing and Drainage Ltd.
The Association of Registered Fire Service Installation Contractors of Hong Kong Limited
Real Estate Development Association of Hong Kong
WSD 3318/15/81
WSD 3608/9/27/95
WSD 1612/4/7

Guidelines on Cleansing and Disinfection of Fresh Water Inside Service

Under the provision of Waterworks Regulation 7, a consumer or the agent shall be responsible for keeping an inside service clean. To this end, the consumer or agent concerned shall clean and disinfect a newly installed fresh water inside service before it is given a supply from the Water Supplies Department. Besides, after repair or maintenance of fresh water inside service, if there is a possibility that extraneous materials can get into the inside service, the inside service shall be cleaned and disinfected before water supply is resumed. The guidelines below on how to clean and disinfect the fresh water inside service are set out for general reference:-

(A) Newly Installed Fresh Water Inside Service

The newly installed fresh water inside service shall be cleaned and disinfected to the satisfaction of the Water Authority in accordance with the following procedures.

(I) Newly Installed Underground Fresh Water Mains

(1) Remove all extraneous materials inside the water mains. Fill the fresh water mains slowly with water and carry out the required water pressure testing. If the result of the test is satisfactory, clean the fresh water mains internally and flush them with potable water. For fresh water mains of sizes less than 600 mm in diameter, swab to remove the dirt and materials inadvertently left in the water mains and flush them with potable water.

(2) Fill the water mains completely with a homogeneous solution of chloride of lime for disinfection. The concentration of the solution has to meet the requirement that when the water mains are filled up with water, the free chlorine in the water will be at least 30 ppm. Keep the water mains under disinfection for at least 24 hours. After disinfection, flush the water mains thoroughly with potable water.

(3) Arrange with the Water Authority to collect samples at representative sampling point(s) as agreed by the Water Authority for bacteriological and chemical analysis. The test parameters and the related acceptance

criteria are listed in the Annex.

Any contamination in underground mains may lead to pollution of the government supply. To ensure quality control and minimize the risk of pollution to the government supply, the Water Authority will carry out sampling and analysis for this part of inside service.

The contact persons of the Water Authority for such arrangements are:-

Areas	**Contact Person**	**Telephone No.**
Hong Kong and Outlying Islands	Waterworks Chemist/Treatment (1)	2891 9276
Kowloon and New Territories East	Waterworks Chemist/Treatment (2)	2691 7689
New Territories West	Waterworks Chemist/Treatment (3)	2450 6121

The Water Authority will inform the Licensed Plumber concerned of the result of analysis. If the results are satisfactory, the fresh water mains can be put into operation. If not, the above disinfection and testing procedures shall be carried out again.

(4) To avoid possible contamination, the fresh water mains concerned shall be put into operation within 7 days from the successful disinfection. In this respect, Licensed Plumbers are advised to allow sufficient time for the Waterworks Chemists to carry out sampling and analysis and to avoid arranging disinfection immediately before long public holidays.

(II) Newly Installed Fresh Water Inside Service other than Those covered in (A)(I) above

(1) Flush the inside service concerned thoroughly with potable water.

(2) After flushing, follow one of the three procedures stated below to disinfect the inside service concerned.

Methods Using Chlorine as a disinfectant

(i) Fill the inside service concerned with a homogeneous solution of chloride of lime for disinfection. The concentration of the solution has

to meet the requirement that when the inside service is filled up with water, the free chlorine in the water will be at least 30 ppm. After keeping the inside service under disinfection for at least 24 hours, the inside service shall be immediately drained and thoroughly flushed with potable water.

or

(ii) Fill the inside service concerned with chlorinated water at an initial concentration of 50 ppm for a contact period of one hour. If the free residual chlorine measured at the end of the contact period is less than 30 ppm, the disinfection process shall be repeated. After successful disinfection, the inside service shall be immediately drained and thoroughly flushed with potable water.

or

Methods Using Disinfectants other than Chlorine

(iii) Fill the inside service concerned with the disinfectant solution other than chlorine at the initial concentration and for the contact time specified by the manufacturer of the disinfectant. If the residual of the disinfectant at the end of the contact time is less than the manufacturer's recommendation, the disinfection procedure shall be repeated. After successful disinfection, the inside service shall be immediately drained and thoroughly flushed with potable water. Flushing shall continue in accordance with the disinfectant manufacturer's instructions/recommendations or until there is no evidence of the disinfectant chemical being present, or it is at a level that is no higher than that present in the potable water supplied.

(3) After disinfection, arrange with either the Water Authority or an accredited laboratory[1] to collect samples at representative sampling point(s) as agreed by the Water Authority for bacteriological and chemical analysis. The test parameters and the related acceptance criteria are listed in the Annex.

If the results are satisfactory, the fresh water inside service can be put

[1] The accredited laboratory shall be accredited for all the individual parameters listed in the Annex.

into operation. If not, the above disinfection and testing procedures shall be carried out again.

The contact persons of the Water Authority for such arrangements are:-

Areas	Contact Person	Telephone No.
Hong Kong and Outlying Islands	Waterworks Chemist/Treatment (1)	2891 9276
Kowloon and New Territories East	Waterworks Chemist/Treatment (2)	2691 7689
New Territories West	Waterworks Chemist/Treatment (3)	2450 6121

If the sampling and analysis is carried out by the Water Authority, the Water Authority will inform the Licensed Plumber concerned of the result of analysis. If an accredited laboratory is arranged to carry out the sampling and analysis, the result of analysis shall be submitted to the Water Authority.

(4) To avoid possible contamination, the fresh water inside service concerned shall be put into operation within 7 days from the successful disinfection. In this respect, Licensed Plumbers are advised to allow sufficient time for the Waterworks Chemists or the accredited laboratory to carry out sampling and analysis and to avoid arranging disinfection immediately before long public holidays.

(B) Repair or Maintenance of Fresh Water Inside Service

(I) Repair or Maintenance of Underground Fresh Water Mains

(1) Keep the excavation surfaces of trench clear from the pipe body and remove all extraneous materials in the fresh water mains. If the trench is flooded, pump water out of the trench.

(2) Clean the internal surface of the exposed pipe ends and the replacement pipe with a solution of chloride of lime. The concentration of free chlorine in the solution shall be at least 30 ppm.

(3) Fill the section of the water mains that has been shut down for repair or

maintenance with a homogeneous solution of chloride of lime for disinfection. The concentration of the solution has to meet the requirement that when the water mains are completely filled with water, the free chlorine in the water will be at least 30 ppm. Fill the water mains with water and isolate them when filling is completed. Keep the water mains under disinfection for at least 30 minutes. After disinfection, flush the water mains thoroughly with potable water through a fire hydrant, washout or, if no such facilities are available, through a submain temporarily put out of service.

(II) Repair or Maintenance of Fresh Water Inside Service other than Those covered in (B)(I) above

After completion of repair or maintenance works, fill the concerned inside service that has been shut down for repair or maintenance with a homogeneous solution of chloride of lime for disinfection. The concentration of the solution has to meet the requirement that when the inside service is completely filled with water, the free chlorine in the water will be at least 30 ppm. Isolate the inside service when filling is completed and keep the inside service under disinfection for at least 30 minutes. After disinfection, flush the inside service thoroughly with potable water.

(C) Proper Operation of Inside Service

Stagnant water provides a favourable breeding environment for bacteria. To minimize the possibility of bacteria growth after putting an inside service into operation, water outlets which are infrequently used or are connected to stagnant water supply pipeworks shall be flushed at full flow for a minimum period of one minute at least on a weekly basis and before use.

Annex

The test parameters shall include but not limited to the following:-

Test parameter	Acceptance Criteria
Turbidity (NTU)	≤ 3.0
Colour (HU)	≤ 5
pH at 25^{o}C	6.5-9.2
Free residual Chlorine (mg/L)	＞0 and ≤ 1.5
Conductivity at 25^{o}C (μS/cm)	≤ 300
Total coliforms (cfu/100mL)	0
E.coli (cfu/100mL)	0
Heterotrophic Plate Count (cfu/mL)	≤ 20

Additional parameters may be tested if there is any sign of suspected contamination.

水 務 署

Water Supplies Department

香港灣仔告士打道七號入境事務大樓
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Appendix 5

檔　號 *Reference* (1) in WSD 3318/50 Pt.5

13 July 2015

Distribution: To all Licensed Plumbers and Authorised Persons

Dear Sirs,

WSD Circular Letter No. 1/2015
Prohibition of Using Leaded Solder at Fresh Water Inside Services and New Parameters for Testing of Water Sample

Water Supplies Department is responsible for the enforcement of the Waterworks Ordinance and Regulations. We therefore highly concern with the quality of water supplied in Inside Services. In accordance with the "Waterworks Ordinance", it is the responsibility of the licensed plumbers to construct and install Inside Service and to ensure the materials of water pipes and fittings installed/to be installed are in compliance with the requirements and/or standards stipulated in "Waterworks Regulations". Any person who contravenes any of the provisions of the Ordinance shall be guilty of an offence and may also be subject to disciplinary action under the regulations.

I like to remind you that the requirement of using lead-free solders for copper pipes at fresh water Inside Services is specified in the standard as stipulated in the Waterworks Regulations. For all applications for new water supply (for example Part I of Form No. WWO 46) submitted on or after 13 July 2015, if soldering is used in the connection between water pipes, a supporting document of lead free grade soft solder or filler metal used in soldering, brazing and/or welding construction methods is required.

In light of the recent cases of lead level of water samples found in the Inside Services exceeding the acceptance criteria, further to WSD Circular Letter No. 2/2012, we add new parameters for testing of water samples. The four additional test parameters and the acceptance criteria are as follow:-

Test parameters	Acceptance Criteria
Lead (μ g/l)	≤ 10
Cadmium (μ g/l)	≤ 3
Chromium (μ g/l)	≤ 50
Nickel (μ g/l)	≤ 70

Should you have any enquiries, please contact our Engineer Mr. Ken CHAN at Tel. No. 2829 4453.

Yours faithfully,

Original signed

(Michael CL LEUNG)
for Water Authority

(with Chinese translation)

c.c. Housing Department
Buildings Department
Architectural Services Department
Fire Services Department
The Hong Kong Housing Society
The Hong Kong Institute of Architects
The Hong Kong Institution of Engineers
The Hong Kong Institute of Surveyors
Hong Kong Federation of Plumbing & Drainage Ltd.
The Institute of Plumbing and Heating Engineering – Hong Kong Council
Hong Kong Plumbing and Sanitary Ware Trade Association Ltd.
Hong Kong Licensed Plumbers Association Ltd.
Hong Kong Plumbing General Union
Hong Kong Water Works Professionals Association Ltd.
The Hong Kong Institution of Plumbing and Drainage Ltd.
The Association of Registered Fire Service Installation Contractors of Hong Kong Limited
Real Estate Development Association of Hong Kong
WSD 3318/15/81
WSD 3608/9/27/95
WSD 1612/4/7

Hong Kong Waterworks Standard Requirements For Plumbing Installation in Buildings

Revision History

Revision	Date	Clauses Amended	Description
1.WSD circular Letter No. 3/96	9 Feb 1996	9.11	Clause amended to require endorsement from the Director of Fire Services for exemption.
2. WSD Circular Letter No. 2/98	4 Sep 1998	4.1	Clause amended to require non-metallic overflow / warning pipes for portable water storage cisterns.
		4.4	Clause amended to require warning pipe to be installed at a level below the overflow pipe and extended to outside of the building periphery for roof cistern or outside pump room for sump cistern.
		4.7	Clause amended to require a physical break between two adjoining cisterns for potable and non-potable water.
		4.9	Clause amended to require notice plate / board to record the dates of cleaning water cisterns.
		4.13	Clause amended to require internal surfaces of floors, walls and soffits of potable water storage cisterns to be lined with a white non-toxic smooth finish.
		9.14	Clause amended to require provision of metal / plastic strikers for fire hose reel outlets.

Revision	Date	Clauses Amended	Description
3. WSD Circular Letter No.3/98	17 Dec 1998	1.9A	Requirement of cleansing supply at car park added.
		1.9B	Requirement of meter position at construction site added.
		7.17	Requirement of cleansing supply at car park added.
		7.18	Requirement of meter position at construction site added.
		10.2(c)	"BS 2871" is replaced by "BS EN 1057".
4. WSD Circular Letter No. 7/99	30 Nov 1999	4.5	Requirement for storage cistern covers amended.
		5.10	The safety requirements for unvented electric thermal storage water heaters followed the Electrical Products(Safety) Regulation (Cap. 406 sub. leg.).
		9.14	Clause amended to require sticker / plate carrying warning message for fire hose reel outlets.
5. WSD Circular Letter No. 1/2000	7 Jun 2000	1.6 2.7 3.9	Clauses amended to reject water pipes embedded within loading bearing structural elements.
6. WSD Circular Letter No. 1/2002	22 Feb 2002	8.2 8.2A to 8.2D 8.3 8.4	Requirements for valve type flushing devices added.

Revision	Date	Clauses Amended	Description
7.WSD Circular Letter No. 2/2003	14 Feb 2003	1.3A 2.5A 3.5A 7.4A	Requirement of section of copper pipe between the water meter position and the first pipe clamp using screw joints added.
8. WSD Circular Letter No. 4/2003	21May 2003	1.4, 2.3, 3.2 & 7.7 1.4A, 2.3A & 3.2A 1.4B, 2.3B & 3.2B 1.5, 2.6 & 3.6 1.9B & 7.18 1.9C	Requirement of detail layout and elevation plan of the meter room/box added. Requirement of permanent display board added. Requirement of submission of as-built added Requirement of position of meter arranged in group amended. Requirement of meter position of a building supply to a construction site amended. Requirement of meter position for installation in a landscape area added.

Revision	Date	Clauses Amended	Description
9 WSD Circular Letter No. 2/2007	20 June 2007	1.4(k) 2.3(k) 3.2(k) 7.7(k) 8.9A 9.5A	Requirement of straight length at upstream and downstream of check meter position added.
		1.11A 1.16A 2.11 3.14 7.10 8.9B 9.5B	Requirement of working clearance at check meter position added.
10 WSD Circular Letter No. 4/2007	26 Oct 2007	4.1	Clause amended to incorporate the requirement for twin cisterns
11 WSD Circular Letter No. 2/2010	24 Sept 2010	1.4(a) 2.3(a) 3.2(a) 7.7(a)	Requirement for meter room amended
		1.4(f) 2.3(f) 3.2(f) 7.7(f)	Requirement for door of meter room amended

Foreword

Section 14(3) of the Waterworks Ordinance (Chapter 102) empowers the Water Authority to prescribe the manner of construction or installation and the nature, size and quality of the pipes and fittings of an inside service or fire service for water supplies. All plumbing proposals for inside service and fire service are therefore subject to the approval of the Water Authority.

The Hong Kong Waterworks Standard Requirements is a set of normal requirements which are applicable to the installation of inside service and fire service in addition to the requirements that are set out in Schedule 2 of the Waterworks Regulations (Chapter 102) or modified under Regulation 25(1).

Where necessary, additional requirements may also be imposed on individual application for water supply depending on the nature and type of the plumbing installations.

Table of Contents

Chapter 1 : Fresh Water Supply to Domestic Buildings [New Buildings]

1.1 All domestic units shall be separately metered.

1.2 All pipework before meter positions shall be exposed or laid in a proper service duct to facilitate inspection and repairs. Provision should be made for checking leakage from any pipework laid underground.

1.3 Normally, a 15 mm diameter meter will be installed. Provision for this should be made as follows: 20 mm x 15 mm bushes, or reducers, at both sides of the meter position with a 200 mm (clear effective length) distance piece of 15 mm tube placed in between. The tube shall be hollow with conspicuous holes drilled through the body. A longscrew (connector) shall be provided immediately after the bush or reducer at the delivery side. The meter position for meter of all sizes shall also be similarly provided with corresponding fittings of appropriate sizes. The length of the distance piece should be as follows:-

Meter Size (mm)	15	25	40	50	80	100	150
Clear Effective Length of Distance Piece (mm)	200	311	346	310	413	483	500

1.3A For a section of copper pipe is used either before or after a water meter position, that section of copper pipe between the water meter position and the first pipe clamp should be jointed by screwed joints.

1.4 When the applicant submits the vertical plumbing line diagrams (VPLD), he/she will also be required to submit the layout and elevation plans of the meter rooms/boxes with dimensions, including the width and height of the entrances (door openings in case of meter boxes) for the Water Authority's approval. All water meters, including vacant meter positions and check meter positions, shall be arranged in groups and housed in meter rooms or meter boxes. The meter rooms/boxes shall be used solely for housing water meters to protect them against exposure to weather, falling objects and other undue external interferences. They shall not be used as store rooms/boxes, etc. No other building services such as drainage systems, fire hoses, E&M installations (equipment, cables and ducting, etc.) shall pass through or be placed inside the meter rooms/boxes except lighting, ventilation and drainage, etc. solely to facilitate meter reading and maintenance of water meters. Unless otherwise accepted by the Water Authority, a typical meter room/box shall comply with the following requirements:

(a) for meter rooms, the minimum distance between the outward face of the meter group and the wall/door opening directly opposite

the meter group shall be 1000mm and there shall be no obstacles in between. Besides, if the door to the meter room is to be opened at an inward position and it is at the opposite side of the meter group, the minimum perpendicular distance between the outward face of the meter group and the door (the point on the door that is nearest to the meter group) when it is fully opened shall be 600mm;

(b) the clear width and height of the door entrance to the meter room shall not be less than 800 mm and 2000 mm respectively. The arrangement of the meter position(s) and the door opening of the meter box shall be arranged in such a manner that staff of the Water Authority would not be required to lean inwards to take meter readings or carry out maintenance works. For meter boxes, the clear depth measured from the outside face shall not be more than 800mm;

(c) when the meter room is occupied for taking meter readings and/or maintenance of water meters, the illumination shall not be less than 120 lux at meter positions and the mechanical ventilation shall not be less than 6 air-changes per hour;

(d) an entrance located at communal area for safe, free, and uninterruped access to the meter room/box shall be provided;

(e) provision of adequate drainage inside the meter room and the meter box positioned at floor level shall be made;

(f) the door(s) to the meter room/box shall not be equipped with any self-closing device. The lock of the door to the meter room shall be located at a level between 0.9m and 1.1m above the finished floor level. The door to the meter room shall be equipped with handle to facilitate door opening. The door handle shall be either in the form of long cylindrical or spherical shape to facilitate handling. Covered or flat sectioned handles shall not be used;

(g) the outside of the door(s) to the meter room/box shall be clearly marked「水錶」,"Water Meters" in both Chinese and English of font size not less than 28 pt for easy identification;

(h) if there are more than one water meter room/box inside a building block, master-key locks shall be used at all meter rooms/boxes and a duplicate master key for the Water Authority or his/her

staff's sole use shall be kept at the management office. In case there are more than 300 water meters or 30 meter rooms/boxes, two duplicate master keys shall be kept for the sole use of the Water Authority.

(i) for high-rise building blocks, water meters shall be installed in meter rooms/boxes. For low-rise buildings with fenced-off area, water meters shall be installed in meter room(s)/box(es) located at the boundary and shall be accessible from the public area

(j) meter rooms/boxes inside market/commercial complex shall be positioned in areas with clear access and with no risk of being obstructed by hawkers, etc.

(k) for check meter of 100mm diameter or smaller, a straight length of pipe of 5 x D (where D is the nominal bore of the meter) should be provided upstream of the check meter position and a straight length of pipe of 2 x D at downstream. For check meter of diameter larger than 100mm, the straight lengths upstream and downstream are 10 x D and 5 x D respectively.

1.4A Upon completion of the water meter installation inside a meter room/box, the Licensed Plumber (LP) shall install a permanent display board at the wall/door inside the meter room/box showing the location and elevation of the meter positions. The top of the board shall not be higher than 1500 mm above the floor level and the bottom of the board shall not be lower than 500 mm for an individual meter above the floor level. This display board shall be constructed of durable plastic or corrosion-resistant plate engraved with words and diagrams in black on light colour background. The wordings should be of font size not less than 18 pt. Details of this display board shall be submitted by the applicant as part of the VPLD for the Water Authority's approval. This requirement can be waived for small meter boxes accommodating 3 meters or less.

1.4B Within two weeks after completion of the water meter installation, the LP shall submit as-built plans of the meter arrangements, the completed Meter Installation Table (MIT) and Part IV of the Form WWO 46 where amongst others the LP undertakes the correctness of the meter positions. The applicant/developer and the Authorised Person shall also countersign in Part IV of the Form WWO 46 to indicate their satisfaction of the correctness of the meter positions.

1.5 For meters arranged in groups, no meter position shall be lower than 300 mm nor higher than 1500 mm above the floor level. This requirement is also applicable for water meters installed inside meter boxes. For Housing Department estates

where corridor meter arrangement is chosen and accepted, individual meter positions shall be at a suitable height not less than 750 mm but not more than 1500 mm above the floor level.

1.6 All water pipes which come into direct contact with concrete shall be protected with suitable material. No water pipe shall be embedded within load bearing structural elements such as columns, beams and slabs in longitudinal direction. You are required to state explicitly in the submitted plumbing drawings that no water pipe will be embedded in load bearing structural elements. In this regard, vertical water pipes piercing through structural slabs and transfer plates; and horizontal water pipes piercing through beams, columns and structural walls may be permitted when such water pipes are protected by sleeving or other suitable means. It is advisable, whenever practicable, to arrange for inspection by the Water Authority prior to concreting on any pipework to be embedded in any structural elements or concealing any pipework by architectural features which cannot be easily removed for inspection and maintenance of the pipework after their installation. Moreover, in any event all underground pipework must be so inspected before it is backfilled or covered up.

1.7 Individual stop valves shall be provided at all draw-off points or at a series of draw-off points if situated close together.

1.8 Cast iron, ductile iron, unplasticized polyvinyl chloride (uPVC), lined galvanized steel or copper pipes of approved grades will be used for a fresh water inside service. All uPVC pipes must be properly supported and shielded from direct sunrays and must be painted with white acrylic paint when exposed. The type, make and duty of all pipe materials and water supply fittings to be used must be fully detailed on the Form WWO 46 "Application for constructing, installing, altering or removing an inside or fire service".

1.9 A tee-branch valve refers to an isolation valve at a branch pipe and which is located close to the main pipe. To facilitate maintenance and repair, tee-branch valves shall be provided:

(a) for all underground water pipes;
(b) if the main pipe is a communal inside service.

1.9A Sufficient cleansing taps shall be provided at car parks of a building for car/floor washing. The cleansing supply at the car park shall be given from a fresh water cistern with a separate meter unless it is a part of the cleansing supply system of the building.

1.9B The meter position of a building supply to a construction site shall be provided within a meter room or meter box located at the hoarding recess area so that reading and maintenance of the meter can be carried out outside the construction

site. Safe, free and uninterrupted access to the meter room/box should be provided and maintained at all time. The door of the meter room or meter box shall be made of chicken-wire or provided with see-through glass panel. Details of the meter room or meter box are subject to the approval of the Water Authority.

1.9C For a meter installed in a landscape area, it should be installed above ground level with a clear working headroom not less then 2m. A safe pedestrian access to the meter position should be provided.

For Direct Supply

1.10 A loose jumper type stopcock shall be provided and placed with the spindle in the vertical position at each meter position on the inlet side of the meter.

1.11 The connection to the common inside service will not be metered but a meter position shall be provided for the insertion of a check meter for checking and waste detection purposes. This meter position should be so located as to be free from flood and obstruction for ease of meter reading and maintenance at all times, and it should be located close to the lot boundary and connection to the Government mains.

1.11A The designer should provide minimum horizontally perpendicular and longitudinal working clearances at each check meter position. The table below stipulates the minimum horizontally perpendicular working clearance, meaning the shortest distance between the longitudinal centre line of the check meter position and a wall or any edge of a door when opened.

	Meter Size (mm)			
	40	50	80	100
Minimum horizontally perpendicular working clearance from the wall or any edge of a door when opened where the check meter position is clamped (mm)	310	310	380	400

The minimum longitudinal working clearance between both end of meter flanges of the check meter position and a wall or any obstruction should be 200mm.

For Indirect Supply

1.12 Meters on indirect supply systems shall be sited at roof level or at other convenient locations.

1.13 A sump and pump system including a sump tank and a roof storage tank shall be fitted before meter positions when the meters are sited at roof level.

1.14 Fullway gate valves shall be fitted before meter positions when the meters are sited at roof level.

1.15 A loose jumper type stopcock shall be provided and placed with the spindle in the vertical position at each meter position on the inlet side of the meter where the meter is not sited at roof level and where the pressure is considered adequate.

1.16 The connection to the sump tank will not be metered but a meter position shall be provided for the insertion of a check meter for checking and waste detection purposes. This meter position should be so located as to be free from flood and obstruction for ease of meter reading and maintenance at all times, and it should be located close to the lot boundary and connection to the Government mains or close to the point of connection from internal distribution mains whichever is applicable.

1.16A The designer should provide minimum horizontally perpendicular and longitudinal working clearances at each check meter position. The table below stipulates the minimum horizontally perpendicular working clearance, meaning the shortest distance between the longitudinal centre line of the check meter position and a wall or any edge of a door when opened.

	Meter Size (mm)			
	40	50	80	100
Minimum horizontally perpendicular working clearance from the wall or any edge of a door when opened where the check meter position is clamped (mm)	310	310	380	400

The minimum longitudinal working clearance between both end of meter flanges of the check meter position and a wall or any obstruction should be 200mm.

1.17 The total volume of the roof storage tank and sump tank shall be on the basis of 135 litres for each of the first 10 flats and 90 litres thereafter for each additional flat. The proportion of capacity of sump tank to roof tank shall be in the order of 1:3 or as advised by the Water Authority.

1.18 No draw-off point in the inside services shall be subject to excessive high pressure. In case of excessive high pressure, a break pressure tank or cistern shall be provided at a suitable level to reduce the water pressure. If this is not practicable, the installation of pressure reducing valves can be pursued with the following requirements:-

(a) a bypass arrangement be incorporated with the provision of a second pressure reducing valve to enable isolation of any defective pressure reducing valve for repair and replacement when necessary;

(b) a pressure indicator be provided for pressure monitoring;

(c) the associated pipes and fittings be able to withstand the maximum static pressure that may arise upon failure of the pressure reducing valve.

Chapter 2 : Separate Metering of Existing Properties on Direct Supply of Fresh Water

2.1 The inside service shall be constructed from each flat to the existing common meter connection or in such other locations as determined by the Water Authority.

2.2 All pipework before meter positions shall be exposed or laid in a proper service duct to facilitate inspection and repairs.

2.3 When the applicant submits the vertical plumbing line diagrams (VPLD), he/she will also be required to submit the layout and elevation plans of the meter rooms/boxes with dimensions, including the width and height of the entrances (door openings in case of meter boxes) for the Water Authority's approval. All water meters, including vacant meter positions and check meter positions, shall be arranged in groups and housed in meter rooms or meter boxes. The meter rooms/boxes shall be used solely for housing water meters to protect them against exposure to weather, falling objects and other undue external interferences. They shall not be used as store rooms/boxes, etc. No other building services such as drainage systems, fire hoses, E&M installations (equipment, cables and ducting, etc.) shall pass through or be placed inside the meter rooms/boxes except lighting, ventilation and drainage, etc. solely to facilitate meter reading and maintenance of water meters. Unless otherwise accepted by the Water Authority, a typical meter room/box shall comply with the following requirements:

(a) for meter rooms, the minimum distance between the outward face of the meter group and the wall/door opening directly opposite the meter group shall be 1000mm and there shall be no obstacles in between. Besides, if the door to the meter room is to be opened at an inward position and it is at the opposite side of the meter group, the minimum perpendicular distance between the outward face of the meter group and the door (the point on the door that is nearest to the meter group) when it is fully opened shall be 600mm;

(b) the clear width and height of the door entrance to the meter room shall not be less than 800 mm and 2000 mm respectively. The arrangement of the meter position(s) and the door opening of the meter box shall be arranged in such a manner that staff of the Water Authority would not be required to lean inwards to take meter readings or carry out maintenance works. For meter boxes,

the clear depth measured from the outside face shall not be more than 800mm;

(c) when the meter room is occupied for taking meter readings and/or maintenance of water meters, the illumination shall not be less than 120 lux at meter positions and the mechanical ventilation shall not be less than 6 air-changes per hour;

(d) an entrance located at communal area for safe, free, and uninterruped access to the meter room/box shall be provided;

(e) provision of adequate drainage inside the meter room and the meter box positioned at floor level shall be made;

(f) the door(s) to the meter room/box shall not be equipped with any self-closing device. The lock of the door to the meter room shall be located at a level between 0.9m and 1.1m above the finished floor level. The door to the meter room shall be equipped with handle to facilitate door opening. The door handle shall be either in the form of long cylindrical or spherical shape to facilitate handling. Covered or flat sectioned handles shall not be used;

(g) the outside of the door(s) to the meter room/box shall be clearly marked「水錶」,"Water Meters" in both Chinese and English of font size not less than 28 pt for easy identification;

(h) if there are more than one water meter room/box inside a building block, master-key locks shall be used at all meter rooms/boxes and a duplicate master key for the Water Authority or his/her staff's sole use shall be kept at the management office. In case there are more than 300 water meters or 30 meter rooms/boxes, two duplicate master keys shall be kept for the sole use of the Water Authority.

(i) for high-rise building blocks, water meters shall be installed in meter rooms/boxes. For low-rise buildings with fenced-off area, water meters shall be installed in meter room(s)/box(es) located at the boundary and shall be accessible from the public area;

(j) meter rooms/boxes inside market/commercial complex shall be positioned in areas with clear access and with no risk of being obstructed by hawkers, etc.

(k) for check meter of 100mm diameter or smaller, a straight length of pipe of 5 x D (where D is the nominal bore of the meter) should be provided upstream of the check meter position and a straight length of pipe of 2 x D at downstream. For check meter of diameter larger than 100mm, the straight lengths upstream and downstream are 10 x D and 5 x D respectively.

2.3A Upon completion of the water meter installation inside a meter room/box, the Licensed Plumber (LP) shall install a permanent display board at the wall/door inside the meter room/box showing the location and elevation of the meter positions. The top of the board shall not be higher than 1500 mm above the floor level and the bottom of the board shall not be lower than 500 mm for an individual meter above the floor level. This display board shall be constructed of durable plastic or corrosion-resistant plate engraved with words and diagrams in black on light colour background. The wordings should be of font size not less than 18 pt. Details of this display board shall be submitted by the applicant as part of the VPLD for the Water Authority's approval. This requirement can be waived for small meter boxes accommodating 3 meters or less.

2.3B Within two weeks after completion of the water meter installation, the LP shall submit as-built plans of the meter arrangements, the completed Meter Installation Table (MIT) and Part IV of the Form WWO 46 where amongst others the LP undertakes the correctness of the meter positions. The applicant/developer and the Authorised Person shall also countersign in Part IV of the Form WWO 46 to indicate their satisfaction of the correctness of the meter positions.

2.4 A loose jumper type stopcock shall be provided and placed with the spindle in the vertical position at each meter position on the inlet side of the meter.

2.5 The meter position for 15 mm diameter meter shall be constructed to include 20 mm x 15 mm bushes, or reducers, at both sides of the meter position with a 200 mm (clear effective length) distance piece of 15 mm tube placed in between. The tube shall be hollow with conspicuous holes drilled through the body. A longscrew (connector) shall be provided immediately after the bush or reducer at the delivery side. The meter position for meter of all sizes shall also be similarly provided with corresponding fittings of appropriate sizes. The length of the distance piece should be as follows:-

Meter Size (mm)	15	25	40	50	80	100	150
Clear Effective Length of Distance Piece (mm)	200	311	346	310	413	483	500

2.5A For a section of copper pipe is used either before or after a water meter position, that section of copper pipe between the water meter position and the first pipe clamp should be jointed by screwed joints.

2.6 For meters arranged in groups, no meter position shall be lower than 300 mm nor higher than 1500 mm above the floor level. This requirement is also applicable for water meters installed inside meter boxes. For Housing Department estates where corridor meter arrangement is chosen and accepted, individual meter positions shall be at a suitable height not less than 750 mm but not more than 1500 mm above the floor level.

2.7 All water pipes which come into direct contact with concrete shall be protected with suitable material. No water pipe shall be embedded within load bearing structural elements such as columns, beams and slabs in longitudinal direction. You are required to state explicitly in the submitted plumbing drawings that no water pipe will be embedded in load bearing structural elements. In this regard, vertical water pipes piercing through structural slabs and transfer plates; and horizontal water pipes piercing through beams, columns and structural walls may be permitted when such water pipes are protected by sleeving or other suitable means. It is advisable, whenever practicable, to arrange for inspection by the Water Authority prior to concreting on any pipework to be embedded in any structural elements or concealing any pipework by architectural features which cannot be easily removed for inspection and maintenance of the pipework after their installation. Moreover, in any event all underground pipework must be so inspected before it is backfilled or covered up.

2.8 Cast iron, ductile iron, unplasticized polyvinyl chloride (uPVC), lined galvanized steel or copper pipes of approved grades will be used for a fresh water inside service. All uPVC pipes must be properly supported and shielded from direct sun rays and must be painted with white acrylic paint when exposed. The type, make and duty of all pipe materials and water supply fittings to be used must be fully detailed on the Form WWO 46 "Application for constructing, installing, altering or removing an inside or fire service" when submitted.

2.9 In an occupied building, a temporary bypass arrangement as close to the delivery side of the meter as possible shall be provided to maintain water supply to various units of accommodation when plumbing work is being carried out on separate meter conversion. The temporary arrangement should be such that the consumption is still measured by the bulk meter. This bypass arrangement must be removed immediately after the new separate meters are fixed. The bulk meter should also be removed if no longer required.

2.10 A tee-branch valve refers to an isolation valve at a branch pipe and which is located close to the main pipe. To facilitate maintenance and repair, tee-branch valves shall be provided:

(a) for all underground water pipes;
(b) if the main pipe is a communal inside service

2.11 The designer should provide minimum horizontally perpendicular and longitudinal working clearances at each check meter position. The table below stipulates the minimum horizontally perpendicular working clearance, meaning the shortest distance between the longitudinal centre line of the check meter position and a wall or any edge of a door when opened.

	Meter Size (mm)			
	40	50	80	100
Minimum horizontally perpendicular working clearance from the wall or any edge of a door when opened where the check meter position is clamped (mm)	310	310	380	400

The minimum longitudinal working clearance between both end of meter flanges of the check meter position and a wall or any obstruction should be 200mm.

Chapter 3 : Separate Metering of Existing Properties on Indirect Supply of Fresh Water

3.1 All pipework before meter positions shall be exposed or laid in a proper service duct to facilitate inspection and repairs. Approved provision should be made for checking leakage from any pipework laid underground.

3.2 When the applicant submits the vertical plumbing line diagrams (VPLD), he/she will also be required to submit the layout and elevation plans of the meter rooms/boxes with dimensions, including the width and height of the entrances (door openings in case of meter boxes) for the Water Authority's approval. All water meters, including vacant meter positions and check meter positions, shall be arranged in groups and housed in meter rooms or meter boxes. The meter rooms/boxes shall be used solely for housing water meters to protect them against exposure to weather, falling objects and other undue external interferences. They shall not be used as store rooms/boxes, etc. No other building services such as drainage systems, fire hoses, E&M installations (equipment, cables and ducting, etc.) shall pass through or be placed inside the meter rooms/boxes except lighting, ventilation and drainage, etc. solely to facilitate meter reading and maintenance of water meters. Unless otherwise accepted by the Water Authority, a typical meter room/box shall comply with the following requirements:

(a) for meter rooms, the minimum distance between the outward face of the meter group and the wall/door opening directly opposite the meter group shall be 1000mm and there shall be no obstacles in between. Besides, if the door to the meter room is to be opened at an inward position and it is at the opposite side of the meter group, the minimum perpendicular distance between the outward face of the meter group and the door (the point on the door that is nearest to the meter group) when it is fully opened shall be 600mm;

(b) the clear width and height of the door entrance to the meter room shall not be less than 800 mm and 2000 mm respectively. The arrangement of the meter position(s) and the door opening of the meter box shall be arranged in such a manner that staff of the Water Authority would not be required to lean inwards to take meter readings or carry out maintenance works. For meter boxes, the clear depth measured from the outside face shall not be more than 800mm;

(c) when the meter room is occupied for taking meter readings and/or maintenance of water meters, the illumination shall not be less than 120 lux at meter positions and the mechanical ventilation shall not be less than 6 air-changes per hour;

(d) an entrance located at communal area for safe, free, and uninterruped access to the meter room/box shall be provided;

(e) provision of adequate drainage inside the meter room and the meter box positioned at floor level shall be made;

(f) the door(s) to the meter room/box shall not be equipped with any self-closing device. The lock of the door to the meter room shall be located at a level between 0.9m and 1.1m above the finished floor level. The door to the meter room shall be equipped with handle to facilitate door opening. The door handle shall be either in the form of long cylindrical or spherical shape to facilitate handling. Covered or flat sectioned handles shall not be used;

(g) the outside of the door(s) to the meter room/box shall be clearly marked「水錶」,"Water Meters" in both Chinese and English of font size not less than 28 pt for easy identification;

(h) if there are more than one water meter room/box inside a building block, master-key locks shall be used at all meter rooms/boxes and a duplicate master key for the Water Authority or his/her staff's sole use shall be kept at the management office. In case there are more than 300 water meters or 30 meter rooms/boxes, two duplicate master keys shall be kept for the sole use of the Water Authority.

(i) for high-rise building blocks, water meters shall be installed in meter rooms/boxes. For low-rise buildings with fenced-off area, water meters shall be installed in meter room(s)/box(es) located at the boundary and shall be accessible from the public area;

(j) meter rooms/boxes inside market/commercial complex shall be positioned in areas with clear access and with no risk of being obstructed by hawkers, etc.

(k) for check meter of 100mm diameter or smaller, a straight length of pipe of 5 x D (where D is the nominal bore of the meter) should be provided upstream of the check meter position and a

straight length of pipe of 2 x D at downstream. For check meter of diameter larger than 100mm, the straight lengths upstream and downstream are 10 x D and 5 x D respectively.

3.2A Upon completion of the water meter installation inside a meter room/box, the Licensed Plumber (LP) shall install a permanent display board at the wall/door inside the meter room/box showing the location and elevation of the meter positions. The top of the board shall not be higher than 1500 mm above the floor level and the bottom of the board shall not be lower than 500 mm for an individual meter above the floor level. This display board shall be constructed of durable plastic or corrosion-resistant plate engraved with words and diagrams in black on light colour background. The wordings should be of font size not less than 18 pt. Details of this display board shall be submitted by the applicant as part of the VPLD for the Water Authority's approval. This requirement can be waived for small meter boxes accommodating 3 meters or less.

3.2B Within two weeks after completion of the water meter installation, the LP shall submit as-built plans of the meter arrangements, the completed Meter Installation Table (MIT) and Part IV of the Form WWO 46 where amongst others the LP undertakes the correctness of the meter positions. The applicant/developer and the Authorised Person shall also countersign in Part IV of the Form WWO 46 to indicate their satisfaction of the correctness of the meter positions.

3.3 The existing sump and pump system shall be provided with a standby pumpset unless this proves to be impracticable.

3.4 Fullway gate valves shall be fitted before meter positions when the meters are sited at roof level.

3.5 The meter position for 15 mm diameter meter shall be constructed to include 20 mm x 15 mm bushes, or reducers, at both sides of the meter position with a 200 mm (clear effective length) distance piece of 15 mm tube placed in between. The tube shall be hollow with conspicuous holes drilled through the body. A longscrew (connector) shall be provided immediately after the bush or reducer at the delivery side. The meter position for meter of all sizes shall also be similarly provided with fittings of appropriate sizes. The length of the distance piece should be as follows:-

Meter Size (mm)	15	25	40	50	80	100	150
Clear Effective Length of Distance Piece (mm)	200	311	346	310	413	483	500

3.5A For a section of copper pipe is used either before or after a water meter position, that section of copper pipe between the water meter position and the first pipe clamp should be jointed by screwed joints.

3.6 For meters arranged in groups, no meter position shall be lower than 300 mm nor higher than 1500 mm above the floor level. This requirement is also applicable for water meters installed inside meter boxes. For Housing Department estates where corridor meter arrangement is chosen and accepted, individual meter positions shall be at a suitable height not less than 750 mm but not more than 1500 mm above the floor level.

3.7 The connection to the sump tank will not be metered but a meter position shall be provided for the insertion of a check meter for checking and waste detection purposes. This meter position should be so located as to be free from flood and obstruction for ease of meter reading and maintenance at all times, and it should be located close to the lot boundary and connection to the Government mains or close to the point of connection from internal distribution mains whichever is applicable.

3.8 A loose jumper type stopcock shall be provided and placed with the spindle in the vertical position at each meter position on the inlet side of the meter where the meter is not sited at roof level and where the pressure is considered adequate.

3.9 All water pipes which come into direct contact with concrete shall be protected with suitable material. No water pipe shall be embedded within load bearing structural elements such as columns, beams and slabs in longitudinal direction. You are required to state explicitly in the submitted plumbing drawings that no water pipe will be embedded in load bearing structural elements. In this regard, vertical water pipes piercing through structural slabs and transfer plates; and horizontal water pipes piercing through beams, columns and structural walls may be permitted when such water pipes are protected by sleeving or other suitable means. It is advisable, whenever practicable, to arrange for inspection by the Water Authority prior to concreting on any pipework to be embedded in any structural elements or concealing any pipework by architectural features which cannot be easily removed for inspection and maintenance of the pipework after their installation. Moreover, in any event all underground pipework must be so inspected before it is backfilled or covered up.

3.10 Cast iron, ductile iron, unplasticized polyvinyl chloride (uPVC), lined galvanized steel or copper pipes of approved grades will be used for a fresh water inside service. All uPVC pipes must be properly supported and shielded from direct sunrays and must be painted with white acrylic paint when exposed. The type, make and duty of all pipe materials and water supply fittings to be used must be fully detailed on the Form WWO 46 "Application for constructing, installing, altering or removing an inside or fire service" when submitted.

3.11 In an occupied building, a temporary bypass arrangement shall be provided to maintain water supply to the various units of accommodation when plumbing work is being carried out on separate meter conversion. The temporary arrangement should be such that the consumption is till measured by the bulk meter. This bypass arrangement must be removed immediately after the new separate meters are fixed. The bulk meter should also be removed if no longer required.

3.12 The total volume of the roof storage tank and sump tank shall be on the basis of 135 litres for each of the first 10 flats and 90 litres thereafter for each additional flat. The proportion of capacity of sump tank to roof tank shall be in the order of 1:3 or as advised by the Water Authority.

3.13 A tee-branch valve refers to an isolation valve at a branch pipe and which is located close to the main pipe. To facilitate maintenance and repair, tee-branch valves shall be provided:

(a) for all underground water pipes;
(b) if the main pipe is a communal inside service.

3.14 The designer should provide minimum horizontally perpendicular and longitudinal working clearances at each check meter position. The table below stipulates the minimum horizontally perpendicular working clearance, meaning the shortest distance between the longitudinal centre line of the check meter position and a wall or any edge of a door when opened.

	Meter Size (mm)			
	40	50	80	100
Minimum horizontally perpendicular working clearance from the wall or any edge of a door when opened where the check meter position is clamped (mm)	310	310	380	400

The minimum longitudinal working clearance between both end of meter flanges of the check meter position and a wall or any obstruction should be 200mm.

Chapter 4 : Installation of Storage Cisterns [or Water Tanks]

4.1 Cisterns shall be fitted with a ball valve and a fullway gate valve at the inlet in the case of a gravity supply. In the case of a pumped supply to a single cistern, the cistern shall be fitted with an automatic control switch and without any stop valve. In the case of a pumped supply to twin cisterns, each cistern shall be fitted with an automatic control switch and a stop valve for temporary isolation purpose. The ball valve or control switch shall shut off the supply when the water level is 25mm below the invert of the overflow pipe or the warning pipe if there exists one. The invert of the inlet pipe or the face of the outlet nose of the ball valve shall be not less than 25mm above the top of the overflow pipe. All overflow and warning pipes of potable water storage cisterns shall be constructed of non-metallic pipe materials.

4.2 Fullway gate valves shall be provided on all the outlets of every cistern and provision shall be made for a drain-off pipe to enable the cistern to be emptied. The drain-off pipe shall be properly plugged or adequate means shall be provided to prevent any unauthorized operation of the control valve at drain-off pipe.

4.3 Every storage cistern shall be provided with an overflow pipe which shall discharge overflowed water to a conspicuous position in a communal area easily visible and accessible by the occupants. The overflow pipe shall be at least one commercial size larger than the inlet pipe and shall in no case be less than 25 mm in diameter. No part of the overflow pipe shall be submerged inside the storage cistern. A grating and a self-closing non-return flap shall be provided at the overflow pipe outside the storage cistern.

4.4 Where necessary a warning pipe may be installed in addition to an overflow pipe. Except that a warning pipe can be of any size not less than 25mm in diameter, it shall comply with all other requirements of an overflow pipe. The warning pipe shall be installed at a level below the overflow pipe and shall be extended to outside of the building periphery for roof cistern or outside the pump room for sump cistern.

4.5 Every storage cistern shall have a lockable close fitting rigid cover secured by mechanical means which excludes light and the ingress of particles and / or insects from the cistern. The cover shall be made of a material or materials which do not shatter or fragment when broken and which will not contaminate any condensate which may form on its underside or the stored water. For the potable water storage cistern, the cover and its base frame shall possess double upstand edges interlocking one another to provide additional protection.

4.6 Storage cisterns shall be so positioned that they are free from obstruction and readily accessible via safe access for cleansing and to facilitate repairs. It shall be located so as to minimise the risk of contamination of the stored water.

4.7 When the storage cistern for potable water is to be placed adjoining to a storage cistern for non-potable water, a physical break shall be provided between the two cisterns, i.e. walls and slabs of the two cisterns must be separated while tie beams linking the cisterns for structural requirements are acceptable. The tie beams shall be constructed in such a manner that cross contamination of two cisterns via the tie beams is not possible.

4.8 All outlet pipes from the storage cistern should, whenever possible, be positioned at the opposite side to the inlet supply pipe.

4.9 It is stipulated in Clause 5(1) of the Wells and Water Storage (Urban Council) By-Laws [HK Law Chapter 132] that every water storage tank and cistern shall at all times be kept in a clean and wholesome condition. In this respect, every cistern is recommended to be thoroughly cleaned and scrubbed with a solution of chloride of lime or bleaching powder containing not less than fifty parts of chlorine in one million parts of water at least once every three months. A notice plate/board should be provided to record the dates of cleaning of the water cisterns. The notice plate/board together with the cleaning date's records should be securely fixed at a conspicuous location easily accessible and visible by the residents and the building management staff.

4.10 Structural design of the cistern and its supports should be subject to the requirements of the Building Authority.

4.11 Fibreglass storage cisterns for potable water shall be of an approved type or certified to contain no toxic materials and to be suitable for storage of potable water.

4.12 The invert of an outlet pipe from a water storage tank with capacity less than 5000 litres shall be at least 30 mm above the bottom of the tank; this distance shall be increased to 100 mm if the storage tank capacity is 5000 litres or more.

4.13 To facilitate cleansing of water storage tanks, all internal surface of floors, walls (to full height) and soffits (except the cistern openings) of potable water storage cisterns should be lined with a white non-toxic smooth finish such as ceramic tiles. In connection with this, it is also advisable to have the same finish for the internal surfaces of floors and walls of flushing and fire service water storage cisterns.

Chapter 5 : Non-Centralized Hot Water System

5.1 When the factory test pressure of the heater is in excess of 1.5 times the maximum static pressure at the mains water supply point, non-pressure type heaters, cistern type water heaters, and instantaneous water heaters are permitted to be connected direct to the supply pipe without the necessity of providing storage. Unvented electric thermal storage water heaters satisfying the requirements stipulated in paragraphs 5.10 and 5.11 are also permitted to be connected direct to the supply pipe.

5.2 When the factory test pressure of the heater is less than 1.5 times the maximum static water pressure at the mains water supply point then, for premises on direct supply, a separate mains water storage cistern of 45 litres capacity shall be provided for each flat to supply the hot water apparatus.

5.3 Pressure type thermal storage heaters other than unvented electric thermal storage water heaters satisfying the requirements stipulated in paragraphs 5.10 and 5.11 shall be supplied from storage cisterns as stipulated in paragraph 5.2, no matter what the pressure at inlet point should be, except these are installed in flats supplied through the indirect or sump and pump system.

5.4 For flats supplied from the roof storage cistern of an indirect or sump and pump system, no separate storage for hot water apparatus will be required but the supply to the apparatus shall be by a separate down feed supplying the apparatus only unless the arrangement in paragraph 5.5 is applied.

5.5 If the flats on the indirect system are supplied through an oversized down feed pipe, the pipe supplying the hot water apparatus shall be branched from the down feed at a point above the top of the apparatus.

5.6 When gas geysers are to be installed on the top floor of a building supplied through storage cisterns, gas geysers with low pressure governors should be installed when the head available is less than 5 metres to the highest hot water draw-off point.

5.7 If mixing valves, water blenders or combination fittings are to be used, the cold water supply to these fixtures shall be drawn from the same source as is supplying the hot water apparatus in order to provide a balanced pressure and to obviate the risk of scalding should the supply at the source fail or be restricted for any reason.

5.8 Except for unvented electric thermal storage water heaters satisfying the requirements stipulated in paragraphs 5.10 and 5.11, all pressure type thermal

storage heaters shall be provided with a vent or expansion pipe taken from its highest point and discharge in the atmosphere above the storage cistern at sufficient height to prevent a constant outflow of hot water therefrom.

5.9 A loose jumper type valve shall be fitted on the inlet of the water heater if a non-return valve is not incorporated in such water heater, but this requirement does not apply to an electric water heater of the thermal storage type satisfying the requirements stipulated in paragraphs 5.10 and 5.11.

5.10 All unvented electric thermal storage water heaters shall comply with the safety requirements under the Electrical Products (Safety) Regulation (Cap. 406 sub. leg.)

5.11 Every system incorporating an unvented electric water heater of the thermal storage type shall be provided with:-

(a) a supply pipe that branches off from the feed pipe at a point above the top of the water heater, or some other device to prevent the water from draining down from the water heater if there is a failure at the source of water supply;

(b) an anti-vacuum valve complying with BS 6282 or some other device to prevent heated water from being syphoned back to the supply pipe; and

(c) a vessel to accommodate the expansion of heated water where that expansion is constrained by a non-return valve or some other device, incorporated at the inlet of the water heater.

5.12 It is advisable that lagged copper pipes are used for hot water system where re-circulation system is designed.

5.13 A tee-branch valve refers to an isolation valve at a branch pipe and which is located close to the main pipe. To facilitate maintenance and repair, tee-branch valves shall be provided:

(a) for all underground water pipes;
(b) if the main pipe is a communal inside service.

Chapter 6 : Centralized Hot Water System

6.1 The cold feed pipe from the roof storage cistern shall supply the hot water system only.

6.2 If mixing valves, water blenders or combination fittings are to be used, the cold water supply to these fixtures shall be drawn by a separate down feed from the hot water storage cistern. This outlet shall be slightly lower than the feed to the hot water system in order to provide a balanced pressure and obviate the risk of scalding should the mains supply fail or be restricted.

6.3 All centralised hot water systems utilising a boiler and cylinder, or calorifier, shall be provided with a vent or expansion pipe taken from the highest point of the cylinder or calorifier, or if a secondary circulation system, from the highest point of such system. In either case the vent or expansion pipe shall discharge to the atmosphere above the storage cistern at sufficient height to prevent a constant outflow of hot water therefrom.

6.4 Under no circumstances shall safety valves, air valves or relief valves be used as a substitute or replacement for a vent or expansion pipe nor should any control valve be installed on the vent or expansion pipes between the highest point of the cylinder or calorifier, and the free end of such pipes.

6.5 When a centralised hot water system of the boiler /cylinder or calorifier type is installed, in addition to the vent pipe as required in paragraph 6.3 above, a safety valve or pressure relief valve shall be provided to the boiler or to the primary flow pipe as close to the boiler as possible. Such valve shall be set to discharge when the pressure in the boiler exceeds 35kPa above that of the static pressure of the system.

6.6 No tap or other means of drawing off water, (other than a screwed plug with a removable key for emptying the system for cleansing and repair), shall be connected to any part of the hot water system below the top of the hot water cylinder in such a way that the level of the water in cylinder can be lowered.

6.7 In a hot water system comprising more than one storage cylinders at different levels, paragraph 6.6 should read as applying to the lowest cylinder.

6.8 To avoid wastage of water when repairs are being effected, a stop valve shall be fitted on the cold feed pipe at the outlet from the storage cistern.

6.9 If the storage cylinder is installed in a lower floor, and additional stop valve shall be fitted near the inlet to the cylinder.

6.10 Such stop valve as provided under paragraphs 6.8 and 6.9 shall have loose keys or hand-wheels which shall be kept in a safe place to prevent unauthorised interference.

6.11 A screwed plug with a removable key shall be provided at the lower part of the system for the purpose of draining down or emptying the system.

6.12 No stop valve shall be installed in the primary flow or return pipes except when a vent pipe is connected to the boiler and such installation shall only be made under skilled supervision.

6.13 It is advisable that lagged copper pipes are used for hot water system where re-circulation system is designed.

6.14 Installation of boilers/ steam boilers shall comply with the relevant Boilers and Pressure Vessels Regulations [HK Law Chapter 56].

6.15 A tee-branch valve refers to an isolation valve at a branch pipe and which is located close to the main pipe. To facilitate maintenance and repair, tee-branch valves shall be provided:

(a) for all underground water pipes;
(b) if the main pipe is a communal inside service.

Chapter 7 : Fresh Water Supply to Commercial and Industrial Buildings

7.1 For industrial buildings, the entire internal services shall be supplied from storage tanks with separate outlets / downpipes feeding independent systems to serve separately the industrial and processing purposes and the other general and ablution appliances. These independent systems should not be interconnected. The permissible capacity of storage tanks for industrial use is one-day demand when the industrial buildings are situated outside the full supply zones during water restriction.

7.2 For office buildings, theatres and other places of entertainment the provision of storage will not be obligatory, and if storage is to be provided, this shall not exceed the capacity determined by the Water Authority.

7.3 All pipework before meter positions shall be exposed or laid in a proper service duct to facilitate inspection and repairs. Provisions should be made for checking leakage from any pipework laid underground.

7.4 The meter position for 15 mm diameter meter shall be constructed to include 20 mm x 15 mm bushes, or reducers, at both sides of the meter position with a 200 mm (clear effective length) distance piece of 15 mm tube placed in between. The tube shall be hollow with conspicuous holes drilled through the body. A longscrew (connector) shall be provided immediately after the bush or reducer at the delivery side. The meter position for meter of all sizes shall also be similarly provided with corresponding fittings of appropriate sizes. The length of the distance piece should be as follows:-

Meter Size (mm)	15	25	40	50	80	100	150
Clear Effective Length of Distance Piece (mm)	200	311	346	310	413	483	500

7.4A For a section of copper pipe is used either before or after a water meter position, that section of copper pipe between the water meter position and the first pipe clamp should be jointed by screwed joints.

7.5 A loose jumper type stopcock shall be provided and placed with the spindle in the vertical position before the meter on all connections up to and including 40 mm diameter.

7.6 For connections larger than 40 mm diameter, a gate valve shall be provided before the meter position and a non-return or check valve fitted on the delivery side as close as possible to the meter.

7.7 When the applicant submits the vertical plumbing line diagrams (VPLD), he/she will also be required to submit the layout and elevation plans of the meter rooms/boxes with dimensions, including the width and height of the entrances (door openings in case of meter boxes) for the Water Authority's approval. All water meters, including vacant meter positions and check meter positions, shall be arranged in groups and housed in meter rooms or meter boxes. The meter rooms/boxes shall be used solely for housing water meters to protect them against exposure to weather, falling objects and other undue external interferences. They shall not be used as store rooms/boxes, etc. No other building services such as drainage systems, fire hoses, E&M installations (equipment, cables and ducting, etc.) shall pass through or be placed inside the meter rooms/boxes except lighting, ventilation and drainage, etc. solely to facilitate meter reading and maintenance of water meters. Unless otherwise accepted by the Water Authority, a typical meter room/box shall comply with the following requirements:

(a) for meter rooms, the minimum distance between the outward face of the meter group and the wall/door opening directly opposite the meter group shall be 1000mm and there shall be no obstacles in between. Besides, if the door to the meter room is to be opened at an inward position and it is at the opposite side of the meter group, the minimum perpendicular distance between the outward face of the meter group and the door (the point on the door that is nearest to the meter group) when it is fully opened shall be 600mm;

(b) the clear width and height of the door entrance to the meter room shall not be less than 800 mm and 2000 mm respectively. The arrangement of the meter position(s) and the door opening of the meter box shall be arranged in such a manner that staff of the Water Authority would not be required to lean inwards to take meter readings or carry out maintenance works. For meter boxes, the clear depth measured from the outside face shall not be more than 800mm;

(c) when the meter room is occupied for taking meter readings and/or maintenance of water meters, the illumination shall not be less than 120 lux at meter positions and the mechanical ventilation shall not be less than 6 air-changes per hour;

(d) an entrance located at communal area for safe, free, and uninterruped access to the meter room/box shall be provided;

(e) provision of adequate drainage inside the meter room and the meter box positioned at floor level shall be made;

(f) the door(s) to the meter room/box shall not be equipped with any self-closing device. The lock of the door to the meter room shall be located at a level between 0.9m and 1.1m above the finished floor level. The door to the meter room shall be equipped with handle to facilitate door opening. The door handle shall be either in the form of long cylindrical or spherical shape to facilitate handling. Covered or flat sectioned handles shall not be used;

(g) the outside of the door(s) to the meter room/box shall be clearly marked「水錶」,"Water Meters" in both Chinese and English of font size not less than 28 pt for easy identification;

(h) if there are more than one water meter room/box inside a building block, master-key locks shall be used at all meter rooms/boxes and a duplicate master key for the Water Authority or his/her staff's sole use shall be kept at the management office. In case there are more than 300 water meters or 30 meter rooms/boxes, two duplicate master keys shall be kept for the sole use of the Water Authority.

(i) for high-rise building blocks, water meters shall be installed in meter rooms/boxes. For low-rise buildings with fenced-off area, water meters shall be installed in meter room(s)/box(es) located at the boundary and shall be accessible from the public area;

(j) meter rooms/boxes inside market/commercial complex shall be positioned in areas with clear access and with no risk of being obstructed by hawkers, etc.

(k) for check meter of 100mm diameter or smaller, a straight length of pipe of 5 x D (where D is the nominal bore of the meter) should be provided upstream of the check meter position and a straight length of pipe of 2 x D at downstream. For check meter of diameter larger than 100mm, the straight lengths upstream and downstream are 10 x D and 5 x D respectively.

7.8 Fullway gate valves shall be fitted before meter positions when the meters are sited at roof level.

7.9 A loose jumper type stopcock shall be provided and placed with the spindle in vertical position at each meter position on the inlet side of the meter where the meter is not sited at roof level and where the pressure is considered adequate.

7.10 For building to be supplied via a sump and pump system, the connection to the sump tank will not be metered but a check meter position shall be provided for checking and waste detecting purposes. This meter position should be so located as to be free from flood and obstruction for ease of meter readings and maintenance at all times, and it should be close to the lot boundary and connection to the Government mains or close to the point of connection from internal distribution mains whichever is applicable.

The designer should provide minimum horizontally perpendicular and longitudinal working clearances at each check meter position. The table below stipulates the minimum horizontally perpendicular working clearance, meaning the shortest distance between the longitudinal centre line of the check meter position and a wall or any edge of a door when opened.

	Meter Size (mm)			
	40	50	80	100
Minimum horizontally perpendicular working clearance from the wall or any edge of a door when opened where the check meter position is clamped (mm)	310	310	380	400

The minimum longitudinal working clearance between both end of meter flanges of the check meter position and a wall or any obstruction should be 200mm.

7.11 Spring taps, of non-concussive type and of approved pattern, shall be used for the public or communal lavatory basins except for those in private clubs in which the use of screw down tap is permissible.

7.12 All G.I. piping which comes into direct contact with concrete shall be bitumen-coated and wrapped with hessian or other suitable material or where such pipe passes through a wall or suspended floor, it may be protected by sleeving or other suitable means. It is advisable, whenever practicable, to arrange for inspection by the Water Authority prior to concreting any pipework to be embedded in any wall or suspended slab and in any event all underground pipework must be so inspected before it is backfilled or covered up. However, the pipework arrangement should be so designed as to minimize concealed piping as far as possible.

7.13 Individual stop valves shall be provided at all draw-off points or at a series of draw-off points if situated close together.

7.14 Cast iron, ductile iron, unplasticized polyvinyl chloride (uPVC), galvanized steel or copper pipes of approved grades will be used for a fresh water inside service. All uPVC pipes must be properly supported and shielded from direct sun rays and must be painted with white acrylic paint when exposed. The type, make and duty of all pipe materials and water supply fittings to be used must be fully detailed on the Form WWO 46 "Application for constructing, installing, altering or removing an inside or fire service" when submitted.

7.15 A sump and pump system shall be provided with a standby pumpset. The proportion of capacity of sump tank to roof tank shall be in the order of 1:3 or as advised by the Water Authority.

7.16 A tee-branch valve refers to an isolation valve at a branch pipe and which is located close to the main pipe. To facilitate maintenance and repair, tee-branch valves shall be provided:

(a) for all underground water pipes;
(b) if the main pipe is a communal inside service.

7.17 Sufficient cleansing taps shall be provided at car parks of a building for car/floor washing. The cleansing supply at the car park shall be given from a fresh water cistern with a separate meter unless it is a part of the cleansing supply system of the building.

7.18 The meter position of a building supply to a construction site shall be provided within a meter room or meter box located at the hoarding recess area so that reading and maintenance of the meter can be carried out outside the construction site. Safe, free and uninterrupted access to the meter room/box should be provided and maintained at all time. The door of the meter room or meter box shall be made of chicken-wire or provided with see-through glass panel. Details of the meter room or meter box are subject to the approval of the Water Authority.

Chapter 8 : Flushing Supply from Government Mains [Fresh or Salt]

8.1 A separate water storage tank shall be provided for flushing purposes.

8.2 The water discharge mechanism of flushing devices shall either be one of the following types:

(a) with a flushing cistern:
  (i) valveless siphonic;
  (ii) drop valve;
  (iii) flap valve; or
  (iv) dual flush valve;

(b) without a flushing cistern:
  (i) flushing valve (flushometer valve).

They can either be actuated by mechanical means or by sensors.

8.2A Every flushing cistern shall have an overflow terminating in a conspicuous position.

8.2B The discharge volume of the flushing devices shall be preset at the smallest compatible with the toilet bowl to ensure that effective clearance can be achieved by a single flush of water.

8.2C The requirements on the use of valve type flushing cisterns (refer to paragraphs 8.2(a)(ii), (iii) and (iv) above) are as follows:

(a) The valve seal of the flushing devices shall be easily replaceable.

(b) A dual flush valve which is designed to give two different volumes of flush shall have a readily discernible method of actuating the flush at different volumes. Such method should be illustrated clearly and permanently displayed at the cistern or nearby.

(c) For dual flush devices, the reduced flushing volume shall not be more than two-thirds of the larger flushing volume.

(d) The components of all valve type flushing devices shall be resistant to salt water corrosion.

(e) The flushing devices must pass the 200,000-cycle endurance test.

8.2D The requirements on the use of flushing valves (refer to paragraph 8.2 (b) above) are as follows:

(a) Installation of a filter before a flushing valve or a group of flushing valves is required.

(b) The cartridge and other valve components shall be easily replaceable.

(c) The valve components shall be resistant to salt water corrosion.

(d) Flushing valves shall be used within the range of working pressures specified by the manufacturer.

(e) The flushing devices must pass the 200,000-cycle endurance test.

(f) Flushing valve shall only be used where there is a good maintenance management system for frequent inspection and cleaning of filters. Normally only public toilets (such as those administered by government, quasi-government bodies, hotel operators, commercial complex management offices, etc.) will be considered.

(g) To facilitate users to report defective flushing valves in case they occur, it is advisable to secure in a conspicuous place in the public toilet, where the flushing valves are installed, a plate etched with the name of the responsible party and the telephone number in both Chinese and English. Other effective arrangements may also be considered.

8.3 Not used.

8.4 For an existing building with permission to use mains water (fresh or salt) for flushing purposes, any existing flushing apparatus found unsuitable shall be replaced with a proper apparatus as specified under paragraphs 8.2 and 8.2A to 8.2D above.

8.5 It is the requirement under the Buildings Ordinance [HK Law Chapter 123] that all new buildings shall be provided with a plumbing system to supply water for flushing purposes and every part of such plumbing system (including the storage tank) shall be constructed of such materials that are suitable for use with salt water.

8.6 If the water supply pressure is high, a break pressure tank or cistern shall be provided at a suitable level to prevent excessive water pressure in the supply system. If this is not practicable, pressure reducing valves shall be provided to meet the following requirements:-

(a) a bypass arrangement shall be provided for the installation of a second pressure reducing valve allowing the other pressure reducing valve to be isolated for repair and replacement when necessary;

(b) a pressure indicator on the low pressure side of the pressure reducing valve shall be provided for pressure monitoring;

(c) the associated pipes and fittings shall be able to withstand the maximum permissible pressure that may arise upon the failure of the pressure reducing valve.

8.7 A tee-branch valve refers to an isolation valve at a branch pipe and which is located close to the main pipe. To facilitate maintenance and repair, tee-branch valves shall be provided:

(a) for all underground water pipes;
(b) in a flushing system if the main pipe serves more than one domestic unit or commercial floor.

For Temporary Mains Fresh Water Flushing Supply

8.8 The inlet pipe to the separate storage tank should not be less than 40 mm diameter; its portion before meter position shall be exposed or laid in a proper service duct and extended to the lot boundary.

8.9 To facilitate meter installation, a meter position shall be provided in the communal area of the building as close to the existing potable supply meters as possible.

8.9A For check meter of 100mm diameter or smaller, a straight length of pipe of 5 x D (where D is the nominal bore of the meter) should be provided upstream of the check meter position and a straight length of pipe of 2 x D at downstream. For check meter of diameter larger than 100mm, the straight lengths upstream and downstream are 10 x D and 5 x D respectively.

8.9B The designer should provide minimum horizontally perpendicular and longitudinal working clearances at each check meter position. The table below stipulates the minimum horizontally perpendicular working clearance, meaning

the shortest distance between the longitudinal centre line of the check meter position and a wall or any edge of a door when opened.

	Meter Size (mm)			
	40	50	80	100
Minimum horizontally perpendicular working clearance from the wall or any edge of a door when opened where the check meter position is clamped (mm)	310	310	380	400

The minimum longitudinal working clearance between both end of meter flanges of the check meter position and a wall or any obstruction should be 200mm.

8.10 The meter position for 15 mm diameter meter shall be constructed to include 20 mm x 15 mm bushes, or reducers, at both sides of the meter position with a 200 mm (clear effective length) distance piece of 15 mm tube placed in between. The tube shall be hollow with conspicuous holes drilled through the body. A longscrew (connector) shall be provided immediately after the bush or reducer at the delivery side. The meter position for meter of all sizes shall also be similarly provided with corresponding fittings of appropriate sizes. The length of the distance piece should be as follows:-

Meter Size (mm)	15	25	40	50	80	100	150
Clear Effective Length of Distance Piece (mm)	200	311	346	310	413	483	500

8.11 A loose jumper type stopcock shall be provided and placed with the spindle in the vertical position before the meter on all connections up to and including 40 mm diameter.

8.12 For connections larger than 40 mm diameter, a gate valve shall be provided before the meter position and a non-return or check valve fitted on the delivery side as close as possible to the meter.

8.13 The capacity of the water storage tank shall be limited to 45 litres per flushing apparatus with a minimum of 250 litres.

8.14 In case of a temporary mains fresh water supply is proposed to be provided as the alternative source to augment an existing independent (not Government) supply, the storage tank for the flushing cistern shall be constructed in accordance with Waterworks Drawing No. W 1543/5B.

For Mains Salt Water Flushing Supply

8.15 The inlet pipe to the separate storage tank shall not be less than 40 mm diameter.

8.16 Salt water supply will not be metered, but a meter position shall be provided for the purpose of periodic checking of consumption. This meter position should be so located as to be free from flood and obstruction for ease of meter reading and maintenance at all times, and it should be close to the lot boundary and connection to the Government mains or close to the point of connection from internal distribution mains whichever is applicable.

8.17 A fullway gate valve shall be fitted at the inlet side of the meter position and a non-return or check valve shall be fitted on the delivery side as close as possible to the meter.

8.18 There is no specific requirement for the storage capacity, but a storage not less than half a day's consumption is recommended.

8.19 All flushing water tanks and associated fittings and pipeworks etc. must be of salt water resistant materials, e.g. uPVC, vitreous earthenware, cast iron, gunmetal etc. to the approval of the Water Authority. The type, make and duty of all materials to be used shall be fully detailed on the Form WWO 46 "Application for constructing, installing, altering or removing an inside or fire service".

Chapter 9 : Installation of a Fresh / Salt Water Fire Service

9.1 A fresh / salt water fire service must be entirely independent of the other water supply arrangements within the building or development concerned.

9.2 A fresh or salt water fire-fighting supply may be approved. A salt water installation may be "primed" with fresh water to inhibit corrosion etc. Such priming arrangements must be approved by the Water Authority prior to installation.

9.3 Cast iron, ductile iron, galvanized wrought iron, galvanized steel or copper pipes and fittings of approved grades will be used for a fresh water fire service. Consideration can also be given for the use of wrought iron pipe and black steel pipe without being galvanized, upon application, for a fresh water fire service after a positive air break (i.e. fire service tank or sump tank).

9.4 Cast iron, ductile iron and fittings capable of withstanding the corrosive effect of salt water must be used in a salt water fire service.

9.5 An independent connection shall be provided from the Government water mains for the fire service installation. The fire service connection will not be metered but a check meter position shall be provided for checking and waste detecting purposes. This meter position should be so located as to be free from flood and obstruction for ease of meter reading and maintenance at all times, and should be located close to the lot boundary and connection to the Government mains or close to the point of connection from internal distribution mains whichever is applicable. All pipework before the check meter position shall be exposed or laid in a proper service duct to facilitate inspection and /or repairs. Provision should be made for checking leakage from any pipework laid underground.

9.5A For check meter of 100mm diameter or smaller, a straight length of pipe of 5 x D (where D is the nominal bore of the meter) should be provided upstream of the check meter position and a straight length of pipe of 2 x D at downstream. For check meter of diameter larger than 100mm, the straight lengths upstream and downstream are 10 x D and 5 x D respectively.

9.5B The designer should provide minimum horizontally perpendicular and longitudinal working clearances at each check meter position. The table below stipulates the minimum horizontally perpendicular working clearance, meaning the shortest distance between the longitudinal centre line of the check meter position and a wall or any edge of a door when opened.

	Meter Size (mm)			
	40	50	80	100
Minimum horizontally perpendicular working clearance from the wall or any edge of a door when opened where the check meter position is clamped (mm)	310	310	380	400

The minimum longitudinal working clearance between both end of meter flanges of the check meter position and a wall or any obstruction should be 200mm.

9.6 A fullway gate valve and a non-return valve have to be installed on the fire service as close to the Government water supply connection as possible.

9.7 A tee-branch valve refers to an isolation valve at a branch pipe and which is located close to the main pipe. To facilitate maintenance and repair, tee-branch valves shall be provided for all underground water pipes.

Sprinkler / Drencher System

9.8 A dual connection from the Government unrestricted supply ring main will be provided for a fire service sprinkler / drencher system situated in the recognized Waterworks unrestricted industrial supply zone. Twin connections, one from an unrestricted supply main and one from a distribution main, will be provided for a fire service sprinkler / drencher system situated outside the recognized unrestricted industrial supply zone, where practicable.

9.9 Where it is not practical to connect the fire service sprinkler /drencher system to an unrestricted supply main, Fire Services Department may require the provision of fire service tank to serve as secondary source for the fire service installation. Dependent upon Fire Services Department's requirements, a single or dual connection can be given to serve the fire service tank of secondary source.

9.10 Where direct connections to sprinkler / drencher system are to be from the Government mains, an additional butterfly valve, without stop screw and lock nut on handle and strapped in open position, shall be installed at a point on the supply pipe before the fire service inlet and as close as possible to the control valves of the connections.

9.11 No part of any fire service sprinkler / drencher system supplied from the Government mains shall be used for supplying any other services including other fire service installations, e.g. hose reels, except that a common suction tank can be used for both sprinkler / drencher and hose reel systems. Any exemption

from this requirement should have the endorsement of the Director of Fire Services.

Hydrant / Hose Reel System

9.12 Common tank arrangements for fire-fighting and flushing or other purposes are not acceptable when a Government supply is involved. Where a building is to be provided with a non-Government flushing supply and where it is proposed to feed the fire service from that supply, the developer is advised to install an independent fire service system if it is envisaged that the fire service system may require to be connected to the Government mains at a later stage.

9.13 Supply to hydrant / hose reel system must not be fed directly from the Government mains.

9.14 Fire hose reel outlets shall be housed in glass-fronted cabinets secured under lock and key. The glass panel shall be of a frangible type and shall not exceed 1.5mm in thickness, and that it shall be of such size and design so as not to cause any undue obstruction to the free use of the hose reel. Furthermore, a metal or plastic striker shall be provided in the vicinity of the cabinet for the purpose of breaking the glass panel in case of emergency. To prevent misuse of fire hose reels, a sticker or plate carrying the following warning message should be securely fixed on or near every hose reel outlet and the message should be easily visible by the residents.

消 防 用 水
嚴禁作其他用途

USE OF WATER FROM FIRE SERVICES
FOR PURPOSES OTHER THAN FIRE
FIGHTING IS STRICTLY PROHIBITED

水務監督辦事處 Office of the Water Authority

Fire Service Ring Mains

9.15 Fire service ring main in a large industrial complex shall be connected to an unrestricted supply main, if practical. In case this is not practical, a "dual" connection from the Government ring main shall be given.

9.16 The fire service ring main shall not be connected to or used to supply any other services.

Chapter 10 : The Use of Pipes and Fittings and the Associated Installation Requirements in Inside Service

10.1 The type of pipe materials to be used in an inside service shall be detailed in the plumbing proposal. The licensed plumber shall also submit details of the pipes and fittings he intends to use in Form WWO 46 for the approval of the Water Authority.

10.2 Pipes and fittings shall conform to Schedule 2 of the Waterworks Regulations. From time to time the Water Authority may approve other pipe materials for use in cold water, hot water or salt water inside service. The following pipe materials may be used in cold water, hot water or salt water inside service as appropriate:

(a) cast iron pipe to BS 4622;

(b) ductile iron pipe to BS 4772;

(c) copper pipe to BS EN 1057;

(d) unplasticized polyvinyl chloride (uPVC) pipe to BS 3505 Class D;

(e) chlorinated polyvinyl chloride (PVC-C) pipe to BS 7291 Parts 1 & 4;

(f) polyethylene (PE) pipe to BS 6730 or BS 6572;

(g) crosslinked polyethylene pipe to BS 7291 Parts 1 & 3;

(h) polybutylene (PB) pipe to BS 7291 Parts 1 & 2;

(i) lined (uPVC / polyethylene lining) galvanized steel pipe of the approved type.

10.3 uPVC fittings shall be used at the meter position if uPVC materials are used as inside service. Brass fittings shall be used at the meter position if copper, lined galvanized steel or thermo-plastic materials are used as inside service.

10.4 The metal work of an inside service shall not be used as an earth electrode. [Paragraph 12C(1)(b) of the Code of Practice for the Electricity (Wiring) Regulations, 1992 Edition]. Therefore, the use of non-metallic pipes or fittings should not have had any effect on the earthing arrangement of the building.

10.5 However, for some old buildings metallic water pipes might have been used to form part of the earthing arrangement. Under such circumstances, whenever an electrical insulation is to be introduced in the inside service, the applicant or his licensed plumber is advised to consult his registered electrician to confirm that the earthing arrangement in the premises / building is still acceptable. If the earthing arrangement becomes substandard, then actions should be taken to comply with the Electricity (Wiring) Regulations [HK Law Chapter 406].

W **Water Supplies Department**

Handbook on Plumbing Installation for Buildings

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List of Figures

Preface

Water Supplies Department issued several booklets on the requirements, policies and practices of plumbing installations. They are:

(a) Hong Kong Waterworks Standard Requirements for Plumbing Installation in Buildings;
(b) Water Supplies Department Circular Letters issued to Licensed Plumbers and Authorized Persons;
(c) General Information on the Use of Different Types of Pipe Materials as Inside Service in Buildings;
(d) Installation Notes of Different Types of Corrosion Resistant Pipe Materials as Inside Service in Buildings; and
(e) A Guide to the Preparation of Plumbing Proposals.

With an aim to providing more comprehensive information in a user-friendly manner to the practitioners for submission of plumbing proposals for new building developments to the Water Authority, this **Handbook on Plumbing Installation for Buildings** summarises the current Hong Kong waterworks requirements in respect of policies, procedures and practices that the practitioners are expected to observe. This book is therefore intended to serve as a handy reference for those concerned.

The contents of this book are based on the following references:-

(a) the Waterworks Ordinance (Cap 102) and the Waterworks Regulations (Cap 102 Subsidiary Legislation);
(b) The Hong Kong Waterworks Standard Requirements for Plumbing Installation in Buildings; and
(c) Water Supplies Department Circular Letters issued to Licensed Plumbers and Authorized Persons.

In all circumstances, it is the responsibility of the applicants to ensure that the plumbing proposals comply with the prevailing waterworks requirements. It is therefore important for the readers of this book to refer to the original text of these documents for the latest information on new or modified requirements from the Water Authority before they submit plumbing proposals. In case there is any discrepancy between the references and this book, the references should take precedence.

For information and procedures on how to apply for water supply applications, you are advised to visit the WSD's website at http://www.wsd.gov.hk/

Your suggestions and comments on this book are welcome. Please send them to:-

Chief Engineer/Customer Services
Water Supplies Department
Immigration Tower, 7 Gloucester Road, Hong Kong

1. General

1.1 Definitions

The definitions used in this booklet are as follows:-

Agent	A person who is approved under Section 7 of Waterworks Ordinance as an agent of a communal service.
Authorized Person	An Authorized Person registered under the Buildings Ordinance.
Communal Service	That part of a fire service or inside service which is used in common by more than one consumer in the same premises.
Connexion to the Main	The pipe between the main and the control valve which is nearest to the main and which regulates the flow of a supply from the main into a fire service or inside service, such control valve and all fittings between such control valve and the main.
Consumer	A person who is approved under Section 7 of Waterworks Ordinance as a consumer of a fire service or inside service.
Direct Supply System	A plumbing system which conveys water directly from the government water mains to the point of usage without any transit water storage tanks.
Fire Service	The pipes and fittings in premises, and any pipes and fittings between the premises and a connexion to the main, which are used or are intended to be used for a supply solely for the purposes of fire fighting.
Fitting	Any apparatus, cistern, cock, equipment, machinery, material, tank, tap and valve; and any appliance or device other than a meter, which is installed or used in a fire service or inside service.
Indirect Supply System	A plumbing system which conveys water from the government water mains to the point of usage through a transit water storage tank.
Inside Service	The pipes and fittings in premises, and any pipes and fittings between the premises and a connexion to the main (other than the pipes and fittings forming part of a fire service) which are used or are intended to be used for the purposes of a supply.
Licensed Plumber	A person licensed under the Waterworks Ordinance to construct, install, maintain, alter, repair or remove fire services or inside services.
Main	Main includes a connexion to the main and any pipe owned by the Government and maintained by the Water Authority for the purposes of a supply.

Meter	An appliance or device owned by the Government and maintained by the Water Authority for the purpose of measuring water consumption.
Premises	Any building or structure or any part thereof and any place in which there is a fire service, inside service or any part of the waterwork; or in which a fire service or inside service is intended to be constructed or installed.
Water Authority	The Director of Water Supplies
Waterworks	Any property occupied, used or maintained by the Water Authority for the purpose of water supply, including all water gathering grounds.

1.2 Abbreviations

Abbreviations used in this booklet are as follows:-

BS	British Standards
FSD	Fire Services Department
GI	Galvanized Steel
HKWSR	Hong Kong Waterworks Standard Requirements for Plumbing Installation in Buildings
LP	Licensed Plumber
PB	Polybutylene
PE	Polyethylene
PVC-C	Chlorinated Polyvinyl Chloride
PVC-U	Unplasticised Polyvinyl Chloride
TMF	Temporary Mains Fresh Water for Flushing
VPLD	Vertical Plumbing Line Diagram(s)
WSD	Water Supplies Department
WW	Waterworks
WWReg	Waterworks Regulations

1.3 Commonly Used Waterworks Pipes and Fittings

The functions of some commonly used waterworks pipes and fittings are described below:-

Fitting	Function
Anti-vacuum Valve	a valve in a water service that opens to admit air if the pressure within the water service falls below atmospheric pressure.
Ball Valve	a valve that controls the entry of water into a storage cistern or flushing cistern, closing off the supply when the water level in the cistern has reached a predetermined level. It is sometimes called a ball cock or float-operated valve.
Boiler	an enclosed vessel in which water is heated by the direct application of heat
Butterfly Valve	a valve in which a disc is rotated about a diametric axis of a cylinder to vary the aperture. It is used where space is limited or more sophisticated control is required.
Calorifer	a storage vessel, not open to the atmosphere, in which a supply of water is heated. The vessel contains an element, such as a coil of pipe, through which is passed a supply of hot water or steam, in such a way that the two supplies do not mix, heat being transferred through the walls of the element.
Expansion Vessel	a closed vessel for accommodating the thermal expansion of water in a pressurized hot water heating system
Float Switch	a device incorporating a float that operates a switch in response to changes in the level of a liquid.
Gate Valve	a valve that provides a straight-through passage for the flow of fluid and in which the passage can be closed by a gate. It is used where the water pressure is low and on distribution pipework from a storage cistern. This valve is sometimes referred to as a fullway gate valve because when it is fully open, there is no restriction of flow through the valve.
Loose Jumper Type Stopcock	a screwdown pattern valve with horizontal inlet and outlet connections. It incorporates a loose jumper valve permitting flow in one direction only. It is used for isolating the supply of water in a high pressure pipeline. In case the supply main is shut off and drained down for any reason, the ‘non-return’ action of the loose valve plate will stop any backflow from the service pipe.

Non-return Valve	a valve that prevents reversal of flow in the pipe of a water supply by means of the check mechanism, the valve being opened by the flow of water and closed by the action of the check mechanism when the flow ceases, or by back pressure. It is also known as check valve.
Pressure Reducing Valve	a valve that reduces the pressure of a fluid immediately downstream of its position in a pipeline to a preselected value or by a predetermined ratio.
Pressure Relief Valve	A self-acting valve that automatically opens to prevent a predetermined safe pressure being exceeded.
Temperature Relief Valve	A self-acting valve that automatically opens to prevent a predetermined safe temperature being exceeded.

2. Responsibilities of Water Authority and Consumers/Agents

2.1 Divisions of Responsibilities

The division of responsibilities for Water Authority, consumer/agent on the maintenance of water supply systems are as follows (Fig 1 & Fig 2):-

Area of Responsibility	Maintained by
Connexion to the main	Water Authority
Water meter	Water Authority (the Consumer/Agent is however responsible for the safe custody of the meter serving his/her premises.)
Communal inside/fire service within the building/lot boundary	Agent
Non-communal inside/fire service within the building/lot boundary	Consumer

2.2 Obligations of Consumers/Agents

The obligations of a consumer/agent under the Waterworks Ordinance are as follows:-

OBLIGATIONS	
Consumer	Agent
(i) proper maintenance of the inside services within his/her premises. (ii) safe custody of the water meter for his/her premises. If the meter is stolen or damaged (not as a result of fair wear and tear), he/she must pay for its replacement or costs of repairs. (iii) payment of a deposit and all charges in respect of the supply to the premises.	(i) proper maintenance of the communal services within the premises. (ii) safe custody of the water meter for the communal services. If the meter is stolen or damaged (not as a result of fair wear and tear), the Agent must pay for its replacement or costs of repairs. (iii) payment of a deposit and all charges in respect of the supply to the communal service.

The liability of a consumer/agent in respect of a supply will continue, until another consumer/agent is approved by the Water Authority in his/her place or an undertaking given under Section 7 of Waterworks Ordinance is cancelled by the Water Authority.

2.3 General Principles for Installing Plumbing Works

The followings are the general principles for installing plumbing works:-

(a) all water fittings and pipework shall comply with the relevant Waterworks Regulations;
(b) all plumbing works shall be carried out in accordance with the Hong Kong Waterworks Requirements;
(c) all plumbing works shall be carried out by a licensed plumber.

As far as practicable, it is advised that the communal service should not be run through the individual premises because access to the fire service and/or communal service for routine inspection, maintenance and repair of the communal service may be restricted and obstructed by individual premises.

3. Submissions of Plumbing Proposals

3.1 General

Plumbing installation that receives water supply from the Waterworks has to comply with the Waterworks requirements under the provision of the Waterworks Ordinance/Regulations, Hong Kong Waterworks Standard Requirements for Plumbing Installation in Buildings (HKWSR), and Water Supplies Department Circular Letters issued to Licensed Plumbers and Authorized Persons. Approval from the Water Authority is required in order to construct, install, alter or remove a plumbing installation.

Plumbing installation that is not to receive water supply from the Waterworks does not need the approval of the Water Authority. However, it is advisable for the plumbing installation to follow the Waterworks requirements such that when a supply from the Waterworks becomes necessary, the modification of the plumbing installation to comply with the Waterworks requirements will be minimized.

3.1.1 Minimum Residual Pressure

The Water Authority maintained a minimum residual pressure of 30-metre head in most ***existing*** fresh water supply zones except at their extremities. To tie in with various national standards and international practice, the Water Authority has decided to lower the minimum residual pressure to 20-metre head, except at the extremities of supply zones for new developments in new or existing supply zones or re-developments in existing supply zones, for plumbing proposals first submitted to the Water Authority on or after 1 April 2008.

3.1.2 Application for Water Supply for two- storey Warehouse through One Stop Centre (OSC)

Applicant may apply for water supply for 2-storey warehouse through the OSC operated under the Efficiency Unit (EU) of Chief Secretary for Administration's Office with effect from 1 December 2008. The OSC is an option in addition to the existing channels of application. It aims to streamline the application process by setting a centralized office for receiving submissions of building plans and related applications (including technical audit for water supply connection works) and coordinating joint inspections for two-storey warehouses. For applicants who would like to join the service, the scope of works must satisfy the criteria specified by the EU. For details, please refer to the EU's website at http://www.eu.gov.hk/english/osc/osc.html.

3.1.3 Household-Scale Solar Water Heater System for Village House

The Electrical and Mechanical Services Department (EMSD) provides general guidelines for the intending purchasers, owners and installers of household-scale solar water heating system to be installed at village houses. The guidelines helps the above people to understand the installation requirements and application procedures associated with the installation, operation and maintenance of the aforesaid solar water heating system. For details, please refer to the EMSD's website at
http://www.emsd.gov.hk/emsd/e_download/pee/Guidance_Notes-solar_water_heating_system.pdf

3.2 Submissions

3.2.1 Plumbing Works

The applicant should obtain from the Water Authority such information as are relevant to the design of the plumbing installation and submit the plumbing proposal to the Water Authority for approval. The Water Authority will as far as practical provide the information to the applicant such as location and size of connection points, water pressures, single or double-end fed supply.

WSD pledges to vet submissions of plumbing proposals for new building developments in 20 clear working days. Sometimes it may take a longer time for the applicant to clarify on points not clearly mentioned in the proposal. Therefore, it is advisable for the applicant to submit the plumbing proposal to the Water Authority for approval early in order not to delay the plumbing works. **No plumbing work shall commence before the plumbing proposal has been approved by the Water Authority.** It is important for the applicant to bear in mind the need to accommodate all the inside service and fire service, which include water storage tanks, break pressure tanks, meter rooms etc. together with the associated access, in the layout and structural design of the development.

3.2.2 Replumbing Works

Prior to carrying out replumbing works within private buildings, approval from the Water Authority must be sought. Failing this is in contravention of Section 14 of the Waterworks Ordinance and the offenders are liable to prosecution.
The Water Authority would like to replace the old meters of the buildings in conjunction with the replumbing works. For better co-ordination of work, it is considered more appropriate to have the meter replacement works to be carried out by the same licensed

plumber engaged in the replumbing works. In our approval to the application for replumbing works, the licensed plumber will be invited to carry out the meter replacement works and our District staff will inform the licensed plumber of the detailed arrangement.

3.3 Plumbing Proposals

Applicants should submit Application Forms WWO 542 together with plumbing proposals.

The plumbing proposal shall include:-

(i) a list of the documents submitted to the Water Authority.

(ii) a block plan in a scale of 1:1000 showing the location and boundary of the development. The locations should be marked with datum level.

(iii) a plan showing the alignment and size of the proposed connection pipes from the main to the development.

(iv) a plan showing the proposed alignment and size of the internal underground water pipes to be laid in the development.

(v) vertical plumbing line diagrams and water pipe alignment plans.

(vi) a schedule containing the following items:-

- (a) number of flats/units in each block of the building.
- (b) the address of each premises in the building that requires individually metered water supply.
- (c) number of draw-off points and sanitary fittings in each/unit.
- (d) estimated daily consumption for all trade purposes.

(vii) a drawing showing the arrangements of water meters in meter rooms/boxes and the fittings at the meter positions.

(viii) the relevant standards of the pipe materials to be used in the application.

(ix) capacities of the water storage tanks to be installed such as roof storage tanks and the water consumption of domestic appliances such as water heaters. Catalogues of such equipment and appliances etc. shall also be attached.

(x) any other information as may be required by the Water Authority.

3.4 Format

One set of the plumbing proposals is required. All drawings shall be:-

(a) identified by drawing numbers and drawing titles;

(b) folded to a plan size not exceeding the A4 size (i.e. 297 mm by 210 mm) and in such a way to display the drawing numbers and drawing titles.

For revised drawings, details of all the amendments shall be listed as notes to the drawings and the amendments shall also be highlighted or coloured in the drawings for easy

identification. The submission, whether approved or not, will not be returned to the applicant. Once approved, no details in the submission shall be altered without the written approval of the Water Authority.

4. Licensed Plumbers

4.1 General

4.1.1 Category of Grades

A licensed plumber (LP) is categorised into two grades:-

Grade I	for the construction, installation, maintenance, alteration, repair or removal of a fire service or inside service of any type
*Grade II **	for the maintenance and repair of a fire service or inside service; and for the installation, maintenance, repair or removal of water appliances

** No new Grade II plumbers' licence will be issued after 1 October 1993.*

4.1.2 Application for New Water Supply - Response Time

The Water Authority has provided target response time for completing the key activities in respect of the application for new water supply. To further step up the service to the public and the practitioners, the Water Authority has, from time to time, reviewed the target response time to look for improvements. (Please see http://www.wsd.gov.hk/en/about_us/performance_pledge/index.htm for updated details)
In case an application is not processed within the target response time or the applicant wants to discuss the way in which an application has been handled, the applicant can contact the supervisory staff of WSD's Regional Office to which the application has been submitted. The list of case officers and business facilitation officers can be obtained from webpage http://www.wsd.gov.hk/filemanager/en/share/pdf/list_case_officers.pdf

If the case still cannot be resolved, the applicant can bring up the matter to WSD's headquarters (refer to the Preface of this handbook for address) in writing.

4.1.3 Excavation Permit Fee Under the Land Ordinance (Miscellaneous Provision) (Amendment Ordinance 2003)

The Land (Miscellaneous Provision) (Amendment) Ordinance 2003 gazetted on 23 May 2003 was taken effect on 1 April 2004. Under the Ordinance, a fee is payable in respect of all excavation permits applied on or after 1 April 2004 for excavation in unleased land which is either a street maintained by the Highways Department or other than any street maintained by the Highways Department.

To recover the cost, the Water Authority will issue an additional and separate demand note on the estimated excavation permit fees to applicants irrespective of the approval dates of their plumbing proposals if the excavation permit is applied on or after 1 April 2004 for any part of their concerned water supply connection work. This demand note is subject to

adjustment according to the actual final excavation permit fees incurred for the work.

4.1.4 Awareness of Anti-corruption Laws

Licensed Plumber should always be aware of the anti-corruption laws and avoid to contravene them during their course of works. For details, please refer to the website of Independent Commission Against Corruption at http://www.icac.org.hk/ .

4.2 Commencement of Work

Provided that all pipes and fittings intended to be installed are approved by the Water Authority, the licensed plumber, who is employed by the applicant, should submit details of the plumbing proposals on Parts I and II of WWO 46 - "Notice/Application for Constructing, Installing, Altering or Removing an Inside or Fire Service" to notify the Water Authority of the details and commencement date of plumbing works. For the application of water supply for the food business (restaurant) premises, the Annex i.e. the material list may be submitted at a later stage but at least 7 working days before the submission of Part IV of WWO 46 requesting WSD for inspection of the completed plumbing works.

If any of the pipes and fittings used/to be used have not yet been approved by the Water Authority, prior approval must be obtained from the Water Authority before the commencement of plumbing work.

4.3 Interim Inspections and Final Inspections

No pipe or fitting forming part of a fire service or an inside service shall be used or covered up until it has been inspected and approved by the Water Authority. Hence, it is advisable, whenever practicable, to arrange for inspection by the Water Authority prior to concreting on any pipework to be embedded in structural elements or concealing any pipework by architectural features which cannot be easily removed for inspection and maintenance of the pipework after their installation; and in any event all underground plumbing works must be so inspected before it is backfilled or covered up. Moreover, the pipework arrangement should be so designed to minimize concealed pipework as far as possible.

The concealed inside service and fire service (not including underground pipeworks) will be inspected at random by the Water Authority. These random inspections will either be initiated by the licensed plumber or by the Water Authority. In either case, 3 working days' advance notice should be given to the other party in order to arrange a suitable time for conducting such random inspections.

Provided that due regard have been given to ensure compliance with Waterworks requirements and the approved plumbing details, the requirement of random inspection for concealed pipework is exempted for government projects administered by full-time resident government site staff.

4.4 Completion of Work

The licensed plumber should report completion of work on Part IV of WWO 46 within 7 working days after completion of the plumbing works to inform the Water Authority to arrange for final inspection. Water supply will only be effected after the inside service / fire service has been checked in order.

4.5 Works of a Minor Nature

No fire service or inside service shall be constructed, installed, maintained, altered, repaired or removed by a person other than a licensed plumber or a public officer authorized by the Water Authority, except for alteration or repairs to a fire service or inside service which are, in the opinion of the Water Authority, of a [1]minor nature or the rewashering of a tap.

Minor alterations and repairs to inside services without dismantling and reinstallation of the water meter within a domestic premises may be exempted as follows:-

(i) Replacement of defective piping, taps, stopcocks, gate valves, ball valves and work of a similar nature.
(ii) Repairs to leaking pipes or fittings and minor alterations to pipework.
(iii) Extensions within the same premises to supply a single additional tap, fitting or appliance, provided that the fitting or appliance does not require the installation of a storage tank.

Minor alterations and repairs to inside services shall conform to waterworks requirement in respect of quality of workmanship and material.

However, as most alterations, addition and extension to the existing plumbing installation can cause a change in the flow conditions in one way or another, it is in the interest of the consumer/agent that in case of doubt to notify the Water Authority of their intention, who will give an appropriate advice as necessary.

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[1] Works of a minor nature are works which can be completed without the involvement of specialised trade skill and those which do not change the general arrangement of the plumbing installation already approved by the Water Authority, or affect the flow conditions of the plumbing system thus causing possible supply problems.

5. Metering

5.1 General

Metering is required to measure water consumed for billing purposes. Meter position shall be provided by the LP (employed by the applicant) for meter installation while water meters will be provided by the Water Authority. Water meters may be installed either by the Water Authority or the licensed plumber.

The size and location of the water meter will be determined by the Water Authority. For domestic supply, a meter size of 15mm is usually recommended. For trade and industrial supply, the meter size is determined based on the actual water consumption.

However, a check meter position and/or a waste detection chamber shall be provided at the inlet pipe to the communal service for consumption check and waste detection purposes. The check meter position and/or a waste detection chamber shall be close to the lot boundary or close to the point of connection from the internal distribution mains whichever is applicable.

5.2 Meter Position

The meter position for a 15 mm diameter meter shall be constructed to include 20 mm x 15 mm bushes at both sides of the meter position with a 200 mm (clear effective length) distance piece of 15 mm tube placed in between (refer to Fig 3). The tube shall be hollow with conspicuous holes drilled through the body. A long screw connector shall be provided immediately after the bush at the delivery side. The meter position for meter of all sizes shall also be similarly provided with corresponding fittings of appropriate sizes. The length of the distance piece should be as follows (refer to Fig 4):-

Meter Size (mm)	15	25	40	50	80	100	150
Clear Effective Length of Distance Piece (mm)	200	311	346	310	413	483	500

If a section of copper pipe is used either before or after a water meter position, the section of copper pipe between the water meter position and the first pipe clamp should be jointed by screwed joints.

When the applicant submits the vertical plumbing line diagrams (VPLD), he/she will also be required to submit the layout and elevation plans of the meter rooms/boxes with dimensions, including the width and height of the entrances (door openings in case of meter boxes) for the Water Authority's approval. All water meters, including vacant meter positions and check meter positions, shall be arranged in groups and housed in meter rooms or meter boxes.

The meter rooms/boxes shall be used solely for housing water meters to protect them against exposure to weather, falling objects and other undue external interferences. They shall not be used as store rooms/boxes, etc. No other building services such as drainage systems, fire hoses, E&M installations (equipment, cables and ducting, etc.) shall pass through or be placed inside the meter rooms/boxes except lighting, ventilation and drainage, etc. solely to facilitate meter reading and maintenance of water meters. Unless otherwise accepted by the Water Authority, a typical meter room/box shall comply with the following requirements:

(a) for meter rooms, the minimum distance between the outward face of the meter group and the wall/door opening directly opposite the meter group shall be 1000mm and there shall be no obstacles in between. Besides, if the door to the meter room is to be opened at an inward position and it is at the opposite side of the meter group, the minimum perpendicular distance between the outward face of the meter group and the door (the point on the door that is nearest to the meter group) when it is fully opened shall be 600mm;

(b) the clear width and height of the door entrance to the meter room shall not be less than 800 mm and 2000 mm respectively. The arrangement of the meter position(s) and the door opening of the meter box shall be arranged in such a manner that staff of the Water Authority would not be required to lean inwards to take meter readings or carry out maintenance works. For meter boxes, the clear depth measured from the outside face shall not be more than 800mm;

(c) when the meter room is occupied for taking meter readings and/or maintenance of water meters, the illumination shall not be less than 120 lux at meter positions and the mechanical ventilation shall not be less than 6 air-changes per hour;

(d) an entrance located at communal area for safe, free, and uninterruped access to the meter room/box shall be provided;

(e) provision of adequate drainage inside the meter room and the meter box positioned at floor level shall be made;

(f) the door(s) to the meter room/box shall not be equipped with any self-closing device. The lock of the door to the meter room shall be located at a level between 0.9m and 1.1m above the finished floor level. The door to the meter room shall be equipped with handle to facilitate door opening. The door handle shall be either in the form of long cylindrical or spherical shape to facilitate handling. Covered or flat sectioned handles shall not be used;

(g) the outside of the door(s) to the meter room/box shall be clearly marked「水錶」,"Water Meters" in both Chinese and English of font size not less than 28 pt for easy identification;

(h) If there are more than one water meter room/box inside a building block, master-key locks shall be used at all meter rooms/boxes and a duplicate master key for the Water Authority or his/her staff's sole use shall be kept at the management office. In case there are more than 300 water meters or 30 meter rooms/boxes, two duplicate master keys shall be kept for the sole use of the Water Authority.

(i) for high-rise building blocks, water meters shall be installed in meter rooms/boxes. For low-rise buildings with fenced-off area, water meters shall be installed in meter room(s)/box(es) located at the boundary and shall be accessible from the public area;

(j) meter rooms/boxes inside market/commercial complex shall be positioned in areas with clear access and with no risk of being obstructed by hawkers, etc.

Upon completion of the water meter installation inside a meter room/box, the LP shall install a permanent display board at the wall/door inside the meter room/box showing the location and elevation of the meter positions. The top of the board shall not be higher than 1500 mm above the floor level and the bottom of the board shall not be lower than 500 mm for an individual meter above the floor level. This display board shall be constructed of durable plastic or corrosion-resistant plate engraved with words and diagrams in black on light colour background. The wordings should be of font size not less than 18 pt. Details of this display board shall be submitted by the applicant as part of the VPLD for the Water Authority's approval. This requirement can be waived for small meter boxes accommodating 3 meters or less.

Within two weeks after completion of the water meter installation, the LP shall submit as-built plans of the meter arrangements, the completed Meter Installation Table (MIT) and Part IV of the Form WWO 46 where amongst others the LP undertakes the correctness of the meter positions. The applicant/developer and the Authorised Person shall also countersign in Part IV of the Form WWO 46 to indicate their satisfaction of the correctness of the meter positions.

For meters arranged in groups, no meter position shall be lower than 300 mm nor higher than 1500 mm above the floor level. This requirement is also applicable for water meters installed inside meter boxes. For Housing Department estates where corridor meter arrangement is chosen and accepted, individual meter positions shall be at a suitable height not less than 750 mm but not more than 1500 mm above the floor level.

The meter position of a building supply to a construction site shall be provided within a

meter room or meter box located at the hoarding recess area so that reading and maintenance of the meter can be carried out outside the construction site. Safe, free and uninterrupted access to the meter room/box should be provided and maintained at all time. The door of the meter room or meter box shall be made of chicken-wire or provided with see-through glass panel. Details of the meter room or meter box are subject to the approval of the Water Authority.

For a meter installed in a landscape area, it should be installed above ground level with a clear working headroom not less then 2m. A safe pedestrian access to the meter position should be provided.

When the meters are sited at roof level, fullway gate valves shall be fitted before meter positions. For connections up to and including 40 mm diameter, a loose jumper type stopcock shall be provided and placed with spindle in the vertical position at each meter position on the inlet side of the meter where the meter is not sited at roof level and where the pressure is considered adequate. For connections larger than 40 mm diameter, a fullway gate valve shall be provided before the meter position and a non-return or check valve fitted on the delivery side as close as possible to the meter position.

The following practice should be adopted in plumbing work design for meter positions:-

(a) the fittings at the meter position should facilitate easy installation and removal of the water meter without the need to work on other pipes;

(b) the pipework at the meter position should be securely fixed to support the weight of the water meter and to resist any torsion, bending and tension during the installation and removal of the water meter.

5.3 Master Meter

The Water Authority had implemented the master metering policy after 31 December 2005. The purpose of introducing master metering is to detect water leakage and unlawful taking of water before meters. A master meter room to house the master meter and its by-pass arrangement should be provided as close to and within the boundary lot as possible. The details of implementation of the policy are as follows:

(a) (i) For all new developments, except single detached village type buildings and single block buildings, plumbing designers shall be required to provide master meter room with master meter position(s) in the plumbing, submit undertaking Form WWO 542 for the consumership(s) of master meter(s) and arrange licensed plumber to install master meter(s). These requirements shall apply to all plumbing proposals first submitted to the Water Authority after 31 December 2005.

(ii) For development with more than 1 detached village type building, master meter

requirement shall be applied if the total length of underground and concealed pipes exceeds 15m.

(iii) For developments not required to install master meters, fire service shall be connected from the main outside the lot boundary. Also, check meter positions shall be provided in fresh water and TMF inside service and fire service.

(b) The water supply connection arrangement for fresh water supply, fire service supply and Temporary Mains-water for Flushing (TMF) supply will be as shown in the Fig. 27 and 28.

(c) The master meter will substitute current requirement of check meter positions in all fresh water and TMF inside service and fire service. There will be 1 master meter installed in each set of connection points at the lot or building boundary. Twin or dual main connections are regarded as one set of connection points.

(d) Downstream of the master meter,

(i) <u>for fresh water supply</u>
all individual domestic premises, water usage points or group of water usage points shall be metered with separate meters.

(ii) <u>for fire service</u>
there shall be no other meter.

(iii) <u>for TMF supply</u>
there shall be 1 communal TMF meter to each individual block of buildings.

(e) To ensure accuracy of master meter, the plumbing designer shall provide two lengths of straight pipe, one upstream and one downstream of the master meter. The length upstream and downstream should not be less than 10 times the nominal diameter of the master meter and 5 times respectively.

(f) To facilitate replacement of master meter(s), a 100mm diameter by-pass arrangement should be provided for future maintenance of water supply during meter replacement. (refer to Fig. 28 and Fig. 30).

(g) To facilitate installation, inspection, reading, service, and replacement of master meter(s), the plumbing designer shall house master meter(s) and associated by-pass(es) in meter room(s) preferably with at-grade access where feasible. Please refer to Fig. 29-33 which indicate the design considerations for the at-grade master meter room.

(h) (i) If the watermain is to be laid underneath internal roads which is scheduled to be handed over to government within 5 years after completion, master meters should

be installed for each separate connection group for the buildings/podia at their respective boundaries.

(ii) If the handing over is scheduled longer than 5 years after completion, the said master meter positions mentioned in (h)(i) are still required but temporarily bridged over by short pieces. On top of this, master meters are also required at the estate's boundary (refer to Fig. 34)

(i) Fire service supply needs to be unaffected by potable supply interruption as far as practicable. Also, the metering characteristics of both supplies are different. Therefore, fire service needs to be separate from the potable supply right at the lot boundary. A typical configuration of master meter is shown in the Figs. 27 and 28.

5.4 Check Meter

For check meter of 100 diameter or smaller, a straight length of pipe of 5 x D (where D is the nominal bore of the meter) should be provided upstream of the check meter position and a straight length of pipe of 2 x D at downstream. For check meter of diameter larger than 100mm, the straight lengths upstream and downstream are 10 x D and 5 x D respectively.

The designer should provide minimum horizontally perpendicular and longitudinal working clearances at each check meter position. The table below stipulates the minimum horizontally perpendicular working clearance, meaning the shortest distance between the longitudinal centre line of the check meter position and a wall or any edge of a door when opened.

	Meter Size (mm)			
	40	**50**	**80**	**100**
Minimum horizontally perpendicular working clearance from the wall or any edge of a door when opened where the check meter position is clamped (Distance A (mm) as shown in Fig.35)	310	310	380	400

The minimum longitudinal working clearance between both ends of meter flanges of the check meter position and a wall or any obstruction should be 200 mm.

6. Inside Service

6.1 Fresh Water Supply

The treated fresh water provided by the WSD complies fully with the drinking water standard according to the guidelines of the World Health Organization. However, in order to ensure that consumers can enjoy good quality of water at the taps, building owners have to maintain their plumbing systems properly as well. To encourage the building owners to do this, the WSD launched the "Fresh Water Plumbing Quality Maintenance Recognition Scheme" in 2002. Since 1 January 2008, the Scheme has been renamed as "Quality Water Recognition Scheme for Buildings". Please contact WSD's Customer Telephone Enquiry Centre at tel. no. 2824 5000 or visit the website at http://www.wsd.gov.hk for more details of the Scheme.

6.1.1 Metering Requirement

All fresh water supplies to inside service shall be metered. All domestic supplies and concessionary supplies shall be separately metered. For different usages of concessionary supplies, please see Section 6.1.10.

6.1.2 Pipe Materials

Pipes and fittings shall conform to Part I of Schedule 2 of the Waterworks Regulations. The Water Authority may approve other pipe materials for use in water supplies from time to time.

The following table summaries the different pipe materials that are commonly used in water supply systems:

Pipe Material	Fresh Water Inside Service		Salt Water Inside Service	Fire Service		Standards
	Cold Water	Hot Water		Fresh Water	Salt Water	
cast iron	✓	✓	✓ (with internal cement lining)	✓	✓	BS 4622
copper	✓	✓	×	✓	×	BS EN 1057
ductile iron	✓	✓	✓ (with internal cement lining)	✓	✓	BS EN 545
GI with PVC-C	✓	✓	×	✓	✓	BS 1387 &

lining						internal lining of an approved type
GI with PVC-U/ PE lining	✓	×	×	×	×	BS 1387 & internal lining of an approved type
polybutylene (PB)	✓	✓	×	×	×	BS 7291
polyethylene (PE)	✓	×	×	×	×	BS 6572(below ground)
	✓	×	×	×	×	BS 6730(above ground)
chlorinated polyvinyl chloride (PVC-C)	✓	✓	×	×	×	BS 7291
unplasticized polyvinyl chloride (PVC-U)	✓	×	✓	×	×	BS 3505 Class D or above
crosslinked polyethylene (PE-X)	✓	✓	×	×	×	BS 7291
stainless steel	✓	✓	×	✓	×	BS EN 10312

✓: suitable for use when the relevant standards are complied with

×: not suitable for use in general

The use of unlined GI pipes and fittings as fresh water inside service in new buildings and upon renewal of the plumbing installations in existing buildings is prohibited. However, this requirement does not apply to pipes and fittings installed prior to 23 December 1995 nor to minor repairs to such plumbing works.

For PB and PE pipes, the applicants should refer to the relevant approval letters and/or governing standards to determine the gradings of pipe to be installed.

The Water Authority may also accept pipes and fittings of other standards equivalent to the British Standards.

6.1.3 Guidelines on Cleansing and Disinfection of Fresh Water Inside Service

Under the provision of Waterworks Regulation 7, a consumer or the agent shall be responsible for keeping an inside service clean. To this end, the consumer or agent

concerned shall clean and disinfect a newly installed fresh water inside service before it is given a supply from the Water Supplies Department. Besides, after repair or maintenance of fresh water inside service, if there is a possibility that extraneous materials can get into the inside service, the inside service shall be cleaned and disinfected before water supply is resumed. The guidelines below on how to clean and disinfect the fresh water inside service are set out for general reference:-

(A) Newly Installed Fresh Water Inside Service

The newly installed fresh water inside service shall be cleaned and disinfected to the satisfaction of the Water Authority in accordance with the following procedures.

(I) Newly Installed Underground Fresh Water Mains

(1) Remove all extraneous materials inside the water mains. Fill the fresh water mains slowly with water and carry out the required water pressure testing. If the result of the test is satisfactory, clean the fresh water mains internally and flush them with potable water. For fresh water mains of sizes less than 600 mm in diameter, swab to remove the dirt and materials inadvertently left in the water mains and flush them with potable water.

(2) Fill the water mains completely with a homogeneous solution of chloride of lime for disinfection. The concentration of the solution has to meet the requirement that when the water mains are filled up with water, the free chlorine in the water will be at least 30 ppm. Keep the water mains under disinfection for at least 24 hours. After disinfection, flush the water mains thoroughly with potable water.

(3) Arrange with the Water Authority to collect samples at representative sampling point(s) as agreed by the Water Authority for bacteriological and chemical analysis. The test parameters and the related acceptance criteria are listed in Appendix A3.

Any contamination in underground mains may lead to pollution of the government supply. To ensure quality control and minimize the risk of pollution to the government supply, the Water Authority will carry out sampling and analysis for this part of inside service.

The contact persons of the Water Authority for such arrangements are:-

Areas	Contact Person	Telephone No.
Hong Kong & Outlying Islands	Waterworks Chemist/Treatment (1)	2891 9276
Kowloon and New Territories East	Waterworks Chemist/Treatment (2)	2691 7689
New Territories West	Waterworks Chemist/Treatment (3)	2450 6121

The Water Authority will inform the Licensed Plumber concerned of the result of analysis. If the results are satisfactory, the fresh water mains can be put into operation. If not, the above disinfection and testing procedures shall be carried out again.

(4) To avoid possible contamination, the fresh water mains concerned shall be put into operation within 7 days from the successful disinfection. In this respect, Licensed Plumbers are advised to allow sufficient time for the Waterworks Chemists to carry out sampling and analysis and to avoid arranging disinfection immediately before long public holidays.

(II) Newly Installed Fresh Water Inside Service other than Those covered in (A)(I) above

(1) Flush the inside service concerned thoroughly with potable water.

(2) After flushing, follow one of the three procedures stated below to disinfect the inside service concerned.

Methods Using Chlorine as a disinfectant

(i) Fill the inside service concerned with a homogeneous solution of chloride of lime for disinfection. The concentration of the solution has to meet the requirement that when the inside service is filled up with water, the free chlorine in the water will be at least 30 ppm. After keeping the inside service under disinfection for at least 24 hours, the inside service shall be immediately drained and thoroughly flushed with potable water.

or

(ii) Fill the inside service concerned with chlorinated water at an initial concentration of 50 ppm for a contact period of one hour. If the free residual chlorine measured at the end of the contact period is less than 30 ppm, the disinfection process shall be repeated. After successful disinfection, the inside service shall be immediately drained and thoroughly flushed with potable water.

or

Methods Using Disinfectants other than Chlorine

(iii) Fill the inside service concerned with the disinfectant solution other than chlorine at the initial concentration and for the contact time specified by the manufacturer of the disinfectant. If the residual of the disinfectant at the end of the contact time is less than the manufacturer's recommendation, the disinfection procedure shall be repeated. After successful disinfection, the inside service shall be immediately drained and thoroughly flushed with potable water. Flushing shall continue in accordance with the disinfectant manufacturer's instructions/recommendations or until there is no evidence of the disinfectant chemical being present, or it is at a level that is no higher than that present in the potable water supplied.

[Note : The applicant is requested to submit to the Water Authority at least one month before disinfection is carried out the type(s) and details of the proposed non-chlorine based disinfectant. The Water Authority will advise the applicant of any additional test parameters and related acceptance criteria for water samples (i.e. other than those stated in Paragraph (3) below) within two weeks upon receipt of the details.]

(3) After disinfection, arrange with either the Water Authority or an accredited laboratory[2] to collect samples at representative sampling point(s) as agreed by the Water Authority for bacteriological and chemical analysis. The test parameters and the related acceptance criteria are listed in Appendix A3 (Note: See Note of Paragraph (2)(iii) above also if non-chlorine based disinfectant is used).

If the results are satisfactory, the fresh water inside service can be put into operation. If not, the above disinfection and testing procedures shall be carried out again.

The contact persons of the Water Authority for such arrangements are:-

Areas	**Contact Person**	**Telephone No.**
Hong Kong & Outlying Islands	Waterworks Chemist/Treatment (1)	2891 9276
Kowloon and New Territories East	Waterworks Chemist/Treatment (2)	2691 7689
New Territories West	Waterworks Chemist/Treatment (3)	2450 6121

If the sampling and analysis is carried out by the Water Authority, the Water Authority will inform the Licensed Plumber concerned of the result of analysis. If an accredited laboratory is arranged to carry out the sampling and analysis, the

[2] The accredited laboratory shall be accredited for all the individual parameters listed in Appendix A3.

result of analysis shall be submitted to the Water Authority.

(4) To avoid possible contamination, the fresh water inside service concerned shall be put into operation within 7 days from the successful disinfection. In this respect, Licensed Plumbers are advised to allow sufficient time for the Waterworks Chemists or the accredited laboratory to carry out sampling and analysis and to avoid arranging disinfection immediately before long public holidays.

(B) Repair or Maintenance of Fresh Water Inside Service

(I) Repair or Maintenance of Underground Fresh Water Mains

(1) Keep the excavation surfaces of trench clear from the pipe body and remove all extraneous materials in the fresh water mains. If the trench is flooded, pump water out of the trench.

(2) Clean the internal surface of the exposed pipe ends and the replacement pipe with a solution of chloride of lime. The concentration of free chlorine in the solution shall be at least 30 ppm.

(3) Fill the section of the water mains that has been shut down for repair or maintenance with a homogeneous solution of chloride of lime for disinfection. The concentration of the solution has to meet the requirement that when the water mains are completely filled with water, the free chlorine in the water will be at least 30 ppm. Fill the water mains with water and isolate them when filling is completed. Keep the water mains under disinfection for at least 30 minutes. After disinfection, flush the water mains thoroughly with potable water through a fire hydrant, washout or, if no such facilities are available, through a submain temporarily put out of service.

(II) Repair or Maintenance of Fresh Water Inside Service other than Those covered in (B)(I) above

After completion of repair or maintenance works, fill the concerned inside service that has been shut down for repair or maintenance with a homogeneous solution of chloride of lime for disinfection. The concentration of the solution has to meet the requirement that when the inside service is completely filled with water, the free chlorine in the water will be at least 30 ppm. Isolate the inside service when filling is completed and keep the inside service under disinfection for at least 30 minutes. After disinfection, flush the inside service thoroughly with potable water.

(C) Proper Operation of Inside Service

Stagnant water provides a favourable breeding environment for bacteria. To minimize the possibility of bacteria growth after putting an inside service into operation, water outlets which are infrequently used or are connected to stagnant water supply pipeworks shall be flushed at full flow for a minimum period of one minute at least on a weekly basis and before use.

6.1.4 Application for Approval of Water Supply Pipes and Fittings

The acceptance letters or no-objection letters for pipes and fittings are issued against the products irrespective of the supplier or suppliers' agents. For a change in the supplier or supplier's agent for a product by the same manufacturer, it is not necessary to make a re-submission.

6.1.4.1 Approval/No Objection Letter for Water Supply Pipes

All thermoplastic pipes for conveyance of potable water are required to be tested to BS 6920 on the suitability of their use in contact with water with regard to their effect on the quality of water. The Water Authority will issue a “no-objection” letter for thermoplastic pipes in compliance with BS 6920.

6.1.4.2 Approval/No Objection Letter for Water Fittings

Water fittings accepted by the Water Authority for installation in inside services should be under one of the following categories:-

(a) Fittings marked in accordance with the appropriate British Standard and bearing the registered certification trade mark of the British Standard Institution (the BS Kitemark);
(b) Fittings accepted and certified by the Water Research Centre of the United Kingdom for compliance with the requirements of the Water Supply (Water Fittings) Regulations / Water Byelaws in the United Kingdom;
(c) Fittings approved by the Water Authority as suitable for use locally in conformity with the Waterworks Ordinance and Regulations.

All fittings to be installed in the water supply plumbing system must fall within one of the above categories in respect of their types and origin as approved by the Water Authority and conform to the waterworks requirements.

To obtain approval of waterwork fittings from the Water Authority, the applicant is required to produce certification from the British Standard Institution, the United Kingdom Water Research Centre or testing agents approved by the Water Authority to the effect that the fittings comply with the requirements of the Waterworks Regulations.

Under Category (c) of compliance of water supply fittings, the Water Authority issues acceptance letters for draw-off taps, stop valves, gate valves, ball valves, mixing valves and combination fittings. To apply for approval of water fittings, the applicant is required to submit a test report (original or certified true copy) together with 6 copies of the catalogue of the fittings under a covering letter to the Water Authority. No application form is required. The list of approved testing agencies is available in the WSD's website at http://www.wsd.gov.hk

6.15 Supply Modes

Water supply to premises can be effected in one of two ways:-

(i) **direct supply system**, where it is feasible to supply water by gravity from the mains (refer to Fig 5).
(ii) **indirect supply system**, where it is necessary for the water supplied to the inside service in highrise buildings be boosted in some ways like a sump and pump system or a hydro pneumatic pump system which is usually provided to the topmost floors after a roof storage tank. (refer to Fig 6).

6.1.6 Plumbing Arrangements

6.1.6.1 General

All plumbing works before meter positions shall be exposed or laid in a proper service duct to facilitate inspection and repairs. Provision shall be made for checking leakage from any plumbing work laid underground.

If the connection is not laid in an exposed manner at the lot boundary, then it shall be laid underground with an adequate cover. For carriageway a minimum cover of 1000mm is usually required. Watermains located in Industrial Area or beneath footpaths/verges/cycle tracks whenever there is a possibility of vehicles parking or running on them should be laid with the same cover as those under carriageways. All underground plumbing works will be inspected by the Water Authority before it is backfilled or covered up.

6.1.6.2 Direct Supply System

The meters shall be sited at convenient locations in communal area.

6.1.6.3 Indirect Supply System

The meters shall be sited at roof level or at other convenient locations.

6.1.7 Domestic Appliances

6.1.7.1 Use of Water Purifiers / Filters

Water purifiers / filters shall not be used without the permission in writing of the Water Authority. As the treated municipal water supply to the whole territory of Hong Kong conforms chemically and bacteriologically to the Guideline Standards for Drinking Water of the World Health Organisation and is monitored closely by extensive sampling at treatment works, distribution networks and consumers' taps. the Water Authority does not normally approve nor recommend the installation of water filters in domestic premises because they can give rise to health hazards if they are not properly maintained.

Domestic water purifiers / filters must not be connected directly to the mains supply because of the possibility of contamination. They may be installed in an indirect supply system via the storage tank where there is no possibility of contamination of the mains supply, or of the supply to other premises, e.g. in a communal inside service a separate storage tank would be necessary.

As contaminated water in the filter can backflow to communal water supply system or upstream, the Water Authority does not recommend the installation of any water filter. When there is installation of any domestic filter or water filter incorporated in water using apparatuses (such as drinking fountain etc.), precautionary measures should be taken to ensure proper backflow prevention incorporated or installed where appropriate. The Water Authority does not require any test results of the filters before installation, i.e. "general acceptance" is not required and will not be given.

Despite the above, customers should carry out proper maintenance of water tanks and pipes in their buildings so as to maintain the water quality and to reduce the possibility of pollution arising from the use of water filters. Regular maintenance of domestic water filters is also equally important.

6.1.7.2 Use of Washing Machines / Dish-washing Machines

Where there is no possibility of back siphonage resulting in contamination of the water supply, washing machines / dish-washing machines may be connected directly to the mains. Washing machines / dish-washing machines with submerged inlets must not be connected directly to the mains and should be supplied with water via a storage tank. A ventilation

valve and reflux preventer shall be installed at the supply inlet at a level above the top edge of the washing machine / dish-washing machine.

6.1.8 Construction Supply

Provided that the construction site is within easy reach of the Waterworks distribution system, metered supply may be given for construction purposes.

For individual construction sites, metered water supply may either be tapped directly from the mains or from a fire hydrant. In cases of boring works for site investigation and location of sites are not confined to one particular area or the limit of the works area makes it technically impracticable for the installation of building supply meters, the applicant may apply for a meter adaptor to draw a supply from any fire hydrant near to the works area.

6.1.9 Supply to Temporary Structures and Modified/Converted Structures

6.1.9.1 Temporary Structure

Application for water supply to temporary structures will be considered regardless of the land status or the structural status of the premises concerned. Supply may be given provided it is technically feasible and Waterworks requirements are met.

6.1.9.2 Modified/Converted Structure

These include converted garages, sub-divided dwelling units, and structures where the nature of usage has changed(e.g. residential, commercial, industrial). Applications for metered water supply can be considered and approved with a statement which dissociates the approval from the legal status of the structure if it is technically feasible and Waterworks requirements are met.

6.1.9.3 Legal Implication of Providing Metered Water Supply

In all cases, the provision of metered water supply by the Water Authority will **not** confer any legal implication on the structural status of the premises nor carry any effect of precluding action being taken in respect of the structure by another authority.

6.1.10 Supply for Cooling / Air-conditioning / Humidification Purposes

Water supply shall not be used for any heating, cooling or humidification purposes except with the approval of the Water Authority. Uses of mains (fresh or salt) water may be given for cooling / air-conditioning / humidification purposes to meet the following requirements:

(a) closed circuit cooling systems for any purpose where operational losses are negligible and no water is rejected to waste;

(b) cooling systems involving no loss through evaporation and where all the water is re-used after cooling for an industrial process; (The normal trade requirement must not be less than that required for air-conditioning/cooling purposes at peak load);
(c) evaporative cooling systems essential to an industrial process, whether this be for cooling or for air-conditioning purposes and provided that system losses arise from evaporative only;
(d) evaporative cooling/air-conditioning/humidification systems for essential purposes other than industrial processes provided that system losses arise from evaporation only;
(e) humidification essential to an industrial process(e.g. the spraying of a fine mist in textile weaving plants).

The use of mains water in evaporative type plants for essential purposes other than industrial process is limited to those cases where the cooling / air-conditioning / humidification system is absolutely necessary. An example of such case is the use of mains water for the evaporative type air-conditioning system to serve those areas in hospitals, such as the operating theatres, intensive care units, mortuary etc., where air-conditioning is essential for operation requirement. Other examples are the provision of evaporative type cooling system for cold storage purpose or laboratory testing; and air-conditioning / humidification system for major computer facilities, art gallery or testing laboratory. The type of evaporative plant used should be of an enclosed design from which wastage of water by splashing is prevented.

In order to promote the use of more energy efficient air-conditioning systems in Hong Kong, a pilot scheme for the application to use fresh water for non-domestic air-conditioning in selected areas (i.e. evaporative cooling tower in the air-conditioning system) was commenced in June 2000. The pilot scheme is converted to the standing scheme on 1 June 2008. For more updated information, please refer to EMSD's website http://www.emsd.gov.hk/

Please contact the staff of EMSD or the Water Authority for details about the exact locations of the latest selected areas and the requirements for approving applications for water supply to water-cooled air-conditioning systems under the scheme.

6.1.11 Concessionary Usage of Mains Water

Approval to use government water supply for the purposes listed below can normally be given on concessionary basis when the territory is on full supply, subject to adequacy of the local water supply and distribution system. Such approval will be withdrawn if in the opinion of the Water Authority the supply situation requires it.

The concessionary usages are as follows:-

(i) initial filling of swimming pools and paddling pools and subsequent annual refilling

and make-up purposes, provided that the water is fully re-circulated.

(ii) initial filling of model boat pools and subsequently refilling once in every two months in summer and once in every three months in winter.

(iii) initial filling of fountains and water features and subsequent make-up purposes, provided that the water is fully re-circulated.

(iv) initial filling of artificial lakes in public recreation areas and subsequent make-up purposes.

(v) watering flower-gardens at public housing estates, Home Ownership Schemes, Private Sector Participation Schemes, schools, institutes, community service centres, large private developments, amenity areas alongside highways, and gardens maintained by government departments, including traffic islands and sitting out areas, where the aggregate area of the flower beds is not less than 30 m^2.

(a) point supply: the layout of the supply points should be such that each point will serve an area within the sweep of a 20 m-long hose, and the number of supply points shall be kept to a minimum.

(b) 'drip feed' irrigation system: where the aggregate area of flower beds exceeds 30 m^2, one connection point should normally be given. Additional connection point may be given only when physical barrier exists preventing extension of the drip feed irrigation system and the distance of two successive connection points exceeds 40 m. This category of concessionary usage must be supplied off tank.

(vi) watering plant nurseries.

(vii) irrigating large landscaped areas in new towns. This category of concessionary usage must be supplied off tank.

(viii) watering large area of grass in sports fields such as tennis courts, bowling greens, cricket pitches and football pitches. Supply may be permitted only if there is no practical alternative.

(ix) internal cleansing in buildings such as washing down floors and staircases, refuse chutes and lifts in large blocks of flats and offices; for essential floor cleansing in factories, hawker bazaars, markets, abattoirs and public latrines; and for washing down buses, railway rolling stocks, aircraft, cargo containers and government refuse vehicles, bins and handcarts; for car-washing in garages and car-parks. This category of concessionary usage must be supplied off tank.

(x) operation of mechanical washing vehicles such as mechanical street-cleaners belonging to government departments.

(xi) cleansing for the purpose of air pollution control in respect of smoke or gas emitted from plants or equipment provided that water loss is due to evaporation only. This category of concessionary usage must be supplied off tank.

(xii) dust suppression essential to an industrial process either from an operation standpoint or on grounds of air pollution control. Recycling of water is required unless it is demonstrated to be impracticable. This category of concessionary usage

must be supplied off tank.

The purpose of having some of the concessionary supplies to be supplied off tank is to prevent contamination of the supply source through back siphonage. Similar provisions should also be considered for other categories. For concessionary supplies under (v)(a),(vi),(vii) & (viii), where the installation takes the form of supply standpipe and that a hose will only be connected to the draw-off point when water is drawn, an anti-vacuum valve and a non-return valve may be installed at the draw-off point in lieu of a water storage tank for preventing back siphonage because the potential hazard of water contamination is relatively low. However, every draw-off tap that is freely accessible by the general public should be kept under lock and key.

Installation of water points for internal cleansing of open yards and for other miscellaneous domestic purposes in private houses of bungalow type or the like can be permitted as part of the domestic supply. This will not be taken as a concessionary supply.
Wheel-washing for lorries in construction and reclamation sites is categorised as construction supply. This use is permitted provided the water is fully re-circulated.

6.1.12 Hot Water Systems

6.1.12.1 Non-centralized Hot Water System

Type of Water Heater	Requirement for Direct Connection (without storage tank) to Supply Pipe
Non-pressure type heaters (Fig 7), Cistern type water heaters (Fig 8), Instantaneous water heaters (Fig 9)	the factory test pressure of the heater is in excess of 1.5 times the maximum static pressure at the water mains supply point
Unvented electric thermal storage water Heaters (Fig 10)	HKWSR Clause 5.11 and with safety devices complying with Electrical Products (Safety) Regulation
Pressure type thermal storage heaters Other than unvented heaters (Fig 11)	storage tank is required in all cases with a vented pipe.

A loose jumper type valve shall be fitted on the inlet of the water heater if a non-return valve is not incorporated in such water heater, but this requirement does not apply to an electric water heater of the thermal storage type satisfying HKWSR Clause 5.11.

HKWSR Clause 5.11

Every system incorporating an unvented electric water heater of the thermal storage

type shall be provided with:-
(a) a supply pipe that branches off from the feed pipe at a point above the top of the water heater, or some other device to prevent the water from draining down from the water heater if there is a failure at the source of water supply;
(b) an anti-vacuum valve complying with BS 6282 or some other device to prevent heated water from being syphoned back to the supply pipe; and
(c) a vessel to accommodate the expansion of heated water where that expansion is constrained by a non-return valve or some other device, incorporated at the inlet of the water heater.

Pressure type thermal storage heaters other than unvented electric thermal storage water heaters shall be supplied from a separate mains water storage cistern, no matter what the pressure at inlet point should be, except these are installed in flats supplied through the indirect or sump and pump system. They shall be provided with a vent or an expansion pipe taken from its highest point and discharge in the atmosphere above the storage cistern at sufficient height to prevent a constant outflow of hot water therefrom.

When the factory test pressure of the heater is less than 1½ times the maximum static water pressure at the mains water supply point then, for premises on direct supply, a separate mains water storage cistern of 45 litres capacity shall be provided for each flat to supply the hot water apparatus.

For flats supplied from the roof storage cistern (of an indirect or sump and pump system), no separate storage for hot water apparatus will be required but the supply to the apparatus shall be by a separate down feed supplying the apparatus only unless the flats on the indirect system are supplied through an oversized down feed pipe, for which case the pipe supplying the hot water apparatus shall be branched from the down feed at a point above the top of the apparatus.

Some heaters, such as gas geysers and instantaneous type electric water heaters, may require a minimum pressure and flow for their proper functioning. When these heaters are to be installed, their suitability shall be checked against the available pressure and flow, especially for the uppermost floors served by the direct system or the indirect system.

If mixing valves, water blenders or combination fittings are to be used, the cold water supply to these fixtures shall be drawn from the same source that supplies the hot water apparatus in order to provide a balanced pressure and to obviate the risk of scalding should the supply at the source fail or be restricted for any reason.

The Electricity (Wiring) Regulations require that installation of unvented electric thermal

storage type water heaters shall be carried out by a Grade R registered electrical worker. The safety devices of unvented storage type electric water heaters are under the control of the Electric Products (Safety) Regulations administered by the Electrical and Mechanical Services Department.

For the installation of unvented electric thermal storage type water heaters, the drain pipe provided for the relief valves shall be installed in such a manner that the water released from the valves shall be discharged to a safe and visible location.

The Water Authority may consider acceptance of plumbing installation and a supply to be given without heaters installed on the following conditions:-

(a) If VPLD indicates that heaters will not be installed but plumbing details are shown to provide supply points for heaters, a written undertaking must be obtained from the architect/developer with full description of the type of heaters intended to be installed in future so that VPLD should be checked and approved to comply with Waterworks requirements for the installation of the particular heaters.
(b) If heaters are shown on VPLD but cannot be installed in place ready for final inspection, an advance written undertaking should be obtained from the architect/developer giving a prescribed date for the heaters to be installed.
(c) A warning plate should be secured in a proper and conspicuous place as near to the heater position as possible and etched with the following instruction in both English and Chinese:

"Only [*type of water heater*] water heaters should be installed.
Prior approval must be obtained from the Water Authority."
"只准安裝[熱水器種類]熱水器，並須先向水務監督申請"

The Water Authority shall carry out re-inspections to the premises 6 months after the installation of meters to check if the correct type of heaters have been installed.

6.1.12.2 Centralized Hot Water System

All centralised hot water systems utilising a boiler and cylinder (direct system) (Fig 12), or calorifier (indirect system) (Fig 13), shall be provided with a vent or an expansion pipe taken from the highest point of the cylinder or calorifier, or if a secondary circulation system, from the highest point of such system. In either case the vent or expansion pipe shall discharge to the atmosphere above the storage cistern at sufficient height to prevent a constant outflow of hot water therefrom. Under no circumstances shall safety valves, air valves or relief valves be used as a substitute or replacement for a vent or expansion pipe nor should any control valve be installed on the vent or expansion pipe between the highest point of the cylinder or

calorifier, and the free end of such pipe.

When a centralised hot water system of the boiler/cylinder or calorifier type is installed, in addition to the vent pipe as required above, a safety valve or pressure relief valve shall be provided to the boiler or to the primary flow pipe as close to the boiler as possible. Such valve shall be set to discharge when the pressure in the boiler exceeds 35 kPa above that of the static pressure of the system.

The cold feed pipe to the boiler/cylinder or calorifer shall not be used for other purpose. If mixing valves, water blenders or combination fittings are to be used, the cold water supply to these fixtures shall be drawn by a separate down feed from the same water storage cistern supplying the hot water system. This outlet shall be slightly lower than the feed to the hot water system in order to provide a balanced pressure and obviate the risk of scalding should the mains supply fail or be restricted.

A screwed plug with a removable key shall be provided at the lower part of the system for the purpose of draining down or emptying the system. No stop valve shall be installed in the primary flow or return pipes except when a vent pipe is connected to the boiler and such installation shall only be made under skilled supervision.

No tap or other means of drawing off water (other than a screwed plug with a removable key for emptying the system for cleansing and repair) shall be connected to any part of the hot water system below the top of the hot water cylinder in such a way that the level of water in the cylinder can be lowered. In a hot water system comprising more than one storage cylinder at different levels, this requirement should apply to the lowest cylinder.

The hot water taps shall be fixed at a distance from a hot water apparatus or from a flow and return system not greater than 12m for pipes up to and including 20 mm diameter, 8m for pipes up to 25mm diameter, and 3m for pipes above 25 mm diameter.

To avoid waste of water when repairs are being effected, a stop valve shall be fitted on the cold feed pipe at the outlet from the storage cistern. If the storage cylinder is installed at a lower floor, and additional stop valve shall be fitted near the inlet to the cylinder. Such stop valve as provided shall have loose keys or hand-wheels which shall be kept in a safe place to prevent unauthorized interference.

6.2 Flushing Supply

Flushing supply may be obtained from the government supply system or from other sources. For inside service using government water supply for flushing, it should comply with the

Waterworks requirements. The inside service for flushing water supplied from privately owned wells, nullah intakes, stream intakes or other water source need not comply with the Waterworks requirements. If it is foreseen that flushing supply from government supply system is likely to be required, the flushing system should comply with the Waterworks requirements in order to minimise the modification work required at a later stage.

6.2.1 Metering Requirement

All flushing water supply systems shall be kept separate from water supply systems. A water meter shall be installed at each flushing system receiving a temporary mains fresh water (TMF) supply. TMF flushing supply is normally given to the entire building through a communal meter. Individual units with independent flushing supply systems will involve a very complicated plumbing arrangement which is both expensive and technically difficult because of the need to comply with the off-tank supply requirement. Hence, application for flushing supply should be submitted by a representative of the building and application for individual units is not entertained.

Salt water flushing supply is also subject to the bulk application but it is not metered. However, a meter position shall be provided for consumption check and waste detection purposes. It shall be close to the lot boundary or close to the point of connection from the internal distribution mains whichever is applicable.

6.2.2 Pipe Materials

Pipes and fittings shall conform to Schedule 2 of the Waterworks Regulations. The Water Authority may approve other pipe materials for use in salt water inside service from time to time.

Pipes on a salt water inside service shall be made of salt water resistant materials, e.g. ductile iron, cast iron, unplasticized polyvinyl chloride, vitreous earthware and gunmetal etc.

6.2.3 Plumbing Arrangements

6.2.3.1 General

A separate water storage tank shall be provided for flushing purpose. Every water closet, latrine shall be provided with a flushing cistern which shall have an overflow terminating in a conspicuous position.

For existing buildings for which permission is given to use government water supply in lieu of private supply for flushing purpose, any existing unsuitable flushing apparatus shall be

replaced with proper apparatus within a reasonable period before a government supply is given.

It is the requirement under Buildings Ordinance that all new buildings shall be provided with a system of plumbing for the supply of water for flushing purposes and every part of such system of plumbing (including the storage tank) shall be constructed of material that is suitable for use with salt water.

6.2.3.2 Salt Water Supply

Salt water supply to premises can be effected in two different ways (Fig 14). These are:-

(i) Direct Supply to a Roof Storage Tank

This system is used when the mains supply pressure is adequate. The storage tank is used to guard against contamination, accidental interruption of supply and to even out peak demands.

(ii) Sump and Pump System

This system is used when the mains pressure is insufficient to effect a direct supply to the roof tank. In this system, salt water is supplied from the mains to a sump tank from which it is pumped to a high level storage tank whence it gravitates to the draw-off points. Direct boosting from salt water mains is not permitted.

6.2.3.3 Temporary Mains Fresh Water for Flushing (TMF)

Mains fresh water may be given for flushing only in cases where the Water Authority is satisfied that there is no suitable alternative. Such flushing supply should be given on a temporary basis and shall revert to salt water supply when this becomes available.

When salt water becomes available in areas containing premises using fresh water as a temporary alternative, the Water Authority will inform the consumers that permission to use fresh water will be withdrawn in 3 months' time and salt water will be provided in lieu. Consumers will also be informed of the estimated cost of the salt water connection.

In the case of a TMF supply to be provided as the alternative source to augment an existing non-government supply, the water storage tank shall be constructed in accordance with Fig 15 (Drawing No W1543/5B).

6.2.3.4 Flushing Devices

Flushing devices can be classified broadly into 2 main types viz. the valveless syphonic type and the valve type. The current Waterworks Regulations require that flushing cisterns shall be of the valveless syphonic type capable of giving a flush between 7.5 and 15 litres. The

practice of accepting only valveless syphonic type cisterns is mainly to prevent leakage of water into the toilet bowl, as in the past, the water-tightness of most valve type flushing devices was often a problem. However, a disadvantage of valveless syphonic type cisterns is that they require a comparatively larger volume of water to generate the necessary flushing effect and a cistern volume of 7.5 litres is seen as the practically minimum requirement. With the improvement in design and material, valve type flushing devices have become more reliable in their performance. A major advantage of valve type flushing devices is that they can give instantaneous flushing even with a relatively smaller volume of flushing water. This helps reduce water required for flushing. Valve type flushing mechanism also permits the design of "dual-flush" cisterns in which the volume of water to be discharged from the cistern can be selected by choosing either a "full-flush" or a "half-flush" depending on need. This allows further reduction in flushing water requirement.

Therefore, by means of the WSD Circular Letter No. 4/2000 of 31 October 2000, the Water Authority relaxes the waterworks requirements in respect of the flushing mechanism and minimum flushing volume, as follows:-

(a) the use of valve type flushing devices (mechanical or sensor type with single flush or dual flush) in addition to valveless syphonic type flushing apparatuses; and

(b) the use of flushing devices which are capable to give a single flushing volume of less than 7.5 litres.

An essential requirement on the relaxation on the use of valve type flushing devices is that the design flushing volume should be compatible with the bowl to ensure effective clearance of waste by a single flush. For the use of flushing valves, a good management system ensuring frequent inspection and cleaning of filters is required. Normally, only public toilet with good management will be considered for the use. In case the flushing valve with a built-in strainer in place of a filter is adopted, the designer must ensure that the strainer can be readily inspected and cleaned. Otherwise, the installation of a filter readily accessible for inspection and cleaning is suggested.

The Water Authority will proceed to amend the Waterworks Regulations for the above changes. The proposed amendments to the Waterworks Regulations shall not apply to existing flushing apparatuses (including valve type flushing cisterns without the approval of the Water Authority) installed before the commencement of the new Regulations. No person shall be required to alter or renew any such flushing apparatuses by virtue of the amendments unless such flushing apparatuses are in the opinion of the Water Authority so defective or in such condition as to cause waste. In case the existing flushing apparatuses are found

defective or leaking, consumers are allowed to either repair the defective flushing apparatuses or replace them by the approved type flushing apparatuses.

6.2.3.5 Identification of Internal Fresh and Salt Water Mains within Large Developments

To avoid connecting the internal fresh water pipe to salt water pipe by mistakes, the following guidelines shall be closely observed:-

(a) when designing the plumbing proposals of large developments with internal fresh and flushing water mains to be laid at the same location, different pipe materials and/or different sizing for the fresh and flushing water mains should be used so that each of the two pipes systems can be easily identified and distinguished from the other on site.

(b) before connecting newly completed pipes to internal fresh or flushing watermains under supply, utmost care should be exercised in identifying and distinguishing each of the two pipe systems. The identification can be done by following step by step a planned operation procedure and test methods such as chemical tests. It is also important that any newly laid pipework should not be put into use before it has been inspected and approved by the Water Authority.

These good practices should also be applied to other similar types of multi-system pipeworks such as those with a private sea water cooling system.

7. Fire Service

The Director of Fire Services is responsible for approving proposals for installations of or alterations to fire services. The fire service in a building such as the choice of the fire-fighting system and its capacity must satisfy the requirements of the Fire Services Department (FSD). Only the plumbing system of the fire service is subject to the requirements of the Water Authority.

For installations which are to be connected to government mains, the method of supply and the materials used must be subject to the approval of the Water Authority and their installation should comply with the Waterworks requirements. The fire service should be designed to guard against contamination, waste and misuse.

7.1 Metering Requirement

As no charge is imposed on the consumption of water used for fire fighting and hence no chargeable meter will be installed for the fire service. However, check meter positions shall be provided for consumption check and waste detection purposes. It is also to remind that use of water from fire service for purposes other than fire fighting is prohibited.

The check meter position shall be close to the lot boundary or close to the point of connection from the internal distribution mains whichever is applicable. A fullway gate valve and a non-return valve have to be installed on the fire service as close as possible to the government water supply connection.

7.2 Pipe Materials

Pipes and fittings shall conform to Schedule 2 of the Waterworks Regulations. The Water Authority may approve other pipe materials for use in fire service from time to time.

Pipes on a fresh water fire service shall be made of cast iron, ductile iron, galvanized wrought iron, galvanized steel or copper of approved standards. Consideration can be given for the use of wrought iron pipe and black steel pipe without being galvanized, upon application, for a fresh water fire service after a positive air break (i.e. fire service tank or sump tank). Pipes and fittings on a salt water fire service shall be cast iron, ductile iron and fittings capable of withstanding the corrosive effect of salt water.

7.3 Supply Types and Arrangements

7.3.1 General

Fire service supply may be from a fresh water or salt water source and it must be from an independent connection. The fire service must be entirely independent of other water supply arrangements within the building or development concerned. A salt water installation may be "primed" with fresh water to inhibit corrosion etc. Such priming arrangements must be approved by the Water Authority prior to installation.

All pipeworks before check meter positions shall be exposed or laid in a proper service duct to facilitate inspection and repairs. Provision shall be made for checking leakage from any pipeworks laid underground. If the connection is not laid in an exposed manner at the lot boundary, then it shall be laid underground with an adequate cover. For carriageway a minimum cover of 1000mm is usually required. Watermains beneath footpaths/verges/cycle tracks should be laid with the same cover as those under carriageways.

The followings are some commonly used types of fire service systems:-

7.3.2 Sprinkler / Drencher System

Sprinkler system (Fig 16) is an automatic system which comes into operation at a predetermined temperature. It is designed to:

(i) detect a fire;
(ii) give an alarm;
(iii) attack and contain an outbreak of fire until the arrival of the Fire Services.

Drencher system is a system of pipes designed to operate either automatically or manually and provide a curtain of water over buildings which constitute a particular dangerous fire hazard e.g. tanks containing highly imflammable liquids.

A dual connection from the Government unrestricted supply ring main shall be provided for a fire service sprinkler / drencher system situated in the recognised Waterworks unrestricted industrial supply zone. Twin connections, one from an unrestricted supply main and one from a distribution main, will be provided for a fire service sprinkler / drencher system situated outside the recognised unrestricted industrial supply zone, where practicable.

Where it is not practical to connect the fire service sprinkler / drencher system to an unrestricted supply main, FSD may require the provision of fire service tank to serve as secondary source for the fire service installation. Dependent uponFSD's requirements, a single or dual connection can be given to serve the fire service tank of secondary source.

No part of any fire service sprinkler / drencher system supplied from the Government mains shall be used for supplying any other services including other fire services including other fire service installations, e.g. hose reels, except that a common suction tank can be used for both sprinkler and hose reel systems. Any exemption from this requirement should have the endorsement of the Director of Fire Services.

Where direct connections to a sprinkler / drencher system are to be from the government mains, an additional butterfly valve, without stop screw and lock nut on handle and strapped in open position, shall be installed at a point on the supply pipe before the fire service inlet and as close as possible to the control valves of the connections.

Application for improvised sprinkler systems (Fig. 17) should be first submitted to the FSD for endorsement before it is submitted to the Water Authority for processing.

7.3.3 Hydrant/Hose Reel System (Fig. 18)

This system ensures that an immediate supply of water is available to any floor of a multi-storey building. Supply must not be fed directly from the government mains and the outlet should be housed in a glass-fronted cabinet secured under lock and key. The glass panel shall be of a frangible type and shall not exceed 1.5 mm in thickness, and that it shall be of such size and design so as not to cause any undue obstruction to the free use of the hose reel. Furthermore, a metal or plastic striker shall be provided in the vicinity of the cabinet for the purpose of breaking the glass panel in case of emergency.

Common tank arrangements for fire-fighting and flushing or other purposes are not acceptable when a government supply is involved. Where a building is to be provided with a non-government flushing supply and where it is proposed to feed the fire service from that supply, the applicant is advised to install an independent fire service system if it is envisaged that the fire service system may require to be connected to the government main at a later stage.

7.3.4 Street Fire Hydrant System (Fig. 19 & Fig. 20)

A street fire hydrant system serves as the secondary water supply for firemen during fire fighting operation. The system consists of standard pedestal type street fire hydrants installed along emergency vehicular access to a building.

7.3.5 Fire Service Ring Mains

Where in large industrial complexes a fire service ring main is required this should be

connected to an unrestricted supply main, if practical. In cases where this is not practical a "dual" connection from the government ring main should be provided.

Fire service ring mains shall not be connected to or used for supplying any other service, except with the approval of the Water Authority.

7.3.6 Fire Service Installations for the New Territories Exempted Houses (NTEH)

FSD Circular letter No. 4/2006 has provided three sets of guidelines on specifications, installation and maintenance of fire service installations and equipment for the new fire safety requirements for NTEH applications. For details, please refer to the FSD's website at http://www.hkfsd.gov.hk/home/eng/source/circular/2006_04.pdf.

7.3.7 Installation of Sprinkler System for Specified Commercial Buildings (SCB) / Prescribed Commercial Premises (PCP) under the Fire Safety (Commercial Premises) Ordinance Cap. 502 and Composite Buildings under the Fire Safety (Buildings) Ordinance Cap. 572

In line with the FSD's requirement to improve the fire service system of SCB, PCP and non-domestic portion of composite building with total floor areas exceeding 230m^2, the following three options are acceptable to the FSD:

(a) addition of a new sprinkler system with water supplies in accordance with the requirements stipulated in para. 5.24 and para. 5.28 of the FSD's Code of Practice for "Minimum Fire Service Installations and Equipment (revision 1994)";
(b) addition of an improvised sprinkler system with its supply drawing from an existing FH/HR tank;
(c) addition of an improvised sprinkler system with direct connection to government mains.

For applications to install the improvised sprinkler systems stated in (b) & (c) above, the endorsement and referral from the FSD are required before any input is made by WSD's District staff to process such applications. The FSD in thus the first stop in processing such applications.

For SCB, PCP and non-domestic portion of composite building with total floor areas exceeding 230m^2, the provision of an automatic sprinkler system has been included as one of the requirements under the Fire Safety (Commercial Premises) Ordinance and Fire Safety (Buildings) Ordinance. For those existing buildings/premises without such a provision, the 3 options above are acceptable for the provision of a sprinkler system. Installation of an improvised sprinkler system is often required due to structural and spatial constraints of the

existing buildings.

8. Storage Cisterns ,Water Pumps and other Miscellaneous

8.1 Storage Cisterns (or Water Tanks)

Storage cisterns may be made of fibre glass, reinforced concrete or other materials approved by the Water Authority. Reinforced concrete is the most common material used. Prior approval by the Water Authority must be sought when fibre glass tank is to be used. Fibreglass storage cistern for potable water shall be of an approved type or certified to contain no toxic materials and suitable for storage of potable water.

A water storage cistern shall be fitted with a ball valve and a fullway gate valve at the inlet in the case of a gravity supply. In the case of a pumped supply to a single cistern, the cistern shall be fitted with an automatic control switch and without any stop valve. In the case of a pumped supply to twin cisterns, each cistern shall be fitted with an automatic control switch and a stop valve for temporary isolation purpose. The ball valve or control switch shall shut off the supply when the water level is 25 mm below the invert of the overflow pipe or the warning pipe if there exists one. The invert of the inlet pipe or the face of the outlet nose of the ball valve shall be not less than 25 mm above the top of the overflow pipe. All overflow and warning pipes of potable water storage cisterns shall be constructed of non-metallic pipe materials. The invert of an outlet pipe from a water storage cistern with capacity less than 5,000 litres shall be at least 30 mm above the bottom of the cistern; this distance shall be increased to 100 mm if the capacity is 5,000 litres or more. The outlet pipe of every water storage cistern shall be provided with fullway gate valve. Provision shall be made for a drain-off pipe to enable the cistern to be emptied. The drain-off pipe shall be properly plugged or adequate means shall be provided to prevent any unauthorized operation of the control valve at drain-off pipe.

An overflow pipe shall be provided which shall discharge overflow water to a conspicuous position in a communal area easily visible and accessible by the occupants. The overflow pipe shall be at least one commercial size larger than the inlet pipe and shall in no case be less than 25 mm in diameter. No part of the overflow pipe shall be submerged inside the storage cistern. A grating and a self-closing non-return flap shall be provided at the overflow pipe outside the storage cistern. A warning pipe may be installed in addition to an overflow pipe. Except that a warning pipe can be of any size not less than 25 mm in diameter, it shall comply with all other requirements of an overflow pipe. The warning pipe shall be installed at a level below the overflow pipe and shall be extended to outside of the building periphery for roof cistern or outside the pump room for sump cistern.

Double sealed covers with locking devices so constructed as to prevent the ingress of surface water shall be provided for all storage cisterns other than cisterns for flushing and

fire-fighting purposes. Storage cisterns shall be so positioned that they are free from obstruction and readily accessible via safe access for cleansing and to facilitate repairs. It shall be located so as to minimise the risk of contamination of the stored water.

When the storage cistern for potable water is to be placed adjoining to a storage cistern for non-potable water, a physical break shall be provided between the two cisterns, i.e. walls and slabs of the two cisterns must be separated while tie beams linking the cisterns for structural requirements are acceptable. The tie beams shall be constructed in such a manner that cross contamination of two cisterns via the tie beams is not possible.

All outlet pipes from the storage cistern should, whenever possible, be positioned at the opposite side to the inlet supply pipe to prevent stagnation of water.

Structural design of the cistern and its supports should be subject to the requirements of the Building Authority.

8.1.1 Cleaning of Storage Cisterns

Potable water storage cisterns should be cleaned regularly at least once every three months, or more frequently if necessary, in order to prevent the accumulation of dirt and rust which may lead to discoloured water and chokage of water meter. To facilitate cleaning of water storage cisterns, all internal surface of floors, walls (to full height) and soffits (except the cistern openings) of potable water storage cisterns should be lined with a white non-toxic smooth finish such as ceramic tiles. A notice plate/board should be provided to record the dates of cleaning of the water cisterns. The notice plate/board together with the cleaning dates records should be securely fixed at a conspicuous location easily accessible and visible by the residents and the building management staff.

The following steps outline the general procedures for cleaning of the potable water storage cisterns in buildings:

<u>Preparation Stage</u>

i) the management office shall notify the affected occupants the date and time of cleaning, duration of supply interruption and expected supply resumption time at conspicuous location easily visible by the occupants.

<u>Cleaning Stage</u>

i) close the outlet valve of the cistern.
ii) empty the cistern through the washout pipe.
iii) thoroughly scrub and clean the cistern with fresh water.
iv) drain away the water.

v) scrub out the cistern thoroughly with a solution of chloride of lime or bleaching power containing not less than 50 parts of chlorine in one million parts of water.
vi) rinse the cistern thoroughly with fresh water.
vii) refill the cistern with fresh water.
viii) the cistern is ready for use after the outlet valve is open.

8.1.2 Size of Storage Cisterns

The storage capacities of water tanks must be approved by the Water Authority. The proportion of capacity of sump tank to roof tank shall be in the order of 1:3 or as advised by the Water Authority.
In general the storage capacities are recommended as follows:-
(i) Flushing Supply

Salt Water	minimum 1/2 day consumption
TMF	45 litres per flushing apparatus, minimum 250 litres

(ii) Domestic Water Supply
Sump and pump system

Up to 10 flats	135 litres/flat Total storage including sump tank
> 10 flats	90 litres for each additional flat

(iii) Trade/Commercial Water Supply

For industrial buildings, the entire internal service shall be supplied from storage tanks with separated outlets/downpipes feeding independent systems to serve separately the industrial and processing purposes and the other general and ablution appliances. These independent systems shall not be interconnected. The recommended capacity of storage tanks for industrial use is one-day demand.

For office buildings, theatres and other places of entertainment the provision of storage tanks will not be obligatory, and if storage is to be provided, this shall not exceed the capacity determined by the Water Authority.

8.2 Water Pumps

Where a sump-and-pump system is used, it shall be provided with a duplicate pumpset. The pumping capacity of the pumps shall not be less than the designed out-flow rate of the

storage tank being supplied.

All pipework connections to and from pumps should be adequately supported and anchored against thrust to avoid stress on pump casings and to ensure proper alignment. Consideration should be given to minimise noise nuisance to adjacent consumers when choosing a pump system.

8.3 Valves and Taps

Valve materials should conform to Part II of Schedule 2 of the Waterworks Regulations. Individual stop valves shall be provided at all draw-off points or at a series of draw-off points if situated close together.

8.3.1 Use of Pressure Reducing Valves (Fig. 21)

No part in the internal pipeworks shall be subject to excessive high pressure. In case of excessive high pressure, the provision of break pressure tanks at a suitable level of the internal supply system would be a positive and reliable means to reduce the water pressure. Alternately, pressure reducing valves may be provided in lieu of break pressure tank. Application for the installation of pressure reducing valve should be submitted to the Water Authority for approval on the basis of the merits of each individual case.

Whenever a pressure reducing valve is installed, a bypass arrangement shall be incorporated with the provision of a second pressure reducing valve, except for fire service installations, to enable isolation of any defective pressure reducing valve for repair and replacement when necessary. A pressure indicator shall be provided for pressure monitoring and the associated pipes and fittings shall be able to withstand the maximum pressure that may arise upon the failure of the pressure reducing valve.

8.3.2 Tee-branch Valve

A tee-branch valve refers to an isolation valve at a branch pipe and which is located close to the main pipe. To facilitate maintenance and repair, tee-branch valves shall be provided:

(i) for all underground water pipes.
(ii) if the main pipe is a communal inside service.
(iii) in a flushing system if the main pipe serves more than one domestic unit or commercial floor.

8.3.3 Hot Water Mixing Valves

Installation of hot water mixing valves may be approved provided that both the cold and hot

water are drawn from the same source, i.e. both hot and cold water supplied from a common storage cistern, or under direct mains pressure.

8.3.4 Taps

When infra-red sensor operated automatic taps are used as inside services, a stop cock or gate valve must be installed at the upstream of each fitting for manual isolation of water supply.

Self-closing taps, of non-concussive type and of approved pattern, shall be used for the public or communal lavatory basins except for those in private clubs in which the use of screw-down tap is permissible.

8.4 Earthing

The metal work of an inside service shall not be used as an earth electrode. The use of non-metallic pipes or fittings should not have had any effect on the earthing arrangement of the building. However, for some old buildings metallic water pipes might have been used to form part of the earthing arrangement. Under such circumstances, whenever an electrical insulation is to be introduced in the inside service, the applicant or his/her licensed plumber is advised to consult the registered electrician to confirm that the earthing arrangement in the premises/building is acceptable. If the earthing arrangement becomes substandard, then actions should be taken to comply with the Electricity (Wiring) Regulations.

8.5 Separate Metering in Existing Premises

The inside service shall be constructed from each flat to the existing common meter positions. The existing sump-and-pump system, if any, shall be provided with a standby pumpset unless this proves to be impracticable.

In an occupied building, a temporary by-pass arrangement as close to the delivery side of the meter as possible shall be provided to maintain water supply to various units of accommodation when plumbing work is being carried out on separate meter conversion. The temporary arrangement shall be such that the consumption is still measured by the bulk meter. This by-pass arrangement must be removed immediately after the new separate meters are fixed. The bulk meter shall also be removed if no longer required.

8.6 Authorizing Private Developers/Authorized Persons to Undertake Water Supply Connection Works

Developers and Authorized Persons are encouraged to employ approved contractors to carry out all or any of the following works:-

(a) connection to the public drainage;
(b) provision of water supply connection;
(c) construction of run-in and repair of damaged footpaths.

This will improve developer's control of their development programmes. As reflected from a survey with Authorized Persons, the issue of Occupation Permits under this arrangement could be advanced by up to three months.

The unified form HBP1 "Application for Technical Audit of Run-in or Damaged Footways/Drainage/Water Supply Connection Works Carried Out by a Member of the Public" and the Practitioner's Guidelines on the scheme can be downloaded from the website http://www.devb-wb.gov.hk/.

9. Maintenance

The common problems in the internal water supply systems are water quality complaints, weak supply pressure and seepage / leakage of water. The main causes of these problems are usually due to corroded pipes and/or uncleaned storage cisterns, choked pipes and/or unauthorized alternation of inside service, and leaking pipe or pipe burst respectively. In this respect, the management office or the agent is recommended to :-

(i) thoroughly clean every fresh water storage cistern and scrub with a solution of chloride of lime or bleaching powder at least once every three months;

(ii) to conduct regular checks to the plumbing system to ensure that it conforms to the approved conditions;

(iii) to rectify any corroded pipes and irregularities immediately.

No system can be guaranteed forever but its service life can be greatly improved by proper maintenance and identifying initial signs of defects before they have a chance of further propagation.

Regular maintenance of the internal water supply system will not only help ensure that the plumbing system performs as it is intended but also minimize the cost of repair work required to rectify the damage to the plumbing system. A typical maintenance schedule is shown below for reference:-

Component	Action
Meters	Take meter reading and check water consumption for early signs of leakage Check the meter in correct working order
meter and valve chamber rooms	Ensure ease of opening to access doors/covers Clean out as necessary
Pipework	Check supports and inspect for loose-fittings Check for soundness of pipework Inspect for signs of corrosion and leakage Disconnect any unused pipes and fittings connected to the service installations
Pumps	Check operation of pumps in order and ensure noise levels to be minimal

Pressure reducing valves	Check the pressure at the upstream and downstream of valve within acceptable limits
Storage cisterns	Clean the potable water storage cisterns under a proper cleaning procedure once every three months, or more frequently if necessary ensure no cross connection between water storage tanks of different natures look for signs of leakage or overflow check for stagnant water, e.g. dust on surface of water check conditions of cistern supports confirm operation of overflow and warning pipes ensure the cover is of double sealed type, under lock and effective in preventing ingress of water

Appendix A1: Checklist for Vetting Plumbing Proposals

Points to Consider	Criteria
A <u>Potable & Flushing Supplies</u>	
A1 Government Supply Mains :	
(i) available water pressure	- Pressure being adequate with regard to the elevation of the premises.
(ii) capacity of supply system	- Capacity of the system being adequate.
(iii) location	- Suitable Government supply main nearest to the premises.
(iv) size	- Adequate to supply the premises.
A2 Connection Pipe :	
(i) location	- Nearest to the suitable Government supply main.
(ii) size	- Adequate to supply all proposed plumbing installations. - Minimum size of 40 mm dia. for flushing supply. - (HKWSR 8.8 & 8.15)
(iii) alignment	- All pipework before meter positions shall be exposed or laid in a proper service duct. (HKWSR 1.2, 7.3 & 8.8)
A3 Water Meter/Check Meter Position :	
(i) location	- The siting of a meter shall be determined by the Water Authority. - Meters shall be arranged in groups and sited at convenient locations in communal area and housed in meter rooms/boxes. - Meters on indirect supply systems shall be sited at roof level or at other convenient locations and housed in meter rooms/boxes. - Check meter positions will be required at the connections to the common inside service and to the sump tank. - Salt water supply will not be metered, but a meter position shall be provided. - Proper drainage, lighting and flood prevention facilities should be provided at the meter room. (WWReg 27, HKWSR 1.4, 1.5, 1.11, 1.12, 1.16, 7.7, 7.10, 8.9 & 8.16)

Points to Consider	Criteria
(ii) size	- Size of water meter should be adequate to meet the estimated consumption.
(iii) no. required	- All domestic units shall be separately metered. (HKWSR 1.1)
(iv) type of metered supply	- Water supplies are classified into domestic, construction, shipping and trade purposes. - (WWReg 2)
(v) arrangement	- A standard meter position should be provided with bushes or reducers at both sides of the meter position and with a distance piece of hollow tube with conspicuous holes drilled through the body placed in between. A longscrew (connector) shall be provided immediately after the bush or reducer at the delivery side. - Meters shall be arranged in groups and sited at convenient locations in communal area and housed in meter rooms/boxes. (HKWSR 1.3, 1.4, 1.5, 1.12, & 7.7)
(vi) fittings	- PVC-U fittings shall be used at meter position if PVC-U materials are used as inside service. - Brass fittings shall be used at meter position if copper, lined galvanized steel or thermal plastic materials are used inside service. (HKWSR 10.3)
A4 Water Storage Cisterns :	
(i) location	- Every cistern shall be located so as to minimize the risk of contamination of the stored water. (WWReg Sch 2 Pt III Para 4 & 9, HKWSR 4.6, 4.7 & 4.10)
(ii) storage capacity	- For domestic buildings, the total volume of the roof storage tank and sump tank shall be on the basis of 135 litres for each of the first 10 flats and 90 litres thereafter for each additional flat. The proportion of capacity of sump tank to

Points to Consider	Criteria
	roof tank shall be in the order of 1:3 or as advised by the Water Authority. - For industrial use, the permissible capacity of storage tank is one day demand. - For temporary mains fresh water flushing, the capacity of the water storage tank shall be limited to 45 litres per flushing apparatus with a minimum of 250 litres. - For salt water flushing supply, there is no limit to the storage capacity but a storage of no less than half a day's consumption is recommended. (HKWSR 1.17, 3.12, 7.1, 8.13 & 8.18)
(iii) material	- Every cistern shall be constructed of concrete, galvanized steel or other approved material. - Fibeglass storage cisterns for potable water shall be of an approved type. - All flushing water tanks must be of salt water resistant materials. (WWReg Sch 2 Pt III Para 2 & 3, HKWSR 4.11 & 8.19)
(iv) associated fittings	- Cisterns shall be fitted with a ball valve controlled inlet in the case of a gravity supply or with an automatic control switch in the case of a pumped supply. - An overflow pipe of one commercial size larger than the inlet pipe, and in no case less than 25 mm diameter, shall be fitted to each cistern and shall be extended to terminate in a conspicuous position in a communal area easily visible and accessible by the occupants. - A stop valve shall be provided on the outlet of every cistern and provision shall be made for a drain off pipe to enable the cistern to be emptied. - Safe access shall be provided to all cisterns by means of a secure permanent ladder or readily available portable ladder. - A grating and a self-closing non-return flap shall be provided at the overflow pipe outside the storage cistern. - Double sealed covers with locking devices shall be provided for all storage

Points to Consider	Criteria
	cisterns other than cisterns for flushing and fire-fighting purposes. (WWReg Sch 2 Pt III Para. 5, 6, 7 & 10, HKWSR 4.1, 4.2, 4.3, 4.4, 4.5, 4.6 & 4.8)
A5 Water Pumps :	
(i) pumping capacity	- Not less than the designed outflow rate of the storage cistern being supplied.
(ii) provision of standby pump	- A standby pumpset shall be provided. (HKWSR 3.3)
A6 Pipings :	
(i) material	- Pipes on a fresh water inside service shall be made of cast iron, ductile iron, PVC-U, polybutylene, steel or copper or any approved material. - Pipes on a salt water inside service shall be made of cast iron, PVC-U, vitreous earthenware, gunmetal, or any other approved materials. (WWReg Sch 2 Pt I Para 1(3), 1(4), 5, 9, 12, 13 & 16, HKWSR 1.8, 2.8, 3.10, 7.14, 8.19 & 10.2)
(ii) size	- Depends on the no. and types of fittings served. - No pipe shall be less than 20 mm diameter, except that a branch pipe may be 15 mm diameter if the pipe run is short and the pipe supplies only one draw-off point. (WWReg Sch 2 Pt I Para 2)
(iii) routing/alignment	- All pipework before meter positions shall be exposed or laid in proper service duct. (HKWSR 1.2, 2.2, 3.1, 7.3 & 8.8) - The pipings which solely serve a particular flat/unit should not run through other flats/units as far as practicable.
A7 Control Valves :	
(i) size	- Depends on the size of the pipings.
(ii) type	- A loose jumper type stopcock shall be provided and placed with spindle in the vertical position before the meter

Points to Consider	Criteria
	position. - Fullway gate valves shall be fitted before meter positions when the meters are sited at roof level. - Cisterns shall be fitted with a ball valve and a fullway gate valve at the inlet in the case of a gravity supply or with an automatic control switch and without any stop valve in the case of a pumped supply. Fullway gate valve should be provided on the outlets of every cistern. - Spring taps, of non-concussive type and of approved pattern, shall be used for public or communal lavatory basins. - For connections larger than 40 mm diameter, a gate valve shall be provided before the meter position and a non-return or check valve fitted on the delivery side as close as possible to the meter. (HKWSR 1.10, 1.14, 1.15, 2.4, 3.4, 4.1, 4.2, 7.5, 7.8, 7.9, 7.11, 8.11, 8.12 & 8.17)
(iii) location	- Individual stop valves shall be provided at all draw-off points or at a series of draw-off points if situated close together. (HKWSR 1.7 & 7.13) - Boundary valves shall be provided at the connection points as close to the lot boundary as possible. (HKWSR 1.11, 1.16, 3.7, 7.10, 8.16 & 9.5) - A tee-branch valve refers to an isolation valve at a branch pipe and which is located close to the main pipe. To facilitate maintenance and repair, tee-branch valves shall be provided : ● for all underground water pipes; ● if the main pipe is a communal inside service; ● in a flushing system if the main pipe serves more than one domestic unit or commercial floor. (HKWSR 1.9, 2.10, 3.13, 5.13, 6.15, 7.16 & 8.7)
A8 Hot Water System : (i) type of water heater	- The following types of water heaters may, with the written permission of the

Points to Consider	Criteria
	Water Authority, be connected direct to a main : ● non-pressure type water heaters where no restriction of flow can be effected beyond the inlet control valve; ● cistern type water heaters; ● instantaneous water heaters where the guaranteed test pressure of the water heater is at least 1½ times the static head available at the water heater; ● electric water heaters of the thermal storage type; ● having a guaranteed test pressure at least 1½ times the static head available at the water heater; and ● not being provided with an individual expansion pipe but complying with WWReg Sch 2 Pt IV Para 11 (WWReg Sch 2 Pt IV Para 1(2)(a)(b)(c) & (d))
(ii) compliance with WWReg/ HKWSR	- Should refer to WWReg Sch 2 Pt IV & HKWSR Chapter 5 & 6 for details.
A9 Cooling/Air-Conditioning System :	
(i) purpose	- Approvals for the use of mains water (fresh or salt) may be given to meet the following requirements : ● closed circuit cooling systems for any purpose where operational losses are negligible and no water is rejected to waste; ● cooling systems involving no loss through evaporation and where all the water is re-used after cooling for an industrial process; ● evaporative cooling systems essential to an industrial process, whether this be for cooling or for air-conditioning purposes and provided that system losses arise from evaporation only; ● evaporative cooling/air conditioning/humidification system for essential purposes other than industrial processes provided that system losses arise from evaporation

Points to Consider	Criteria
	only; ● humidification essential to an industrial process.
(ii) type	- use of mains water for cooling/air-conditioning and humidification purposes within the first 2 categories above. - use of mains water for cooling/air-conditioning and humidification purposes within the last 3 categories above; the applicant must demonstrate that the type of evaporate plant proposed is of an enclosed design from which wastage of water by splashing is prevented.
(iii) estimated consumption	- Demand can be met by the Distribution Supply System.
(iv) any alternative private source	- The applicant must prove that the demand cannot be effectively met by alternative means (e.g. air cooling, private source or a sea water supply is impractical)
A10 Typical Schematic Plumbing Diagram for food business (restaurant)/kitchen	- kitchen equipment connected to the potable supply are divided into the following categories:
(i) provision of off-tank	Cat 1 – direct supply by tapping over without connecting to water pipe (except water heater)
(ii) kitchen equipment to be submitted for approval	Cat 2(a) – off-tank supply with submerged inlet and for drinking purpose. Cat 2(b) – off-tank supply with submerged inlet but NOT for drinking purpose Cat 3 – off-tank supply to hydro-vent system
	- Separate water tanks are used for different categories of kitchen equipment to avoid backward and cross contamination of water

Points to Consider	Criteria
	- refer to the typical schematic plumbing diagram at Fig. 36 for further details and kitchen equipment required to be submitted to WSD for approval
B <u>Fire Service Supply</u>	
B1 Government Supply Mains :	
(i) available water pressure	- Pressure being adequate with regard to the elevation of the premises.
(ii) location	- Suitable Government supply main nearest to the premises.
(iii) size	- Not less than the size of the connection required.
(iv) unrestricted/restricted supply	- information may be given to the applicant upon request.
(v) single end/double ends feed	- information may be given to the applicant upon request.
B2 Connection Pipes :	
(i) location	- Nearest to the suitable Government supply main.
(ii) size	- Size required by applicant not greater than that of the available Government supply main.
(iii) alignment	- The fire service connection should be located close to the lot boundary or close to the point of connection from internal distribution main whichever is applicable. All pipe work before the check meter position shall be exposed or laid in a proper service duct. (HKWSR 9.5)
B3 Check Meter Position :	
(i) location	- A check meter position should be located so as to free from flood and obstruction and should be located close to the lot boundary and connection to Waterworks main or close to the point of connection from internal distribution main whichever is applicable. (HKWSR 9.5)
(ii) size	- Depends on size of piping.

Points to Consider	Criteria
B4 Water Storage Cisterns :	
(i) location	- Storage cisterns shall be so positioned that they are free from obstruction and readily accessible via safe access. (WWReg Sch 2 Pt III Para 4(a) & 9, HKWSR 4.6)
(ii) material	- Every cistern shall be constructed of concrete, galvanized steel or other approved material. (WWReg Sch 2 Pt III Para 2 & 3)
(iii) associated fittings	- Cisterns shall be fitted with a ball valve controlled inlet in case of a gravity supply or with an automatic control switch in the case of a pumped supply. - An overflow pipe of one commercial size larger than the inlet pipe, and in no case less than 25 mm diameter, shall be fitted to each cistern and shall be extended to terminate in a conspicuous position in a communal area easily visible and accessible by the occupants. A grating and a self-closing non-return flap shall be provided at the overflow pipe outside the storage cistern. - A stop valve shall be provided on the outlet of every cistern and provision shall be made for a drain-pipe to enable the cistern to be emptied. - Safe access shall be provided to all cisterns by means of a secure permanent ladder or readily available portable ladder. (WWReg Sch 2 Pt III Para 5, 6, 7 & 10, HKWSR 4.1, 4.2, 4.3, 4.4, 4.5, 4.6 & 4.8)
(i) materials	- Piping on a fresh water fire service shall be made of cast iron, wrought iron, steel, copper, ductile iron. - Cast iron, ductile iron and fittings capable of withstanding the corrosive effect of salt water must be used in a salt water fire service. (WWReg Sch 2 Pt I Para 1(1), HKWSR 9.3 & 9.4)
(ii) routing/alignment	- An independent connection shall be provided from the Government water

Points to Consider	Criteria
	main for the fire service installation. - All pipe work before the check meter position shall be exposed or laid in a proper service duct to facilitate inspection and/or repairs. (HKWSR 9.5)
B6 Control Valves : (i) type	- Cisterns shall be fitted with a ball valve and a fullway gate valve at the inlet in the case of a gravity supply or with an automatic control switch and without any stop valve in the case of a pumped supply. - Fullway gate valves shall be provided on all the outlets of every cistern and provision shall be made for a drain-off pipe to enable the cistern to be emptied. - A fullway gate valve and a non-return valve have to be installed on the fire service as close to the Government water supply connection as possible. - Where direct connections to sprinkler/drencher system are to be from Government mains, an additional butterfly valve, shall be installed at a point on the supply pipe before the fire service inlet and as close as possible to the control valves of the connections. (HKWSR 4.1, 4.2, 9.6 & 9.10)
(ii) size	- Depends on size of piping.
(iii) location	- As close to the Government water supply connection as possible. When direct connections to sprinkler/drencher system are to be from Government mains, an additional butterfly valve, shall be installed at a point on the supply pipe before the fire service inlet and as close as possible to the control valves of the connections. - Tee-branch valves shall be provided for all underground water pipes. (HKWSR 9.6, 9.7 & 9.10)
B7 Compliance	

Points to Consider	Criteria
(i) arrangement	- Independent of other water supply arrangements. A salt water installation may be primed with fresh water. - Fire service ring mains. (HKWSR 9.1, 9.2, 9.11, 9.12, 9.15 & 9.16)
(ii) type	- Sprinkler/Drencher System. - Hydrant/hose Reel System. (HKWSR 9.8 - 9.14)

Appendix A2: Common Mistakes by Practitioners

Plumbing systems shall be designed, constructed, operated and maintained to prevent contamination, wastage and misuse of mains water. Plumbing arrangement shall be so designed as to minimize concealed piping as far as possible, and all pipes and fittings shall be properly supported.

The followings are some common mistakes found in the plumbing submissions.

A) Common Mistakes for Meter/Check Meter Positions (Fig 22)		
		WSD Requirement
①	The check meter positions are not located close to the lot boundary and connection to the Government mains.	HKWSR 1.11 & 1.16
②	Size of potable and flushing supply connections is not indicated.	
③	A loose jumper type valve in lieu of a fullway gate valve is fixed at the inlet side of the salt water flushing supply check meter position. A non-return valve has not been fitted on the delivery side as close as possible to the check meter position.	HKWSR 8.17
④	Detailed drawing with dimensions showing the arrangement of meter position in meter box/cabinet and the fitting at the meter position is not given, e.g. a clear side distance from the centre of meter position on the delivery side to the internal wall of the meter cabinet/room should be indicated and the vertical distance space between each meter position should be indicated.	
⑤	The meters are housed in a multi-function room used for other purpose, e.g. fire service.	HKWSR 1.4
⑥	No proper floor drain is provided in the meter room.	HKWSR 1.4
⑦	The meter positions in the meter room are arranged in groups with front-row and back-row making meter reading and maintenance difficult.	
⑧	Meter sizes are not indicated. The premises that the meters are serving to are not specified.	
B) Common Mistakes for Inside Service (Fig 23)		
①	Types of water heaters to be used are not indicated. Catalogues of water heaters are not submitted.	

②	Sizes of supply pipes are not specified.	
③	Stop valve is not provided to the supply pipe serving the series of draw-off points.	HKWSR 1.7
④	The hot-water draw-off point is not at the left hand side according to the conventional practice.	
⑤	A receptacle, e.g. a sink is not indicated at the draw-off point.	
C) Common Mistakes for Sump and Pump System (Fig 24)		
①	Details of the storage tank, e.g. storage capacity, materials of the tank and the silencer pipe in the storage tank are not specified.	
②	A fullway gate valve is not provided on the drain-off pipe.	HKWSR 4.2
③	Details of overflow pipe, e.g. size, alignment are not indicated.	HKWSR 4.3
④	The overflow pipe was submerged inside the storage cistern and sited above the inlet.	HKWSR 4.3
⑤	Fullway gate valves have not been provided to the outlet of the storage cistern. The outlet was not positioned at the opposite side to the inlet supply pipe. Size of outlet pipe was not shown.	HKWSR 4.2 & 4.8
⑥	Pump rate and head are not specified.	
⑦	Cistern is not fitted with a ball valve and a fullway gate valve at the inlet in the case of a gravity supply or with an automatic control switch and without any stop valve in the case of a pumped supply. Size of inlet pipe was not shown.	HKWSR 4.1
D) Common Mistakes for Watering Flower Beds Plumbing System (Fig 25)		
①	Detailed dimensions showing the arrangement of the water meter in a meter box and the fittings at the meter position are not shown.	
②	No check meter position is provided. The check meter position is not located close to the lot boundary and connection to the Government mains.	HKWSR 1.11
③	Tee-branch valves are not provided at the branch pipe serving a series of supply points.	HKWSR 1.9
④	A stop valve is not installed on each vertical supply standpipe.	HKWSR 1.7

⑤	The total aggregate planting area and the estimated daily consumption are not given. The flower beds are not highlighted on the layout plan for easy identification.	
⑥	The orientation of the site is not indicated.	
⑦	Meter position is not indicated on the layout plan.	
⑧	Sizes of supply pipes is not specified.	
⑨	The layout plan is not drawn to scale.	
E) Common Mistakes for Fire Service (Fig 26)		
①	A fullway gate valve and a non-return valve are not installed on the fire service close to the government water supply connection.	HKWSR 9.6
②	Size of check meter is not indicated. Detailed drawing showing the arrangement of check meter position is not given.	
③	No additional butterfly valve is provided for the direct fed sprinkler system.	HKWSR 9.10
④	The check meter is housed inside a pump room, not in a designated meter room.	
⑤	The overflow pipe is not discharged to a conspicuous position outside the pump room.	HKWSR 4.3
⑥	A tee-branch valve is not provided to the underground water pipes to facilitate maintenance and repair.	HKWSR 1.9
⑦	Individual stop valve is not provided for the street fire hydrant.	
⑧	No typical installation details for the street fire hydrant is given.	
⑨	No fullway gate valve is provided to the supply pipe of each hose reel.	
⑩	The fire hose reel outlets is not housed in glass-fronted cabinets secured under lock and key.	HKWSR 9.14

Appendix A3: Test Parameters and Acceptance Criteria

The test parameters shall include but not limited to the following:-

Test parameter	Acceptance Criteria
Turbidity (NTU)	≤ 3.0
Colour (HU)	≤ 5
pH at 25^{o}C	6.5-9.2
Free residual Chlorine (mg/L)	＞0 and ≤ 1.5
Conductivity at 25^{o}C (μS/cm)	≤ 300
Total coliforms (cfu/100mL)	0
E.coli (cfu/100mL)	0
Heterotrophic Plate Count (cfu/mL)	≤ 20

Additional parameters may be tested if there is any sign of suspected contamination.

Appendix 8

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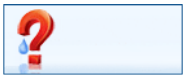

Home > Plumbing and Engineering > Fittings to be Installed or Used in Inside Service or Fire Service > Guideline on Application for Approval of Water Supply Pipes and Fittings

Guideline on Application for Approval of Water Supply Pipes and Fittings

Water supply pipes and fittings accepted by this Authority for installation in inside services should be under one of the following categories:

a. Water supply pipes and fittings marked in accordance with the appropriate British Standard and bearing the registered certification trade mark of the British Standard Institution (the B.S. Kitemark).
b. Water supply pipes and fittings accepted and certified by the Water Regulations Advisory Scheme of U.K. for compliance with the requirements of The Water Supply (Water Fittings) Regulations/Scottish Water Byelaws in UK.
c. Water supply pipes and fittings approved by this Authority as suitable for use locally in conformity with the Waterworks Ordinance and Regulations.

Pipes and fittings to be installed in the water supply plumbing system must be one of the above categories in respect of their types and origin as approved by this Authority and conform to Waterworks requirements.

To obtain approval on your pipes and fittings from this Authority, you are required to produce one set of certification from the British Standard Institution, the U.K. Water Regulations Advisory Scheme or testing agents approved by this Authority to the effect that the pipes and fittings comply with the requirements of the Waterworks Regulations.

Under Category (b) and (c) of compliance of water supply fittings, this Authority issues acceptance letters for the terminal fittings (e.g. draw-off taps, stop valves, gate valves, ball valves, mixing valves and combination fittings). The approved testing agents for testing Category(c) fittings are listed in Annex.

Any one of the approved testing agents can give you advice on the testing requirements as soon as they have details of your pipes and fittings.

When you submit your application, you are required to send us a test report (original or certified true copy) together with two identical copies of the catalogue/fact sheet Note 1 of the pipes and fittings under a covering letter signed by the applicant or stamped with the company chop. No application form and no application fee are required.

Please send the application submission in hard copy by post to "Technical Support Unit, Water Supplies Department" at the following address: Room 4705, 47/F, Immigration Tower, 7 Gloucester Road, Wan Chai, Hong Kong. Please also mark "Application for Approval of Terminal Fittings" on the envelope.

Apart from terminal fitting, no general acceptance letter will be issued to pipes and fittings from this office on a pre-installation basis.

Annex

List of Approved Testing Agencies

	Approved Testing Agency	Telephone	Fax	Up to Note 2
(1)	**Castco Testing Centre Ltd.** 29A, On Chuen Street, Fanling, N.T., Hong Kong.	Tel: 2677 2138	Fax: 2677 0351	30 June 2017
(2)	**ETS-Testconsult Ltd.** 8/F, Block B, Veristrong Industrial Centre, 34-36 Au Pui Wan Street, Fo Tan, Shatin, N.T., Hong Kong.	Tel: 2695 8318	Fax: 2695 3944	30 June 2017

(3)	**Fugro Technical Services Ltd** Fugro Development Centre, 5 Lok Yi Street, 17 M.S. Castle Peak Road, Tai Lam, Tuen Mun, N.T., Hong Kong.	Tel: 2450 8233	Fax: 2450 6138	30 June 2017
(4)	**Nutek Systems, Ltd.** Unit B, 13/F., Universal Industrial Centre, 23-25 Shan Mei Street, Fo Tan, Shatin, N.T., Hong Kong.	Tel: 2605 5736	Fax: 2692 0798	30 June 2017

Note

1. Catalogue/fact sheets shall explicitly provide the following information, preferable with the paper size not larger than A4 - name of the manufacturer, full address of the factory, brand and model reference, a description of fitting, size of the fitting inlet as well as body markings on the product. Images and sectional drawings of the fitting, body marking for identification and diagrams with dimensions indicated clearly for visualization are also required.
2. Subject to the organisation holds a valid accreditation issued by the Hong Kong Laboratory Accreditation Scheme (HOKLAS) in the mean time.

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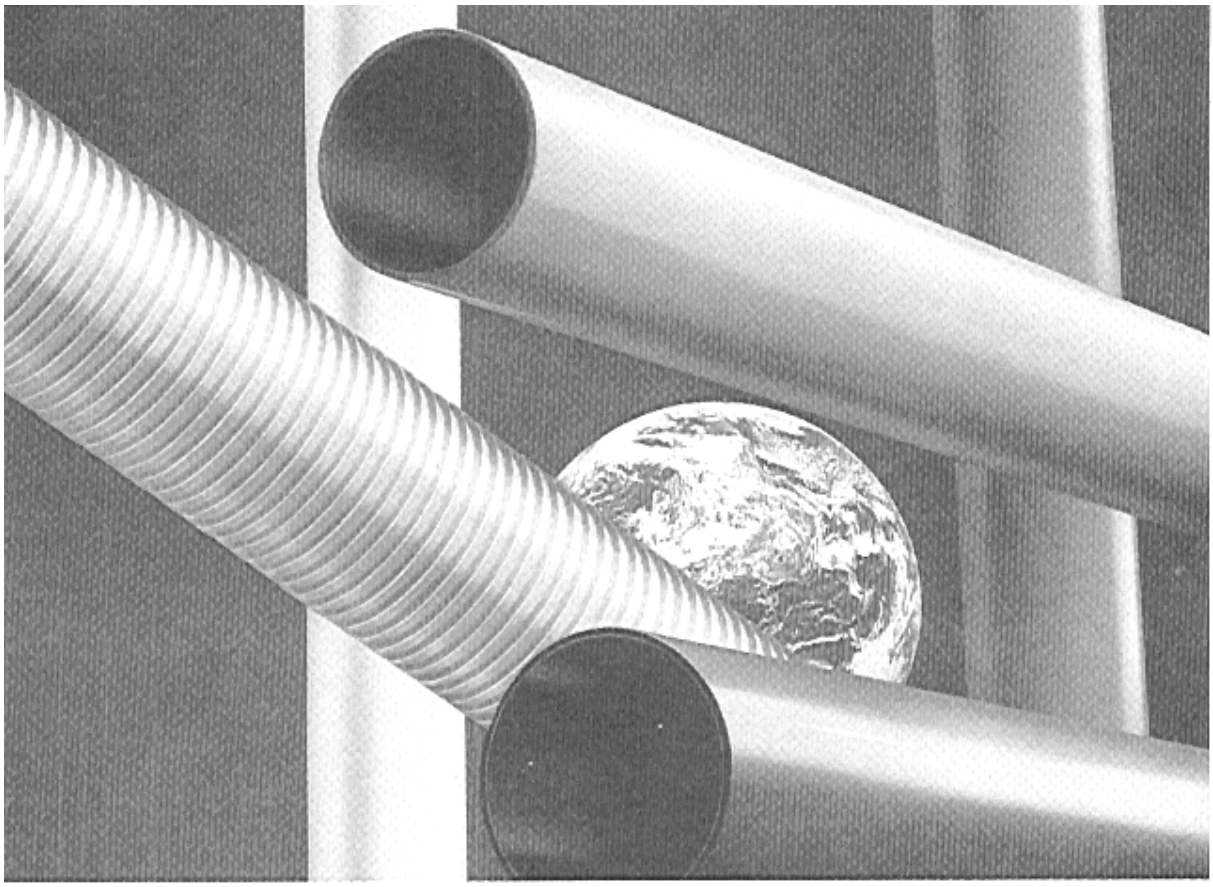
Last revision date: 15 Jan 2015

General Information

on the Use of Different Types of Corrosion Resistant Pipe Materials as Inside Service in Buildings



Water Supplies Department
June 2000

Preface

These notes are meant to provide consumers with some general information on the corrosion resistant type of pipe materials approved by the Water Authority but are not intended to serve as a design guide or a technical pipe laying manual. It is therefore advisable for the consumers to consult the suppliers on the properties and characteristics of the pipe material should they wish to use any particular type of pipe materials.

The Office of the Water Authority wishes to thank the following organisations who have kindly agreed to join a Working Party in preparing the notes for their efforts and valuable contributions:

Hong Kong Plumbing & Sanitary Ware Trade Association

Hong Kong Licensed Plumbers Association

The Institute of Plumbing - Hong Kong Council

Hong Kong Plumbing General Union

The Office of the Water Authority also wishes to thank the Hong Kong Institute of Architects and the Hong Kong Institution of Engineers who have offered their comments on the notes.

Contents

I. INTRODUCTION

Discolouration of drinking water, which by no means a new problem, is basically due to corrosion of the internal surface of the galvanized steel pipes (G.I. Pipes) commonly used as the "**inside service**" for fresh water supply in the consumers' premises, resulting in excessive amount of fine iron particles remaining in suspension in the water. This problem is particularly acute when the water has been standing idle in the pipes for some time, or when it is first drawn out from the tap in the morning. Under normal circumstances, the water should become clear after the tap has been turned on for a while.

By the enactment of the Waterworks (Amendment) Regulation 1994 made on 23 December 1994, the use of galvanized steel pipes which are without proper internal lining as fresh water inside service in all new buildings and upon renewal of the plumbing system in all existing building are prohibited after 23 December 1995.

Apart from the internally-lined galvanized steel pipes, there are alternative pipe materials permitted for use as fresh water inside services and are currently available in Hong Kong. This booklet is to provide some general information on these alternative pipe materials.

II. TYPES OF PIPE MATERIALS

Pipe materials for small diameter pipes of sizes below 100 mm suitable for use as inside service can be grouped as metallic, thermoplastics or a combination of the two.

They include:

Metallic

- Copper
- Stainless steel

Thermoplastics

- PVC-U
- PVC-C
- Polyethylene (PE)
- Medium Density Polyethylene (MDPE)
- High Density Polyethylene (HDPE)
- Crosslinked Polyethylene (PEX)
- Polybutylene (PB)
- Acrylonitrile Butadiene Styrene (ABS)

Composite

- Lined galvanized steel
- Crosslinked Polyethylene/Aluminium/Crosslinked Polyethylene Composite Pressure Pipe (PEX-AL-PEX)
- High Density Polyethylene/Aluminium/High Density Polyethylene Composite Pressure Pipe (HDPE-AL-HDPE)

Copper

Copper pipes complying with **BS EN 1057** are for use in both **hot and cold** water supply. Copper pipes have high pressure rating, good durability and good resistance to corrosion attack in most soil. The smooth surface of copper pipes gives low resistance to water flow. Compression joints and capillary joints are the principal methods for jointing copper tubes and fittings.

Stainless Steel

Stainless steel pipes complying with **BS 4127** are suitable for **hot and cold** water supply. The pipes are jointed by capillary or compression fittings. Stainless steel pipes have high resistance to corrosion attack, high strength and good resistance to accidental damage.

Lined Galvanized Steel (PVC-U/PVC-C/Polyethylene Lining or Epoxy Resin Coated)

Lined galvanized steel pipes are steel pipes with the provision of an internal protection lining to resist corrosion and encrustation. Because of the composite nature of the materials, these pipes possess the rigidity of steel pipes on the external surface and the resistance to corrosion on the internal surface. The lined galvanized steel pipe can be used in vulnerable conditions such as exposure to direct sunlight and traffic loads. Jointing of lined galvanized steel pipes is similar to that of unlined galvanized steel pipes and is therefore readily compatible with the existing mains network.

PVC-U/PE lined steel pipe can withstand a maximum pressure of 9.8 bar at 20°C. For use in hot water supply, PVC-C lined steel pipe can withstand a maximum pressure of 9.8 bar at 82°C.

There is no relevant British Standard for this kind of pipe. However, there are JIS, JWWA, WSP and SS Standards.

Unplasticised Polyvinyl Chloride (PVC-U)

Unplasticised polyvinyl chloride (PVC-U) pipes complying with **BS 3505 for Class D (12 Bar)** are suitable for **cold** water services. PVC-U is a rigid material, light weight and has a good resistance to corrosion attack. As this type of materal has a high coefficient of thermal expansion, PVC-U pipes is thus not suitable for hot water supply.

PVC-U is sensitive to point loading, impact and fatigue loading conditions. So PVC-U pipes are not recommended for use under major carriageways and exposed conditions. PVC-U can be attacked by surface active organic compounds (e.g. detergents) and certain concentrated oxidizing agents (e.g. chlorine gas, concentrated nitric acid) which can increase the risk of brittle fracture. Same as other plastic materials, PVC-U pipes are susceptible to ultra-voilet degradation.

Because PVC-U is not a conductor of electricity, problems of galvanic corrosion do not occur, and the piping system will not suffer from oxidation corrosion. They are jointed

by solvent cement which requires:

(a) Good skill in making a proper joint;

(b) Clean and dry condition for a good bond; and

(c) A drying time of 8 hours before being subjected to the designed working pressure and 24 hours before being tested to 1.5 times the designed working pressure.

Chlorinated Polyvinyl Chloride (PVC-C)

Chlorinated polyvinyl chloride (PVC-C) pipes complying with **BS 7291 - Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings:**

(i) **Part 1. - General requirements**; and

(ii) **Part 4. - Specification for chlorinated polyvinyl chloride (PVC-C) pipes and associated fittings and solvent cement**

are suitable for **hot and cold** water services.
PVC-C pipe is manufactured by the addition of extra chlorine atoms to molecules of PVC and the resultant polymer has a higher service temperature. It resembles PVC in many aspects, except that it may be used in hot water services and has a good resistance to corrosion attack. It is inert to most acids, alkalis, salts and paraffinic hydrocarbon solutions and is often used in chemical plant. However, it is susceptible to permeation/degradation by certain organic contaminants. The inertness of PVC-C, coupled with the smooth bore of the pipe and fittings, almost completely eliminates scale build-up within pipe system. This type of pipe has, however, a high rate of thermal expansion.

It should be noted that the working pressure for which a plastic component is suitable generally reduces relative to an increase in the temperature and/or the duration of use at elevated temperature to which the component is subjected. Therefore, information on the change of pressure rating with temperature for PVC-C pipes must be obtained from the manufacturer or from the applicable product specification.

PVC-C is sensitive to point loading, impact and fatigue loading conditions. So PVC-C pipes are not recommended for use under major carriageways and exposed conditions. Same as other plastic materials, PVC-C pipes are susceptible to ultra-violet degradation.

Because PVC-C is not a conductor of electricity, problems of galvanic corrosion do not occur, and the piping system will not suffer from oxidation corrosion. They are jointed by solvent cement which requires:

(a) Good skill in making a proper joint;

(b) Clean and dry condition for a good bond; and

(c) A drying time of 8 hours before being subjected to the designed working pressure and 24 hours before being tested to 1.5 times the designed working pressure.

Polyethylene, Medium Density Polyethylene (MDPE) and High Density Polyethylene (HDPE)

Polyethylene is a synthetic thermoplastic material produced from the polymerisation of ethylene in a closed loop reactor. The conditions under which polymerisation takes place and the specific catalyst used control the properties of the polymer. A wider range of materials may be produced which can be broadly characterised by their molecular weight, crystallinity and density.

The molecular weight distribution influences both the melt flow characteristics and the toughness of the material. The absolute value of the molecular weight also controls toughness.

The density of the material is closely related to its crystallinity or structural regularity which in turn influences a wide range of physical properties. For example, the increase in the density of the material would improve its short term strength but would trade off its ductility. The lower the ductility of the material the more difficult it becomes in the redistribution of stresses around defects and cracks thus reducing the effective toughness of the material.

Medium density polyethylene (MDPE) specified to **BS 6572 - Specification for blue polyethylene pipes up to nominal sizes 63 for below ground use for potable water or BS 6730 - Specification for black polyethylene pipes up to nominal size 63 for above ground use for cold potable water** is a relatively new pipe material for mainlaying in water industry. Jointing of MDPE pipes may be carried out mechanically or using fusion methods. MDPE pipes made by different manufacturers however may not be compatible for direct fusion jointing although they may be jointed using an electrofusion coupler or a mechanical joint.

There are five methods available for jointing MDPE pipes.

- butt fusion welding
- socket fusion welding
- electrofusion welding
- push-fit spigot and socket joints
- mechanical couplers/compression fittings

MDPE pipes are light in weight, resistant to corrosion attack, weldable and flexible. MDPE has a relatively high coefficient of thermal expansion and is susceptible to UV degradation. It is not intended for above ground and outdoor use. It should be noted that the working pressure for MDPE pipes would be reduced in an increase of the temperature and the duration of its use. Therefore, information on the change of pressure rating with temperature for MDPE pipes must be obtained from the manufacturer or from the applicable product specification.

MDPE pipes can suffer permeation and structural attack by a range of organic and inorganic compounds (such as fuel oil, detergents, chlorine gas, concentrated oxidizing acids, benzene and chlorinated hydrocarbons) so they should not be laid in environment which is contaminated with these compounds or there is a significant risk of spillage of such compounds.

Crosslinked Polyethylene (PE-X)

Crosslinked Polyethylene (PE-X) pipes and fittings complying with **BS 7291 - Thermoplastics pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings:**

(i) **Part 1. - General requirements;** and

(ii) **Part 3. - Specification for crosslinked polyethylene (PE-X) pipes and associated fittings**

are suitable for **hot and cold** water services.

The base material of a PE-X pipe is high density polyethylene of high molecular weight, with organic peroxide serving as the cross-linking agent. There are various cross-

linking methods for PE moulding or extrusion either alone or in combination with other plastic materials. The polymer chains are linked together under pressure to form a three-dimensional structure.

It should be noted that the working pressure for PE-X pipes would be reduced in an increase of the temperature and the duration of its use. Therefore, information on the change of pressure rating with temperature for PE-X pipes must be obtained from the manufacturer or from the applicable product specification.

On account of its high coefficient of expansion, the pipe must be installed in such a way that temperature-induced linear expansion and contraction can be accommodated.

In case of exposed installation, the pipes must be encased to provide protection against UV degradation.

PE-X pipes cannot be jointed by direct fusion jointing or electrofusion coupler. They must be jointed by mechanical couplers/compression fittings.

Crosslinked Polyethylene/Aluminium/Crosslinked Polyethylene (PEX-AL-PEX) Pressure Pipe and Polyethylene/Aluminium/Polyethylene (PE-AL-PE) Composite Pressure Pipe.

PEX/AL/PEX or **HDPE/AL/HDPE** pipe is a co-extruded crosslinked polyethylene or high density polyethylene composite pressure pipe with a welded aluminium tube reinforcement between the inner and outer layers. The inner and outer layers are made of crosslinked polyethylene or high density polyethylene and are bonded to the aluminium tube by a melt adhesive. Pipes may be in coils for small sizes or in straight lengths.

As cross-linked polyethylene pipe can withstand higher temperature than ordinary polyethylene pipe, it can be used for above-ground **hot and cold** water services at operating pressures up to 10 bar at a temperature up to 95°C(short term 110°C) whereas the pipe with high density polyethylene material is suitable for above-ground **cold** water services.

PE-X/AL/PE-X or HDPE/AL/HDPE are semi-rigid and light in weight. Copper pipes are 3-4 times heavier for the same application and galvanized steel pipes are 15-17 times heavier.

Polyethylene material is UV-degradable and is therefore not suitable for use in installations exposed to direct sunlight. Pipework system should be protected against

freezing. However, they can normally withstand several freeze/thaw cycles without bursting.

Installations containing PE-X/AL/PE-X or HDPE/AL/HDPE pipes cannot be used as an electrical earth point.

There is no British Standard Specification for this kind of pipe material and they shall comply with the relevant American Standards and Canadian Standards.

Polybutylene (PB)

Polybutylene pipes and fittings complying with **BS 7291 - Thermoplastic pipes and associated fittings for hot and cold water for domestic purposes and heating installations in buildings:-**

(i) **Part 1. - General requirements**; and

(ii) **Part 2. - Specification for polybutylene (PB) pipes and associated fittings**

are suitable for **hot and cold** water services.

Polybutylene is synthesized by the polymerization of butylene isomers. The resultant polymer has a variety of side branches, which give it better protection against oxygen when exposed to sunlight when compared with other polyolefins. However, when Polybutylene pipes are to be installed outdoor exposed to direct sunlight, the types with proper oxygen barrier should be preferred.
It should be noted that the working pressure for PB pipes would be reduced in an increase of the temperature and the duration of its use. Therefore, information on the change of pressure rating with temperature for PB pipes must be obtained from the manufacturer or from the applicable product specification.

Polybutylene pipes can be jointed by fusion welding techniques and compression fittings. In consideration of the high coefficient of thermal expansion of polybutylene, measures should be taken to make allowance for expansion in hot water system.

Acrylonitrile Butadiene Styrene (ABS)

ABS pipes are made from an Acrylonitrile Butadiene Styrene formulation and can withstand a minimum continuous working pressure of 10 bar at 20°C. These pipes are

jointed by cold solvent welding (solvent cement). The material is tough and has high impact strength and good chemical resistance.

ABS pipes and fittings are accepted by WRc. There is yet no British Standard Specification and other National Standards to cover this kind of pipe material for domestic use. However, **BS 5391 - Specification for acrylonitrile-butadiene-styrene (ABS) pressure pipe, Part 1 - Pipe for industrial uses** is available.

III A Summary of the Advantages and Disadvantages of the Different Types of Pipe Materials

Pipe Materials	Advantages	Disadvantages
Copper	- High pressure capability - Good formability - Good corrosion resistance - High strength and durability to withstand external loading - Ease of jointing - Suitable for conveying hot water - Readily available in local market	- Soft water can cause internal corrosion attack of copper pipes giving rise to 'blue' water
Stainless Steel	- High pressure capability - Good corrosion resistance - High strength and durability - Ease of jointing - Suitable for conveying hot water	
Lined galvanized steel (PVC-U, PVC-C, PB, polyethylene or epoxy resin lining)	- Good resistance to internal corrosion and encrustation - Smooth internal surface to give better flow characteristic - Readily compatible with existing commonly used unlined steel pipe	- Heavy weight - Susceptible to impact damage, greater care required in handling - The cutting, threading, chamfering and jointing of the piping system demands higher skill and is susceptible to poor installation practice.
PVC-U	- Good corrosion resistance - Light weight - Ease of jointing - Low cost - Smooth internal surface giving low frictional resistance and preventing scale build-up - Readily available in local market	- Brittle, susceptible to impact damage - Long drying time of solvent cement in jointing - Low abrasion resistance - Susceptible to permeation /degradation by certain organic contaminants - UV degradation on prolonged exposure to direct sunlight

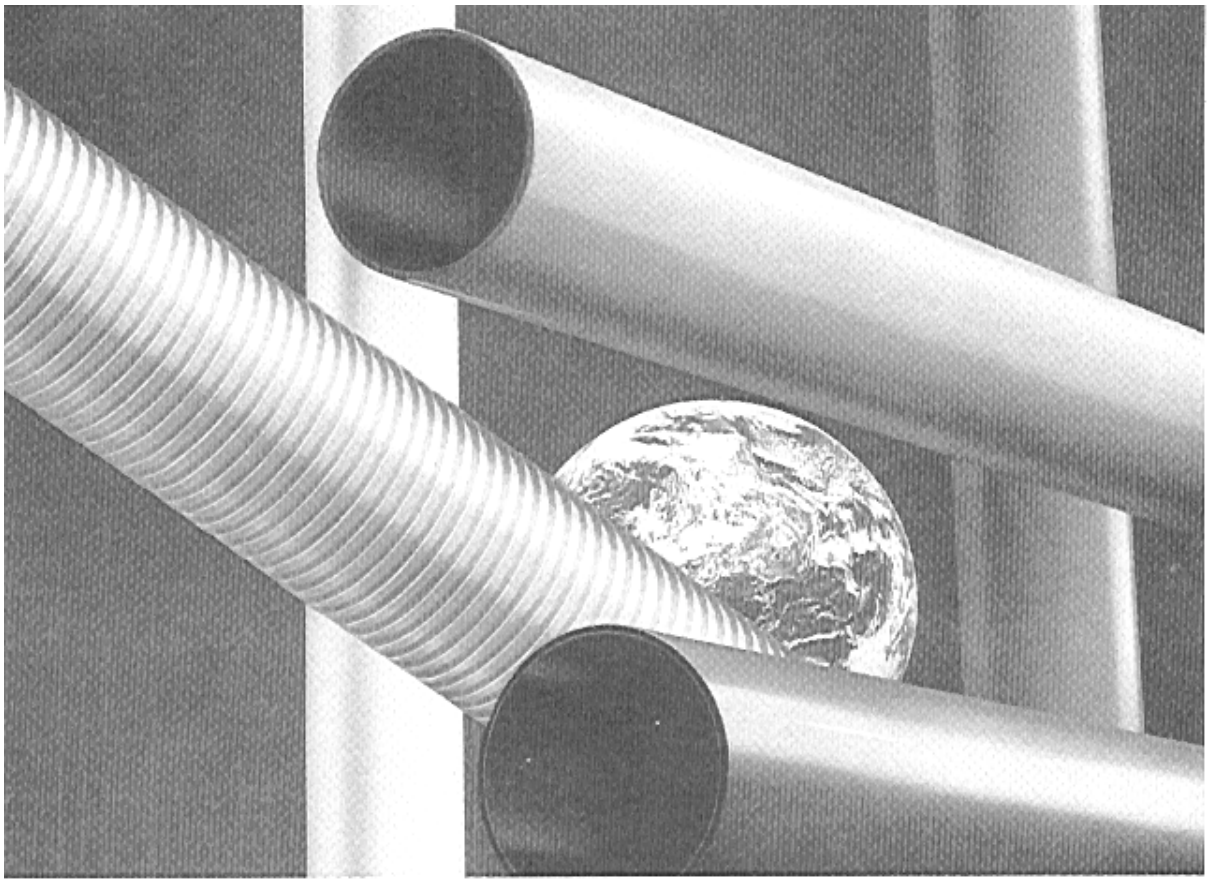
Pipe Materials	Advantages	Disadvantages
		- Susceptible to poor installation practice
MDPE	- Good corrosion resistance - Good formability - Fusion and mechanical joint available - Low frictional resistance - Strong and tough - Flexible and durable, light and easy to handle - Good resistance to impact - Light weight	- Fusion jointing requires skilled installers and special equipment (electricity supply is required) - Subject to creep - Strength decreasing with time though at a very slow rate - MPDE pipes made by different manufacturers may not be compatible for direct fusion jointing - Susceptible to ultra-violet degradation on prolonged exposure to direct sunlight - Susceptible to permeation /degradation by certain inorganic and organic contaminants
PVC-C	- Good corrosion and chemical resistance - Light weight - Smooth bore giving low frictional resistance and preventing scale build-up - No galvanic or oxidative corrosion - Can be connected to other materials easily - Suitable for conveying hot water	- Brittle, susceptible to impact damage - Long drying time of solvent cement in jointing - Can be flammable - Reduction in strength and rigidity with increase of temperature - Susceptible to permeation /degradation by certain organic contaminants - Susceptible to ultra-voilet degradation on prolonged exposure to direct sunlight - Susceptible to poor installation practice

Pipe Materials	Advantages	Disadvantages
PE-X	- Light weight - Good corrosion and chemical resistance - Smooth bore giving low frictional resistance and preventing scale build-up - Can withstand an excessive temperature of up to 120°C for a short period - Flexible, can be cold bent - Suitable for conveying hot water	- Subject to creep - Susceptible to ultra-voilet degradation on prolonged exposure to direct sunlight - Can only be jointed together by mechanical jointing - Can be flammable
PB	- Good corrosion and abrasion resistance - Flexible, can be cold bent - Durable, light and easy to handle and repair - Smooth internal surface giving low resistance to flow and preventing scale build-up - High temperature resistance - Can be welded to form a leak free system (the British Standard has not yet been amended to include this aspect) - Suitable for conveying hot water	- Susceptible to ultra-violet degradation on prolonged exposure to direct sunlight - Susceptible to corrosion attack by organic solvents - Reduction in strength with increase of temperature - Subject to creep
ABS	- Ability to absorb impact energy without failure - Ductile compared with PVC-U and PVC-C - Light and durable - Good resistance to corrosion - Smooth internal surface giving low resistance to flow and preventing scale build-up - No galvanic or oxidative corrosion	- Reduction in strength and rigidity with increase of temperature - Susceptible to slight surface degradation on prolonged exposure to direct sunlight - Susceptible to corrosion attack by organic solvents - Susceptible to poor installation practice - Long drying time of solvent cement in jointing

Pipe Materials	Advantages	Disadvantages
PEX-AL-PEX composite pipe	- Can be exposed to direct sunlight (black pipe) - Can withstand an excessive temperature of up to 110°C for a short period - Light weight - Can be cold bent to a minimum of five times of its diameter - Smooth internal surface giving low resistance to flow and preventing scale build-up - The pipe is not permeable to oxygen which cannot thus enter recirculating water and be deleterious to other system components - Suitable for conveying hot water - No galvanic or oxidative corrosion	- Can only be jointed together by mechanical jointing - Susceptible to corrosion attack by organic solvents - Susceptible to ultra-violet degradation (except black pipe) on prolonged exposure to direct sunlight
PE-AL-PE composite pipe	- Light weight - Good corrosion and chemical resistance - Smooth bore giving low frictional resistance and preventing scale build-up - Can be cold bent to a minimum of five times of its diameter - No galvanic or oxidative corrosion	- Susceptible to ultra-violet degradation on prolonged exposure to direct sunlight - Can only be jointed together by mechanical jointing - Susceptible to corrosion attack by organic solvents

Installation Notes

of Different Types of Corrosion Resistant Pipe Materials
as Inside Service in Buildings



Water Supplies Department
June 2000

Preface

These notes are meant to provide plumbers/installers with some practical information and the practices to be followed in the application and installation of the corrosion resistant type of pipe materials approved by the Water Authority but are not intended to serve as a design guide or a technical pipe laying manual. It is therefore advisable for the plumbers/installers to consult the suppliers on the properties and characteristics of the pipe material should they wish to use any particular type of pipe materials.

The Office of the Water Authority wishes to thank the following organisations for their efforts and valuable contributions, who have kindly agreed to join a Working Party in preparing the notes:

Hong Kong Plumbing & Sanitary Ware Trade Association

Hong Kong Licensed Plumbers Association

The Institute of Plumbing - Hong Kong Council

Hong Kong Plumbing General Union

The Office of the Water Authority also wishes to thank the Hong Kong Institute of Architects and the Hong Kong Institution of Engineers who have offered their comments on the notes.

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Lined Galvanized Steel Pipe for Cold and Hot Water Services

- Since 23 July 1991, lined galvanized steel pipes are allowed to be used on cold water services in Hong Kong subject to the following conditions:

  (a) the steel pipes and fittings shall be galvanized and shall comply with BS 1387 for medium tubes and tubulars and with BS 143 and BS 1256 for malleable cast iron and cast copper alloy pipe fittings respectively;

  (b) the protective lining material may be made up of epoxy, unplasticised polyvinyl chloride, or polyethylene conforming to a recognised National/International standard which is acceptable to the Water Authority; and

  (c) the material for the protective lining shall also be tested for suitability for use in potable water supply and comply with the requirements of BS 6920 - "Suitability of non-metallic products for use in contact with water intended for human consumption with regard to their effect on the quality of the water".

- The PE or PVC-U lining has a lower frictional loss than metallic pipes. The c values for plastic (PE or PVC-U), metallic and A.C. pipes in the Williams and Hazen Formula are 150, 125 and 110 respectively.

- A band saw with plenty of cooling water shall be used to cut and make the pipe ends smooth and clean. After cutting, the burr of internal lining shall be removed with a reamer or scraper. The pipe shall not be cut by gas, arc or high-speed grinder as the lining inside will be damaged by the high temperature.

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

- Pipes shall be jointed with screwed fittings with pipe threads complying with BS 21. Screwed joints shall have tapered threads and shall be made with approved jointing material. Where the cutting of threads removes the galvanizing, an anti-corrosive sealing compound shall be applied to restore the integrity of the protective finish.

- For lined galvanized steel pipe, elbows instead of bends can be used.

- The meter position for 15mm diameter meter shall be constructed to include 20mm x 15mm brass bushes, or reducers, at both sides of the meter position with a 200mm (clear effective length) distance piece of 15mm G.I. tube placed in between. A brass longscrew (connector) shall be provided immediately after the bush or reducer at the delivery side. Alternative arrangement for meter position can also be accepted provided that the water meters can be installed and removed with ease. The meter position for meter of all sizes shall also be similarly provided with corresponding fittings of appropriate sizes.

PB Pipe for Hot and Cold Water Services

- PB pipes are flexible and can be available in straight or coil form.

- The coefficient of thermal expansion of PB is (1.3×10^{-4}mm mm^{-1} per °C), i.e., the linear expansion for PB pipe is approximately 13mm per 10°C temperature change for every 10 meters of pipe. Allowance shall be made for free thermal movement in a long run of piping especially in hot water systems. Expansion loop in the form of an Omega shape or S snake shape shall be formed for a long straight run of pipe.

- The PB pipe has a lower frictional loss than metallic pipes. The c values for plastic (PB), metallic and A.C. pipes in the Williams and Hazen Formula are 150, 125 and 110 respectively.

- The system must be adequately supported to prevent distortion. Maximum spacing between horizontal supports and vertical run shall be as shown in table 2 of BS 5955 : Part 8.

- Pipe supports shall be designed to provide a permanent fixing. Where fittings such as valves and manual controls are used, these shall be firmly anchored so as to minimize any turning moment imparted to the pipe by operation of handwheel, levers etc. It is recommended that pipe clips made from plastics materials are used, preferably encompassing the pipe by more than 80% of its circumference.

- All joints shall be made in accordance with the instructions of the fittings manufacturer or in the absence of instructions, in accordance with the procedures detailed in Appendix B of BS 5955 : Part 8. It is noted that it is possible to joint polybutylene pipes by thermal fusion. However, BS 7291 Part 2 has not yet be amended to include any material-related requirements for such joints and fittings. In general, PB pipe can only be jointed together by mechanical joints.

- PB pipework shall not be connected directly to a boiler or circulator. In this situation it is recommended to use a 350mm (or more) length of copper connection pipe for heat dissipation. Similarly, do not let PB come close to articles which are likely to become very hot.

- PB pipes have some degree of flexibility and may be cold bent to a minimum radius as specified by the manufacturer to accommodate contours and curvatures. If the manufacturer does not specify the minimum cold bend radii, the minimum cold bend radii shall be in accordance with table 3 of BS 5955 : Part 8. It is necessary to support the cold bend in order to maintain its configuration. Where bend clips are available, these should be used to hold the bend.

- Using the thermoplastics nature of the material, tighter bends can be formed in PB by hot bending. This is, however, a skilled operation and is not recommended for use on site.

- When an installation is completed it should always be thoroughly flushed through with water and fully pressure tested in accordance with Appendix C of BS 5955 : Part 8 before commissioning.

- PB is a non-conductor of electricity and the system must not be used as electrical earthing point.

- The meter position for 15mm diameter meter shall be constructed to include 20mm x 15mm brass bushes, or reducers, at both sides of the meter position with a 200mm (clear effective length) distance piece of 15mm G.I. tube placed in between. A brass longscrew (connector) shall be provided immediately after the bush or reducer at the delivery side. The meter position for meter of all sizes shall also be similarly provided with corresponding fittings of appropriate sizes.

- BS 5955 : Part 8 specifies methods and gives guidance for the installation of polybutylene (PB) pipes and associated fittings compatible with the scope of BS 7291.

PE-X Pipe for Hot and Cold Water Services

- The base material of PE-X is a high-density polyethylene of high molecular weight. The term crosslinking is used to describe the chemical linking of the PE molecules into a three-dimensional network. Because of this cross-linking, the material is capable of withstanding higher temperature. There are various

cross-linking methods for PE moulding or extrusion either alone or in combination with other plastic materials, e.g. by radiation, peroxide, etc.

- PE-X pipes are flexible and can be available in straight or coil form.

- The coefficient of thermal expansion of PE-X is (2×10^{-4}mm mm^{-1} per °C), i.e, the linear expansion for PE-X pipe is approximately 20mm per 10°C temperature change for every 10 metres of pipe. Allowance shall be made for free thermal movement in a long run of piping especially in hot water systems. Expansion loop in the form of an Omega shape or S snake shape shall be formed for a long straight run of pipe length.

- The PE-X pipe has a lower frictional loss than metallic pipes. The c values for plastic (PEX), metallic and A.C. pipes in the Williams and Hazen Formula are 150, 125 and 110 respectively.

- The system must be adequately supported to prevent distortion. Maximum spacing between horizontal supports and vertical run shall be as shown in table 2 of BS 5955 : Part 8.

- Pipe supports shall be designed to provide a permanent fixing. Where fittings such as valves and manual controls are used, these shall be firmly anchored so as to minimize any turning moment imparted to the pipe by operation of handwheel, levers etc. It is recommended that pipe clips made from plastics materials are used, preferably encompassing the pipe by more than 80% of its circumference.

- All joints shall be made in accordance with the instructions of the fittings manufacturer or in the absence of instructions, in accordance with the procedures detailed in Appendix B BS 5955 : Part 8. In general, PE-X pipe can only be jointed together by mechanical joints.

- PE-X pipework shall not be connected directly to a boiler or circulator. In this situation it is recommended to use a 350mm (or more) length of copper connection pipe for heat dissipation. Similarly, do not let PE-X come close to articles which are likely to become very hot.

- PE-X is a non-conductor of electricity and the system must not be used as electrical earthing point.

- PE-X have some degree of flexibility and may be cold bent to a minimum radius as specified by the manufacturer to accommodate contours and curvatures. If the manufacturer does not specify the minimum cold bend radii, the minimum cold bend radii shall be in accordance with table 3 of BS 5955 :

Part 8. It is necessary to support the cold bend in order to maintain its configuration. Where bend clips are available, these should be used to hold the bend.

- Using the thermoplastics nature of the material, tighter bends can be formed in PE-X by hot bending. This is, however, a skilled operation and is not recommended for use on site.

- When an installation is completed it should always be thoroughly flushed through with water and fully pressure tested before commissioning.

- The meter position for 15mm diameter meter shall be constructed to include 20mm x 15mm brass bushes, or reducers, at both sides of the meter position with a 200mm (clear effective length) distance piece of 15mm G.I. tube placed in between. A brass longscrew (connector) shall be provided immediately after the bush or reducer at the delivery side. The meter position for meter of all size shall also be similarly provided with corresponding fittings of appropriate sizes.

- BS 5955 : Part 8 specifies methods and gives guidance for the installation of crosslinked polyethylene (PE-X) pipes and associated fittings compatible with the scope of BS 7291.

Hunter PVC-C Pipe for Hot and Cold Water Services

- Chlorinated Polyvinyl Chloride (PVC-C) pipe is produced by adding extra chlorine atoms to PVC molecules. The resultant polymer has a higher density and can be used at higher service temperatures.

- The Hunter-Genova (PVC-C) pipe and fittings are manufactured to the America specifications of ASTM D 2846, requiring a minimum hydrostatic burst strength of 100 psi at 82°C and 400 psi at 20°C for continuous use for 50 years. This system has also been approved by the Water Research Centre (WRc) in U.K. for use above ground and in contact with cold water or continuously in contact with hot water withstanding a maximum working pressure of 15 bar at 20°C and 2 bar at 85°C.

- PVC-C material and the Nova-Weld C solvent cement used in the Hunter-Genova System pass all the WRc requirements for toxicity, taste and resistance to microbiological growth. It has been examined, tested and accepted by the WRc to have complied with the U.K. Water Fittings Byelaws and Regulations when correctly installed.

- Hunter-Genova (PVC-C) Pipe and Fittings is of tan colour to BS 4800, 10C31.

- Hunter-Genova (PVC-C) pipe is available in 15, 22 and 28mm sizes and supplied in standard length of 3m. A full range of fittings is available to enable connections be made to other materials easily.

- The coefficient of thermal expansion of PVC-C is (0.65×10^{-4}mm mm^{-1} per °C), i.e., the linear expansion for PVC-C pipe is approximately 6.5mm per 10°C temperature change for every 10 meters of pipe. Allowance shall be made for free thermal movement in a long run of piping especially in hot water systems. Expansion loop in the form of an Omega shape or S snake shape shall be formed for a long straight run of pipe.

- The PVC-C pipe has a lower frictional loss than metallic pipes. The c values for plastic (PVC-C), metallic and A.C. pipes in the Williams and Hazen Formula are 150, 125 and 110 respectively.

- The system must be adequately supported to prevent distortion. Maximum spacing between horizontal supports and vertical run shall be 500mm and 1m respectively.

- Pipe supports shall be designed to provide a permanent fixing. Where fittings such as valves and manual controls are used, these shall be firmly anchored so as to minimize any turning moment imparted to the pipe by operation of handwheel, levers etc. It is recommended that pipe clips made from plastics materials are used, preferably encompassing the pipe by more than 80% of its circumference.

- The method of jointing is similar to PVC-U system. It is not recommended to substantially bend PVC-C pipe, and therefore, all changes in direction must be made by using the appropriate fittings.

- Solvent cementing of PVC-C should not be made in wet conditions, or at temperatures below 0°C or above 40°C. The joints should be left undisturbed for 8 hours before applying the working pressure. To ensure that they have gained sufficient strength, a drying time of 24 hours is required before testing to 1.5 times working pressure.

- PVC-C pipework shall not be connected directly to a boiler or circulator. In this situation it is recommended to use a 350mm (or more) length of copper connection pipe for heat dissipation. Similarly, do not let PVC-C come close to articles which are likely to become very hot.

- When an installation is completed it should always be thoroughly flushed through with water and fully pressure tested in accordance with Appendix C of BS 5955 : Part 8 before commissioning.

- PVC-C is a non-conductor of electricity and the system must not be used as electrical earthing point.

- The meter position for 15mm diameter meter shall be constructed to include 20mm x 15mm brass bushes, or reducers, at both sides of the meter position with a 200mm (clear effective length) distance piece of 15mm G.I. tube placed in between. A brass longscrew (connector) shall be provided immediately after the bush or reducer at the delivery side. The meter position for meter of all sizes shall also be similarly provided with corresponding fittings of appropriate sizes.

- BS 5955 : Part 8 specifies methods and gives guidance for the installation of chlorinated polyvinyl chloride (PVC-C) pipes and associated fittings compatible with the scope of BS 7291.

ABS Pipe for Cold Water Services

- ABS pipes are made from an Acrylonitrile Butadiene Styrene formulation. The copolymeric system can be blended to yield the optimum balance of properties suited to a selected end use. Acrylonitrile imparts chemical resistance and rigidity. Butadiene endows the product with impact strength and toughness while Styrene contributes to ease of processing.

- ABS is classified as a rigid thermoplastic over its working temperature range, -40°C to + 80°C. The system can withstand a minimum continuous working pressure of 10 bar at 20°C for 50 years. The material is tough and has high impact strength and good chemical resistance.

- The pipes are jointed by cold solvent welding (solvent cement).

- ABS pipes and fittings are accepted by WRc. According to the available information, there is no British Standard Specification and other National Standards for this kind of pipe material except a BS for industrial use - BS 5391 - Specification for Acrylonitrile-butadiene-styrene (ABS) pressure pipe, Part 1 - Pipe for industrial uses.

- The coefficient of thermal expansion of ABS is (1.01×10^{-4}mm mm^{-1} per °C), i.e., the linear expansion for ABS pipe is approximately 10.1mm per 10°C temperature change for every 10 metres of pipe. Allowance shall be made for free thermal movement in a long run of piping especially in hot water systems. Expansion loop in the form of an Omega shape or S snake shape shall be formed for a long straight run of pipe.

- The ABS pipe has a lower frictional loss than metallic pipes. The c values for plastic (ABS), metallic and A.C. pipes in the Williams and Hazen Formula are 150, 125 and 110 respectively.

- The system must be adequately supported to prevent distortion. With increased temperature, pipe rigidity decreases thus necessitating more frequent support. Therefore, the maximum spacing shall be in accordance with the instructions of the manufacturer. It is recommended that pipe clips made from plastics materials are used, preferably encompassing the pipe by more than 80% of its circumference.

- Pipe supports shall be designed to provide a permanent fixing. Where fittings such as valves and manual controls are used, these shall be firmly anchored so as to minimize any turning moment imparted to the pipe by operation of handwheel, levers etc.

- The method of jointing is similar to PVC-U system. It is not recommended to substantially bend ABS pipe, and therefore, all changes in direction must be made by using the appropriate fittings.

- Solvent cementing of ABS should not be made in wet conditions. 24 hours drying time must be allowed before applying full working pressure. The joint may be used earlier at lower pressures but not within 4 hours of completing the jointing procedure.

- When an installation is completed it should always be thoroughly flushed through with water and fully pressure tested in accordance with the recommendation o the manufacturer before commissioning.

- ABS is a non-conductor of electricity and the system must not be used as electrical earthing point.

- ABS suffers only slight surface degradation on prolonged exposure to direct sunlight. Loss of properties can be substantially reduced by the simple precaution of painting the surface with white paint.

- The meter position for 15mm diameter meter shall be constructed to include 20m x 15mm brass bushes, or reducers, at both sides of the meter position with a 200mm (clear effective length) distance piece of 15mm G.I. tube placed in between. A brass longscrew (connector) shall be provided immediately after the bush or reducer at the delivery side. The meter position for meter of all sizes shall also be similarly provided with corresponding fittings of appropriate sizes.

KITEC Pipe for Hot and Cold Water Services

- KITEC pipe was invented by a British expert Mr. Izhak Barnoach and the patent was owned by a Dutch Company Kitechnology B.V.

- KITEC pipe is a coextruded crosslinked polyethylene or high density polyethylene composite pressure pipe with a welded aluminum tube reinforcement between the inner an outer layers. The inner and outer layers are made of crosslinked polyethylene or high density polyethylene and are bonded to the aluminum tube by a melt adhesive.

- Orange and Black KITEC pipe and connectors are for use in above-ground hot and cold water services, including potable water. Orange KITEC pipe should not be used for installations exposed to direct sunlight. Black KITEC pipe can be used instead.

- Blue KITEC pipe and connectors are for use in above-ground cold water services, including potable water.

- Both systems have been examined, tested and accepted by WRc to have complied with the U.K. Water Fittings Byelaws and Regulations when correctly installed.

- The pipe is supplied in coils of 50m or 100m for the 25mm size, in coils of 100m or 200m for the 16mm and 20mm size, and in coils of 200m or 400m for the 14mm size. Straight 4m length of pipe are also available in all sizes up to 25mm O.D.

- The coefficient of thermal expansion of KITEC pipe is (1.17×10^{-4}mm mm^{-1} per °C), i.e., the linear expansion is approximately 11.7mm per 10°C temperature change for every 10 metres of pipe. Allowance shall be made for free thermal movement in a long run of piping especially in hot water systems. Expansion loop in the form of an Omega or S shape shall be formed for a straight long run of pipe.

- The KITEC pipe has a lower frictional loss than metallic pipes. The c values for plastic (PE or PEX), metallic and A.C. pipes in the Williams and Hazen Formula are 150, 125 and 110 respectively.

- KITEC pipes shall be supported at regular intervals using pipe clips recommended by the supplier. Maximum spacing between horizontal and vertical supports shall be as shown below:

Recommended spacing of pipe supports		
Nominal Pipe Size	Horizontal Run (mm)	Vertical Run (mm)
1014 ID 10mm x OD 14mm	800	1000
1216 ID 12mm x OD 16mm	800	1000
1620 ID 16mm x OD 20mm	800	1000
2025 ID 20mm x OD 25mm	1000	1200

- KITEC pipes/tubes shall not be threaded. They shall not be solvent welded nor glued. Each jointing incorporates a purpose made KITEC connector at one end and a male BSP thread at the other. Each connector shall stamped with the size and the KITEC symbol. The connectors are manufactured from brass to Table 7 of B.S. 864 : Part 2 - Specification for capillary and compression fittings for copper tubes.

- Pipe supports shall be designed to provide a permanent fixing. Where fittings such as valves and manual controls are used, these shall be firmly anchored so as to minimize any turning moment imparted to the pipe by operation of handwheel, levers etc.

- KITEC pipework should not contain any joints below floor level. When installing pipes in solid floors or walls, suitable ducting or chasing must be used to provide access to pipe work for repair or replacement.

- A pipe cutter and a special flaring tool is required for the preparation of the joint.

- KITEC pipes can be bent manually or with a suitable bending spring for directional changes but the radius of curvature shall not be less than five times the diameter of the pipe or tube.

- KITEC hot water systems are not intended to be used for temperatures above 82°C. When making a connection to a heated cylinder where temperature

could regularly exceed 82°C it is recommended that a short length of metal pipe be installed between the water heater outlet and the pipe system.

- Crosslinked polyethylene and high density polyethylene are insulating materials and hence KITEC pipes must not be used for earthing of electrical equipments.

- The meter position for 15mm diameter meter shall be constructed to include 20mm x 15mm brass bushes, or reducers, at both sides of the meter position with a 200mm (clear effective length) distance piece of 15mm G.I. tube placed in between. A brass longscrew (connector) shall be provided immediately after the bush or reducer at the delivery side. The meter position for meter of all sizes shall also be similarly provided with corresponding fittings of appropriate sizes.

MDPE/HDPE Pipe for Cold Water Services

- Please refer to the requirements of CP 312 - Code of Practice for Plastic Pipework published by the British Standards Institution and Manual for the design, Installation and Operation of MDPE pipe system for water supply distribution published by WRc on the design, installation and operation of MDPE/HDPE pipe systems.