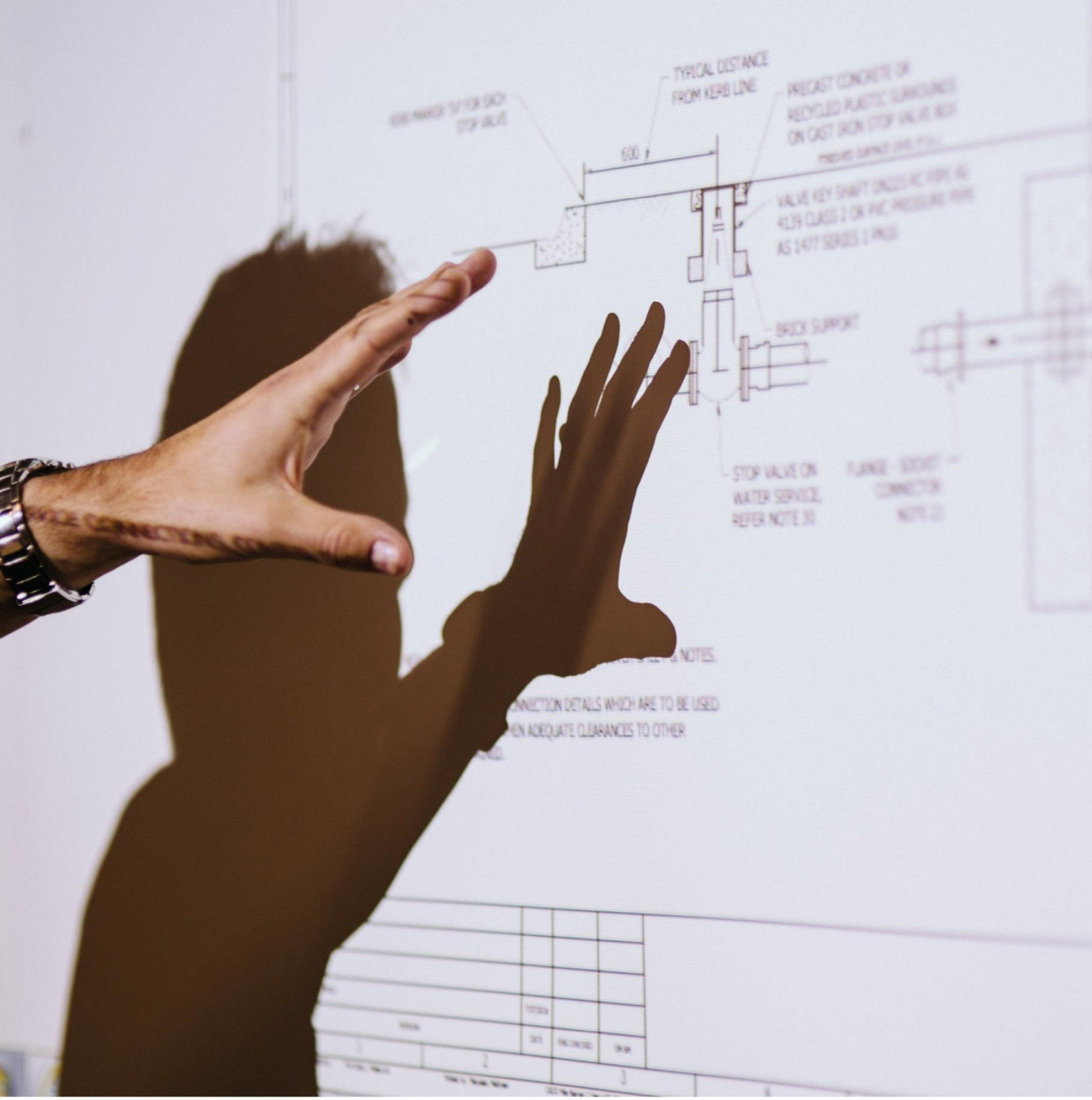

STD-SPE-M-006
REQUIREMENTS FOR PROPERTY SERVICE CONNECTIONS AND WATER METERS

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Document management

Document authorisation table

Issue	Date	Updated by	Reviewer	Approver
4	01/05/23	Sol Asadollahi Technical Director	Guy Price Manager Metering, Asset Information and Account Management Brad Porter Technical Advisor - Metering Projects	Sol Asadollahi Technical Director
5	26/09/24	Sol Asadollahi Technical Director	Brad Porter Technical Advisor - Metering Projects	Sol Asadollahi Technical Director

Version control table

Issue	Date	Reason for issue
1	19/03/18	Initial issue for public and internal consultation
2	02/07/18	Issued for use
3	30/08/19	Amended where indicated in Appendix E and re-issued for use
4	01/05/23	Including the unit metering requirement for stakeholder review
5	26/09/24	Including the unit metering requirement released for use

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Abbreviations

ACT	Australian Capital Territory
CCTV	Closed Circuit Television
DICL	Ductile iron cement lined
DWV	Drain, waste and vent
ITP	Inspection and Test Plan
MH	Maintenance hole
NATA	National Association of Testing Authorities
PE	Polyethylene
PVC-U	Unplasticised polyvinyl chloride
RRJ	Rubber ring joint
SCJ	Solvent cement joint
TCCS	Transport Canberra and City Services
VC	Vitrified clay
WAE	Work as executed
WHS	Work, health and safety
WSA, WSAA	Water Services Association of Australia

Definitions

Brownfield application	Is the opposite of a greenfield application. Examples include: (i) the upgrade of a main, or (ii) the addition of new property service connections to an existing main.
Class B unit plan	Class B units have boundaries that are unlimited in terms of height, apart from any encroachments above or below the unit. Class B units can be stand alone, or share a common boundary, such as a wall with another Class B unit. Older "townhouse" type units on unit titled land are typically Class B. Example: The boundary of a Class B unit is usually the boundary of the land on which a townhouse has been built (or improvements to the land, such as a garage etc.). Unit owners are responsible for all maintenance, repair, and improvement of everything inside the boundary of the unit. Class B - usually units that have a 'footprint' on the ground - such as a townhouse - and the boundary is defined by a surveyed line around the land the unit sits on.
Sub-Meter	Is a water meter that is installed downstream of the Icon Water Master Meter, on the same property, for the purpose of measuring the water usage of each individual unit as well as common property water usage so that Icon Water can bill individual unit title owners directly, as well as directly bill common property water usage to the property's body corporate. There will be one water meter per unit as well as an allowance for one additional sub-water meter for common areas (e.g., fill-points for pools, communal toilets, garden taps, irrigation etc.). The term Sub-Meter is used to describe individual water meters within multi-unit complexes. The term also differentiates from a master meter that measures the supply of water to a multi-unit complex as a whole.
Greenfield application	Is an application where no existing buildings or infrastructure exists. For example, the construction of a new main in-conjunction with new property service connections is a greenfield application.
Infill Development	Also known as "brownfield" development as per the definition above.
Master Meter	The Icon Water - water meter installed at the front property boundary on a multi-unit residential or multi-unit commercial/industrial development. The 'Master Meter' measures the supply of water in its entirety, to a premise, and is located upstream of the Sub-Meters. Icon Water is responsible for supplying this water meter. Icon Water's water network extends up to the immediate downstream connection of this water meter unless the limit of responsibility has been negotiated to be at a different location between the property owner and Icon Water and this location has been approved by the Utilities Technical Regulator.

1 Background

Icon Water has adopted Water Services Association of Australia (WSAA) codes and specifications as a basis for its own water and sewerage network design and construction standards (aka “Icon Water Standards”). This is to ensure consistency with the majority of Australian urban water agencies thereby making it easier for engineering service providers to better understand Icon Water’s requirements.

This document details Icon Water’s requirements for property service connections, both sewerage and water supply, as well as requirements for water meters. Generic requirements for property service connections and water meters are actually detailed in WSAA codes *WSA 02 Gravity Sewerage Code of Australia* and *WSA 03 Water Supply Code of Australia* but Icon Water has decided to supersede the generic requirements of *WSA 02* and *WSA 03* with this document.

This document shall be read in-conjunction with Icon Water’s *Service and Installation Rules* as well as the Icon Water *SD Series* of drawings and all details described within this document are mandatory requirements and shall not be amended without the written consent of Icon Water.

2 Scope

This document details the design, specification and installation requirements for pipes, valves, fittings and ancillary items which are specified and installed from the point of connection on the mains (whether they be sewer or water) to the limit of Icon Water responsibility (i.e. the “tie point”) on a consumer premises; in the case of multi-unit developments, the limit of responsibility relating to individual Sub-meters. It also includes the requirements for WAE records and acceptance testing of Sub-metering and shall be read with the Icon Water Standards documents that are applicable.

This document overrides the requirements detailed in *WSA 02* and *WSA 03* for property service connections and water meters.

The Icon Water supplements to *WSA 02* and *WSA 03*, namely *STD-SPE-G-011* and *STD-SPE-G-012* respectively, direct the reader to this document for all requirements (with the exception of WAE records and acceptance testing of mains) relating to property service connections and water meters.

If licensed plumbers, drainers and constructors are engaged to do work other than consumer plumbing and/or plumbing and sanitary drainage works up to the cut-in point on an Icon Water main or maintenance structure, and/or they are required to perform acceptance testing activities and provide WAE records, then they are required to comply with *WSA 02* and *WSA 03* as amended by Icon Water supplements *STD-SPE-G-011* and *STD-SPE-G-012*.

3 Purpose

The primary reason for publishing a separate document is to make it easier for licensed plumbers and drainers to interpret and fully comply with Icon Water’s requirements for property service connections and water meters without having to purchase the above-mentioned WSAA codes as these codes only dedicate a relatively small amount of content to such topics and this content is located in multiple clauses spread throughout both the WSA 02 and WSA 03 codes.

4 Referenced documents

The documents listed in Table 4.1 are either referenced by this specification or shall be read in-conjunction with this specification.

Table 4.1 Referenced Documents

Item	Document number	Title
Australian standards		
1	AS/NZS 1260	PVC-U pipes and fittings for drain, waste and vent application
2	AS/NZS 3500	“Plumbing Code of Australia”
3	AS/NZS 4020	Testing of products for use in contact with drinking water
WSAA codes and publications		
4	WSA 02-2014.3.1	Gravity Sewerage Code of Australia
5	WSA 03-2011.3.1	Water Supply Code of Australia
6	WSA 201	Manual for the selection and application of protective coatings
7	None allocated	WSA Product Specifications
Icon Water standards		
8	None allocated	Service and Installation Rules
9	*SD Series*	Standard Drawings
10	STD-SPE-C-004	Survey and Tolerancing Requirements
11	STD-SPE-G-005	Supplement to WSA 201 Manual for the Selection and Application of Protective Coatings
12	STD-SPE-G-006	Approved Products List
13	STD-SPE-G-018	Drafting Standards
14	STD-SPE-G-019	Asset Creation and Approval Process
Transport Canberra and Community Services standards		
15	MIS 06	Municipal Infrastructure Standards, Part 6, Verges
Australian Capital Territory government regulations		
16	None allocated	Water and Sewerage Regulation 2001
17	None allocated	Unit Title Legislation Amendment Bill 2022
Evo-energy		
18	None allocated	Evo-energy Service and Installation Rules

5 General requirements

5.1 Asset creation and approval

Icon Water specification *STD-SPE-G-019 Asset Creation and Approval Process* provides overarching requirements for the design and construction of the water supply and sewerage network (including property service connections and water meters). Should the document you are currently reading be "silent" with respect to a particular requirement, you should consult *STD-SPE-G-019* in the first instance to determine which Icon Water standards document is applicable.

Note: All Icon Water Standards relevant to developers, builders and licensed plumbers which relate to the water supply and sewerage network are available from www.iconwater.com.au and they are subject to review and amendment from time-to-time.

5.2 Construction safety

Licensed plumbers and other construction trades are required to comply with relevant WHS legislation whilst planning and performing construction activities. One of the methods of complying with such legislation is to adopt the requirements of the relevant code of practice (available from SafeWork Australia or WorkSafe ACT). Licensed plumbers and constructors should note that an Icon Water inspector has the authority to suspend works on Icon Water assets if unsafe practices are being employed.

For property service connections, example hazards include, but are not limited to:

- Deep excavations - when existing mains require exposing so that a cut-in can be performed.
- Sewage exposure – from sewer mains which may have been damaged prior to or during construction activities.
- Projectiles – when hydrostatic testing of water mains is conducted without adequate thrust restraint.
- Asphyxiation – if unauthorised personnel entry into a maintenance hole occurs without appropriate protocols such as gas testing prior to, and during entry taking place.
- "Hitting" buried utilities – when gas mains, water mains, sewer mains and power cables are "hit" whilst excavating leading to explosion, electrocution, projectiles and health hazards etc.

Constructors and licensed plumbers should note that Icon Water's *SD Series* of standard drawings, whilst showing minimum mandatory requirements, are not location specific and it is the responsibility of the constructor or licensed plumber to ensure that all hazards have been identified and eliminated or at least mitigated to a level of risk deemed to be as low as reasonably practicable prior to starting installation and construction activities.

5.3 Products and materials

Only products and materials specifically listed in Icon Water's Approved Products List shall be used for the works. Alternative products and materials shall not be used unless pre-approved in writing by Icon Water. Should there be a compelling reason for the use of an alternative product or material which is not listed in the Icon Water Approved Products List, contact Icon Water as early as possible so that a review can be completed and either a written rejection or approval provided. It should be noted that Icon Water is under no obligation to provide approval for alternative products and materials and such approval, if it is forthcoming, may not be in accordance with the planned project timeframe.

Note: The valves and fittings in the Icon Water Approved Products List have been rigorously appraised by Icon Water for issues such as corrosion resistance, ease of installation, design life, tooling requirements, maintenance team familiarity, AS/NZS 4020 compliance for drinking water and WaterMark certification etc. It is noted that other urban water agencies may use alternative products; but this does not ensure that they are compatible with Icon Water requirements, nor does it guarantee that they will be approved if proposed as an alternative by a Developer, Designer or Constructor.

5.4 Service easements and building restrictions

There may be circumstances when the water supply or sewer must follow an alignment through leased land and in such circumstances, restrictions are imposed on how close a structure can be to an Icon Water asset. Similarly, building restrictions apply for structures, whether they be permanent or temporary, with regards to how close they can be built to Icon Water assets regardless of whether they are located in leased or public land. For specific requirements, refer to Icon Water's *Service and Installation Rules* as well as *STD-SPE-G-019 Asset Creation and Approval Process*. Note: Refer to *Evoenergy Service and Installation Rules* for separation distances from electrical infrastructure.

5.5 Icon Water live assets

Only Icon Water personnel are permitted to perform work on Icon Water "live" assets. A live asset is defined as an existing asset (e.g. water main, sewer main etc.) that has not been deemed "abandoned" or "disused". This means that parties such as constructors and licensed plumbers are not permitted to perform work such as but not limited to: cut-ins and connections to sewer mains or water mains, operate any stop valve on a water main, or lift a maintenance hole cover from a maintenance hole for any purpose. Furthermore, hydrants can only be operated for the purposes of drawing water when a permit is issued by Icon Water and Icon Water provides a standpipe (which comes complete with a flow meter).

Refer to *STD-SPE-G-019 Asset Creation and Approval Process* for additional details relating to arranging for Icon Water personnel to perform a cut-in on a live main or provide a temporary water supply for construction purposes.

5.6 Set-out, tolerancing and work as executed details

Both water and sewer property service connections are required to be set-out and located within the tolerances detailed in Icon Water specification *STD-SPE-C-004 Survey and Tolerancing Requirements*.

Work as executed (WAE) details shall also be recorded in accordance with the requirements of *STD-SPE-C-004 Survey and Tolerancing Requirements* as well as *STD-SPE-G-018 Drafting Standards*.

It should be noted that Icon Water (and hence the "Dial Before You Dig" national referral service) cannot guarantee the exact location of existing buried services. This is due to the fact that Icon Water and other utilities rely on third parties such as constructors and consulting engineers to record the exact location of buried assets accurately. It is a known issue that with a buried network of assets in the ACT that is more than one hundred years old, construction practices and data recording practices have varied in accuracy over the years and varied between engineering service providers where errors and omissions do occur from time-to-time.

5.7 Acceptance testing – mains versus property service connections

Acceptance testing of all pipework between the Icon Water mains and the sewer tie point or the isolation valve upstream of the (master) water meter shall be tested in accordance with the requirements of *WSA 02* and *WSA 03* as amended by Icon Water supplements *STD-SPE-G-011* and *STD-SPE-G-012*. Constructors (and hence pipe laying contractors) are expected to be familiar with the acceptance testing requirements of WSA 02 and WSA 03. Customer pipework with individual Icon Water supplied water meters installed shall be tested in accordance with *AS/NZS 3500*.

Icon Water acknowledges that licensed plumbers who primarily work with consumer plumbing which is required to comply with AS/NZS 3500 may choose not to purchase a copy of *WSA 02* and *WSA 03* (which is the reason for publishing this document). However, if a licensed plumber is involved in the installation of pipework from the Icon Water mains (i.e. outside of the scope of AS/NZS 3500) then they are expected to be familiar with the acceptance testing requirements of WSA 02 and WSA 03. Section 8 provides acceptance testing requirements specifically for water mains-to-meter and sewer mains-to-tie pipe runs so that licensed plumbers who are not involved in mains construction can comply with *WSA 02* and *WSA 03* acceptance testing requirements without having to purchase these codes.

6 Technical requirements for sewer service ties

6.1 Lease drainage and sewer service ties

The sewerage system shall be designed so that waterborne wastes can be efficiently removed from each lease. The design shall allow for known future site development and all reasonable endeavours shall be taken to ensure that likely site development is also catered for by the design.

Increasing the depth of sewers external to leases at extra cost to the public in order to permit gravity drainage of basement fixtures within specific leases in not permitted. Basements shall be required to be serviced by sullage pumps to prevent the risk if backflow and flooding from external mains.

A single sewer service tie (aka "property connection point") is required to service the entire leased block.

All details relating to the design, installation and testing etc. of a consumer sanitary sewer drain such as but not limited to: depth, minimum depth of cover and grade shall comply with the requirements of the (ACT) *Water and Sewerage Regulation 2001* and AS/NZS 3500. Allowance shall be made for:

- Any possible earthworks that may occur during the development of the site (e.g. providing driveways and/or a level area for buildings). Note: For industrial blocks where considerable earthworks are commonly encountered, this allowance is of particular importance.

- All building restrictions that prevent part of the block to be developed (e.g. setback distances from the front building line).

6.2 Minimum and maximum depth of sewer service ties

The maximum depth of the sewer service tie, when referenced between the finished surface level and the pipe soffit shall be no deeper than 1500 mm. Note: These depths have been based on consultation with the ACT Master Plumbers Association and have been selected to mitigate the safety issues associated with deep excavations. Refer to Icon Water *SD Series* of drawings for construction requirements. It should be noted that for multi-storey mixed-use, multi-storey commercial or residential apartment developments, the Developer can apply to Icon Water (for a special approval) to have the maximum depth of the sewer increased to a maximum of 2500 mm to the pipe soffit depending upon site and project specific factors. Icon Water requires unhindered access to the tie point, unhindered access to excavate the sewerage connection is achieved when the customer retains a zone clear of obstructions on all sides of the tie of a radius equal to the depth of the tie. For example, if the tie is 2 metres deep, keep a zone clear of obstructions of a radius 2 metres around the tie. Obstructions include, but are not limited to, tree trunks, tree roots, tree branches lower than 3 metres, fences, shrubs, hedges, rockeries, masonry walls, letterboxes, building footings, irrigation pipes, paths, driveways, and garden edging. Lawn and low ground covers are acceptable provided they are prevented from growing over boundary riser cap and the customer understands they may be removed or trampled when Icon Water undertake maintenance works.

Sewers shall have minimum depths of cover in accordance with *WSA 02* as amended by Icon Water in *STD-SPE-G-011*. The sewer service tie point shall have a minimum depth of cover in accordance with Table 6.2.1.

Table 6.2.1 Minimum Cover Over Sewer Service Tie Point

Location	Minimum cover (mm)
Residential blocks	600
Industrial and commercial blocks	600
Road reserves	750

6.3 Location and marking

Sewer service tie locations shall be in accordance with Icon Water's *SD Series* of drawings and the following requirements:

a) All reasonable endeavours shall be taken to ensure that sewer service tie connecting to a sewer outside a leased block shall be at right angles to the sewer. Where a service is to a maintenance hole or "dead-end", the service shall be at an angle between 90° and 180° from the downstream sewer to ensure a smooth flow of entry into the main line.

b) Sewer service ties shall be located clear of driveways and retaining walls unless specifically approved by Icon Water.

c) Where the sewer is located outside the leased block, the sewer service tie shall terminate within 1.0 metre inside the property line.

d) All reasonable endeavours shall be taken to ensure that the sewer service tie is located on the sewer at 1.0 metre from the property line at the lowest corner of the property. However, it is permissible to locate the sewer service tie at a position other than the lowest corner of a residential block provided that no more than fourteen (14) residential dwellings and no non-residential leases are serviced upstream of that block. In such circumstances, particular attention must be paid to the requirements of Section 6.2 regarding the maximum permissible depth of a sewer service tie and to the requirements of Section 6.1 relating to the servicing of an entire lease.

e) The upstream end of any "dead end" sewer shall extend to at least 1.0 metre past the block boundary to accommodate a sewer service tie noting that it is an Icon Water requirement that dead end sewers be terminated with a rodding point unless there is a planned future upstream connection. Refer to the Icon Water *SD Series* of drawings for installation details.

f) Sewer service tie locations shall be identified with an approved detectable marker tape (ref: Icon Water Approved Products List) coloured cream in accordance with AS 2648.1. The tape shall be secured to the end of the tie and brought vertically to the surface and attached to a marker stake which shall protrude 300 mm above the finished surface level.

6.4 Materials

Sewer service ties shall be constructed of PVC-U (DWV) non-pressure pipes and fittings conforming to WSA PS-230 and AS/NZS 1260 and the joints shall be either of the SCJ or RRJ type unless:

- Extreme ground movements are predicted
- Organic solvents are present in the soil
- There is doubt surrounding the nature of the sanitary waste (e.g. industrial area or hospital) and its compatibility with PVC-U.

Vitrified clay (VC) pipe and fittings conforming to WSA PS-231 and AS 1741 (or EN 295 in lieu of AS 1741) shall be used in industrial areas or for contaminated ground conditions where PVC-U is incompatible, or there is sufficient doubt relating to the compatibility of PVC-U in these conditions. VC pipe and fittings shall not be used if PVC-U is a suitable material.

6.5 Size of sewer service tie

Sewer service ties shall be sized (by the Designer) to cater for the hydraulic requirements of the site that is being serviced and sizing shall be in accordance with the *Water and Sewerage Regulation 2001* and AS/NZS 3500.

Generally, sewer service ties are DN100 in size and this is the minimum allowable size. In certain circumstances, a larger sewer service tie may be required for a large or special site such as a commercial or industrial premises and high-density developments (e.g. apartment complexes).

6.6 Construction and installation

The Icon Water *SD Series* of drawings (e.g. SD-2106) provide construction and installation details. These details are mandatory requirements. Refer to Appendix D for a listing of relevant *SD Series* drawings relating to sewer mains-to-tie applications. Specific requirements are provided as follows:

a) Sewer service ties sized DN150 and larger shall be connected directly to a maintenance hole (MH) regardless of depth of the sewer main. Buried vertical risers and 45° jump-ups shall not be used for DN150 sewer service ties. Where practical, a DN100 sewer service tie should discharge directly into a maintenance hole in lieu of a separate branch connection to a sewer.

b) For DN100 sewer service ties and sewer mains depths 3500 mm and deeper, if it is not practical to discharge into a MH, the sewer service tie shall be connected to the sewer main via a 45° jump-up. Only if a 45° jump-up is not practical (typically due to deep sewers near property boundaries) then a buried vertical riser may be used.

c) Buried vertical risers shall be installed on a compacted trench base with suitable concrete support. Once the riser is installed, it becomes the responsibility of the licensed plumber who has been engaged by the lease owner to:

    - Connect the consumer sanitary drain at the tie point by installing a 45° slope junction and extending the riser to the surface and terminating it with a screw cap and rodding point cover.

    - Connect at a depth complying with the hydraulic requirements of the *Water and Sewerage Regulation 2001* and AS/NZS 3500 whilst ensuring that a connection depth of 1500 mm below finished surface level (or 2500 mm by special approval) is not exceeded.

d) Only one field cut shall be provided on full pipe lengths between consecutive sewer service ties and MHs with the exception of short pipe lengths (with RRJs) installed to allow for differential settlement between adjacent rigid structures. Otherwise, standard lengths must be used to obtain the necessary dimensions.

e) For dead ends where a future upstream connection is planned and for all sewer service ties, VC services shall be sealed with a VC plug, rubber ring and galvanised wire retaining clip. PVC-U services shall be sealed with a solvent cemented end or screw cap. An anchor block shall also be installed to provide thrust restraint.

f) Sewer service tie grades shall be between 2.0% (minimum) and 100% (maximum).

g) Special requirements exist for pipe embedment and trench fill when sewer service tie grades exceed 15%. In such instances, the following requirements apply:

    - Sewer service tie grade greater than 15% and up to 50%: Use low slump concrete bedding

    - Sewer service tie grade exceeding 50%: Use a plain concrete surround.

7 Technical requirements for water service property connections

7.1 General requirements

Note: Section 7 applies to all types of leases and developments; however, for multi-unit developments, it only covers the water service property connection and the Master Meter assembly. Refer to Section 8 for information regarding sub-metering of unit complexes.

It is the responsibility of the Developer to ensure that property service connections are installed for new leases and for the redevelopment of existing leases noting that final connection (i.e. "cut-in") to an existing live main can only be performed by Icon Water.

Construction and installation requirements for all sizes of property service connections (including pipe bedding and backfill requirements) are shown on the Icon Water *SD Series* of drawings and these are mandatory requirements. Refer to Appendix C for a listing of relevant *SD Series* drawings for mains-to-meter applications.

The connection protocols for different circumstances relating to property service connections are described in Icon Water's *Service and Installation Rules*.

When a new water connection is required to replace existing services, the existing services must be disconnected at the cost of the Developer before a new water connection is provided. The requirements detailed in Sections 7.2 through 7.9 inclusive are not retrospective (for existing developments) but it is Icon Water's policy to permit existing developments to adopt these requirements wherever practical at Icon Water's discretion.

The design of the internal hydraulic systems within a lease (e.g. a multi-unit development) shall ensure that noise, shock-wave transfer and cross-contamination between dwellings does not occur during operation of any part of the service. Similarly, water hammer (resulting in nuisance noise, shock-waves or damage) in an Icon Water main due to the design of the internal hydraulic system within a lease is not acceptable and it should be noted that Icon Water has the authority to limit or disconnect the water supply at the point of connection if this situation is not rectified in a timely manner to the satisfaction of Icon Water.

All piping shall be arranged so that backflow into the Icon Water network does not occur. This shall be achieved by complying with the requirements of AS/NZS3500 for backflow prevention and engaging licensed plumbers for the installation of all piping within a consumer premises.

Water shall not be drawn from the Icon Water network until the Master meter and Sub-meters assembly has been installed by a licensed plumber and inspected and accepted by Icon Water. A temporary approval to draw water from the network prior to the water meter assembly being installed may be granted upon receipt of a written request outlining the reasons why such approval is required. Refer to Icon Water's *Service and Installation Rules* and *STD-SPE-G-019 Asset Creation and Approval Process* for specific details.

7.2 Lease entitlement – Size and number of connections

For Icon Water referencing purposes only, the size of the property service connection is defined by the size of the water meter (even if the water meter is installed on a pipe of a larger diameter i.e. a DN100 service with a DN50 meter for clarity).

Each lease, is entitled to a total number of connections as follows:

a) One connection to a single residence or single unit non-residential (commercial or industrial) development.

b) Two connections to a residential dual occupancy or two-unit residential body corporate.

c) One connection to each unit in a multi-unit residential or multi-unit non-residential development where all units have an accessible public street frontage.

d) One connection only to a multi-unit residential or non-residential development where one or more of the units does not have an accessible public street frontage.

Each approved connection, irrespective of dwelling type or land use type, is entitled to be sized DN20. Where usage requirements justify the installation of a larger size of water service, these must be clearly stated on development proposals and submitted to Icon Water during the first design submission. Icon Water is the sole arbiter for the purpose of determining the size of the connection (and hence water meter).

Note 1: Refer to Section 7.5 for private fire service requirements.

Note 2: Refer to Appendix B for informative (not mandatory) water meter sizing details.

7.3 Water meters

The number of water meters serving a lease shall be:

a) One water meter on each connection immediately downstream of the Icon Water isolation valve at the front property boundary.

b) A separate meter for common property water usage of unit titles.

Icon Water supports water meter for each unit title in a multi-unit development and refer to Section 8 for requirements, as there may be some uncertainty regarding this provision.

As stated in Section 7.2, Icon Water is the sole arbiter for determining the size of the water meter. Icon Water shall issue the water meter(s) for a development, including associated couplings to a licensed plumber authorised by the Developer (or customer). The water meter(s) must be installed within ten (10) days of receiving such meter(s).

Note 1: Refer to Section 7.4 for Icon Water's requirements regarding the location of water meters.

Note 2: Refer to Section 7.5 for Icon Water's requirements for the metering of fire services.

Note 3: Refer to Section 7.8 for meter box, pit and enclosure requirements.

Some water meter types require a minimum length of straight pipe immediately upstream and downstream of the meter so that the manufacturer's stated accuracy can be achieved. Similarly, some water meter types require the installation of a dirt box upstream of the meter. Refer to Icon Water's Approved Products List for specific straight length and dirt box installation requirements for each make/model of approved water meter.

7.4 Water meter location and service alignment

The service (and hence location of the water meter) shall terminate inside the front property boundary at a maximum distance to the front property boundary as shown on the Icon Water *SD Series* of drawings. In some circumstances, the water service may be extended further inside the block boundary subject to Icon Water written approval and compliance with the requirements (for inspection, maintenance and meter reading) of the *Water and Sewerage Regulation 2001*.

Supply shall not be from the side or rear property boundaries with the exception of a battle-axe block where the supply may be from the rear property boundary if Icon Water determine that it is not practical to supply from the front. All reasonable endeavours shall be taken to ensure that mains-to-meter pipe runs are located at 90° to the water main and the pipe protection envelope for a DN100 main based on the Service and Installation Rules document shall be considered.

Water services, including mains-to-meter pipe runs and water meters, must be located in unobstructed ground (in line with pipe protection envelope of Icon Water "Water and Sewerage Service and Installation Rules") free of surface obstructions such as, but not limited to, paved driveways (e.g., concrete, asphalt, stencilcrete), pad-mount transformers, communication boxes, and mini-pillars. An exception to this

requirement is paved footpaths managed by TCCS. A minimum clearance of 1.0 meter around the meter boxes is required. In certain circumstances, Icon Water may grant special approval on a case-by-case basis for DN20 meter boxes with only 500 mm clearance at the rear and 500 mm on one side. In all other cases, a 1.0-meter clearance is required at the front (facing the water meter from the street) and on one side. Refer to Figures 7.4.1A and 7.4.1B below for further details.

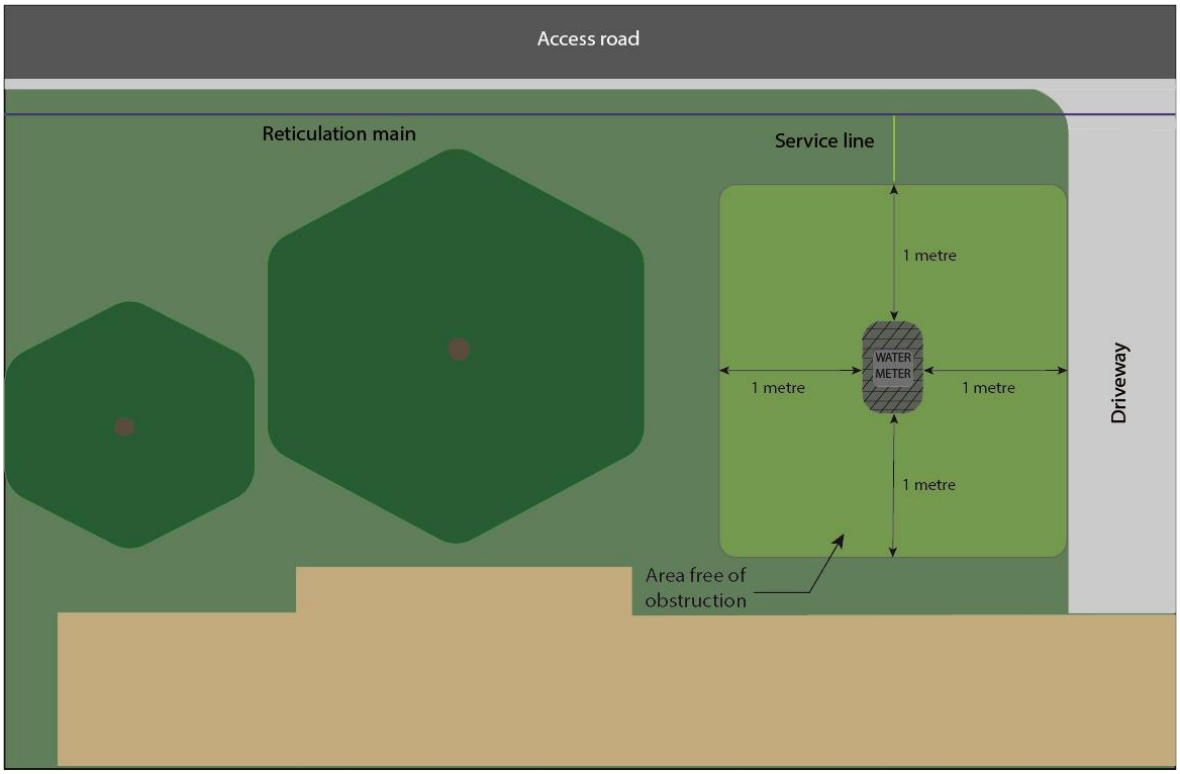


Fig. 7.4.1A Minimum Clearances for DN20 Water Meters in Meter Boxes

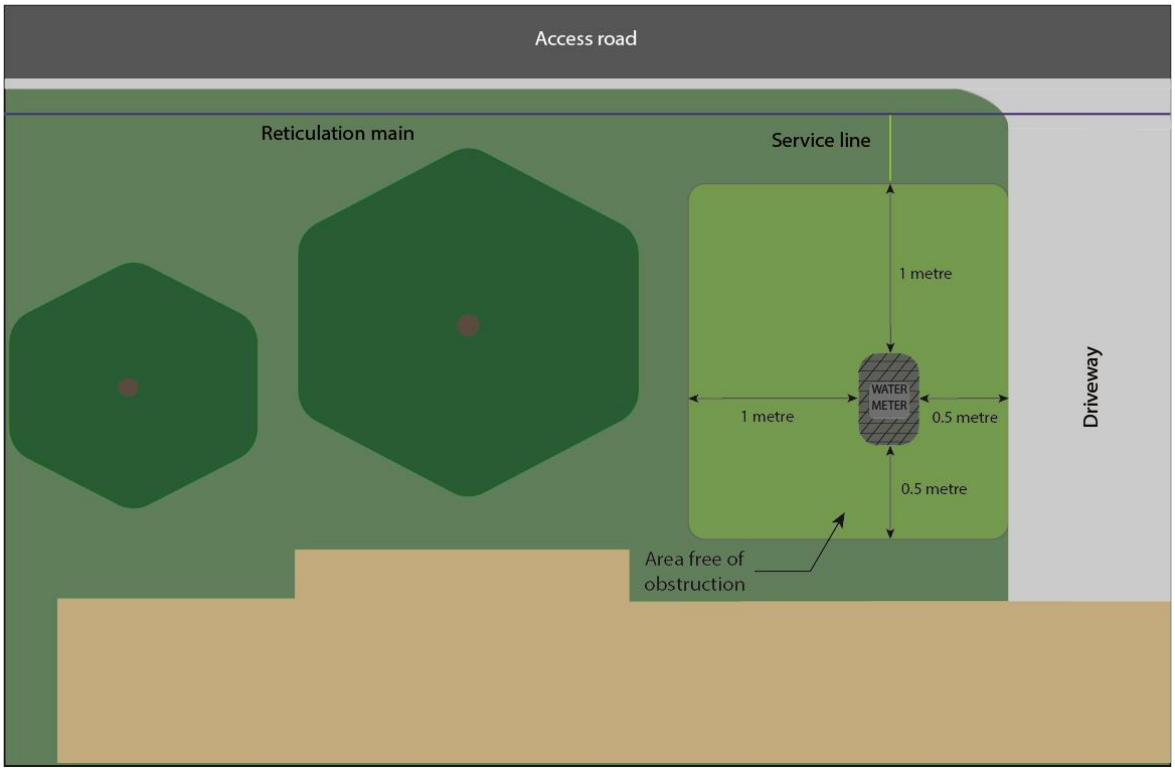


Fig. 7.4.1B Minimum Clearances for DN20 Water Meters in Meter Boxes – Special Approval

Water services may penetrate through retaining walls or fence footings on the proviso that the mains-to-meter pipe run shall be laid in a polyethylene pipe enveloper sleeve through such a retaining wall or footing. The internal diameter of enveloper sleeve pipe shall be sized 100mm larger than the water service carrier pipe to provide sufficient clearance so that the mains-to-meter pipe can be installed (or removed) after the retaining wall or fence footing has been constructed without causing unnecessary damage to the retaining wall or footing. A continuous tracer wire shall be installed. The pipe protection envelopes in the Icon Water *Service and Installation Rules* shall be complied with at all times.

7.5 Fire services on consumer premises

Where private fire services are required to be supplied via the Icon Water network, Icon Water does not permit the installation of above-ground hydrants on fire service mains external to buildings by default. Hydrants in these locations shall be underground spring hydrants unless Icon Water advises otherwise.

Fire hose reels must be served from the metered domestic water supply unless they are at first floor level or above in which case, they can be supplied from the dedicated fire service. The only place where this rule does not apply is in multi-story parking garages; where all fire hose reels are required to be supplied from a metered supply, and backflow prevention that complies with AS 3500 must be installed.

The private fire service is required to be separate to the domestic water service (i.e. Icon Water does not approve the use of combined fire and domestic water service lines) unless an unusual or exceptional set of circumstances exist. In such cases, contact Icon Water early in the design phase so that project specific requirements can be determined in consultation with the Developer's (or customer's) authorised fire services engineering consultant and ACT Fire and Rescue.

Depending on the site's hydraulic needs, Icon Water may approve one of two options: a single fire service alongside a separate domestic service, both connected to the Icon Water mains; or a dual fire service combined with a separate domestic service, connected to the Icon Water mains through two separate connections.

Icon Water has no requirement for the installation of water meters on fire service lines. Previously, Icon Water required that allowance for future installation of a water meter on fire services lines be made but this requirement has been suspended until further notice.

7.6 Water service connections – DN20 to DN40 inclusive

The following requirements shall be taken to be minimum mandatory requirements for water service connections sized DN20 through DN40 inclusive:

a) All construction and installation details (including trenching, bedding and backfill details) shall be in accordance with Icon Water's *SD Series* of drawings.

b) "Mains-to-meter" pipe and fittings including a meter downstream of the meter box shall be either:

- Type B hard drawn (or annealed for DN20 and D25) copper pipe to AS1432 with brazed joints. All brazed joints shall comply with silver alloy brazing designation B4 of AS 1169.1 Table 2.

- Type B hard drawn (or annealed for DN20 and D25) copper pipe to AS 1432 with copper-alloy press-fit fittings in accordance with AS3688 and the Icon Water Approved Product List; installed using tooling specifically listed in the Icon Water Approved Products List for the brand of press-fit fitting specifically used.

- SDR 11 PN16 PE100 polyethylene (PE) pipe and fittings in accordance with AS/NZS 4130 and AS/NZS 4129 respectively. PE pipe shall be supplied one size larger than copper due to its thicker wall and shall be laid in one continuous length (i.e. no joints) from the isolating ball valve at the mains through to the meter box.

c) PE pipe must be connected to PE to copper adaptors (min 500 mm upstream of the meter box) with BSP threads must have brass or copper-alloy threads. Threaded plastic fittings shall not be used (i.e. metal-to-metal threaded fit-up only shall be used).

d) Tracer wire shall be installed for the full mains-to-meter pipe run when PE pipe is used, and it shall meet the following requirements:

- A 1.0 mm PVC-coated tracer wire shall be taped to the PE pipe and wound at least three times around the copper riser for DN32 and DN40 installations.

- Termination at the meter box: For DN32 and DN40 installation the tracer wire shall terminate by attaching it to the underside of the meter isolation valve using a copper or brass clamp. For DN20 and DN25 installations the wire is to terminate in the pit as per SD drawings

- Termination at the water main (non-metallic): The tracer wire shall terminate with a bared and twisted connection made with the water main tracer wire.

- Termination at the water main (metallic): The tracer wire shall terminate at the main isolation ball valve. If a DICL main has been tapped with a brass adaptor, the tracer wire shall be terminated at the adaptor.

- The electrical conductivity must be tested by the installer prior to backfilling with a written certification provided to Icon Water.

e) Marking tape in accordance with AS 2648 shall be laid 150 mm above the mains-to-meter pipe run. The tape shall be brought to the surface at the meter box (or enclosure) and it shall be tied directly below the meter isolation valve at the copper riser.

f) Mains-to-meter pipe runs shall ensure a minimum horizontal clearance of 500 mm from buried electrical services.

g) Connections to new mains shall be performed using pre-tapped connectors (or approved mechanical couplings with a screwed or flanged take-off when polyethylene mains have been specifically approved by Icon Water).

h) Connections to existing mains shall be performed using approved tapping bands (or approved mechanical couplings or electrofusion tapping saddles with a screwed or flanged take-off when the main is constructed of polyethylene). Note: Only Icon Water personnel are authorised to perform work on existing “live” assets and this includes mains tappings.

i) Mains connections shall be a minimum of 1000 mm apart when referenced from tapping centreline-to-centreline and no closer than 1000 mm to a flushing bend on a dead end or normally closed zone valve.

j) A minimum clearance of 1000 mm shall be maintained at all times between the meter isolation valve and any paved surface (e.g. driveway or footpath) for maintenance purposes.

k) “Mains-to-meter” valves shall meet the following requirements:

- Water main isolation valve: Ball type, copper alloy.

- Meter isolation valve(s) for DN20 and DN25 meters: Ball valve type, quarter turn, copper alloy with on/off indication on the lever, with female or male thread to facilitate connection and nut and tail union (swivel nut) for connection to Icon Water meter to AS/NZS 4796:2016 – Metal bodied and plastic bodied ball valves for property service connection. Refer to drawing SD-3306-D for the acceptable solutions.

- Meter isolation valve(s) for DN32 and DN40 meters: Ball valve type, quarter turn, stainless steel or copper alloy with on/off indication on the lever.

7.7 Water service connections – DN50 and larger

The following requirements shall be taken to be minimum mandatory requirements for water service connections sized DN50 and larger:

a) All construction and installation details, including trenching, bedding, and backfill specifications, must adhere to Icon Water's SD Series of drawings.

b) “Mains-to-meter” pipe and fittings shall be selected in accordance with Table 7.7.1.

c) Tracer wire shall be installed for the full mains-to-meter pipe run for non-metallic pipe materials and it shall meet the following requirements:

- A 1.0 mm PVC-coated tracer wire shall be taped to the pipe.
- Termination at the meter pit or enclosure: The tracer wire shall be brought through the meter pit wall or enclosure floor as applicable and neatly terminated with a crimped lug on a suitable flange nut (outside the pressure nut) on the first flange inside the pit or enclosure.
- Termination at the water main (non-metallic): The tracer wire shall terminate with a bared and twisted connection made with the water main tracer wire.
- Termination at the water main (metallic): The tracer wire shall terminate at the main isolation ball valve. If a DICL main has been tapped with a brass adaptor, the tracer wire shall be terminated at the adaptor.
- The electrical conductivity must be tested by the installer prior to backfilling with a written certification provided to Icon Water.

d) Marking tape in accordance with AS 2648 shall be laid 150 mm above the mains-to-meter pipe run. The tape shall terminate at the meter pit concrete anchor block or base or the enclosure as applicable.

e) Mains connections shall be a minimum of 1000 mm apart when referenced from pipe centreline-to-centreline and no closer than 1000 mm to a flushing bend on a dead end or normally closed zone valve.

f) Mains-to-meter pipe runs shall ensure a minimum horizontal clearance of 500 mm from buried electrical services.

g) All stop valves (for direct buried applications, below-ground meter pits and above-ground enclosure installations) shall be PN16 resilient seated gate valves to AS/NZS 2638.2 with the following requirements:

- Flanged to AS 4087 PN16.
- Anti-clockwise to close.
- Direction of rotation for opening/closing clearly marked.
- Ductile iron body/bonnet with a Fusion Bonded Epoxy (FBE) coating to AS 4158.
- WaterMark certified and AS/NZS 4020 compliant.
- Supplied with a handwheel for valves installed in meter pits and enclosures otherwise they shall have a stem which allows operation by extension key if direct buried.

h) By default, connections to the water main shall be made using flanged reducing tees (FL-FL-FL) in-between flange-socket (FL-SO) connecting spools. However, pre-tapped connectors may be used for DN50 connections on new water mains. Tapping band connections shall not be used.

i) A stop valve is required on both sides of the connection (tee) to the main for property service connections with a size of DN50 or larger, as a default measure. Icon Water will provide guidance on whether stop valves are necessary for smaller property service connections on a case-by-case basis. Please refer to the standard drawings SD-3308, SD-3310, and SD-3312 for more information.

j) A minimum clearance of 1000 mm shall be maintained at all times between the meter isolation valve and any paved surface (e.g. driveway or footpath) for maintenance purposes.

k) All pipes stored outside at the job site overnight shall be capped at both ends to prevent contamination and vermin etc. from entering.

Table 7.7.1 Approved Mains-to-Meter Pipe and Fitting Options (DN50 and Larger)

Attribute	
COPPER	
Allowable Sizes:	DN50 to DN100 inclusive.
Pipe:	Type B hard-drawn copper pipe to AS 1432.
Fittings:	Copper or copper-alloy fittings brazed using silver alloy brazing designation B4 of AS 1169.1 Table 2. Alternatively, copper or copper-alloy press-fit fittings complying with AS 3688 (inclusive if AS/NZS 4020) may be used subject to compliance with the fitting brand and corresponding allowable installation tooling specifically detailed in the Icon Water Approved Products List.
Flanges:	Copper or copper-alloy pipe flanges to AS 4087 PN16 shall be installed where shown on the approved drawings. Direct buried flanges shall only be used to connect to direct buried valves.
Flange gaskets:	3.0 mm EPDM gasket to be installed between mating flange faces.
Flange bolting:	All flange bolts and nuts shall be grade 4.6 hot-dipped galvanised steel with a hot-dipped galvanised washer under both the nut and the bolt head. All direct buried flanges and flange bolts, nuts and washers shall be wrapped in petrolatum-based tape where indicated on the project drawings (for aggressive soils) otherwise no additional corrosion protection is required. Mixed metals interaction within pits and enclosures: Accelerated corrosion can occur when dissimilar metals are in contact in an environment which contains sufficient moisture to create the transfer of ions between metallic components. Insulating sleeves and washers shall be installed in accordance with the Icon Water *SD Series* of drawings when such interactions cannot be prevented by any other approved means.
Usage limits:	No usage limits apply (i.e. copper may be used for both direct buried applications as well as within meter pits and meter enclosures).

Attribute	
POLYETHYLENE	
Allowable Sizes:	DN63 and DN80 only.
Pipe:	SDR 11 PN16 PE100 polyethylene to AS/NZS 4130. PE pipe shall be supplied one size larger than copper pipe due to its thicker wall.
Fittings:	PN16 PE electrofusion or butt-weld fittings or mechanical couplings to AS/NZS 4129.
Flanges:	PN16 PE stub-type with loose 316 stainless steel backing rings.
Flange gaskets:	3.0 mm EPDM gasket to be installed between mating flange faces.
Flange bolting:	All flange bolts and nuts shall be 316 stainless steel with a stainless steel washer under both the nut and the bolt head with anti-seize grease.
Usage limits:	Polyethylene shall be installed in one continuous length (i.e. no joints) between the isolation valve at the main and either (i) to a pipe material change upstream of the meter pit or (ii) to the elbow directly beneath the first riser in the above-ground enclosure. Within Icon Water's pipework responsibility, PE pipe and fittings shall only be used for buried services and shall not be used within meter pits and meter enclosures. Buried flanges shall only be used to connect to buried valves. If electrofusion or butt-welding is required to join PE pipe and fittings, the following requirements are mandatory: • Butt-fusion welding shall be the preferred method and it shall be conducted outside of the trench so that the PE pipe run is pre-strung prior to being lowered into the trench during installation. Final closures shall be performed using electrofusion welding in the trench or by using approved mechanical couplings. • Butt-fusion welding shall not be conducted inside trenches. • All welding shall be performed by welders who have successfully completed training by a Registered Training Organisation, endorsed by the Plastics Industry Pipe Association for the relevant welding method(s). Note: The Plastics Industry Pipe Association provides technical guidelines for electrofusion welding – POP001 and butt welding – POP003.

Attribute	
DUCTILE IRON CEMENT LINED	
Allowable Sizes:	DN100 and larger.
Pipe:	PN35 and Flange Class.
Fittings:	PN16 FBE (or Rilsan/Nylon 11) coated DI fittings to AS/NZS 2280.
Flanges:	PN16 PE stub-type with loose stainless steel backing rings. All buried valves shall be flange-flange connections.
Flange gaskets:	3.0 mm EPDM gasket to be installed between mating flange faces.
Flange bolting:	Buried Flanges: Bolts and nuts shall be 316 stainless steel with a stainless steel washer under both the nut and the bolt head. Flanges within pits and enclosures: Flange bolts located within meter pits and meter enclosures shall all be 316 stainless steel with a stainless steel washer under both the nut and the bolt head. Alternatively, hot-dipped galvanised Grade 4.6 bolts, nuts and washers may be used on the proviso that all flanges, bolts, nuts and washers within the pit or enclosure are hot-dipped galvanised. Mixed metals interaction within pits and enclosures: Accelerated corrosion can occur when dissimilar metals are in contact in an environment which contains sufficient moisture to create the transfer of ions between metallic components. Insulating sleeves and washers shall be installed in accordance with the Icon Water *SD Series* of drawings when such interactions cannot be prevented by any other approved means.
Usage limits:	DICL may be used for both direct buried applications as well as within meter pits and meter enclosures. Corrosion protection requirements for direct buried DICL are as follows: • Polyethylene sleeving (coloured blue) in accordance with AS 3680 shall be installed on all ductile iron pipes sized DN225 and above where indicated in *STD-SPE-G-006 Approved Products List* or where advised by Icon Water in the event of contaminated or aggressive soil being found at the project location. Note: Typically (as per the Icon Water Approved Products List) sleeving is not required for ductile iron pipe externally coated with a ZN/Al coating with an epoxy top-coat unless the soil is aggressive or contaminated. • Only polyethylene sleeving from the suppliers listed for ductile iron pipe in Icon Water's Approved Products List shall be installed. • When installing polyethylene sleeving, do so in accordance with AS 3681. Do not allow sleeved items to be exposed to sunlight for more than seven (7) days.

Attribute	Requirements
PVC-M or PVC-O	
Allowable Sizes:	DN100 to DN375 inclusive.
Pipe:	PVC-M Series 2 SP-SO pipes to AS/NZS 4765; or PVC-O Series 2 to AS/NZS 4441
Fittings:	No fittings – refer to usage limits. Rubber ring joints (RRJ) only.
Flanges:	No flanges – refer to usage limits.
Usage limits:	PVC-M and PVC-O shall only be used in direct buried mains-to-meter pipe runs between ductile iron fittings and is not permitted to be used within meter pits and meter enclosures.

7.8 Water meter boxes, pits and enclosures

7.8.1 General requirements and selection criteria

The Icon Water limit of responsibility with regards to property service connections is clearly shown on the Icon Water *SD Series* of drawings. In general terms (excluding multi-unit developments which are detailed in Section 8) the Icon Water responsibility ends at the discharge flange or coupling of the Icon Water issued water meter (for a domestic water service) and the discharge flange or coupling of the first stop valve (for a dedicated fire service line).

Icon Water is required to maintain in good order, all Icon Water assets up to the limit of Icon Water responsibility. To this end, Icon Water maintenance personnel require safe and unencumbered access up to the limit of Icon Water responsibility as well as an easy means to dismantle pipework for the purpose of replacement and repair. This means that the arrangement of pipework immediately downstream of the Icon Water limit of responsibility must also take Icon Water maintenance, repair and access requirements into consideration.

The Icon Water *SD Series* of standard drawings provides options for above-ground and below-ground installations for water meters and fire service stop valve. The selection of whether a meter box, meter pit or above-ground enclosure should be used shall be determined in accordance with Table 7.8.1.

Note: Icon Water has an inspection team which performs random inspections on new water meter installations. Examples of “failed” water meter installations are presented in Appendix A.

Table 7.8.1 Selection Criteria – Water Meter Boxes, Pits and Enclosures

Water Meter Size	Selection Criteria – Box, Pit or Enclosure
DN20 and DN25	The water meter shall be installed below-ground in the meter box approved by Icon Water, noting the minimum clearances that are required for maintenance purposes as shown in the SD Series drawings. If this is not achievable (e.g. developments built up to the front property boundary) then Icon Water shall be contacted for the purpose of obtaining a written approval for the installation of an above-ground enclosure. Such an enclosure may be a dedicated cabinet, or an enclosure built into the front wall of the premises on the proviso that the maximum distance from the front property boundary is not exceeded.

Water Meter Size	Selection Criteria – Box, Pit or Enclosure
	When the Icon Water approved meter box is used, additional items not shown on the Icon Water *SD Series* of drawings, such as but not limited to pressure reducing valves and back-flow prevention devices shall not be installed in the same box. Otherwise, if an above-ground enclosure is approved by Icon Water, such items may be installed in the same enclosure (downstream of the Icon Water limit of responsibility) provided that they do not encumber the access required by Icon Water maintenance personnel and that they do not prevent Icon Water from dismantling, replacing and repairing pipework up to the Icon Water limit of responsibility. If Icon Water believes that it will have to damage pipework downstream of the Icon Water limit of responsibility to perform repairs, renewals or maintenance then the installation will not be approved. All installations shall comply with the Icon Water *SD Series* of drawings.
DN32 and DN40	The water meter shall be installed below-ground in a meter box noting the minimum clearances that are required for maintenance purposes. If this is not practical (e.g. developments built up to the front property boundary) then Icon Water shall be contacted for the purpose of obtaining a written approval for the installation of an above-ground enclosure. Such an enclosure may be a dedicated cabinet, or an enclosure built into the front wall of the premises on the proviso that the maximum distance from the front property boundary is not exceeded. Additional items not shown on the Icon Water *SD Series* of drawings, such as but not limited to pressure reducing valves and back-flow prevention devices may be installed in the same box or above-ground enclosure (downstream of the Icon Water limit of responsibility) provided that they do not encumber the access required by Icon Water maintenance personnel and that they do not prevent Icon Water from dismantling, replacing and repairing pipework up to the Icon Water limit of responsibility. If Icon Water believes that it will have to damage pipework downstream of the Icon Water limit of responsibility to perform repairs, renewals or maintenance, then the installation will not be approved. All installations shall comply with the Icon Water *SD Series* of drawings.
DN50 and larger	Icon Water prefers that for non-residential water meters of sizes DN50 and larger, the water meter is installed above-ground in an enclosure which is readily accessible for Icon Water meter readers and maintenance personnel. However, below-ground installations may also be employed. Additional items not shown on the Icon Water *SD Series* of drawings, such as but not limited to pressure reducing valves and back-flow prevention devices may be installed in the same pit or above-ground enclosure (downstream of the Icon Water limit of responsibility) provided that they do not encumber the access required by Icon Water maintenance personnel and that they do not prevent Icon Water from dismantling, replacing and repairing pipework up to the Icon Water limit of responsibility. If Icon Water believes+98741 it will have to damage pipework downstream of the Icon Water limit of responsibility to perform repairs, renewals or maintenance then the installation will not be approved.

Notes:

1. Previously, Icon Water only allowed below-ground installations due to the issue of freezing of water services in the colder winter months. If an above-ground enclosure is to be used, the pipework and the enclosure must be fully enclosed (i.e. no gaps or vents except for drainage of leaks, if required) and fully insulated on all surfaces in accordance with the Icon Water *SD Series* of drawings noting a minimum ambient air temperature for design purposes of -10°C otherwise it will not be approved.

2. Above-ground enclosures may be of masonry construction (e.g. block, brick or concrete) or they may be of powder coated galvanised steel construction. Other material types may be considered if they achieve the security, design life and insulation performance of the above-mentioned materials.

3. Water meters require unencumbered access at all times of the day or night for maintenance purposes. Icon Water will not approve designs which impede the primary access zone (e.g. car parking directly in front of a meter enclosure and meter enclosures behind locked gates or inside locked premises.

4. The selection criteria for meters of size "DN50 and larger" should also be applied in cases where a metered water supply is needed along with a separate fire service, regardless of the water meter size. Furthermore, the mandatory requirements outlined in Section 7.8.2 must be adhered to under such circumstances.

7.8.2 Mandatory meter pit design details – DN50 meters and larger

The following requirements shall be taken to be minimum mandatory requirements for meter pits required for water meters sized DN50 and larger:

a) Meter pits shall meet the requirements of the Icon Water *SD Series* of drawings.

b) Meter pits shall be constructed of either (i) reinforced concrete by either cast in-situ methods or the installation of pre-cast slab and riser sections, or (ii) reinforced concrete blockwork. Pits constructed of standard brickwork are no longer acceptable.

c) No attempt has been made by Icon Water to provide detailed structural design details on the Icon Water *SD Series* of drawings. Therefore, each meter pit shall require a suitably qualified and experienced civil or structural engineer to design specifically for the project conditions to be encountered. The engineer shall take into account details such as but not limited to: geotechnical data, buoyancy and flotation, pipe thrust loads, pipe penetration details, pipe support loads, construction joints and water stops, pit wall and slab reinforcement, pit cover design loads and pit cover allowable deflection etc. Reinforced concrete structures shall have a minimum design life of 100 years and structural steel components shall have a minimum design life of 50 years. The engineer shall provide certification that all structural items have been designed in accordance with Icon Water Standards, Icon Water project specific requirements (if any have been stated) as well as the relevant Australian standards and applicable legislation.

d) Meter pits shall have a 3.0 metre wide access corridor provided along at least one (long) side for Icon Water maintenance vehicles. This access corridor may be a shared use area such as a driveway or parking space on the proviso that the space can be quickly and easily cleared if Icon Water is required to perform maintenance work in the meter pit and surrounding area.

e) The top of the meter pit shall finish 50 to 100 mm above finished surface level to avoid the pit flooding during heavy rain events. However, if the meter pit is to be located in an area shared with vehicles, removable vehicle bollards shall be installed as appropriate. Alternatively, the top of the meter pit shall finish 300 to 400 mm above finished surface level. Meter pit covers shall be designed for the appropriate vehicle loads.

f) A DN100 PVC-U DWV drainp shall be cast into the meter pit so that the pipe invert is flush with the lowest point in the meter pit floor slab. The drain shall be connected to the stormwater system.

7.8.3 Mandatory meter pit cover design details – DN50 meters and larger

The following requirements shall be taken to be minimum mandatory requirements for meter pit covers required for water meters sized DN50 and larger:

a) Meter pit covers shall meet the requirements of the Icon Water *SD Series* of drawings.

b) Covers must be capable of a mid-span deflection of less than 5.0 mm when subjected to a uniformly distributed load (UDL) of 2.5 kPa. The same deflection criteria applies if the covers are designed for vehicle loads. Any cover panel support beams (if required) must be easily removed (i.e. they shall not be cast-in).

c) The maximum mass of each cover panel shall be 32 kg. For cover panels of mass less than or equal to 20 kg, only one lifting handle is required, otherwise two lifting handles shall be provided for each cover panel. Hand slots are not acceptable unless the use of handles is not practical, and the mass of the cover is less than or equal to 10 kg. Cover panels must be hinged one end, where possible

d) Approved pit cover materials and components:

- Carbon steel or aluminium chequer plate (minimum thickness of 6.0 mm) and suitably stiffened with carbon steel or aluminium angle respectively. Carbon steel items to be hot-dipped galvanised (in accordance with WSA 201 as amended by Icon Water in *STD-SPE-G-005*) after fabrication. "Cold galvanising" is not permitted except for hinge bolts which are to be spot-welded after installation of the covers to prevent unapproved removal by the public.

- Hot-dipped galvanised fasteners shall be used for galvanised cover components. Grade 4.6 galvanised steel hinge bolts shall be used for both galvanised steel and aluminium cover panel hinges. All other fasteners in aluminium cover components (if required) shall be 316 stainless steel.

e) A hinged inspection cover (of minimum dimensions 200 x 200 mm sq.) shall be installed in the cover panel located directly over each water meter. The hinged inspection cover, in the cover panel, shall be located so that it's centre is directly over the middle of the water meter display located below. The inspection cover must have a 25mm half circle cut-out provided, on edge opposite hinge, for it to be easily lifted by meter readers

7.8.4 Mandatory above-ground enclosure design details – all sizes

The following requirements shall be taken to be minimum mandatory requirements for above-ground meter enclosures regardless of size:

a) Enclosures shall meet the requirements of the Icon Water *SD Series* of drawings.

b) Locks/keying shall be in accordance with Icon Water's Security Policy.

c) A property service isolation valve shall be installed on the consumer premises within 600 mm of the property boundary for water meters sized DN20 to DN40 inclusive, and within 1000 mm of the property boundary for water meters sized DN50 and larger.

d) Water meters require unencumbered access at all times of the day or night for maintenance purposes. Icon Water will not approve designs which impede the primary access zone (e.g. car parking directly in front of a meter enclosure and meter enclosures behind locked gates or inside locked premises).

e) Whilst Icon Water is responsible for providing a water service up to the responsibility limits shown on the *SD Series* drawings, Icon Water cannot be held responsible for mains-to-meter pipe runs that are inaccessible on the consumer premises. In such cases, the inaccessible pipework shall be the leaseholder's responsibility.

f) No attempt has been made by Icon Water to provide detailed structural or building (e.g. fire rating) design details on the Icon Water *SD Series* of drawings. Therefore, each meter enclosure shall require a suitably qualified and experienced civil or structural engineer to design specifically for

the project conditions to be encountered. The engineer shall take into account details such as but not limited to: pipe thrust loads, pipe penetration details and pipe support loads and spacing. Enclosures of masonry construction shall have a minimum design life of 50 years and powder coated galvanised steel enclosures shall have a minimum design life of 25 years. The engineer shall provide certification that all items have been designed in accordance with Icon Water Standards, Icon Water project specific requirements (if any have been stated) as well as the relevant Australian standards and applicable legislation.

7.9 Miscellaneous construction and installation details

Water mains shall have minimum depths of cover in accordance with *WSA 03* as amended by Icon Water in *STD-SPE-G-012*. The mains-to-meter pipe run shall have a minimum depth of cover in accordance with Table 7.9.1. Trench construction (including bedding and backfill details) shall be in accordance with the Icon Water *SD Series* of drawings. For example: *SD-2106* and *SD-2107*.

Table 7.9.2 Minimum Cover Over Mains-to-Meter Pipe Run

Location	Minimum cover (mm)
Residential blocks	450 for pipes ≤ DN63 600 for pipes > DN63
Industrial and commercial blocks	600
Road reserves	750

7.10 EQUIVALENT PIPE SIZES

Equivalent service connection nominal diameter for Copper and PE pipe shall be determined using Table 7.10.1.

Table 7.10.1 Equivalent PE Pipe Diameter and Copper Pipe Type B AS1432

COPPER			EQUIVALENT PE 100 PIPE SERIES		
Type	**Pipe Size DN**	**ID (mm)**	**Pipe Size DN**	**Mean ID (mm)**	**PN**
Copper - Type B	20	17.0	25	20.7	16
Copper - Type B	25	23.0	32	26.5	16
Copper - Type B	32	29.3	40	33.0	16
Copper - Type B	40	35.7	50	41.2	16
Copper - Type B	50	48.4	63	52.0	16

7.11 Direct boosting from the Icon Water network

Water cannot be pumped directly from the property connection unless pre-approved in writing by Icon Water as part of the design and construction approvals process. The maximum pump flow should not result in the minimum residual pressure allowable of the street main being exceeded under peak demand conditions. One of the reasons for this approval requirement is that direct boosting has the potential to cause either nuisance or damaging pressure surges in the Icon Water network or neighbouring property services. Icon Water has previously had to either (i) repair water mains due to direct boosting issues, or (ii) require customers to rectify their on-site boosting systems due to nuisance surges being transmitted within the property services of neighbours. It is known that other Australian water authorities also experience issues with direct boosting by customers from time-to-time. Additionally, the situations that could potentially compromise the quality of drinking water include negative pressure and associated risk of backflow into the water supply system. One example of this would be if negative pressure causes the spring hydrant mushrooms on the hydrants to loosen, which would then potentially draw contamination into the network.

***Commentary 1**: An alternative to direct boosting is the installation of a break tank in-between the property service connection and the pressure booster pump. If the break tank is filled from the property connection via a slow-acting valve of an appropriate (operator selectable) opening/closing duration, both nuisance and damaging pressure surges are eliminated.*

Should a break tank solution be deemed to be less desirable by the Designer when compared to direct boosting, an application can be made to Icon Water for direct boosting (at the "in-principle" phase of the project). It is advisable to meet with Icon Water in such instances so that the project details can be discussed. Icon Water will request certain design details so that an assessment can be made as to whether the proposed direct boosting installation may cause pressure surge issues.

***Commentary 2**: A booster pump which is driven via a variable speed drive with a ramp-up and ramp-down time of at least 10 seconds for property connection flowrates of up to 15 L/s will generally result in an acceptable pressure surge magnitude. The use of direct-on-line booster pumps typically result in relatively high pressure surges which are unlikely to be accepted by Icon Water.*

At the time of accepting the application for direct boosting, Icon Water will provide notification in writing of the maximum allowable surge magnitude and corresponding overall surge duration. The values obtained from pressure surge testing (at conclusion of the works) will be required to be less than these values for a final certificate to be issued.

***Commentary 3**: The maximum allowable surge magnitude may not be the same for every project that a Designer or Contractor works on. This is due to the fact that variables such as the required flowrate, materials of construction of the main, age of the main, size of the main, number of connections along the main, mains static pressure etc. will vary from location to location and all of these variables will have an effect on the pressure surge "seen" by the main.*

Icon Water may forego its requirement to undertake pressure surge testing at the completion of the works. If it does so, notification will be provided in writing during the construction phase of the project.

8 Sub-Metering – Unit titles

Class A and Class B are the two classes of units in the ACT, according to the Unit Titles Act. Typically, a Class A unit consists of apartments, the perimeter of which is delineated by the unit's floors, walls, and ceilings. Class B units typically have a footprint on the ground, such as a townhouse, and the boundary of these properties is defined by a surveyed line that encircles the entire parcel of land on which the property is situated. Class A units are located in multi-story buildings, whereas Class B units, such as townhouses, are freestanding and each dwelling may consist of multiple storeys, the dwellings are not 'stacked', vertically, on top of each other.

As part of stage two of the Unit Title Reform project, legislative changes were made to the Unit Titles Management Act to improve the planning, governance, and management of unit plans in the ACT. Prior to the Unit Title Legislation Amendments made by the Environment, Planning and Sustainable Development Directorate (EPSDD) of the ACT Government, individual water meters were not required in residential and commercial developments with multiple units. This meant that, in the majority of cases, individual property owners were unaware of their water consumption; consequently, it was possible that they were not encouraged to reduce their usage, resulting in billing inequity.

Unit titles of multi-unit developments that draw water supply from Icon Water's potable water network must be individually metered. They must comply with this specification and relevant Icon Water standards. Sub-Metering allows for itemised billing based on sub-meter readings for multi-unit developments, thereby providing owners with insights into the cost of water consumption per unit. Icon Water standards provide guidance for individual metering across all unit title categories, including residential, commercial, and mixed-use developments.

This section outlines the design, installation, and handover requirements for Sub-Meters within unit titles located in Icon Water's service area. It provides guidelines on installing Sub-Meters and approved configurations for Class B unit titles. Developments whose installations do not comply with these specifications and the relevant SD drawings will have their work deemed defective by Icon Water. It will then be the developer's responsibility to correct these defects at their own expense, ensuring their work aligns with Icon Water's requirements, using approved products and materials. The rectification process may include, but is not limited to, the complete removal of the non-compliant product or material, and its replacement with an approved alternative.

Other Unit Title developments that meet these requirements are also eligible to apply for Sub-Metering. Class B units, typically townhouses or stand-alone dwellings within a unit complex, will begin the transition period from 1 January 2025, during which developers can opt in. Mandatory individual Class B unit metering will start on 1 July 2025.

8.1 Dual Occupancy Residential Development

Dual occupancies shall not be Sub-Metered and shall have two separate connections to the water network (one for each dwelling). Each connection must be equipped with an Icon Water meter and comply with all Icon Water policies as well as the technical requirements outlined in this specification. Even if a single connection to the Icon Water potable water supply system already exists, a separate DN20 meter must be installed for each dwelling.

8.1.1 Secondary Residences (Granny Flat)

Secondary residences, often referred to as 'granny flats' in the ACT, are typically covered under a single lease, which means that separate servicing and metering are usually not required. However, if desired, an owner can request a separate service and water meter installation at their own expense. These secondary residences must be located on a residential property with a minimum area of 500 m2. The size of such a residence should fall within the range of 40 m2 to 90 m2. For the most current information and definition of secondary residence, it is advisable to consult the ACT planning website.

8.2 Sub-Metering design submission – Unit titles

The applicant must submit an external servicing plan as per Icon Water drafting standard and design form pack, along with drawings detailing the Master Meter and Sub-Meters arrangements. The developer shall not commence constructing the metering arrangement until Icon Water approves the hydraulic assessment and detailed design drawings of Sub-Meter locations and other design requirements. The following items must be considered as part of the design review and approval process.

1. The application must include scaled drawings detailing the internal water service design within the development, indicating the proposed location of each Sub-Meter and surrounding clearances. The application must adhere to the requirements outlined in this technical specification and Icon Water's SD series of drawings. A full set of hydraulic and detailed design drawings must be submitted to Icon Water for assessment as part of the application process. The drawings must provide:

    - A locality plan giving the overall layout and location of the development.
    - A detailed design drawing for the development, include a table of:
        (i) Unit numbers (unit numbers are final and represent the postal address) / allocated meter size
        (ii) Location of the Sub-Meters for each unit including the clearances
        (iii) Location of the Master Meter
        (iv) Showing and confirming that there is no unmetered branch line downstream of the Master Meter and all water fixtures in the common area are metered by a dedicated body corporate Sub-Meter.

2. An application must be submitted for Sub-Metering at the same time as plans for new developments are submitted.

3. If the original application does not comply with this specification, the applicant will be required to modify the design and resubmit the application.

4. A detailed drawing shall clearly provide the detail for the access to the Master and Sub-Meters for each proposed unit.

5. The application must provide the flow requirements and unit characteristics of the development. Icon Water will determine the appropriate size of the water meter(s) based on this data. The hydraulic engineer must also submit all relevant information, assumptions, and calculations used in this process to Icon Water.

6. The acceptable scales for the metering arrangements are 1:5, 1:10 for sections and details, and 1:20, 1:50 for arrangement plans. Drawings must be prepared in accordance with STD-SPE-G-018 Icon Water Drafting Standard to ensure at the completion Icon Water has accurate information of the as-constructed drawings.

8.3 Metering of common property area – Unit titles

Where a development consists of three or more units, a master meter and individual Sub-Meters are required. For residential developments, Sub-Meters will not be approved for fewer than three units.

Common property areas must also be Sub-Metered (e.g. designated common areas such as recreation areas, bin wash down areas, and public toilets).

If a development has multiple Body Corporates, Icon Water will only approve one Sub-Meter for all connected Body Corporates. The Body Corporates may install private meters and internal water service mains, with ownership and maintenance of these meters being the responsibility of those who benefit from these private assets.

If the consumption registered on the Master Meter exceeds the sum of the Sub-Meters, the additional consumption will be attributed to the Body Corporate Sub-Meter. Icon Water does not expect a significant difference if the internal pipework has been properly designed, maintained, and is free of defects.

8.4 Ownership – Class B unit pipework and fittings

Icon Water will only own and be responsible for maintaining Sub-Meters that have been installed with their approval in accordance with this specification and are used to measure water usage of unit title developments. Since the water Sub-Meter on the customer's property is Icon Water's asset, the reading, maintenance and replacement of Sub-Meters is Icon Water's responsibility.

Leakage occurring at the ball valves or meter connection is NOT the responsibility of Icon Water. Icon Water is only responsible for split or burst meters, not for leakage at the connection point of the flange or union to the sub-meter. For clarity, Icon Water is NOT responsible for the following components of Sub-Metering arrangements:

- Sub-Meter enclosure.
- Any fittings located upstream or downstream of the Sub-Meter, as well as the isolation valves located on either side of the Sub-Meter.
- The pipe works (including all of the pipework and fittings) that are required in order to connect the Master meter to Sub-Meters.
- The piping and fittings that is located downstream of Sub-Meters.

8.5 Approved Sub-Meter Components

The Sub-Meters shall be installed with a standard assembly consisting of the following components, all of which are from Icon Water's Approved Product List. The Figures 8.5.1 through 8.5.3 are showing examples of approved configurations from the Icon Water SD drawings.

(i) Meter blank spool/spacer – (if required prior to the installation of the DN20 meter)-

(ii) Meter box – (for the inground installations DN20)

(iii) Meter box base – (for the inground installations DN20)

(iv) Meter box lid - (for the inground installations DN20)

(v) Wall mounted bracket – meter bracket must be fitted to the individual meter and attached to the cabinet wall for support (only for cabinet installations DN20)

(vi) Water Sub-Meter

(vii) Ball valve with the integrated swivel nut including Nitrile Rubber Washer (DN20)

The swivel nut and rubber washer of the ball valve connecting to the Sub-Meter must be from the Icon Water approved product list to simplify the removal and replacement of the water meter. The ball valves

must be rated PN 16 and operated with a tamper-proof, lockable lever handle. The following are the two approved end connections compatible with the wall-mounted bracket installation and in ground arrangement:

- ☑ The end thread of the valve must have an external 1" thread so that a nut can be used to connect it to the water Sub-Meter wall mounted bracket.
- ☑ The other option is a plain end with a groove and a circlip. This connection is designed to secure the ball valve to water Sub-Meter wall mounted bracket using a circlip.

Fig. 8.5.1 Example of approved end connections of the ball valve

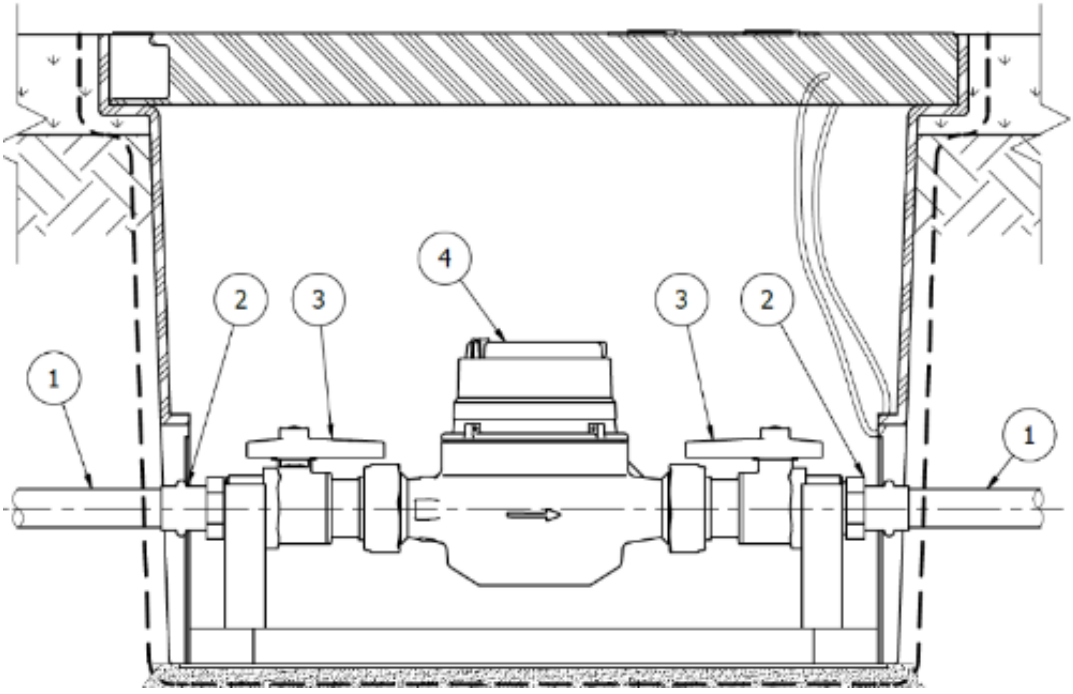


Fig. 8.5.2 Approved Water Sub-Meter DN20 – Inground pit installation

1 Copper Service Pipe

2 BSP/Press Fit adaptor

3 Approved Icon Water Ball valve

4 Water meter DN20

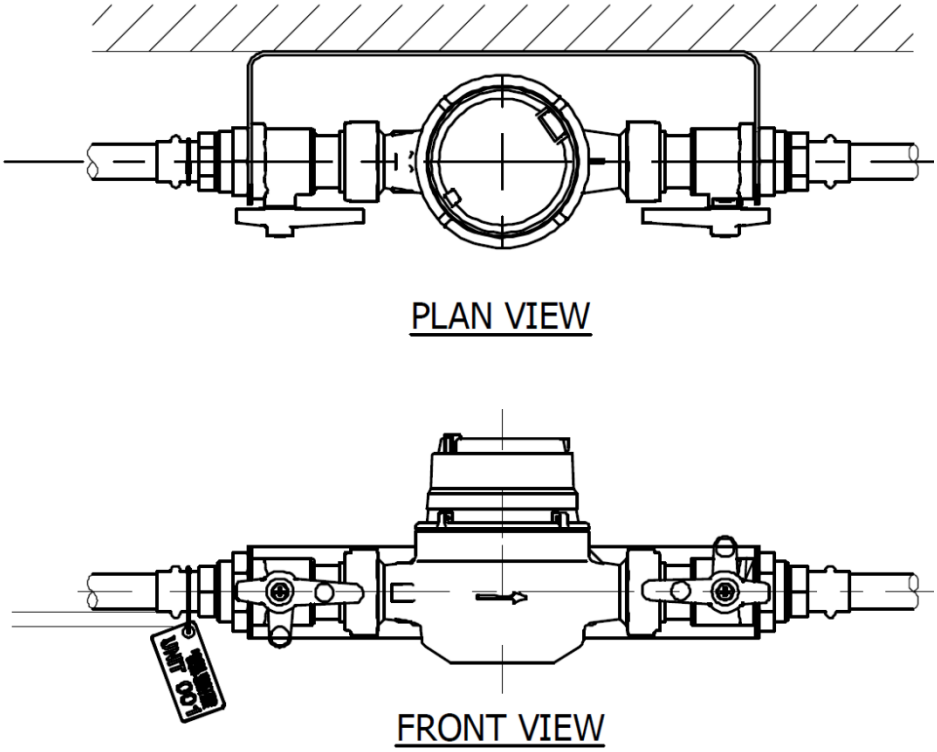


Fig. 8.5.3 Approved Water Sub-Meter DN20 – Cabinet installation with Stainless Steel or PE bracket

8.6 Sub-Metering Installation – CLASS B Unit Title Development

Sub-Meters should be grouped together and installed at ground level in an accessible area. For unit title developments, the Master Meter must be installed in compliance with Section 7 of this specification, with an additional Sub-Meter for each unit. An exception applies to unit title developments where all units have direct access to the public road and no separate connection is required for the common area. In these cases, one meter per unit with a separate tie point may be installed to directly service each unit. Generally, Sub-Meters can be installed using one of the approved servicing solutions detailed below:

Solution A-1 Below-ground installation for up to 6 Sub-Meters (Including Body Corporate); standard meter box with manifold layout at the development boundary.

(i) "T" Arrangement: Sub-Meters at a right angle to the property boundary or

(ii) "Straight" Arrangement: Sub-Meters Parallel to the property boundary. And directly opposite the tapping connection.

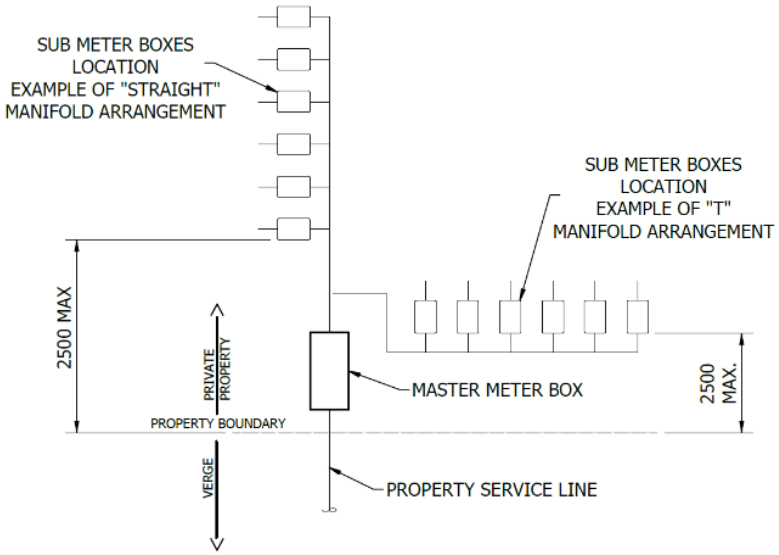


Fig. 8.6.1 Typical Sub-Meter “T” and “Straight” arrangements

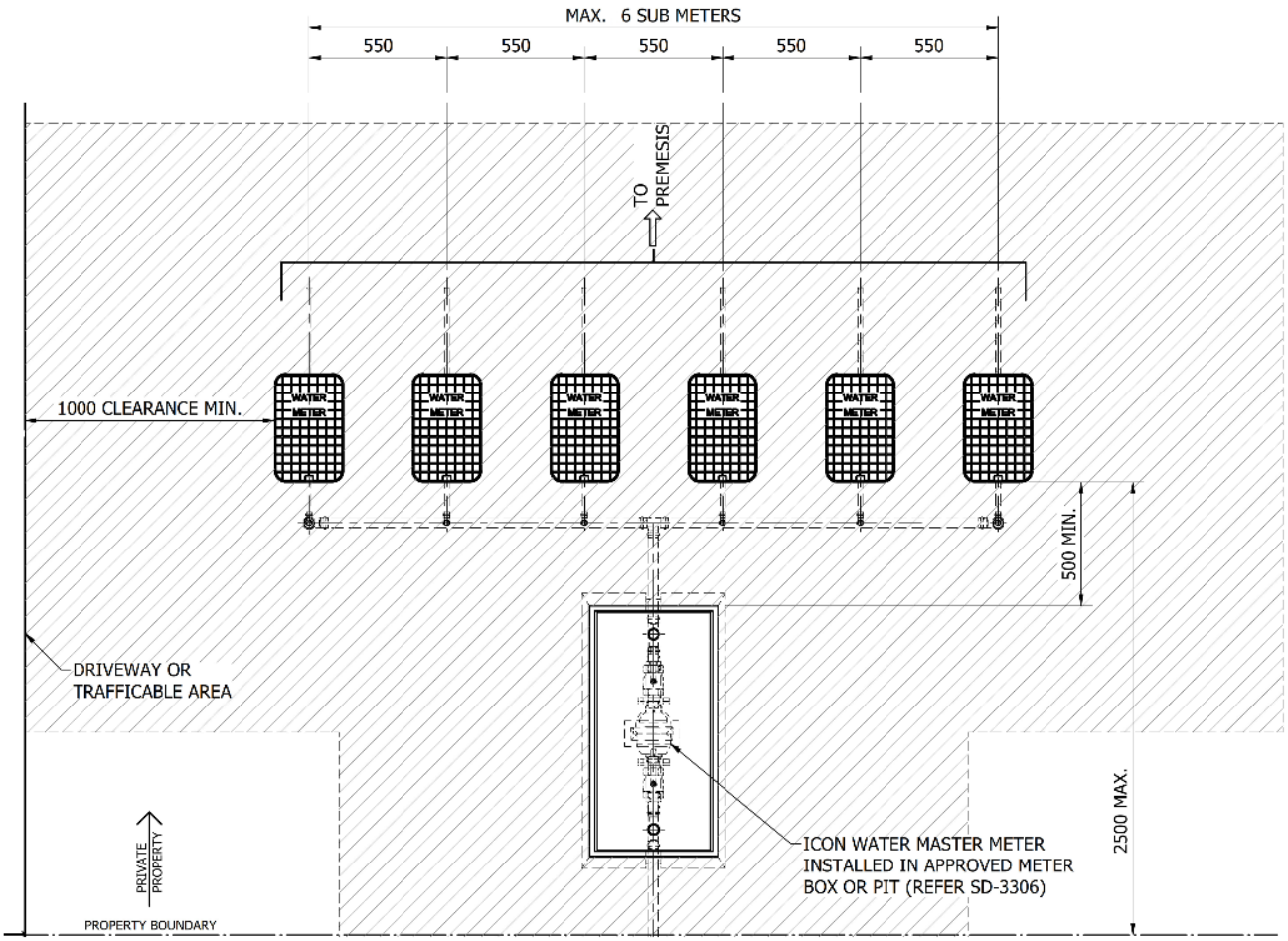


Fig. 8.6.2 Typical Sub-Meter box assemblies – plan view

Solution A-2 Sub-meters installed in standard meter box (outside individual units of the unit title development)

The Master Meter is installed at the unit title development boundary, and Sub-Meters are installed at the front of each unit, compliant with the access requirements and clearance around the meter boxes, this arrangement is acceptable for up to 10 Sub-Meters including body corporate). Refer to drawings SD-3357 and SD-3355 for more details. Sub-meters are connected to the internal pipework and must be designed by a suitably qualified hydraulic consultant to ensure that the pressure and flow rate for downstream connections are not adversely affected due to water usage by other units. In this arrangement, water pressure could be impacted as distance from the main supply increases, resulting in low water pressure at connections farthest from the water network, especially when multiple connections are used simultaneously. While Icon Water will not be responsible for the internal hydraulic design, this factor must be considered in the planning and selection of the arrangement. The layout of the development will determine the optimal placement of the sub-meters, however all access and clearance requirements in section 7 of this specification must be satisfied as a hold point for the approval of this option.

Fig. 8.6.3 Sub-meter installed in standard meter box (outside individual units)

Solution B-Above-ground installation in cabinet enclosure at the unit title development boundary

For class B unit title developments, the space required at the property boundary or in front of individual units for underground installation may not be achievable. To optimise this, in Solution B, sub-meters for Class B units should be grouped and installed within a sub-meter cabinet, following Icon Water's requirements in standard drawing SD-3356.

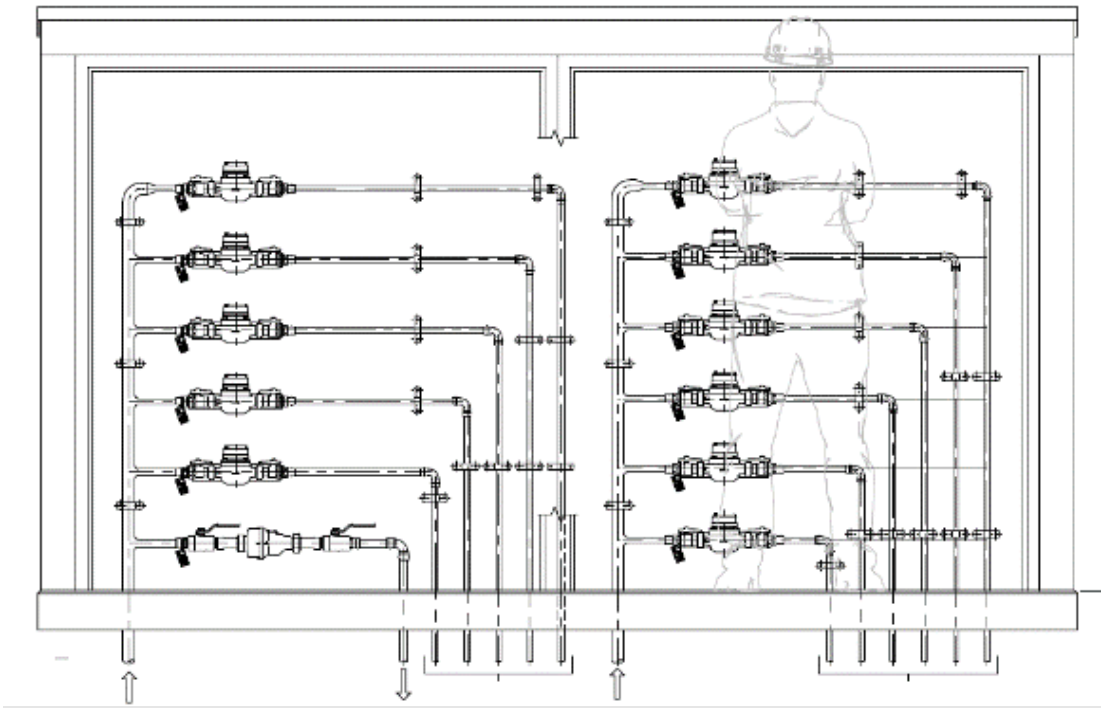


Fig. 8.6.2 Typical Sub-Meter Cabinet assembly – Elevation

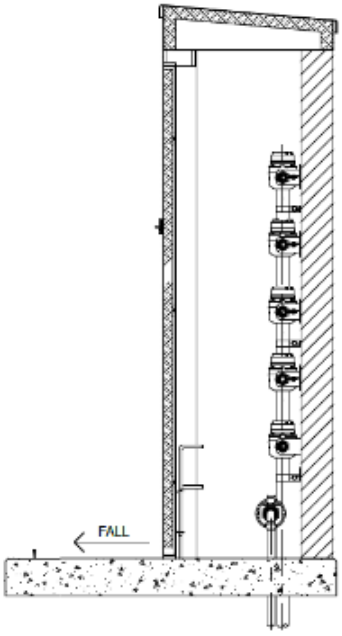


Fig. 8.6.3 Typical Sub-Meter cabinet assembly – Side view

Solution C- For larger developments (more than 10 units), Sub-Meters should be grouped together and installed in a common area within sub-meter cabinets. The layout of the development will determine the optimal placement of these cabinets, with the number of cabinets designed based on the size of the development. All access and clearance requirements must be met as a hold point for the approval of this option. Refer to drawings SD-3358 for further details.

The access to the meter cabinets requires a minimum clearance of 1.5 metres at the front (door side) of the cabinet for safe reading, maintenance, and replacement. Icon Water's service trucks, which are 8.6 metres in length, 2.5 metres in width, and 3.5 metres in height, need sufficient space for manoeuvring. The driveway must provide adequate space for the service truck to reach the meters efficiently, 24 hours a day, seven days a week. The enclosure must be clearly marked 'Water Sub-Meters' on the outside of the door, and where more than one Sub-Meter enclosure is installed, each enclosure should have an ID number.

The application must be aware that this option requires truck access to the location of the meter cabinet for Icon Water to carry out the required reading, maintenance, repair, and replacement of the meters.

Table 8.6.1 Overview of solutions for unit metering

Option	Location of Sub-Meters	Type of Installation	Max Number of Sub-Meters	Considerations
A1	At property boundary	Below ground in meter box	6	Ideal when ground space is available at the boundary. Ensure there is clear and unobstructed access is provided and the standard installation, refer to SD3355.
B	At property boundary	Above ground in cabinet	No Limit	Ideal when below-ground space is limited at the boundary. Ensure cabinet meets clearance and other standard requirements in SD3356.
A2	Inside the property common area	Below ground in meter box	10	Least preferred option - Consider internal hydraulic design. Ensure suitable access and compliance with clearance rules around each meter box of 1 m refer to SD3357
C	Inside the property common area	Above ground in cabinets	No Limit	Ensure there is enough space for grouped sub-meters and that they are accessible for maintenance. Make sure the cabinets are located in a common area with sufficient room for Icon Water service trucks to access refer to SD3358

8.6.1 General requirements

Sub-Meters must be installed in an accessible area for reading, maintenance, and replacement. The developer should determine the best Sub-Meter layout in accordance with Icon Water SD Series of drawings and this specification. The Sub-Meter layout design must meet the following general requirements:

- ☑ All Sub-Meters shall be housed in a Sub-Meter enclosure or Icon Water approved meter box.
- ☑ Sub-Meters must be installed close to the Master Meter following standard drawings SD-3350 to 3358 with required clearance around the allocated space to the meters. Icon Water requires Sub-

Meters to be accessible and clear of obstructions within the property boundary, not inside buildings or gated properties.

- ☑ In order to prevent theft and vandalism, the meter assembly needs to be placed in a secure location and given adequate protection.

- ☑ Sub-Meters must not be installed at the rear of a unit where Icon Water personnel have to go inside the building or through a fence in order to access the Sub-Meters.

- ☑ The Master Meter must be installed at the property boundary in accordance with section 7 of this specification.

- ☑ The interconnecting pipe from the Master Meter to the individual Sub-Meters must comply with AS/NZS 3500.1 in all respects.

- ☑ All Sub-Meters must be installed by a licenced plumber. The Sub-Meters that are used with unit title developments are required to be mounted horizontally, and the dial face of the meter must point upwards to maintain optimal meter performance over the life of the meter, ensure consistent installations across developments and to ensure meters can be read easily.

- ☑ Sub-Meters must not be installed in walkways, driveways, or other locations that could endanger meter readers and Icon Water maintenance team.

- ☑ Sub-Meters must not be situated in garages, roof cavities or ceiling spaces.

- ☑ Sub-Meters must be installed so that leakage won't cause property damage or safety issues.

- ☑ It is essential for Icon Water staff to easily identify the unit each Sub-Meter is connected to. Therefore, all Sub-Meters must be clearly labelled with a permanent, waterproof identification tag. This tag must be affixed to each Sub-Meter installation in line with Icon Water's standard drawings SD1307, SD3355, and SD3356.

- ☑ Sub-Meters and Sub-Meter pits are not to be encased in concrete.

8.6.2 Below ground installation - CLASS B developments

Sub-Meters installed underground; the following are the installation requirements:

- ☑ The meter boxes must be an Icon Water approved product.

- ☑ Sub-Meters must not be installed in walkways, driveways or other areas where they would cause a potential hazard for either meter readers or building occupants, or conflict with vehicle movements. Water Sub-Meter box must be installed in the correct location and configuration.

- ☑ Sub-Meters should comply with the installation requirements for a 20mm water meter as defined in the Icon Water standard drawings SD3355, SD3357 as applicable.

- ☑ Each Sub-Meter box should be clearly identified on the outside with the words 'Water Sub-Meter' in a permanent arrangement, in addition to the unit tag. Refer to SD1307.

- ☑ Water meter box lids must be attached to the pit with a length of stainless-steel braided wire of such length to enable removal of lid without restriction.

- ☑ The maintenance of the pit is and will remain the responsibility of the property owner. If reading, replacement, or maintenance cannot be performed due to the nature of the pit (not approved product) or meter installation, the owner will be requested to remedy the problem.

- ☑ No fittings, including, but not limited to: bends, elbows, stop valves, check valves or meters, shall be encased in concrete.

- ☑ Water meter Copper pipe tail (in accordance to standard drawing SD-3355) must extend upstream of Sub-Meter box.

- ☑ The Sub-Meter assembly shall be installed within an Icon Water approved meter box with a non-slip lid.

- ☑ Bedding or soil shall not surround or cover any components within the meter box.

- ☑ Install the meter box on a stable foundation such concrete base, compacted sand, cement stabilised sand or 10mm compacted aggregate.

- ☑ Geotextile fabric must be installed in such a way as to preventing the ingress of sand, dirt and mud to water meter box.

- ☑ Meter identification tag must be permanently attached to the side of the meter box in accordance with SD-1307 for tag details and Icon Water standard drawing SD-3355.

- ☑ Excavation for the meter box should be approximately 150mm greater than the outer dimensions around the meter box side walls, and 100mm below the base. Any large, sharp objects or other protrusions that may damage the meter box must be removed prior to placement of the meter box in the excavated area.

Fig. 8.6.4 Typical Sub-Meter box assembly

8.6.3 Above ground installation - CLASS B developments

For unit title developments, one acceptable option is to install a Master Meter at the property boundary, with individual Sub-Meters grouped together in one or more above-ground enclosures. These enclosures shall be designed based on SD3356 and SD3358 standard drawings, as applicable. The installation requirements are as follows:

- ☑ Sub-Meter enclosures must be located in accessible areas within the development. The cabinets must fully enclose the isolation valves and Sub-Meters, with doors hinged for manual opening.

- ☑ The enclosure shall be placed at ground level within the property boundary, ensuring an unobstructed working space for maintenance and replacement. The working space shall be at least 1.5 metres wide, extending from the enclosure's access door. Refer to drawing SD-3356 for further details.

- ☑ The enclosure shall allow the doors to swing open to at least 90 degrees with 600 mm clearance for the person standing at the front of the cabinet. This will enable full access for maintenance activities.

- ☑ Sub-Meter enclosures shall be fixed to a solid wall or mounted on a concrete plinth, the working area in the front of the enclosure shall be concrete pavement with a broom finish for slip resistance.

- ☑ The enclosure shall be clearly marked ‘WATER SUB-METERS’, fixed permanently and centrally on the external access point or door as per SD-1307.

- ☑ Where more than one Sub-Meter enclosure is required within a development, each enclosure shall have a reference identification number on the enclosure as a point of reference (for example ‘WATER SUB-METERS – ENCLOSURE 1 OF 2’).

- ☑ All enclosures must be watertight and equipped with floor drains to manage any potential seepage that may occur during maintenance activities. This requirement is subject to site-specific conditions.

- ☑ All penetrations of the enclosure structure shall be sealed and protected against corrosion.

- ☑ The enclosure shall be constructed of either 316 stainless steel matt finish (for external enclosures) or coated steel, with the coating meeting the requirements of WSA201 and featuring anti-graffiti properties. Additionally, the enclosure must include internal insulation.

- ☑ The enclosure must feature lockable doors, as per Icon Water's specifications. A standardised Icon Water lock, operable with an EL85 key, should be installed on all exterior doors.

- ☑ All external edges must be rounded, and all edges and corners must be accurately and neatly folded..

- ☑ Adequate lighting is available during daylight hours.

- ☑ The following dimensions shall be considered in the design of the Sub-Meter cabinet consistent with Icon Water standard drawings SD-3356.

    a) The pipework shall be horizontal and spacing between adjacent service pipes shall be: 225mm (centre to centre) for the horizontal installations. For 32-50mm meters, 100mm between outside edges of meters.

    b) There must be a horizontal clearance of a least 100mm between the outer-most pipes and the edge of the enclosure structure and a vertical clearance of 400mm between the centre of the meter and the edge of the enclosure structure (or another obstruction).

c) There must be a clearance of min 100 mm between the downstream service lines as they exit the cabinet - refer Figure 8.6.5.

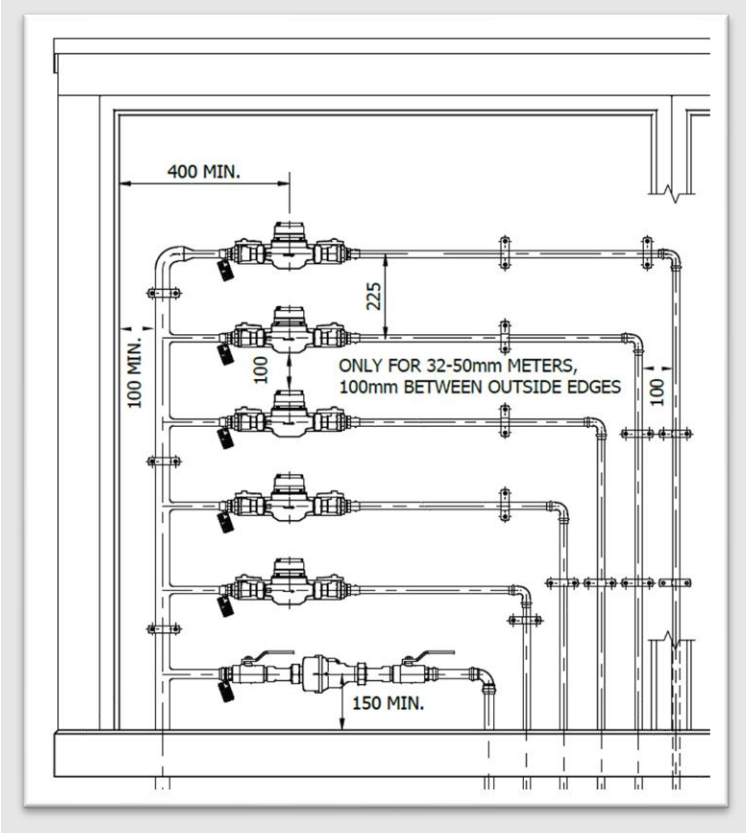


Fig. 8.6.5 The clearances in the meter cabinet

☑ Sub-meters must be installed so that the centre of the pipework is no higher than 1400 mm and no lower than 150 mm from the adjacent ground or floor level in front of the enclosure. For meters larger than DN25, the measurement should be taken from the bottom of the meter.

☑ The dial face of the Sub-Meters must be oriented so that it can be easily read by an individual standing unassisted at floor level next to the enclosure. A minimum clearance of 400 mm is required between the top row of installed meters and the top of the cabinet. Refer to Figure 8.6.6 for further details.

☑ Approved brackets establish the precise clearance for DN20 meters. For other sizes and configurations, a minimum clearance of 50 mm from the internal rear of the cabinet to the meter edge must be maintained.

☑ There must be a minimum clearance of 200 mm from the extremity to the inside of the cabinet door.

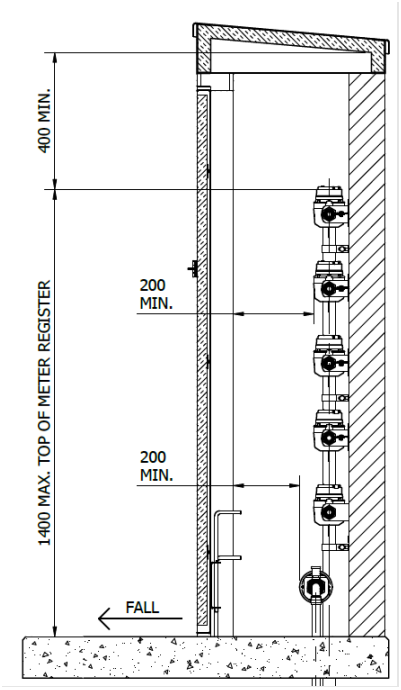


Fig. 8.6.6 The required clearances in the meter cabinet inside view

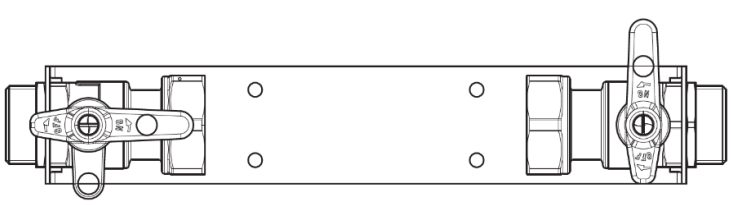


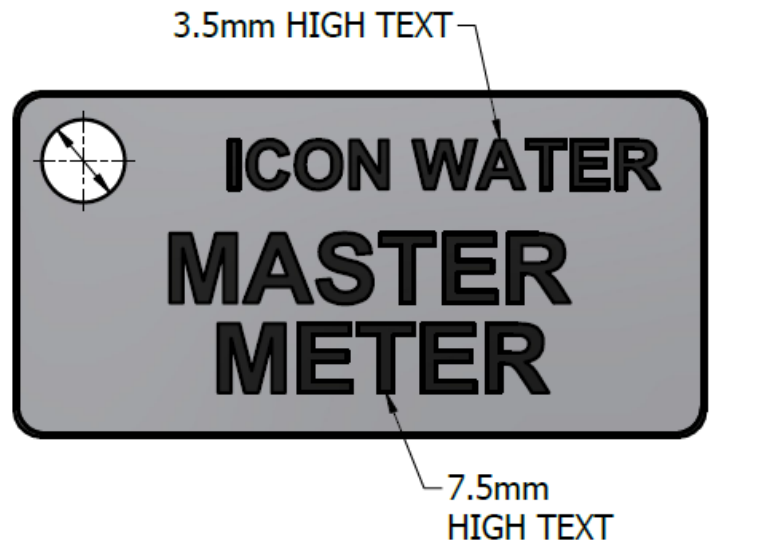
Fig. 8.6.7 Typical cabinet mount bracket with ball valves

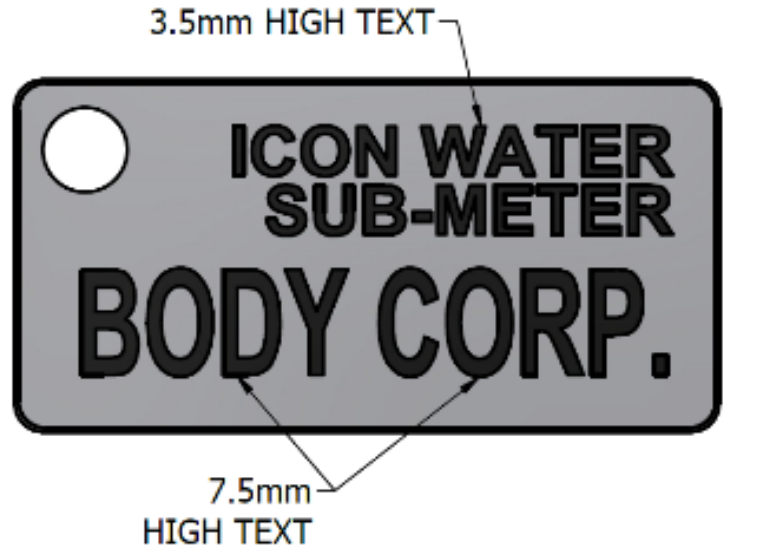
8.7 Sub-Meter identification

Every Sub-Meter is required to have a label. The label must clearly indicate the unit number, both in written and printed form. The label should be attached in accordance with the following stipulations:

- Cabinet arrangement: The label should be affixed to the pipework upstream of the meter using a 1mm meter sealing wire, as specified in standard document SD-3356.
- In-ground arrangement: The label should be secured to the meter box in alignment with standard document SD-3355.

The label must clearly state the unit number associated with the respective Sub-Meter. If the Sub-Meter services a common area, this should be explicitly indicated on the tag. The Sub-Meter tag dimensions are required to be 50 mm by 25 mm. The unit number shall be permanently marked in accordance with Icon Water's standard guidelines for labelling. The plumber who certifiers will verify and attach tags to the Sub-Meters during connectivity checks to ensure the meter exclusively serves the indicated unit. Labels must comply with the specifications in standard document SD-1307 and be engraved on a 1.5mm Traffolyte Plastic material. Furthermore, labels must be durable, waterproof, and easily readable.





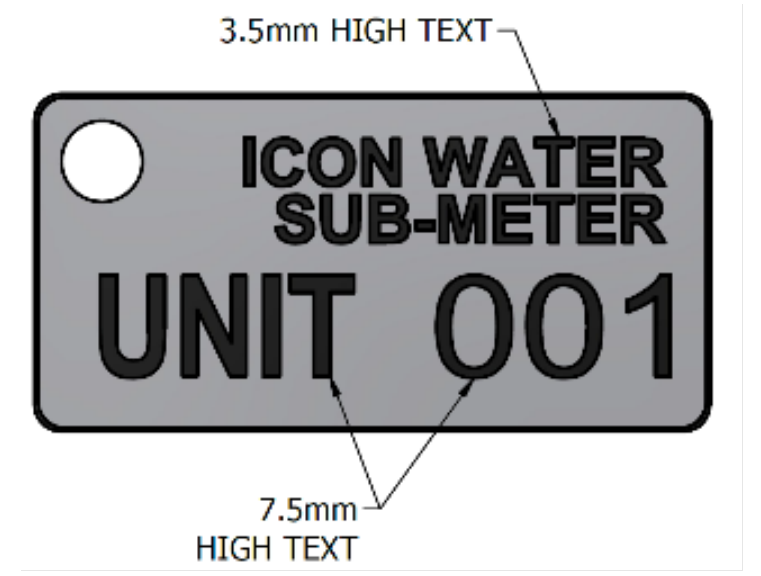


Fig. 8.7.1 Typical Sub-Meter tag samples

8.8 Sub-Meter sizing

While residential Sub-Meters are typically sized at 20mm diameter, the size of Sub-Meters within a development should be determined via a hydraulic analysis completed by a suitably qualified hydraulic consultant. The hydraulic consultant is responsible for the pipe sizing and the pipe sizing shall be determined by using AS/NZ 3500. The length of the service pipe from the reticulation water main to the furthermost dwelling supplied affects the pressures and the hydraulic consultant shall provide the calculations to ensure the adequate pressure and the flowrates. Meters that are incorrectly sized may result in under-recording of a water consumption or problems with flow and pressure internal to the site.

8.9 Internal water service design plans and drawings

The applicant shall submit drawings and hydraulic plans to Icon Water for approval and must include:

- clearly showing the proposed location and size of each meter and the area or unit or dwelling served.
- Include a plan showing the design and layout of the water service within the development and location of the master and Sub-Meters for each proposed occupancy.
- The plans shall ensure all fixtures in the common area are Sub-Metered, by a single Icon Water body corporate meter.
- The plans shall show the approximate location of each Sub-Meter enclosure in the complex; plans shall be to scale.
- detailed information regarding the Sub-Meter assembly and arrangement

Icon Water metering team will allocate meters to each unit in accordance with the tagging on the service pipe.

8.10 Sub-Meter Handover

8.10.1 Connectivity audit

Upon completing the installation of Sub-Meters, a licensed plumbing certifier must conduct a 'connectivity audit.' This audit involves matching each Sub-Meter with its corresponding unit title to ensure the meter and plumbing system function correctly. The purpose is to confirm that each unit is connected to a single Sub-Meter, and every Sub-Meter is accurately labelled with the unit number and name it serves. Meter readings should be collected to verify the audit process. For example, using a 10-litre bucket can help check the connectivity and ensure the meters are plumbed to the correct unit, as specified in the plans and drawings.

The plumber is responsible for ensuring the Sub-Meters are installed in compliance with Icon Water specifications, performing a comprehensive test, and providing an accurate plan for the design hydraulic engineer to inspect and certify the as-built drawings. The plumbing certifier must be licensed under the Construction Occupations (Licensing) Act 2004 and meet the necessary eligibility criteria.

During the connectivity audit, the following must be verified:

a) The Sub-Meters are accessible for reading and maintenance, as per Icon Water requirements.

b) Each Sub-Meter is correctly installed and measuring flow only to the specific unit, lot, or storey being tested (this verification must be done through physical testing by the building certifier); and

c) Each Sub-Meter is clearly identified with tags or other labels indicating the premises it serves.

If the connectivity audit reveals incorrect installation of Sub-Meters, the applicant must investigate and resolve any cross-connections or mismatches, then apply for another audit. Icon Water must be notified of all inspections.

8.10.2 As constructed Drawings:

Once the certified plumber has successfully completed the connectivity audit for the development's Sub-Meters and issued the final plumbing compliance certificate, Icon Water requires the work to be inspected and the as-constructed drawings certified by a registered engineer.

During the certification of the Sub-Metering work, the Chartered/Registered Engineer must ensure that the installation aligns with the submitted as-built plans and Icon Water specifications. Please note that a non-chartered engineer cannot conduct this inspection on behalf of the Chartered/Registered Engineer..

The hydraulic as-constructed drawings for unit title developments must include the following information:

a) The serial number and size of the Sub-Meter (in a table format similar to below).

b) A description of the unit that is supplied through each Sub-Meter; the as-constructed drawings need to show the Sub-Meter array and highlight what each service feeds as meter number will eventually be redundant due to cyclic replacement.

c) Drawings shall be to scale and compliant with Icon Water STD-SPE-G018; making sure that Sub-Meter installations are accurately reflected in the as-constructed drawings.

d) The alignment of the as-constructed water main and Sub-Meters are to be surveyed on completion.

e) Confirmation that Sub-Meters are installed in an accessible area for reading and maintenance purposes.

The Chartered/Registered Engineer shall certify that the work.

a) The work has been completed in accordance with the Approval Conditions set by Icon Water, the approved hydraulic design and drawings, and includes any design variations approved by the responsible officer.

b) An informational label, displaying the name and phone number of the maintenance company or Body Corporate, is affixed in a location inside the meter cabinet that is easily visible.

c) All necessary construction documentation, required for the Icon Water As-Constructed Package, has been completed, inspected, and confirmed.

Below is an example of a typical Sub-Meter table to be submitted with the As Built Drawings.

Meter No.	Meter Size	Unit No.	Level	Meter Reading (kL) and date	Location of Sub-Meter
K000123	20mm	Unit 8	G	0000010	Outside Main entrance on Right side with adequate access

9 Acceptance testing

9.1 General

Icon Water understands that licensed plumbers and drainers who are not involved in main-laying activities do not have a requirement to purchase *WSA 02* and *WSA 03*. Therefore, the acceptance testing requirements detailed in Section 8 of this document may be used in lieu of the *WSA 02* and *WSA 03* requirements specifically (and only) for:

a) Water mains-to-meter applications, and

b) Sewer mains-to-tie applications

The requirements detailed in Section 8 of this document shall not be used for the acceptance testing of water and sewer mains. Water and sewer mains shall be tested in accordance with *WSA 02* and *WSA 03* (as amended by Icon Water specifications *STD-SPE-G-011* and *STD-SPE-G-012* respectively).

Potential acceptance tests required by Icon Water are:

a) Visual inspection

b) Compaction testing

c) Ovality testing (of sewer mains-to-ties)

d) Internal inspection (via CCTV or equivalent)

e) Air or vacuum testing (of sewer mains-to-ties)

f) Hydrostatic testing (of water mains-to-meter)

g) Measurement of grade (of sewer mains-to-tie)

h) Infiltration testing (of sewer mains-to-tie)

Table 8.1.1 provides a summary of when specific acceptance tests are required.

Table 8.1.1 Summary of Acceptance Tests

Acceptance test	When to be performed
Visual inspection	Visual inspections (if required) are performed by Icon Water to check (i) pipe minimum cover (ii) trench width (iii) embedment and backfill material (iv) approximate degree of compaction (v) approved products and materials, and (vi) final surface levels. Icon Water will always perform visual inspections prior to asset handover in the following instances: a) for water-mains-to-meter pipe runs in sizes DN50 and above (including pits and enclosures), b) for sewer mains-to-meter pipe runs in sizes DN100 and above, otherwise, random inspections will be conducted or the Contractor will be notified in advance for instances not meeting (a) or (b) above.

Acceptance test	When to be performed
	Icon Water visually inspects all water meters after installation. Non-conformance notices (directing rectification) are sent when defects exist. Visual inspections form part of progressive acceptance testing as well as final testing.
Compaction testing	Compaction testing (if required) is to be performed by the Contractor with the results provided to Icon Water at the time of asset handover. Greenfield Developments: Compaction testing is required for all greenfield developments as part of the overall mains and branch construction program. Brownfield Developments: Compaction testing is not required for brownfield water mains-to-meter pipe runs or brownfield sewer mains-to-tie pipe runs unless either (i) it is a TCCS requirement, or (ii) Icon Water has specifically requested in advance that such tests be performed, or (iii) Icon Water has reason to believe that construction quality has been sub-standard. Refer to Section 8.4 for detailed compaction testing requirements. Compaction testing forms part of the progressive acceptance testing program.
Ovality testing	Ovality testing is not required for water mains-to-meter pipe runs (of all sizes) or sewer mains-to-tie pipe runs of sizes less than DN150. Icon Water will advise if ovality testing is required for sewer mains-to-tie applications sized DN150 and above during the early stages of construction otherwise Icon Water will direct that ovality testing be performed only when Icon Water has reason to believe that construction quality has been sub-standard. Where ovality testing is required by Icon Water, it must be undertaken by using either a proving tool or CCTV inspection in-conjunction with the appropriate measuring device and measurement software. Refer to Section 8.5 for detailed ovality testing requirements when employing a proving tool. Ovality testing forms part of the progressive acceptance testing program.
CCTV inspection	CCTV inspections are not required by default for water mains-to-meter or sewer-mains-tie applications. However, should Icon Water have grounds to believe that the required constructions grades, materials of construction, jointing types etc. have not been achieved in accordance with the relevant design and construction standards and approved construction drawings; or if other defects are suspected to be present, then Icon Water will direct the Contractor to engage the services of an independent, appropriately qualified CCTV operator. Refer to Section 8.6 for detailed CCTV inspection requirements.

Acceptance test	When to be performed
	Where such inspections are required, they must meet the following requirements: a) The CCTV operator holds a Statement of Attainment in *NWPNET016 Inspect Sewer or Stormwater Line* (or equivalent). b) All CCTV activities and are undertaken in accordance with WSA 05 Conduit Inspection Reporting Code of Australia. This also includes reporting requirements. c) Must be of such quality that an accurate assessment of the internal condition of the pipe can be made. CCTV inspections can either form part of the progressive acceptance testing program or be performed at the conclusion of the works.
Sewer Mains-to-Tie Air Testing or Vacuum Testing	Greenfield Developments: Sewer mains-to-tie pipe runs are to be either air pressure tested or vacuum tested for all greenfield developments as part of the overall mains and branch construction program. Brownfield Developments: Pressure or vacuum testing of sewer mains-to-tie pipe runs is not required by default for brownfield construction of new or replacement sewer mains-to-tie pipe runs unless such a run emanates from a manhole. In such instances, testing is required. The Contractor shall nominate either vacuum or pressure testing prior to the commencement of the test. The Contractor is not permitted to change from one method to the other. Refer to Section 8.7 and Section 8.8 for specific details relating to air testing and vacuum testing respectively. Air or vacuum testing can either form part of the progressive acceptance testing program or be performed at the conclusion of the works.
Hydrostatic Testing of Water Mains-to-Meter Pipe Runs	Greenfield Developments: Hydrostatic testing of water mains-to-meter pipe runs is required by default for all greenfield developments regardless of pipe size and length. Brownfield Developments: Hydrostatic testing of water mains-to-meter pipe runs is required by default for all brownfields developments regardless of pipe size and length. However, Icon Water is not required to be present during testing of sizes less than DN50 unless (i) Icon Water has previously advised that it requires an Icon water representative to be present, or (ii) witnessing the test is part of a random inspection program. Refer to Section 8.9 for specific details relating to hydrostatic testing. Hydrostatic testing can either form part of the progressive acceptance testing program or be performed at the conclusion of the works.

Acceptance test	When to be performed
Measurement of Grade for Sewer Mains-to-Tie Pipe Runs	Greenfield Developments: Sewer mains-to-tie pipe runs are required to be surveyed in accordance with Icon Water specification *STD-SPE-C-004 Survey and Tolerancing Requirements*. Such a survey (in-conjunction with Icon Water visual inspections and any CCTV inspection) will confirm that the pipe run has been constructed in accordance with the design drawings. Brownfield Developments: Sewer mains-to-tie pipe runs sized less than DN150 are not required to be surveyed, or their grades measured by default unless (i) Icon Water has reason to believe that the required constructions grades have not been achieved in accordance with the relevant design and construction standards and approved construction drawings, or (ii) the length of the pipe run from the mains to the property tie is in excess of 20 metres. Sewer grades can be measured by direct survey (prior to embedment and backfilling) or CCTV scanner (in conjunction with appropriate measurement instrumentation). Ovality testing typically forms part of the progressive acceptance testing program.
Infiltration Testing of Sewer Mains-to-Tie Pipe Runs	When a free-standing water table exists at a level of 150 mm or higher above a sewer mains-to-tie pipe run then an infiltration test is required for both greenfield and brownfield developments to determine the extent of any infiltration. Refer to Section 8.11 for specific details relating to infiltration testing. Infiltration testing is performed at the conclusion of the works.
Pressure Surge Testing	Pressure surge testing is a requirement when Icon Water has provided approval to the Developer for the property to have an on-site pump (or pumps) which directly pump (aka “boost”) from the Icon Water water network. Pressure surge testing is the responsibility of Icon Water and it will be scheduled in collaboration with the Contractor. Alternatively, Icon Water may provide a notification in writing that it will forego the requirement for pressure surge testing in some instances (at the sole discretion of Icon Water). Pressure surge testing is performed at the conclusion of the works.

9.2 Requirements common to both water and sewer property service connections

9.2.1 Notice period

This section should be read in-conjunction with *STD-SPE-G-019 Asset Creation and Acceptance Process.*

Progressive acceptance testing: A minimum notice period of two working days is required to be provided to Icon Water for all progressive acceptance testing.

Acceptance testing at conclusion of the works: A minimum notice period of five working days is required to be provided to Icon Water for scheduled acceptance testing at the conclusion of the works. For example: pressure surge testing.

Icon Water has the right to witness any, and all testing being performed.

In some instances, Icon Water may choose to not be in attendance and the scheduled acceptance test may proceed without Icon Water being present. In such instances, Icon Water will provide notification in advance.

9.2.2 Pre-work

Pipes shall be cleaned of all construction debris, foreign material and blockages etc. before any test is performed.

Visible damage, leaks and other similar defects/faults shall be remedied using new products and materials as well as permanent construction techniques appropriate for new works prior to re-testing. That is, temporary repairs and/or second-hand products/materials are not acceptable.

The results of all acceptance tests (including pressure gauge calibration/certification from an independent, NATA accredited (or equivalent) calibration/testing provider) shall be provided to Icon Water at the time of handover of the assets.

9.2.3 Pressure instrumentation

Analogue or digital pressure/vacuum gauges are both acceptable instrument types for measuring pressure during hydrostatic testing, low-pressure (pneumatic) testing and vacuum testing. Regardless of whether the gauge used is analogue or digital, a copy of the gauge calibration certificate must be sighted by Icon Water prior to the start of the test and a PDF copy provided at handover. The calibration certificate must have been originally provided by a NATA (or equivalent) independent calibration/testing services provider and must be no older than 12 months.

Table 8.2.3.1 summarises the mandatory requirements for pressure instrumentation.

Table 8.2.3.1 Requirements for Pressure Instrumentation

Attribute	Analogue gauges	Digital gauges
Gauge (Dial) Size:	100 mm dia. or larger	No requirements
Units:(Note)	"kPa" or "bar"	"kPa" or "bar"
Minimum Accuracy:	± 1.0% of full-scale	± 0.5% of selected range
Water Mains-to-Meter Hydrostatic Testing		
Gauge Range:	0 to 1600 kPa or 0 to 2500 kPa	User selectable on the proviso that 0.5% of the range is less than or equal to 20 kPa.
Minimum Graduations:	At least every 25 kPa	Not applicable
Sewer Mains-to-Tie Air Testing		
Gauge Range:	0 to 100 kPa or -100 to 60 kPa	User selectable on the proviso that 0.5% of the range is less than or equal to 0.5 kPa.
Minimum Graduations:	At least every 2.5 kPa	Not applicable
Sewer Mains-to-Tie Vacuum Testing		
Gauge Range:	-100 to 0 kPa or -100 to 60 kPa	User selectable on the proviso that 0.5% of the range is less than or equal to 0.5 kPa.
Minimum Graduations:	At least every 2.5 kPa	Not applicable

Note: It is acceptable to have pressure gauge units stated in "bar" in lieu of "kPa" noting that 1 bar is equivalent to 100 kPa. The above-mentioned "kPa" requirements can be converted to "bar". For example, graduation marks "at least every 25 kPa" can be re-stated as graduation marks "at least every 0.25 bar. Refer to Appendix D for photographs of acceptable analogue pressure/vacuum gauges.

9.2.4 Acceptance test results

The results of all acceptance tests conducted shall be provided to Icon Water at the time of asset handover. Requirements for test results are detailed in Table 8.2.4.1

Table 8.2.4.1 Test Results – Summary of Requirements

Acceptance test	Requirements for results
Hydrostatic or Air/Vacuum Testing	• Test results (in checksheet or ITP format) to be provided in electronic PDF format. • Pressure gauge calibration certificate(s) issued by a NATA (or equivalent) independent testing/calibration service provider to be provided in electronic PDF format. The certificate(s) must have been issued within the previous 12 months from the date of pipe testing.
Compaction Testing	• Test results/report to be provided in electronic PDF format. Such results/report must have been issued by a NATA (or equivalent) independent testing service provider.

Acceptance test	Requirements for results
Ovality Testing	Test results can be part of the CCTV records or alternatively, if a proving tool has been used to confirm ovality then: • Test results (in checksheet or ITP format) to be provided in electronic PDF format. • Ovality proving tool calibration certificate issued by a NATA (or equivalent) independent testing service provider. The certificate must have been issued within the previous 12 months from the date of ovality testing.
CCTV Inspection	• Test results/report and video (electronic) files to be provided in compliance with the requirements of *WSA 05 Conduit Inspection Reporting Code of Australia.* • CCTV operator qualifications to be provided upon request in electronic PDF format.
Measurement of Grade	• Test results can be part of the CCTV records or alternatively, if surveying has been employed then reduced levels (RLs) at relevant points along the pipe run are to be supplied in PDF format by a qualified surveyor. Refer to *STD-SPE-C-004 Survey and Tolerancing Requirements* for surveyor qualification details and survey quality level requirements.
Infiltration Testing	• Test results (in checksheet or ITP format) to be provided in electronic PDF format.
Pressure Surge Testing	• Pressure surge testing is the responsibility of Icon Water and it will be scheduled in collaboration with the Contractor. • Icon Water will provide written notification of whether or not the testing has been successful or unsuccessful.

9.3 Visual inspections

Refer back to Table 8.1.1 for visual inspection requirements.

9.4 Compaction testing

Compaction test results must be in accordance with the values stipulated on the project design drawings and/or Icon Water Design and Construction Standards (as applicable). Icon Water acknowledges that if TCCS standard requirements differ to Icon Water requirements for a specific project, then TCCS requirements in the “trenchfill zone” take precedence over Icon Water requirements, however, Icon Water requirements take precedence in the “pipe embedment zone”.

For brownfield developments, it is Icon Water’s expectation that licensed plumbers and drainers will refer to and comply with Icon Water standard drawings *SD-2106* and *SD-2107* which show minimum depths of cover, trench fill and embedment requirements for both trafficable and non-trafficable areas within certain

application limits. Should the application not comply with the limits of use stipulated on these drawings, a suitably qualified civil engineer (refer to Icon Water specifications *STD-SPE-G-019 Asset Creation and Acceptance Process* and/or *STD-SPE-C-001 Civil and Structural Works* for qualification requirements) is required to provide design drawings for approval by Icon Water which depict project specific embedment, backfill and embedment details.

Pre-approved compaction methods are: vibrating plate compactors (for sand and other granular materials) and vibrating tamping rammers (for cohesive materials such as clay). These compactor types are to be used to compact material in lifts no greater than 150 mm. If these pre-approved compaction methods are not employed, then a compaction trial on a representative pipe and trench length of at least four (4) metres is required to be witnessed by Icon Water to pre-qualify the compaction method.

Specific requirements for compaction testing are provided in Table 8.4.1.

Table 8.4.1 Specific Compaction Testing Requirements

Requirements by zone	
Embedment	Undertake compaction testing in the embedment zone for pipes sized larger than DN300. By default, compaction testing in the embedment zone is not required for pipes sized less than or equal to DN300 unless one or more of the following conditions apply: • The allowable bearing pressure of the native soil is less than 50 kPa. • It has been determined that pipe laying and/or embedment compaction was not conducted in accordance with the relevant Icon Water specifications and Australian standards. • It has been determined that embedment compaction was not conducted using an approved or pre-qualified compaction method. • Icon Water has reason to believe that construction quality has been sub-standard. Compaction testing in the embedment zone shall be conducted at the pipe spring line (± 50 mm) for each 100 lineal metres of pipe run or part thereof.
Trench-fill in trafficable areas	Conduct one test in each 300 mm layer of fill for each 50 lineal metres of pipe or part thereof.
Trench-fill in non-trafficable areas	Conduct one test in each 900 mm layer of fill for each 100 lineal metres of pipe or part thereof.
Requirements common to all zones	
Test locations	Compaction testing shall be undertaken at locations representative of the fill, embedment, trench and embankment.
Re-testing	If one or more of the initial test results do not comply with the compaction requirements stipulated on the project specific drawing or Icon Water standard drawing (as applicable) then two additional tests must be conducted in the zone represented by the initial test. If one or more of the repeat tests do not comply, the full zone must be re-compacted and testing must be repeated until compliance is achieved.

9.5 Ovality testing

Ovality testing may be conducted using either CCTV inspections (with appropriate measurement devices) or proving tools.

If proving tools are used, the requirements for such devices are as follows:

a) Made from either timber, steel, aluminium alloy or plastic.

b) Must be fitted with pull rings at each end.

c) Must have an indelible marking that shows the tool's outside diameter as well as an identification number or character set which is traceable to the tool's calibration certificate.

d) Must have an outside diameter calculated in accordance with the following equation:

$$OD = [0.01d(100 - n) - 2.5] \pm 0.5\ mm$$

Where:

$$OD = proving\ tool\ outside\ diameter\ (mm)$$

$$n = allowable\ percentage\ deflection\ (\%)$$

$$d = internal\ pipe\ diameter\ (mm)$$

e) All dimensional details, materials of construction and geometry details must be submitted to Icon Water for review and approval prior to undertaking ovality testing. Alternatively, an Icon Water representative may inspect and approve (or reject) the proving tool on site just prior to the test being conducted.

Any pipe run that fails ovality testing shall be replaced with a new pipe of the same size and material and joint type etc. and the re-laid section shall be re-tested for ovality.

9.6 CCTV inspections

CCTV inspections must meet the following requirements:

a) The CCTV operator holds a Statement of Attainment in *NWPNET016 Inspect Sewer or Stormwater Line* (or equivalent).

b) All CCTV activities and are undertaken in accordance with WSA 05 Conduit Inspection Reporting Code of Australia. This also includes reporting requirements.

c) Must be of such quality that an accurate assessment of the internal condition of the pipe can be made.

9.7 Air testing

The method for air testing sewer mains-to-tie pipe runs is as follows:

a) Plug all sewer inlets and outlets and cap and seal all inspection openings and risers.

b) Slowly apply an initial test pressure of 27 kPa approximately.

- Note 1: Rapid pressurisation may cause significant air temperature changes that may affect testing accuracy.

- Note 2: Where the pipe run is below the water table, ensure that the differential pressure is at least 27 kPa but no higher than 50 kPa.

c) Close the valve on the air pressure line and shut-off the pump. Allow the air pressure to stabilise for at least 3 minutes to identify any initial leakage.

d) When the pressure has stabilised and is at or above the starting test pressure of 24 kPa, commence the test by allowing the gauge pressure to drop to 24 kPa, at which point initiate the time of recording. Record the pressure drop over the test period.

e) Accept the length of the pipe run under test if the pressure loss is less than or equal to 7.0 kPa for the relevant time interval shown in Table 8.7.1.

f) If the pipe run fails the test, re-apply the test pressure to identify any leaks.

g) Rectify all defects using permanent construction techniques and approved products and materials prior to conducting any further testing.

h) Rectify any visible or audible faults even if the pressure testing is satisfactory.

Safety Note: Ensure that a pressure relief device is fitted on the pressure test equipment with a relief pressure setting no higher than 50 kPa.

Table 8.7.1 Pressure and Vacuum Air Testing Acceptance Times for a 7 kPa Pressure Change

Pipe size	Minimum test duration (minutes)
DN100	2
DN150	3
DN225	4
DN300	6
DN375	7
DN450	10

Note: This table is only applicable for pipe runs ≤ 50 metres in length and is extracted from Table 21.3 of *WSA 02*.

9.8 Vacuum testing

The method for vacuum testing sewer mains-to-tie pipe runs is as follows:

a) Plug all sewer inlets and outlets and cap and seal all inspection openings and risers.

b) Apply an initial test vacuum of -27 kPa approximately.

c) Close the valve on the vacuum line and shut-off the vacuum pump. Allow the vacuum to stabilise for at least 3 minutes to identify any initial leakage.

d) When the vacuum has stabilised and is at or below the starting vacuum of -24 kPa, commence the test by allowing the vacuum to drop to -24 kPa, at which point initiate the time of recording. Record the reduction in vacuum over the test period.

e) Accept the length of the pipe run under test if the vacuum reduction is less than or equal to 7.0 kPa for the relevant time interval shown in Table 8.7.1 (located in Section 8.7 above).

f) If the pipe run fails the test, re-apply the test vacuum to identify any leaks.

g) Rectify all defects using permanent construction techniques and approved products and materials prior to conducting any further testing.

h) Rectify any visible or audible faults even if the pressure testing is satisfactory.

9.9 Hydrostatic testing

The method for hydrostatic testing of water mains-to-meter pipe runs is as follows:

a) On the discharge side of the water meter (i) provide a local high point to allow air to be dispelled from the line prior to the start of testing, and (ii) allow for the connection of a calibrated and certified pressure gauge. Also provide a suitable fitting and ball valve on the discharge side of the water meter if a bucket pump is required to be used to provide the test pressure.

b) Using either the water from the main or an alternate disinfected source of water, slowly fill the line and bleed air from the high point fitting. When air bubbles are no longer visible, the test may commence.

c) For brownfield property service connections (i.e. “tap-ins”): Close the property service stop-cock (isolation valve) at the main.

d) Apply an initial pressure of 1400 kPa (e.g. using a bucket pump) and observe the gauge readings periodically once the pump is no longer operating. Acceptance criteria is as follows:

- For pipe sizes ≤ DN50 and pipe run lengths ≤ 15 metres: If there is no drop in pressure after a minimum of 30 minutes, then the test is satisfactory.
- For pipe sizes ≤ DN50 and pipe run lengths > 15 metres: If there is no drop in pressure after a minimum of 60 minutes, then the test is satisfactory.
- For pipe sizes > DN50 and pipe run lengths ≤ 15 metres: If there is no drop in pressure after a minimum of 30 minutes, then the test is satisfactory.
- For pipe sizes > DN50 and pipe run lengths > 15 metres: If there is no drop in pressure after a minimum of 60 minutes, then the test is satisfactory.

Note: Polyethylene pipe runs may continue to expand significantly throughout the test period which in-turn will cause the pressure to drop. This is due to the creep response and viscoelastic nature of polyethylene. For this reason, polyethylene must be tested separately from all other pipe materials.

9.10 Measurement of grade

Refer back to Table 8.1.1 for requirements relating to the measurement of pipe grades.

9.11 Infiltration testing

The method for infiltration testing of sewer mains-to-tie pipe runs is as follows:

a) Ensuring that the bore of the pipe run is clean, dry and not connected to any operating service, use CCTV or a pipe inspection camera (of commercial quality) to view and record the condition of the pipe run. After a minimum of 24 hours, re-inspect the pipe run and record the condition.

b) If no water ingress has occurred over the 24 hour period, the pipe run is acceptable with regards to infiltration.

Alternatively, in lieu of using CCTV or a pipe inspection camera when connecting to a manhole:

a) Temporarily plug the connection at the manhole. After a period of 24 hours, remove the plug and observe any water in the line. If there is no water, the pipe run is acceptable with regards to infiltration.

9.12 Pressure surge testing

Pressure surge testing is a requirement when Icon Water has approved a design for a direct bosting arrangement for a water property service.

Icon Water personnel will either:

- Conduct the pressure surge test with Icon Water supplying and installing all required measuring devices and equipment etc., or

- Engage the services of a suitably qualified and experienced contractor to perform the surge testing on Icon Water's behalf with the supply and installation of all required measuring devices and equipment etc. being the responsibility of such a contractor.

Pressure surge testing requires collaboration between the Contractor and Icon Water. The Contractor shall be responsible for running all pumping equipment and actuated valves (if installed) so that Icon Water can log the pressure in the supply main at suitable locations when pumps are started/ stopped and valves are opened/ closed. Note: Suitable locations will typically be a fire hydrant close to the property as well as potentially a second fire hydrant some distance away.

Icon Water will retain all test records. Written advice will be provided by Icon Water as to whether the test was successful or not. A successful test is one where the pressure surge magnitude and duration is less than the value stipulated in Icon Water's design approval notification.

***Commentary**: Regardless of whether Icon Water conducts a successful pressure surge test at completion of the works, at a later date if the property owner or their agent makes a material change to the direct boosting system such that the pressure surge level increase to an unacceptable magnitude, Icon Water has rights under the relevant technical code, Service and Installation Rules and customer agreement to compel the property owner to remedy such a situation to the satisfaction of Icon Water.*

10 Appendix A – Examples of unacceptable water meter installations

Fig. 8.1 Failed DN20 Water Meter Installation
(Not centred; PE100 riser downstream)

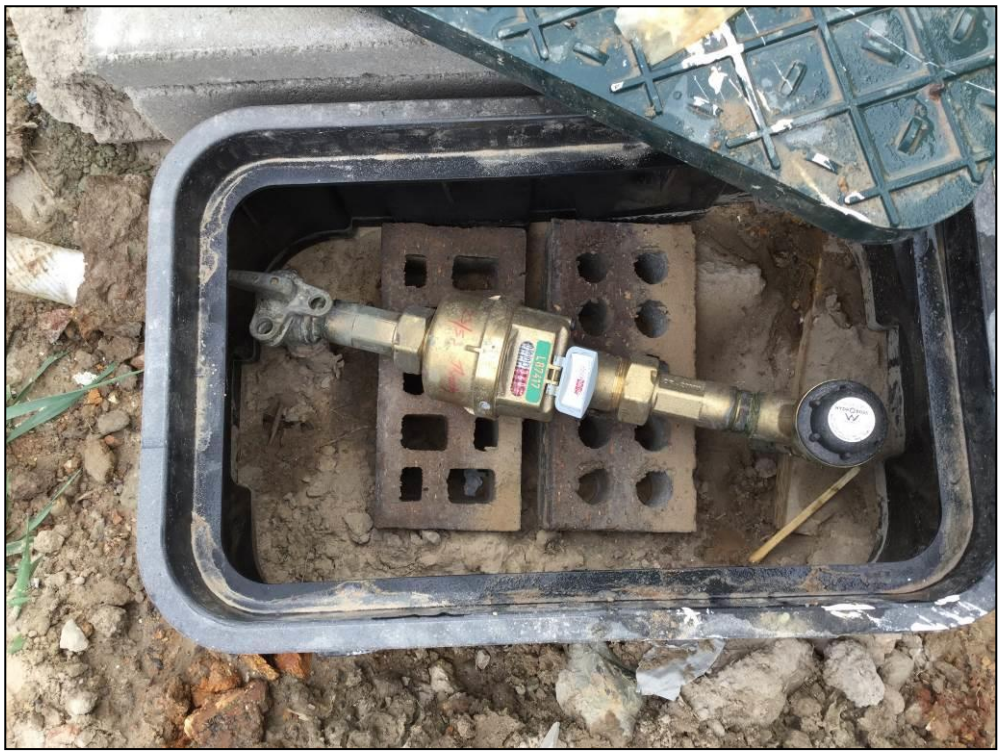


Fig. 8.2 Failed DN20 Water Meter Installation
(Not centred; reduced valve clearance; PRV in box)

Fig. 8.3 Failed DN20 Water Meter Installation
(Water meter and meter box too high)

Fig. 8.4 Failed DN20 Water Meter Installation
(Water meter in driveway and meter too high)

11 Appendix B – Water meter sizing details

Fig. 9.1 Water Meter Sizing Details

WATER METER SIZING SCHEDULE								
METER SIZE (mm)	METER MAKE AND MODEL CURRENTLY SUPPLIED / IN STOCK	METER LENGTH (mm)	INSTALLATION REQUIREMENTS					
			CONNECTION TYPE	NOM. FIRE SERVICE METER SPOOL LENGTH (mm)	DIRT BOX LENGTH (mm) *SENSUS ONLY	BACKFLOW PREVENTION	MAXIMUM CONTINUOUS FLOW (l/s)
20	ELSTER V100	153	THREADED BSP			INTEGRATED DUAL-CHECK VALVE	1.11
25	ELSTER V100	177	THREADED BSP			INTEGRATED SINGLE-CHECK VALVE	1.75
32	ELSTER V100	189	FLANGE 2 BOLT			INTEGRATED SINGLE-CHECK VALVE	2.78
40	ELSTER V100	231	FLANGE 2 BOLT			INTEGRATED SINGLE-CHECK VALVE	4.44
50	ELSTER V300	300	FLANGE 2 BOLT				6.94
50	SENSUS MEISTREAM PLUS	300 (ISO) 311 (AS)	FLANGE 4 BOLT FIGURE B5	1020 (AS)	200 / 311		9.72
80	SENSUS MEISTREAM PLUS	350 (ISO) 413 (AS)	FLANGE 4 BOLT FIGURE B5	1465 (AS)	200 / 225* / 413		17.50
100	SENSUS MEISTREAM PLUS	350 (ISO) 483 (AS)	FLANGE 4 BOLT FIGURE B5	1765 (AS)	250 / 483		27.78
150	SENSUS MEISTREAM PLUS	300 (ISO) 500 (AS)	FLANGE 4 BOLT FIGURE B5	2200 (AS)	300 / 500		69.44

12 Appendix C – Listing of relevant SD Series drawings

The following table lists the most relevant Icon Water standard (*SD Series*) drawings for use by licensed plumbers and drainers involved in property service connection works. This listing is informative only and may not be current if additional drawings have been released prior to this specification being updated. For the full set of up-to-date Icon Water standard drawings, always refer to the Icon Water website.

Drawing No.	Abridged Drawing Title
SD-1102	Design Symbols for Plans and Tie Books
SD-1103	Line types and Notation For Plans and Tie Books
SD-1104	Hydraulic Connections Drawing, Drawing Example and Requirements
SD-1307	Metering Sign
SD-2005	Property Connection Details, Sewer Ties, Sheet 1 of 2
SD-2006	Property Connection Details, Sewer Ties, Sheet 2 of 2
SD-2106	Minimum Pipe Cover and Clearances, Standard Conditions and Applications
SD-2107	Water Mains-to-Meter and Sewer Tie Applications, Trench Embedment and Backfill Details
SD-2201	Cast In Situ Maintenance Hole, 1050 dia. with Branches, Arrangement and Details
SD-2204	Precast and Cast In-Situ Maintenance Holes, 1050, 1200 and 1500 dia. Covers and Surrounds, Arrangement and Fixing Details
SD-2208	Precast and Cast In-Situ Maintenance Holes, Standard Offsets and Benching, Details
SD-2209	Sewer Maintenance Shafts (SMS) and Rodding Points, Typical Arrangements
SD-2210	Precast and Cast In-Situ Maintenance Holes, Pipe Connection, Details
SD-3010	Typical New Mains Construction, Polyethylene Mains
SD-3011	Typical Mains Renewals – Pipe bursting, Polyethylene Mains
SD-3012	Typical New Mains Construction, Ductile Iron Mains
SD-3013	Typical New Mains Construction, PVC Mains
SD-3202	Inground Sluice Valve and Hydrant Installations, Typical Details
SD-3306	Water Service Connections, DN20 to DN40 Meters, Below Ground Installations, Arrangement and Connection Details
SD-3307	Water Service Connections, DN20 to DN40 Meters, Above Ground Installations, Arrangement and Connection Details
SD-3308	Water Service Connections, Water Meters DN50 and Larger, Below Ground Installations, Arrangement and Connection Details
SD-3310	Water Service Connections, Single Fire Service with Metered Service, Below Ground Installation, Arrangement and Connection Details
SD-3312	Water Service Connections, Dual Fire Service with Metered Service, Below Ground Installation, Arrangement and Connection Details

Drawing No.	Abridged Drawing Title
SD-3313	Water Service Connections, Dual Fire Service with Metered Service, Above Ground Installation, Arrangement and Details
SD-3314	Water Service Connections, Example Below Ground Installation, Single Fire Service with Metered Service
SD-5001	Thrust Blocks and Anchors, Gate Valve Thrust Restraint, Typical Details
SD-5002	Thrust Blocks and Anchors (DN100 – DN750), Details, Sheet 1 of 2
SD-5003	Thrust Blocks and Anchors (DN100 – DN750), Details, Sheet 2 of 2
SD-5010	Flanged Joints, Corrosion Protection and Bolting Details
SD-5306	Pipe Supports, Hot Dip Galvanised, Light Duty Type, Details
SD-5500	RPZD Station, General Arrangement and Notes
SD-8108	Access Ladders (Fixed Vertical) and Staggered Step-Irons for Maintenance Holes, Details
SD-8263	Access Covers – Hot Dip Galvanised Steel, Hinged, Hinge Stay, Details
SD-8273	Access Covers – Hot Dip Galvanised Steel, Fixed Frame (Fold Flat) Cover, Typical Arrangements
SD-8274	Access Covers – Hot Dip Galvanised Steel, Fixed Frame (Fold Flat) Cover, Frame Details
SD-8276	Access Covers – Hot Dip Galvanised Steel, Fixed Frame (Fold Flat) Cover, Hinged Hatch – Plate, Details
SD-8281	Access Covers – Hot Dip Galvanised Steel, Drop In and Fixed Frame, Standard Parts, Details
SD-9100	Steelwork, Notes
SD-9103	Aluminium Work, Notes
SD-9300	Concrete Work, Notes
SD-9302	Civil Works, Soil Classification, Guidelines
SD-9410	Pipework, Notes

13 Appendix D – Acceptable analogue pressure gauge examples

Fig. 12.1 An example of an acceptable analogue pressure gauge for hydrostatic testing of water mains-to-meter pipe runs at 1400 kPa (14 bar)

Fig. 12.2 An example of an acceptable analogue vacuum gauge for vacuum testing of sewer mains-to-tie pipe runs at -24 kPa (-0.24 bar)

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