STD-SPE-G-011
SUPPLEMENT TO WSA 02-2014-3.2
GRAVITY SEWERAGE CODE OF AUSTRALIA

icon WATER

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Document management

Document authorisation table

Issue	Date	Author	Reviewer	Approver
1	08/02/18	K. Danenbergsons	N/A	N/A
2	02/07/18	K. Danenbergsons	Various	D. Eager
3	30/08/19	K. Danenbergsons	Various	C. Patrick
4	21/03/22	Updated by Rajesh Bhandari and Sonia Bursle	Sol Asadollahi	Nicole Vonarx

Version control table

Issue	Date	Reason for issue
1	08/02/18	Initial issue for public and internal consultation
2	02/07/18	Issued for use
3	30/08/19	Amended as shown in Appendix B and re-issued for use.
4	21/03/22	Amended as shown in Appendix B and re-issued for use.

Document applicability table

Asset area	Applicable (Yes/No)	Asset area	Applicable (Yes/No)
Dams (DAM)	No	Water Network (WAT)	No
Bulk Water Supply (BWS)	No	Sewerage Network (SEW)	**Yes**
Water Treatment Plants (WTP)	No	Sewage Pump Stations (SPS)	No
Water Pump Stations (WPS)	No	Sewage Treatment Plants (STP)	No
Reservoirs (RES)	No	Recycled Water Systems (REC)	No

Table of Contents

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 specific requirements.

This document is Icon Water’s supplement to the 2014 version (3.2) of *WSA 02 Gravity Sewerage Code of Australia*. WSA 02 is available from the WSAA online shop. Refer to https://www.wsaa.asn.au/shop for further details relating to purchasing this code.

This document shall be read in-conjunction with WSA 02 and all details described within this document are mandatory requirements and shall not be amended without the written consent of Icon Water.

2 Scope

WSA 02 has been designed to be read in-conjunction with each urban water agency’s specific requirements for asset creation, asset acceptance, work as executed records and approved products etc. This document (and WSA 02) is applicable to the asset areas shown in the document applicability table (located prior to the table of contents).

This document modifies and takes precedence over the requirements detailed in WSA 02. However, designers and constructors must familiarise themselves with the requirements of WSA 02 and shall not rely solely on this document for design and construction requirements.

Specific details relating to customer property service connections (aka “sewer ties”) are not included in this document and instead are detailed in Icon Water specification *STD-SPE-M-006 Property Service Connections and Water Meters* as well as in Icon Water’s *SD series* of standard drawings. This has been done so that licensed plumbers do not need to purchase and familiarise themselves with WSA-02 and WSA-03 if their scope of work is solely limited to installing water meters and associated consumer premises plumbing from the tie point.

3 Purpose

The purpose of this document is to modify some specific requirements of WSA 02:

- In situations where Icon Water believes that the same, or an improved outcome can be achieved through alternative means.
- In situations where the historical practices used in the ACT are still acceptable but in conflict with the requirements of WSA 02 and it is not practical to change these practices.
- When local conditions such as climate, terrain, topography and available materials etc. dictate alternative methods and means are to be employed.
- When ACT legislation or ACT government agencies have alternative requirements.

4 Referenced documents

The documents listed in Table 4.1 are either referenced by this specification, or are required to be read in-conjunction with this specification. It should be noted that Icon Water specification *STD-SPE-G-019 Asset Creation Approval Process* provides overarching requirements for developers, designers and constructors and how they should interact with Icon Water in the planning, approvals, construction, testing, acceptance and handover phases of a new water and sewerage network asset's lifecycle.

Table 4.1 Referenced Documents

Item	Document number	Title
Australian standards		
1	AS 1657	Fixed platforms, walkways, stairways and ladders – Design, construction and installation
2	AS 2200	Design charts for water supply and sewerage
3	AS/NZS 2566	Buried flexible pipelines (all parts)
4	AS/NZS 3500	"Plumbing code of Australia"
5	AS 3680	Polyethylene sleeving for ductile iron piping
6	AS 3681	Application of polyethylene sleeving for ductile iron piping
WSAA codes and publications		
7	WSA 02-2014.3.2	Gravity Sewerage Code of Australia
8	WSA 201	Manual for the selection and application of protective coatings
9	None allocated	WSA Product Specifications
Icon Water standards		
10	SD Series	Standard Drawings
11	STD-SPE-G-005	Supplement to WSA 201 Manual for the selection and application of protective coatings
12	STD-SPE-G-008	Technical specification - Design requirements for safe access, egress and working at heights
13	STD-SPE-G-009	Supplement to AS 1657 Fixed Platforms, Walkways, Stairways and Ladders – Design, Construction and Installation
14	STD-SPE-G-018	Drafting Standards
15	STD-SPE-G-019	Asset Creation and Approval Process
16	STD-SPE-C-004	Survey and Tolerancing Requirements
17	STD-SPE-M-006	Property Service Connections and Water Meters
Transport Canberra and City Services standards		
18	MIS 06	Municipal Infrastructure Standards, Part 6, Verges

5 Amendments and additions to WSA 02(Version 3.2)

This section provides amendments and additions to WSA 02. These amendments and additions shall be treated by designers, suppliers, specifiers and constructors etc. as being mandatory requirements which either supersede or supplement (as applicable) the requirements of WSA 02.

5.1 Amendments and additions to WSA 02 Introduction and Part 0

Table 5.1.1 details amendments and additions to WSA 02 Introduction and Part 0: Glossary of Terms and Abbreviations.

Table 5.1.1 Amendments and additions to WSA 02 Introduction and Part 0: Glossary of Terms and Abbreviations

WSA 02 Introduction and Part 0 Page Ref.	Amendment and/or addition
Page 7	**Scope of Code** Delete para. 3 and replace with the following wording: Whilst the Gravity Sewerage Code of Australia covers the planning, design and construction of trunk, branch, reticulation and property connection sewers up to and including DN1200, Icon Water only applies the Gravity Sewerage Code of Australia to sewers up to and including DN600. The concepts may be applied to larger sewers should Icon Water's other standards and specifications be "silent" with respect to a particular application.
Page 9	After the section titled "**Water Industry Standards**", add the following section and wording… **Icon Water Standards and Specifications** The latest versions of the following Icon Water standards and specifications are to be complied with in every sewerage network project: • "SD Series" drawings • *STD-SPE-G-005 Supplement to WSA 201, Manual for the Selection and Application of Protective Coatings* • *STD-SPE-G-006 Approved Products List* • *STD-SPE-G-008 Design Guidelines for Safe Access, Egress and Working at Heights* • *STD-SPE-G-009 Supplement to AS 1657-2013 Fixed Platforms, Walkways, Stairways and Ladders – Design, Construction and Installation* • *STD-SPE-G-018 Drafting Standards* • *STD-SPE-G-019 Asset Creation and Approval Process* • *STD-SPE-C-004 Survey and Tolerancing Requirements* • *STD-SPE-M-006 Property Service Connections and Water Meters*

WSA 02 Introduction and Part 0 Page Ref.	Amendment and/or addition
	The above mentioned listing of standards and specifications is not exhaustive and is subject to change. A full, up-to-date listing and all relevant standards and specifications can be accessed and downloaded from Icon Water's website at www.iconwater.com.au
Pp 36-50	**GLOSSARY OF TERMS** Add the following wording to the definition for "**access chamber**"… An access chamber can also be known as a buried maintenance structure, or specifically as a valve chamber or scour chamber etc. within Icon Water's referenced standards and specifications. Add a new term "**ACT**" with the following definition: The Australian Capital Territory. Delete the definition of "**allotment**" and "**lot**" and insert the words… Where the term "allotment" or "lot" has been provided within WSA 02, insert the words "block of land". Add a new term "**block of land**" with the following definition: An area of land on the final plan of a subdivision for which a separate Land Act Lease will be issued on completion of the subdivision. Delete the definition of "**Concept Plan**" and insert the words… A package of information provided to the designer by Icon Water to enable the appropriate planning/design of major water system components to be performed. This information package has traditionally been referred to as a "Water Supply and Sewerage Strategy Plan" in some Icon Water documentation. Modify the existing definition of "**connection point**" as follows: Point of connection between the property connection sewer and the customer sanitary drain. Also called "property connection point" or "sewer tie". Delete the definition of "**Designer**" and replace with the following definition: A person or organisation engaged by either Icon Water, the Developer or a Constructor to design the works on their behalf. Delete the definition of "**Developer**" and replace with the following definition: Any person or company who undertakes works, either within or outside leased land, which will require modifications or additions to Icon Water's hydraulic networks.

WSA 02 Introduction and Part 0 Page Ref.	Amendment and/or addition
	Add a new term "**Master Plan**" with the following definition: Plan showing the layout and sizes of sewers serving a proposed land package. The plan shows land use, road and block layout, proposed sewers and maintenance holes and catchment boundaries etc. Add a new term "**NATA**" with the following definition: National Association of Testing Authorities. Add a new term "**Net Sewered Area**" with the following definition: The area of development, excluding arterial roads, major floodways and parklands, for which a sewerage network must cater for. Add a new term "**Peak Wet Weather Flow**" with the following definition: This is the term that was traditionally used by Icon Water which has now been replaced by the term "design flow" in the majority of instances. Refer to "design flow" for a specific definition. Add a new term "**sewer tie**" with the following definition: Also known as "connection point". Refer to "connection point" for a specific definition. Add a new term "**TCCS**" with the following definition: Transport Canberra and City Services. Add a new term "**Work As Executed (WAE)**" with the following definition: Has the same meaning as "Work as Constructed" and is traditionally the term used in Icon Water documentation. Refer to "Work as Constructed" for a specific definition.

WSA 02 Introduction and Part 0 Page Ref.	Amendment and/or addition
Page 50	**II ABBREVIATIONS** Add the following abbreviations: **ACT** The Australian Capital Territory **NSA** Net sewered area **PCC** Daily, per capita sewage contribution **$Portion_{wet}$** The percentage of the sewerage network below nominal groundwater level **RP** Rodding point **SMS** Sewer maintenance shaft **TCCS** Transport Canberra and City Services **TEP** Total equivalent population **TPF** Total pumped flow **WAE** Work as executed

5.2 Amendments and additions to WSA 02 Part 1

Table 5.2.1 details amendments and additions to WSA 02 Part 1: Planning and Design.

Table 5.2.1 Amendments and additions to WSA 02 Part 1: Planning and Design

WSA 02 Part 1 Page Ref.	Amendment and/or addition
Page 59	**1.1 SCOPE** Add a new paragraph directly after the section title as follows: The details provided in this section shall be taken to be general water agency requirements and shall be read in-conjunction with Icon Water specification *STD-SPE-G-019 Asset Approval Creation Process*. The specific requirements of *STD-SPE-G-019* shall take precedence over the generic requirements detailed in this section should any conflict or ambiguity exist.
Page 64	***1.2.7.3 Design outputs*** Add a new paragraph at the end of this section … Design Drawings shall comply with Icon Water's drafting standards as detailed in specification *STD-SPE-G-018*.
Page 65	**1.3.1 Design Life** Reword the second paragraph as follows… Minimum asset design lives for sewer items are shown in Table 1.2. Modify Table 1.2 by changing the title to "MINIMUM ASSET DESIGN LIFE" and the words "Expected design life, years" to "Minimum required asset design life, years".
Page 69	**2 SYSTEM PLANNING** Insert the following words directly after the section title as follows: The details provided in this section shall be taken to be general water agency requirements and shall be read in-conjunction with Icon Water specification *STD-SPE-G-019 Asset Approval Creation Process*. The specific requirements of *STD-SPE-G-019* shall take precedence over the generic requirements detailed in this section should any conflict or ambiguity exist.
Page 71	**2.3.3 Catchment analysis** Modify point (a) after the first paragraph as follows: (a) Hydraulic loading of the proposed development (design flows), including likely future development and potential inflows and infiltration (Refer to Section 3 as modified by Icon Water). Note: Icon Water does not use the method detailed in Appendix B for determining an estimation of Equivalent Population (EP).

WSA 02 Part 1 Page Ref.	Amendment and/or addition
Page 73	**2.4.2 Estimating future catchment loads** Delete all existing content in this section and replace with the following text: Average daily loading shall be calculated as the product of the estimated EP draining to the point of design interest, and a residential loading rate of 180 L/EP/d. Refer to Section 3 (as modified by Icon Water) for flow estimation requirements specific to Icon Water for future catchment loads.
Page 73	**2.4.3 Estimating existing system loads** Add a note at the end of this section as follows: Note: The residential population for each district and division of the ACT, present and future, can be obtained from the ACT Government's Environment, Planning and Sustainable Development Directorate.
Pp. 78	**3. FLOW ESTIMATION** Delete all existing content in Sections 3.1 through 3.3.5 inclusive and replace with the following content: **IW.3.1 GENERAL** Icon Water uses a flow estimation method based partly on the existing content of WSA 02 (including Appendix C) as well as an updated method based on Icon Water's previous design standards. To avoid any confusion associated with deletions, amendments and cross referencing, all content in existing WSA 02 Sections 3.1 through 3.3.5 inclusive (as well as Appendix C) has been deleted (i.e. should not be used by planners and Designers). The similarities and differences between Icon Water's method of flow estimation and that of the unmodified version of WSA 02 are as follows: • Calculation of EP: Icon Water uses the data detailed in Table IW.1 instead of the WSA 02 method. • Calculation of ADWF: Icon Water uses the relationships provided in Section IW.3.4.2 instead of the WSA 02 method. • Calculation of PDWF: Icon Water continues to use the method provided in Section IW.3.4.2 instead of the WSA 02 method. • Calculation of Design Flow: Icon Water has adopted the method of WSA 02. Refer to Section IW.3.4.1 for details. **IW.3.2 EQUIVALENT POPULATION** Design EP's can be obtained from Table IW.1. Design EP's for classification types not included in Table IW.1 shall be referred to Icon Water during the initial planning phase of a development.

WSA 02 Part 1 Page Ref.	Amendment and/or addition

Table IW.1 Design Equivalent Populations

Classification	Unit	EP per Unit	Comments
Residential(Note 1)			
Low density	per dwelling	3.5	< 25 dwellings per hectare NSA
Medium density		2.5	25 ≤ dwellings per hectare NSA ≤ 80
High density		2.0	> 80 dwellings per hectare NSA
Commercial			
Shops and offices	per employee	0.3	
	Gross lettable floor space (10,000m^2)	300	Default value when information on employee numbers is not available or not available with sufficient accuracy.
Public visitor buildings or sport spectator facilities	per visitor	0.05	
Restaurants and clubs	per seat	0.1	
Tourist or hospital accommodation	per bed	0.5	
Industrial			
Dry trades	as per commercial shops and offices		
Wet trades	case-by-case		On a case by case basis as determined by Icon Water.
Institutional			
Schools and educational facilities	per student or staff member	0.2	

Notes:

1. Residential EP calculations using area and development densities can also be used as determined by Icon Water on a case-by-case basis if total dwelling number are unknown.

IW.3.3 TOTAL EQUIVALENT POPULATION

For single landuse catchments, the TEP is determined from the EP per unit values provided in Table IW.1 using the following relationship:

$$TEP = EP/unit \times units \qquad \textit{Eqn. 3.3.1}$$

WSA 02 Part 1 Page Ref.	Amendment and/or addition

For mixed landuse catchments, the peak flows from different areas are non-synchronous (e.g. the peak morning flow from residential areas precedes the peak flow from commercial areas). Therefore, the critical design flow may coincide with the peak flow originating from any of the various land use types depending upon the relative magnitudes of the contributing EP values. The TEP shall be taken to be the higher of the TEP values calculated in Equations 3.3.2A and 3.3.2B as follows:

$$TEP = Residential\ TEP + 0.67(Non\ Residential\ TEP)$$ *Eqn. 3.3.2A*

$$TEP = 0.36(Residential\ TEP) + Non\ Residential\ TEP$$ *Eqn. 3.3.2B*

IW.3.4 FLOW PARAMETERS

IW.3.4.1 General

The flow in a sewer comprises domestic sewage, industrial wastes, groundwater infiltration and storm inflows and rainfall independent infiltration.

Flow (in L/s) is composed of three components where the overall design flow is represented by the equation:

$$Design\ flow = PDWF + GWI + RDI$$ *Eqn. 3.4.1.1*

IW.3.4.2 Peak dry weather flow

The relationships to be used in estimating the PDWF are as follows:

$$PCC = 180\ L/EP/day$$ *Eqn. 3.4.2.1*

$$ADWF = \{(\sum Residential\ EP) + (\sum Non\ Residential\ EP)\} \times \frac{PCC}{86400}$$ *Eqn. 3.4.2.2*

$$PDWF = 5.83 \times \frac{ADWF}{TEP^{0.1}}$$ *Eqn. 3.4.2.3*

The ADWF and PDWF values calculated using the above-mentioned relationships do not include any contribution for pumped flows. Localised effects due to pumped flows should be analysed during the planning and design phases of the development using the following relationships:

$$Localised\ ADWF = ADWF + \frac{1}{3}TPF$$ *Eqn. 3.4.2.4*

$$Localised\ PDWF = PDWF + \frac{2}{3}TPF$$ *Eqn. 3.4.2.5*

WSA 02 Part 1 Page Ref.	Amendment and/or addition

IW.3.4.3 Groundwater infiltration

Groundwater infiltration (GWI) is caused when the long-term non-rainfall dependent groundwater table or seawater level exceeds pipe inverts and enters the sewer network through pipe wall permeation and defects such as cracks, porosity, corroded and/or eroded areas, ineffective and/or tree root penetrated joints at pipes, fittings and maintenance structures and their displacement.

The allowance for GWI assumes that good quality materials and workmanship have been used for sewer system construction and that ongoing condition assessment, inspection and maintenance is performed. The relationship to be used in estimating GWI is:

$$GWI = 0.01875 \times NSA \times Portion_{wet} \qquad \textit{Eqn. 3.4.3.1}$$

Where Icon Water uses a default value for $Portion_{wet}$ equal to 0.75.

IW.3.4.4 Rainfall dependent infiltration

Rainfall Dependent Infiltration (RDI) is the peak (rainfall dependent) inflow and infiltration that may enter the sewer network as inflow via localised flooding of yard gully traps, illegal stormwater connections and as rainfall infiltration through pipe and maintenance structure defects. RDI is affected by factors such as soil type, the conditions of pipes, fittings, joints (including customer sanitary drains), maintenance structures, surface covers and community awareness and attitudes regarding the impact of sanitary drains and illegal stormwater connections. Control of RDI requires Icon Water to deploy programmed monitoring, condition assessment, inspection, testing and maintenance of the sewer network and to cultivate community awareness to improve the level of compliance of customer sanitary drains.

RDI is calculated in L/s as follows:

$$RDI = 0.028 \times A_{Eff} \times C \times I \qquad \textit{Eqn. 3.4.4.1}$$

Where:

A_{Eff} is the effective area capable of contributing rainfall dependent infiltration.

Calculation of A_{Eff} depends on the type of development (i.e. residential or industrial), the area and the density (i.e. *EP* per hectare of development).

For residential developments: A_{Eff} is a function of the development density as follows:

$$A_{Eff} = NSA \times (Density/150)^{0.5} \quad \text{for } \textit{Density} \leq 150 \textit{ EP} / \text{ha.} \qquad \textit{Eqn. 3.4.4.5(a)}$$

$$A_{Eff} = NSA \quad \text{for } \textit{Density} > 150 \textit{ EP} / \text{ha.} \qquad \textit{Eqn. 3.4.4.5(b)}$$

Density = the development's EP density per NSA in hectares

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For commercial and industrial developments: A_{Eff} is a function of the expected portion of the catchment to be covered with impervious structures, such as building roofs, sealed roads and car parks (all of which will discharge rain runoff to stormwater drains).

$$A_{Eff} = NSA \times \left(1 - 0.75 Portion_{Impervious}\right) \qquad \textit{Eqn. 3.4.4.5(c)}$$

Portion$_{Impervious}$: Is the portion of the *NSA* likely to be covered by impervious structures that drain directly to the stormwater system (e.g. if a development has 20% coverage by such structures then *Portion*$_{Impervious}$ = 0.2).

When key data is unknown for commercial and industrial developments: Icon Water will set A_{Eff} to a default value given by:

$$A_{Eff} = NSA \times 0.75 \qquad \textit{Eqn. 3.4.4.5(d)}$$

C = IIF leakage severity coefficient = 1.2 for Icon Water sewer mains

This is similar to the stormwater "run-off coefficient". It defines the contribution of rainfall run-off to sewer flows via IIF. *C* comprises the sum of the contributions from a "soil movement" aspect (e.g. highest contribution for expansive clays and a "defects aspect" including the effectiveness of Icon Water's long-term strategy for maintenance and managing the impact of sanitary sewers).

The default value of *C* shall be set to 1.2 which is based on Icon Water setting a value of Soil Aspect equal to 0.6 and a value of Network Defects equal to 0.6.

I is a function of rainfall intensity at the development's geographic location, the catchment area size and required sewer system containment standard. These influencing factors are related by:

$$I = I_{1,2} \times Factor_{Size} \times Factor_{Containment} \qquad \textit{Eqn. 3.4.4.2}$$

Where:

$I_{1,2}$ is the one hour duration rainfall intensity at the location, for an average recurrence interval of two years.

Rainfall intensities for particular locations may be determined from the Bureau of Meteorology at www.bom.gov.au using their online calculation tool. This online calculation tool requires coordinates for particular locations. Geoscience Australia can provide coordinates based on place names if exact coordinates are not already known. Go to www.ga.gov.au for details.

Note: As at 27/02/18, a Canberra location with the coordinates of 35.2809° S, 149.1300° E has a value of $I_{1,2}$ determined using the Bureau of Meteorology's online calculation tool of 21.4. The following figures have been taken from the Bureau of Meteorology's online tool for reference using these coordinates.

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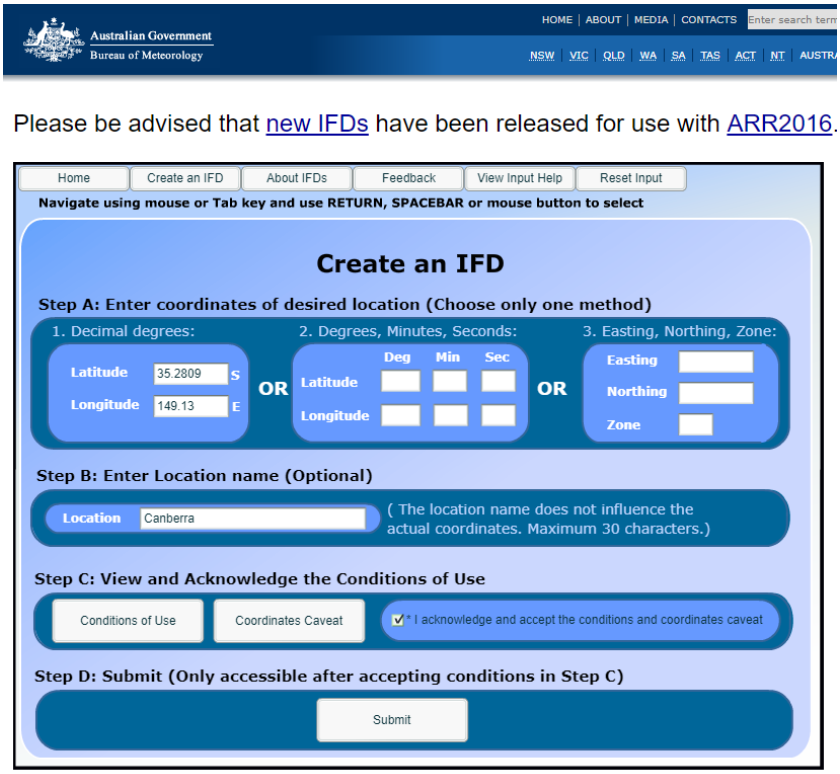

Fig. IW.3.4.4.1 Bureau of Meteorology Rainfall Intensity Online Tool – Input Page

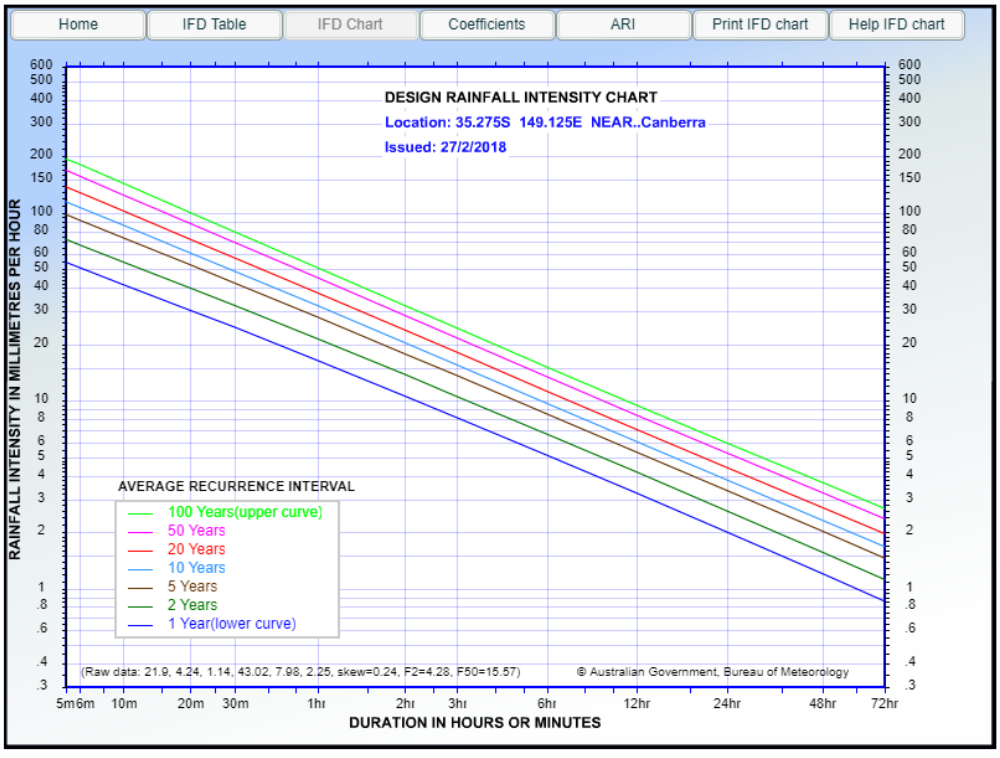

Fig. IW.3.4.4.2 Bureau of Meteorology Rainfall Intensity Online Tool – Output Chart

Home | IFD Table | IFD Chart | Coefficients | ARI | Print IFD table | Help IFD table

Intensity-Frequency-Duration Table

Location: 35.275S 149.125E NEAR.. Canberra Issued: 27/2/2018

Rainfall intensity in mm/h for various durations and Average Recurrence Interval

Duration	Average Recurrence Interval						
	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
5Mins	54.7	72.4	98.2	115	138	169	194
6Mins	51.1	67.5	91.5	107	128	157	181
10Mins	41.7	54.9	73.9	86.2	103	125	144
20Mins	30.3	39.8	52.8	61.2	72.3	87.8	100
30Mins	24.6	32.1	42.3	48.9	57.6	69.6	79.2
1Hr	16.4	21.4	27.9	32.1	37.6	45.2	51.2
2Hrs	10.6	13.8	17.8	20.4	23.8	28.5	32.2
3Hrs	8.12	10.5	13.6	15.5	18.1	21.6	24.4
6Hrs	5.12	6.63	8.50	9.67	11.2	13.4	15.1
12Hrs	3.22	4.17	5.33	6.06	7.04	8.37	9.44
24Hrs	2.00	2.59	3.33	3.79	4.41	5.26	5.94
48Hrs	1.20	1.56	2.02	2.31	2.70	3.24	3.67
72Hrs	.860	1.12	1.46	1.68	1.97	2.36	2.68

(Raw data: 21.9, 4.24, 1.14, 43.02, 7.98, 2.25, skew=0.24, F2=4.28, F50=15.57)

Copy Table

Fig. IW.3.4.4.3 Bureau of Meteorology Rainfall Intensity Online Tool – Output Table

Factor$_{Size}$ accounts for the fact that II flow concentration times are faster for smaller catchments. It is calculated as follows:

$$Factor_{Size} = (40/NSA)^{0.12} \qquad \textit{Eqn. 3.4.4.3}$$

Factor$_{Containment}$ reflects local environmental aspects and regulations on wet weather sewage containment (overflow frequency). The level of containment required in the ACT is based on an ARI of 10 years and Icon Water has determined its value to be 1.5 using Appendix C of WSA 02:

$$Factor_{Containment} = 1.5 \qquad \textit{Eqn. 3.4.4.4}$$

IW.3.4.5 Design flow and peak wet weather flow

The Peak Wet Weather Flow shall be taken to be the Design Flow and it shall be determined in accordance with Section IW.3.4.1 using Eqn. 3.4.1.1.

WSA 02 Part 1 Page Ref.	Amendment and/or addition
Page 80	**4. PRODUCTS AND MATERIALS** **4.1 GENERAL** Add a new paragraph directly under the section title as follows: Icon Water requires all products and materials to be in accordance with the Icon Water Approved Products List. Products and materials not specifically listed in the Icon Water Approved Products List shall not be used unless prior written authorisation has been obtained from Icon Water. It should be noted that Icon Water is under no obligation to approve alternative products and will only consider such alternatives if there is a compelling reason to do so. Developers, Designers and Constructors should not rely on Icon Water approving alternative products and materials in a timeframe that suits their project schedule. Designers shall not use the words “or equivalent” on drawings and other project specific documentation as Designers are required to specifically name the chosen product or material in specific detail so that it can be easily procured by the Constructor and easily checked for compliance by Icon Water. Otherwise, if this cannot be done for some compelling reason, the words “or approved equivalent” shall be used.

<table>
<tr><th>WSA 02 Part 1 Page Ref.</th><th>Amendment and/or addition</th></tr>
<tr><td>Page 80</td><td>

4.2 IDENTIFICATION OF SEWER SYSTEMS

Delete Table 4.1 COLOUR IDENTIFICATION OF COMPONENTS IN RETICULATION SEWER SYSTEMS and all notes and replace with Table IW.2 and new notes as follows:

Table IW.2 Sewer System Component Colour Identification

<table>
<tr><th colspan="2">COMPONENT</th><th>GRAVITY SEWERS</th><th>PRESSURISED SEWERS(Note 1)</th></tr>
<tr><td colspan="4">RETICULATION SEWERS ≤ DN300</td></tr>
<tr><td rowspan="6">Pipe</td><td>DICL
SCL</td><td colspan="2">Pipe: Black exterior finish coat

Sleeving: Cream coloured polyethylene sleeving (if sleeving is deemed to be required)</td></tr>
<tr><td>PE</td><td>Black with white or cream stripes</td><td>Black with cream stripes or co-extruded cream outer sheath or solid cream</td></tr>
<tr><td>PP</td><td>Grey or black exterior

Inner colour of white or cream</td><td>PP is not approved</td></tr>
<tr><td>PVC</td><td>Grey</td><td>Cream</td></tr>
<tr><td>VC</td><td>Natural brown</td><td>VC is not approved</td></tr>
<tr><td>GRP</td><td>Beige</td><td>Beige</td></tr>
<tr><td colspan="2">Fittings</td><td>No specific requirement</td><td>No specific requirement</td></tr>
<tr><td colspan="2">Valve spindle cap and handle</td><td>Not applicable</td><td>No specific requirement</td></tr>
<tr><td colspan="2">Valve body</td><td>Not applicable</td><td>No specific requirement</td></tr>
<tr><td colspan="2">Scours (outlets)</td><td>Not applicable</td><td>No specific requirement</td></tr>
<tr><td colspan="2">Marking tapes</td><td>Cream</td><td>Cream</td></tr>
<tr><td colspan="2">Surface fittings and surrounds</td><td>No specific requirement</td><td>No specific requirement</td></tr>
<tr><td colspan="2">Marker posts and plates</td><td>Cream</td><td>Cream</td></tr>
<tr><td colspan="4">PROPERTY CONNECTION SEWERS(Note 2)</td></tr>
<tr><td rowspan="3">Pipe</td><td>PE</td><td>Plain black</td><td>Black with cream stripes or co-extruded cream outer sheath or solid cream</td></tr>
<tr><td>PP</td><td>Grey or black</td><td>PP is not approved</td></tr>
<tr><td>PVC</td><td>Grey</td><td>Cream</td></tr>
<tr><td colspan="2">Fittings</td><td>No specific requirement</td><td>No specific requirement</td></tr>
<tr><td colspan="2">Valve spindle cap and handle</td><td>No specific requirement</td><td>No specific requirement</td></tr>
<tr><td colspan="2">Valve body</td><td>No specific requirement</td><td>No specific requirement</td></tr>
<tr><td colspan="2">Surface boxes</td><td>Not applicable</td><td>No specific requirement</td></tr>
<tr><td colspan="2">Surface boxes (lids)</td><td>Not applicable</td><td>No specific requirement</td></tr>
</table>

Notes:

1. Pressurised sewers include pressure and vacuum sewers and pressure (rising) mains.
2. Property connection sewers include pressure laterals and property discharge lines.

</td></tr>
<tr><td>Page 84</td><td>

4.5 DUCTILE IRON GRAVITY SEWERS
4.5.2 Sizes and configurations

Add a second paragraph as follows:

Icon Water does not accept DN200 and DN250 sized pipes for installation within the gravity sewer network.

</td></tr>
</table>

WSA 02 Part 1 Page Ref.	Amendment and/or addition
Page 84	**4.5 DUCTILE IRON GRAVITY SEWERS** **4.5.3 Cement mortar lining** Add a second note under Table 4.2 as follows: Icon Water requires cement mortar linings to be of either (i) high alumina cement, or (ii) calcium aluminate cement. Refer to the Icon Water Approved Products List for details.
Page 85	**4.5 DUCTILE IRON GRAVITY SEWERS** **4.5.4 Sleeving** Delete the first paragraph and replace with the following text: Polyethylene sleeving (coloured as per the Icon Water amended requirements of Table 4.1) in accordance with AS 3680 shall be installed on all ductile iron pipes sized DN225 and above regardless of the external coating type unless the Icon Water Approved Products List specifically states otherwise. For example, Zn/Al externally coated DICL pressure pipes may not require sleeving under certain circumstances. Should any ambiguity exist between WSA 02, this supplement or the Icon Water Approved Products List, the Icon Water Approved Products List shall take precedence.
Page 87	**4.6 PVC GRAVITY SEWERS** **4.6.2 Sizes and configurations** Add a second paragraph as follows: Icon Water does not accept DN200 and DN250 sized pipes for installation within the gravity sewer network. Furthermore, Icon Water prohibits the bending of PVC .
Page 87	**4.7 POLYETHYLENE GRAVITY SEWERS** Insert the following text directly under the section title: Icon Water does not permit polyethylene to be used for new mains construction unless a curved mains alignment is required or trenchless techniques are the only viable method of installation and an additional written approval is sought from the relevant Icon Water Principal Engineer. Polyethylene may be used for network renewals projects where specified in the project documentation. Refer to the Icon Water Approved Products List for specific guidance. Should any ambiguity exist between WSA 02, this supplement or the Icon Water Approved Products List, the Icon Water Approved Products List shall take precedence.

WSA 02 Part 1 Page Ref.	Amendment and/or addition
Page 89	**4.8 POLYPROPYLENE GRAVITY SEWERS** **4.8.2 Sizes and configurations** Add a second paragraph as follows: Icon Water does not accept DN200 and DN250 sized pipes for installation within the gravity sewer network.
Page 89	**4.10 PLASTIC-LINED CONCRETE GRAVITY SEWERS** Insert the following text directly under the section title: Icon Water does not permit plastic-lined concrete gravity pipes without a project specific approval by the relevant Icon Water Principal Engineer. Should such an approval be granted, Icon Water will provide specific project requirements in addition to the requirements provided in WSA 02.
Page 90	**4.11 VITRIFIED CLAY SEWERS** **4.11.2 Sizes and configurations** Add a second paragraph as follows: Icon Water does not accept DN200 and DN250 sized pipes for installation within the gravity sewer network.
Page 90	**4.12 STEEL GRAVITY SEWERS** Insert the following text directly under the section title: Icon Water does not permit gravity sewer pipes of steel construction without a project specific approval by the relevant Icon Water Principal Engineer. Should such an approval be granted, Icon Water will provide specific project requirements in addition to the requirements provided in WSA 02.
Page 92	**4.13 MAINTENANCE STRUCTURES** **4.13.2 Classification and application** Insert the following text directly under the section title: Icon Water only utilises maintenance holes (suitable for person entry) as well as maintenance shafts (non-person entry) and rodding points (non-person entry). Maintenance chambers are not approved.
Page 93	**4.13 MAINTENANCE STRUCTURES** **4.13.3 Sizes and configurations** Insert a second paragraph as follows: Refer to the Icon Water Approved Products List, *STD-SPE-G-005* (i.e. Icon Water's supplement to WSA 201) and the SD series of standard drawings for: allowable cover types, corrosion protection and coating requirements, as well as approved configurations.

WSA 02 Part 1 Page Ref.	Amendment and/or addition
Page 94	**4.14 MARKING TAPES** **4.14.2 Application** Delete the existing paragraph and replace with the following text: Marker tape shall be installed for all sewer pipes installed by direct burial methods at 150 mm above the pipe crown. Detectable tape shall be used for non-metallic pipes and non-detectable tape shall be used for metallic pipe. Tape shall be coloured "cream" for all sewerage applications and shall have the following wording clearly marked: "CAUTION BURIED SEWER BELOW" Refer to WSA PS-318 and WSA PS-319 for additional requirements and to the Icon Water Approved Products List for approved products and suppliers. Tracer wire shall be installed for all sewer pipes installed by trenchless techniques. Tracer wire shall be of the type and brand detailed in Icon Water's Approved Products List and shall be installed in accordance with the manufacturer's instructions.
Page 94	**4.15 ACCESS COVERS AND FRAMES** **4.15.3 Cast iron access covers and frames** Insert an additional paragraph at the end of this section as follows: Icon Water specifies the use of AS 3996 Class B and Class D covers only. Refer to the Icon Water Approved Products List for further details.
Page 97	**5 DETAIL DESIGN** Insert the following words directly after the section title as follows: The details provided in this section shall be taken to be general water agency requirements and shall be read in-conjunction with Icon Water specification *STD-SPE-G-019 Asset Approval Creation Process*. The specific requirements of *STD-SPE-G-019* shall take precedence over the generic requirements detailed in this section should any conflict or ambiguity exist.
Page 98	**5 DETAIL DESIGN** **5.2.2 Design Accuracy** Modify the final paragraph as follows: Levels shall be referenced to the Australian Height Datum (AHD). Location in plan shall be referenced to the ACT Standard Grid for all assets located within the borders of the ACT. Refer to Icon Water specification *STD-SPE-C-004 Survey and Tolerancing Requirements* for further details.

WSA 02 Part 1 Page Ref.	Amendment and/or addition
Page 99	**5.2.4 Location of sewers** **5.2.4.1 General** Add the following text directly below the existing section title: This section shall be read in-conjunction with Icon Water's *Service and Installation Rules* and *STD-SPE-G-019 Asset Creation and Approval Process*. If any ambiguity exists, the requirements detailed in Icon Water's *Service and Installation Rules* shall take precedence. Modify the existing second paragraph as follows: Sewers sized DN300 and larger shall be located in public property provided there is sufficient access for operations and maintenance. A pre-design meeting between the Designer and Icon Water will ensure the location criteria for each case is satisfactorily identified and understood.
Page 101	**5.2.5 Trenchless techniques for pipe installation** Add a new paragraph directly under the section title as follows: The proposed use of trenchless techniques requires Designers to provide specific details on their design drawings which indicate the trenchless technique proposed and how the installation method will proceed. The use of trenchless techniques is subject to the written approval of the relevant Icon Water Principal Engineer. The Designer should request a meeting with Icon Water as early as possible in the design phase so that project specific requirements can be provided.
Page 102	**5.2.6 Near-horizontal boreholes and tunnels** Add a new paragraph directly under the section title as follows: The proposed use of near-horizontal boreholes and tunnels requires Designers to provide specific details on their design drawings which indicate how the installation method will proceed. The use of this installation technique is subject to the written approval of the relevant Icon Water Principal Engineer. The Designer should request a meeting with Icon Water as early as possible in the design phase so that project specific requirements can be provided.

WSA 02 Part 1 Page Ref.	Amendment and/or addition
Page 106	**5.2.8 Easements** Add the following new sub-section and text after the last paragraph of this section: **IW5.2.8.1 Icon Water requirements for sewer easements** An easement is not the preferred location for a sewer main and Designers are required to avoid the use of easements if at all possible. However, there are situations when it is necessary to create an easement to ensure that the sewer is protected and can be maintained (should they be located anywhere other than in the road reserve). Designers should be aware of the restrictions which easements place on a lease. Layouts and alignments shall be arranged to minimise the need for such reserves. Easements shall be sized by the Designer to include the zone of influence of the trench for the sewer and shall have sufficient width to minimise the risk of consequential damage in the event of a mains failure as well as providing sufficient width for access of construction and maintenance machinery. Locations requiring easements for mains are: private properties, public reserves, government reserves, other government owned land, private roads or accessways in both conventional and community title subdivisions, rights of way and carriageways. The Designer shall advise Icon Water via appropriate design submissions of land take requirements for the sewerage systems. The easement shall provide rights of occupation and ensure suitable conditions for operation (including drainage) and access by Icon Water. Construction of works in the vicinity of Icon Water easements shall be brought to the attention of Icon Water for consideration and if necessary, for determining site specific requirements. Earth cover over sewerage pipes within easements shall not be reduced without the prior written approval of Icon Water. For specific mandatory requirements regarding easements for Icon Water sewerage assets, refer to Icon Water's *Service and Installation Rules*.
Page 107	**5.2.9 Disused sewers** Delete all existing content and replace with the following text: Decommissioned Icon Water assets to be removed from the site where practicable. Where a design results in the disuse of an existing sewer, the Design Drawings and Specification shall detail proposed treatment such as demolition of top 1 m of an MH top and/or capping both ends of the sewer at each MH or complete removal of the sewer and structures. The works undertaken on disused sewers and MHs shall be recorded as part of the Work As Constructed details .

WSA 02 Part 1 Page Ref.	Amendment and/or addition
Page 107	**5.3 HORIZONTAL ALIGNMENT OF SEWERS** **5.3.2 Roads, reserves and open space** Add the following new sub-section and text after the last paragraph of this section: **IW5.3.2.1 Icon Water requirements for sewers in roads, reserves and open space** **Sewers should be located outside of leased land** • The design of a sewer system should take into account the fact that there is a significant increase in the risk of tree root related blockages after a period of twenty years and that there is inconvenience caused to a resident or business owner if Icon Water has to enter a residential, commercial or industrial premises for maintenance purposes. Therefore, minimising the use of sewer alignments and reserves in leased land is a requirement for the Designer of sewer systems. • Where there is public land at the rear or the side of a leased block, the sewer should be located within the public land rather than within the leased block. **Principal carrier sewers should be diverted around leased land** • Blockages in the sewer system have the potential to result in sewage overflows into leased properties. To minimise problems caused by blockages, wherever practicable, sewers, particularly main carriers, should be located in public areas rather than within leases. **Future development, playing fields and maintenance holes** • When a sewer is to be located across an open area, it shall be located so that the open area is maximised for future development and its impact is minimised on possible future use of such an area. • When sewers are located under playing fields, they shall be located such that maintenance holes are not located within the playing area. • To lessen the risk of overflows into residential premises (in the case of a sewer blockage) the Designer shall (i) locate maintenance holes so that the number of connections into small, near maximum loaded sewers is minimised, and (ii) locate connection ties at the low side of blocks. **Roadways** • Sewers should be located on the high side of road reserves so that a relatively short connection from adjacent properties is achieved. Refer to TCCS standards for further details relating to standard sewer locations in road verges.

WSA 02 Part 1 Page Ref.	Amendment and/or addition
	Alignments reserved for other utilities • Where there is a significant advantage in placing a sewer on an alignment reserved for another buried utility, it may be so placed provided that the relevant authority agrees in writing to release the reservation. A copy of the agreement shall be submitted to Icon Water as part of Design Submission 1. Refer to STD-SPE-G-019 Asset Approval and Creation Process for submission details.
Page 109	**5.3 HORIZONTAL ALIGNMENT OF SEWERS** **5.3.5 Maintenance structures and vent shafts** Delete the existing paragraph and replace with the following text: The selection of a suitable location for maintenance structures and vent shafts may influence the horizontal alignment of sewers. Clearances for operational purposes shall be taken into account by the Designer when locating maintenance structures. The Designer shall use the clearances and requirements depicted on the Icon Water *SD series* of standard drawings when determining maintenance access clearance requirements and shall note that such access requirements also include an allowance for worker rescue in the event of an emergency.
Page 109	**5.3.6 Changes in direction using an MH** Delete the paragraph immediately above Table 5.2 as well as Table 5.2 and all notes below Table 5.2 and replace with the following text: The maximum allowable deflection of a sewer through an MH shall be in accordance with the details shown on the Icon Water SD Series of standard drawings.
Page 110	**5.3.7 Changes in direction using an MS or MC** Delete the existing paragraph and replace with the following text: Icon Water does not allow the use of MCs in the sewerage network. For allowable changes in direction of sewers using an MS, refer to the Icon Water SD Series of standard drawings.
Page 113	**5.4 OBSTRUCTIONS AND CLEARANCES** **5.4.4 Clearance from structures** Add a paragraph after the last paragraph as follows: Refer to Icon Water's *Service and Installation Rules* for specific details relating to the required clearances from structures.
Page 115	**5.4.6 Marker posts** Add a final paragraph as follows: Refer to the Icon Water SD Series of drawings for specific requirements relating to marker posts.

WSA 02 Part 1 Page Ref.	Amendment and/or addition
Page 112	**5.4 OBSTRUCTIONS AND CLEARANCES** After Section 5.4.6 Marker posts, add the following new section: **IW. 5.4.7 Trees** Trees and large shrubs should be planted so that the mature canopy does not encroach into or over the pipe protection envelope of a sewer network. In a new subdivision, where above is not feasible due to allocated width of verge module; for sewer pipes sized smaller than DN375, the minimum centreline-to-centreline clearance from trees shall be 1.8 metres. For sewer pipes sized DN375 and larger, contact Icon Water for specific clearance requirements as these will depend upon a number of factors including tree species, available footprint and pipe joint type etc.
Pp. 115-121	**5.5 PIPE SIZING AND GRADING** Delete all existing content in Sections 5.5.1 through 5.5.9.2 inclusive (excluding Clause 5.5.4) and replace with the following text: **IW.5.5.1 General** The sizing principles used by Icon Water are based on a probability of surcharge not exceeding a 1 in 10 years ARI. Icon Water does not use the methods detailed in WSA 02. Note: Surcharge occurs when the flow depth exceeds the pipe obvert. **IW.5.5.2 Pipe Sizing** The capacity of a sewer pipe shall be equal to, or shall exceed the Design Flow where the Design Flow has been determined in accordance with Section IW.3.4. Pipe capacities shall be determined using either the Manning or Colebrook-White equations, with the roughness factors determined from Table IW.3. Where an actual internal diameter is used in calculations, it shall be taken as the average internal diameter for the representative pipe length including joints. Surcharging of sewers at flows up to the Design Flow is not allowed unless written approval is obtained from the relevant Icon Water Principal Engineer.

WSA 02 Part 1 Page Ref.	Amendment and/or addition

Table IW.3 Pipe Specific Roughness Values

Gravity Sewer Details	Pipe Specific Roughness	
	Manning Equation "n"	Colebrook-White Equation *"k"*
Sizes < DN600 VC, DICL and SCL PVC, PE and GRP	 0.012 0.011	 1.1 mm 0.6 mm
Sizes ≥ DN600 DICL, SCL, PE and GRP	0.013 – 0.015[Note]	1.5 – 3.0 mm[Note]

Note: For sewers sized DN600 and larger, contact Icon Water for accurate specific roughness values.

IW.5.5.3 Minimum grades for sewers

Minimum grades shall be in accordance with the following requirements:

- For curved sewers, the grade must exceed the values shown in Table IW.4 due to the fact that curved sewers will marginally increase operation and maintenance requirements compared to straight sewers. Furthermore, accuracy in constructing curved sewers is more difficult to achieve.
- For DN150 straight sewers, the grade must exceed the values shown in Table IW.5.
- All straight sewers sized larger than DN150 shall be designed to have a grade exceeding the sulphide-slime control grade (S_{ss}) and the self-cleansing grade (S_{sc}) as determined from Eqns. IW.5.5.3.1 and IW.5.5.3.2.
- For sewers sized larger than DN150 but less than DN300, where large cost penalties are involved in achieving the sulphide slime control grade (S_{ss}) some relaxation of requirements may be permitted and written authorisation for such relaxation shall be obtained from Icon Water. For DN300 and larger sewers, this requirement shall not be relaxed under any circumstances. If Icon Water requirements are relaxed, Icon Water shall advise in writing of the requirement noting that the grade must exceed the absolute minimum grade (S_{min}) as determined from Eqn. IW.5.5.3.4.
- Design submittals (in accordance with *STD-SPE-G-019 Asset Creation and Approval Process*) shall show the proposed grades, minimum slime control grades and any septicity control measures considered to be necessary. These measures shall include, but not be limited to: limitations on pipe materials, special internal coatings or linings, forced ventilation and flushing flow requirements. Note: Unprotected concrete shall not be permitted in systems where grades are less than those required for slime control.

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- The Designer shall make allowance for load build-up within the catchment. Where it is unlikely that self-cleansing flows will be achieved within two years of the first connections to the system, or slime control grades within five years, the Designer shall develop proposals for self-cleansing and slime control and refer these to Icon Water for review and approval.

- The Designer shall exceed the tabulated minimum grades for short intermediate sections of sewer, when the upstream and downstream sections are laid at steeper grades. The grade chosen shall be compatible with the upstream and downstream sections so as to provide the required self-cleansing properties.

Table IW.4 Minimum Grades for Curved Sewers

Sewer size	Minimum grade (%)
DN150	1.50
DN225	1.25
DN300	1.00

Table IW.5 Minimum Grades for DN150 Straight Sewers

Ultimate number of residential properties draining to the sewer	Minimum grade (%)
1 house	1.25
2 houses	1.20
7 houses	1.10
12 houses	1.00
18 houses	0.90
28 houses	0.80
35 houses or thereafter	0.70

For straight sewers of sizes larger than DN150, the sizing equations are:

$$S_{sc} = 0.0135/R_p \qquad \textit{Eqn. IW.5.5.3.1}$$

$$S_{SS} = 0.0338/R_p \qquad \textit{Eqn. IW.5.5.3.2}$$

Where:

S_{sc} = minimum grade for self-cleansing (%)
S_{ss} = minimum grade for sulphide slime control (%)
R_p = hydraulic radius at 75% of the localised PDWF from Eqn. IW.3.4.2.5

75% of the localised PDWF is taken to be the most probable peak dry weather flow when pumped flows as well as gravity flows are taken into account. It is abbreviated as Q_{dmp} and it is expressed mathematically as:

$$Q_{dmp} = 0.75 \times (PDWF + \frac{2}{3}TPF) \qquad \textit{Eqn. IW.5.5.3.3}$$

WSA 02 Part 1 Page Ref.	Amendment and/or addition
	For straight sewers sized larger than DN150, the absolute minimum grade can be obtained from the following equation: $S_{min} = 80/ID$ *Eqn. IW.5.5.3.4* The maximum capacity of the pipe shall be used to determine the absolute minimum grade not the Design Flow. The maximum capacity of the pipe shall be determined from either the Manning or Colebrook-White equations as detailed in Section IW.5.5.2. **IW.5.5.4 Maximum grades for sewers** Restrictions are placed on the maximum grades of sewers to limit internal pipe wall erosion, turbulence and hydrogen sulphide as well as pipe movement (due to trench flows causing a loss of bedding). The maximum grade shall be that for which the velocity is 3.0 m/s at PDWF. When determining the maximum grade, either the Manning or the Colebrook-White equation shall be used with pipe specific roughness values obtained from Table IW.3.
Page 126	**5.6.5 Minimum depth of sewer connection point** **5.6.5.4 Depth of connection point** Delete all existing content and replace with the following text: The minimum depth of the service tie (aka "property connection point") shall be determined in accordance with the requirements of Section 5.6.5.3 and the soffit requirements of Section 5.6.5.2. For the maximum depth of the sewer service tie, refer to Icon Water's *SD Series* of drawings for construction requirements as well as Icon Water specification *STD-SPE-M-006 Property Connections and Water Meters* for additional requirements.
Pp. 128	**5.6.6 Grading through MHs** **5.6.6.5 Large falls at MHs** Replace all references to Table 5.13 with Table IW.6. Delete Table 5.13 and all notes and replace with Table IW.6 and notes as follows:

<table>
<tr><th>WSA 02 Part 1 Page Ref.</th><th>Amendment and/or addition</th></tr>
<tr><td></td><td>

Table IW.6 Limitations on Large Falls at MHs Using Internal and External Drops

<table>
<tr><th>Inlet sewer DN</th><th>Type of drop</th><th>Max. number of drops at MH</th><th>MH inlet pipe size</th><th>MH drop pipe size</th><th>Limitations</th></tr>
<tr><td>150 - 375</td><td>Internal</td><td>1 in DN1050
2 in DN1200</td><td>150
225</td><td>≥ 150
≥ 150</td><td rowspan="2">Dependent on other lines coming into the MH, a maximum of 3 inlets into the MH are allowed</td></tr>
<tr><td>150 - 375</td><td>External</td><td>3 in DN1050 MH
3 in DN1200 MH</td><td>150
225
300
375</td><td>≥ 150
≥ 150
≥ 225
≥ 300</td></tr>
</table>

Note: The maximum number of internal drop pipes shall be determined in accordance with Clause 7.6.8.

</td></tr>
<tr><td>Pp. –132-141</td><td>

6 PROPERTY CONNECTION

Delete all content in this section including sub-sections 6.1 through 6.7 inclusive and replace with the following text:

The planning, design and construction requirements for property connections shall be in accordance with Icon Water's SD Series of drawings as well as Icon Water specification *STD-SPE-M-006 Property Connections and Water Meters.*

</td></tr>
<tr><td>Pp. –142-147</td><td>

7 MAINTENANCE STRUCTURES
7.1 TYPES OF MAINTENANCE STRUCTURES

Delete all content in Sections 7.1 through 7.5 inclusive and replace with the following content:

IW.7.1. ALLOWABLE TYPES OF MAINTENANCE STRUCTURES

Icon Water only allows the construction of maintenance holes (MHs), sewer maintenance shafts (SMSs) and dead end rodding points (RPs) as standard within the Icon Water sewerage network.

Specialty sewerage structures such as siphons and vortex drops may be required from time-to-time and the requirements relating to such specialty structures shall be provided by Icon Water on a project-by-project basis.

IW.7.2 LOCATIONS OF MAINTENANCE STRUCTURES

The design shall incorporate the following requirements with regards to the location of maintenance structures:

- RPs shall only be provided at dead ends and they shall be in accordance with the Icon Water SD Series of drawings. Preferably, RPs shall not be located within a trafficable area.
- SMSs may be used in lieu of MHs on DN150 and DN225 mains only on the proviso that the maximum spacing between MHs does not exceed 160 metres and the distance between a SMS and a MH does not

</td></tr>
</table>

WSA 02 Part 1 Page Ref.	Amendment and/or addition
	exceed 80 metres. SMSs shall not be located within a trafficable area (preferably) and shall be in accordance with the Icon Water SD Series of drawings. • MHs shall be provided at locations: o Where there is a high risk of blockage. Examples include but are not limited to: changes of direction, changes in grade, changes in pipe size and changes in level. o Where junction structures are required to combine flow. Examples include but are not limited to: connections with other sewers and with service ties DN150 and larger. o Where there are shallow points in the system (e.g. to form an emergency overflow relief path in times of acute hydraulic overload or blockage of the pipe system). o When access is required at regular intervals in accordance with the maximum spacing provided in Section IW.7.3. o When there is a change of pipe material that results in a change of internal diameter or internal wall profile. o When pipe jacking is the required installation method. o When a pressure (rising) main discharges into a gravity main. o Either side of railway lines or boundaries, major roads and waterways etc. • MH locations are subject to the following additional requirements: o MHs shall not, in so far as reasonably practicable, be located in driveways and cycle ways due to potential differential settlement and movement of the surrounding paving leading to potential trip hazards and/or damage to the top of the MH structure. o MHs shall not, in so far as reasonably practicable, be located in road pavements due to the need to enact traffic management protocols in the event of an emergency which may be difficult at short notice and during the night. If an MH has to be located within the road pavement out of necessity, then (i) the centre of the MH shall be located within the centre of the slowest traffic lane to minimise tyre travel over the structure cover and frame, and (ii) it shall not be located at a road intersection or roundabout. o MHs shall not, in so far as reasonably practicable, be located in leased properties due to the potential requirement for emergency access at any time during the day and night. o MHs shall not, in so far as reasonably practicable, be located in floodways below 1:5 year flood levels. Furthermore, no access cover shall be located below the 1:2 year flood level.

<table>
<tr><th>WSA 02 Part 1 Page Ref.</th><th>Amendment and/or addition</th></tr>
<tr><td></td><td>

MHs shall not be located in an area where the cross-fall does not comply with the requirements of Section 7.9.2.
MHs shall be provided with sufficient access clearance so that portable barriers with integrated davits can be used for safe person entry as per the requirements of Icon Water specification STD-SPE-G-008 Design Requirements for Safe Access, Egress and Working at Heights and the Icon Water SD Series of drawings.
The preferred location areas for MHs are within roadside verges, and median strips and these locations shall be specified by Designers unless it is not reasonably practicable to do so. Footpaths are not preferred due to potential future differential settlement leading to trip hazards but should be considered as a location if the alternative location(s) are situated within a road pavement, cycleway or driveway.

IW.7.3 SPACING OF MAINTENANCE STRUCTURES

SMSs shall be spaced in accordance with the requirements detailed in Section IW.7.2.

MHs shall be spaced in accordance with Tables IW.7 and IW.8 noting that curved sewers require MHs to be closer together as visual inspection between maintenance hole to maintenance hole is not generally possible.

Table IW.7 Maximum Maintenance Hole Spacing – Straight Sewers

<table>
<tr><th>Sewer size</th><th>Maximum MH spacing (m)</th></tr>
<tr><td>DN150 – DN450</td><td>100</td></tr>
<tr><td>DN525 – DN600</td><td>150</td></tr>
</table>

Table IW.8 Maximum Maintenance Hole Spacing – Curved Sewers

<table>
<tr><th>Sewer size</th><th>Maximum MH spacing (m)</th></tr>
<tr><td>DN150 – DN450</td><td>80</td></tr>
<tr><td>DN525 – DN600</td><td>100</td></tr>
</table>

<u>Notes</u>:

For curved sewers, MHs shall be located on tangent points where the curve does not form a true tangent to the preceding or following straight.

The combination of single straight and single curve is acceptable. For purposes of maximum lengths between maintenance holes, Table IW.8 shall apply.
</td></tr>
<tr><td>Page 148</td><td>7.6 MAINTENANCE HOLES (MHs)
7.6.1 General

Where Clause 7.1 is referenced, replace with Section IW.7.1.

Where Clause 7.3 is referenced, replace with Section IW.7.2.</td></tr>
</table>

<table>
<tr><th>WSA 02
Part 1
Page Ref.</th><th>Amendment and/or addition</th></tr>
<tr><td>Page 148</td><td>7.6 MAINTENANCE HOLES (MHs)
7.6.3 Design parameters for MHs

Where Clause 7.2 and Table 7.1 is referenced, replace with Section IW.7.1.

Delete the second paragraph (as Icon Water does not currently approved the use of MHs constructed of GRP, PP or PE).

7.6.4. Design requirements for connection of sewers to MHs

Delete all references to GRP, PP and PE MHs as Icon Water does not currently approve these materials for MH construction.

Delete all references to Table 5.13 and replace with Table IW.6.

Delete all references to Table 5.2 and replace with Icon Water SD Series drawings.</td></tr>
<tr><td>Page 153</td><td>7.6 MAINTENANCE HOLES (MHs)
7.6.4.3 Rocker Pipes

Delete Table 7.2 and Note 1 replace with Table IW.9 and new notes as follows:

Table IW.9 External MH Drop Pipe Structure

<table>
<tr><th>Inlet sewer
(DN)</th><th>“D” min. vertical
(mm)</th><th>“T” min.
(mm)</th></tr>
<tr><td>150</td><td>450</td><td rowspan="4">Refer to Icon Water SD Series drawings</td></tr>
<tr><td>225</td><td>450</td></tr>
<tr><td>300</td><td>560</td></tr>
<tr><td>375</td><td>680</td></tr>
</table>

<u>Notes</u>:

1. Refer to the Icon Water SD Series of drawings for the distance depicted as “T” in Figures 7.13 and 7.14.</td></tr>
<tr><td>Pp. 154-156</td><td>7.6 MAINTENANCE HOLES (MHs)
7.6.5 Connection of property connection sewers into MHs

Delete all references to Table 7.1 and to MCs.

7.6.6 MH drops

Replace all references to Table 5.13 with Table IW.6 instead.

Replace all references to Table 7.2 in Figures 7.13 and 7.14 with Table IW.9 instead.</td></tr>
<tr><td>Page 158</td><td>7.6 MAINTENANCE HOLES (MHs)
7.6.7 Diameters of MHs

Delete all references to 900 mm diameter MHs as these are not approved for use within the Icon Water sewerage network.</td></tr>
</table>

WSA 02 Part 1 Page Ref.	Amendment and/or addition
Page 158	**7.6 MAINTENANCE HOLES (MHs)** **7.6.9 Ladders, step irons and landings** Delete all content in this section and replace with the following text: Requirements for ladders, step irons and landings shall be in accordance with Icon Water specifications *STD-SPE-G-008 Design Requirements for Safe Access, Egress and Working at Heights*, *STD-SPE-G-009 Supplement to AS 1657 Fixed Platforms, Walkways, Stairways and Ladders – Design, Construction and Installation*, as well as the Icon Water SD Series of drawings. A summary of these requirements is as follows: • Staggered step irons shall be specified for DN1050 MHs only. • Vertical rung ladders shall be specified for all MHs of diameters larger than DN1050. • Where the depth to benching from the top of the MH is greater than 6000 mm, an intermediate landing shall be specified.
Pp. 159-171	**7.7 MAINTENANCE SHAFTS (MSs) / MAINTENANCE CHAMBERS (MCs)** Delete all content in Sections 7.7.1 through 7.7.4.4 (including all figures) and replace with the following text: Refer to Sections IW.7.1 and IW.7.2 for the locations and allowable types of maintenance structures. Refer to the Icon Water SD series of drawings for allowable installation and construction details for maintenance structures.
Pp. 171-173	**7.8 INSPECTION SHAFTS (ISs)** Delete all content in Sections 7.8.1 through 7.8.5.2 inclusive (including all figures) and replace with the following text: Inspection shafts shall meet the requirements detailed in the Icon Water SD Series of drawings as well as *STD-SPE-M-006 Property Service Connections and Water Meters.*

<table>
<tr><th>WSA 02 Part 1 Page Ref.</th><th>Amendment and/or addition</th></tr>
<tr><td>Pp. 173-176</td><td>

7.9 MAINTENANCE STRUCTURE COVERS
7.9.1 General

Replace all references to Table 7.5 with Table IW10.

Delete Table 7.5 and all notes replace with Table IW.10 as follows:

Table IW.10 MH Cover Requirements

<table>
<tr><th>Location</th><th>MH cover requirements</th><th>Height of MH cover above FSL (mm)</th></tr>
<tr><td>Trafficable paved areas including public and private roads as well as residential and commercial driveways.</td><td rowspan="2">Class D metal cover and metal surround. Bolt down when the location is subject to surcharge (e.g. an overloaded sewer or within 100 metres of a sewer rising main) or in a 1:100 ARI flood event zone.</td><td rowspan="5">In basements and paved areas = 0

In existing and built up areas = 25

In new subdivisions = 75

In undeveloped areas = 100

In flood prone areas = 150 min.</td></tr>
<tr><td>Non-paved areas which have a high likelihood of vehicle traffic.</td></tr>
<tr><td>Paved or non-paved areas not subject to vehicle traffic or surcharge or flood with no requirement to be gas tight.</td><td>Class B reinforced concrete cover and surround or Class B metal cover and metal (or concrete) surround.</td></tr>
<tr><td>Basements and other poorly ventilated areas.</td><td rowspan="2">Class B or Class D metal cover and surround as applicable depending upon whether the location is non-trafficable respectively.

Gas tight and bolt down.</td></tr>
<tr><td>Sewage pumping stations – Collection maintenance holes</td></tr>
</table>

Notes:

1. Refer to the Icon Water SD Series of drawings for specific installation requirements relating to sealing and bolting down.

2. Class B reinforced plastic covers may be used to replace existing Class B covers in areas not prone to bushfire. Such covers shall not be used for new developments and shall only be installed by Icon Water personnel.

</td></tr>
</table>

WSA 02 Part 1 Page Ref.	Amendment and/or addition
Pp 176-177	**7.10 SEWERS FROM JUNCTIONS** Reword point (c) as follows: (c) terminates at an RP if the length is greater than 10 m; Delete all content in Section 7.10 after point (e) which is presented on page 176 and 177 and replace with the following content: **IW.7.10.1 Specific Icon Water requirements for junction maintenance holes** MHs are to be constructed where sewers, or service ties sized DN150 and larger, form a junction with a main sewer. The MH junctions are to be designed to provide a smooth flow transition from the branch sewer, and to maintain a free air path through the maintenance hole for all flows less than the Design Flow (i.e. PWWF). The Designer shall ensure that deep flows up to the Design Flow in the major line do not result in surcharging of the branch line. Inlet and outlet pipes must be set at levels relative to each other such that flows do not stagnate in any of the connected pipes. Channel benching on all branch sewers shall be graded to ensure smooth flow transition from inlets to outlet. These requirements shall be achieved using Table IW.11 and IW.12. When utilising Table IW.11, note must be taken of the data presented in Table IW.12 which takes precedence for minimum falls across maintenance holes. **Table IW.11 Allowable Branch-to-Main Sewer Connections for MHs** **Key**: OL = pipes connected obvert level to obvert level CL = pipes connected centreline to centreline Where both sewers are larger than DN300, the design of the junction angles shall incorporate sound hydraulic principles to limit turbulence and hydrogen sulphide emissions such as those detailed in *The Melbourne and Metropolitan Boards of Works (1989), Hydrogen Sulphide Control Manual – Septicity, Corrosion and Odour Control in Sewerage Systems, Volumes 1 and 2, Technological Standing Committee on Hydrogen Sulphide Corrosion in Sewerage Works, Melbourne, Australia* (which is available from WSAA). Icon Water may request to review design calculations and sketch layouts as part of the second design submission (for Major Works) as per the requirements of Icon Water document *STD-SPE-G-019 Asset Creation and Approval Process*.

Branch Sewer	Main Sewer						
	DN150	DN225	DN300	DN375	DN450	DN525	DN600
DN150	OL	OL	OL	OL	CL	CL	CL
DN225		OL	OL	OL	CL	CL	CL
DN300			OL	OL	CL	CL	CL
DN375				OL	CL	CL	CL
DN450					CL	CL	CL
DN525						CL	CL
DN600							CL

<table>
<tr><th>WSA 02 Part 1 Page Ref.</th><th>Amendment and/or addition</th></tr>
<tr><td></td><td>

Table IW.12 Difference Between Branch and Main Sewer Invert Levels at MHs

<table>
<tr><th rowspan="2">Branch Sewer</th><th colspan="7">Main Sewer</th></tr>
<tr><th>DN150</th><th>DN225</th><th>DN300</th><th>DN375</th><th>DN450</th><th>DN525</th><th>DN600</th></tr>
<tr><td>DN150(1)</td><td>50</td><td>75</td><td>Note 3</td><td>Note 3</td><td>Note 3</td><td>Note 3</td><td>Note 3</td></tr>
<tr><td>DN150(2)</td><td>75</td><td>75</td><td>Note 3</td><td>Note 3</td><td>Note 3</td><td>Note 3</td><td>Note 3</td></tr>
<tr><td>DN225</td><td></td><td>50</td><td>75</td><td>Note 3</td><td>Note 3</td><td>Note 3</td><td>Note 3</td></tr>
<tr><td>DN300</td><td></td><td></td><td>50</td><td>75</td><td>Note 3</td><td>Note 3</td><td>Note 3</td></tr>
<tr><td>DN375</td><td></td><td></td><td></td><td>50</td><td>50</td><td>Note 3</td><td>Note 3</td></tr>
<tr><td>DN450</td><td></td><td></td><td></td><td></td><td>30</td><td>50</td><td>Note 3</td></tr>
<tr><td>DN525</td><td></td><td></td><td></td><td></td><td></td><td>30</td><td>50</td></tr>
<tr><td>DN600</td><td></td><td></td><td></td><td></td><td></td><td></td><td>30</td></tr>
</table>

Notes:

1. DN150(1): Both the branch and the main have similar hydraulic loads
2. DN150(2): The branch sewer is collecting 5 or less residential dwellings
3. Refer to Table IW.11.
4. The minimum fall shall be defined as the difference between the branch inlet invert level and the maintenance hole outlet invert level, measured at the inside face of the maintenance hole.

</td></tr>
<tr><td>Page 177</td><td>

7.11 OTHER MAINTENANCE STRUCTURES AT INTERFACE OF PROPERTY CONNECTION SEWER AND SANITARY DRAINS

Delete all content in this section and replace with the following text:

The planning, design and construction requirements for property connections shall be in accordance with Icon Water's SD Series of drawings as well as Icon Water specification *STD-SPE-M-006 Property Connections and Water Meters.*

</td></tr>
<tr><td>Pp. 178 - 185</td><td>

8.2 WATER SEALS, BOUNDARY TRAPS, WATER SEALED MHs and GAS CHECK MHs

Add a new paragraph directly under the section title on page 178 as follows:

In Sections 8.2.1 through 8.2.3.3 inclusive, the Designer should note that the specification and installation of items such as boundary traps on the customer side of the sewer tie (aka "property service connection") is not the responsibility of Icon Water. Design, specification and installation of such items shall be in accordance with AS/NZS 3500.2. For further details relating to sewer ties, refer to Icon Water specification *STD-SPE-M-006 Property Connections and Water Meters.*

On pages 178 through 185, delete all references to MCs.

</td></tr>
<tr><td>Page 185</td><td>

8.3 VERTICAL AND NEAR VERTICAL SEWERS
8.3.2 Design parameters for bored, exposed and encased vertical and near vertical sewers

Delete all references to MCs.

</td></tr>
</table>

WSA 02 Part 1 Page Ref.	Amendment and/or addition
Page 187	**8.5 VORTEX INLETS AND WATER CUSHIONS** Add the following paragraph directly under the section title: Specific requirements for vortex inlets and water cushions shall be provided by Icon Water on a project-by-project basis.
Page 188	**8.6 INVERTED SYPHONS** Add the following paragraph directly under the section title: Specific requirements for inverted syphons shall be provided by Icon Water on a project-by-project basis.
Page 190	**8.7 EMERGENCY RELIEF STRUCTURES** Add the following paragraph directly under the section title: The Designer shall contact the EPA and Icon Water to determine project specific requirements for emergency relief structures (ERFs) as early as possible in the design phase and prior to the first design submission to Icon Water.
Page 192	**8.7 EMERGENCY RELIEF STRUCTURES** **8.7.2.3 Overflow pipe** At point (d) delete all references to MCs and MSs. Only MHs shall be used.
Page 219	**10.2 DESIGN DRAWINGS** **10.2.1 General** Modify the first paragraph as follows: Design drawings and specifications shall be prepared in accordance with the requirements of Icon Water's SD series of drawings and Icon Water's drafting standard (STD-SPE-G-018). Additional requirements are provided in Sections 10.2.2 through 10.4 inclusive.
Page 224	**10.5 RECORDING OF WORK AS CONSTRUCTED INFORMATION** Delete all content in this section and replace with the following text: Work as Constructed (aka "Work as Executed") drawings and documentation shall be provided in the same format as the Design Drawings and shall be in accordance with the following Icon Water specifications: • *STD-SPE-G-018 Drafting Standards* • *STD-SPE-G-019 Asset Creation and Approval Process* • *STD-SPE-C-004 Survey and Tolerancing Requirements*

5.3 Amendments and additions to WSA 02 Part 2

Table 5.3.1 details amendments and additions to WSA 02 Part 2: Construction.

Table 5.3.1 Amendments and additions to WSA 02 Part 2: Construction

WSA 02 Part 2 Page Ref.	Amendment and/or addition
Where applicable	Delete all references to Maintenance Chambers (MCs) wherever they appear in WSA 02 Part 2 and note that Icon Water only allows the construction of Maintenance Holes (MHs), Sewer Maintenance Shafts (SMSs) and Rodding Points (RPs) as detailed in the Icon Water SD Series of standard drawings.
Page 228	**12 GENERAL CONSTRUCTION** **12.1 GENERAL** Modify the last paragraph of this section as follows: Use only the types, products, materials, sizes, lengths, classes, jointing methods and corrosion protection systems for the pipes, fittings and maintenance structures as specified. The make, model, brand, manufacturer etc. of all products and materials shall be in compliance with the details provided in Icon Water's Approved Products List and the relevant WSAA product specifications. Alternative products and materials shall not be used. If any doubt arises, obtain written direction from Icon Water prior to use.
Page 228	**12.2 ORDER OF CONSTRUCTION, TESTING AND COMMISSIONING** Modify point (b) as follows: Install all Works in accordance with the Design Drawings, the Specification and Icon Water Standards, progressively working upstream and collect Work As Constructed information as work proceeds.
Page 229	**12.5 PROTECTION OF PROPERTY AND ENVIRONMENT** **12.5.1 Protection of other services** Add the following paragraph of text directly after the first paragraph: Details of services shown on the Design Drawings are not to be taken as indicating all existing services or exact locations. Add the following paragraph after Point (l) as follows: While working near Icon Water assets activities and works causing additional stress such as vibration and ground movements shall be prevented by nominating alternative low vibration work methods for example compaction equipment that generates smaller vibrations, light roller, plate compactors, static compaction equipment. An engineering assessment report is required to demonstrate there will be no adverse impact on Icon Water's assets.

WSA 02 Part 2 Page Ref.	Amendment and/or addition
Page 236	**13 PRODUCTS AND MATERIALS** **13.1 APPROVED PRODUCTS AND MATERIALS** Delete all existing content in this section and replace with the following text: Only products and materials specifically shown on the Design Drawings and Project Specification shall be used. The make, model, brand, manufacturer etc. of such products and materials shall be in compliance with the details provided in Icon Water's Approved Products List and the relevant WSAA product specifications. Alternative products and materials shall not be used. If any doubt arises, obtain written direction from Icon Water prior to use. If the words "or equivalent" are found in project design documentation, these words shall be taken to be an error by the Designer and shall be interpreted as "or approved equivalent" by the Constructor where the necessary "approval" must be obtained in writing from Icon Water.
Page 239	**13.5 SUPPLY OF WATER TO THE WORKS** Modify the third paragraph as follows: Due to the potential of contamination to the water supply system by backflow, fit a WaterMark certified testable backflow prevention device or air gap so as to be visible on the tanker (vehicle) at all times when drawing water from hydrants. Use only Icon Water approved and supplied stand pipes with inbuilt backflow devices.
Page 248	**16.2 HORIZONTAL AND VERTICAL DEFLECTION OF SEWERS** **16.2.2 Methods of Deflection** Add a second paragraph with content as follows: Bending of PVC is prohibited.
Page 249	**16.2 HORIZONTAL AND VERTICAL DEFLECTION OF SEWERS** **16.2.3 Horizontal curves** Delete the first paragraph at the top of page 249 (as the bending of PVC is prohibited).
Page 249	**16.2 HORIZONTAL AND VERTICAL DEFLECTION OF SEWERS** **16.2.4 Vertical curves** Delete any reference to the bending of PVC (as the bending of PVC is prohibited).
Page 250	**16.7 PROPERTY CONNECTION SEWERS** Delete all existing content in this section and replace with the following text: Icon Water requirements for property connection sewers are also detailed in Icon Water specification *STD-SPE-M-006 Property Service Connections and Water Meters* as well as the Icon Water SD Series of drawings. Install property connection sewers as specified in the project documentation.

WSA 02 Part 2 Page Ref.	Amendment and/or addition
	Ensure tolerances for position, level and plumb are within the limits specified in Icon Water specification *STD-SPE-C-004 Survey and Tolerancing Requirements*. Fill and compact as specified for the reticulation sewer. Where concrete surround or encasement of a riser is specified, allow a minimum of 16 h for the concrete to set before constructing a property connection sewer. Locate vertical drops or risers to prevent damage to the sewer and provide support to maintain their position during encasement or backfilling. Where PVC property connection sewers are used with PE reticulation sewers, install a PE junction fitting included in the reticulation sewer so that the conversion from PE to PVC can be adjacent to this junction. Use a metal-banded flexible coupling with shear band (Refer to WSA PS-235) or a Water Agency approved transition coupling to make the conversion from PE to PVC.
Page 251	**16.10 CORROSION PROTECTION OF CAST IRON** Delete all existing content in this section and replace with the following text: Cast iron shall be taken to include grey cast iron and ductile iron. Polyethylene sleeving (coloured cream) in accordance with AS 3680 shall be installed on all ductile iron pipes sized DN225 and above where indicated in *STD-SPE-G-006 Approved Products List* or where advised by Icon Water in the event of contaminated or aggressive soil being found at the project location. Note: Typically (as per the Icon Water Approved Products List) sleeving is not required for ductile iron pipe externally coated with a ZN/Al coating with an epoxy top-coat unless the soil is aggressive or contaminated. Only polyethylene sleeving from the suppliers listed for ductile iron in Icon Water's *Approved Products List* shall be installed. When installing polyethylene sleeving, do so in accordance with AS 3681. Do not allow sleeving items to be exposed to sunlight for more than seven (7) days.
Page 251	**16.11 MARKERS** Add a new sub-section as follows: **IW.16.11.3 Tracer Wire** All sewer mains constructed of trenchless techniques shall have a tracer wire installed unless they are located inside a steel sleeve. The tracer wire shall be of an approved type/make as listed in Icon Water's Approved Products List and shall be installed in accordance with the tracer wire manufacturer's instructions.
Page 257	**16.17 WELDING OF PE PIPELINES** **16.17.1 General** Delete all existing content and replace with the following text: Where welding of a PE sewer mains is required, butt-fusion welding shall be the preferred method and it shall be conducted outside of the trench so that the PE

WSA 02 Part 2 Page Ref.	Amendment and/or addition
	main is pre-strung prior to being lowered into the trench during installation. All internal weld beads shall be removed so a smooth bore is produced. Final closures (if required) shall be performed using electrofusion welding in the trench or by using approved mechanical couplings as detailed in Icon Water's Approved Products List. Butt-fusion welding shall not be conducted inside trenches. The Plastics Industry Pipe Association provides technical guidelines for electrofusion welding – POP001 and butt welding – POP003. Undertake all welding in accordance with the Specification and relevant Design Drawings.
Page 261	**17.2.6 Internal coating of concrete MHs** Delete all existing content and replace with the following text: Coat MHs in accordance with the requirements of WSA 201 as amended by Icon Water in *specification STD-SPE-G-005 Supplement to WSA 201 Manual for Selection and Application of Protective Coatings* and the selected coating manufacturer's instructions.
Page 261	**17.3 GLASS REINFORCED PLASTIC (GRP) MHs** Delete all text and replace with the following text: Icon Water does not allow the use of GRP MHs in the sewerage network. **17.4 POLYETHYLENE (PE) MHs** Delete all text and replace with the following text: Icon Water does not allow the use of PE MHs in the sewerage network. **17.5 POLYPROPYLENE (PP) MHs** Delete all text and replace with the following text: Icon Water does not allow the use of PP MHs in the sewerage network.
Page 270	**21 ACCEPTANCE TESTING** **21.1 General** Modify the paragraph and 7 dot points immediately after dot point (e) as follows: Undertake acceptance testing of all sewers and structures in accordance with this code and in the following order unless notified otherwise by Icon Water: 1. Visual inspection – above ground 2. Compaction testing 3. Pressure testing (low pressure air or vacuum or hydrostatic) 4. Infiltration testing (only if a freestanding water table exists at a level ≥ 150 mm above a sewer sized DN150 or larger; or when requested by Icon Water)

WSA 02 Part 2 Page Ref.	Amendment and/or addition
	5. Deflection (ovality) testing of flexible sewers 6. Measurement of sewer grade 7. CCTV inspection of 5% of the total sewer main (and tie) length to be handed over to Icon Water. The locations and individual lengths are to be nominated in advance and submitted to Icon Water in writing for acceptance. CCTV inspection is to occur just prior to the final handover inspection. Note: Icon Water reserves the right to request additional lengths of sewer mains (and ties) to be CCTV inspected if Icon Water has reason to believe that the construction quality (e.g. grade, debris, infiltration, jointing etc.) is not in accordance with Icon Water's design and construction standards. Provide additional content at the end of this section as follows: Regardless of the type of test conducted, Icon Water requires that: a) The testing procedure is submitted in writing to Icon Water for acceptance at least five (5) working days prior to the scheduled date of the test. Testing shall not take place without Icon Water's written acceptance of the testing procedure. b) A PDF copy be submitted of the in-date (i.e. not older than 12 month) calibration certificates of all instruments used during testing. In particular, pressure gauges used for pressure testing purposes shall have current (i.e. not older than 12 month) certification for accuracy from an independent, NATA or equivalent, accredited testing provider. Pressure gauges shall be permanently marked to allow them to be identified against the test certificates. The additional requirements for pressure gauges detailed in Appendix A must also be complied with. c) A PDF copy of certified test certificates be submitted which show that the testing has been conducted in accordance with Icon Water Standards and the submitted testing procedure. Such certificates shall include the test data/results. d) Where testing is conducted by a laboratory, a Recognised Testing Laboratory shall be used.
Page 278	**21.4.5 Testing of Concrete MHs** **21.4.5.2 Test Method** Modify *Table 21.4 Concrete MH Testing frequency* to show that Icon Water requires 100% of all maintenance holes to be tested regardless of number, size or construction type.
Page 285	**22 TOLERANCES ON AS CONSTRUCTED WORK** Delete all content in this section including sections 22.1 through 22.4 inclusive and replace with the following text: Construct all sewer mains, associated structures and components in the positions, and to the grades shown on the Design Drawings in accordance with the tolerancing requirements of Icon Water Specification *STD-SPE-C-004 Survey and Tolerancing Requirements.*

WSA 02 Part 2 Page Ref.	Amendment and/or addition
Page 288	**23 CONNECTION TO EXISTING SEWERS** Delete all content in this section and replace with the following text: Only Icon Water personnel are permitted to perform work on “live” sewerage network assets. The Constructor shall fully expose the existing sewer all-round the proposed point of connection so that full access is provided for all tools and equipment necessary for Icon Water personnel to perform the connection. The Constructor shall ensure that their constructed works are aligned in accordance with the requirements of *STD-SPE-C-004 Survey and Tolerancing Requirements* so that Icon Water personnel can perform the connection using standard piping components. Icon Water personnel are not permitted to perform a connection if the works are not in accordance with the Design Drawings (as approved by Icon Water). The Constructor shall provide all pipe fittings, ancillary components and the necessary trench supports and traffic control whilst the connection is being performed. The Constructor shall also perform all necessary backfilling, compaction and restoration works after completion of the connection.
Page 291	**25 WORK AS CONSTRUCTED DETAILS** Delete all content and replace with the following text: Prepare Work as Constructed (aka “Work as Executed”) drawings and documentation in accordance with the requirements of the following Icon Water specifications: • *STD-SPE-G-018 Drafting Standards* • *STD-SPE-G-019 Asset Creation Approval Process* • *STD-SPE-C-004 Survey and Tolerancing Requirements* **Note**: Generally, the Work as Constructed details will require recording during the progress of the works rather than solely at the completion of the works.

6 Appendix A – Additional requirements for pressure instrumentation

Analogue or digital pressure gauges are both acceptable instrument types for measuring pressure during air or vacuum testing. Table 6.1 summarises the mandatory requirements for pressure instrumentation.

Table 6.1 Requirements for Pressure Instrumentation – Air or Vacuum Testing

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
Sewer Mains 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 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 2.5 kPa" can be re-stated as graduation marks "at least every 0.025 bar".

Fig. 6.1 provides an example of an acceptable analogue pressure gauge for a vacuum test pressure of -24 kPa (-0.24 bar).

Fig. 6.1 Example of an acceptable analogue pressure gauge for a test pressure of -24 kPa (-0.24 bar)

7 Appendix B – Update history

Amendments in this issue (4) are provided in the table below.

Clause/Section	Description
Section 5.1,Page 3,STD-SPE -G 011	Addition of Text "Introduction and"
Page 4,Glossary of Terms, STD-SPE -G 011	Add text and “Lot” after “Allotment”
Page 5,Glossary of Terms, STD-SPE -G 011	Delete text in 5th,6th &7th rows
Various pages, STD-SPE -G011	Amendment of page number to align with WSA02(Version 3.2)
Page 4 ,National Standard for Construction Work STD-SPE -G 011	Delete the entire row
Page 6, Abbreviations,STD-SPE-G011	Add "Transport Canberra and City Services" in the list of abbreviations
Page 7, Clause 1.3.1 Design Life,STD-SPE-G011	Delete Clause 1.2.6 and Insert Clause 1.3.1
Page 17,Clause 4.6.2 Sizes and Configurations STD-SPE-G011	Deleted Text "Unless they are joined by solvent Cement"
Page 21,Clause 5.2.9, Disused Sewers, STD-SPE -G011	Major Text amendments
Page 24,Clause 5.4.7,Trees	Major Text amendments
Page 24, Clause 5.5,Pipe Sizing and Grading, STD-SPE -G011	Insert Text " Excluding Clause 5.5.4"
Page 34, Clause 7.10,Sewers From Junctions , STD-SPE -G011	Addition of Text and Change in Page number
Page 35, Clause 8.2,Water Seals, Boundary Traps, Water Sealed MHs and Gas Check MHs ,STD-SPE -G011	Updates on page number in Text
Page 37, Clause 12.5.1,Protection of other services, STD-SPE -G011	Insert additional Text for working near Icon Water assets
Page 41, Clause 21.1,General, STD-SPE -G011	Subsection (a) corrected and replaced with (b)

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