

For information

**Legislative Council
Panel on Development**

**Measures to Minimize Fresh Water Losses in Inside Services
in Residential Developments**

PURPOSE

This paper informs Members of the current measures for minimizing fresh water losses in inside services (IS)¹ in residential developments together with some new initiatives being explored by the Water Supplies Department.

BACKGROUND

2. Supply of water to households in Hong Kong by the Water Supplies Department (WSD) is governed by the Waterworks Ordinance (Cap 102) (WWO) and the Waterworks Regulations (WWR). Registered consumers (RC) are required under the WWO and WWR to upkeep the IS of their premises to ensure that the water supplied would not be wasted, misused² or polluted at all times. The IS can broadly be classified into communal part and non-communal parts. The communal part comprises the system that serves more than one flat, including the common feeder pipe(s), pump(s) and appurtenance(s), if any, conveying water from the connection point at the lot boundary³ of the developments to the IS of individual flats which are classified as non-communal parts. The communal part of the IS is usually un-metered, while the non-communal parts comprising mainly the feeder pipes of the individual flats are equipped with a water meter. The typical arrangements of the IS are shown in **Enclosure I** and **Enclosure II**.

¹ For a residential development, the registered consumers are responsible for the maintenance and repairs of the systems within the development (inside service). The inside service includes pipes and fittings in premises, and those between premises and those connecting to the public mains.

² One of the misuse is the use of fresh water supply which is not measured with a water meter.

³ For the purpose of this paper, 'lot boundary' is taken to include the boundary of leased land or land which the user has lawful right to use in the way provided for under a license, permit or the like.

3. Ageing of the IS may result in leakage and hence loss of fresh water. To reduce water loss from leaking IS of residential developments, the defects in the IS have to be located and rectified by the RC as early as possible.

CURRENT MEASURES

4. Whilst preventing an IS from leaking is primarily the responsibility of the RC under the WWO, the WSD adopts a number of measures as summarized below to detect water losses in the IS of residential developments. After detecting and confirming the leakage of the IS in its investigation, the WSD will require the responsible party to repair the leaking IS in order to prevent further wastage of water.

5. Currently, control of water leakage of IS is mainly exercised by means of the authority empowered under the WWO to serve notice to require the RC to repair the defective IS within a designated period of time, failing which the WSD may disconnect the IS with prior notice. A “Waterworks Form K – Notice Requiring the Consumer to Carry out Repairs or Other Works” will be issued to the RC when the need for repair is apparent for defects which may result in wastage/misuse/pollution of supply. In the “Form K”, a reasonable time limit for the RC to complete the repair is specified, taking into account the seriousness of the defect and the anticipated duration of the repair. Check for compliance with the served “Form K” will be undertaken upon the reporting of the completion of the repair by the RC or within 5 working days after the expiry of the repair period specified in the “Form K”. For non-compliant cases, the WSD will issue a “Waterworks Form J - Notice of Disconnection” within 2 working days after the re-inspection. Samples of “Form K” and “Form J” are in **Enclosure III**.

6. Current measures to detect and minimize water losses in the IS of residential developments include:

(a) **Inspection by WSD staff**

WSD’s meter readers (MRs) take meter readings regularly. If the readings indicate an abnormal high consumption of water, WSD consumer services inspectors (CSIs) will follow up to check if there is any leakage of the IS. Leaks identified will be reported and the RCs will be served with a notice for rectification under the WWR (as mentioned in paragraph 5 above).

(b) Action on receipt of complaints or reports

WSD CSIs conduct inspections of the IS concerned upon receipt of leakage complaints, requests from the consumers, and referrals from others. Same as (a) above, if a leaking IS is found, WSD will serve a notice under WWR requiring the RC to repair the defective IS.

(c) Network leakage monitoring in Waste Detection Areas

WSD has been monitoring the leakage of water supply networks in designated waste detection areas⁴ (WDA). It involves isolation of the network within a WDA at the night time and the conduct of various leak detection tests. Leakage within a WDA will be reflected by a high minimum night flow. Devices like noise loggers and leak noise correlators will then be deployed to pinpoint the leak locations. Details of leakage detection using leak noise correlators and noise loggers are given in **Enclosure IV**. Leakage, if any, found in the public water distribution network will be promptly repaired. If a leaking IS is found, the WSD will serve a notice under WWR same as (a) above. For suspected leakage of IS, the WSD will require the responsible party to investigate and rectify any identified leakage.

(d) Leakage monitoring of large housing estates

To monitor the water consumption of large housing estates (each comprising not less than 1,000 households), the WSD has been progressively installing, where practicable, **bulk meters**⁵ at targeted existing estates or **master meters**⁵ at new estates under the Master Metering Policy⁶ (MMP) Stage 1 (Details of the MMP are described in paragraphs 9 to 11 below). The consumptions recorded by the bulk meters or master meters are compared

⁴ WSD has been carrying out leakage monitoring based for waste detection areas (WDAs). Currently, WSD has established 1,055 WDAs in its network and the department is carrying out leakage detection in a 18-month cycle for each WDA.

⁵ Bulk meters are water meters installed outside and adjacent to the lot boundary of residential developments whilst master meters are water meters installed inside and adjacent to the lot boundary of residential developments. Up to date, WSD has installed bulk meters to 44 large housing estates and master meters to 34 new developments.

⁶ Master Metering Policy was introduced in 2004 to step up the tackling of water losses within residential developments due to leakage of the IS, by installing master meter within the lot boundary of residential developments. WSD is responsible for the maintenance of the master meters.

with the aggregate water consumptions recorded by individual household meters in the respective residential development. If there is suspected leakage in the IS, the WSD will require the responsible party to investigate and rectify any identified leakage.

EFFECTIVENESS OF CURRENT MEASURES

7. The number of “Form K” and “Form J” issued for leaking IS cases, disconnections after issue of “Form J” and repairs works successfully carried out in the past 3 years are shown in the table below.

Year	No. of Form K issued	No. of Form J issued due to non-compliance with Form K	No. of disconnections after issue of Form J	No. of cases of successful repairs
2008/09	3,645	695 (19% of Form K)	112 (16% of Form J) (3% of Form K)	3,533 (97% of Form K)
2009/10	3,546	770 (22% of Form K)	106 (14% of Form J) (3% of Form K)	3,440 (97% of Form K)
2010/11	3,747	992 (26% of Form K)	114 (11% of Form J) (3% of Form K)	3,633 (97% of Form K)

The above figures show that about 97% of the RC finally did carry out the repairs to the defective IS and comply with the notices issued by the WSD. This indicates that the serving of notices is an **effective** measure to minimize water losses.

8. Based on past experience, a small number of cases involved leaking underground mains inside the internal roads of large building estates, i.e. leakage in the communal pipes, whereby due to the large number of building units involved, the management company and the RCs encountered difficulties in consolidating a common view for the repairs. The management company often requires much longer

time to mediate with the owners/tenants of the building units, identify the exact location of the leaks and arrange for the repair by a contractor. In this regard, the WSD has to maintain close liaison with the management company to monitor the progress of the repair works. In view that a disconnection of the IS would affect quite a large number of building units, the WSD often takes a sympathetic view allowing time for the management company to tackle the issue. As such, a few of the aforesaid cases took a long time to settle.

9. Since September 2005, the WSD, with the support of the then Environmental Transport and Works Bureau, has been implementing Stage I of the MMP to new large developments. Commencing from January 2006, the developers have been required to provide meter rooms or chambers within the lot boundaries of their developments so that WSD can arrange installation of master meters therein. Up to end 2010, 71 master meters have been installed in 34 new developments including 2 new public housing estates.

10. At the time of MMP Stage I implementation, the WSD also tentatively planned to implement the Stage II MMP for existing large developments of not less than 1,000 households commencing from 2012, should a review of the experience gained in the Stage I MMP support it. Preliminary review of the Stage I MMP revealed that the management company of existing large developments might encounter great difficulties in providing the required space for the construction of master meter rooms or chambers (photograph of the piping system inside a master meter room is shown at **Enclosure V**) or identifying suitable positions for the installation of the master meters. The main reasons are:

- (i) the bulkiness of the master meters, which are mechanical meters of physical sizes ranging from about 300mm(L) x 180mm(W) x 200mm(H) to 500mm(L) x 450mm(W) x 500mm(H) commensurate with the large flow quantities they are to measure;
- (ii) the large size of the meter room or chamber due to the technical requirement of having sufficient lengths of straight pipes upstream and downstream of the meter for ensuring laminated flow for accurate flow measurement; and
- (iii) much space and modification of the plumbing system is required in order to minimize the need of interruption of water supply to the existing

developments⁷.

11. As an alternative, WSD has been pursuing installation of bulk meters outside the boundary of existing estates to detect possible IS leakage if space permitted.

NEW INITIATIVES BEING EXPLORED

12. While the WSD will continue to adopt the existing measures to detect leaking IS and to enhance the MMP, the following new initiatives are being explored in conjunction with the Development Bureau:-

(a) Enhancement of leakage detection by clamp-on meters

Conventional methods adopted for leakage detection and monitoring in WDAs rely heavily on the flow meters installed at strategic locations. To enhance the operations, clamp-on ultra-sonic meter is being considered for use in the leakage tests for WDAs and for the substitution of bulk meters and master meters. Photos of the clamp-on meter are in **Enclosure VI**. A pair of transducers is to be clamped on the water pipe at an appropriate location of the piping network. The main advantages of using this type of meter are the increased mobility and smaller impact to the existing plumbing systems. However, it is necessary to remove the sheath of the piping so that the transducer sensors will be in direct contact with the base material of the pipes concerned. Unless this is done, the accuracy of the flow measurement obtained will not be guaranteed. The WSD is conducting a trial to explore the operational use of such clamp-on ultra-sonic meters and to overcome the difficulties in measuring the quantity of water losses in existing residential developments.

(b) Design enhancement

From time to time, the WSD has made enhancements on the requirements of plumbing installations to minimize fresh water losses, reduce the

⁷ The installation of by-pass pipes is a pre-requisite for the installation of master meters. However, it is often very difficult to squeeze out additional space in existing residential developments for the purpose and the installation of by-pass pipes requires significant modifications to the existing plumbing which is also undesirable.

formation and ease the detection of leakage in IS. The enhancements already made include: (i) reduction of the minimum residual pressure for new developments and installation of break pressure tank/pressure reducing valve in the IS as the loss of water in case of leakage will be minimized under a lower water pressure; (ii) abandonment of the use of unlined galvanized steel pipes and the adoption of the use of thermoplastic pipe materials such as polyethylene to ensure that more corrosion resistant materials will be used in the IS; (iii) prohibition of the embedment of water pipes within load bearing structural elements to guard against pipes failing under excessive loading and to allow easier inspection and maintenance; and (iv) housing of fire hose reel outlets in glass-fronted cabinets secured under locks so as to prevent the loss of water through illegal usage. The WSD will continue to review and enhance the design requirements of plumbing systems as appropriate taking into consideration the overseas experiences, new technologies and opinions of various stakeholders of the trades.

(c) Inspection of inside services by consumers

It should be more convenient and effective for the consumers to make arrangements to identify and repair the leaking spots in their IS. Therefore, the requiring of consumers to carry out regular inspection of their IS would help arrest water losses. The approach is in line with those for maintenance of private slopes as well as building structures and ancillaries. In case the RCs raise the need of financial support for the repair works identified by the inspections carried out by the RCs, they can seek assistance from the Buildings Department “Building Safety Loan Scheme” which is applicable to water supply plumbing improvement works in buildings. The loan scheme covers all private buildings including domestic, composite, commercial and industrial buildings and could be a handy provision for those with acute financial needs.

(d) Publicity and Education

The WSD will enhance its publicity effort to promote public awareness of the importance of regular inspection and prompt repair of IS by the RCs. Related publicity campaigns in the form of announcement for public interest (APIs), bill messages, roving exhibitions, public seminars, and publicity pamphlets will be stepped up. Moreover, in the Water

Conservation Education Centre⁸ under planning, the WSD will provide guides for the general public on the inspection and repair of IS.

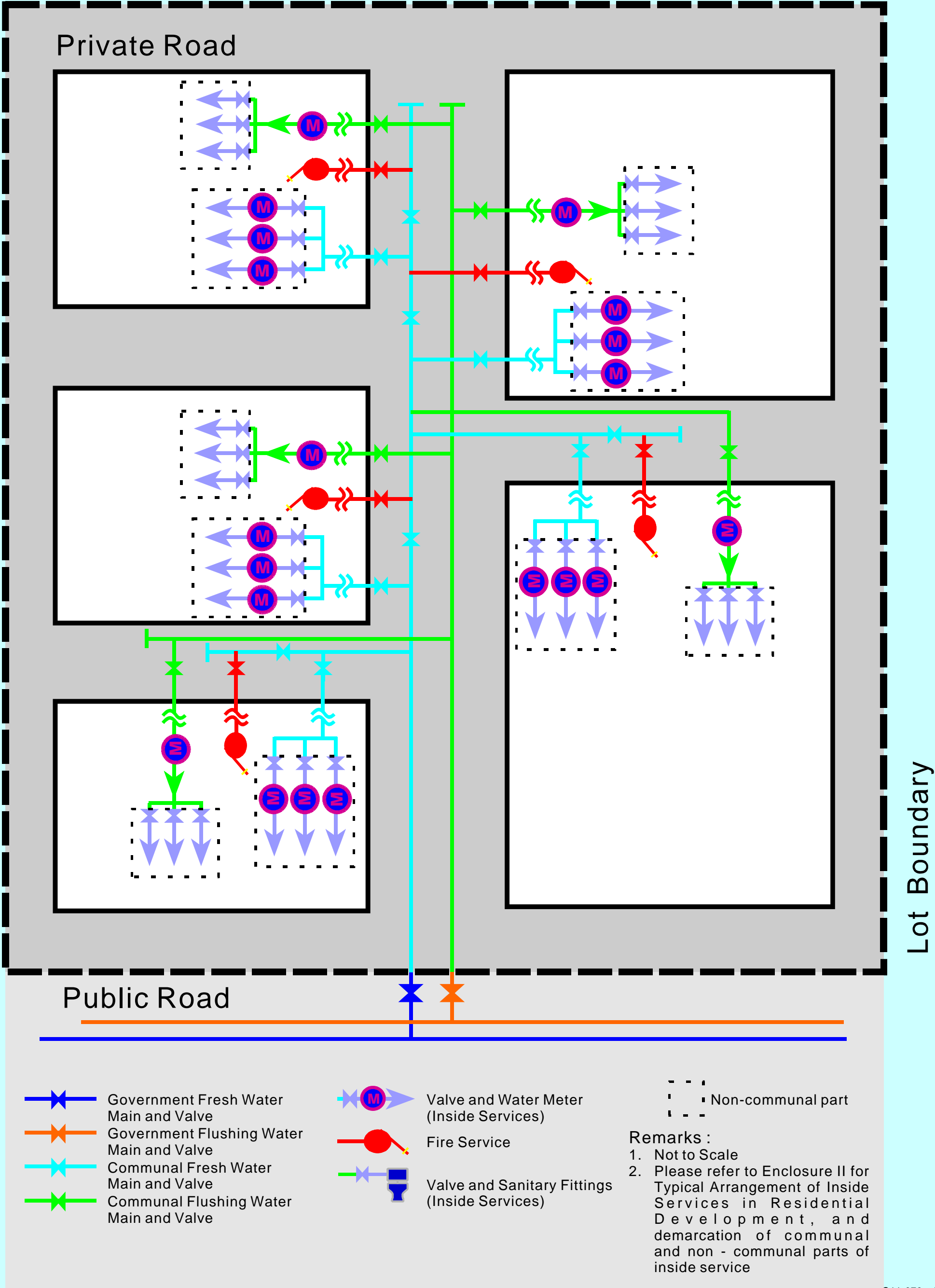
Development Bureau

Water Supplies Department

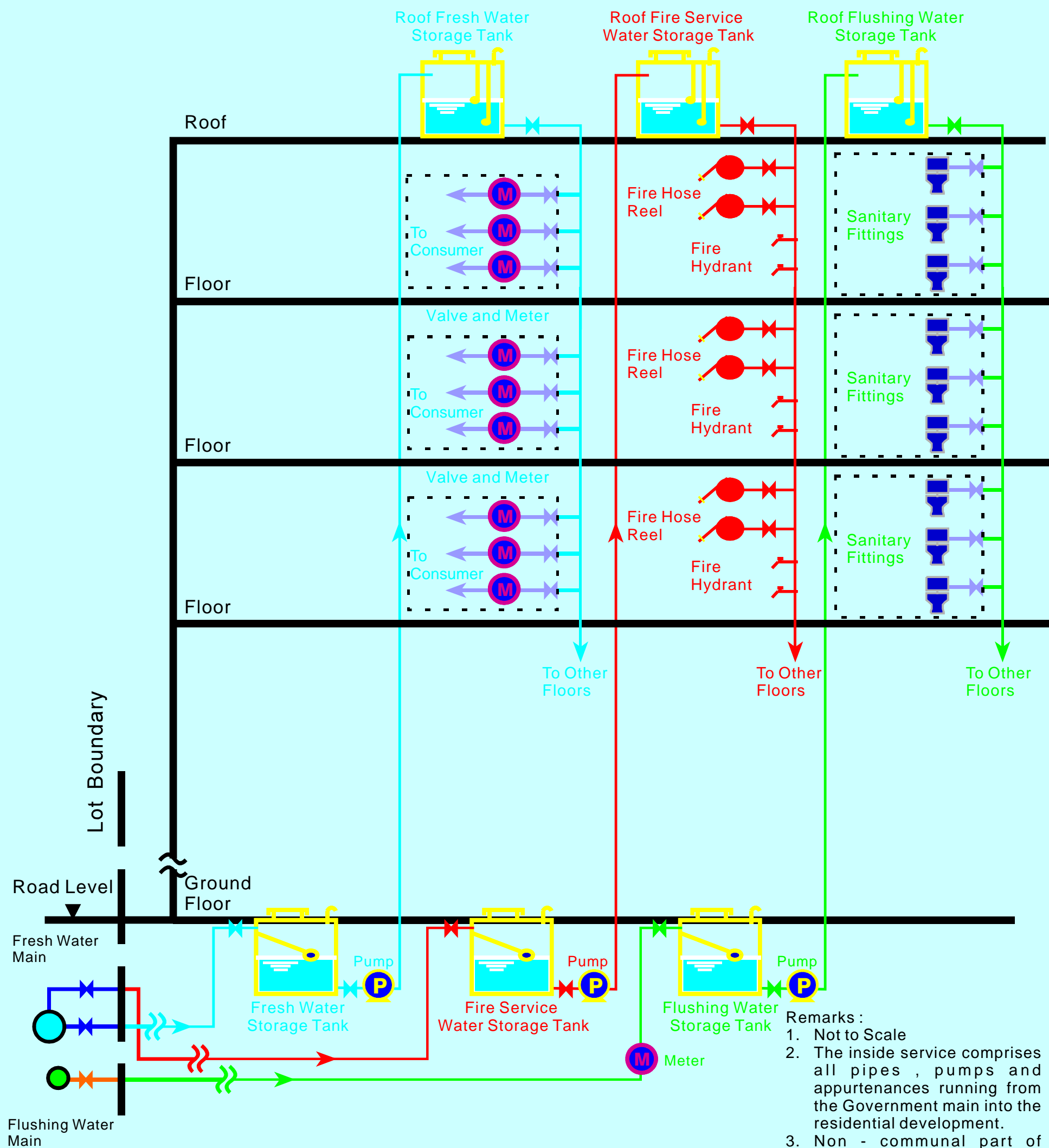
June 2011

⁸ WSD has a plan to open the temporary Water Conservation Education Centre (WCEC) at the existing Mong Kok Office by end 2011. A permanent WCEC will be set up at the future WSD New Territories West Regional Office.

TYPICAL ARRANGEMENT OF
INSIDE SERVICE IN RESIDENTIAL DEVELOPMENT



TYPICAL ARRANGEMENT OF
INSIDE SERVICE IN RESIDENTIAL DEVELOPMENT



- Remarks :
1. Not to Scale
 2. The inside service comprises all pipes , pumps and appurtenances running from the Government main into the residential development.
 3. Non - communal part of inside service is demarcated with the dotted lines - - -
 4. Communal part of the inside service is the remaining part of the inside service that has not been demarcated.

表格 K 的範本
Sample of Form K

附件 III
Enclosure III

Ref.:
Serial No.:



Water Supplies Department
Immigration Tower, 7 Gloucester Road,
Wan Chai, Hong Kong

Date: _____

**NOTICE REQUIRING THE CONSUMER TO CARRY OUT
REPAIRS OR OTHER WORKS**

Registered Consumer/Agent

Address

PREMISES
Account No.
Meter No.

After inspection, it has been found that the fire service or inside service of the above premises in certain respects does not conform to the requirements of the Waterworks Ordinance and you are requested hereby under Section 16 to have the repairs/alterations detailed below, carried out by a licensed plumber within _____ days and to report as soon as the work is completed.

If you require further information, this can be obtained from the duty Consumer Services Inspector/_____.

* 611 King's Road, Hong Kong. (Telephone _____)

* 128 Sai Yee Street, Kowloon. (Telephone _____)

* 9/F., WSD Kowloon East Regional Building, 11 Tai Yip lane, Kowloon Bay, Kowloon.
(Telephone _____)

* 12/F., Kowloon West Regional Building, 2 Lai Hong Street, Cheung Sha Wan, Kowloon.
(Telephone _____)

Works to be carried out:-

The following is an extract from Section 10(e) of the Waterworks Ordinance Chapter 102:

“The Water Authority may disconnect a fire service or inside service if 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.”

A service so disconnected will not be reconnected until the works have been carried out to the satisfaction of the Water Authority. A reconnection fee will be charged.

**delete whichever is inapplicable*

c.c. Occupiers and/or Building Management

(copy to be sent only if the service address is not the same as the mailing address or in the case of a communal service having a registered agent, BUT the address of the registered consumer or agent shall not be shown on the copy)

_____ for Water Authority

SAVE WATER – SAVE MONEY

要求用戶進行修理或其他工程通知書

檔案編號：

本通知書編號：

用戶 / 代理人：

地址：

用水樓宇：.....
用戶編號：.....
水錶編號：.....

經本署檢查後，發現上述樓宇的消防供水系統或內部供水系統在某些方面不符合水務設施條例的規定。現據該條例第 16 條，請你於 天內僱用持牌水喉匠進行下述修理 / 更改工程，並於工程竣工後立即向本署報告。

如你需要更多資料，可向當值用戶服務督察 / 查詢。

- 地點 — *
- * 香港英皇道 611 號 (電話：)
 - * 九龍洗衣街 128 號 (電話：)
 - * 九龍九龍灣大業里 11 號水務署九龍東區大樓 9 樓 (電話：)
 - * 九龍長沙灣荔康街 2 號水務署九龍西區大樓 12 樓 (電話：)

應進行的工程

現將香港法例第 102 章水務設施條例第 10(e) 條摘錄如下：

「若用戶或代理人收到根據上述條例第 16 條發出的通知書後，並無進行通知書內指明的修理或其他工程，則水務監督可截斷消防供水系統或內部供水系統的供應。」

凡因該等情況而截斷供應的供水系統，須待上述工程完成，並使水務監督滿意後，方能再行接駁。重新接駁供水須收取費用。

水務監督

(代行)

年 月 日

*請刪去不適用者

副本送交住戶 及/或 大廈管理處

(若郵寄地址和截水樓宇址不相同或通知書是寄給公用供水系統的註冊代理人，但副本不可顯示郵寄地址)

節省用水 —— 節省金錢

表格 J 的範本
Sample of Form J

NOTICE OF DISCONNECTION



Water Supplies Department

Immigration Tower, 7 Gloucester Road, Wan Chai,
Hong Kong

Date : _____

Ref :

To : (Registered consumer or agent)

Address :

Premises :

You are hereby notified that the water supply at the premises detailed above is to be disconnected after _____ days from the date of this notice under Section 10 of the Waterworks Ordinance for the reason stated below :-

Failure to comply with the requirement of the
Letter No. _____ dated _____
(A copy is attached for your reference)

for Water Authority

c.c. Occupiers and/or Building Management
(copy to be sent only if the service address is not the same as the mailing address or in the case of a communal service having a registered agent, BUT the address of the registered consumer or agent shall not be shown on the copy)

Note : If you have complied with the requirements of my notice Ref./Serial No. * _____
dated _____ please notify the District Inspector _____
on Telephone No. _____ or Fax No. _____

* Delete as appropriate

SAVE WATER-SAVE MONEY



截水通知書

水務署

香港灣仔告士打道七號入境事務大樓

檔號：

致：

先生/女士：

截水樓宇： _____

特此通知，本署將根據水務設施條例第 10 條的規定，於本通知書
發出日期起計 _____ 日後截斷上述樓宇的供水，理由如下：

未有按照本署 _____ 年 _____ 月 _____ 日 所發出之信件
編號 _____ 號的指示辦理有關工程(副本夾附)

水務監督
(_____ 代行)

副本送： 有關住戶 及/或 大廈管理處
(若郵寄地址和截水樓宇址不相同或通知書是寄給公用供水系統的註冊代理人，但副本不可顯示郵寄地址)

年 _____ 月 _____ 日

註： 如你已辦妥本署於 _____ 年 _____ 月 _____ 日 發出
檔號/編號* _____ 的通知書所載規定，
請致電 _____ 或傳真 _____ 通知分區督察 _____ 先生。

*請刪去不適用者

節省用水 —— 節省金錢

Leakage Control, Monitoring and Detection Works

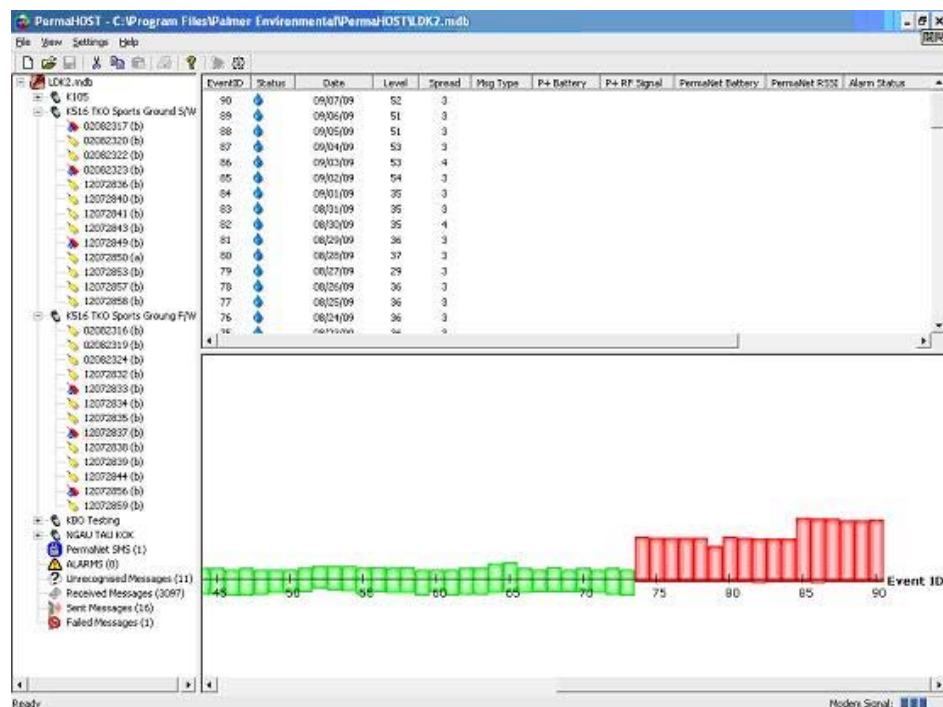
I. Locating leak with Noise Loggers



Typical Equipment



Typical Set-up

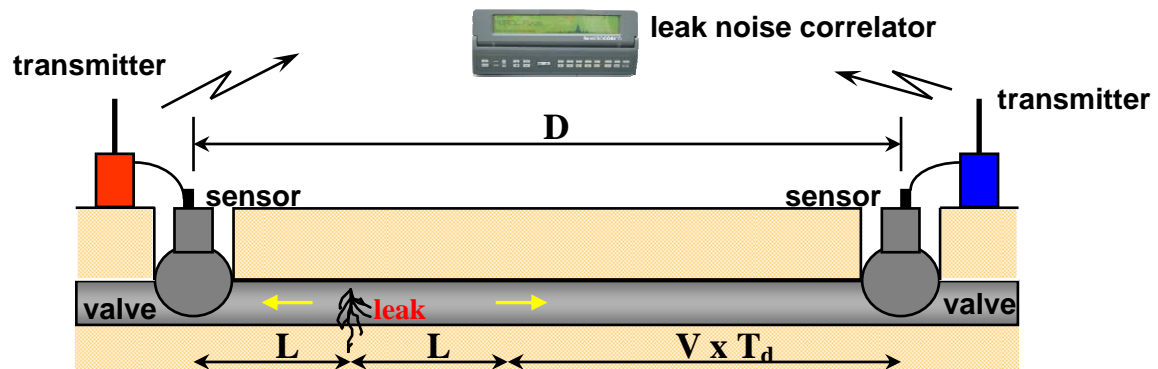


Illustrative Result

Note:

The bar above the horizontal axis represents the main noise level. The bar below the horizontal axis represents the spread of the noise level distribution. A high main noise level and narrow noise spread indicates a possible leak and is highlighted in red. A low main noise level and wide noise spread indicates “no leak” and is highlighted in green.

II. Pinpointing Leak with Leak Noise Correlator



Pinpoint Leak Location in a Pipe

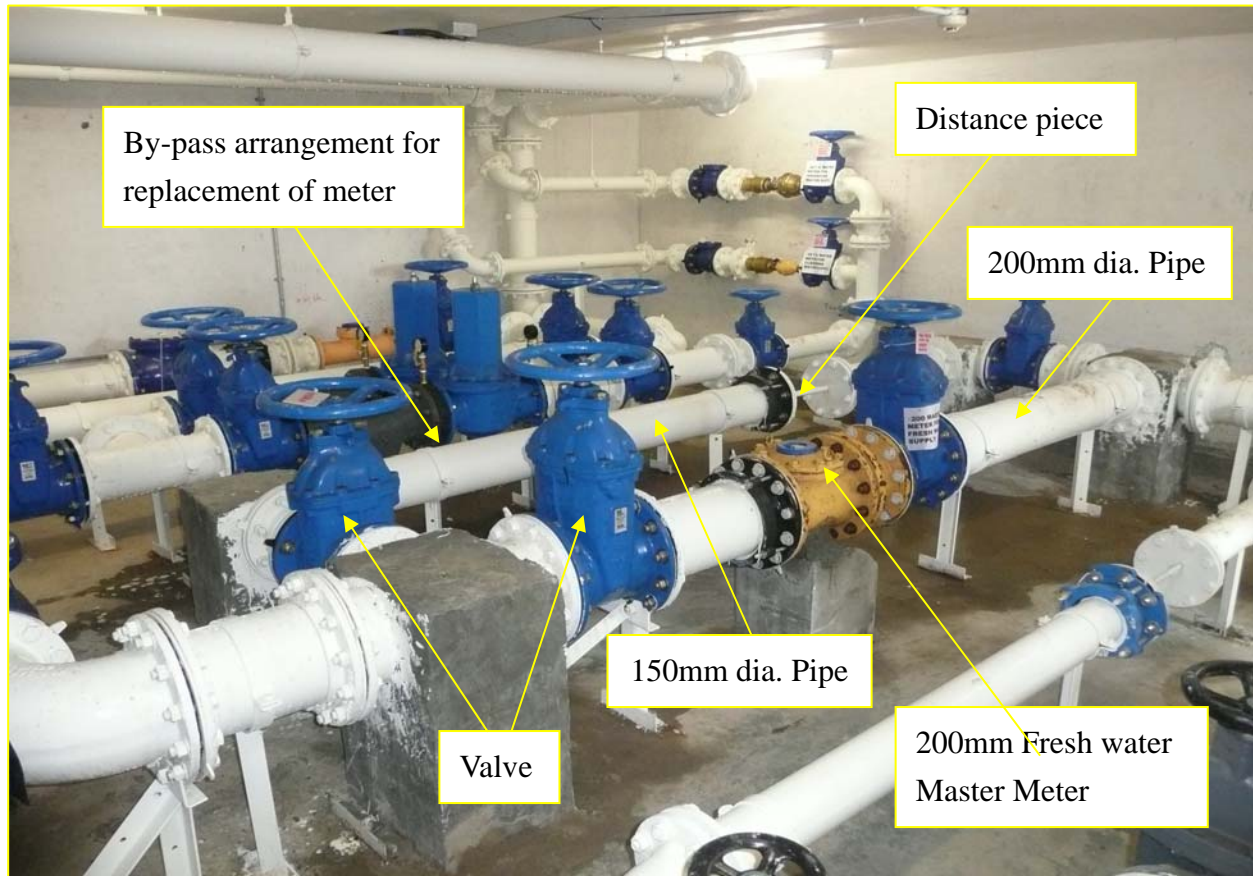
Note:

- (1) A leak noise correlator is used to pinpoint the location of a leak along a section of water main. Two sensors are deployed on the valves on either side of the suspected leak location. Before carrying out the pinpointing by using leak noise corrector, the distance between the two sensors (D), pipe diameter and the pipe material are required to be input to the leak noise corrector.
- (2) When there is a leak, the leak noise will propagate along the water main and reach the two sensors with a time difference T_d and then to the correlator via the transmitters. A correlation peak will be shown on the display screen of the correlator, indicating a possible leak.
- (3) The leak position is calculated by the correlator using the formula $L = (D - V \times T_d) / 2$, where T_d is the time difference and V is the sound velocity along the water main based on the input data.

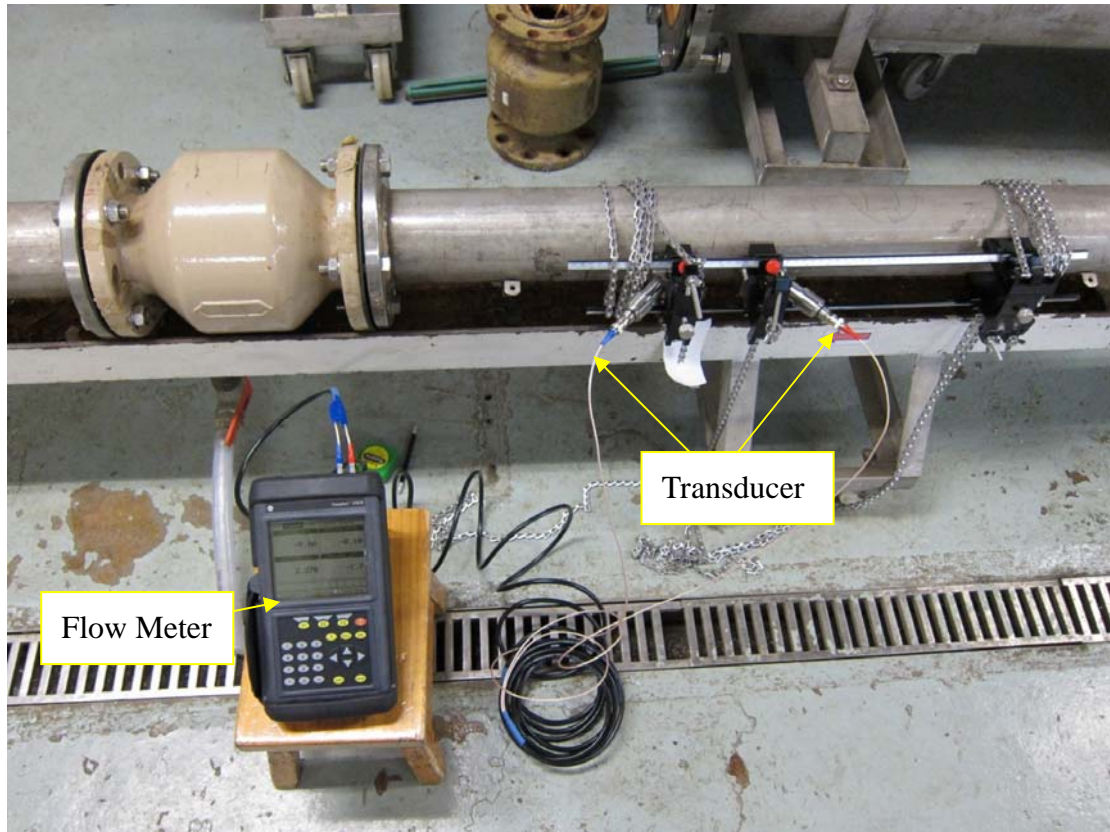


Taking Measurement

Enclosure V



Master Meter and Piping System inside a Master Meter Room



Clamp-on Meter