

Part 4  
Water Reticulation Design  
July 2009

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**PART 4 – WATER RETICULATION**  
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## 1. INTRODUCTION

This Part of The Authority’s “Engineering Guidelines for Subdivisions and Developments” is related to water reticulation. Reference to the Authority will include reference to the Council as the Water Authority.

The design of water reticulation shall generally be in accordance with the latest version of the Water Services Association of Australia (WSAA) “Water Supply Code of Australia (WSA 03). **This part of The Authority’s “Engineering Guidelines” take precedence over WSA 03** (ie. these are The Authority’s requirements which may be different to WSA 03).

The other parts of the “Engineering Guidelines for Subdivisions and Developments” are as follows:

- Part 1 General Requirements
- Part 2 Guidelines for Design of Roads
- Part 3 Guidelines for Design of Drainage
- Part 4 Guidelines for Design of Water Reticulation**
- Part 5 Guidelines for Design of Sewerage Reticulation
- Part 6 Guidelines for Landscaping, and Measures for Erosion, Sedimentation and Pollution Control
- Part 7 Guidelines for Testing.

This part of the “Engineering Guidelines” is set out in the same order as WSA 03 for ease of cross-referencing.

## 2. GENERAL

The Authority (as the Water Agency) will not provide a “Concept Plan” for the localised water supply system. This is the responsibility of the “Designer” and particularly so if the proposed development is going to be staged (i.e. developed in stages). The Authority will, however provide details of items (a) to (h) inclusive as specified in Clause 1.5.2 of WSA 03 where available.

If such a staged development is proposed the “Designer” shall provide an indicative overall concept plan of the development at the time of submitting the first stage to The Authority for approval. This concept plan shall not be binding with respect to the proposed layout/staging; however, the final number of tenements cannot differ by more than 20% between the original concept plan and the ultimate constructed development.

All development in bush fire prone areas is to comply with the RFS NSW planning for bushfire protection.

## 3. SYSTEM PLANNING

### 3.1 SYSTEM PLANNING PROCESS

### **3.1.1 Extending/upgrading an existing water supply system** (Refer WSA 2.1.1)

In lieu of (a) and (b) of this Clause of WSA 03, the “Planner/Designer” shall:

- a. Take into account points (i), (ii) and (iii) which will be provided by The Authority in designing the extension/upgrade of an existing water supply system to ensure that it adequately services any existing and any future customers on that system.
- b. Provide details of the proposed extension/upgrade in the preliminary/early phases of the design in particular existing and future customers, to The Authority to allow it to be “trialled/modelled” in The Authority’s network analysis and determine its impact on the existing water reticulation system.
- c. The outcome of this trialling may lead to The Authority placing additional requirements on the proposed extension/upgrade and/or the developer to augment the existing system to meet the demands of the proposed extension/upgrade.

### **3.2 DEMANDS** (Refer WSA 2.2.1)

Demand rates shall be in accordance with Table 2.1 (Melbourne/Geelong) unless the demand of the proposed development is known and exceeds those values in Table 2.1 in which case the “known” demand shall be used.

### **3.3 SYSTEM HYDRAULICS**

#### **3.3.1 Minimum allowable service pressure** (Refer WSA 2.4.3.3 and Table 2.2)

The minimum allowable service pressure shall be 300 kPa (30 m head) throughout the reticulation system when meeting a peak instantaneous demand of 0.15 litres/second/tenement. These minimum pressures are to be achieved with the relevant supplying water storage reservoir two thirds full.

Where the pressure does not meet the authority requirement this may be registered on the title as determined by the Authority.

In outlying areas the Authority may permit the minimum service pressure to be reduced to 100 kPa (10 m head), however in these instances the relevant property will be required to install a storage tank (1500 litres minimum capacity) and an on-property system capable of providing a minimum pressure of 300 kPa (30 m head).

#### **3.3.2 Pressure variation analysis** (Refer WSA 2.4.4)

Where distribution and reticulation systems are designed to control diurnal pressure variations, the diurnal demand factors are to be used for each customer category. Consult with the Authority prior to undertaking any analysis to determine requirements.

### **3.3.3 Determining supply zones** (Refer WSA 2.4.4)

The Authority has no issue with different supply zones. The creation of **different pressure zones is not preferred** and “Planners/Designers” should discuss this issue with the Authority in the early stages of the design phase in an attempt to eliminate such zones. Pressure zones shall be consistent with The Authority’s existing system.

### **3.4 PUMPING STATIONS** (Refer WSA 2.6 (C))

A standby pump of the same capacity as the duty pump is required. Provision shall be made in the design and ultimate operation for the standby and duty pumps to be alternated.

The design of any water pump station **must be** undertaken in consultation with the Authority’s Water and Wastewater Mechanical and Electrical Group.

### **3.5 SERVICE RESERVOIRS** (Refer WSA 2.7)

The minimum capacity for any service reservoir shall be on one day supply at peak demand.

The reservoir should be located at an elevation such that the water level when the reservoir is 2/3 full provides not less than the minimum allowable service pressures at the customer’s services under peak demand conditions (Table 2.2 of WSA –03 modified as per 2.4 above). Reservoirs are to be designed as part of an overall system and are to be located at elevations consistent with other reservoirs within the same pressure zone.

## **4. HYDRAULIC DESIGN**

### **4.1 SIZING OF MAINS**

#### **4.1.1 Minimum pipe sizes** (Refer WSA 3.2.2)

The minimum acceptable pipe size is 100 mm diameter for “residential” areas and 150 mm diameter for commercial and industrial areas.

The minimum pipe size for the bowls of courts, cul-de-sacs shall be 50 mm copper (65 mm nominal diameter if polyethylene (PE) pipe is being used), however fire hydrants must have a minimum main diameter of 100 mm on the supply side.

#### **4.1.2 Fire flows** (Refer WSA 3.2.4)

The following applies in addition to Clause 3.2.4 of WSA 03:

A minimum supply head of 28 metres is to be achieved at any fire hydrant within the reticulation system when drawing 11 litres/second from the individual hydrant and meeting a peak instantaneous demand of 0.10 litres/second/tenement throughout the system. A tenement is deemed to be the demand relating to a typical residential lot. Where the demand differs from

that of a standard tenement the anticipated water supply demand for each development shall be used in undertaking the above calculations.

## **4.2 DESIGN PRESSURES**

### **4.2.1 Maximum design pressure (denoted on design drawings)** (Refer WSA 3.4.2)

The maximum design pressures are not required to be recorded on the 'design drawings' as per Clause 3.4.2 of WSA 03. However they should be shown on an overall concept plan at strategic locations that shall be included with the design computations provided to Authority when the design is submitted for approval.

### **4.2.2 Empirical Sizing of Reticulation Mains (notes)** (Refer WSA 3.2.3)

Minimum class 16

## **4.3 PIPE AND FITTINGS PRESSURE CLASS**

### **4.3.1 Minimum pressure class** (Refer WSA 3.7.2)

The minimum pipe and fittings pressure class for reticulation mains shall be PN 35 where ductile iron cement lined (DICL) pipes are used and Class 16 DIOD where uPVC rubber ring jointed pipe are used.

## **4.4 PIPELINE MATERIALS** (REFER WSA 3.8)

The following pipeline materials are currently approved for use however other materials may be considered but will require the Water Authority approval on a case-by-case basis.

### **4.4.1 Property Service Connections**

PN 35 ductile iron cement lined (DICL) spigot and socket, rubber ring jointed pipe manufactured in accordance with AS 2280. If DICL flanged pipe is to be used the class shall be flange class pipe.

Type 'A'; copper pipe manufactured in accordance with AS 1432.

NOTE: Copper is only permitted for the bowl sections of courts and cul-de-sacs and property services. Pipeline fittings for joining Copper pipe to be silver soldered.

Class 16 PE is only permitted for the bowl sections of courts and cul-de-sacs and property services. However if the property service has to cross a road PE can only be used if it is inserted into a sleeve pipe of minimum Class 16. Sleeved pipes shall be installed so that water hammer and pressure fluctuations do not cause pipe movement with the conduit.

Pipeline fittings for joining PE to be only those approved by the Water Authority; and Pipeline fittings for joining DICL and/or uPVC pipes shall be cast or ductile iron, cement lined and

conforming to AS 2544 and AS 2280 respectively. If gibault joints are used they shall be the elongated type.

Copper tube Type A and Polyethylene (PE) pipe with trace wire is approved for use in property service connections. Copper tube is not approved for water reticulation use other than Courts and Cul-de-sacs. However if the property service has to cross a road, copper tube and Polyethylene (PE) pipe with trace wire is to be inserted into a sleeve pipe of minimum Class 16. Sleeved pipes shall be installed so that water hammer and pressure fluctuations do not cause pipe movement within the conduit.

#### **4.4.2 Watermains DN100 to DN360**

Between DN100 and DN250 water mains shall be constructed in:

PVC-M (AS/NZS 4765), Series 1 or 2 minimum PN 16 rubber ring joint. PVC must be lilac coloured where used in reuse or raw water systems;

PVC-O (AS/NZS 4441), UNDER REVIEW.

DICL (AS/NZS 2280), PN 35 rubber ring joint, polyethylene wrapped AS 3680; if DICL flanged pipe is to be used the class shall be flange class pipe;

Polyethylene (AS/NZS 4130) minimum PN 16, blue striped for potable systems, lilac striped for reuse or raw water systems. All jointing to be electro-fusion or butt-welded.

Place tracing wire in all PVC and Polyethylene trenches.

#### **4.4.3 Watermains DN375 and larger**

DN300 and over water mains shall be constructed in:

DICL AS/NZS 2280, PN 35, rubber ring joint, polyethylene wrapped AS 3680;

Series 2 PVC Rubber Ring Joint minimum PN 16.

#### **4.4.4 Fittings**

Pipeline fittings for joining DICL, DIOD and/or uPVC pipes shall be conform to AS 2544 and AS 2280 respectively. If gibault joints are used they shall be the elongated type or vari gib type.

## **5. GENERAL DESIGN**

### **5.1 GENERAL REQUIREMENTS**

#### **5.1.1 Design tolerances (Refer WSA 4.1.1)**

The following shall apply in lieu of Clause 4.1.1(a) and (b) (ii):

“The alignments shall be calculated to the nearest 5 mm and expressed/shown on the drawings to two decimal places with the rounding application being 0.4 mm rounded down to the second decimal place and rounded up to the second decimal place of a metre.

The horizontal alignment shall be referenced to GMA.

#### **5.1.2 Levels** (Refer WSA 4.1.2)

In addition to the requirements of Clause 4.1.2; where a longitudinal elevation forms part of the design drawings levels shall be specified at:

- Every 15 metre interval; and
- Horizontal changes if alignment where a bend(s) is used;
- Vertical changes if alignment where a bend(s) is used.

## **5.2 LOCATION OF WATERMAINS**

### **5.2.1 General** (Refer WSA 4.3.1a)

Additional to clause 4.3.1a watermains are to be located on the nature strip with the pipe 2.7 metres from the property boundary. Alternative alignments are subject to approval from the Authority.

### **5.2.2 Watermains near trees** (Refer WSA 4.3.9)

In lieu of Clause 4.3.5 of WSA 03 the ‘specialist advice’ shall be sought from Council’s Parks and Recreation Section. Further, the Parks and Recreation Section may require portions of the main to be underbored – this shall be specified on the Design Drawings. Particular attention is required in relation to the impact on the tree route system from the cumulative impact of the construction of all services and works.

### **5.2.3 Railway reserves** (Refer WSA 4.3.5)

In addition to watermains being laid within railway reserves (either along or across them) being authorised by the Railway owner and complying with AS 4799, the design and ultimate construction shall comply with the requirements of the Railway owner.

### **5.2.4 Crossing Creeks or Drainage Reserves** (Refer WSA 4.3.10)

Stabilisation or directional bore as approved by the Authority.

Pipes under existing roadways are to be encased or directionally bored as approved by the Authority.

### **5.3 CONNECTION OF NEW MAINS TO EXISTING MAINS (REFER WSA 4.7)**

Where it is necessary to connect to, tap into, or relocate an existing water supply main, The Authority Staff should carry out this work at the developer's expense.

The developer should lodge payment for the work in advance and give 14 days notice of when connection is required.

The Authority will provide all pipes and fittings required to complete the connection or tapping at the developer's expense.

### **5.4 PROPERTY SERVICES (REFER WSA 4.9)**

A common property service, which is then further divided to service additional properties, IS NOT PERMITTED.

Property services shall be located such that the point where the meter assembly is located is within 300 mm of the property side boundary or in the middle of the property. Coordinate service design with other services.

### **5.5 OBSTRUCTION OF CLEARANCES**

#### **5.5.1 Deviation of mains around structures (Refer WSA 4.3.10)**

The maximum individual joint deflection for DICL in either the horizontal or vertical plane or a multiple joint (i.e. where there is deflection in both planes) shall be not more than 75% of the manufacturer's recommendation.

Pipe deflection for DIOD uPVC shall be to Manufacturers Specifications (ie. No deflection in joints, deflection bends at mid point of pipe).

## **6. STRUCTURAL DESIGN**

### **6.1 PIPE ANCHORAGE**

#### **6.1.1 Anchor Blocks (Refer WSA 5.9.3)**

Rapid set concrete anchor blocks are not allowed.

#### **6.1.2 Restrained Elastomeric Seal Joint Water Mains (DICL) (Refer WSA 5.9.4)**

Not accepted.

## 7. APPURTENANCES

### 7.1 STOP VALVES

All stop valves shall be anticlockwise closing.

#### 7.1.1 Gate valves (Refer WSA 6.4.1)

#### 7.1.2 Stop valves for transfer/distribution mains (Refer WSA 6.2.2)

### 7.2 AIR VALVES

#### 7.2.1 Installation design criteria

Air Valve Types to be only those approved by the Water Authority.

#### 7.2.2 Air valve types (Refer WSA 6.4.2)

Air Valve Types to be only those approved by the Water Authority.

### 7.3 SWABBING JOINTS (Refer WSA 6.7)

Not required.

### 7.4 HYDRANTS

#### 7.4.1 Hydrant types (Refer WSA 6.8.3)

Only spring type hydrants accepted.

#### 7.4.2 Hydrant Spacing (Refer WSA 6.87)

Fire hydrants are to be provided in the main at maximum spacing of 60 metres and flushing hydrants are to be installed at all dead ends, including temporary dead ends for the purpose of flushing the main in addition to fire fighting. In addition provide hydrants / fire protection in accordance with BCA and fire authority requirements.

**Table 7.1 Average Day Demands for New Domestic Properties**

<b>Class of Building</b>	<b>Fire Fighting Flow (L/s)</b>
1. Properties that are zoned for commercial (3) or industrial (4) purposes in the relevant LEP.	20
2. Any property not included in Category 1.	10

### **7.4.3 Hydrant Locations (Refer WSA 6.8.8)**

Always in Road Reserve in accordance with Fire Authority requirements.

## **7.5 FIRE FIGHTING FLOWS**

Table 2.6 Appendix 2B outlines the requirements for fire fighting. Note that the water supply system is not designed to fight bushfires. To check for fire fighting adequacy a flow in accordance with Table 2.6 should be applied at selected points within the reticulation system in addition to peak hour flow on a 95 percentile peak day demand. Under these conditions, the pressures at the selected point and the surrounding water supply system should not fall below that specified.

When checking a property for fire fighting adequacy, the fire flow should be taken from the closest hydrant to the property.

In commercial and industrial areas or in areas of high rise buildings a minimum of 150 mm diameter pipes should be used. Special fire fighting requirements exist for some large industries or in cases where fire could be especially severe.

The water systems are not designed, nor intended, to fight bush fires where flows in excess of the design allowances nominated here are attempted to be drawn from the system.

## **7.6 UNACCOUNTED WATER**

An allowance equivalent to 15% of the average demand is to be made for unaccounted water resulting from leakage in the water distribution system and meter inaccuracies. Peaking factors are not to be applied to unaccounted water.

## **7.7 DISINFECTION OF WATERMANS**

All new watermains are to be disinfected prior to connection to the Authority system. Disinfection must be carried out by approved contractor.

## **8. DESIGN REVIEW AND DRAWINGS**

### **8.1 DESIGN REVIEW (REFER WSA 7.1)**

Submit a water supply check list.

### **8.2 DESIGN DRAWINGS (Refer WSA 7.2)**

Provide longitudinal sections for trunk mains in accordance with WSA.

## **9. STANDARD DRAWINGS**

Albury City standard drawings take precedence over WSA.

