

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





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Reservoirs (RES)	No	Recycled Water Systems (REC)	No

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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	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.
Infill Development	Also known as “brownfield” development as per the definition above.
Greenfield	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.

Refer to the Icon Water document titled *STD-SPE-G-019 Asset Approval and Creation Process* for definitions of all other key terms.

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* by this document.

This document shall be read in-conjunction with 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. It does not detail requirements for WAE records or acceptance testing of mains other than providing the titles of the appropriate 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	<i>SD Series</i>	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
Evoenergy		
17	None allocated	Evoenergy 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, 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 to 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 also varied between engineering service providers, and 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 Icon Water limit of responsibility on the consumer premises (e.g. sewer tie point or downstream side of 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*.

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 is not permitted. Basements shall be required to be serviced by sillage pumps to prevent the risk of 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 or 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.

Sewers shall have minimum depths of cover in accordance with *WSA 02* as amended by Icon Water in *STD-SPE-G-011*. These depths are reproduced in Table 6.2.1. The sewer service tie point shall have a minimum depth of cover in accordance with Table 6.2.2.

Table 6.2.1 Minimum Cover Over Sewers

Location	Minimum cover to soffit of sewer (mm)
Public and private leased land not subject to vehicular loading	600 – new developments 450 – existing developments
Private leased land zoned residential subject to vehicular loading	750
Footways, nature strips, industrial and commercial leases, sealed road pavements other than major roads subject to vehicular loading	900
Unsealed road carriageways	1200
Major road carriageways	1200
Future road, rail and light rail pavements	1200

Table 6.2.2 Minimum Cover Over Sewer Service Tie Point

Location	Minimum cover to soffit of sewer service tie point (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 also 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 cap 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 trenchfill 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

It is the responsibility of the Developer to ensure that property service connections (aka “mains-to-meter” 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/NZS 3500 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 water meter assembly has been installed by a licensed plumber and inspected/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 in a pipe of a larger diameter).

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

- a) One connection to a single residence or single unit non-residential development.
- b) Two connections to a residential dual occupancy or two unit residential body corporate, with the water meters co-located.
- 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 non-residential development where one or more of the units does not have an accessible public street frontage.

Each 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 water meter for common property water usage.

Note: As an option, one water meter for each unit in a multi-unit development (both residential and non-residential) may be provided upon written approval from Icon Water.

Developments that are required to install multi-unit metering will have a condition placed on the planning approval.

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 fourteen (14) days of receiving such meter(s). For DN20 water meters, Icon Water shall also issue the meter box at the same time if the water meter installation is to correspond to a DN20 below ground installation.

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.

Water services (i.e. mains-to-meter pipe runs) and water meters shall be located in free ground unencumbered by any surface obstructions such as but not limited to: paved (e.g. concrete, asphalt, stencilcrete) driveways, pad-mount transformers, communication boxes and mini-pillars. Paved footpaths (by TCCS) are the exception to this requirement. A minimum of 1.0 metre clearance to obstructions is required all-round.

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 sleeve through such a retaining wall or footing. The sleeve pipe shall be sized 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 exception to this requirement is for multi-storey car parks where all fire hose reels must be served from a metered supply and backflow prevention in accordance with AS 3500 shall 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 upon the hydraulic requirements of the site, Icon Water will either approve the use of a single fire service with a separate domestic service with one connection at the Icon Water mains; or a dual fire service with a single, separate domestic service with two connections at the Icon Water mains.

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 shall be either:
 - Type B hard drawn (or annealed for DN20 and D25) copper pipe to AS 1432 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 AS 3688 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 copper riser at the meter box.
- c) PE pipe shall only be connected to copper riser pipes and brass isolation valves using adapter couplings which 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.
 - Termination at the meter box: The tracer wire shall terminate by attaching it to the underside of the meter isolation valve using a copper or brass clamp.
 - 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 type, quarter turn, copper alloy with on/off indication on the lever, female threaded inlet and male threaded outlet.
 - Meter isolation valve(s) for DN32 and DN40 meters: Ball type, quarter turn, copper alloy with on/off indication on the lever, female threaded inlet and male threaded outlet.

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 details) shall be in accordance with 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 (i.e. PVC-M, PVC-O and PE) 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 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 unless approved in writing by Icon Water for a specific project.
- i) A stop valve either side of the connection (tee) to the main is required for property service connections sized DN100 and larger by default. Icon Water will advise (on a project-by-project basis) if stop valves are required for smaller property service connections. Note: Refer to standard drawings *SD-3308*, *SD-3310* and *SD-3312* for details.
- 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	Requirements
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. <u>Mixed metals interaction within pits and enclosures:</u> 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 <i>SD Series</i> 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	Requirements
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.
Usage limits:	<p>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) the elbow directly beneath the first riser in the above-ground enclosure.</p> <p>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.</p> <p>If electrofusion or butt-welding is required to join PE pipe and fittings, the following requirements are mandatory:</p> <ul style="list-style-type: none"> • 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). <p><u>Note:</u> The Plastics Industry Pipe Association provides technical guidelines for electrofusion welding – POP001 and butt welding – POP003.</p>

Attribute	Requirements
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:	<p><u>Buried Flanges:</u> Bolts and nuts shall be 316 stainless steel with a stainless steel washer under both the nut and the bolt head.</p> <p><u>Flanges within pits and enclosures:</u> 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.</p> <p><u>Mixed metals interaction within pits and enclosures:</u> 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 <i>SD Series</i> of drawings when such interactions cannot be prevented by any other approved means.</p>
Usage limits:	<p>DICL may be used for both direct buried applications as well as within meter pits and meter enclosures.</p> <p>Corrosion protection requirements for direct buried DICL are as follows:</p> <ul style="list-style-type: none"> • Polyethylene sleeving (coloured blue) in accordance with AS 3680 shall be installed on all ductile iron pipes sized DN225 and above where indicated in <i>STD-SPE-G-006 Approved Products List</i> 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, 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	<p>The water meter shall be installed below-ground in the meter box issued by Icon Water noting the minimum clearances that are required for maintenance purposes as shown in the <i>SD Series</i> drawings. If this is not practical (e.g. multi-unit developments or 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.</p> <p>When the Icon Water issued meter box is used, additional items not shown on the Icon Water <i>SD Series</i> 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 has to damage pipework downstream of the Icon Water limit of responsibility to perform repairs, renewals or maintenance then the installation will not be approved.</p> <p>All installations shall comply with the Icon Water <i>SD Series</i> of drawings.</p>
DN32 and DN40	<p>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. multi-unit developments or 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.</p> <p>Additional items not shown on the Icon Water <i>SD Series</i> 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.</p> <p>All installations shall comply with the Icon Water <i>SD Series</i> of drawings.</p>

Water Meter Size	Selection Criteria – Box, Pit or Enclosure
DN50 and larger	<p>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.</p> <p>Additional items not shown on the Icon Water <i>SD Series</i> 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 has to damage pipework downstream of the Icon Water limit of responsibility to perform repairs, renewals or maintenance then the installation will not be approved.</p>

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) 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 “DN50 and larger” meters shall also be used when a metered water supply (regardless of water meter size) in conjunction with a separate fire service is required. Similarly, the mandatory requirements shown in Section 7.8.2 shall be complied with in such instances.

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 brick-work 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 and the meter pit covers shall be designed for the appropriate vehicle loads.
- f) A DN100 PVC-U DWV drain pipe shall be cast in to the meter pit so that the drain 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.
- d) Approved pit cover materials and components:
 - Carbon steel or aluminium chequerplate (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 over the cover panel cut-out located directly over each water meter. The cut-out in the cover panel shall be located so that it's centre is directly over the middle of the water meter display located below.

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*. These depths are reproduced in Table 7.9.1. The mains-to-meter pipe run shall have a minimum depth of cover in accordance with Table 7.9.2.

Table 7.9.1 Minimum Cover Over Water Mains

Location	Minimum cover to soffit of water mains (mm)
Public and private leased land not subject to vehicular loading	450
Private leased land zoned residential subject to vehicular loading	450
Embankments	750
Footways, nature strips, industrial and commercial leases, sealed road pavements other than major roads subject to vehicular loading	600
Unsealed road carriageways	750
Major road carriageways	750
Future road, rail and light rail pavements	1200

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

Location	Minimum cover to soffit of mains to meter pipe run (mm)
Residential blocks	450 for pipes \leq DN63 600 for pipes $>$ DN63
Industrial and commercial blocks	600
Road reserves	750

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*.

7.10 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. 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.

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 Acceptance testing

8.1 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	<p>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.</p> <p>Icon Water will always perform visual inspections prior to asset handover in the following instances:</p> <ul style="list-style-type: none"> 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, <p>otherwise, random inspections will be conducted or the Contractor will be notified in advance for instances not meeting (a) or (b) above.</p> <p>Icon Water visually inspects all water meter installations of sizes less than DN50 after installation. Non-conformance notices (directing rectification) are sent when defects exist.</p> <p>Visual inspections form part of progressive acceptance testing as well as final testing.</p>

Acceptance test	When to be performed
Compaction testing	<p>Compaction testing (if required) is to be performed by the Contractor with the results provided to Icon Water at the time of asset handover.</p> <p><u>Greenfield Developments:</u> Compaction testing is required for all greenfield developments as part of the overall mains and branch construction program.</p> <p><u>Brownfield Developments:</u> 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.</p> <p>Refer to Section 8.4 for detailed compaction testing requirements.</p> <p>Compaction testing forms part of the progressive acceptance testing program.</p>
Ovality testing	<p>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.</p> <p>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.</p> <p>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.</p> <p>Refer to Section 8.5 for detailed ovality testing requirements when employing a proving tool.</p> <p>Ovality testing forms part of the progressive acceptance testing program.</p>
CCTV inspection	<p>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.</p> <p>Refer to Section 8.6 for detailed CCTV inspection requirements.</p> <p>Where such inspections are required, they must meet the following requirements:</p> <ul style="list-style-type: none"> a) The CCTV operator holds a Statement of Attainment in <i>NWPNET016 Inspect Sewer or Stormwater Line</i> (or equivalent).

Acceptance test	When to be performed
	<p>b) All CCTV activities and are undertaken in accordance with WSA 05 Conduit Inspection Reporting Code of Australia. This also includes reporting requirements.</p> <p>c) Must be of such quality that an accurate assessment of the internal condition of the pipe can be made.</p> <p>CCTV inspections can either form part of the progressive acceptance testing program or be performed at the conclusion of the works.</p>
<p>Sewer Mains-to-Tie Air Testing or Vacuum Testing</p>	<p><u>Greenfield Developments:</u> 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.</p> <p><u>Brownfield Developments:</u> 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.</p> <p>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.</p> <p>Refer to Section 8.7 and Section 8.8 for specific details relating to air testing and vacuum testing respectively.</p> <p>Air or vacuum testing can either form part of the progressive acceptance testing program or be performed at the conclusion of the works.</p>
<p>Hydrostatic Testing of Water Mains-to-Meter Pipe Runs</p>	<p><u>Greenfield Developments:</u> Hydrostatic testing of water mains-to-meter pipe runs is required by default for all greenfield developments regardless of pipe size and length.</p> <p><u>Brownfield Developments:</u> 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.</p> <p>Refer to Section 8.9 for specific details relating to hydrostatic testing.</p> <p>Hydrostatic testing can either form part of the progressive acceptance testing program or be performed at the conclusion of the works.</p>

Acceptance test	When to be performed
<p>Measurement of Grade for Sewer Mains-to-Tie Pipe Runs</p>	<p><u>Greenfield Developments:</u> Sewer mains-to-tie pipe runs are required to be surveyed in accordance with Icon Water specification <i>STD-SPE-C-004 Survey and Tolerancing Requirements</i>. 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.</p> <p><u>Brownfield Developments:</u> 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.</p> <p>Sewer grades can be measured by direct survey (prior to embedment and backfilling) or CCTV scanner (in conjunction with appropriate measurement instrumentation).</p> <p>Ovality testing typically forms part of the progressive acceptance testing program.</p>
<p>Infiltration Testing of Sewer Mains-to-Tie Pipe Runs</p>	<p>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.</p> <p>Refer to Section 8.11 for specific details relating to infiltration testing.</p> <p>Infiltration testing is performed at the conclusion of the works.</p>
<p>Pressure Surge Testing</p>	<p>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.</p> <p>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).</p> <p>Pressure surge testing is performed at the conclusion of the works.</p>

8.2 Requirements common to both water and sewer property service connections

8.2.1 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.

8.2.2 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.

8.2.3 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.

8.2.4 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	<ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • 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	<p>Test results can be part of the CCTV records or alternatively, if a proving tool has been used to confirm ovality then:</p> <ul style="list-style-type: none"> • 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	<ul style="list-style-type: none"> • Test results/report and video (electronic) files to be provided in compliance with the requirements of <i>WSA 05 Conduit Inspection Reporting Code of Australia</i>. • CCTV operator qualifications to be provided upon request in electronic PDF format.
Measurement of Grade	<ul style="list-style-type: none"> • 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 <i>STD-SPE-C-004 Survey and Tolerancing Requirements</i> for surveyor qualification details and survey quality level requirements.
Infiltration Testing	<ul style="list-style-type: none"> • Test results (in checksheet or ITP format) to be provided in electronic PDF format.
Pressure Surge Testing	<ul style="list-style-type: none"> • 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.

8.3 Visual inspections

Refer back to Table 8.1.1 for visual inspection requirements.

8.4 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	<p>Undertake compaction testing in the embedment zone for pipes sized larger than DN300.</p> <p>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:</p> <ul style="list-style-type: none"> • 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. <p>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.</p>
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.

8.5 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:

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

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.

8.6 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.

8.7 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 \leq 50 metres in length and is extracted from Table 21.3 of WSA 02.

8.8 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.

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

8.10 Measurement of grade

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

8.11 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.

8.12 Pressure surge testing

Pressure surge testing is a requirement when Icon Water has approved a design for a direct boosting 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.*

9 Appendix A – Examples of unacceptable water meter installations



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

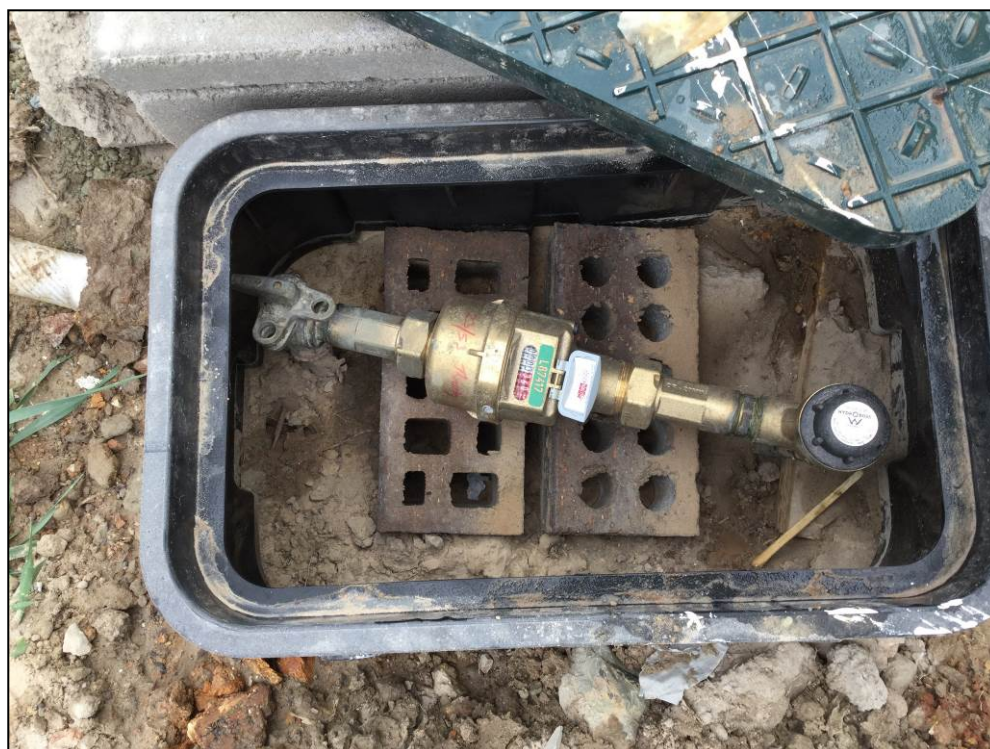


Fig. 8.2 Failed DN20 Water Meter Installation
(Not centred; reduced valve clearance; PRV in box)



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

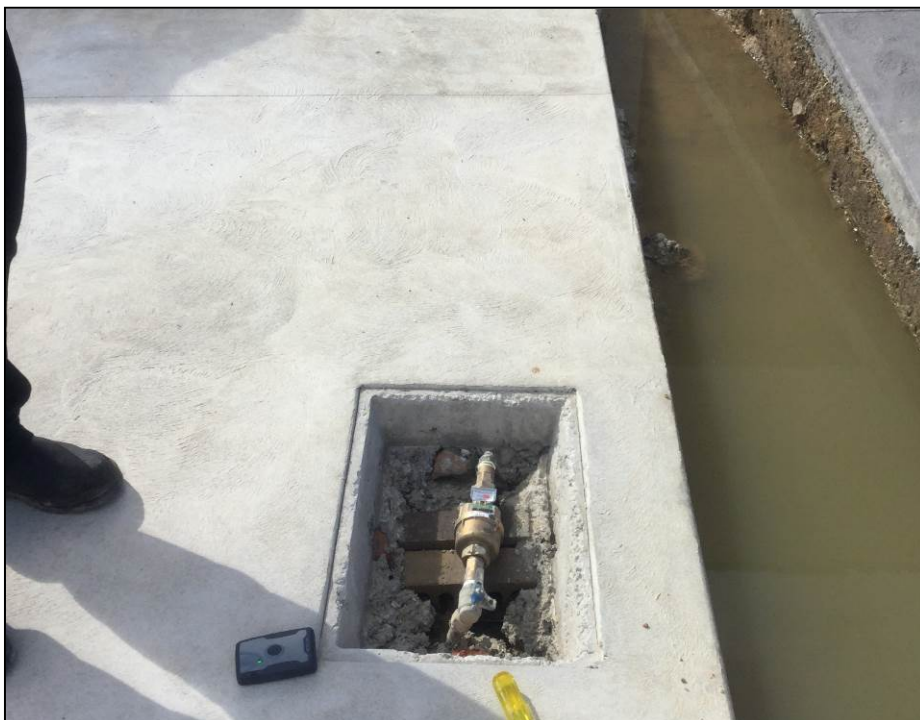


Fig. 8.4 Failed DN20 Water Meter Installation
(Water meter in driveway and meter too high)

10 Appendix B – 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 BUILT			INTEGRATED SINGLE-CHECK VALVE	2.78
40	ELSTER V100	231	FLANGE 2 BUILT			INTEGRATED SINGLE-CHECK VALVE	4.44
50	ELSTER V300	300	FLANGE 2 BUILT				6.94
50	SENSUS MEISTREAM PLUS	300 (ISO) 311 (AS)	FLANGE 4 BUILT FIGURE B5	1020 (AS)	200 / 311		9.72
80	SENSUS MEISTREAM PLUS	350 (ISO) 413 (AS)	FLANGE 4 BUILT FIGURE B5	1465 (AS)	200 / 225* / 413		17.50
100	SENSUS MEISTREAM PLUS	350 (ISO) 483 (AS)	FLANGE 4 BUILT FIGURE B5	1765 (AS)	250 / 483		27.78
150	SENSUS MEISTREAM PLUS	300 (ISO) 500 (AS)	FLANGE 4 BUILT FIGURE B5	2200 (AS)	300 / 500		69.44

Fig. 9.1 Water Meter Sizing Details

11 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	Linetypes 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 – Pipebursting, 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
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

Drawing No.	Abridged Drawing Title
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

12 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)

13 Appendix E – Update history

Amendments in this issue (3) are provided in the table below.


Section	Update
Doc. Mngt	<ul style="list-style-type: none"> Issue 2 updated to Issue 3
Abbreviations	<ul style="list-style-type: none"> Added the following abbreviations: <i>CCTV</i>, <i>ITP</i>, <i>NATA</i> and <i>TCCS</i>.
Definitions	<ul style="list-style-type: none"> New section. Added definitions for <i>Brownfield</i>, <i>Infill</i> and <i>Greenfield</i>.
2	<ul style="list-style-type: none"> Minor wording amendment.
5.7	<ul style="list-style-type: none"> Section title update. Clarification provided to let the reader know that a new section (Section 8) now provides detailed acceptance testing requirements.
6.2	<ul style="list-style-type: none"> Sewer depths up to 2500 mm may be approved by Icon Water in certain applications.
6.6	<ul style="list-style-type: none"> Reference to new Appendix C. Sewer depths up to 2500 mm may be approved by Icon Water in certain applications.
7.1	<ul style="list-style-type: none"> Reference to new Appendix C. Water hammer specifically detailed.
7.7	<ul style="list-style-type: none"> Stop valves either side of the branch on the main are now required for connections sized DN100 and larger. All pipes stored outside at the job site overnight are to be capped. DICL pipe sleeving requirements updated in-line with the Approved Products List.
7.8.2	<ul style="list-style-type: none"> Meter pits constricted of standard brick-work are no longer acceptable.
7.9	<ul style="list-style-type: none"> The minimum cover values in Table 7.9.1 have been corrected to match the values shown on the SD Series of drawings. Note: This was an error in the previous issue. Example SD series drawings quoted for bedding and backfill (SD-2106 and SD-2107).
7.10	<ul style="list-style-type: none"> New section titled "Direct boosting from the Icon Water network". Icon Water may now approve direct boosting under certain circumstances.
8	<ul style="list-style-type: none"> New section titled "Acceptance testing".
Appendix C	<ul style="list-style-type: none"> New section which provides a listing of relevant SD Series drawings which are applicable to water mains-to-meter and sewer mains-to-tie applications.
Appendix D	<ul style="list-style-type: none"> New section titled "Acceptable analogue pressure gauge examples" which shows photographs of acceptable analogue pressure gauges for hydrostatic testing of water mains-to-meter pipe runs and vacuum testing of sewer mains-to-tie pipe runs.
Appendix E	<ul style="list-style-type: none"> New section titled "Update history" which provides a tabulation of updates between issues of this specification.

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