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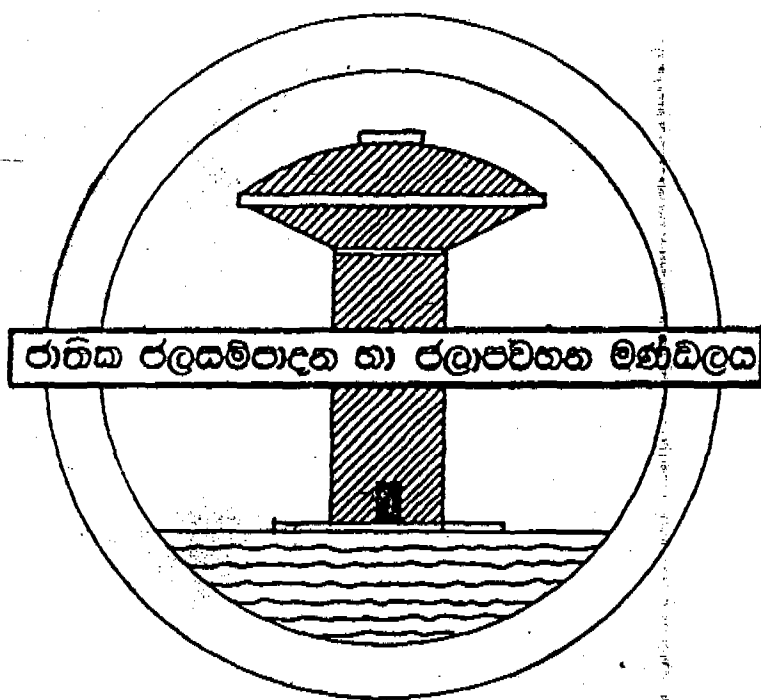
MINISTRY OF LOCAL GOVERNMENT, HOUSING AND CONSTRUCTION

**NATIONAL WATER SUPPLY AND DRAINAGE BOARD**

SRI LANKA

262.4

89 WA



MANUAL D-8

WATER SERVICE CONNECTIONS

March 1989

**WATER SUPPLY AND SANITATION SECTOR PROJECT**

(USAID SRI LANKA PROJECT 383-0088)

MANUAL D-8

WATER SERVICE CONNECTIONS

March 1989

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## WATER SERVICE CONNECTIONS

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## 1. INTRODUCTION

This Manual sets out procedures for design and installation of service connections to all types of premises. Its objective is to assist NWSDB and Local Authority staff in maintaining a good standard of service connection installations, and to assist builders, developers, engineers and architects in adopting approved service layouts. Aspects of service connection installations up to and including the meter are included. For details after the meter, and inside consumers' premises, reference should be made to Manual D9, Plumbing Code.

The new application procedure, (Annex A) should be followed and, with this Manual, should assist with the standardisation of connection procedures.

Materials and fittings used should comply with the relevant Sri Lanka Standards or British Standard where no Sri Lanka Standard exists.

The Manual was put together by G.A. Bridger of the USAID Project staff, in August 1988 using Ref. 1 (CP 310) and Ref. 2 as a foundation. Subsequently the draft manual was reviewed by NWSDB staff and revised and modified (with additional reference to the new BS 6700 which replaces CP 310) to become complementary with the Plumbing Code being prepared by Consultants.

The manual should be revised and updated on an annual basis by a Committee under the DGM (O&M).

## 2. SERVICE LOCATION

### 2.1 Service Pipe Location

Adopt the following guidelines:

- o Where possible, lay underground service pipes at right angles to the main and in approximately straight lines to facilitate location for repairs.
- o Locate service pipe within legal access to premises - avoid crossing land owned by others, even if permission is granted (subsequent owners may not agree).
- o Locate service pipe so that meter may be installed in front corner of property boundary (Fig. 1). NWSDB/LA should not be responsible for long lengths of service pipe inside consumers' premises.
- o Where building abuts a road, it may be necessary to locate service pipe so that meter may be installed at convenient place within building (Figs. 2 & 5).
- o The normal layout of service pipe should be according to Fig. 3. Meters shall normally be above ground except in special circumstances (see Section 3).
- o Underground piping shall have a minimum cover as follows:
  - 1.0 m under roads;
  - 0.6 m inside premises;
  - 0.8 m elsewhere outside premises.
- o Service pipes must not run beneath any building or wall foundations.
- o Stop valves shall be installed on each side of meter. The inlet stop valve shall not be a wheel or gate type valve and shall be provided by NWSDB. The outlet stop valve shall be provided by the consumer.
- o In designing and planning the layout of pipework, attention should be given to the maximum rate or discharge required, economy in labour and materials, accessibility, protection against damage and corrosion, and avoidance of airlock, noise transmission and unsightly arrangements.
- o Changes in diameter and in direction should preferably be gradual rather than abrupt to avoid undue loss of head.

- o Where piping has to be laid in any ground liable to subsidence then special consideration should be given to the type of pipes and joints to be used in order to minimise risk of damage due to settlement. Where piping has to be laid across recently disturbed ground, continuous longitudinal support should be provided and not merely supporting piers at intervals.

2.2 One Connection per Consumer (and One Consumer per Connection)

Adopt the following guidelines:

- o There shall be one service pipe and meter for each consumer. If an existing service pipe becomes inadequate to provide the required flow, it shall be closed and abandoned and replaced by a new service.
- o For large consumers such as colleges/hospitals, etc. where several connections already exist, negotiate with the consumer for provision of one connection only to a storage tank. Distribution within the property shall be the responsibility of the consumer. All other connections must be removed.
- o Each consumer shall have a separate service pipe. Where an existing building is subdivided into two or more units, the owner(s) shall install all necessary piping to allow separate metering of each unit according to NWSDB requirements.
- o Allow only 1 connection per apartment block. For blocks where each apartment is now metered in an unsatisfactory way, negotiate with block owner/manager and either:
  - (i) Remove individual meters and meter each apartment block. The block owner/manager must be responsible for paying the bill and collecting water rates from each tenant/owner, or
  - (ii) Install (at block owner's expense) new service pipes to each apartment so that meters can be fixed in an accessible, safe and standard location, adjacent to the supply tank (likely to be costly).

## 2.3 Cross Connection Control

Adopt the following guidelines:

- o There shall be no inter-connection or cross connection between any pipe or fitting containing NWSDB/LA supplied water and a pipe or fitting containing water from any other source. The provision of reflux or non-return valves or closed and sealed stop-valves is not a permissible substitute for complete absence of connection.
- o The design of pipework shall allow no possibility of backflow towards the source of supply from any cistern or appliance, whether by back-siphonage or otherwise. Valves cannot be relied on to prevent such backflow.
- o Where a supply of NWSDB/LA water is required as an alternative or standby to a supply of water from another source or is required to be mixed with the latter, it shall be delivered into a cistern by a pipe or fitting discharging into the air at a height above the top edge of the cistern equal to twice its nominal bore, and in no case less than 150 mm (see Fig. 4).
- o All pipework shall be so designed, laid, fixed and maintained to be completely watertight, thereby avoiding waste of water, damage to property and the risk of contamination of the water conveyed.
- o No piping shall be laid in or through any sewer or drain or any manhole connected therewith, nor in ground contaminated by sewage. Farmyards, animal pens and cesspools should be avoided.



### 3. METER INSTALLATION RULES

#### 3.1 Small Meters (12-50 mm)

- o In all cases the meter shall be accessible to the meter reader; i.e. not too low down or high up, not facing the wrong way, or otherwise inaccessible.
- o The meter location shall not be an obstruction or hazard to public or consumer safety.
- o Horizontal type meters shall only be fixed horizontally - follow the instructions of the meter manufacturer. Vertical type meters may be installed either vertically or horizontally.
- o pipework shall be adequately supported but leaving sufficient room for changing the meter with the connections provided.
- o Fix the meter a minimum of 300 mm above ground, in a location not liable to be flooded or buried, and safe from damage or tampering. This should normally be in front corner of yard just inside the property boundary (Section 2.1 and Figs. 1 and 3).
- o If there is no front yard and the meter has to be installed inside building, fix the meter in a convenient place with access so that it may be easily read (Figs. 2 and 5).
- o If location outside the building and yard cannot be avoided, install meter in a lockable box, which should preferably be recessed into the wall (Fig.6).
- o In special circumstances, where above ground or inside meter location is not feasible, then meter should be installed below ground in a meter box (Fig. 7).

#### 3.2 Large Meters (75-200 mm)

Adopt the following guidelines:

- o Meters shall be installed in front corner of property boundary, as for small meters. Location outside premises shall not be permitted.
- o If the location is safe from damage and vandalism, above ground installation is preferred (as Fig. 3).
- o If the location is not safe, above or below ground level installation in a meter chamber is necessary. The chamber must be above normal water table level and have a small accessible cover for meter reading (Figure 8).

- o For accuracy of metering, sufficient length of straight pipe must be allowed before and after meter. Refer to meter manufacturer's installation instructions or Fig. 9.

### 3.3 Apartment Blocks and Terraced Housing Units

Depending on the particular site situation, one of the following alternatives should be used:

- (i) One large meter per block, is preferable to individual apartment meters. (Figs. 10 and 11). Note that submeters may be installed and maintained by the building owner, if he wishes.
- (ii) If installation of a master meter is not feasible (this should not be the case on new buildings) locate individual apartment meters in a standard location with a label denoting apartment numbers (figs. 12, 13 and 14)
- (iii) If desired, a master meter may be installed in addition to individual sub-meters, all billed separately by NWSDB. The building owner/manager would be responsible for all water recorded by the master meter after deduction of all sub-metered consumption within the building.

### 3.4 Tall Building Systems

In tall buildings the mains pressure may be insufficient to reach the higher storeys and NWSDB should be consulted on the provision of water supply to the building at a very early stage. In general, the following supply systems will be suitable (the height range given will depend on system pressure at road level):

	<u>Height of Fittings</u>	<u>Method of Supply</u>
(i)	Level of highest fitting less than 10 metres above road level	Direct
(ii)	Level of highest fitting above 10 metres but less than 15 metres above road level	Indirect supply through high level storage cistern
(iii)	Level of highest fitting above 15 metres above road level	Indirect supply through low level cistern with pumping to high level cistern.

The mode of supply of water to tall buildings beyond the reach of direct mains pressure will be as given in (ii) above. The water from the main will flow through a master meter to a low-level cistern with ballvalve control. From the low-level cistern, pumps (with duplicate in case of breakdown) will deliver the water to high-level storage cisterns of 24 hour storage capacity to cater for breakdowns and emergencies. The high-level storage cisterns are to be provided in duplicate and the pipework so arranged to enable maintenance and cleaning to be carried out without interruption of water supply. The building owner/manager will be responsible for maintenance of the low level/high level cisterns, pumps and all piping and fittings after the master meter.

In tall buildings, fittings should not be subject to pressures greater than 30 metres head. This can be achieved by the provision of intermediate cisterns and pumps or by the use of pressure reducing valves. Water requirements for fire-fighting purposes should not be stored in potable water storage cisterns, unless arrangements are made in the design, to be approved by NWSDB/LA, that the combined storage will not cause stagnation and/or contamination of the water stored

Where a building is divided into apartments or other separately occupied parts which are supplied from a common service pipe, there should be a stopvalve to control the supply to each apartment, fixed after the meter so as to be under the control of the occupiers. Another stopvalve should be fixed before the meter to facilitate installation and removal of the meter by NWSDB/LA. The service pipe should be so arranged that it does not pass through any part of the building on its way to give a supply elsewhere.

## 4. PIPE AND METER SIZING

(Extracted from BS 6700 : 1987)

### 4.1 Pipe Sizing

The sizes of the pipes and fittings used in a water service shall be such as will provide an adequate rate of delivery of water without recourse to wasteful oversizing.

The installation shall be sized so that the design flow rates given in Table 1 will be available at each outlet when only that outlet is open and at all outlets for most of the time; simultaneous use of outlets may reduce flow rates, sometimes to below the design values.

In addition the pipes and fittings shall be sized so that the water velocity in any pipe does not exceed those given in Table 2.

The design flow rates to storage cisterns shall be determined by dividing the cistern capacity by the filling time. Where individual houses or flats are supplied from individual minimal sized storage cisterns filling time shall be less than 1 h. For larger installations filling times can be 4 h or more depending upon usage.

A method of calculating pipe sizes is given in Annex B.

### 4.2 Meter Sizing

A guideline for sizing consumer meters is given in Table 3.

## 5. MATERIALS AND WORKMANSHIP

### 5.1 Pipe Materials

In choosing the material of pipes and fittings, account should be taken of the character of the water to be conveyed and of the nature of any ground in which the pipe is to be laid. The material should be resistant to possible corrosion, both inside and outside, or should be suitably protected against corrosion, and should have no effect on the quality of the water conveyed.

Generally, uPVC pipe to SLS 147 Class 1000 shall be used for service connections. The NWSDB prohibits the use of unlined cast iron, bare mild steel and lead pipes to convey potable water. Wherever possible unlined galvanised iron pipes are not to be used.

#### Unplasticised PVC Pipe

Plastic pipe is particularly useful in circumstances where soil or water conditions would cause metal pipes to corrode. The most commonly used material is unplasticized polyvinyl chloride which is a rigid material with great tensile strength. PVC pipes are far lighter in weight than other pipe materials thus giving great advantages in handling and transportation. Their smooth bore induces better flow characteristics than those encountered in metal or asbestos cement pipes, as there is no corrosive attack. PVC pipe is easily sawn to length and, in comparison with other materials, will often be more competitive in price. PVC pipe must comply with SLS 147: 1983.

PVC has a high rate of thermal expansion and allowance must be made for this in PVC pipe installations. The pipe system must provide for freedom of movement and ample support must be provided to remove the danger of increased stress being placed on junctions and joints. This material is not suitable for use with hot water.

#### Polyethylene Pipe

Polyethylene pipe to BS 6572 is suitable for services laid below ground or for above ground use, providing the pipe is not exposed to direct sunlight.

## 5.2 Workmanship

PVC pipe joints - small diameter PVC pipes are jointed by using special jointing solvents provided by the pipe maker. Joints may be of the spigot and socket type, having the socket formed integral with the pipe or, alternatively, separate sleeves may be used. Joints for sizes of 75 mm bore upwards are of the spigot and socket type made with jointing solvents; flanged joints are also available. Flexible joints may be used in conjunction with plain-ended pipes .

Small diameter plastic pipes may be jointed to metal piping by means of union adaptors. For PVC pipes of 75 mm bore and upwards, flexible joints or flanged joints may be used.

Service pipes - adopt the following guidelines:

- o Service pipes of less than 50 mm bore are usually connected to mains by means of right-angled screw-down ferrules of non-ferrous metal; 25 mm and 20 mm ferrules should not be used in mains of less than 100 mm bore. The main is drilled and tapped and the ferrule screwed in; this may be done by an under-pressure-tapping machine which prevents any interference with the use of the main.
- o Service pipes may be connected to mains of asbestos-cement, PVC, or thin-walled steel by means of a ferrule screwed into a saddle of iron or steel, copper-alloy or plastic secured to the main by bolts or wedges. Ferrous metals should be suitably protected. A special tool is required for tapping PVC to prevent the formation of swarf.
- o Service pipes of 50 mm bore and upwards should be connected to special branch pipes inserted into the line of the main. Special branch pipes should also be used for service pipes of less than 50 mm bore where the bore of the main is not much greater than that of the service pipe.
- o Precautions against contamination of the main should be taken when making a connection, and where any risk exists, the main should be subsequently sterilized.

- o A surface box, mounted on a guard, should be fixed over the underground stopvalve to give access for operating the latter. The limited space provided by this arrangement will not permit the repacking of the stopvalve gland or other repairs to be carried out without excavation, which is necessary to give adequate space and to prevent the danger of contamination of the interior of the stopvalve by any local filth. The guard may be supported on bricks, and should not rest on the service pipe.
- o Every underground pipe entering a building should do so at a level not less than 500 mm below the outside ground surface unless, due to some obstruction, it is not practicable to do so in which case the pipe shall be at the greatest depth that is reasonably practicable. At the point of entry the pipe should be accommodated in a sleeve which should have previously been solidly built in, and the space between the pipe and sleeve should be filled with bituminous or other suitable material for a minimum length of 150 mm at both ends to prevent the passage of water, gas or vermin.
- o Care should be taken to ensure that all piping and fittings are clean internally, and free from particles of sand, soil, metal filings and chips, etc, which besides causing obstructions might lead to failure by corrosion or damage to fittings.

### 5.3 Disinfection

All mains and services to be used for water for domestic purposes should be thoroughly and efficiently disinfected before being taken into use, and after being opened up for repairs. The disinfection of mains should be carried out by specialists. Service pipes should if possible be disinfected together with the mains. Storage cisterns and distributing pipes can be disinfected as follows:

The cisterns and pipes should first be filled with water and thoroughly flushed out. The cistern should then be filled with water again and chlorine solution added gradually while the cistern is filling to ensure thorough mixing. Sufficient chemical should be used to give the water a dose of 50 parts of chlorine to one million parts of water (50 mg/l). If ordinary "bleaching powder" is used, the proportions will be 150 gm of powder to 1000 litres of water: the powder should be mixed with water to a creamy consistency before being added to the water in the cistern. If a proprietary brand

of chemical is used, the proportions should be as instructed by the makers. When the cistern is full, the supply should be stopped, and all the taps on the distributing pipes opened successively, working progressively away from cistern. Each tap should be closed when the water discharged begins to smell of chlorine. The cistern should then be "topped up" with water from the supply pipe and with more chlorine in the recommended proportions. The cistern and pipes should then remain charged for at least three hours, whereupon a test should be made for residual chlorine; if none is found, the disinfection will have to be carried out again.

Finally, the cistern and pipes should be thoroughly flushed out before any water is used for domestic purposes.

#### 5.4 Testing and Inspection

- o When the service is complete, it should be slowly and carefully charged with water, prior to backfilling, allowing all air to escape and avoiding all shock of water hammer. The service should then be inspected under working conditions of pressure and flow.
- o All piping and fittings should be checked for satisfactory support, and protection from damage and corrosion.
- o Record drawings showing service pipe layout and valve position should be kept up-to-date and inspection undertaken to ensure that any subsequent work has not introduced cross-connections or any other undesirable feature.

#### 5.5 Backfilling

- o Where the pipes are unprotected by concrete haunching, the first operation in filling shall be carefully to hand-pack and tamp selected fine material around the lower half of the pipes so as to buttress them to the sides of the trench.
- o The filling shall then be continued to 150 mm over the top of the pipe using selected fine hand-packed material, watered and rammed on both sides of the pipe with a wooden rammer. On no account shall material be tipped into the trench until the first 150 mm of filling has been completed. The process of filling and tamping shall proceed evenly so as to maintain an equal pressure on both sides of the pipeline.



- o Filling shall continue in layers not exceeding 150 mm in thickness, each layer being watered and well rammed.
- o When pipes are laid under roads and pavements subjected to heavy traffic loads, the trenches may be covered with reinforced concrete slabs of suitable dimensions.

## 6. MAINS IN PRIVATE STREETS

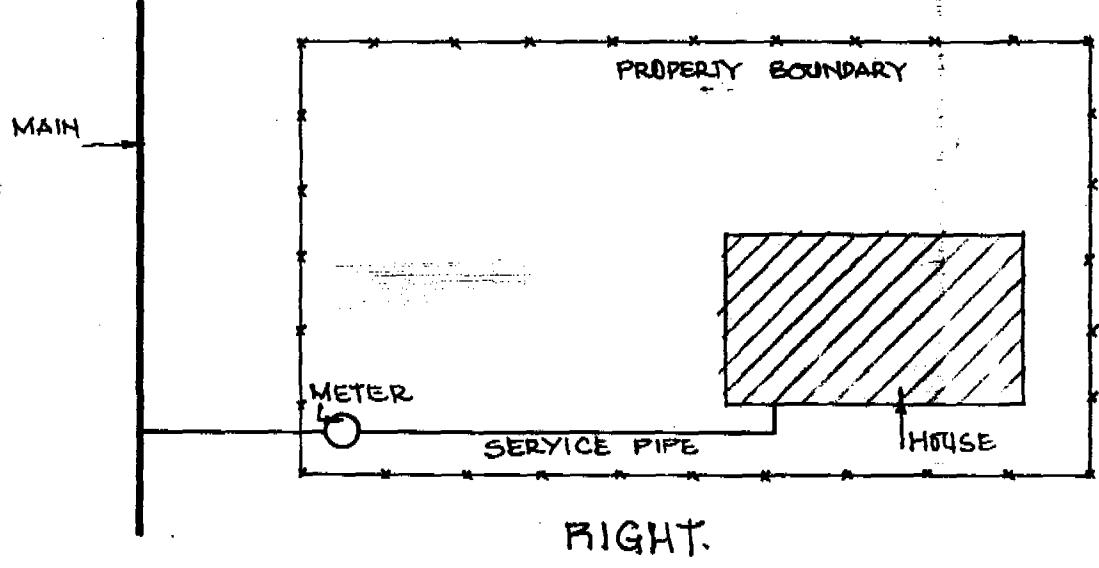
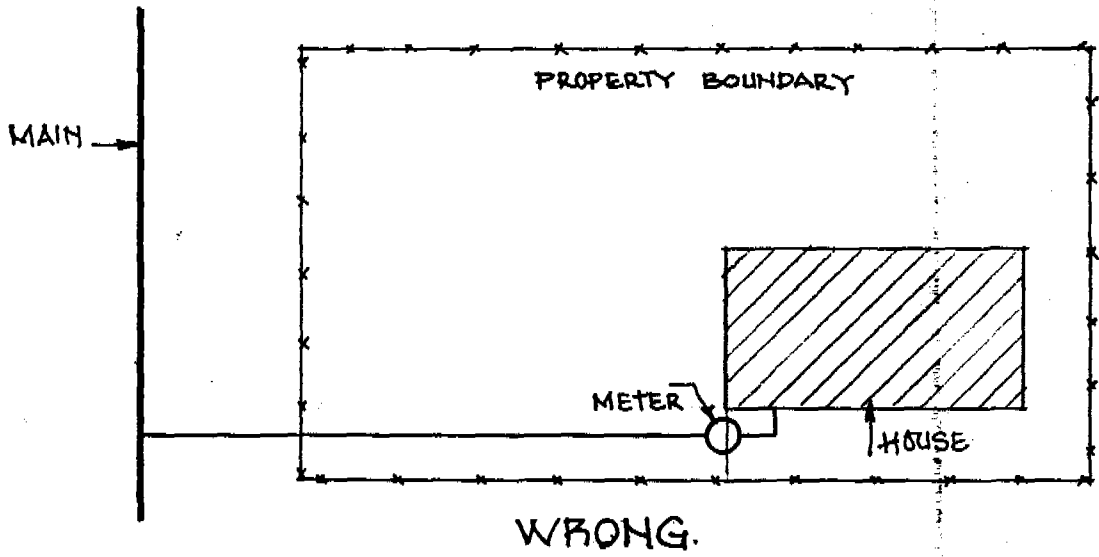
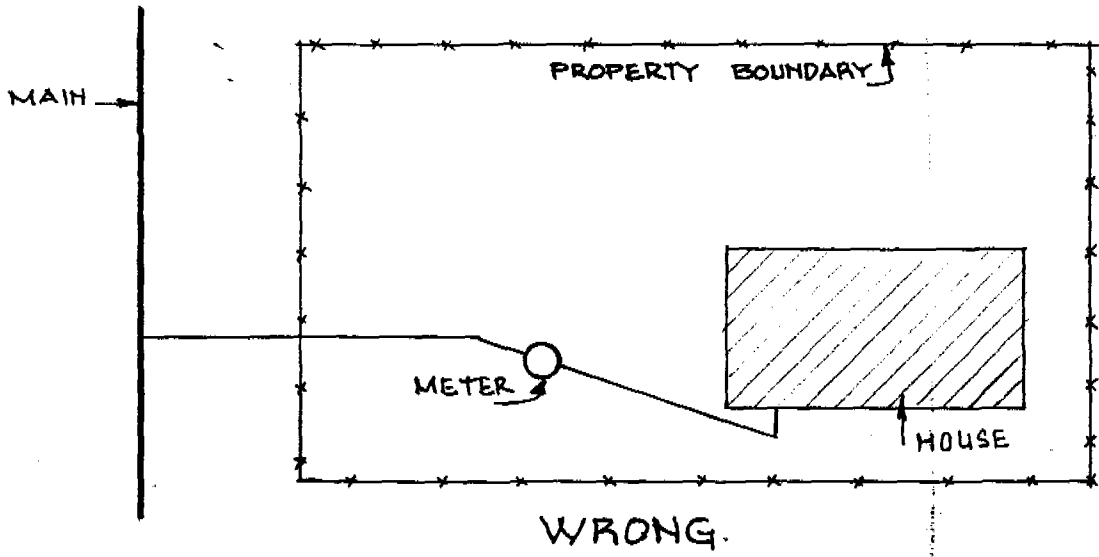
The NWSDB Law No. 2 of 1974, Section 24 sets out the statutory requirements for laying or enlarging water mains along private streets (reproduced in Annex C).

This has been developed by the Greater Colombo management into a Board Paper which is described in a letter from DGM (F) to AGM (GC) dated September 15, 1988 (reproduced in Annex D).

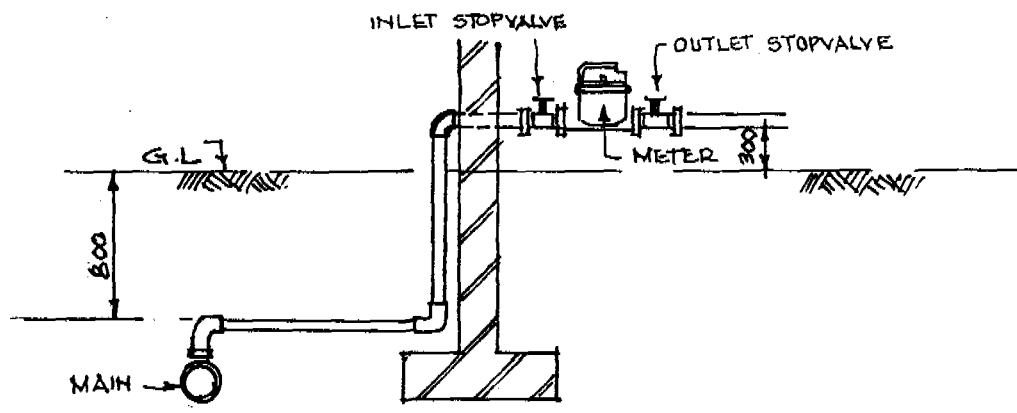
Refer to these two documents for the policy and procedure with regard to laying of water mains in private streets.

## R E F E R E N C E S

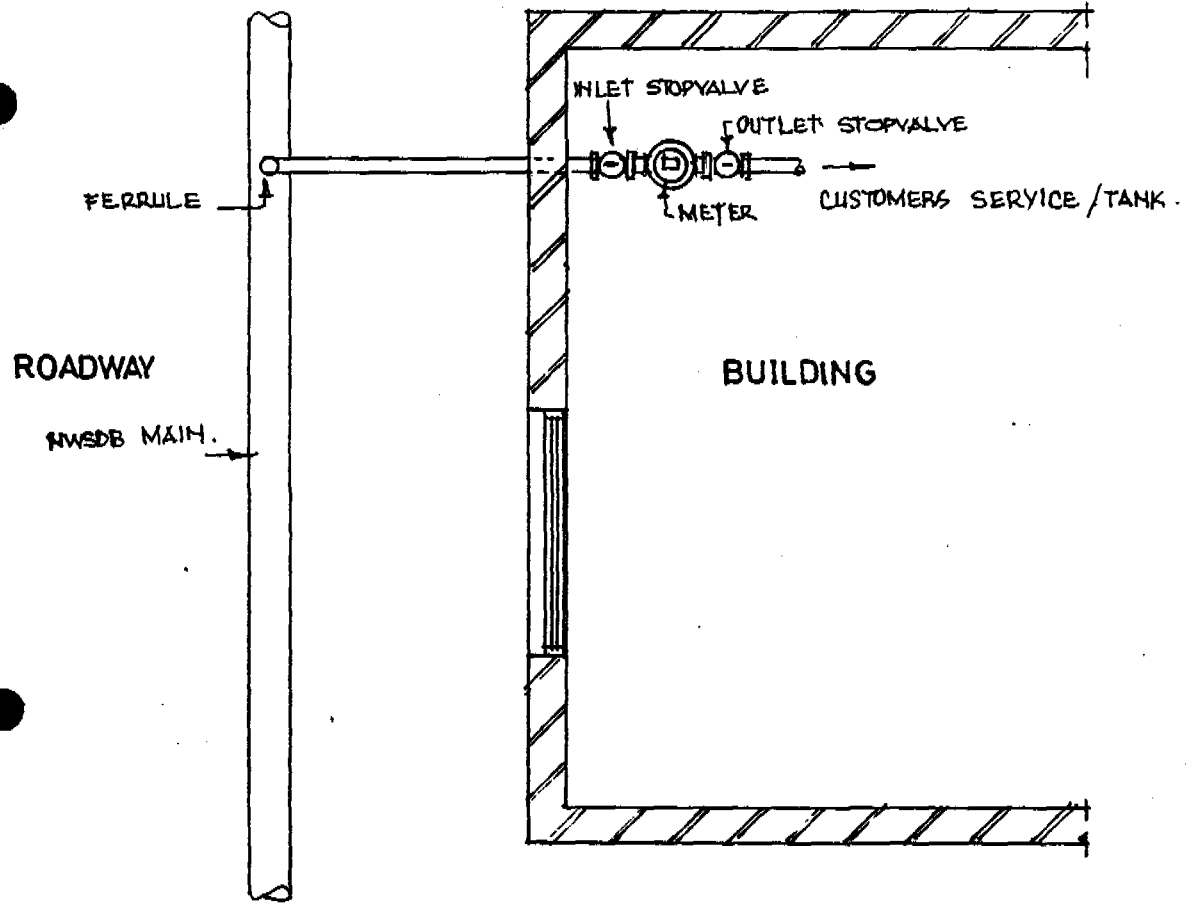
1. British Standard Code of Practice, CP 310: 1965: Water Supply
2. Public Utilities Board, Singapore, Code of Practice on Water Services, 1981
3. British Standard Specification for Design, installation, testing and maintenance of services supplying water for domestic use with buildings and their curtilages, BS 6700: 1987.
4. Sri Lanka Standards Institution, Yearbook, 1988.
5. Water Research Centre, U.K. Water Supply Byelaws Guide, 1986.
6. Government of Sri Lanka, NWSDB Law No. 2 of 1974, of the National State Assembly.
7. Government of Ceylon Legislative Enactments, Colombo Municipal Council Waterworks Ordinance, 1956 Revision, 1960.



STANDARD SERVICE PIPE LOCATION.  
(RIGHT & WRONG)



ELEVATION



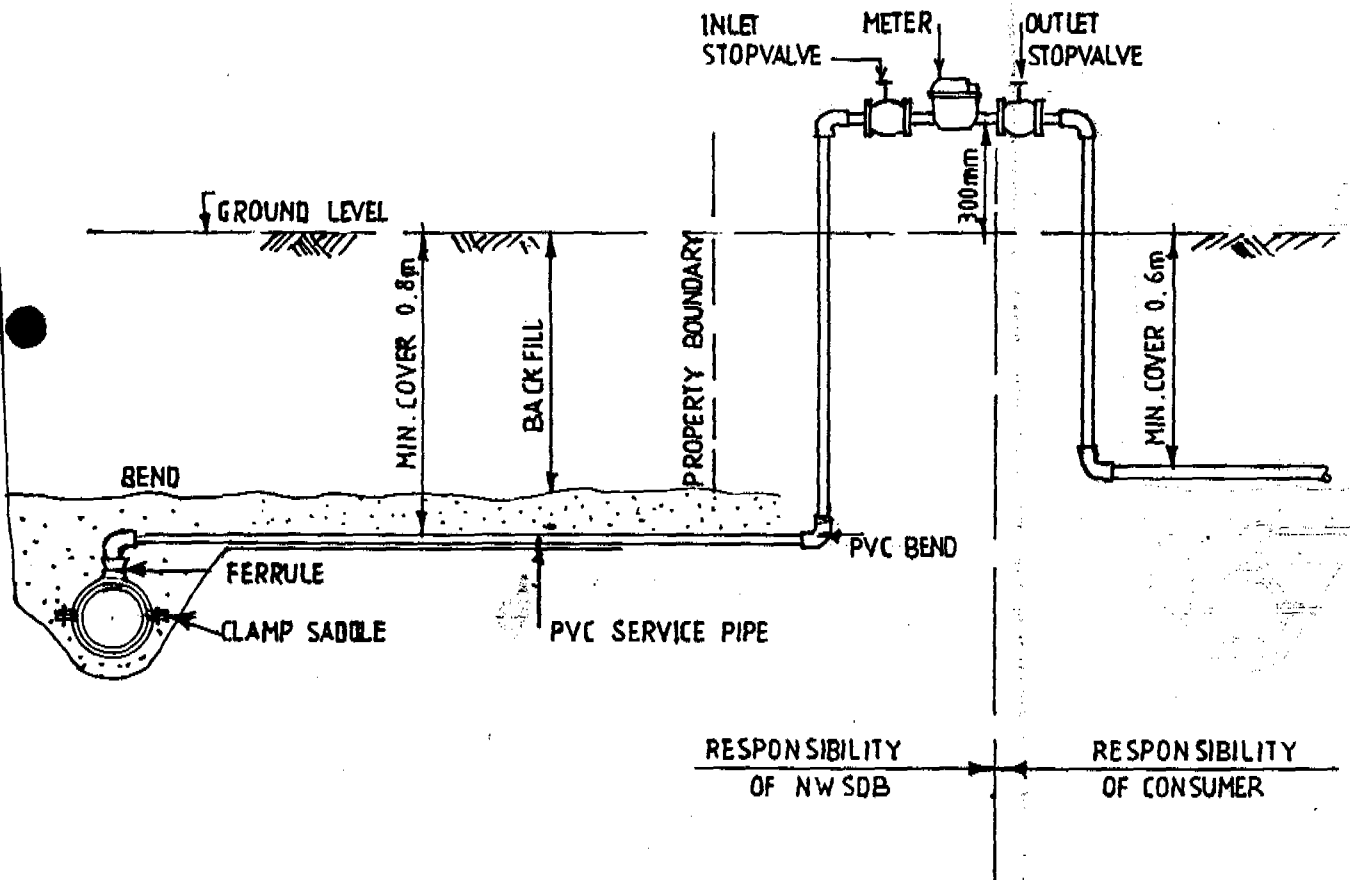
PLAN.

NOTE:

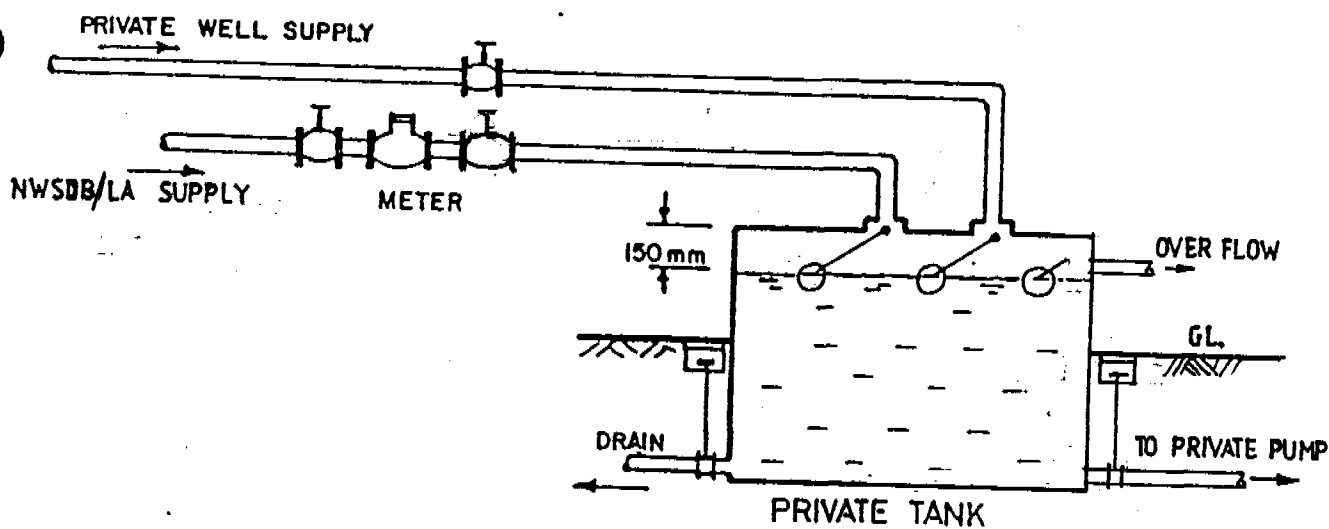
1. LOCATE SERVICE & METER AT SIDE OF PROPERTY IF POSSIBLE.
2. SERVICE LINES MUST NOT BE LAYD BENEATH BUILDING FOUNDATIONS.

SERVICE PIPE LOCATION  
(NO FRONT YARD)

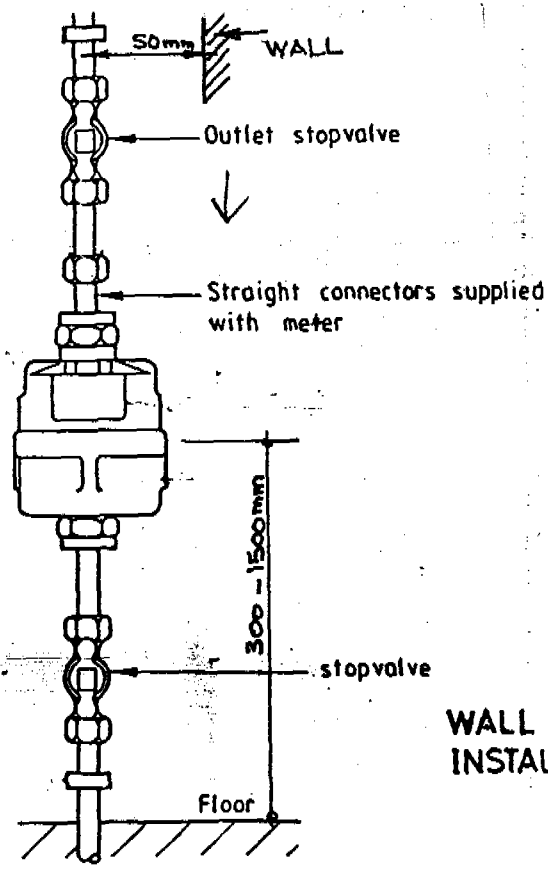
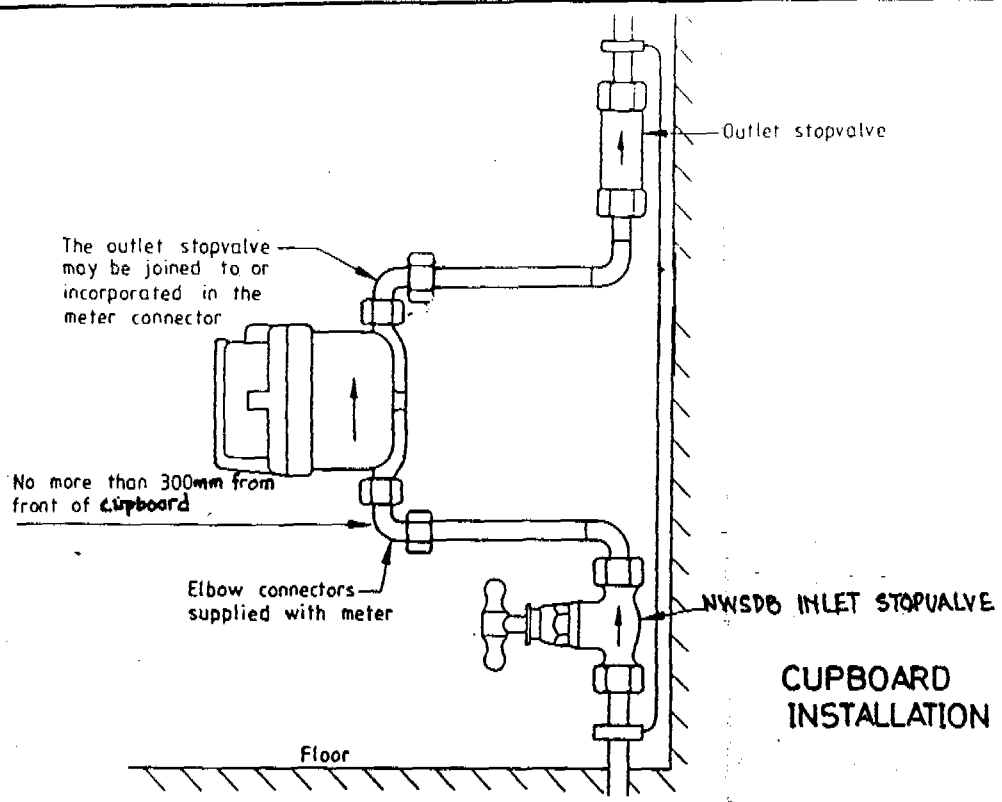
FIGURE - 2.



NORMAL SERVICE PIPE LAYOUT

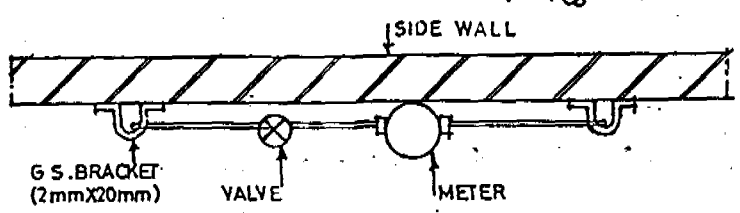


TYPICAL CONNECTION WITH  
DUAL SUPPLY SOURCES



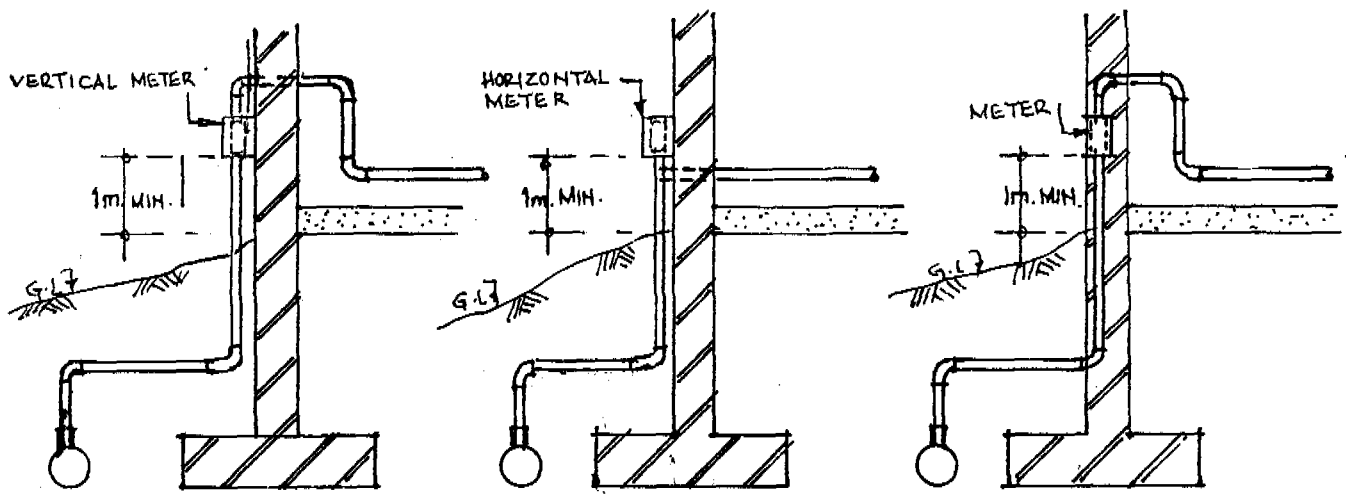
**NOTE:**  
METER SHOULD BE POSITIONED FOR EASY READING.

**WALL INSTALLATION**

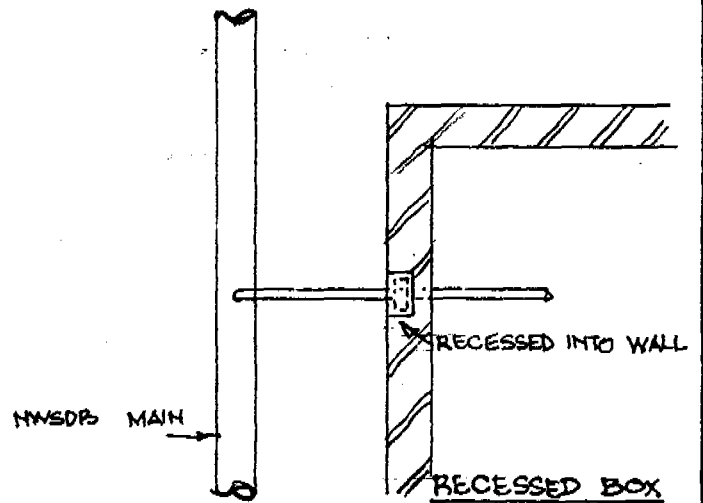
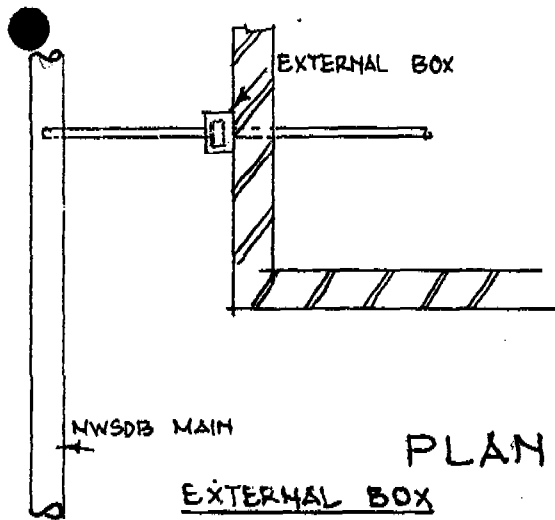


**PLAN**  
DETAIL OF SIDE WALL SUPPORT

**TYPICAL INDOORS METER INSTALLATION**



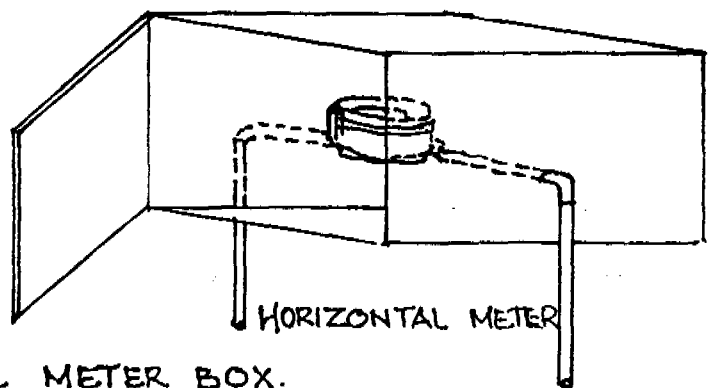
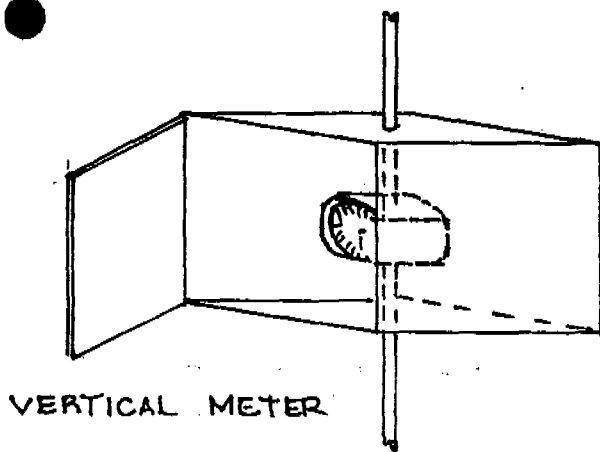
ELEVATIONS.



PLANS.

EXTERNAL BOX

RECESSED BOX

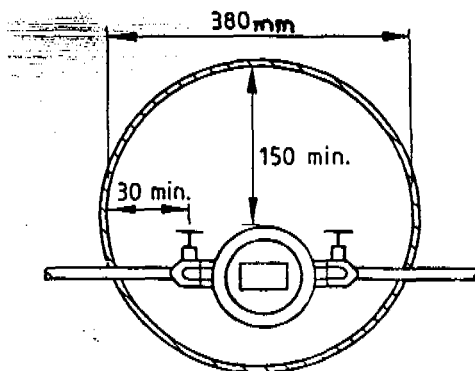
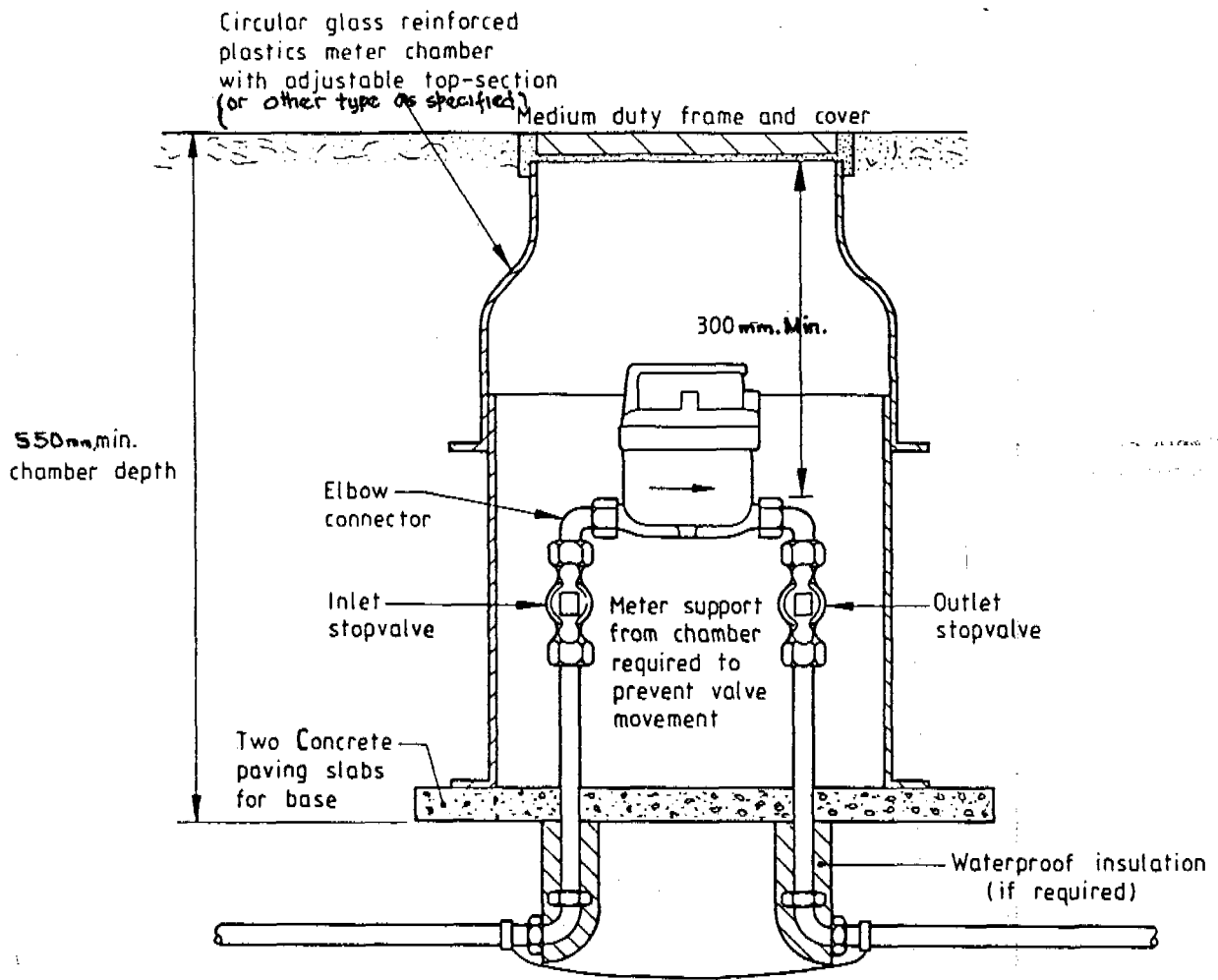


EXTERNAL METER BOX.

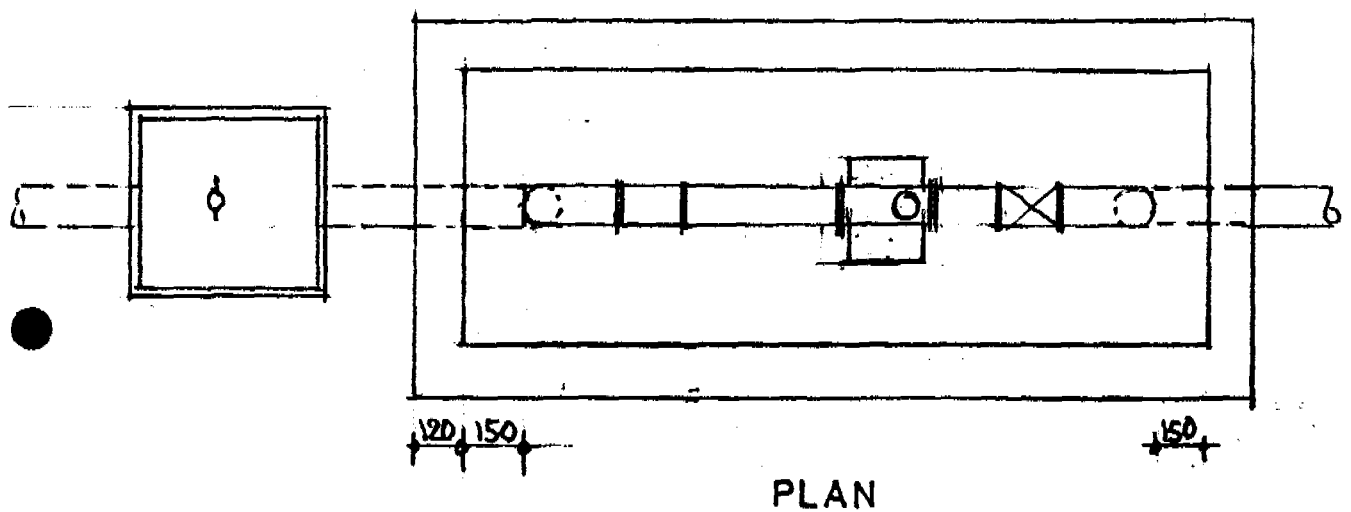
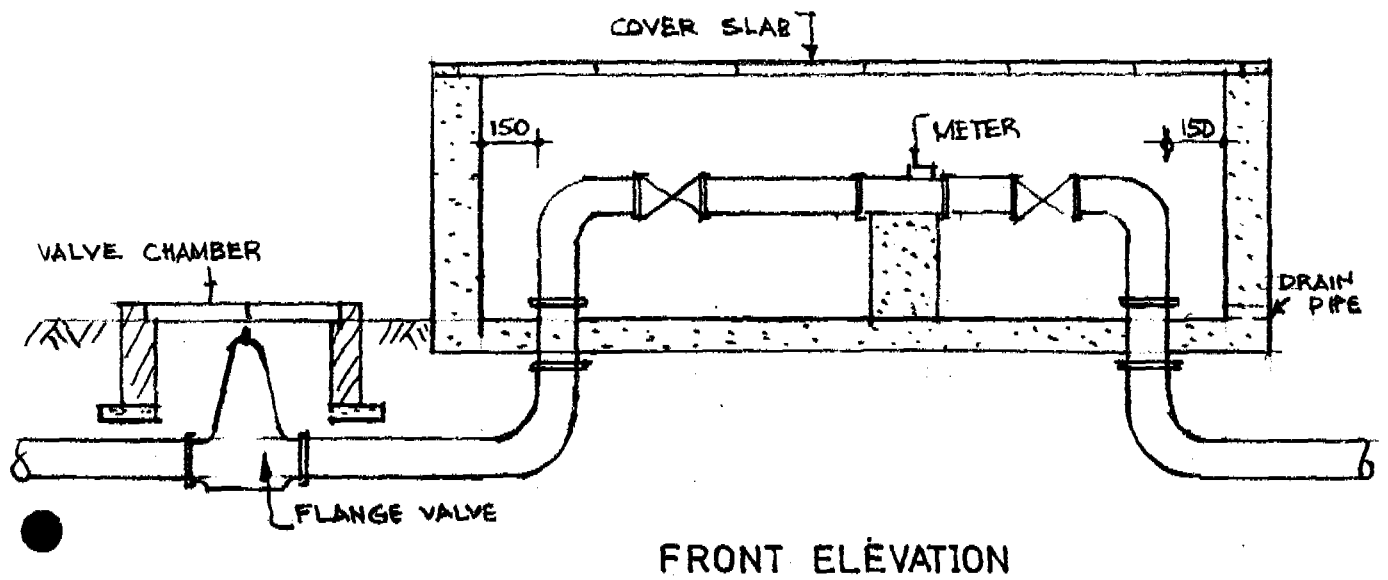
METER LOCATION OUTSIDE PREMISES

FIGURE -6.



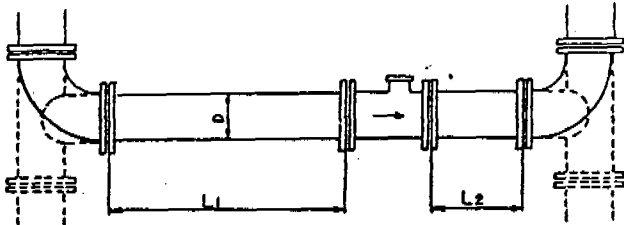
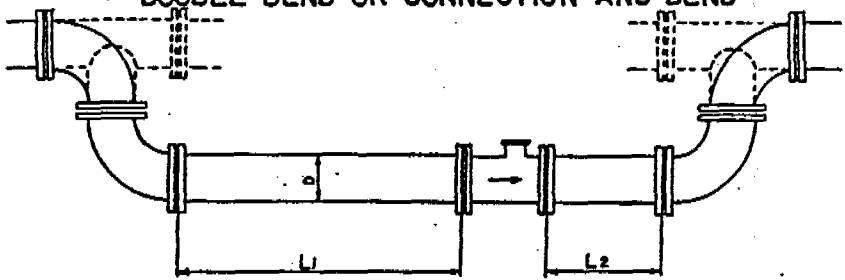
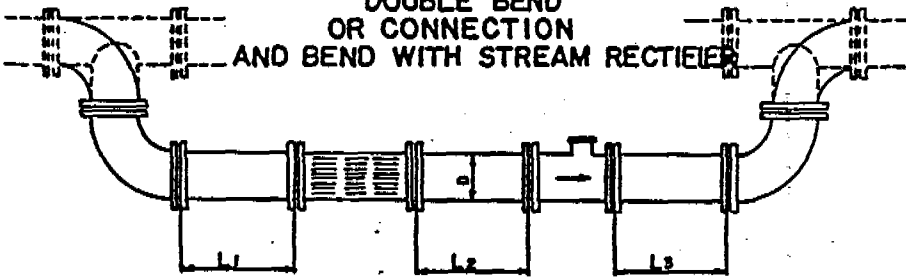
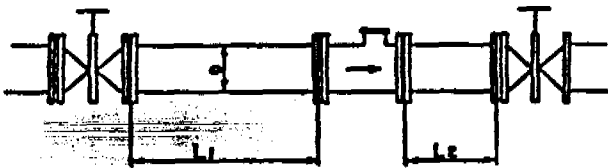
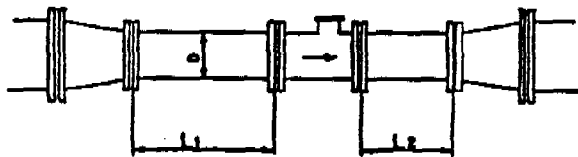


TYPICAL BELOW GROUND METER LOCATION  
(SPECIAL CASES ONLY)



NOTE: METER CHAMBER MAY BE BELOW GL  
IF WATER TABLE IS LOW, OTHERWISE  
ABOVE GL AS SHOWN.

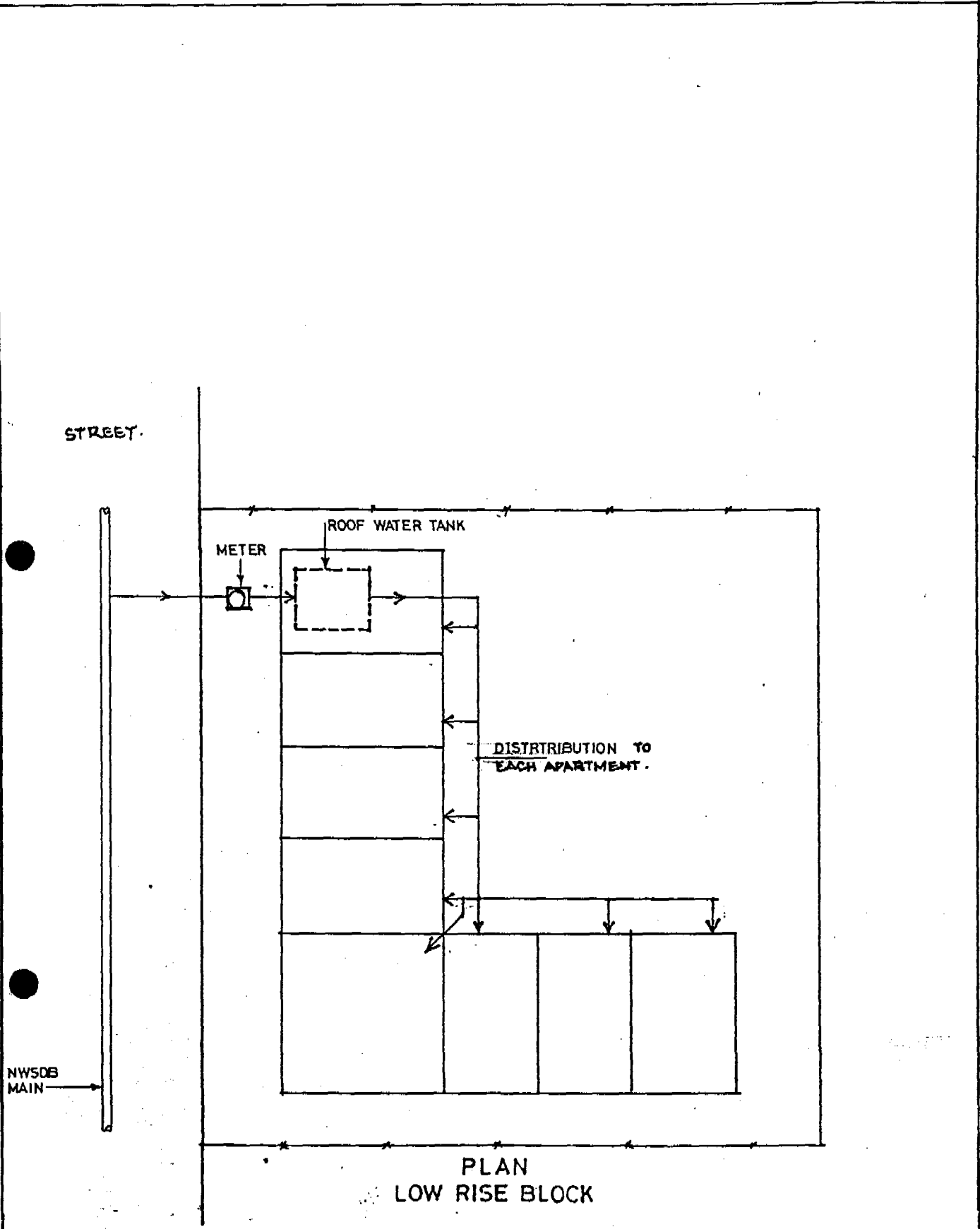
TYPICAL LARGE METER CHAMBER

EXAMPLES OF INSTALLATION	LENGTH OF STRAIGHT SECTION REQUIRED
<p style="text-align: center;">BENDS, CONNECTIONS etc.</p>  <p>A</p>	$L_1 \geq 6 \times D$ $L_2 \geq 2 \times D$
<p style="text-align: center;">DOUBLE BEND OR CONNECTION AND BEND</p>  <p>B</p>	$L_1 \geq 25 \times D$ $L_2 \geq 4 \times D$
<p style="text-align: center;">DOUBLE BEND OR CONNECTION AND BEND WITH STREAM RECTIFIERS</p>  <p>C</p>	$L_1 \geq 2 \times D$ $L_2 \geq 2 \times D$ $L_3 \geq 4 \times D$
<p style="text-align: center;">GATE VALVE OR CHECK VALVES</p>  <p>D</p>	$L_1 \geq 15 \times D$ $L_2 \geq 5 \times D$
<p style="text-align: center;">REDUCERS</p>  <p>E</p>	$L_1 \geq 3 \times D$ $L_2 \geq 2 \times D$

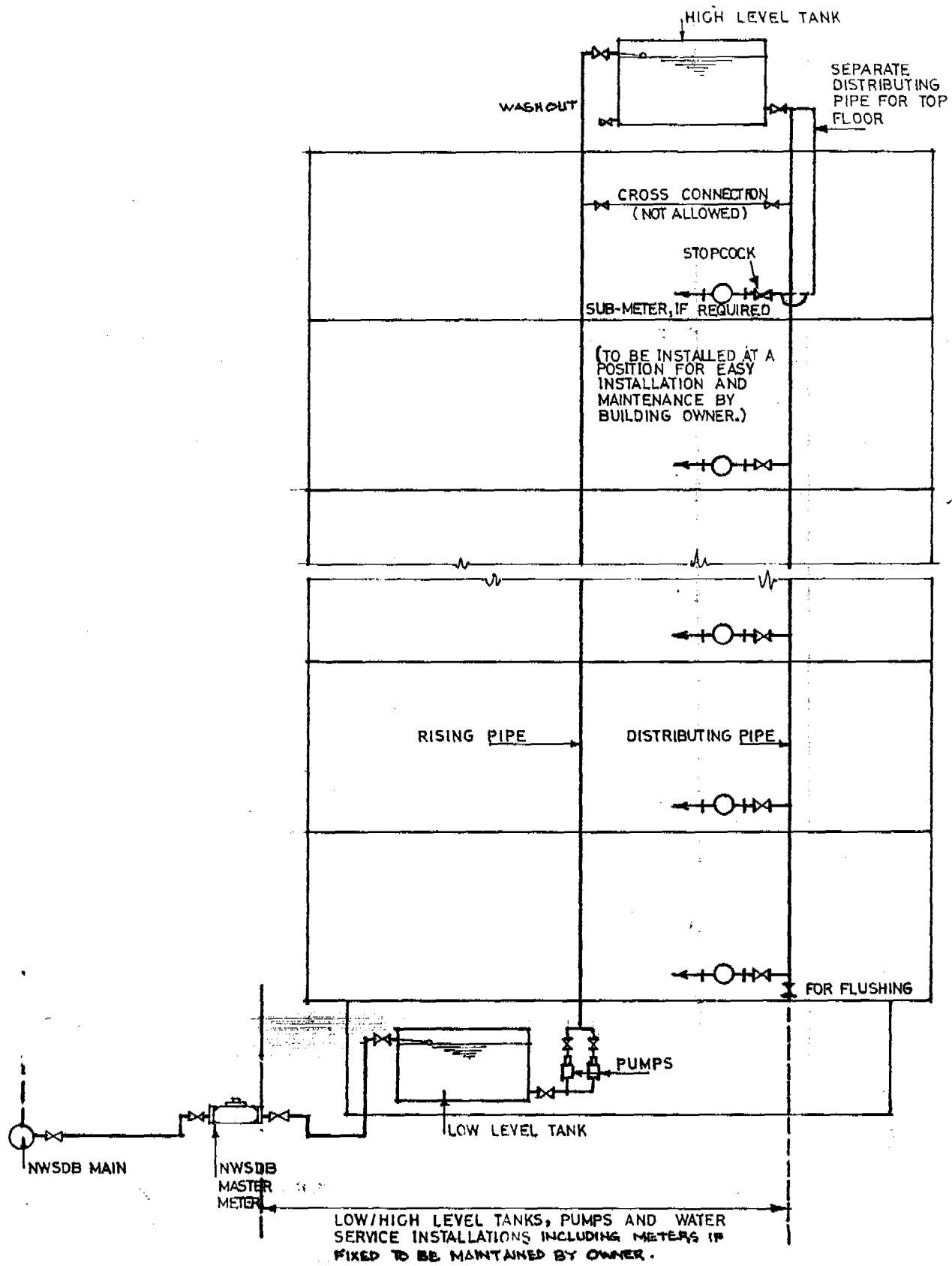
NOTE: BASED ON BOSCO METER MOUNTING INSTRUCTIONS

## LARGE METER INSTALLATION RULES

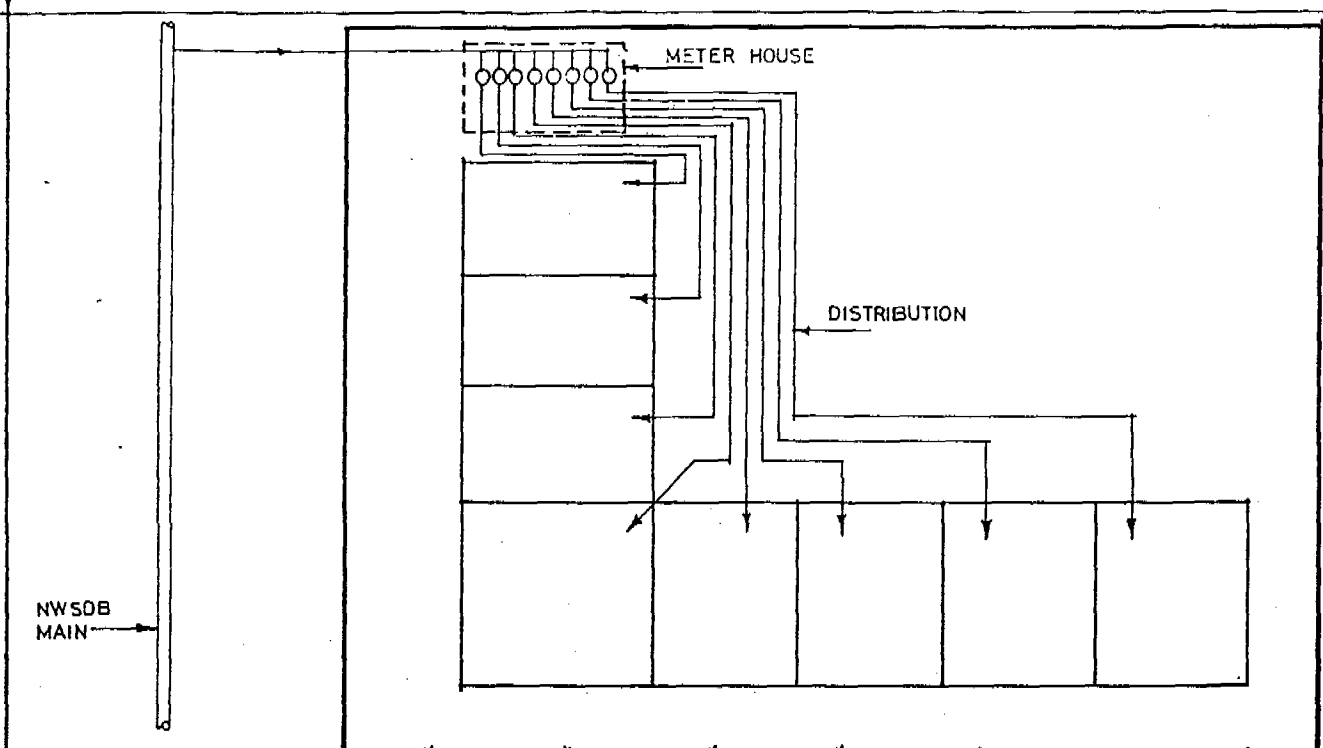
FIGURE 9



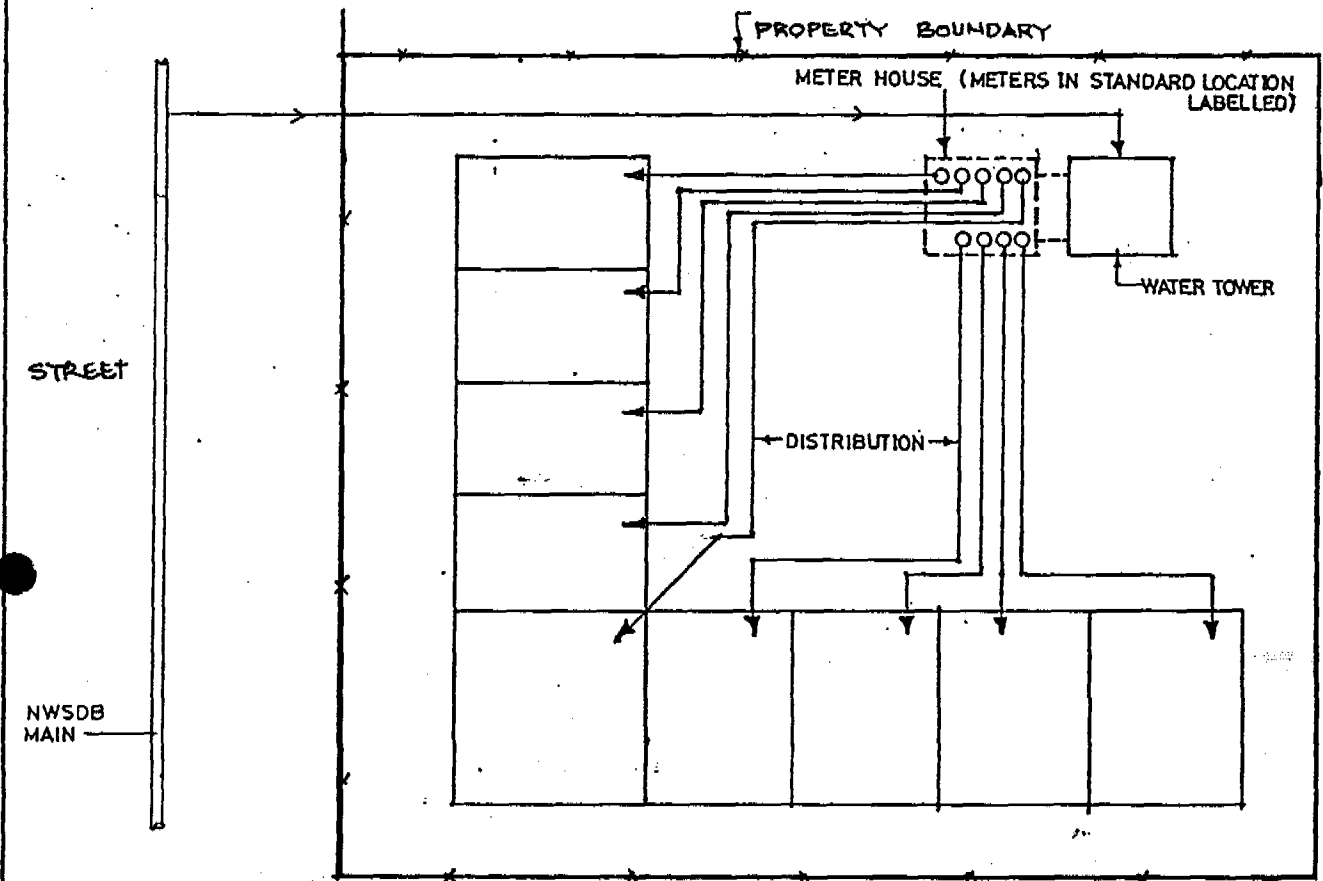
TYPICAL APARTMENT BLOCK CONNECTION  
MASTER METER, LOW RISE



TYPICAL APARTMENT BLOCK CONNECTION  
 MASTER METER, HIGH RISE

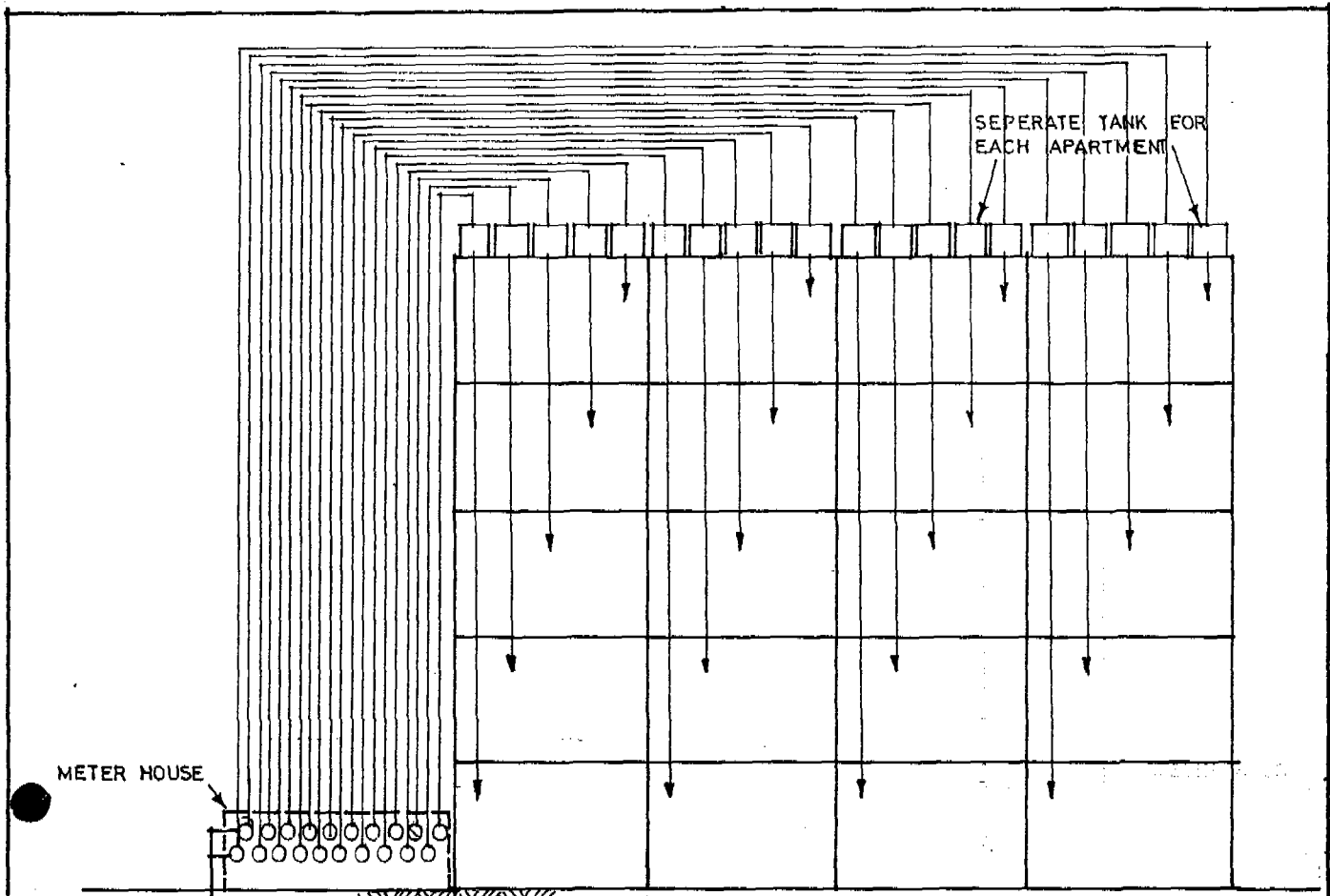


PLAN

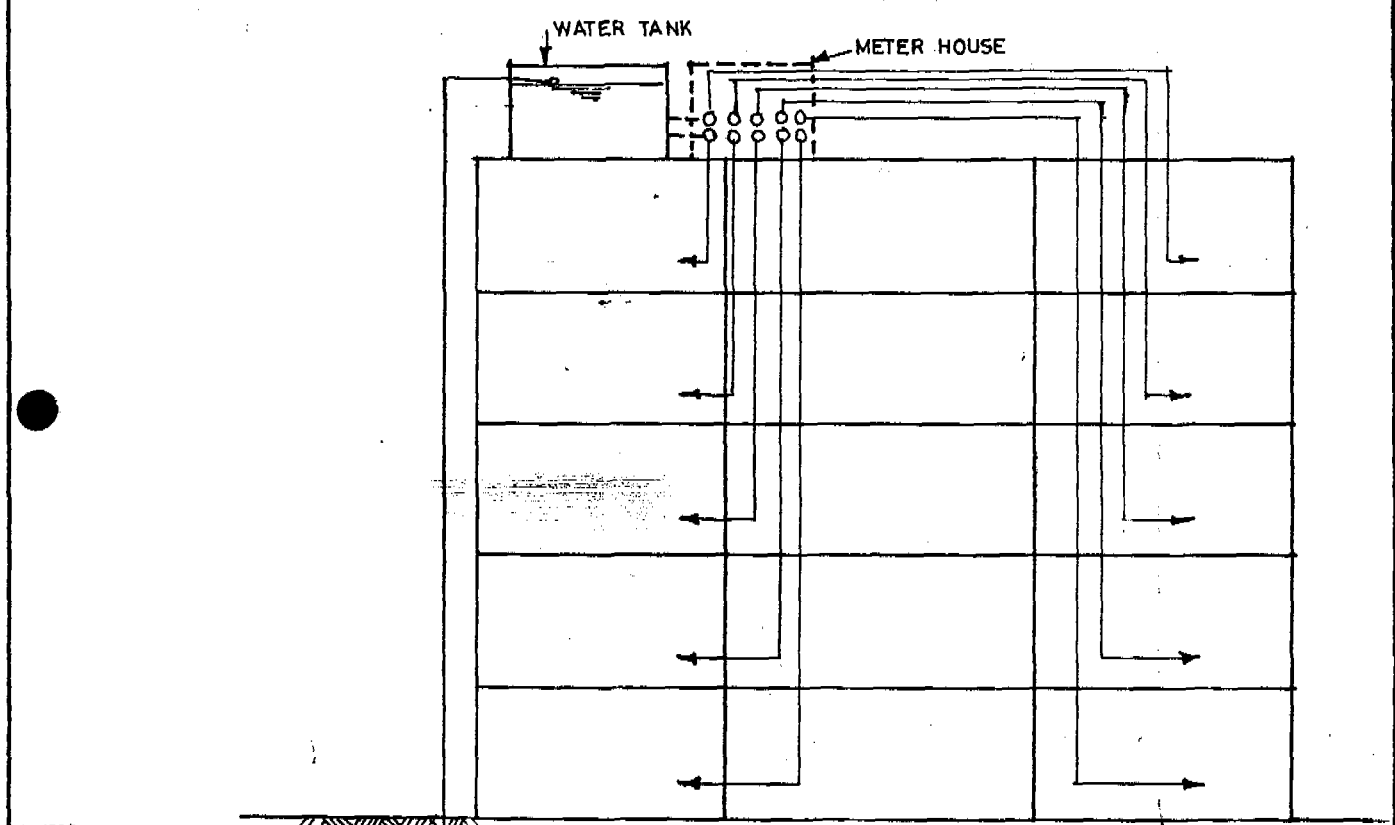


PLAN

TYPICAL APARTMENT BLOCK CONNECTION  
INDIVIDUAL METERING LOW RISE

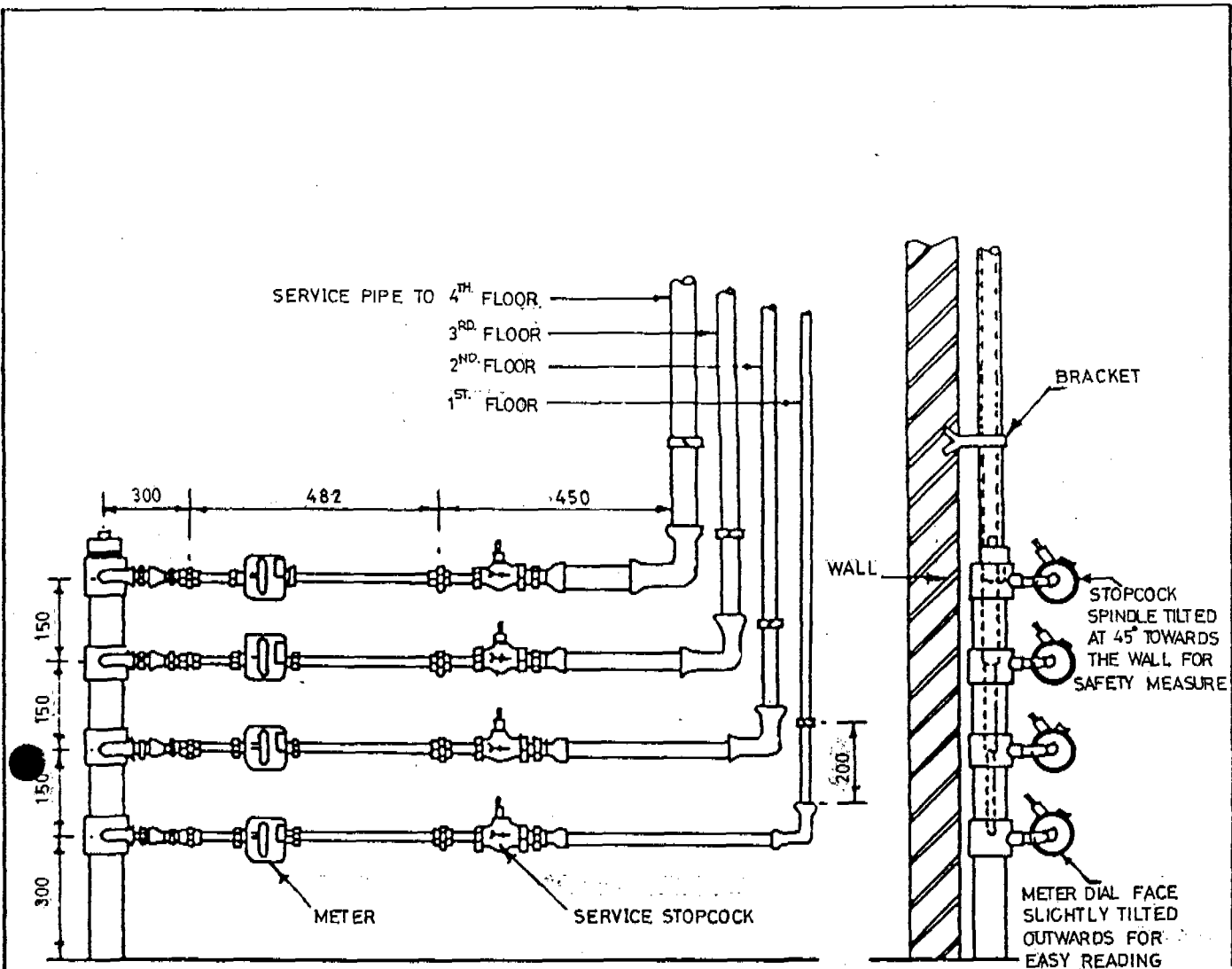


ELEVATION



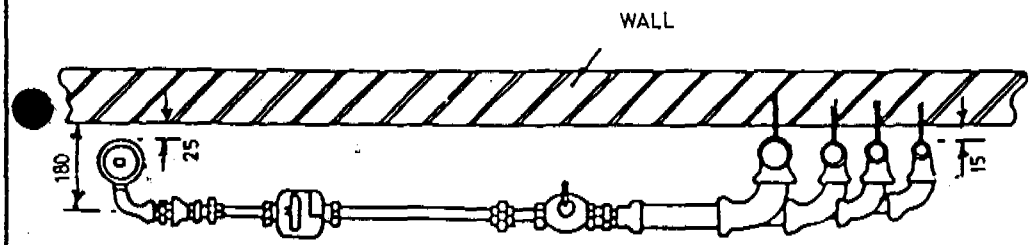
ELEVATION

TYPICAL APARTMENT BLOCK CONNECTION  
INDEPENDENT METERING HIGH RISE



FRONT ELEVATION

SIDE ELEVATION



PLAN

TYPICAL DETAIL OF APARTMENT BLOCK  
METER INSTALLATION



Table 1. Design flow rates	
Outlet fitting	Rate of flow
	L/s
WC flushing cistern float-operated valve	0.10
WC flushing trough float-operated valve	0.15 per WC served
Spray tap or spray mixer tap	0.04 per tap
Wash basin tap	0.15 hot or cold
Bidet	0.15 hot or cold
Bath tap of nominal size $\frac{3}{4}$	0.30 hot or cold
Bath tap of nominal size 1	0.60 hot or cold
Shower head	0.10 hot or cold
Sink tap of nominal size $\frac{1}{2}$	0.20 hot or cold
Sink tap of nominal size $\frac{3}{4}$	0.30 hot or cold
Sink tap of nominal size 1	0.60 hot or cold
Urinal flushing cisterns	0.004 per position served

NOTE 1. Clothes and dishwashing machines in individual dwellings can normally be satisfactorily supplied by a sink tap of nominal size  $\frac{1}{2}$  but manufacturer's instructions should be checked.

NOTE 2. WC flushing troughs are advisable where anticipated use of WCs is more frequent than once per minute.

NOTE 3. Mixer fittings or combination tap assemblies deliver less flow than two separate taps, but the difference can normally be disregarded for pipe sizing.

NOTE 4. The rate of flow will vary according to the type of shower head fitted and the manufacturer should be consulted regarding the recommended discharge rate.

Table 2. Maximum water velocities in pipework	
Water temperature	Maximum water velocity
°C	m/s
10	3.0
50	3.0
70	2.5
90	2.0

NOTE. These maxima do not apply to small bore connections of limited length supplied as parts of taps, etc. The subject of maximum water velocities is currently under investigation and the velocities specified will be amended if the results of this investigation so require.

Table 3 - Recommended Meter Sizes

Size of meter (mm)	Maximum Instant. Flow (m <sup>3</sup> /hr)	Normal Steady Flow (m <sup>3</sup> /hr)	Flow (m <sup>3</sup> /hr) for Loss of Head of		Recommended Max. Monthly Consumption (m <sup>3</sup> )
			3 m	10 m	
15 (Piston)	3	1.5	1.5	3	130
25 (Piston/ Inferential)	7	3.5	3.5	7	700
40 (Piston/ Inferential)	20	10	10	20	3,000
65 (Inferential)	40	20	20	40	8,000
100 (Piston)	70	30	30	70	10,000
100 (Inferential)	150	60	60	150	20,000
100 (Compound)	150	60	60	150	20,000
150 (Inferential)	300	150	150	300	45,000
150 (Compound)	300	150	150	300	45,000

**WATER SERVICE CONNECTION  
APPLICATION PROCEDURE**

## ANNEXES

- A - Covering Letter for Application
- B - Application Form
- C - Standard Letter - Connection Not Possible
- D - Acknowledgement of Application
- E - Standard Memorandum for Premises Inspection
- F - Inspection Report
- G - Standard letter - Approval of Water Service Connection
- H - Invoice for Water Service Connection
- I - Standard Letter - Refusal of Water Service Connection
- J - Standard Letter - Application for Road Authority Approval
- K - Consumer Agreement for Water Service Connection
- L - Standard Memorandum - Instruction to OIC to Install Connection, plus Job Card
- M - Standard letter to Consumer re Installation
- N - Addendum to Agreement
- O - New Connection Advice Form to Commercial Section
- P - Standard Service Connection Costs

INSTRUCTION TO NWSDB OFFICERS ON PROCEDURE  
FOR GIVING WATER SERVICE CONNECTIONS

1. Application form (Annex B) including covering letter (Annex A) is to be given free to personal callers or to be mailed in response to telephone or written requests. The applicant should be asked to give the address of the premises where service is required.

If it is obvious at this time that a supply cannot be given because:

- a) The applicant's premises is not in the supply area.  
or
- b) There is a policy decision by the M (O&M) not to issue any further new connections in the applicant's area.

then Application form should not be issued. Instead complete and issue standard letter (Annex C).

2. Applicant submits form including necessary documentation and inspection fee of Rs. 100/- either in person or by mail. NWSDB Officer immediately gives the application a number and checks the following:
  - a) That all questions have been answered.
  - b) That inspection fee is enclosed.
  - c) That satisfactory documentation is enclosed verifying that the building is an authorized structure (see Note 1 of Application form).
  - d) That satisfactory documentation is enclosed verifying ownership or tenancy.

If all is correct, issue an acknowledgement and receipt (Annex D).

If all is not correct, return the complete application, documents and fee with a note pointing out which item or items of the application are incomplete, requesting applicant to correct and re-submit Form.

3. M (O&M) then instructs the relevant OIC using standard memorandum (Annex E) to prepare an Inspection Report (Annex F). The Application form is sent to the OIC along with the inspection request.
4. The OIC is expected to complete the inspection and report back within 1 week. OIC completes the bottom half of the standard memorandum (Annex E) and returns this with the Inspection Report and Application Form to the M (O&M) for approval.
5. M (O&M) reviews Application Form and Inspection Report and informs consumer of approval using standard letter (Annex G), including Invoice (Annex H), or refusal (Annex I) with copies to OIC. Further instructions are given to Applicant at this stage regarding payment and obtaining Road Authority approval, if required.
6. Applicant obtains Road Authority approval, if required (Annex J) and pays necessary road reinstatement fee.
7. Applicant pays connection charges (Annex H) and signs Agreement (Annex K).
8. M (O&M) instructs OIC to request materials from Stores and install connection (Annex L). The consumer file, which should contain:
  - o Application Form
  - o Inspection Report
  - o Agreement
  - o Correspondenceshould be retained in the office of M (O&M).
9. OIC arranges with consumer a suitable date and time for installation (Annex M) draws materials from Stores and makes connection at the agreed time.
10. OIC completes Job Card and Agreement Addendum, and Consumer certifies on Addendum that work has been done.
11. OIC installs meter, records meter number and initial reading, and enters information on Agreement Addendum (Annex N).
12. OIC immediately returns Agreement Addendum and completed Job Card (Annex L) to M (O&M). M (O&M) arranges for completion of the New Connection Advice Form (Annex O) and forwards this to Commercial Section for inclusion in billing list.
13. M (O&M) sends letter to relevant Road Authority or LGA that work is complete and road reinstatement costs have been paid, in order to facilitate road reinstatement.

GAB/sh:  
March 1989.

## COVERING LETTER FOR APPLICATION

National Water Supply & Drainage Board  
Regional/Branch Office

Telephone: \_\_\_\_\_

Date: \_\_\_\_\_ 19\_\_

Mr./Mrs. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Dear Sir/Madam,

Re: APPLICATION FOR WATER SERVICE CONNECTION

Thank you for your recent enquiry for a Water Service Connection.

Please complete fully the Application Form attached including the sketch on page 3 and read carefully the explanatory notes on Page 4. Then read through the items (a) to (i) on page 2 before signing the Application. A current water tariff and schedule of standard connection charges are attached for your information.

The completed Application form with the necessary documentation and fee should be submitted by mail or in person to the NWSDB office as shown on the form. A receipt will be issued in acknowledgement of the Application and fee (by mail in the case of mailed applications).

Normally within 1 week following receipt of your completed Application, we will make an inspection of your premises and shortly thereafter you will be notified whether a connection can be provided.

Assuming there are no problems, you will then be given instructions for obtaining Road Authority approval for the road crossing, if required, and for making payment and signing the Agreement. For this, it is usually necessary for you to attend this office, although other arrangements may be made in special circumstances.

As soon as possible after payment is made and the Agreement signed, we will contact you to arrange a suitable time to make the connection. You will be requested to certify on an Addendum to the Agreement that the work has been done satisfactorily, and you will subsequently be billed for all water consumption from the time of completion of the connection.

Please contact the above office if you have any queries regarding your connection application.

Yours faithfully,

Manager (O&amp;M)

encls. 1. Application Form  
2. Current water tariff  
3. Schedule of standard connection charges

NATIONAL WATER SUPPLY & DRAINAGE BOARD

Address to Send Application:

Manager (O&M)  
National Water Supply & Drainage Board

Telephone: \_\_\_\_\_

APPLICATION FOR WATER SERVICE CONNECTION

Water Supply Scheme \_\_\_\_\_

Local Authority \_\_\_\_\_

1. Name in full : .....

2. Address of premises where Water Service Connection is required (see Note 1) : .....

3. Are you the owner or tenant (see Note 2) : .....

4. Postal address : .....

5. Purpose for which service required : Domestic Commercial Industrial Institutional Construction

6. If other than domestic, describe nature of business, institution or construction : .....

Facilities at premises (give numbers) : WC flushing cisterns

Total No. of water outlets including showers, taps & bidets : \_\_\_\_\_

Ground Tank  : Capacity \_\_\_\_\_ litres

Overhead Tank  : Capacity \_\_\_\_\_ litres

Other (describe) \_\_\_\_\_

8. Do you wish to purchase PVC pipes and fittings or have NWSDB supply them (see Note 5) : Customer to Purchase  NWSDB to Supply

I hereby certify that:

- a) I understand that my premises is not a Special case as defined by Note 3.
- b) The plumbing at the premises is complete and ready for inspection, and I attach a sketch of the location of the premises and access (see page 3 and Note 1 (a)).
- c) Copies of the necessary documentation required for proof of authorised structure and access (see Note 1) are attached and are authentic.
- d) The access to my premises does not cross land owned by others (see Note 1 (d)).
- e) Copies of the necessary documentation required for proof of ownership or tenancy (see Note 2) are attached and are authentic.
- f) I understand that I will be liable for the total cost of the connection according to standard NWSDB connection charges, and for all subsequent water bills.
- g) I understand that pipelaying outside the premises is prohibited without the prior approval of NWSDB, and that external pipelaying within the premises should not be carried out until the application is approved.
- g) (i)\* I will be available to attend the NWSDB office in person to make the payment and sign the agreement.  
(ii)\* I will not be available to attend the NWSDB office in person and therefore, the payment will be remitted and my signature on the Agreement attested by a Justice of Peace.
- i) I enclose a money order\*/cheque\*/cash\* for Rs. 100/- as an Application and Inspection fee (see Note 4).

Date: \_\_\_\_\_

\_\_\_\_\_  
Signature of Applicant

---

\* Delete as necessary



SKETCH OF LOCATION OF PREMISES AND ACCESS (to be completed by Applicant)

(See Notes 1 (a) and 1 (d))

## Explanatory Notes Regarding Application for Water Service Connection

### Note 1 - Proof of Authorized Structure and Access

- a) Provide with the Application in the space provided a sketch of the location of premises and access to assist NWSDB in locating premises.
- b) Provide with the Application a photocopy of the following documents to show that the building is an authorized structure:
  - (i) If building is not recently constructed : Annual assessment notice of Local Government Authority (LGA) or Certificate of Conformity or letter from relevant LGA or Grama Sevaka (GS) confirming that the building is an authorized structure.
  - (ii) If building is recently constructed : Certificate of Conformity issued by LGA.
  - (iii) If building is to be constructed : Building plan approved by LGA.
- c) If there is a difference between the premises address on the application and that on the document submitted, this shall be satisfactorily explained to the Manager (O&M).
- d) Where the access or water service connection route to the applicant's premises crosses land owned by others, then a connection cannot be given. Where NWSDB considers that right of access may be in question, the it may request with the Application a plan prepared by a Licensed Surveyor, indicating right of access.

### Note - 2 Proof of Ownership or Tenancy

If you are the owner and occupier of the premises, make sure that the documents submitted are in your name. If the applicant's name differs from that on the assessment notice or supporting document, a letter giving a valid reason, certified by a JP, shall be submitted with the Application.

- b) If you are a tenant, the following documents shall be submitted with the Application;
  - (i) The written permission of the owner, or
  - (ii) A recommendation of the Rent Control Board.

### Note 3 - Special Cases

Connections regarded as Special Cases are:

- (a) Where a major road has to be crossed, involving additional costs.
- (b) Where a larger pipe is required for shared connections, etc.

If you consider your connection may be a Special Case, do not complete this Application, but contact the Manager (O&M) to request a special survey, which will be undertaken at no cost to you.

### Note 4 - Application Fee

In the event of the Application not being approved due to reasons beyond the control of the Applicant, the Application/Inspection fee may or may not be refunded at the discretion of the Manager (O&M).

### Note 5 - Purchase of Pipes and Fittings by Applicant

NWSDB will normally supply all materials and labour required. However, you may, if you wish, supply the necessary PVC pipes and fittings provided they conform to Sri Lanka Standards 147 and 659, Type 1000, and bear the SLS mark. No other pipes and fittings will be accepted. If you wish to take this option, check appropriate box on Form, item 8. NWSDB will supply, in all cases, the ferrule saddle, water meter and any other fittings required.

STANDARD LETTER - CONNECTION NOT POSSIBLE

National Water Supply & Drainage Board,  
\_\_\_\_\_ Regional/Branch Office,  
\_\_\_\_\_  
\_\_\_\_\_

Telephone : \_\_\_\_\_

Date: \_\_\_\_\_ 19\_\_.

Mr./Mrs. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Dear Sir/Madam,

Re: Enquiry for Water Service Connection  
to Premises at \_\_\_\_\_

Thank you for your recent enquiry for a Water Service Connection. However, I regret to inform you that a connection to the above premises cannot be provided at this time because:

- a) \* The premises is not in the supply area
- b) \* Due to supply restrictions there is presently in effect a policy decision not to provide any further connections in your area.

Your enquiry will be held on file at this office and if there is any future change in the situation, I will inform you.

Yours faithfully,

Manager (O&M) \_\_\_\_\_  
National Water Supply & Drainage Board

cc: OIC \_\_\_\_\_ WSS

---

\* Delete as necessary

ACKNOWLEDGEMENT OF APPLICATION

National Water Supply & Drainage Board  
Regional/Branch Office

Telephone: \_\_\_\_\_

Date: \_\_\_\_\_

Application No.: \_\_\_\_\_

To: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Dear Sir/Madam,

**Acknowledgement of Application for Water Service Connection  
to Premises at**

Thank you for your Application for a Water Service Connection. NWSDB is in receipt of your application fee of Rs. 100/- Following our inspection of the premises which should be during the next week, we will be writing to you again with further instructions. Please quote the above application number in all future communications regarding your connection.

Yours faithfully,

Manager (O&M) \_\_\_\_\_

Complete in Duplicate

ANNEX - E

STANDARD MEMORANDUM  
FOR PREMISES INSPECTION

Date : \_\_\_\_\_

Application No.: \_\_\_\_\_

To: OIC \_\_\_\_\_

Scheme : \_\_\_\_\_

Address : \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Address of premises: \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Instruction to Inspect Premises for Water Service Connection

at \_\_\_\_\_

You are hereby instructed to inspect the above premises. The relevant Application for Water Service Connection is attached for verification as necessary.

Manager (O&M)

cc: Consumer's File

OIC to complete this section following inspection and return to M (O&M)

Date: \_\_\_\_\_

Application No.: \_\_\_\_\_

To: Manager (O&M)  
\_\_\_\_\_  
\_\_\_\_\_

Inspection Report of Premises at \_\_\_\_\_

The above premises was inspected by me on \_\_\_\_\_ (date).  
The Inspection Report and Application are attached hereto.

\_\_\_\_\_  
OIC

NATIONAL WATER SUPPLY & DRAINAGE BOARD  
INSPECTION REPORT FOR WATER SERVICE CONNECTION

Application No.: \_\_\_\_\_

1. Access to premises (see Application Items 1(a) and (d)) Verified  Not verified (give reasons)   
(verify location and right of access according to sketch)

2. Purpose for which water service required? (see Application Items 5, 6) Verified  Not verified (give reasons)

3. Was there a connection previously? Yes  No

If yes, reason for disconnection \_\_\_\_\_

4. Details of proposed water facilities (see Application Item 7) Application Correct  Application not correct if so, revise on Application form as necessary

Total loading Units (see Inspection Report - Note 1) \_\_\_\_\_ Loading Units

Design flow rate (Note2) \_\_\_\_\_ Litres/second (l/s)

5. Condition of internal pipes, fittings & appliances

Materials to approved standards	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Adequate support and protection from damage and corrosion	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>
Adequate cross-connection control	Yes	<input type="checkbox"/>	No	<input type="checkbox"/>

If No to above questions, give reasons \_\_\_\_\_

Note that subsequent to the connection being made the plumbing should be checked for water tightness.

6. Distance from main to meter site (along service connection route) \_\_\_\_\_ metres

Ground conditions along service connection route

Unsurfaced (grass/earth) \_\_\_\_\_ metres

Unsurfaced footpath \_\_\_\_\_ metres

Paved sidewalk \_\_\_\_\_ metres

Roadway :

Private gravel road \_\_\_\_\_ metres

Private tarred road \_\_\_\_\_ metres

Public gravel road \_\_\_\_\_ metres Class \_\_\_\_\_

Public tarred road \_\_\_\_\_ metres Class \_\_\_\_\_

7. Public road/sidewalk cut required Yes  No

If yes, name of Road Authority \_\_\_\_\_

Length of road cut (metres) \_\_\_\_\_ (m)

Area of road cut (metres<sup>2</sup>) \_\_\_\_\_ (m<sup>2</sup>)

Length of sidewalk cut (metres) \_\_\_\_\_ (m)

Area of sidewalk cut (metres<sup>2</sup>) \_\_\_\_\_ (m<sup>2</sup>)

Complete sketch of damaged road/sidewalk on Sheet 5

8. Distribution main pressure (m head of water) Normal (working) \_\_\_\_\_ m Maximum (static) \_\_\_\_\_ m Minimum \_\_\_\_\_ m ( $h_m$ )

Above pressures were Measured  Estimated

Normal supply hours in system \_\_\_\_\_ hours

Hours which supply may be given to consumer \_\_\_\_\_ hours

(if different)

Elevation of service relative to main Meter location \_\_\_\_\_ m - above/below main ( $h_1$ )

Consumer's storage tank or main tap elevation \_\_\_\_\_ m - above/below main ( $h_2$ )

Available head (minimum)  $h_m - (h_1 + h_2) =$  \_\_\_\_\_ m

10. Determination of pipe diameter (assume 15 mm to start).  
(see Note 4). Note that for normal domestic connections, ferrule and meter size should be 15 mm, though pipe may be greater if necessary.

Actual length of pipe run to consumer storage/outlet \_\_\_\_\_ m

No. of elbows \_\_\_\_\_ effective length \_\_\_\_\_ m Total eff. length \_\_\_\_\_ m

No. of tees \_\_\_\_\_ effective length \_\_\_\_\_ m Total eff. length \_\_\_\_\_ m

Total effective length (L) \_\_\_\_\_ m

Available head \_\_\_\_\_ m

Head loss through meter & stop valve \_\_\_\_\_ m (see Note 5)

Net available head (H) \_\_\_\_\_ m

Available loss of head per metre run of effective length of pipe  $= \frac{L}{H} =$  \_\_\_\_\_

Capacity of pipe = \_\_\_\_\_ (l/s) which is greater \* than design flow rate

Diameter approved \_\_\_\_\_ mm Recommended meter size \_\_\_\_\_ mm (see Note 7)

\* If not greater, re-calculate with increased size of pipe

11. Connection charge

Rs.

Basic rate for 10 m minimum

Extra for \_\_\_\_\_ m @ Rs. \_\_\_\_\_/m

Extra for tarred road cut \_\_\_\_\_ m @ Rs. \_\_\_\_\_/m

Total charge

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
=====\*

\* Amount to be checked and entered in Invoice

12. Material List: (See over)

Inspection completed by: \_\_\_\_\_

Checked by: \_\_\_\_\_

Date : \_\_\_\_\_

Date : \_\_\_\_\_

Recommendation of M (O&M)

Approve connection

Do not approve connection  
for reasons given below

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Signed : \_\_\_\_\_  
Manager (O&M)

Date : \_\_\_\_\_



12. Materials List

<u>Description</u>	<u>Dia.</u>	<u>Quantity</u>	<u>Applicant to Purchase *</u> <u>(check)</u>
Clamp Saddle	_____	_____	_____
Saddle clip	_____	_____	_____
Talbot ferrule	_____	_____	_____
PVC pipe (SLS Type 1000)*	_____	_____	_____
PVC tapered union *	_____	_____	_____
PVC bend *	_____	_____	_____
PVC valve socket *	_____	_____	_____
PVC faucet socket *	_____	_____	_____
PVC solvent cement	_____	_____	_____
Brass stop cock	_____	_____	_____
Water Meter	_____	_____	_____
Other	_____	_____	_____

\* NWSDB to supply  or \* Applicant to supply

\* If applicant has elected to purchase pipes and fittings, complete form below:

-----  
 TEAR HERE AND ATTACH TO APPROVAL LETTER (ANNEX G)

LIST OF FITTINGS TO BE SUPPLIED BY APPLICANT

<u>Description</u>	<u>Dia.</u>	<u>Quantity</u>
PVC pipes	_____	_____
PVC tapered union	_____	_____
PVC bend	_____	_____
PVC valve socket	_____	_____
PVC faucet socket	_____	_____

Important:

Note requirements regarding pipes and fittings standard specifications

\* Delete as necessary

Ref. Item 7 of Inspection Report

SKETCH OF REQUIRED DAMAGE TO  
ROAD/SIDEWALK FOR WATER SERVICE CONNECTION

(To be completed at time of inspection)

Applicant's Name: \_\_\_\_\_

Premises Address : \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

Sketch should show:

road, sidewalk, premises boundary, and other features to  
locate position and extent of damage, with dimensions.

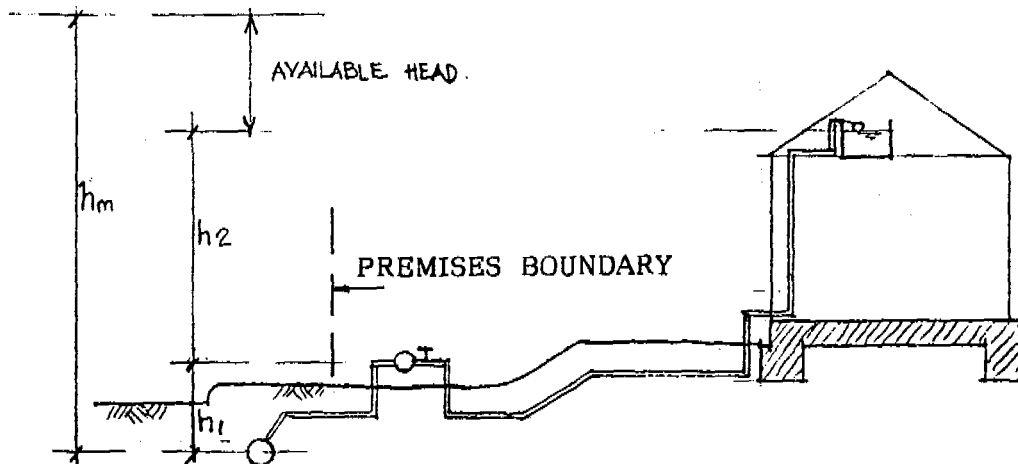
Sketch by : \_\_\_\_\_

Date : \_\_\_\_\_

To be attached to Application for Road Authority Approval (Annex J)

Explanatory Notes Regarding Inspection Report

- Note 1 Loading units: Refer to Water Service Connection Manual M8 Annex - B, Pipe Sizing - Annex B
- Note 2 Design flow rate: Refer to WSC - Annex B
- Note 3 Elevation of service: Sketch profile of pipe route from distribution main to Consumer tank/faucet outlet, e.g.



- Note 4 Determination of pipe diameter: Refer to WSC: Annex B
- Note 5 Headloss through meter/stopvalve: Refer to WSC: Annex B
- Note 6 Capacity of pipe: Refer to WSC: Annex - B
- Note 7 Recommended meter size: Refer to WSC: Table 3, using design flow rate as maximum instantaneous flow.

## STANDARD LETTER - APPROVAL OF WATER SERVICE CONNECTION

National Water Supply & Drainage Board  
Regional/Branch Office

Telephone No.: \_\_\_\_\_

Date: \_\_\_\_\_

Application No.: \_\_\_\_\_

Application Date: \_\_\_\_\_

Mr./Mrs. \_\_\_\_\_

Dear Sir/Madam,

Re: Approval of Water Service Connection  
to premises at \_\_\_\_\_

I have pleasure in informing you that your Application for a Water Service Connection to the above premises has been approved.

The connection charge \*including all materials/\*including all materials not provided by yourself, and labour (according to the standard schedule of charges, previously attached with Application Form, and the required initial deposit are shown in the Invoice attached.

- \* As you state in your Application that you wish to purchase pipes and fittings, a list of items to be provided by yourself is attached. Note that all pipes and fittings shall conform to Sri Lanka Standards 147 and 659, Type 1000, and bear the SLS mark. Other pipes and fittings which do not conform will be rejected.
- \* Since the connection crosses a road/sidewalk of the \_\_\_\_\_ (Authority), prior approval is necessary from that Authority and any payments for road reinstatement should be made to that Authority directly. A letter to the Authority giving details of the extent of damage is attached for your convenience.
- \* Please attend this office to make payment and sign the Agreement within 4 weeks of the above date bringing:  
or
- \* As you state in your Application that you are unable to attend this office, please send by registered mail or messenger both copies of the signed agreement, attested by a JP and including:

- 1) This letter and Invoice
- 2) The required payment
- 3) The Road Authority receipt for payment noting the address of premises and Application number
- 4) Your National Identity Card
- 5) A Rs. 1/- stamp (uncancelled)

Items 1 and 4 will be returned to you along with a copy of the signed Agreement. Payment may be made at this office as follows (M (O&M) to specify relevant method of payment):

\* Monday through Friday between 9:00 am & 12:00 noon and between 1:00 pm & 3:00 pm

- \* If you fail to pay the connection charge within a period of 4 weeks from the date of this letter, you may lose your order of priority.

If you have any queries regarding this letter, please contact the office noted above and quote the Application Number. Following payment and signing of the Agreement, you will be notified of the installation date as soon as possible.

Yours faithfully,

Manager (O&M)  
National Water Supply & Drainage Board

copy: OIC \_\_\_\_\_ WSS

- encls: 1. Invoice  
2. List of Materials to be supplied by Applicant  
3. Letter to Road Authority

\* Delete if not applicable

INVOICE FOR WATER SERVICE CONNECTION

NATIONAL WATER SUPPLY & DRAINAGE BOARD

INVOICE FOR WATER SERVICE CONNECTION

Date: \_\_\_\_\_ 19\_\_.

Application No.: \_\_\_\_\_

<u>Item</u>	<u>Rs.</u>
1. Connection Charge <sup>¶</sup>	
a) Base rate for 10m minimum	_____
b) Extra for _____ m @ Rs. _____/m	_____
c) Extra for tarred road/sidewalk cut _____ m @ Rs. _____/m	_____
Total Connection Charge	
2. Security Deposit against Water Bills	_____
Total amount due	=====

Payment should be made by cash\*, money order or cheque to the NWSDB office on the letterhead, within 4 weeks of the above date. If payment is not received, then the Application will be returned to you.

Please note that for cheque payments, the work will not be put in hand until the cheque is realised.

¶ Ref. Item 11 of Inspection Report (includes cost of water meter).

\* Delete if cash payment not receivable

STANDARD LETTER - REFUSAL OF WATER SERVICE CONNECTION

National Water Supply & Drainage Board  
\_\_\_\_\_ Regional/Branch Office

Telephone No.: \_\_\_\_\_

Date : \_\_\_\_\_

Application No.: \_\_\_\_\_

Mr./Mrs. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Dear Sir/Madam,

Re: Application for Water Service Connection  
to premises at \_\_\_\_\_

I regret to inform you that your Application for a Water Service Connection, which is returned herewith, cannot be approved at this time owing to the following reasons:

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

\*(Where action is required by Consumer)

Please attend to the above points and re-submit your Application for reconsideration.

\*(Where action is required by NWSDB)

It is expected that the supply\*/distribution\* restriction in your area will be resolved by \_\_\_\_\_ (date). Your Application has been registered and will be reconsidered at that time.

Yours faithfully,

Manager (O&M)  
National Water Supply & Drainage Board

cc: OIC \_\_\_\_\_ WSS

STANDARD LETTER -  
APPLICATION FOR ROAD AUTHORITY APPROVAL

National Water Supply & Drainage Board

\_\_\_\_\_ Regional/Branch Office

Telephone No.: \_\_\_\_\_

Date: \_\_\_\_\_

Application No: \_\_\_\_\_

Application Date: \_\_\_\_\_

\_\_\_\_\_ Engineer,

\_\_\_\_\_ Road Authority

Dear Sir,

Re. Damage to Public Highway for Water Service Connection  
to premises at \_\_\_\_\_

I wish to inform you that it is necessary to damage the roadway/sidewalk at the following location in order to install a Water Service Connection for the Applicant named below:

Applicant: \_\_\_\_\_

Address: \_\_\_\_\_

Name of Highway: \_\_\_\_\_

Location: \_\_\_\_\_

The estimated damaged area as shown in the attached sketch is \_\_\_\_\_ m<sup>2</sup>.

Please give the applicant your written approval for damaging the road for the above purpose, and charge the Applicant for any reinstatement necessary.

Yours faithfully,

Manager (O&M)  
National Water Supply & Drainage Board

cc: Applicant

encl: Sketch of road damage required (sheet 5 of Inspection Report)

NATIONAL WATER SUPPLY & DRAINAGE BOARD  
CONSUMER AGREEMENT FOR WATER SERVICE CONNECTION

To be completed by Consumer in **DUPLICATE\*\***

REGION : \_\_\_\_\_

WATER SUPPLY SCHEME : \_\_\_\_\_

APPLICATION NUMBER : \_\_\_\_\_

I/We, the undersigned \_\_\_\_\_  
of \_\_\_\_\_

agree that a Water Service Connection to premises No.: \_\_\_\_\_

be provided by the National Water Supply & Drainage Board, subject to the terms and conditions set out below.

- a) I/We\* agree to conform to the provisions of the National Water Supply & Drainage Board Law No. 2 of 1974 and regulations thereunder and subsequent amendments and also agree that in the event of my/our failing to conform to such regulations at any time, this water connection may be disconnected at the sole discretion of the National Water Supply & Drainage Board and that I/We\* may be liable for the prescribed penalties.
- b) I/We\* agree to prevent wastage and misuse of the water supplied.
- c) I/We\* agree to permit access and provide facilities to any officer duly authorised by the National Water Supply & Drainage Board to inspect all internal and external plumbing including fixtures and fittings, and the conformity thereof with plumbing bylaws in effect, and for the purpose of detection of waste or misuse of water, detection of unauthorized use, damaging of or tampering with water facilities of NWSDB, or de-tection of fouling of water, etc.
- d) I/We\* agree not to make any extensions in internal or external plumbing without the prior written approval of the NWSDB.
- e) I/We\* agree to pay on the due dates water charges at the approved tariff to the National Water Supply & Drainage Board as recorded by the installed meter which will remain the property of the NWSDB.

\_\_\_\_\_  
Seal of JP if Applicant does not  
visit office to sign

\_\_\_\_\_  
(Signature of Applicant on uncanceled stamp of  
the value of Rs. 1/-, with seal of company or  
firm which is relevant)

Place: \_\_\_\_\_

National ID No. of Applicant : \_\_\_\_\_

Date: \_\_\_\_\_

**Witnesses:**

1. Signature : \_\_\_\_\_

2. Signature : \_\_\_\_\_

Name : \_\_\_\_\_

Name : \_\_\_\_\_

Address : \_\_\_\_\_

Address : \_\_\_\_\_

\* Delete as appropriate

\*\* First original to NWSDB (M (O&M)), 2nd original to Consumer





**JOB CARD - NWSDB**

Job No.: \_\_\_\_\_

Labour & Equipment	Time (hr)	Unit Cost (Rs.)	Total Cost (Rs.)
Supervisor/TA			
Fitters 1			
2			
3			
Labourers 1			
2			
3			
4			
5			
6			
Drivers 1			
2			
Other Staff			
<b>Total Labour</b>			
<b>Equipment Used</b>			
Excavators			
Jack Hammer			
Pipe Cutter			
UPT Machine			
Other			
<b>Total Equipment</b>			
<b>Vehicles Used</b>	<b>Distance (Km)</b>		
Lorry			
Pickup			
Other			
<b>Total Vehicles</b>			

Enter totals on front of Job Card

STANDARD MEMORANDUM -  
INSTRUCTION TO OIC TO INSTALL CONNECTION

Date: \_\_\_\_\_

Application No.: \_\_\_\_\_

To: OIC

\_\_\_\_\_ Scheme

\_\_\_\_\_

\_\_\_\_\_

**Instruction to install Connection  
to premises at** \_\_\_\_\_

You are authorized to install the above noted connection according to the following procedure:

1. Use the form of letter attached (Annex M) to agree installation date and time with consumer.
2. Draw materials from store.
3. Make installation at agreed time.
4. Complete the Job Card.
5. Complete the meter reading, meter number, date, etc. on Addendum to Agreement, and get consumer to certify the work was done and the meter reading (Annex N).
6. Hand over the water meter card to consumer.
7. Return Job Card and Addendum to Agreement to M (O&M) immediately after connection is completed so that the consumer may be billed for water without delay.

Manager (O&M)

STANDARD LETTER TO  
CONSUMER RE INSTALLATION

National Water Supply & Drainage Board  
Scheme Office

Telephone: \_\_\_\_\_

Date: \_\_\_\_\_ 19\_\_

Application No.: \_\_\_\_\_

Mr./Mrs. \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Dear Sir/Madam,

Re: New Water Service Connection  
to premises at \_\_\_\_\_

I propose to install the above water connection on \_\_\_\_\_ (date)  
at about \_\_\_\_\_ (time). Please arrange for yourself or your rep-  
resentative to be present at the premises at this time, in order to certify  
that the work is carried out satisfactorily and certify the initial meter  
reading.

If this date or time is unsuitable, please contact the Office stated on  
this letterhead to arrange an alternative date and time.

If you have elected to purchase materials please confirm to this office  
prior to the above that all materials requested are at the premises.  
If you fail to confirm this, then the above connection date will be postponed  
until such time as I receive your confirmation.

If you have not elected to purchase materials, then if I do not hear from  
you, I will assume that the above date and time are satisfactory.

Yours faithfully,

OIC \_\_\_\_\_ WSS

ADDENDUM TO AGREEMENT

TO BE COMPLETED BY OIC AT TIME OF INSTALLATION

Category of Use \_\_\_\_\_

Tariff \_\_\_\_\_

Date of Connection \_\_\_\_\_

Meter Number \_\_\_\_\_

Initial Reading \_\_\_\_\_

Meter Card handed over \_\_\_\_\_

Connection size \_\_\_\_\_ mm

Meter size \_\_\_\_\_ mm

Connection supervised by: \_\_\_\_\_

Signature

Designation

TO BE COMPLETED BY CONSUMER AFTER INSTALLATION OF THE SERVICE CONNECTION

I/We\* confirm that the connection has been made to my/our\* satisfaction and I/We\* have verified the initial meter reading and meter number above, which are recorded on the water meter card now in my/our\* possession.

\_\_\_\_\_  
Signature of Consumer

Date: \_\_\_\_\_

This form should, after completion, be attached to NWSDB  
Copy of Agreement.

\*Delete as necessary

METER STOCK BOOK

Date Issued	Meter No.	Meter Size	No. of Digits in Meter	Connection File No.	Address of Premises	MIR No.	Stock Balance							
							1/2"	3/4"	1"	1 1/2"	2"			

NOTE: Original to Commercial  
Duplicate Book Copy

1990/91 - 1991/92

	1990/91	1991/92	1992/93	1993/94	1994/95
1 Tee (1/2")	90.00	171.00	175.00	180.00	187.00
2 Ferrule (1/2" x 1/2") (not required for 75mm)					
3 PVC Pipes (1/2" class 75000)	140.00	240.00	272.00	276.00	1092.00
4 Bands (1/2")	16.00	28.00	27.00	258.00	221.00
5 Sockets (1/2")	13.00	20.00	25.00	52.00	114.00
6 Stopcock (brass)	30.00	40.00	50.00	110.00	200.00
7 Solvent cement	4.00	5.00	8.00	16.00	26.00
8 Water meter	470.00	550.00	930.00	1497.00	4902.00
Sub-total, materials	763.00	1084.00	1620.00	2438.00	3003.00
3% BTT	22.89	32.52	48.60	103.14	210.05
15% handling & transport	114.45	162.60	243.00	515.70	1050.45
Materials Total	900.34	1279.12	1911.60	3056.84	4263.50
9 Labour for pipelaying, complete, gravel surface, and for connection to main	170.00	170.00	170.00	170.00	170.00
10 Supervision (1 TA)	30.00	30.00	30.00	30.00	30.00
Sub-total, labour	200.00	200.00	200.00	200.00	200.00
15% overheads	30.00	30.00	30.00	30.00	30.00
Labour Total	230.00	230.00	230.00	230.00	230.00
TOTAL, for up to 10m length	1130.34	1509.12	2141.60	4286.84	6493.50
EXTRA, for over 10m length, per metre +	21.89	34.63	51.62	116.33	184.14
EXTRA, for breaking tarred road, per m					

Note: Items 1-2 include 3% BTT and 15% charge for handling and transport  
 Items 9-10 include 15% for overheads (12% EPF and 3% BTT)  
 + Includes only items 3, 5, 7, 9, 10 plus respective overheads

1990/91 - 1991/92

SERVICE CONNECTION COSTS

ITEM	CONNECTION PIPE DIAMETER				
	13mm (1/2in)	20mm (3/4in)	25mm (1in)	38mm (1-1/2in)	50mm (2in)
DIAMETER OF MAIN - 75mm (3in)					
1 Clamp saddle (PVC) †	237.00	237.00	237.00	233.00	275.00
2 Ferrule (Talbot) †	225.00	275.00	350.00		
3 PVC Pipes (Class T1000)	140.00	240.00	372.00	876.00	1392.00
4 Rends (3 No)	16.00	28.00	47.00	158.00	252.00
5 Sockets (4 No)	13.00	20.00	29.00	82.00	114.00
6 Stop cock (brass)	30.00	40.00	50.00	110.00	200.00
7 Solvent cement	4.00	5.00	8.00	18.00	26.00
8 Water meter	470.00	580.00	939.00	1997.00	4902.00
● Sub-total, materials	1135.00	1425.00	2032.00	3474.00	7161.00
3% BTT	34.95	42.75	60.96	104.22	214.83
15% handling & transport	170.25	213.75	304.80	521.10	1074.15
Materials Total	1339.30	1681.50	2397.76	4099.32	8449.98
9 Labour for pipelaying, complete, gravel surface, and for connection to main	170.00	170.00	170.00	170.00	170.00
10 Supervision (1 TA)	30.00	30.00	30.00	30.00	30.00
Sub-total, labour	200.00	200.00	200.00	200.00	200.00
15% overheads	30.00	30.00	30.00	30.00	30.00
Labour Total	230.00	230.00	230.00	230.00	230.00
TOTAL, for up to 10m length	1569.30	1911.50	2627.76	4329.32	8679.98
EXTRA, for over 10m length, per metre +	21.89	34.63	51.62	118.53	184.14
EXTRA, for breaking tarred road, per m					

- : Items 1-8 include 3% BTT and 15% charge for handling and transport
- Items 9-10 include 15% for overheads (12% EPF and 3% ETF)
- † For 38mm and 50mm sizes, cost for PVC Tee instead of ferrule
- + Includes only Items 3, 5, 7, 9, 10 plus respective overheads



SERVICE CONNECTION COSTS

ITEM	CONNECTION PIPE DIAMETER				
	13mm (1/2in)	20mm (3/4in)	25mm (1in)	38mm (1-1/2in)	50mm (2in)
DIAMETER OF MAIN - 100mm (4in)					
1 Clamp saddle (PVC) †	254.00	254.00	254.00	270.00	300.00
2 Ferrule (Talbot) †	225.00	275.00	350.00		
3 PVC Pipes (Class T1000)	140.00	240.00	372.00	876.00	1392.00
4 Bends (3 No)	18.00	28.00	47.00	158.00	252.00
5 Sockets (4 No)	13.00	20.00	29.00	82.00	114.00
6 Stop cock (brass)	30.00	40.00	50.00	110.00	200.00
7 Solvent cement	4.00	5.00	8.00	18.00	26.00
8 Water meter	470.00	580.00	939.00	1997.00	4902.00
Sub-total, materials	1152.00	1442.00	2049.00	3511.00	7186.00
3% BTT	34.56	43.26	61.47	105.33	215.58
15% handling & transport	172.80	216.30	307.35	526.65	1077.90
Materials Total	1359.36	1701.56	2417.82	4142.98	8479.48
9 Labour for pipelaying, complete, gravel surface, and for connection to main	170.00	170.00	170.00	170.00	170.00
10 Supervision (1 TA)	30.00	30.00	30.00	30.00	30.00
Sub-total, labour	200.00	200.00	200.00	200.00	200.00
15% overheads	30.00	30.00	30.00	30.00	30.00
Labour Total	230.00	230.00	230.00	230.00	230.00
TOTAL, for up to 10m length	1589.36	1931.56	2647.82	4372.98	8709.48
EXTRA, for over 10m length, per metre †	21.89	34.63	51.62	118.53	184.14
EXTRA, for breaking tarred road, per m					

Note: Items 1-8 include 3% BTT and 15% charge for handling and transport  
 Items 9-10 include 15% for overheads (12% EPF and 3% ETF)  
 † For 38mm and 50mm sizes, cost for PVC Tee instead of ferrule  
 - Includes only Items 3, 5, 7, 9, 10 plus respective overheads

SERVICE CONNECTION COSTS

ITEM	CONNECTION PIPE DIAMETER				
	13mm (1/2in)	20mm (3/4in)	25mm (1in)	38mm (1-1/2in)	50mm (2in)
DIAMETER OF MAIN - 150mm (6in)					
1 Comp saddle (PVC) †	428.00	438.00	449.00	560.00	600.00
2 Ferrule (Talbot) †	225.00	275.00	350.00		
3 PVC Pipes (Class T1000)	140.00	240.00	372.00	876.00	1392.00
4 Bends (3 No)	16.00	28.00	47.00	158.00	252.00
5 Sockets (4 No)	13.00	20.00	29.00	82.00	114.00
6 Stop cock (brass)	30.00	40.00	50.00	110.00	200.00
7 Solvent cement	4.00	5.00	8.00	18.00	26.00
8 Water meter	470.00	580.00	939.00	1997.00	4902.00
Sub-total, materials	1326.00	1626.00	2244.00	3801.00	7486.00
3% BTT	39.78	48.78	67.32	114.03	224.58
15% handling & transport	198.90	243.90	336.60	570.15	1122.90
Materials Total	1564.68	1918.68	2647.92	4485.18	8833.48
9 Labour for pipelaying, complete, gravel surface, and for connection to main	170.00	170.00	170.00	170.00	170.00
10 Supervision (1 TA)	30.00	30.00	30.00	30.00	30.00
Sub-total, labour	200.00	200.00	200.00	200.00	200.00
15% overheads	30.00	30.00	30.00	30.00	30.00
Labour Total	230.00	230.00	230.00	230.00	230.00
TOTAL, for up to 10m length	1794.68	2148.68	2877.92	4715.18	9063.48
EXTRA, for over 10m length, per metre +	21.89	34.63	51.62	118.53	184.14
EXTRA, for breaking tarred road, per m					

Note: Items 1-8 include 3% BTT and 15% charge for handling and transport

Items 9-10 include 15% for overheads (12% EPF and 3% ETF)

† For 38mm and 50mm sizes, cost for PVC Tee instead of ferrule

+ Includes only Items 3, 5, 7, 9, 10 plus respective overheads

SERVICE CONNECTION COSTS

ITEM	CONNECTION PIPE DIAMETER				
	13mm (1/2in)	20mm (3/4in)	25mm (1in)	38mm (1-1/2in)	50mm (2in)
DIAMETER OF MAIN - 200mm (8in)					
1 Clamp saddle (PVC) †	725.00	730.00	740.00	850.00	900.00
2 Ferrule (Talbot) †	225.00	275.00	350.00		
3 PVC Pipes (Class T1000)	140.00	240.00	372.00	876.00	1392.00
4 Bends (3 No)	16.00	28.00	47.00	158.00	252.00
5 Sockets (4 No)	13.00	20.00	29.00	82.00	114.00
6 Stop cock (brass)	30.00	40.00	50.00	110.00	200.00
7 Solvent cement	4.00	5.00	8.00	18.00	26.00
8 Water meter	470.00	580.00	939.00	1997.00	4902.00
Sub-total, materials	1623.00	1918.00	2535.00	4091.00	7786.00
3% BTT	48.69	57.54	76.05	122.73	233.58
15% handling & transport	243.45	287.70	360.25	613.65	1167.90
Materials Total	1915.14	2263.24	2991.30	4827.38	9187.48
9 Labour for pipelaying, complete, gravel surface, and for connection to main	170.00	170.00	170.00	170.00	170.00
Supervision (1 TA)	30.00	30.00	30.00	30.00	30.00
Sub-total, labour	200.00	200.00	200.00	200.00	200.00
15% overheads	30.00	30.00	30.00	30.00	30.00
Labour Total	230.00	230.00	230.00	230.00	230.00
<b>TOTAL, for up to 10m length</b>	<b>2145.14</b>	<b>2493.24</b>	<b>3221.30</b>	<b>5057.38</b>	<b>9417.48</b>
EXTRA, For over 10m length, per metre †	21.89	34.63	51.62	118.53	164.14
EXTRA, For breaking tarred road, per m					

Note: Items 1-8 include 3% BTT and 15% charge for handling and transport

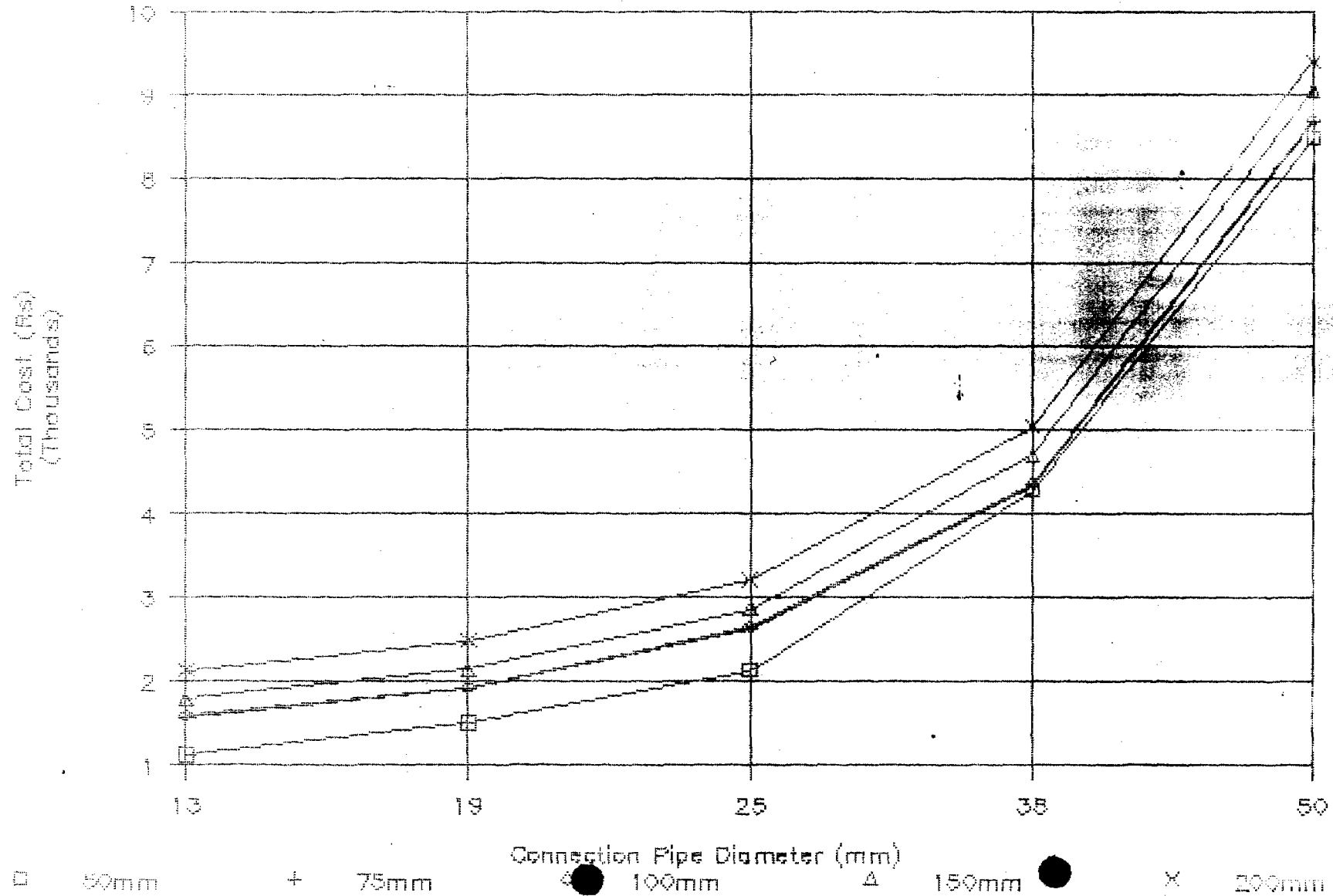
Items 9-10 include 15% for overheads (12% EPF and 3% ETF)

† For 38mm and 50mm sizes, cost for PVC Tee instead of ferrule

+ Includes only items 3, 5, 7, 9, 10 plus respective overheads

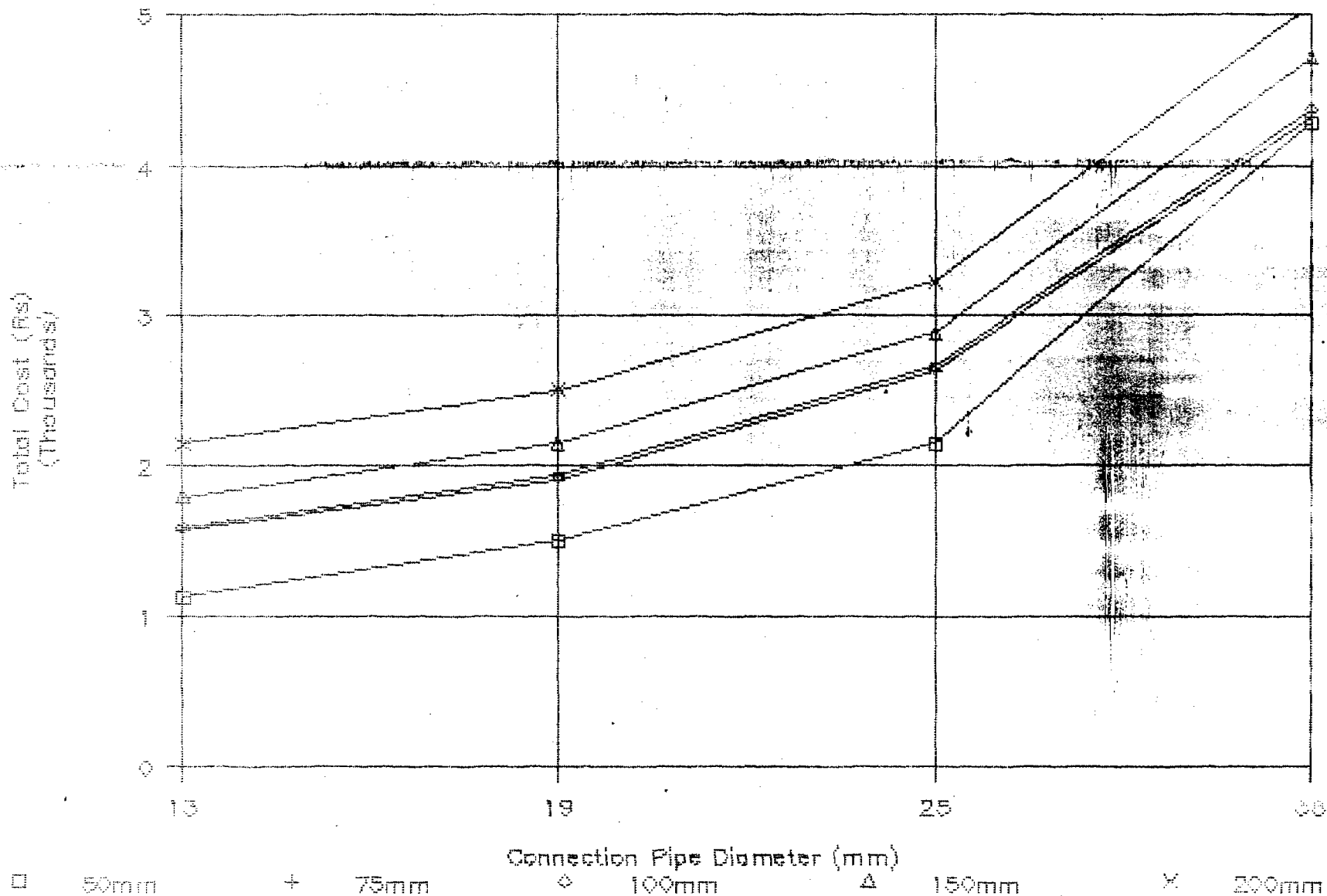
# SERVICE CONNECTION COSTS

For Different Main Sizes



# SERVICE CONNECTION COSTS

For Different Main Sizes



## Appendix E. Pipe sizing calculation

### E.1 Determination of flow rates

#### E.1.1 Assessment of probable demand

In most buildings it rarely happens that all the appliances installed are in simultaneous use. For reasons of economy therefore it is usual to provide for a simultaneous demand less than the possible maximum. This simultaneous demand can be estimated either by application of probability theory using loading units or from data derived by observation and experience of similar installations.

#### E.1.2 Loading units

Loading units are factors taking into account the flow rate at the appliance, the length of time in use and the frequency of use. The number of each type of appliance fed by the pipe run concerned is multiplied by its loading unit as given in table 20 and the results added together to obtain a figure for the total loading units. By use of figure 24 this total of loading units is converted into the total simultaneous demand for that group of appliances, as a design flow rate in litres per second. Owing to differences in the rates of flow and pattern of demand between hot and cold outlets, the loading units applicable also show some variation, but for most practical purposes the same loading units can be added for both hot and cold outlets. Table 20 is based on normal domestic usage and customary (or statutory) provision of appliances. It is not applicable where usage is intensive, e.g. in theatres and conference halls. In such cases it is necessary to establish the pattern of usage and appropriate peak flow demand for the particular case.

### E.2 Head losses in pipes, fittings and valves

#### E.2.1 Pipes

The rate of flow of water through a pipe depends upon the length and bore diameter, the roughness of the surface and the pressure drop (head loss) along the pipe. Copper, stainless steel and plastics pipes are smooth and the relationship between dimensions, flow rate and head loss for pipes of these materials is given in figures 25 and 26.

#### E.2.2 Pipe fittings

The loss of head through pipe fittings (elbows and tees) should be expressed as the loss of head through an equivalent length of pipe as set out in table 21. Alternatively, where it is impracticable to forecast in detail the numbers and types of pipe fittings to be used, an approximation may be made by adding an equivalent length, as a percentage of the actual length, to cover all head losses in pipe fittings. The percentage added may vary between 10 % and 40 % depending on the complexity of the pipe layout; the actual percentage used being left to the experience and discretion of the designer.

#### E.2.3 Valves

The loss of head through stopvalves and check valves is relatively large. These losses are expressed either as the loss of head through an equivalent length of pipe as in table 21 and added to the actual length, or the actual head loss determined from figure 27 and subtracted from the head available. The losses through full flow gate valves can be ignored.

Table 20. Loading units (hot or cold supply)

Appliances	Loading units
WC flushing cistern (9 L)	2
Wash basin	1½ to 3
Bath tap of nominal size ¾	10
Bath tap of nominal size 1	22
Shower	3
Sink tap of nominal size ¾	3
Sink tap of nominal size 1	5

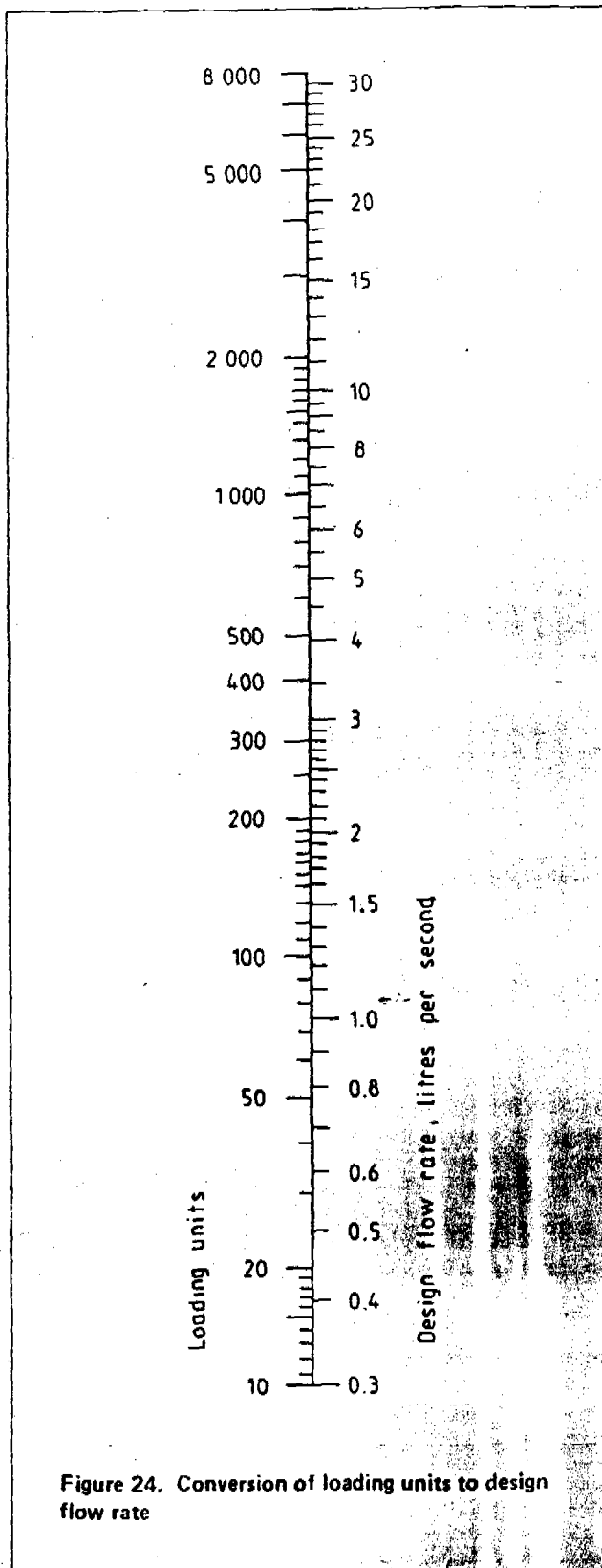
NOTE 1. WC flushing cisterns with single or dual flush do not have the same loading unit.

NOTE 2. The wash basin loading unit is for a single tap, and the larger unit is applicable to situations such as schools and offices where there is a peak period of use. Where multiple taps are installed, an equivalent continuous demand of 0.04 L/s per tap should be assumed.

NOTE 3. Urinal demand is very low, and is normally disregarded.

NOTE 4. Clothes washing machines and dishwashing machines in individual dwellings can be assessed as sinks fitted with taps of nominal size ¾.

NOTE 5. Outlet fittings for industrial purposes or requiring high peak demands to be met should be taken into account by adding 100 % of their flow rate to the design flow rate for other appliances obtained by using loading units.



**Table 21. Equivalent pipe lengths (copper, plastics and stainless steel)**

Bore of pipe	Equivalent pipe length			
	Elbow	Tee	Stopvalve	Check valve
mm	m	m	m	m
12	0.5	0.6	4.0	2.5
20	0.8	1.0	7.0	4.3
25	1.0	1.5	10.0	5.6
32	1.4	2.0	13.0	6.0
40	1.7	2.5	16.0	7.9
50	2.3	3.5	22.0	11.5
65	3.0	4.5	—	—
73	3.4	5.8	34.0	—

NOTE 1. The losses through tees are taken to occur on a change of direction only. Losses through fully open gate valves may be ignored.

NOTE 2. In some systems special fittings with significant head losses are used. For information on head losses in these fittings, reference should be made to the manufacturers.

NOTE 3. Where it is proposed and permitted to use galvanized steel pipes in a small installation, the calculations for pipe sizing, for all practical purposes, may be based on the data given in this table for equivalent nominal sizes of smooth bore pipes. For larger installations, data relating specifically to galvanized steel should be used. Suitable data can be found in the Plumbing Design Guide published by the Institute of Plumbing\*.

**E.2.4 Meters**

If there is a meter in the pipeline, the loss of head through the meter at design flow should be deducted from the available head. The amount of such loss can be obtained from the meter manufacturer or from the water supplier.

**E.2.5 Taps**

The residual head available at each tap should be at least equal to the loss of head through the tap at the design flow rate. Alternatively, the loss of head may be expressed as an equivalent length of pipe. Head losses and equivalent lengths of pipe or taps are given in table 22.

**E.2.6 Float-operated valves**

The nominal size of a float-operated valve, the diameter of its orifice and the size of float required are all dependent on the residual head of water available at the inlet to the valve and the flow required. The relationship between discharge, size of valve, orifice and head loss is shown in figure 28.

Where non-standard float valves are used, the data relating the flow rate to the head of water available at the inlet should be obtained from the manufacturer.

\* Obtainable from the Institute of Plumbing, 64 Station Road, Hornchurch, Essex RM12 6NB.

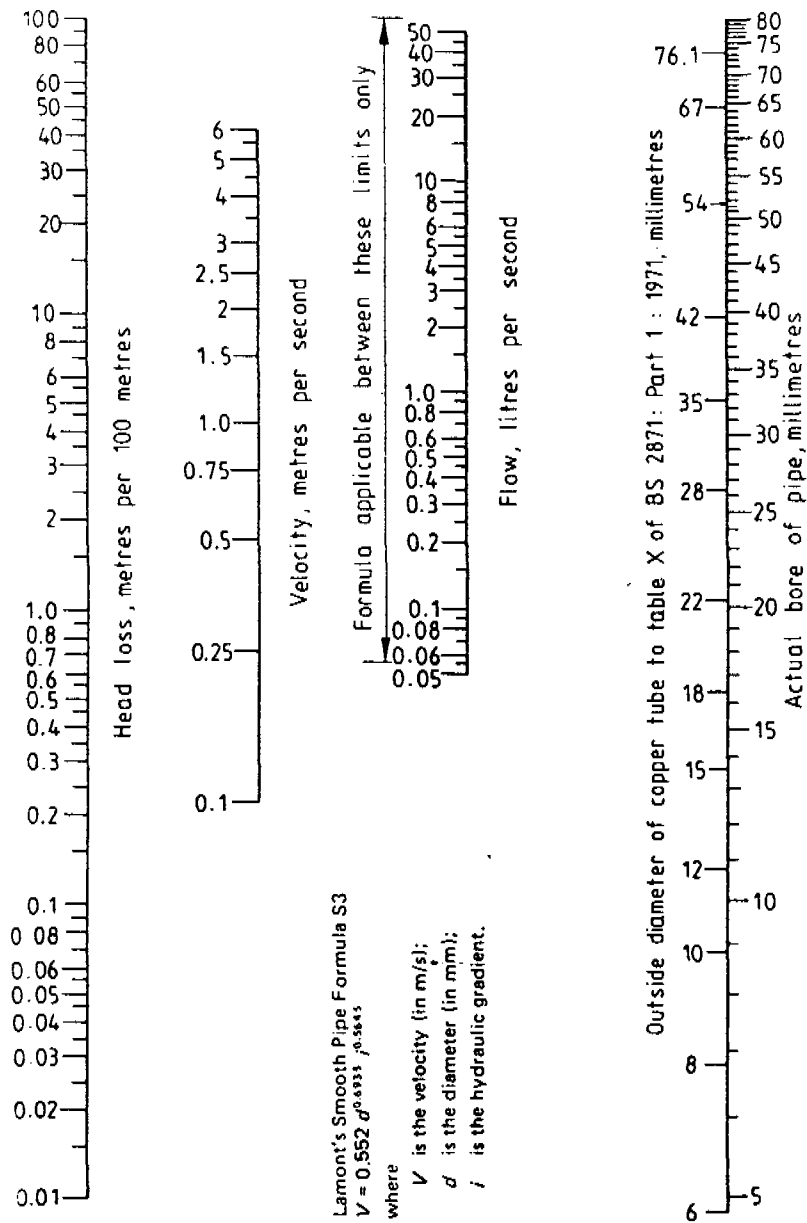


Figure 25. Determination of pipe diameter: cold water services (water at 12.8 °C)



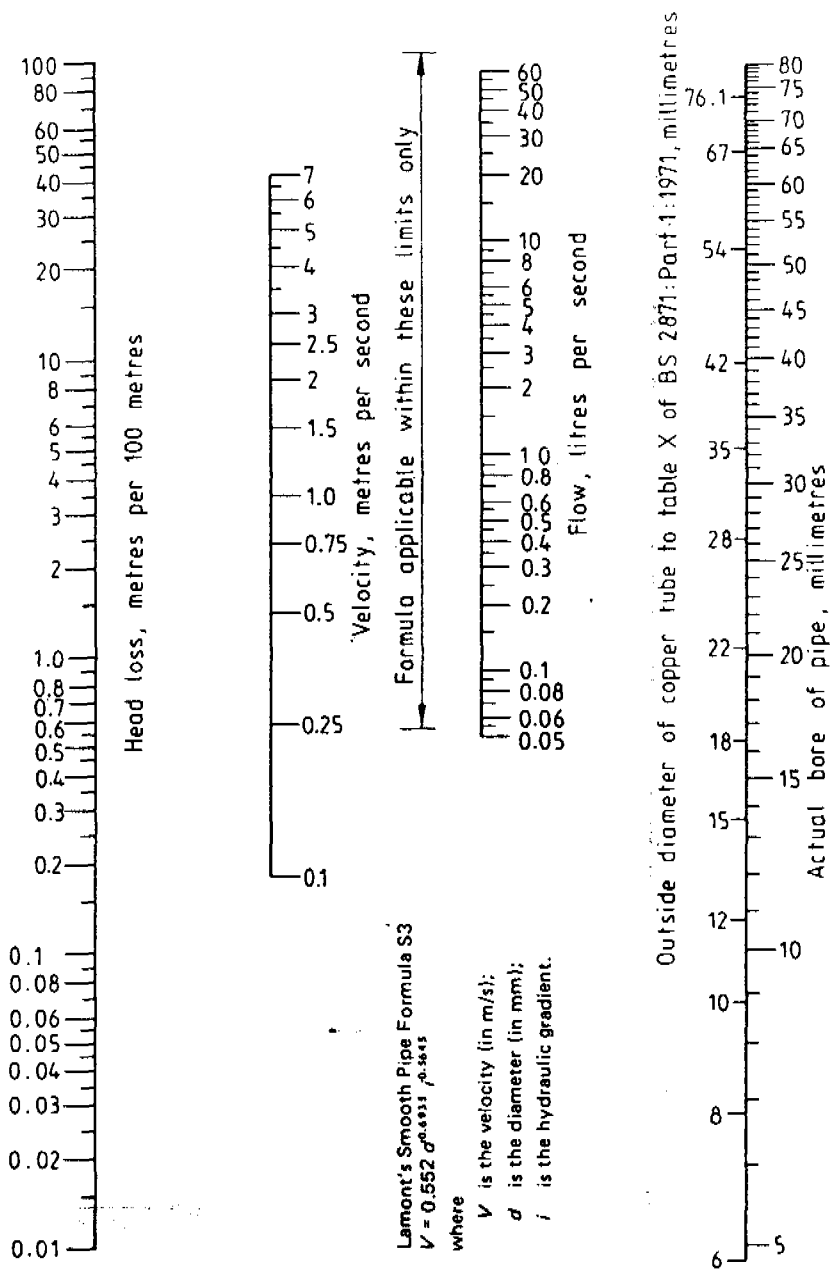


Figure 26. Determination of pipe diameter: hot water services (water at 80 °C)

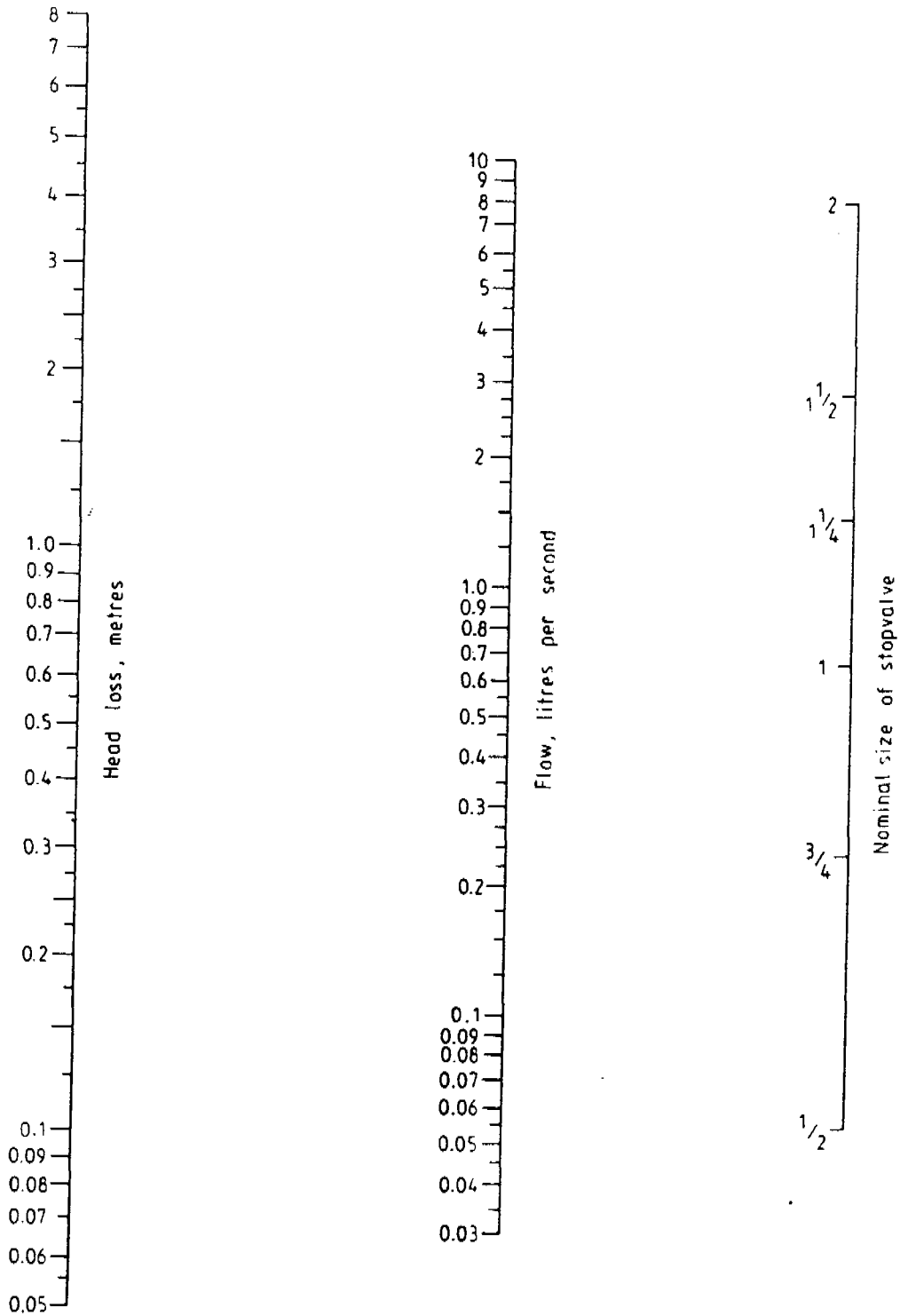


Figure 27. Head loss through stopvalves

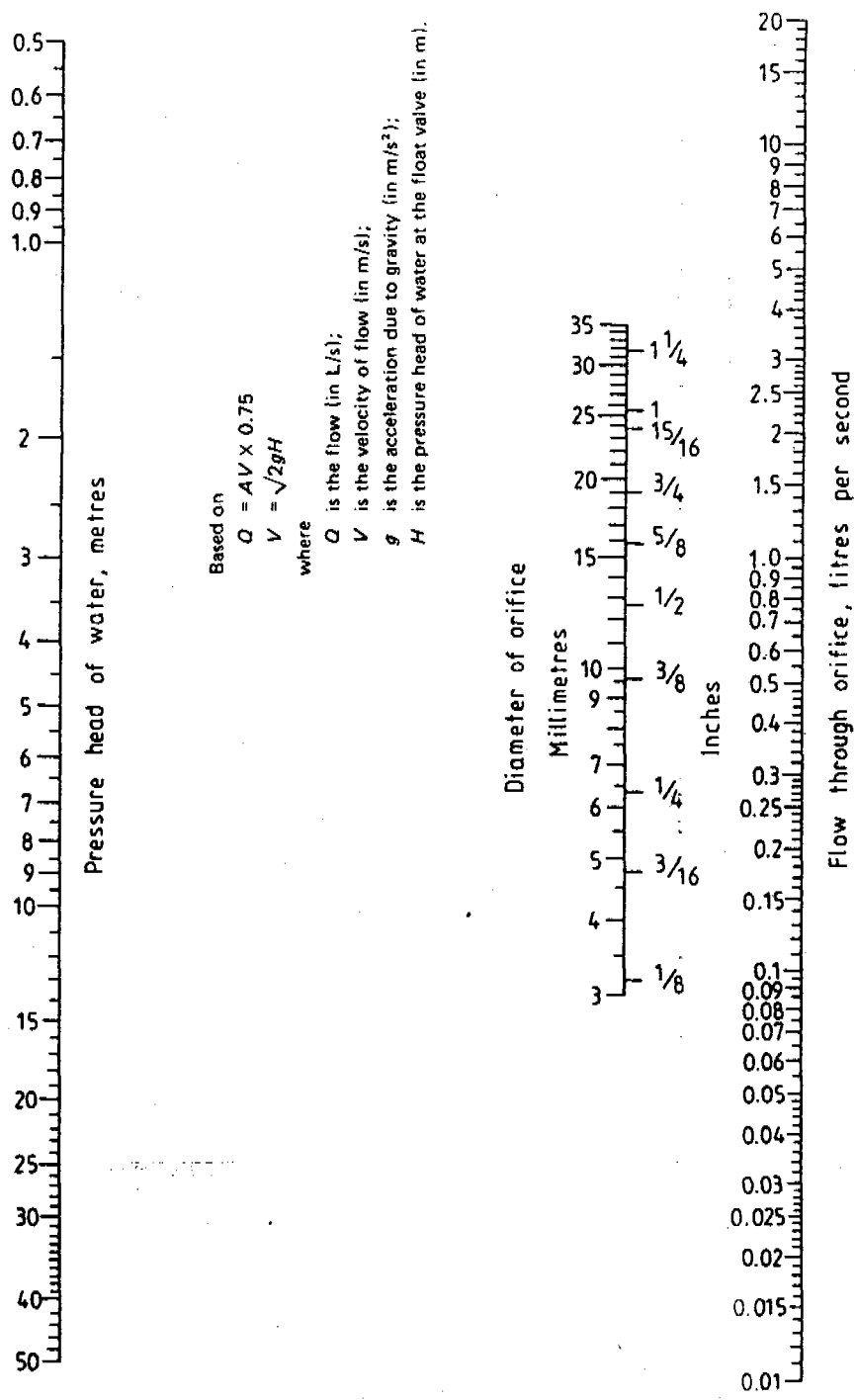


Figure 28. Head loss through float-operated valves

Table 22. Typical loss of head through taps and equivalent pipe lengths

Tap	Flow rate	Loss of head*	Equivalent pipe length
	L/s	m	m
Nominal size ½	0.15	0.5	3.7
Nominal size ¾	0.20	0.8	3.7
Nominal size 1	0.30	0.8	11.8
Nominal size 1½	0.60	1.5	22.0

\* Head losses for stated flow rates are typical only and may vary with taps of different manufacture.

### E.3 Available head

#### E.3.1 Storage cistern supplied systems

Initial available head should normally be measured from the outlet of a cistern, unless the supply is sufficient to allow a depth of half the cistern or 0.5 m (whichever is less) to be assumed. Each pipe length between pipe junctions should be sized on a trial-and-error basis, starting with the first pipe length from the cistern. The residual head at the end of each pipe length should be calculated taking account of head losses in pipework, fittings and valves. If a residual head is arrived at that is negative or less than the head absorbed by the outlet or tap, or if an impractical pipe size is indicated, the diameter of the preceding pipes should be adjusted and the procedure repeated (see E.4.5).

#### E.3.2 Mains pressure supplied systems

The minimum pressure in the main at the time of peak demand should be obtained from the water supplier (see 4.1) and if there is any doubt about this pressure being obtainable in the future a suitable factor should be applied. Once the minimum pressure has been established the method for pipe sizing is identical with that indicated in 4.1.

### E.4 Method of determination of pipe size

#### E.4.1 General

The principle underlying the design of a water supply system is the same whether the cold and hot water supplies to sanitary appliances are obtained from a storage cistern or direct from a main service pipe. Friction losses in the pipes may be determined by the general theory of

roughness, but this has too many variables for normal design purposes. Exponential formulae have been devised, which relate pipe diameter to head loss, water velocity and flow for new pipes in smooth-bore materials. Reduction in capacity with age can be ignored for pipe sizing calculations for pipes carrying clean potable water within buildings. Using figures 25 and 26, which are based on exponential formulae, a pipe diameter can be selected which meets the other three design parameters of design flow, maximum water velocity and permissible head loss.

#### E.4.2 Calculation diagrams

An approximate isometric or similar projection of the scheme should be drawn. This drawing should be to scale to facilitate measurement of pipe lengths and levels unless the data can be obtained otherwise. The possibility of future extensions or additions to the scheme should be considered at this stage. Each pipe junction and fitting should be numbered for calculation purposes and pipes referenced by their terminal junctions and fittings.

#### E.4.3 Calculation sheet

A calculation sheet should be used on which the following data can be entered (see tables 23 and 24):

- (a) pipe reference;
- (b) full demand in loading units;
- (c) simultaneous demand or design flow rate (in L/s);
- (d) pipe diameter;
- (e) velocity;
- (f) head loss (in %);
- (g) drop or rise (that is, the difference in level of inlet and outlet);
- (h) available head at outlet end of pipe length;
- (i) actual pipe length;
- (j) equivalent pipe length (actual plus an allowance for fittings);
- (k) equivalent pipe length of valves, etc.;
- (l) total equivalent pipe length of pipes and valves;
- (m) actual head loss;
- (n) residual head at outlet of pipe length;
- (o) remarks (size of taps, float valves and head required).

#### E.4.4 Alterations and extensions

Where an extension or alteration is carried out to old pipework, the existing pipes may be of imperial sizes, and the calculations should be adjusted accordingly.

**E.4.5 Procedure**

There is no particular 'correct' method for sizing a system of water pipework but one method, based on the use of a calculation sheet as described in E.4.3, is as follows.

<i>Stage</i>	<i>Complete column</i>
1. Prepare the pipework diagram and number each junction consecutively from the cistern or water main.	
2. Enter the pipe reference on the calculation sheet.	1.
3. Determine the loading units for each length of pipe.	2.
4. Convert the loading units to design flow rates in litres per second using figure 24.	3.
5. Starting from the source and using a straightedge in conjunction with figure 25 or 26, select a pipe size, such that the velocity is 3 m/s or less. Note the velocity and percentage head loss.	4, 5 and 6.
6. Determine the vertical distance between the inlet and the outlet of the pipe length (+ drop or - rise).	7.
	8. Determine the available head by adding or deducting the drop or rise respectively from the residual head at the inlet to the pipe length.
	9. Measure the actual length of the pipe being considered.
	10. Determine the effective length of the pipe by adding on to the actual length an equivalent length of pipe to cover head losses in pipe fittings.
	11. Determine the actual head loss of the pipework from columns 6 and 10.
	12. Determine an equivalent length of pipe for valves from table 21.
	13. Add columns 11 and 12 to determine the total equivalent length of pipe for pipe, fittings and valves.
	14. Deduct the actual head loss in column 13 from the available head in column 8 to give residual head.
	15. If residual head is less than the head required for a particular outlet fitting, or if the head is negative, repeat stages 5 to 11, selecting a larger pipe size.

**E.4.6 Example**

The procedure described in E.4.5 can be followed through in the example pipe sizing calculations for the three-storey flats shown in tables 23 and 24.

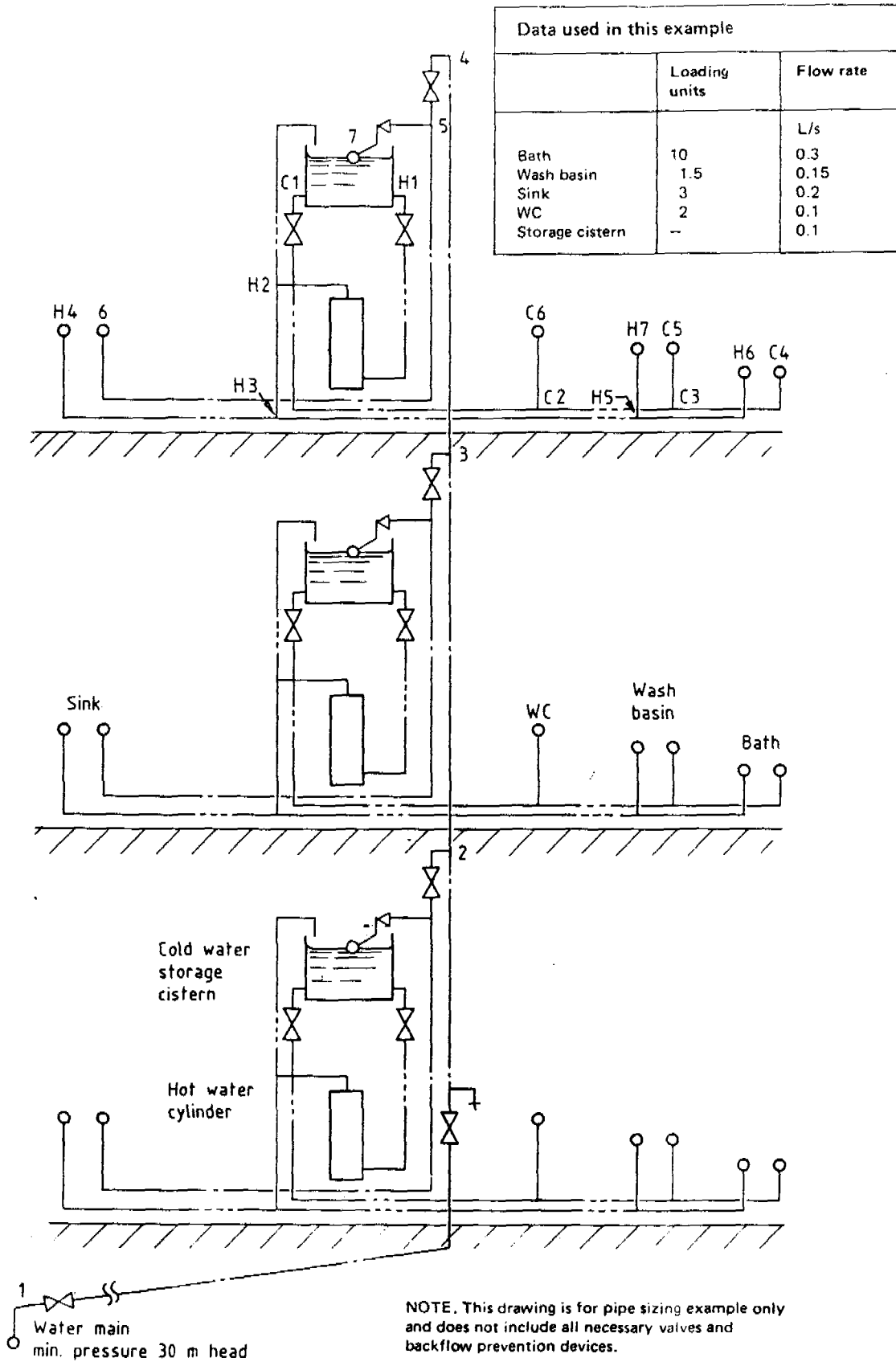


Figure 29. Example of pipe sizing for hot and cold water services, low pressure system

**Table 23. Hot and cold water supply supplied from storage (see figure 29)**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Pipe reference	Loading units	Design flow rate	Pipe size	Velocity	Head loss per 100 m of pipe	Drop + Rise -	Available head	Pipe length		Head loss			Available residual head	Required residual head at fitting
								Actual	Effective	Pipework	Valves*	Total		
		L/s	mm	m/s	m	m	m (14) ± (7)	m	m	m $\frac{(10) \times (6)}{100}$	m	m (11) + (12)	m (8) - (13)	
<b>Cold water distributing pipes in flats</b>														<b>Max. velocity = 3 m/s</b>
C1 to C2	13.5	0.35	28	0.63	2.5	+ 2.0	2.00	4.0	5.6	0.14	GV†=0	0.14	1.86	
C2 to C3	11.5	0.32	28	0.6	2.0		1.86	1.0	1.4	0.03		0.03	1.83	
C3 to C4	10.0	0.30	22	1.0	7.0	- 0.6	1.23	1.5	2.1	0.15		0.15	1.08	Bath = 0.8 m
C3 to C5	1.5	0.15	15	1.1	14.0	- 0.7	1.13	0.7	1.0	0.14		0.14	0.99	Wash basin = 0.5 m
C2 to C6	2.0	0.10	15	0.7	6.2	- 1.0	0.86	1.0	1.4	0.09		0.09	0.77	WC (¾ φ) < 0.5 m
<b>Hot water distributing pipes in flats</b>														<b>Max. velocity = 2 m/s</b>
H1 to H2	14.5	0.37	28	0.7	2.0	+ 1.0	1.00	4.0	5.6	0.11	GV†=0	0.11	0.89	
H2 to H3	14.5	0.37	28	0.7	2.0	+ 1.0	1.89	1.5	2.1	0.04		0.04	1.85	
H3 to H4	3.0	0.20	22	0.6	2.5	- 1.0	0.85	3.0	4.2	0.11		0.11	0.74	Sink (¾) = 0.5 m
H3 to H5	11.5	0.32	28	0.6	1.5		1.25	3.0	4.2	0.06		0.06	1.79	
H5 to H6	10.0	0.30	22	1.0	5.0	- 0.6	1.19	1.5	2.1	0.11		0.11	1.08	Bath H > 0.8 m
H5 to H7	1.5	0.15	15	1.2	11.0	- 0.7	1.09	0.7	1.0	0.11		0.11	0.98	WB H > 0.5 m
<b>Main service pipe: design head in main = 30 m</b>														<b>Max. velocity = 3 m/s</b>
1 to 2	9 + † =	0.6 + 0.3 = 0.9	28	1.7	14.0	- 5.0	25.00	25.0	35.0	4.90	2 SV = 2.2	7.10	17.90	
2 to 3	6 + † =	0.4 + 0.2 = 0.6	28	1.2	7.0	- 3.0	14.90	3.0	4.2	0.29		0.29	14.61	
3 to 4	3 + † =	0.2 + 0.1 = 0.3	28	0.6	2.0	- 3.0	11.61	3.0	4.2	0.08		0.08	11.53	
4 to 5	3 + † =	0.2 + 0.1 = 0.3	15	2.2	45.0	+ 1.0	12.53	1.0	1.4	0.63	SV = 2.0	2.63	9.90	
5 to 6	3	0.2	15	1.5	23.0	+ 1.0	10.90	6.0	8.4	1.93		1.93	8.97	Sink = 0.5 m
5 to 7	-	0.1	15	0.7	6.2	- 0.5	9.40	1.0	1.4	0.09		0.09	9.31	FV§ (¾ φ) = 3.0 m

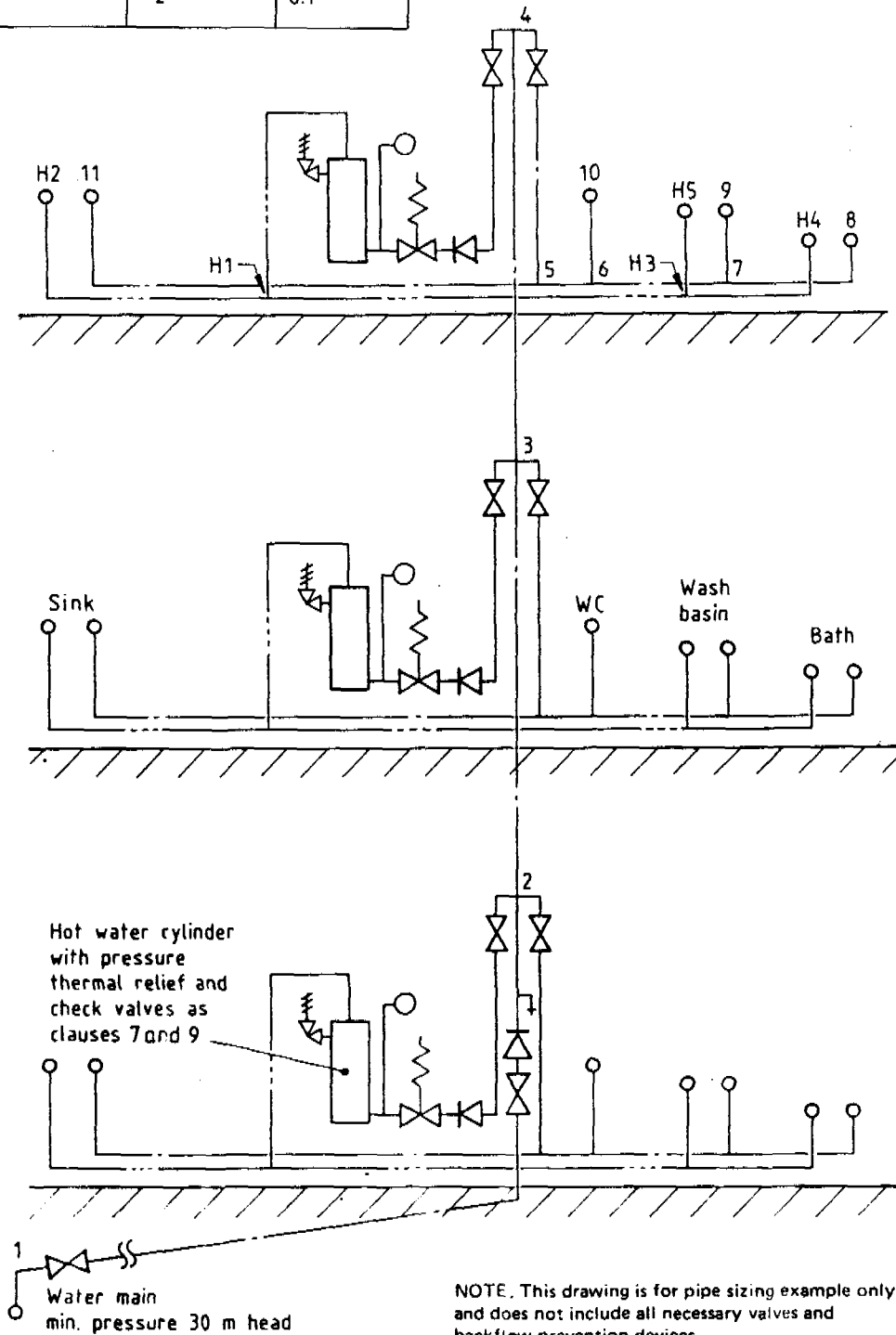
\* SV = stopvalve.

† Main supply to storage cisterns = 0.1 L/s.

‡ GV = gate valve.

§ FV = float-operated valve.

Data used in this example		
	Loading units	Flow rate
Bath	10	L/s
Wash basin	1.5	0.3
Sink	3	0.2
WC	2	0.1



NOTE. This drawing is for pipe sizing example only and does not include all necessary valves and backflow prevention devices.

Figure 30. Example of pipe sizing for hot and cold water services, mains pressure system



**Table 24. Hot and cold water supply direct off main service (see figure 30)**

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Pipe reference	Loading units	Design flow rate	Pipe size	Velocity	Head loss per 100 m of pipe	Drop + Rise -	Available head	Pipe length		Head loss			Available residual head	Required residual head at fitting
								Actual	Effective	Pipework	Valves*	Total		
		L/s	mm	m/s	m	m	m (14) ± (7)	m	m	m $\frac{(10) \times (6)}{100}$	m	m (11) + (12)	m (8) - (13)	
<b>Main service to flats</b>				<b>Design head in main = 30 m</b>							<b>Max. velocity = 3 m/s</b>			
1 to 2	93	1.17	28	2.3	21.0	- 4.0	26.00	24.0	33.6	7.06	2SV+1CV=50	12.06	13.94	
2 to 3	62	0.90	28	1.7	13.5	- 3.0	10.94	3.0	4.2	0.57		0.57	10.37	
3 to 4	31	0.57	28	1.1	6.0	- 3.0	7.37	3.0	4.2	0.25		0.25	7.12	
<b>Cold water services to top flat</b>											<b>Max. velocity = 3 m/s</b>			
4 to 5	16.5	0.40	22	1.3	11.0	+ 2.0	9.12	2.0	2.8	0.31	SV=0.73	1.04	8.08	
5 to 6	13.5	0.35	15	2.6	60.0		8.08	1.0	1.4	0.84		0.84	7.24	
6 to 7	11.5	0.32	15	2.3	48.0		7.24	1.0	1.4	0.67		0.67	6.57	
7 to 8	10.0	0.30	15	2.2	45.0	- 0.5	6.07	1.5	2.1	0.95		0.95	5.12	Bath = 0.8 m
7 to 9	1.5	0.15	15	1.1	13.0	- 0.7	5.87	0.7	1.0	0.13		0.13	5.74	Wash basin = 0.5 m
6 to 10	2.0	0.10	15	0.7	6.1	- 1.0	6.24	1.0	1.4	0.09		0.09	6.15	WC ( $\frac{3}{8}$ $\phi$ ) = 3 m
5 to 11	3.0	0.20	15	1.5	22.0	- 1.0	7.08	4.0	5.6	1.23		1.23	5.85	Sink = 0.8 m
<b>Hot water services to top flat</b>											<b>Max. velocity = 2 m/s</b>			
4 to H1	14.5	0.37	22	1.0	7.5	+ 2.0	16.92	5.5	7.7	0.58	3 valves = 1.89	2.47	14.45	
H1 to H2	3.0	0.20	15	1.5	18.0	- 1.0	13.45	3.0	4.2	0.76		0.76	12.69	Sink = 0.8 m
H1 to H3	11.5	0.32	22	1.05	5.75		14.45	3.0	4.2	0.24		0.24	14.21	
H3 to H4	10.0	0.30	22	1.0	5.4	- 0.5	13.71	1.5	2.1	0.11		0.11	13.60	Bath = 0.8 m
H3 to H5	1.5	0.15	15	1.2	11.0	- 0.7	13.51	0.7	1.0	0.11		0.11	13.40	WB = 0.5 m

\* SV = stopvalve.

CV = check valve.

NOTE Recalculate for ground and first floor flats as above.

*National Water Supply and Drainage Board* 9  
*Law, No. 2 of 1974*

24. (1) If any private street has been constructed to which one or more houses have access, the Board may lay, enlarge, or extend a water main along such private street of such dimensions as may be necessary, and may apportion the whole or part of the cost of laying, enlarging, or extending such main among the owners of the premises fronting upon, adjoining, abutting, or having access to, or deriving any degree of benefit from, such main according to the areas of the respective premises which may derive, or be so situated as to derive, any such benefit from the laying, enlarging, or extending of the said main.

Board to lay or enlarge water main along private street.

(2) The initial cost of laying, enlarging, or extending such main shall be borne by the Board, and the property in the said main shall remain in the Board.

(3) The sums apportioned for payment by the owners of the respective premises shall be made a charge upon such premises, and no private service shall be granted to such premises until the sum apportioned in respect thereof has been paid or an engagement to pay the same be made with the Board as hereinafter provided.

(4) When any premises in any such private street has an already existing supply of water from the Board's mains by private pipes, the Board may, whenever it shall become necessary to take up such private pipes for cleaning or renewal, call upon the owner to connect with the new main.

(5) (a) In any case where any existing main has been laid in any private street at the expense of any private person, it shall be lawful for such person to recover from the owner or owners of any property fronting upon, adjoining, abutting on, or having access to such private street, who apply to the Board for a private service of water, such an apportionment of the cost of the laying of the said main as may be determined by the General Manager of the Board in proportion to the frontage of the premises abutting on such street.

(b) No person shall be permitted to make a connection with any such main until he has paid or given a guarantee for the payment of such apportionment to the satisfaction of such private person.

(6) (a) When any premises fronting upon, adjoining, abutting on, or having access to any such private street has an existing supply of water from the Board's mains by private pipes other than the main which has been laid at the cost of any private person aforesaid, the owner of such premises may be permitted to use such pipes until such time as it shall become necessary to take up such pipes for cleaning or renewal.

(b) When it shall become necessary to take up such pipes for cleaning or renewal, the owner of the said premises shall not be permitted to re-lay such pipes in their former position, but shall connect them with the main in the private street laid by the private person aforesaid, and shall, before any connection is made therewith, pay such apportionment of the cost of laying the aforesaid main as shall be determined by the General Manager of the Board in proportion to the frontage of the premises abutting on such street.

(7) All mains laid in any private street shall vest in the Board, and the cost of their maintenance, renewal, and repair shall be borne by the Board.

## POLICY ON WATER MAINS IN PRIVATE STREETS

My No. FD/10  
Finance Division

15 September 1988

AGM (GCR),

Water Mains in Private Streets - Colombo MC

On Board Paper S/25/87 - 330 of 26 January 1987, the following received approval -

- (a) Laying of water mains in private streets, for which the Board keep a rolling fund of Rs. 2 million from Foreign Aid/Consolidated Fund.
- (b) A scheme for customers to pay their share in instalments. Due to lack of funds the implementation was delayed. With the limited funds now available the instalment concession has been deferred and is not included in the recommendation of AGM (GCR) in his memo to Chairman reference CWO/COL/37 of 23.3.1988, which will now be the basis of implementation.

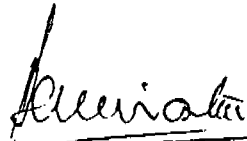
Eventually each consumer has to pay only the "proportionate cost" for the water main. This is determined when the water main estimate is prepared. The percentage of 40 & 20 paid by the first three applicants are in the nature of advance. Any excess over the proportionate charges applicable to them, will be refunded. Thereafter when the fourth applicant and after pay their proportionate charges, these will be refunded to the first three applicants, until the amounts paid are reduced to their proportionate costs. The refunds will be in the ratio 4:4:2. The first three applicants will also receive interest at 20% on their excess payment. This interest will be included in the proportionate costs of subsequent applicants and will be based on the reducing balances of the first three applicants. Any amounts collected over and above the total cost and the 20% interest, will be taken by the Board to cover administrative charges.

Project Manager (CMC) has informed me that CMC has been maintaining a set of registers. I recommend that these are examined and if suitable, used by the Board. These records will be maintained by the Accountant (GCR) and available for audit inspection.

The Finance Division will maintain a "Register of Funds - WMPS" (ie. Water Mains in Private Streets). An estimate for the proposed main has to be approved by the AGM (GCR) and if over Rs.100,000/= by General Manager. Two copies should be sent to Finance Division which will be checked with the above register and confirmed on the original that funds are available by giving an FD number, signing it and returning to AGM (GCR). It is only thereafter that work may commence.

All materials should be drawn from Greater Colombo Region store so as to have effective control.

A Job Card should be maintained for each construction and the materials drawn, entered therein. Details of materials, value, date, and MIRR numbers should be entered so that they can be traced back by audit to the stores records. The personnel costs should be entered in checkroll form 4956 daily and the total cost transferred to the job card when the job is completed. Samples are attached. On completion of the work the engineer incharge will check and certify on the job card that the work is commissioned and send it to the Accountant (GCR) to check with the original estimate. He will instruct the stores in writing, to stop further issues and DGM (F) of any excess spending compared with the approved estimate.. This should be done within two weeks of the completion of the work.



Consultant DGM (Finance)

cc : General Manager  
DGM (O&M)  
Accountant (GCR)  
Stores Manager  
C.I.A.

DLJS/rr.

Notes on Important Aspects of Internal Plumbing

(Note to be attached to Local Authorities' (LA) building applications).

1. Have the work planned and designed by a qualified architect or engineer, and installed by a licensed plumber. (A list of licensed plumbers should be available from your LA).
2. Ensure that the plumbing system conforms in all respects to the Plumbing Code before installation commences (A copy of the Plumbing Code should be available from your LA or the NWSDB).
3. Use only PVC pipes of Type 1000 bearing the Sri Lanka Standard mark for cold water piping.
4. Copper pipe is recommended for hot water systems, since galvanized iron (GI) pipe corrodes rapidly. PVC pipe shall not be used for hot water systems.
5. Outside building, lay pipes at a minimum depth of 600 mm (2 feet). Bed pipes in soft, granular material and not in sharp stones or rocky ground.
6. Do not lay pipes underneath house walls, floors or foundations - settlement may cause breakage and serious damage may result.
7. Pay special attention to the cross connection rules in the Plumbing Code, to prevent backflow from contaminated sources into the drinking water supply.
8. Provide an elevated storage tank or cistern into which the service pipe should discharge.

In small houses it is usual for storage cisterns supplying only cold water fittings to have a capacity of 200 litres to 300 litres, and double this capacity if supplying all water outlets, hot and cold. In larger houses a total storage capacity of 200 litres per bedroom is recommended.

9. If the building is to be divided into 2 or more separate apartments, ensure that the plumbing is designed to allow a separate metered supply to each apartment.