



**BUSSELTON WATER**

# **Pipeline Construction and Design Standard**



## Contents

<b>1.</b>	<b>INTRODUCTION</b> .....	<b>5</b>
<b>2.</b>	<b>REFERENCE MATERIAL</b> .....	<b>5</b>
<b>3.</b>	<b>GLOSSARY OF TERMS</b> .....	<b>5</b>
<b>4.</b>	<b>STANDARD ABBREVIATIONS</b> .....	<b>6</b>
<b>5.</b>	<b>PRELIMINARIES TO CONSTRUCTION</b> .....	<b>7</b>
<b>6.</b>	<b>MAJOR AND GENERAL WORKS</b> .....	<b>7</b>
<b>7.</b>	<b>MINOR WORKS (EXEMPT WORKS)</b> .....	<b>11</b>
<b>8.</b>	<b>DESIGN GUIDELINES</b> .....	<b>12</b>
<b>8.1</b>	<b>REDEVELOPMENT OF EXISTING AREAS</b> .....	<b>12</b>
<b>8.2</b>	<b>WATER RETICULATION PLANNING FOR SUBDIVISIONS</b> .....	<b>12</b>
<b>8.3</b>	<b>LAND REQUIREMENTS</b> .....	<b>12</b>
<b>9.</b>	<b>TECHNICAL REQUIREMENTS (MAINS)</b> .....	<b>12</b>
<b>9.1</b>	<b>DESIGN BASIS</b> .....	<b>12</b>
<b>9.2</b>	<b>BW BASIC DESIGN CRITERIA</b> .....	<b>12</b>
<b>9.3</b>	<b>ADDITIONAL DESIGN CONSIDERATIONS</b> .....	<b>13</b>
<b>9.4</b>	<b>ALIGNMENT CONSIDERATIONS</b> .....	<b>13</b>
<b>9.4.1</b>	<b>VALVES</b> .....	<b>14</b>
<b>9.4.2</b>	<b>LOCATION OF VALVES</b> .....	<b>14</b>
<b>9.5</b>	<b>HYDRANT INSTALLATION</b> .....	<b>14</b>
<b>9.6</b>	<b>AIR VALVES</b> .....	<b>14</b>
<b>9.7</b>	<b>SCOUR VALVES</b> .....	<b>14</b>
<b>9.8</b>	<b>FLUSHING POINTS</b> .....	<b>15</b>
<b>9.9</b>	<b>PRESSURE REDUCING VALVES</b> .....	<b>15</b>
<b>9.10</b>	<b>SERVICES</b> .....	<b>15</b>
<b>9.11</b>	<b>CONNECTIONS OF WATER RETICULATION TO DISTRIBUTION / TRUNK MAINS</b> .....	<b>15</b>
<b>10.</b>	<b>DRAWINGS</b> .....	<b>15</b>
<b>11.</b>	<b>CONSTRUCTED INFORMATION</b> .....	<b>16</b>
<b>12.</b>	<b>PRODUCTS AND MATERIALS</b> .....	<b>16</b>
<b>13.</b>	<b>CONSTRUCTION REQUIREMENTS</b> .....	<b>18</b>
<b>13.1</b>	<b>CONTRACTOR ACCREDITATION REQUIREMENTS</b> .....	<b>18</b>
<b>14.</b>	<b>PREVENTION OF CONTAMINATION</b> .....	<b>19</b>
<b>15.</b>	<b>CONSTRUCTION</b> .....	<b>20</b>
<b>15.1</b>	<b>SURVEY AND SETTING OUT</b> .....	<b>20</b>
<b>15.2</b>	<b>HANDLING OF PIPES AND FITTINGS</b> .....	<b>20</b>
<b>15.3</b>	<b>PIPE ALIGNMENT AND DEPTH</b> .....	<b>20</b>
<b>15.3.1</b>	<b>ALIGNMENT</b> .....	<b>20</b>
<b>15.3.2</b>	<b>COVER IN VERGE</b> .....	<b>21</b>
<b>15.4</b>	<b>EXCAVATION AND BEDDING</b> .....	<b>21</b>
<b>15.4.1</b>	<b>EXCAVATION</b> .....	<b>21</b>
<b>15.4.2</b>	<b>BEDDING</b> .....	<b>21</b>
<b>16.</b>	<b>PIPE LAYING AND JOINTING</b> .....	<b>22</b>
<b>16.1</b>	<b>PREPARATION PRIOR TO INSTALLATION</b> .....	<b>22</b>
<b>17.</b>	<b>JOINTING</b> .....	<b>22</b>
<b>17.1</b>	<b>PVC TO PVC PIPES AND FITTINGS</b> .....	<b>22</b>
<b>17.2</b>	<b>PVC TO DI PIPES AND FITTINGS</b> .....	<b>22</b>
<b>17.3</b>	<b>DI TO DI PIPES AND FITTINGS</b> .....	<b>22</b>
<b>17.4</b>	<b>JOINTING OF STEEL PIPES AND FITTINGS</b> .....	<b>23</b>
<b>17.5</b>	<b>PE TO PE PIPES AND FITTINGS</b> .....	<b>23</b>
<b>17.6</b>	<b>PROTECTION OF STEEL PIPES FROM CORROSION</b> .....	<b>23</b>

<b>18.</b>	<b>LAYING OF PIPES AND INSTALLATION OF FITTINGS .....</b>	<b>24</b>
18.1	DI PIPELINE SYSTEM .....	24
18.2	PVC PIPELINE SYSTEM .....	24
18.3	PE PIPELINE SYSTEM .....	24
18.4	MAJOR ROAD CROSSINGS .....	24
18.5	BRIDGE, TUNNEL AND RIVER CROSSINGS .....	24
18.6	BENDS AND PIPE DEFLECTIONS .....	26
18.7	INSTALLATION OF FITTINGS AND VALVES .....	26
18.10	VALVES .....	26
18.10.1	COVERS, FRAMES AND SURROUNDS .....	27
18.11	TEMPORARY BLANK ENDS .....	27
18.12	CONNECTION TO EXISTING WATER MAINS .....	27
<b>19.</b>	<b>THRUST SUPPORTS AND ANCHORS .....</b>	<b>27</b>
19.1	STEEL PIPE ANCHORAGE .....	28
19.2	BACKFILL AROUND VALVES, HYDRANTS, FLUSHING POINTS AND SERVICE CONNECTIONS .....	29
19.3	RESTORATION OF ROAD RESERVES AND ACCESS WAYS .....	29
<b>20.</b>	<b>TESTING OF MAINS AND SERVICE CONNECTIONS .....</b>	<b>29</b>
20.1	PREPARATION .....	29
20.2	FILLING MAINS FOR TESTING .....	30
20.3	TEST EQUIPMENT .....	30
20.4	OFFICIAL PRESSURE TEST .....	30
20.5	TEST PROCEDURES .....	30
20.5.1	STEEL, PVC, DI AND COPPER PIPELINE SYSTEMS INCLUDING PE IN CUL-DE-SAC .....	30
20.5.2	PE PIPELINE SYSTEMS .....	31
20.5.3	WATER SERVICE CONNECTIONS .....	31
20.6	TEST COMPLIANCE CRITERIA .....	31
20.7	RE-TESTING .....	31
20.8	POST-TEST REQUIREMENTS .....	31
<b>21.</b>	<b>PRELAID WATER SERVICE CONNECTIONS .....</b>	<b>36</b>
21.1	ALIGNMENT AND DEPTH .....	36
21.2	ROAD CROSSINGS .....	36
21.3	TAPPING RETICULATION MAINS .....	36
<b>22.</b>	<b>MISCELLANEOUS WORKS .....</b>	<b>37</b>
22.1	ROAD MARKINGS .....	37
22.2	MARKER POSTS .....	37
22.3	FIRE SERVICES .....	37
	WHERE A CUSTOMER REQUIRES A FIRE SERVICE, THEIR HYDRAULIC CONSULTANT MUST CONTACT BW WITH THEIR REQUIREMENTS FOR SIZING OF FIRE SERVICE. THIS INFORMATION WILL THEN BE ASSESSED BY BW, AND A QUOTE PROVIDED. ANY SPECIFIC REQUIREMENTS SUCH AS MONITORED WAFER BUTTERFLY VALVES, SHOULD BE EXPLICITLY STATED BY THE HYDRAULIC CONSULTANT. ....	37
<b>23.</b>	<b>NON-CONFORMANCE PROCESS .....</b>	<b>38</b>
<b>24.</b>	<b>CONTRACTOR REQUIREMENTS .....</b>	<b>40</b>
<b>25.</b>	<b>JOB SAFETY ANALYSIS .....</b>	<b>41</b>
	<b>ATTACHMENT 1 – CUSTOMER LETTER NOTIFICATION SAMPLES .....</b>	<b>43</b>
	<b>ATTACHMENT 2 – CONCRETE ANCHOR THRUST SUPPORT DIAGRAMS .....</b>	<b>45</b>
	<b>ATTACHMENT 3 – DFES STANDARD HYDRANT INSTALLATION .....</b>	<b>48</b>
	<b>ATTACHMENT 4 – STANDARD WATER SERVICE DRAWING .....</b>	<b>51</b>

## 1. Introduction

Busselton Water (BW) Pipeline Construction and Design Standard provides staff, contractors and consultants with guidelines and technical standards for the design and installation of water supplies within Busselton Water's License area. The standard has been produced to complement existing standards implemented by WSA Water Supply Code WSA03-2011 and the Water Corporation of WA for the design and construction of water reticulation assets. In the event of conflict between the WSA Code, the BW Standard shall take precedence.

## 2. Reference Material

- WSA Water Supply Code of Australia (Water Services Association of Australia) WSA03-2011
- Water Corporation Design standard DS 63 and DS 60
- Polyethylene Pipeline Code WSA 01 – 2004 (Water Services Association of Australia)
- Utility Providers Code of Practice for Western Australia
- Steel Pipeline System Design Manual (Tyco Water)
- Steel Pipeline System Handling and Installation Reference Manual (Tyco Water)
- Pipe Fittings Standard Drawings (Water Corporation and WSA)

## 3. Glossary of Terms

Within the standard the following highlighted in bold expressions shall have the following meaning.

- **As Constructed** – Information and measurements provided to locate works relative to existing assets and other supplied survey information.
- **WSAA Code** – The Water Supply Code of Australia WSA03-2011, as published by the Water Services Association of Australia.
- **BW** – Busselton Water.
- **Deferred Services** - services to be installed to lots released at a later date by the Developer.
- **Drawings** - water reticulation drawings attached to this standard.
- **Drafting Standards** – Busselton Water drafting standards.
- **Lot** - a property requiring a reticulation service.
- **MGA94** – Map Grid of Australia 1994.
- **Pre-laid Services** - water service connections installed in conjunction with the construction of new reticulation mains.
- **Standard** – Published Busselton Water standard.

## 4. Standard Abbreviations

AC	asbestos cement	L	litre
AHD	Australian Height Datum	mg	milligram
AS	Australian Standard	m	metre
B/END	blank end	GRP	glass reinforced plastic
BL	building (property) line	mm	millimetre
BV	butterfly valve	MSCL	mild steel cement mortar lined
BW	Busselton Water	NI	not installed
CI	cast iron	OD	outside (external) diameter in mm.
CU	copper	ID	Internal Diameter in mm.
DAV	dual orifice double air valve	PAW	pedestrian access way
DI	cement lined ductile iron	PE	polyethylene pipe
DN	nominal diameter in mm.	PN	pressure nominal
E&C	expanded and collapsed (slip-in)-steel pipe joint	POS	Public Open Space
EXIST	existing	PVC	polyvinyl chloride
FP	flushing point	RC	reinforced concrete
FW	fullway gate valve	ROW	Right of Way
HYD	hydrant	RRJ	rubber ring joint
kg	Kilogram	S	Steel
kL	kilolitre	SC	scour
kPa	Kilopascal	SV	sluice valve

## SECTION 1

### 5. Preliminaries to Construction

**The Water Services Act 2012, Part 6 – Powers in relation to water services works** divides all of the works into one of the three categories of EXEMPT, GENERAL and MAJOR Works. The requirements of the Preliminaries to Works procedures differ for each category of works and care must be taken in determining the category of works that are proposed.

The Water Services Act allows carrying out all necessary survey and testing work of lands for the proposed works.

For the purposes of this document activities to be undertaken prior to construction activities will be called Prelims (Preliminaries to Construction).

Refer to the (Preliminaries to Construction Manual) for the preliminary to works requirements and/or approvals that are to be undertaken prior to commencement.

### 6. Major and General Works

Below is the definition of major and general works as stated in the Water Services Act 2012;

Major Works are the provision of;

- Dams and reservoirs;
- Water storage tanks when constructed have capacity greater than 10ML; groundwater schemes consisting of bores when constructed have capacity greater than 10ML per day;
- Irrigation schemes (but not including any irrigation channel within existing scheme);
- Water and wastewater treatment plants when constructed have capacity greater than 10ML day;

General Works are the provision of;

- Trunk and distribution mains, pumping stations and mains, control and metering stations, main and branch sewers, main drains, irrigation channels, compensation basins;
- Water and sewerage reticulation mains, other than reticulation mains on land provided at request of the owner of land;
- Groundwater schemes consisting of bores that, when constructed, will have capacity of 10ML or less per day;
- Wastewater treatment plants that, when constructed, will have capacity of, or less than 2ML per day;
- Water treatment plants that, when constructed, will have capacity of, or less than 10ML per day
- Chemical dosing plants;
- Water storage tanks that, when constructed, have capacity of 10ML or less per day;
- Any irrigation channel with an existing irrigation scheme

Major and general works may require a notice setting out;

- description of works;
- area of works to be located;
- purposes for works are required;
- the times when and places at which plans may be inspected
- information as to how, where and by when an objection to or submission in relation to the proposal may be lodged.

Below are government agencies and a description of advice that can be obtained;

**Department of Biodiversity, Conservation and Attractions(DBCA):**

Within Busselton Water's Licence Area, DBCA is the referral body for State issues relating to the protection of flora, fauna and wetlands. Referrals to DBCA are to be made where clearing is required and or crossing wetlands occurs as part of the construction works.

**City of Busselton (CoB):**

The CoB is the controlling body for all local roads within Busselton Water's License Area. Advice relating to works and issues relating to traffic management and planning shall be submitted to the CoB for comment and approval.

**Utility Providers (Western Power, ATCO Gas, Water Corporation, Telstra):**

Prior to the commencement of any works, Busselton Water shall request all relevant Dial Before You Dig information. Where drainage is considered an issue, Busselton Water shall liaise with the CoB to locate these facilities.

**Department of Planning, Lands and Heritage(DPLH):**

DPLH contains the centre of expertise for heritage and cultural issues and maintains a register of Aboriginal sites within Busselton Water's License Area. Where construction is undertaken in proximity to an Aboriginal site, Busselton Water will initiate a section 18 under the *Aboriginal Heritage Act 1972* prior to the commencement of works. Busselton Water also has a NSHA in place.

**Department of Water and Environmental Regulation (DWER):**

Within Busselton Water's Licence Area, DWER is the referral body for Federal issues relating to flora, fauna, wetlands and heritage places defined in the *EPBC Act 1999* as matters of national environmental significance. Referrals to DWER are to be made when carrying out works on nationally protected wetlands (RAMSAR).

DWER provides Government advice on the environmental acceptability of development proposals and planning schemes for mining, industry as well as infrastructure such as ports, railways and pipelines. DWER considers referrals and decides whether they require formal environmental assessments and at what level.

DWER is the licensing body for water extraction and allocation around the state. Busselton Water shall submit applications for new bore or refurbishment proposals to DWER. Any impacts upon a waterway, discharging, dewatering require notification.

**Main Roads WA (MRWA):**

The MRWA is the controlling body for all major roads within the State. Advice relating to works and issues relating to traffic management on major roads shall be submitted to MRWA for comment/approval.

**Customer Advice**

Once clearances for the proposed works are obtained from the necessary government departments, all affected, and/or adjoining landowners are to be advised of the works via a letter drop prior to construction. Domestic users shall be given a minimum of 48 hours' notice and commercial and industrial users a minimum of seven days' notice, in accordance with Busselton Water's Customer Charter. (Refer attachment 1 for examples).

**Government Departments and Utilities Contact Register**

<b>ORGANISATION</b>	<b>ADDRESS</b>	<b>PHONE</b>
Department of Biodiversity, Conservation and Attractions	14 Queen Street Busselton WA 6280	9752 5555
City of Busselton	Locked Bag 1 Busselton WA 6280	9781 0444
Western Power (Perth Office)	GPO Box L921 Perth WA 6842	13 10 87
ATCO Gas – Gas permits (Perth Office)	81 Prinsep Road Jandakot WA 6164	1300 926 755
Water Corporation Technical Department (Perth Office)	Locked Bag 2 Osborne Park Delivery Centre WA 6916	13 13 95
TELSTRA (Network Integrity Group)		1800 810 443
Department of Planning, Lands and Heritage (Perth Office)	PO Box 3153 East Perth WA 6892	1300 651 077
Department of Water and Environmental Regulation (Perth Office)	Level 4, The Atrium, 168 St Georges Terrace, Perth WA 6000	6364 7000
Department of Water and Environmental Regulation (Busselton Office)	PO Box 269 Busselton WA 6280	9781 0188
Main Roads WA (Bunbury Office)	PO Box 5010 Bunbury WA 6231	9724 5600

## **7. Minor works (Exempt works)**

Below is the definition of exempt works as stated in the Water Services Act 2012;

Exempt works are;

- the provision of undertaking of works that are not major or general works;
- the maintenance or repair of existing works;
- the making of alterations, extensions or additions to major or general works that will not materially alter the nature, scope or capacity of the works
- the making of alterations, extensions or additions to general works on –
  - (i) land owned by the licensee; or
  - (ii) a reserve under the Land Administration Act 1997, the care, control and management of which is placed with the licensee under that Act;

Exempt works are not subject to provisions as set out for Major and General Works, however utility information is to be requested for these works via “Dial before your dig”.

Prior to the construction of exempt works all affected and or adjoining landowners are to be advised of the works via a letter drop. Unless works are carried out in an emergency domestic user shall be given a minimum of 24 hour’s notice and commercial and industrial users a minimum of 7 days’ notice (refer attachment 1).



## 8. Design Guidelines

This Part of the Standard sets out drafting and design requirements of Busselton Water (BW). It shall be read in conjunction with Part 1 of the WSAA Code. In the event of conflict between the WSAA Code and this standard, the Standard shall take precedence.

### 8.1 Redevelopment of Existing Areas

The condition and adequacy of existing water supply mains in redevelopment proposal shall be assessed in consultation with BW.

### 8.2 Water Reticulation Planning for Subdivisions

Developer will propose the reticulation layout plan including reticulation main sizes and class, location of distribution main valves and hydrants, in accordance with the WSAA code and this standard. BW will review and confirm the above, as well as the capacities of other elements of the system to ensure the supply to and within the subdivision is integrated with the overall water supply scheme.

Where required BW will request its hydraulic consultant to undertake the design of reticulation and trunk mains. Prior to the request for hydraulic design BW will request a quote from the consultant and submit this to the developer. Works will not commence until payment is received.

### 8.3 Land Requirements

Fee simple ownership is BW's preferred land tenure for all its facilities. Where facilities are identified for a development land identified for those facilities is to be ceded to BW free of cost. In built up areas BW will negotiate with individual owners.

## 9. Technical Requirements (mains)

### 9.1 Design Basis

The design methodology provided in the WSAA Code is acceptable to BW, however design criteria in this Standard shall take precedence over the criteria in the WSAA Code.

BW requires the developer to pay a design fee for the hydraulic design, the development is then assessed to ensure the pipe network and pipe size meets minimum water licence requirements for the all stages of the development.

### 9.2 BW Basic Design Criteria

Under BW's existing customer charter, BW must supply a minimum static head of 15m and a maximum static head of 100m to every serviced lot within its licence area. BW requires all developments to be reviewed hydraulically in context with the water supply system. The BW consultant will review developments as follows:

- Elevation used to meet minimum pressure requirements for an urban property is the ground level found within the front 30m of the property. The highest contour is to be used to calculate the minimum head. Maximum head is to be calculated using the lowest contour. For larger lots where building envelopes

are clearly defined, the elevation used for maximum and minimum head calculations may be restricted to the area of the building envelope.

- Water reticulation mains shall be sized by BW's hydraulic consultant. In general, the consultant will size mains such that flow velocities are kept below 2 m/sec. Distribution, trunk and supply mains are to be assessed on an individual basis however flow velocities generally will not exceed 4m/sec with head losses of between two to three metres per kilometre considered acceptable.

### **9.3 Additional Design Considerations**

BW's consultant will design BW's water supply with the following guidelines:

- Reticulation mains shall be mains DN250mm and smaller (internal diameter).
- In urban, special rural and or high-density development, BW requires a minimum pipe size of DN 100.
- DN 150 pipe shall be used for areas zoned industrial and commercial.
- Larger mains are to be considered to meet future demand.
- Where practicable the reticulation is to form a series of closed loops to minimise dead end mains. Closed loop cul-de-sacs need a hydrant for disinfection and flushing.
- Where possible a group of 50 or more properties shall be supplied by more than one pipe route.
- A Property is to be serviced by a reticulation main along one of its street frontages (Road reserve) in normal circumstances. Laneways will only be allowed if no alternative exists and approved by BW.
- Dead end mains, should be avoided where possible. Where unavoidable they are generally located at the fringe of a reticulation network and shall be sized to cater for future mains extensions. Dead end mains for future development shall have a flushing point as part of the design to assist with water quality management.
- In general services will not be permitted off a main 300mm and larger (internal diameter).
- In general Developers will be required to install mains servicing their planned estate and to the edge of their block, where future connection is required.
- Designer must consider clashes with other street features such as curbing, street lighting, gates, fences, etc.

### **9.4 Alignment considerations**

- Mains are to be located within road reserves on an alignment of 2.1m measured from the property boundary in accordance with the Utility Providers Code of Practice Western Australia.
- Where road reserves are not available, easements are to be negotiated and provided within Developments on Crown land and or Public Open Space.
- Easements shall have a minimum width of 3m and shall where required as part of the subdivision process be transferred to BW free of cost and registered on the land title as an interest and notification.
- Where road reserve vegetation requires clearing, BW may request an easement over adjoining private property (eg farmland paddocks). The developer shall consult with the owner for the provision of an easement.
- Where possible the number of long services is to be minimised; thus, road reserves greater than 30m wide shall have mains located on both sides of the road.
- If a road crossing is unavoidable, each main should cross the road perpendicular to the road reserve boundary at 2.1m off the lot boundary and in line with property truncation point.

- Where a main is to cross a river via a bridge or other structures such as tunnels and or culverts, BW is to be presented with drawings of the proposal and a methodology outlining construction and maintenance issues.
- For river crossings where security of supply is considered an issue, main crossings shall be above ground.
- Mains with service offtakes under lane ways will not be accepted.

#### **9.4.1 Valves**

Sluice Valves shall be resilient seated – PN16 Clockwise Close coated and lined. Within a reticulation network, valves are required to isolate the mains for operational and maintenance purposes. Set out below are guidelines for the installation of valves such that it creates a minimal effect on residents within an area. The network is to be designed to enable the supply of water through alternative mains if the primary main is isolated, without affecting a large number of lots. A primary reticulation main supplies water to a number of secondary reticulation mains. The primary reticulation main is normally a 200mm or 250mm diameter main and supply's 150mm and 100mm (secondary reticulation) mains.

#### **9.4.2 Location of valves**

- All secondary reticulation mains supplied from the primary reticulation main have isolation valves at the off -take from the primary main
- It is possible to isolate any section of a primary reticulation main by the closure of no more than 7 isolating valves.
- Isolating any section of reticulation main interrupts supply to no more than 70 residential lots or 20 non-residential lots
- It is possible to isolate any section of reticulation (but not primary reticulation main) by the closure of no more than five isolating valves
- Valves are to be located opposite street boundary truncation points. Where there is no truncation, the valve shall be located 6m from the street boundary line.

#### **9.5 Hydrant Installation**

Hydrants shall be WA pattern 100mm screw-down type with integral yoke SPS 292 with built-in isolation valve and installed only on DN100 or larger pipes.

Hydrants shall be installed as per the specifications stated in the Department of Fire and Emergency Services (DFES) **Standard for Hydrant Installation**. (See attachment 3)

The DFES hydrant standard conditions have been developed from the Water Corporation Design Standard 63 for water service infrastructure.

#### **9.6 Air Valves**

Generally, air valves are not required throughout a reticulation system. However, air valves may be required on supply mains and or trunk mains, where required air valves are to be as follows:

- Air valves, where used in reticulation systems, shall be of DN 50 dual orifice installed with a flanged or threaded isolating valve.

#### **9.7 Scour Valves**

Scour valves are generally located along reticulation mains located in undulating terrain, or where installation of flushing points is not practical.

- Where required, scouring assembly shall include a DN 100 flanged sluice valve and installed to BW's requirements.

### **9.8 Flushing Points**

- All temporary blank ends and dead ends of mains shall be provided with flushing points.
- Temporary flushing points are to be located at cut-in points for current stage only. Any future connection points will be deemed as permanent.

### **9.9 Pressure Reducing Valves**

- Pressure reducing valves are not generally required within the BW water network however, if required, they shall be hydraulically operated and controlled by a Cla-Val CRD pilot control or Busselton Water approved equivalent.
- Installations are to be above ground and housed in a standard lockable vandal-proof metal cabinet.
- Cabinets shall have lockable doors or removable panels with concealed points of fastenings allowing maintenance access. The cabinets shall be subject to acceptance by BW.
- Pit type installation is not preferred and will only be approved in special circumstances.

### **9.10 Services**

- No services shall be connected directly to a distribution / trunk main in a development area.
- The number of long services shall be minimised wherever practicable.
- Each pre-laid service in developments shall be installed at time of water mains installation to the isolation tap.
- Each service riser pipe and isolation tap to have stand-up protector. Isolation taps to be 300mm from lot boundary and on the opposite boundary to the WP pillar.. As per Attachment 5 Lot entry Arrangements of utilities code of practice
- All short and long single services to be 25mm MDPE. All long dual services to be 32mm MDPE across road protected in a conduit in accordance with Water Corporation standard drawings (Series BD62-8)

### **9.11 Connections of Water Reticulation to Distribution / Trunk Mains**

- The location and size of water reticulation mains connected to distribution / trunk mains shall be determined by BW.
- For industrial subdivisions, the smallest connection shall be minimum DN 200.
- If more than 250 services are to be supplied from the connection, then the connection shall not be smaller than DN 300.

## **10. Drawings**

Drawings shall show sufficient detail to clearly indicate the design of the reticulation at a scale of either 1:1000 or 1:2000; drawings are to include the following:

- A legend indicating the symbols and abbreviations.
- A north direction arrows.
- Water reticulation boundaries.
- Street names, Cadastral boundaries, lot numbers and the total number of lots served (Detailing short and long services).
- Land use, e.g. duplex, POS, school, multi- residential etc.
- Land required by BW, Easements etc.
- Spot levels or contours (details of any significant level changes).
- Location of existing water mains, and proposed connection details.
- Pipe material, class and diameter, and total lengths of mains.
- Alignment of the pipe including location of valves, hydrants, flushing points, pre-laid services (including service pipeline) and an indication of lots to have deferred services.
- Other relevant features potentially impacting/ clashing with water mains such as curbing, street lighting, fencing, gates, etc.
- WAPC Number, plan number and any relevant standard drawings.

## 11. Constructed Information

As constructed documentation shall be supplied to BW by a licensed surveyor and shall be based on measurement of work prior to backfilling trenches and from installed cadastral survey pegs. All As Constructed information shall be to GDA2020/ MGA (Zone 50).

As Constructed Drawings are to detail the following:

- Text indicating the drawing is an As Constructed is to be placed on the drawing along with the surveyor's name and date the As Constructed was undertaken.
- The final design plan is to indicate, length of mains, type and class, the final lot layout and location of pre-laid services, valves and hydrants etc.
- A digital copy of the plan is to be supplied in either DGN (Preferred) or DWG / DXF format. The as constructed in to be spatially correct using GDA2020/ MGA Zone 50 coordinate system and all levels are to be based on AHD.
- Non-standard alignments are to be indicated on the plan in brackets e.g. (1.8)
- Street names, Reserves, Public Open Spaces.
- Busselton Water's Pipeline Construction and Design Standards must be utilised for as-constructed drawings to ensure they meet reticulation network mapping standards. Where BW standards are silent Water Corporation DS63, section 2.2.3 should be followed.
- Drawings to be scale of either 1:1000 or 1:2000.

## 12. Products and Materials

All water reticulation products shall be new and shall have mechanical corrosion resistant and operational characteristics that render it fit-for purpose in live service. The product shall be packaged such that when it is installed in accordance with the manufacturer's installation guidelines, it will operate in pressurised water networks within the specified operating parameters for at least 50 years prior to any major rehabilitation and or replacement.

All elements of water reticulation product in contact with drinking water shall comply with the requirements of AS/NZS4020.

Water reticulation products shall comply with the requirements of the relevant Australian Standard. Where Busselton Water requirements are silent, Water Corporation WA Strategic Product Register approved products are required. Pipes used for water mains shall comply with Table 1 below;

**Table 1**

Type of Pipe	Class of Pipe
Polyvinylchloride (PVC)	PVC-M Series 2 (RRJ) Class 16 AS/NZS 4765
Polyethylene (PE)	For open trench - PE100 PN16 AS/NZS 4130 For directionnel drilling minimum PE100 PN20. Resin to be in accordance with current Water Corporation strategic product register
Steel Pipe	MSCL Sintakote coating Steel Grade HA1016 to AS/NZS 1594
Polyethylene (PE) (Water Services)	PE PE100 PN20 AS/NZS 4130
Copper (CU) (Water Services)	AS 1432 Type B
Pipe Fittings	AS/NZS 2280 Ductile iron coated and lined to AS/NZS 4158 Rated PN16

## 13. Construction Requirements

Water reticulation shall be constructed to the requirements of BW and to the WSAA Code as required. Construction activities that may impact directly or indirectly on existing BW infrastructure are not permissible unless agreed in writing by BW.

### 13.1 Contractor Accreditation Requirements

Water reticulation construction personnel shall be accredited in accordance with the following accreditation programs, appropriate to the pipeline materials of each project:

- Steel pipeline construction –  
Course in Quality Installation of Sintakote Steel  
*Pipelines (Sintakote Pipelines Program) by Tyco Water.*  
*Telephone (03) 9217 3154,*
- PVC pipeline construction –  
PVC Pipe Laying Accreditation  
*Challenger TAFE Fremantle Campus,*  
*Telephone (08) 9239 8330,*
- PE pipeline welding work –  
Units of Competence from the National Training Package (NWP2000), Local  
Government Training Package (LGA00) or Civil Construction Training Package  
(BCC98)  
Units of competence required;  
(a) PMBWELD301A – Butt weld polyethylene plastic pipelines;  
(b) PMBWELD302A – Electrofusion weld polyethylene pipelines.  
At least one person in each pipe laying crew shall be accredited except that, for  
PE pipeline welding work, all welders shall be accredited.

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## **14. Prevention of Contamination**

During the construction of water reticulation, all materials, components and installation shall be configured to prevent any contamination of system water. A high standard of hygiene shall be maintained with respect to the personnel engaged and all materials, tools and equipment used in the construction of the work. Materials, tools or equipment used previously on live sewerage work shall not be permissible on water reticulation work.

## SECTION 3

### 15. Construction

#### 15.1 Survey and Setting Out

Water reticulation shall be set out in accordance with the design drawings. Any deviation from the accepted drawings shall be subject to the approval of BW. When final finished levels are achieved on lot boundaries after the completion of road reserve clearing and road earthworks:

- Sufficient cadastral survey pegs and temporary pegs along curved lot boundaries shall be installed to enable the proper construction of the water reticulation. All pegs shall be uniquely marked to be clearly identifiable in relation to individual lots.
- Cadastral survey pegs installed for the water reticulation work shall remain uncovered and undisturbed and shall be available for the Joint Final Inspection. Any disturbed cadastral survey pegs shall be re-established by a Licensed Surveyor.

#### 15.2 Handling of Pipes and Fittings

All pipes and fittings shall be handled and installed in a manner that will prevent physical or structural damage to pipes, coatings, linings and elastomeric seals.

Pipeline components including coatings and linings that are damaged, including scored pipe surfaces, and cement lining cracks larger than 0.1mm shall be rejected.

Pipes and fittings that have coatings or linings of polymeric or plastic materials shall not be exposed to the external environment for more than 12 months. Prior to use, all pipes are to be checked to ensure they are not out of date. Out of date materials will be rejected by BW.

#### 15.3 Pipe Alignment and Depth

##### 15.3.1 Alignment

Installation of pipe shall not commence until the cadastral survey pegs required to determine the pipe alignment are in position. The following requirements shall apply unless otherwise shown on Drawings:

- Alignments shall generally be in accordance with the Utility Providers Code of Practice, (water mains 2.1m); 1.8m to 2.4m alignment may be considered and approved by BW where clashes with other services occur. Alignments for large distribution/trunk water mains shall be 4.2m unless otherwise agreed to by BW.
- In a common trench, the water reticulation main shall be laid with other services in accordance with the alignments and depths shown on the design drawing.
- In Public Access Ways, Public Open Spaces and other reserves, the main shall be laid parallel to and on an alignment of 2.1m from the nearer side boundary.
- Mains shall be laid true to line within 100mm from their correct alignment, except where obstacles prevent access to the alignment. In such instances, a proposal that is acceptable to all utilities shall be submitted to BW. Agreed alignment variations shall be documented on the As Constructed Drawings

- Pipelines laid on alignments other than 2.1m must be installed with pipe identification/ detection tape 300mm above the pipe crown. Tape must comply with AS2648, include a metallic tracer wire (with corrosion resistance equal to or better than 316 stainless steel) in a sinusoidal wave pattern fully encapsulated within the tape.

### **15.3.2 Cover in Verge**

- Generally, pipes shall be laid as straight as practicable and in compliance with manufacturer's recommendations while maintaining the appropriate minimum cover of 600mm for reticulation mains (less than 250mm diameter) and 900mm for trunk mains (250mm diameter and above) Where a change in grade occurs, the mains shall be laid to avoid exceeding the maximum allowable deflection allowed under the manufacturer's recommendations.
- Maximum cover on reticulation mains of 900mm and 1100mm on trunk mains is allowed.
- A minimum clearance of 100mm all around shall be maintained where the distribution main is to be installed near existing and or proposed services.
- A minimum clearance of 300mm all around shall be maintained where the trunk main is to be installed near existing and or proposed services.
- The depth to the top of the pipe from the final verge level and the gutter level shall be established at intervals not exceeding 50 metres and recorded on the As Constructed Drawings.
- Concrete encasement or protective cover slabs may be allowed by BW in specific cases.

### **15.4 Excavation and Bedding**

Prior to excavation works, all utility facilities are to be located and potholed and any service clashes reported to BW before installation of the mains. All temporary work required to support Public Utility services shall be carried out to ensure that the operation of the services is not interrupted in any way.

#### **15.4.1 Excavation**

Where open trench excavation is proposed, pipe trenches shall be excavated to alignments, depths and widths required by the design drawings. The following requirements shall also apply:

- Where necessary trenches shall be dewatered until each section of main has been completed and tested.
- Groundwater shall not be allowed to enter pipes.
- Over excavation of the trench shall be backfilled and compacted with suitable bedding material.

Where open trench excavation is not practicable, such as across major roads, freeways and railways, under major obstructions, and wherever shown on the Drawings, the pipeline shall be installed by trenchless technology. The methods shall be to the requirements of the controlling authority (eg MRWA) and acceptable to BW.

#### **15.4.2 Bedding**

Bedding material shall be in accordance with the Drawings and shall meet the following requirements:

- For trenches in sand the natural soil at the trench bottom shall be compacted.

- For trenches in gravel and or non-granular soils the trench shall be over-excavated by at least 150mm, in depth and refilled with suitable imported bedding material, and compacted.

In all cases the trench bottom shall be hand trimmed immediately before placing the pipe to provide even support to the whole pipe barrel.

## **16. Pipe Laying and Jointing**

### **16.1 Preparation Prior to installation**

- Pipes shall be examined for cracks, scoring, gouges or any other defects. Where defective pipes are identified they will be rejected by BW.
- Sand and other foreign materials shall be removed from the pipe bore.
- And jointing pipe spigots, socket surfaces and elastomeric rings are to be cleaned.

## **17. Jointing**

### **17.1 PVC to PVC Pipes and Fittings**

Joints between PVC pipes and fittings shall be made with elastomeric seals in accordance with the manufacturer's instructions:

- Pipes are to be installed in a straight line prior to making the joint.
- Only jointing lubricant specified by the pipe manufacturer is to be used
- Socket joints are to be adequately restrained to prevent movement during the jointing process
- Spigot Joints are to be pushed home in a manner recommended by the pipe manufacturer until the witness mark is just visible.
- Pipes damaged during the jointing process are to be removed and replaced.
- Where PVC pipe is cut on site, the cut end shall be chamfered, and witness marked in accordance with the manufacturer's instructions.

### **17.2 PVC to DI Pipes and Fittings**

- PVC socket ends shall be jointed with matching PVC spigot ends only in order to achieve a watertight joint.
- No metallic pipe or pipe fitting spigots shall be jointed to PVC socket ends.
- Where a PVC pipe is cut on site, the cut end shall be chamfered, and witness marked in accordance with the manufacturer's instructions without damaging the pipe.

### **17.3 DI to DI Pipes and Fittings**

- Ductile iron pipes shall be jointed with elastomeric joint seals in accordance with the manufacturer's instructions:
- Each seal is to be retained in the socket groove of the previously laid pipe without any twist or buckle.
- The spigot end of the pipe is to be laid and centred within the elastomeric seal and supported until the jointing process is completed.
- The pipe is "pushed home" firmly and straight in the socket of the previously laid pipe and is to be restrained from springing back.

- Each spigot end of a cut pipe shall be chamfered in accordance with the manufacturer's instructions.

#### **17.4 Jointing of Steel Pipes and Fittings**

Elastomeric seal jointed steel pipes shall be installed in compliance with the manufacturer's instructions. Fittings shall be welded as for weld-jointed steel pipes. Where steel pipes are weld-jointed, installation shall be in accordance with the Steel Pipeline System Handling and Installation Manual and the following requirements:

- All pipe welding shall be in accordance with AS 4041 Pipe work Class 2P, Corporation Welding Specification WS-1 and the Drawings;
- Pipe flanges for valve connections shall be welded to pipes in accordance with the Drawing DS 65 AY58-15-1 of the Water Corporation Pipe Fittings Standard Drawings;
- Welding procedures and qualification of each welder and welding operator shall be in accordance with AS4041 and the requirements of Corporation Welding Specification WS-1;
- Where the cement mortar lining of a pipe or fitting cannot be readily reinstated at the welded joint, a convex band shall be welded over the joint. When the band has cooled, it shall be fully injected with cement grout through a hole in the bottom or side which is then sealed with a welded cap once the grout has set;
- All cut ends and welded areas shall be protected as required by sub-clause "Protection of Steel Pipes from Corrosion" under 17.6.
- Welded joints may be subject to visual examination by BW for acceptance of welding work.

#### **17.5 PE to PE Pipes and Fittings**

- PE pipes and pipe fittings and their jointing shall comply with the requirements in (WSAA) codes.
- Where butt fusion weld jointing is expressly permitted, the pipes shall be prepared for welding in accordance with pipe manufacturer's recommendation.

#### **17.6 Protection of Steel Pipes from Corrosion**

- Damaged pipe coating shall be primed, filled with butyl mastic and wrapped with a 2mm thick reinforced bitumen mastic with PVC backing (Densopol 80, Rockrap 4000 Tape System or approved equivalent), in accordance with the manufacturer's application specification.
- All welded joints, bands, bends, tees, flanges; flange and valve body assembly bolts shall be primed and wrapped with a butyl mastic tape and PVC overwrap system (Denso or approved equivalent) in accordance with the manufacturer's application specification.
- For pipes emerging from below ground, the tape wrapping shall extend to 100mm above the finished ground level.
- Where a protective coating system is used, pipeline and valve surfaces shall be prepared so that rust and any other deleterious materials are removed in accordance with the coating manufacturer's requirements
- In all circumstances, the minimum surface preparation requirements shall be degreasing and mechanical wire brushing to obtain a Class 2 cleanliness in accordance with AS 1627 Part 2.

## **18. Laying of Pipes and Installation of Fittings**

Pipes shall be laid to the following general requirements. At the end of each day's work or at any time when pipe laying is suspended, every open end of each incomplete pipeline shall be plugged with a tapered stopper or an acceptable end cap matching the pipe. No tools or any construction materials shall remain in the pipes.

### **18.1 DI pipeline system**

- Purpose made polyethylene sleeving shall be installed in accordance with the pipe manufacturer's recommendations.
- Any rupture in the sleeving due to damage shall be overwrapped and securely taped.

### **18.2 PVC pipeline system**

- PVC pipelines shall be laid in accordance with manufacturer's instructions and in accordance with the practices recommended in the PVC pipe laying accreditation course.

### **18.3 PE pipeline system**

- PE pipelines shall be laid in accordance with manufacturer's instructions and practices recommended in the PE butt welding accreditation course.
- Allowance shall be made for the likely pipe movement due to temperature changes during installation and commissioning. A final service temperature of  $20^{\circ}\pm 5^{\circ}\text{C}$  may be assumed unless otherwise specified in the Drawings. Pipe lengths and bend locations shall be adjusted for changes in length that will occur when the temperature stabilises at the final service temperature.
- The trenches shall not be backfilled unless the ambient temperature is within  $\pm 5^{\circ}\text{C}$  of the final service temperature.
- PE pipes within the trench may "snake" if the final "snaked" alignment at the final stabilised service temperature is within 100mm of the correct alignment.

### **18.4 Major road crossings**

The pipes shall be laid continuous under road pavement and extend 1.5 metres beyond the road shoulder. The pipeline under the road pavement shall not contain:

- an elastomeric seal or mechanical joint;
- An electrofusion fitting or butt-welded joint in a PE pipe, if the crossing is constructed by trenchless method without being encased in a pipe sleeve.
- Mild steel weld-jointed pipes shall have external fusion bonded polyethylene coating and internal cement lining and shall be in the longest practicable lengths, to minimise the number of welded joints under the road pavement.
- Road Crossings shall cross at 90 degrees to ensure the minimum length under roads. unless approved otherwise in writing by Busseton Water.
- A minimum cover of 1000mm shall be maintained under all road pavement. Mains Roads WA requirements have to be followed where applicable and may be in excess of the above.

### **18.5 Bridge, tunnel and river crossings**

- Each crossing proposal shall detail the construction methodology together with the approval of relevant authorities and shall be submitted to BW for consideration and acceptance.

## **18.6 Bends and Pipe Deflections**

- A pipeline required to follow a long curve may be laid and jointed with deflections at the joints. The maximum angular deflection at a pipe joint shall not exceed the pipe manufacturer's recommendations. Bending of pipes to achieve a curve or for any other purpose is prohibited, except for PE and CU pipes.
- PE pipes may be laid in a curve of radius that is not less than the manufacturer's recommendations.
- An acceptable pipe-bending tool shall be used to bend CU pipe. Crimped or distorted pipes shall be rejected.
- Where the required angle change exceeds the permissible joint deflection, standard bend fittings shall be used.
- Bends shall be installed opposite cadastral survey pegs unless otherwise shown on the Drawings and or accepted by BW.
- Where a bend is required on a truncation at which a valve is also required, the bend and the valve shall be separated by an 800mm minimum length of straight pipe.

## **18.7 Installation of Fittings and Valves**

- The mating flanges of all flanged joints where dissimilar metal contact may occur shall be electrically isolated by means of acceptable flange insulation kits.
- The inside of all valves, hydrants and fittings and the mating surfaces of the spigot ends, collars, flanges and rubber rings shall be cleaned immediately prior to installation and before jointing.
- Pipes shall be cut to ensure installation of fittings in the correct location. The minimum pipe length between adjacent elastomeric seal jointed fittings shall be 1000mm without anchorage and 800mm with anchorage.

## **18.8 Hydrant Risers**

- A double flanged hydrant riser pipe of the appropriate length shall be installed on a hydrant tee to suit the final verge level above the tee. The hydrant installation shall then be completed in accordance with the Water Corporations Standards Drawings. (Series BD62-2-1)

## **18.9 Flushing Points**

- Flushing points on all permanent and temporary blank ends shall be installed in accordance with the Water Corporations Standards Drawings (Series BD62-2-2) and in the locations designated on the approved construction drawings. Except, DN50 gate valve with CI handle to be replaced with DN50 brass ball valve.

## **18.10 Valves**

- All valves and fittings that are non-compliant or defective shall be rejected.
- If a sluice valve and a bend are both required at a truncation, the valve may, subject to agreement, be displaced from the point opposite the truncation by 800mm. The valve shall be positioned in the location least likely to be paved.

### **18.10.1 Covers, Frames and Surrounds**

- Covers, frames and service chamber assemblies for sluice valves, gate valves, stop valves, hydrants and flushing points shall be installed so that the cover level is flush with the final surface level and to the requirements shown on the Drawings.
- Valve Box to have BW moulded in top painted Blue. Busselton Water require valve boxes to be purchased direct from Busselton Water.

### **18.11 Temporary Blank Ends**

- Temporary blank end caps shall be installed on new pipelines to be connected to existing water mains. The end caps shall be installed approximately 4m from the existing water main and shall be clear of any pavement.
- Temporary blank ends shall be adequately anchored to withstand test pressure.

### **18.12 Connection to Existing Water Mains**

- End of main shall be aligned to ensure a straight connection can be installed with no deflection. Existing main location and height to be potholed and confirmed prior to works by Developer.
- Connection zone to be kept clear of other services.

Work on or connection of new pipelines to existing water mains is not permissible unless:

- Written acceptance has been obtained from BW.
- All required pressure testing of the new water reticulation has been successfully conducted and accepted.
- The new water reticulation has been disinfected by BW with confirmation passing test results have been received.
- New mains shall be laid at the specified depths and alignments after ascertaining by manual excavation methods the positions of other existing services in the vicinity.
- Interference with, or operation of any existing main or valve or fitting is not permitted unless approved by BW.

## **19. Thrust Supports and Anchors**

Thrust supports for permanent installation shall be of formed concrete. For temporary installation, repairs and where concreting work is impracticable, jarrah timber may be used. Thrust supports for multiple or compound bend arrangements shall be of concrete only. (Refer attachment 2 for standard concrete thrust supports)

Flange bolts shall be installed with the washers and nuts furthest from any concrete thrust support. Bolt heads must not be encased by the concrete. Corrosion protection of the flange bolts shall be carried out prior to construction of concrete thrust supports.

Thrust supports shall not extend more than 300mm from nominated alignments except where otherwise accepted by BW. Thrust supports shall be installed and the trench backfilled and compacted prior to commencement of pressure testing.

## 19.1 Steel Pipe Anchorage

- Buried Steel Pipeline

Where buried steel pipes are used, thrust supports may be replaced by welded pipeline sections installed on both sides of the fittings as indicated in Table 2 below

**Table 2**

Size DN(mm)	Min Length of Weld (m) each side of pipe		
	45 Degree Bend	60 Degree Bend	90 Degree Bend
100	6	10	30
150	6	10	30
200	6	15	40
250	6	15	40

Note: The lengths are valid for; maximum hydraulic pressure of 1200kPa in pipe, and a minimum 600mm well compacted soil cover over pipes.

- Above Ground Steel Pipeline

Anchorage for above ground steel pipeline shall be constructed to the Drawing details which shall provide for the maximum combined effects of thermal (including link-in temperature), hydraulic, pipe jointing and pipeline support conditions

### Backfill

Initial backfill shall be selected fill material placed and compacted to provide continuous support to the pipe as shown in the standard drawings.

Initial backfill at the sides and up to 150mm above the pipe shall be well compacted so that no joints or pipes are disturbed or damaged. All joints shall be left exposed until the preliminary pressure tests have been successfully completed.

Final backfill of pipe trenches shall be carried out to the requirements of the Drawings.

Where the excavated soil is not suitable for final backfill, imported granular material complying with the requirements shall be imported for backfill.

Except where thrust support by backfill is required for pressure testing, final backfill shall not be carried out until:

- the As Constructed measurements have been taken for pipes and fittings in pipe trenches;
- The Official Pressure Test is accepted, and height and position have been complied with for service risers.

Where backfill is required to provide thrust support, for pressure testing, it shall be carried out only after the As Constructed measurements have been taken.

Any backfilling carried out prior to complying with the above requirements will be rejected and the reticulation may be required to undergo a further pressure test. Compacted final backfill shall be finished as follows:

- In a road verge - levelled to the final verge level.
- Within a pavement area - to the levels meeting the road authority's requirements for the pavement construction.
- At service tapping points and around service risers – to the agreed final ground level.

Sections of water reticulation damaged and repaired during backfilling will require another official pressure test after reinstatement

### **19.2 Backfill around Valves, Hydrants, Flushing Points and Service Connections**

Granular material shall be used for backfilling around all valves, hydrants, flushing points and service connections.

### **19.3 Restoration of Road Reserves and Access Ways**

After backfilling pavements in road reserves or access ways shall be temporarily reinstated and maintained in a safe condition for vehicles and pedestrian traffic. The final surface treatment, including restoration of road pavements, footpaths, landscaping and vegetation shall be to the requirements of the road authority or local authority as appropriate.

## **20. Testing of Mains and Service Connections**

Each pipeline and service connection shall be subjected to a successful preliminary pressure test before carrying out the Official Pressure Test. Official Pressure Tests shall be witnessed by the Construction Engineer and a Busselton Water representative. Details of each Official Pressure Test shall be recorded on a Pressure Test Record Sheet included in this part of the Standard. Each record sheet shall be kept and a copy submitted to BW for its records.

Water service connections may be pressure tested separately to, or in combination with reticulation mains. The tapings and all riser joints and fittings shall remain exposed to allow viewing during the pressure test.

The use of sealant or similar products to plug any detected leakage is not permitted.

### **20.1 Preparation**

Mains shall not be tested until at least 24 hours after concrete thrust supports have been constructed. The following requirements shall be met prior to testing:

- The difference in elevation between any two points on the section of the main under test shall be not greater than 30 metres;
- At least 300mm of suitable fill material shall be placed over the initial backfill for the section of pipeline to be tested, leaving all meter risers, stop tap, water service tapings and hydrant tee flanges exposed to view;

- The pressure test gauge shall be located as close as practicable to the lowest point of the test section.
- All water service tapping points and riser joints included for the pressure test shall be exposed for inspection. All property service stop taps shall be in the open position and have their outlets plugged at the time of testing;
- Where a valve is shut to form one end of a test section, suitable temporary supports shall be installed to prevent the valve moving due to unbalanced hydraulic thrust.
- No pressure testing against valves on live mains shall be conducted prior to approval from BW.

## **20.2 Filling Mains for Testing**

The section of the main to be tested shall be filled gradually with potable water acceptable to Busselton Water. Filling of the main shall be completed at least 24 hours prior to the commencement of the Official Pressure Test. For cement mortar lined pipelines this period shall be 48 hours prior to testing to allow for absorption.

Water for testing purposes may be obtained from the BW live mains provided prior approval has been given by, and detail arrangements for the draining of test water have been made with the BW.

The use of Dyes in test water shall only be acceptable if specifically approved on a job-by-job basis by Busselton Water.

Air from the test section should be expelled. If necessary, temporary air vents may be provided by the use of appropriate tapping band. Temporary air vents shall be removed upon completion of the test and the tapping point sealed with a suitable plug.

## **20.3 Test Equipment**

Main or isolated sections of the main shall be pressure tested by means of a pump capable of raising and maintaining the hydraulic pressure for the duration of the test.

A calibrated pressure gauge of minimum diameter 100mm and maximum 50kPa pressure graduation intervals shall be connected to the pipeline to be tested.

## **20.4 Official Pressure Test**

Each test section shall be subjected to a hydraulic pressure test of 1.25 times the design pressure (H) for the section under test (1.25H), or 1200 kPa (120m head of water) whichever is the higher, as measured at the lowest point of the test section, unless otherwise requested by BW.

For large diameter PE tests, alternative test methods such as in line with AS2566, can be requested to BW.

## **20.5 Test Procedures**

For all water reticulation systems, the test shall be carried out with the test pressure maintained for as long as necessary to inspect all joints and fittings within the test section by a Busselton Water representative. The duration of the test shall not be less than one hour. The Construction Engineer and or representative shall give no less than 48 hours' notice prior to the water pressure test.

### **20.5.1 Steel, PVC, DI and Copper Pipeline Systems including PE in Cul-de-Sac**

The test shall be carried out as outlined in the Code generally except that no water loss or pressure drop during the test shall be acceptable.

### **20.5.2 PE Pipeline Systems**

The test shall be carried out as outlined in Busselton Water HYDROSTATIC TESTING OF HDPE PIPE SYSTEMS attached at the end of this Part, except for the test pressure and test duration requirements herein. Section 2.13 of WSA 01-2004 can be used as an alternative testing method with approval of Busselton Water.

### **20.5.3 Water Service Connections**

Each water service shall be flushed for its full length with water from the main to remove any foreign matter or air. The outlet of the stop tap shall then be sealed with a brass or plastic threaded plug and the stop tap turned on before commencing the pressure test. During the test the copper riser pipe shall be lowered or raised, and the rotated joint inspected for leakage.

### **20.6 Test Compliance Criteria**

Subject to all test preparation and procedures being adhered to, a pressure test shall be acceptable if the following are met:

- There is no visible leak or evidence of leakage detected from the sections/mains being tested.
- There is no loss of water from any pipeline section under test.
- There is no visible leak or evidence of leakage from all water service tapping point or riser joint during testing.

### **20.7 Re-Testing**

If a test section fails the pressure test, the cause of failure shall be determined and rectified. The section shall be re-tested until an acceptable test result is achieved.

### **20.8 Post-Test Requirements**

After satisfactory completion of the pressure test, the test section shall be left charged. All sluice valves and section gate valves shall be left fully opened and all hydrants, flushing points and tapping at temporary dead ends shall remain closed.

After successful pressure test and before backfilling of a pipe trench, the stop tap in the service connection shall be turned off. The stop tap shall then be fitted with a fabricated "stand-up service protector" and the stop tap outlet fitted with a security plug in accordance with Water Corporation Drawings (Series BD64 -9-1 and 2).

## **HYDROSTATIC TESTING OF HDPE PIPE SYSTEMS**

### **1.1 General**

Upon substantial completion of the pipeline or major sections, the line shall be cleaned and hydrostatically tested to detect any leakage prior to commissioning. Testing shall be performed in accordance with the procedure described below. The Contractor shall supply all necessary fittings, equipment and facilities required to undertake the testing. It should be noted that any hydrostatic test is an assessment of the current state of the system, and a pass result is not a guarantee of good workmanship.

### **1.2 Notes on Test Equipment**

The pressure gauge shall be calibrated, certified and accurate to 10kPa. It shall be connected to the feed pipework. It is good practice to include a second gauge for comparison.

The small diameter test pipework shall include a bleed valve at upper end of the pipeline and at all high points together with feed pipework and valve at the lower end of the pipeline. The feed pipework shall include a means of draining off the water in to a measuring cylinder that shall have a capacity of at least 2 litres capacity, graduated to 100ml.

The Contractor shall also have a thermometer for air and water temperature measurement.

### **1.3 Differences in elevation**

Care should be taken not to over pressure the lower end of the system during testing. Gauges should always be placed at the lower end of the length under test. As far as possible the difference between the lower and upper end should be kept to one bar. It is recognized that this may not always be possible when longer lengths are being tested, or where the slope of the pipeline makes it impractical.

### **1.4 Test pressures at elevated temperature**

Where the phase II pressure is within the pressure rating of the pipe and test temperatures are 30 °C or less no adjustment of test pressure is necessary.

When ambient temperatures at the time of test are over 30°C and test pressures are over the pressure rating of the pipe then it may be necessary to modify the test pressure according to the table below or as agreed with the pipe manufacturer.

### **1.5 Additional Notes**

Care should be taken that any mechanical elements on the system are protected from elevated pressure or completely removed from the pipeline.

Do not subject the line to prolonged over-pressure. Always aim to complete the procedure within one working day.

During the summer make sure that the pipe is not subject to direct sunlight during testing.

During pressure testing pay full attention to the OHS aspects of the procedure. Keep the general public away from high pressure test areas.

Test Temp. (°C)	32	38	43	49	54	60
Multiplier	0.9	0.8	0.75	0.65	0.6	0.5

The test equipment must be capable of pressurizing the test length within a reasonable time. If the procedure becomes protracted (beyond one working day) the test length may be modified or reviewed. Extremely long test lengths may be subject to special procedures.

**1.6 Outline Test Procedure**

Seal the pipeline. Fix all blank flanges. Remove air valves. Remove all on line equipment that may be damaged by high pressure. Only test against blank flanges or end caps, do not attempt to test against closed valves.

Cover the pipe with sufficient backfill to protect it from direct sunlight, leaving joints exposed where practical. If backfilling is not practicable schedule the tests for early morning or evening.

Fill the pipeline from the lowest point. Bleed the air from all high points and flange points where it is possible and tighten once water begins to spill.

When the line is full, close off the filling valve and check all flanges and the small diameter test pipework for leaks.

**Phase 1**

Commence raising the pressure at the filling point to the operating pressure or a pressure of 500kPa, whichever is higher. Hold this pressure for a period of 2 hours and add water whenever the pressure drops by 20kPa to maintain a steady pressure.

Visually inspect the pipe length for leakage.

**Phase 2**

After two hours raise the pressure to 1.3 times the operating pressure or 1000kPa, whichever is higher (but not higher than 1.25 times the maximum operating pressure at 20°C of the lowest rated component in the system), as quickly as is practical. Again, maintain this pressure for two hours by adding water whenever the pressure drops by 20kPa.

Visually inspect the pipe length for leakage.

### **Phase 3**

At the end of the second two hours release the pressure back down to the phase 1 level i.e. the operating pressure or 500kPa, within a period of no more than 30 minutes and as quickly as is practical, in a controlled manner. Shut off the test pump valve and observe pressure gauge for one hour.

#### **Phase 3 – Case 1**

If after one hour the pressure in the pipelines remains at or above the Phase 1 pressure, the test is completed with the pipeline passing the hydrostatic test.

#### **Phase 3 – Case 2**

If after one hour the pressure in the pipeline has fallen below the Phase 1 pressure, water shall be added to raise the pressure back to the Phase 1 pressure level, having first noted the low pressure before adding any water.

#### **Phase 3 – Case 2**

Measure the added water by draining it off into a measuring cylinder. (i.e. reduce pressure to the previously recorded low value and save the water bled off). The measured quantity is then compared against the allowable quantity to determine if the pipeline passes the hydrostatic pressure test.

### **1.7 Test Result**

If during Phase 3 the pressure within the pipeline remains at or above the operational pressure of the pipeline for a period of at least one hour, the pipeline is considered to have passed the hydrostatic test.

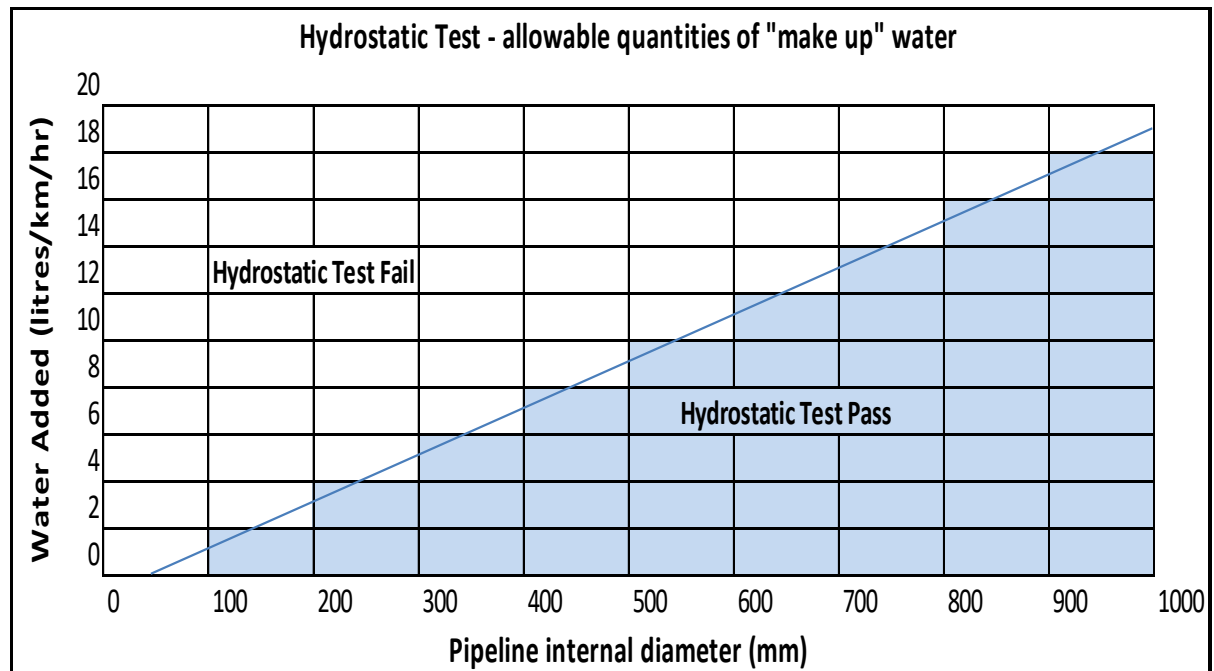
If water needs to be added the pipeline is considered to have passed the hydrostatic test if the quantity of water added in terms of litres of water per km of pipeline length per hour of the phase 3 period is less than that given in the following expression and in **Figure 3**.

Q= added water in litres

DI= internal diameter for the pipeline in mm

(i.e. Internal Diameter divided by 50, minus 1, equals litres/ km/ hour

**Figure 3**



**Commissioning**

The established water business flushing and disinfection methods currently used for PVC and DI pipe shall be adopted for PE pipe. These methods may be adapted to meet particular PE installation conditions, e.g. pre-chlorination of slip lined mains.

## **21. Prelaid Water Service Connections**

Prelaid water service connections in new subdivisions shall be installed in accordance with the Standard Water Service Drawing (refer attachment 4) and Water Corporation standard drawings (Series BD62-8).

### **21.1 Alignment and Depth**

Water services shall be installed where shown on the Drawings in accordance with the typical arrangements shown on the Drawings.

Where it may prove impracticable to comply with the requirements due to concealed obstructions, alteration will require BW approval.

A minimum of 100mm clearance all round shall be provided for all water service pipes relative to other services.

### **21.2 Road Crossings**

Road crossings for service connections shall be installed prior to the construction of the road and inserted through service conduits. Service conduit is to be sealed around the service line immediately after installation. Immediately after installation the ends of the service pipes shall be temporarily enclosed with a plastic bag securely fastened with adhesive tape in accordance with WC standard drawing BD62-8-8.

### **21.3 Tapping Reticulation Mains**

Service tapping locations on water reticulation mains shall be located within 100mm of the standard service alignment unless constrained by the following:

- A minimum of 500mm from a pipe or pipe fitting socket.
- A minimum of 500mm from an adjoining tapping.
- When tapping PVC and PE mains, the swarf and coupon shall not be permitted to fall into the main.
- The tapping band shall be installed so that the off-take is centrally positioned over the tapping hole in the main and in accordance with BW Standard Water Service Drawing. (refer attachment 4)
- Brass Ball valve tapped on 20-45° angle, must connect from tapping band to service pipe work.
- Fittings shall be assembled and jointed in accordance with the manufacturer's recommendations.
- Each threaded joint shall be sealed with PTFE thread tape or Teflon jointing compound applied in accordance with the manufacturer's recommendations.
- Tapping or service pipe work which is positioned more than 200mm from the standard or agreed service location in the road reserve or 100mm within a property will be deemed defective and will be rejected by BW.

---

## **22. Miscellaneous Works**

### **22.1 Road Markings**

Road markings shall be provided and installed by the contractor to indicate the location of valves, permanent flushing points and hydrants. The kerb marking, shall be placed adjacent to the fittings and marked with a suitable blue line marking paint.

Hydrant marking specifications are available by contacting DFES.

### **22.2 Marker Posts**

Where there is no kerbing, metal marker posts shall be provided and installed to indicate the position of valves, flushing points and hydrants.

Hydrant marker post specifications are available by contacting DFES.

### **22.3 Fire services**

Where a customer requires a fire service, their hydraulic consultant must contact BW with their requirements for sizing of fire service. This information will then be assessed by BW, and a quote provided. Any specific requirements such as monitored wafer butterfly valves, should be explicitly stated by the hydraulic consultant.

## **23. Non-Conformance Process**

Busselton Water has a non conformance process to ensure that the installation of new water mains adheres to required standards, regulations, and industry best practices. Any non-conformances are to be highlighted via the non-conformance report (NCR) template in attachment 6. Key functions of the non conformance process are:

1. **Quality Assurance:** ensuring that the installation of new water mains meets the required quality standards. It involves documenting any deviations from the specified requirements and taking corrective actions to address them, thus ensuring the integrity and reliability of the water distribution system.
2. **Compliance:** By identifying and addressing non-conformances during the installation process, the NCR process ensures compliance with relevant regulations, codes, and standards governing water main installation. This includes adherence to safety regulations, material specifications, and construction practices mandated by local authorities and industry bodies.
3. **Risk Management:** Detecting and rectifying non-conformances early in the installation process helps mitigate risks associated with water main failures, leaks, and other operational issues. Addressing potential issues proactively reduces the likelihood of costly repairs, service disruptions, and safety hazards in the future.
4. **Documentation and Accountability:** The NCR process involves documenting instances of non-conformance, including the nature of the deviation, its root cause, and the corrective actions taken. This documentation serves as a record of accountability, providing transparency and traceability throughout the installation project.
5. **Continuous Improvement:** By analysing trends in non-conformances and identifying recurring issues, the NCR process facilitates continuous improvement in installation practices. Lessons learned from past projects can inform future initiatives, leading to enhanced efficiency, effectiveness, and reliability in water main installations.
6. **Customer Satisfaction:** Ensuring that new water mains are installed correctly and in accordance with quality standards contributes to customer satisfaction. Reliable water supply infrastructure promotes confidence among residents, businesses, and other stakeholders, fostering trust in the water utility's ability to deliver safe and reliable services.

Overall, the NCR process for the installation of new water mains serves as a critical quality assurance mechanism, ensuring that infrastructure projects meet the required standards, comply with regulations, and deliver long-term value to the community.

**WATER RETICULATION OFFICIAL PRESSURE TEST RECORD SHEET**

Subdivision Estate Name/Description of Main:

.....  
 .....

Busselton Water File No.....

WAPC No:.....

Busselton Water Drg No:.....

Busselton Water Inspection Officer:

.....

Contractor:

.....

Mains Tested in accordance with the requirements of Busselton Water's Water Reticulation Standard.

MAIN DIA.	TYPE	LENGTH	REMARKS

**NOTE: There are no allowable leakage rates for any type of pipe.**

Date Tested:

.....PASSED/FAILED

Test Pressure..... kPa

Duration of Test MINUTES

Signature of Contractor's Representative Date:

Name of Contractor's Representative:

.....

Witnessed By: Busselton Water Inspection Officer

Date:

## SECTION 4

### 24. Contractor Requirements

This section is to be read in conjunction with section 3 and sets out contractors' obligations and requirements in relation to works undertaken for and on behalf of BW.

In general, works undertaken by contractors will be either within the road reserve or on freehold Busselton Water sites. In all cases the contractor will be required to adhere to the highest possible standards for Work Health and Safety.

The contractor will need to demonstrate to Busselton Water that all the necessary procedures, accreditations and insurances are in place as follows.

- Provision of up to date copies of insurances relating to Workers Compensation and Public Indemnity.
- Certificates required for the works to be carried out (e.g. pipelaying accreditation, machinery operating tickets, basic traffic management, welding accreditation etc.)
- Evidence of electrical tagging of equipment and machinery/plant maintenance records prior to contract award and/or commencement of work.
- Daily submission of a Job Safety Analysis (JSA) reviewing risks and proposals to reduce risk.
- Any relevant licenses specific to the works to be undertaken.
- All contractors entering the site prior to commencement of works will be required to undertake a site-specific contractor induction.

The contractor at all times will be required to ensure the site is kept clean, tidy, safe and secure and that appropriate fencing, signage, traffic management and traffic control is in place. Contractors are to ensure all the necessary PPE are made available to its employees.

Busselton Water requires subcontractors to wear as minimum, long pants, hi-vis long shirt and steel cap boots at all times. Failure to comply with one or of the above will result in the issue of a stop work notice.

Busselton Water has a policy on drugs and alcohol in the workplace which includes random testing. Visitors have a responsibility to present to the workplace in a condition in which they are fit to carry out the requirements of the visit and may be subjected to testing for drugs and alcohol at Busselton Water workplaces.

## 25. Job Safety Analysis

### JHA - Job Hazard Assessment

Complete this form for tasks that are ROUTINE: MODERATE TO HIGH RISK • NON-ROUTINE: LOW-RISK



Date: \_\_\_ / \_\_\_ / \_\_\_ Task: \_\_\_\_\_ Job #: \_\_\_\_\_

#### STEP 1 ▼

SOP #: \_\_\_\_\_

IDENTIFY HAZARDS	TICK	IDENTIFY HAZARDS	TICK	IDENTIFY HAZARDS	TICK
Fatigue		Hot work (eg. Welding)		Public / customers / contractors	
Driving		Incllement weather (eg. heat, wind)		Service under pressure	
Asbestos		Insects / aggressive animals		Slip/ trip obstacles	
Chemical exposure		Manual handling / ergonomics		Sharps	
Confined space entry (Complete JSA)		Mobile plant (eg. excavator)		Traffic	
Electricity / power / radiation		Night work / poor lighting		Underground services	
Electrified meter		Noise		Wet / unstable surfaces	
Energised equipment		Overhead objects		Working alone	
Excavation		Overhead power			
Falls from height		Pinch / crush points			
Fumes / dust / hazardous gases					

CONTROLS FOR FATIGUE	TICK	CONTROLS FOR DRIVING	TICK	CONTROLS FOR DRIVING	TICK
Work day not exceeding 12 hours		Lone worker		Water, first aid kit	
10 hour break before work day				Vehicle checks	
Adequate breaks during task					

#### STEP 2 ▼ Choose ALL appropriate controls for ALL hazards ticked.

CHOOSE CONTROLS	TICK	CHOOSE CONTROLS	TICK	CHOOSE CONTRAILS	TICK
Appropriate permits and approval		Lighting		Safety barriers	
Bridging cables, rubber gloves		Lone worker - log on		Safe hygiene practices	
Cable locator		Look for signs of underground services		Safe manual handling techniques	
Clear vegetation		Machine guarding fitted		Safe means of access / egress	
Communication (eg. mobile phone)		Material safety data sheet (MSDS)		Shoring	
Correct asbestos disposal		Mechanical assistance		Signs	
Dewatering, divert water flow		Mobile plant checks		Site register	
Dial Before you Dig		4Ps: plan, pothole/prodder, protect, proceed		Spotter	
Exclusion zone		PPE Busseton Standard		Sunscreen/insect repellent	
Fall arrest equipment		<i>PPE additional (circle extra requirements)</i>		Tagged signs and cones	
First aid kit and water		Dust mask	Face mask	Traffic Signs and cones	
Gas monitoring equipment		SCBA	Gloves	Trained and competent (in equipment and machinery)	
Harness		Overalls	Hard-hat	Trained and competent (for task)	
Identify slip / trip hazards, inform others		Hearing protection	Other		
Induction		Portable safety switch / RCD			
Inform Western Power		Purging			
Isolation and tagging		Rescue / evacuation planned			
Keep area tidy					

#### STEP 3 ▼ Team member sign off

NAME:		NAME:		NAME:	
SIGN:		SIGN:		SIGN:	
NAME:		NAME:		NAME:	
SIGN:		SIGN:		SIGN:	

If you are unable to apply appropriate controls you must check with your supervisor before commencing work. Review this JHA if job conditions, equipment or personal change at anytime.



## Attachment 1 – Customer Letter Notification Samples

Date

The Occupier  
Important Notice

Dear Valued Customer

Re: **Important Notice Regarding Your Water Supply**  
**Street Name**

Please be advised that Busselton Water will be undertaking critical mains maintenance in your area on **Day, Date Month Year, between time. and time.** Unfortunately, your water supply may be interrupted during this time.

During this time, you may want to store sufficient quantities of water for personal use.

Maintenance can in some instances cause water to appear discoloured, however this does not last. If you do experience any discolouration, please remember to run an outside tap for a few minutes to allow the sediment or cloudiness to clear from the water line. We recommend you capture this water for use on your garden.

Busselton Water regrets any inconvenience caused by this maintenance activity.

For further information please contact Busselton Water on (08) 9781 0500.

Yours faithfully

David Hughes-Owens  
**Chief Executive Officer**

## **NOTICE OF COMMENCEMENT OF WATER MAINS UPGRADE**

Attention: The property owner/occupier

Please be advised that Busselton Water's contractor **Name** will be undertaking water main upgrades between **Day,Date,Month,Year**, with works aiming to be completed by **Day,Date,Month,Year**,

The mains upgrade is planned to be in the following areas/streets:

**Street Name – if more than one street state proposed time of works in each location**

Main upgrades within the City of Busselton road reserve will result in some disruption to the vegetation, driveways and traffic delays/detours. We hope to keep disruption to a minimum and on completion of the works we will restore the road reserve and property driveways to as near as practicable to its original condition before construction commenced.

Only a small section will be disturbed at any one time and if residents affected by the pipeline construction can ensure during this time that their verges remain free of parked cars, caravans, trailers and boats to ensure suitable access for excavation.

Water main upgrades are an important part of our annual capital works program to ensure the integrity of our water supply system. Busselton Water regrets any inconvenience this may cause and seeks your tolerance in this matter.

If you have any concerns or encounter any problems during the course of the works, or are not satisfied after your property verge reinstatement has been completed please contact;

**Name** Contact no. (Project Manager) or

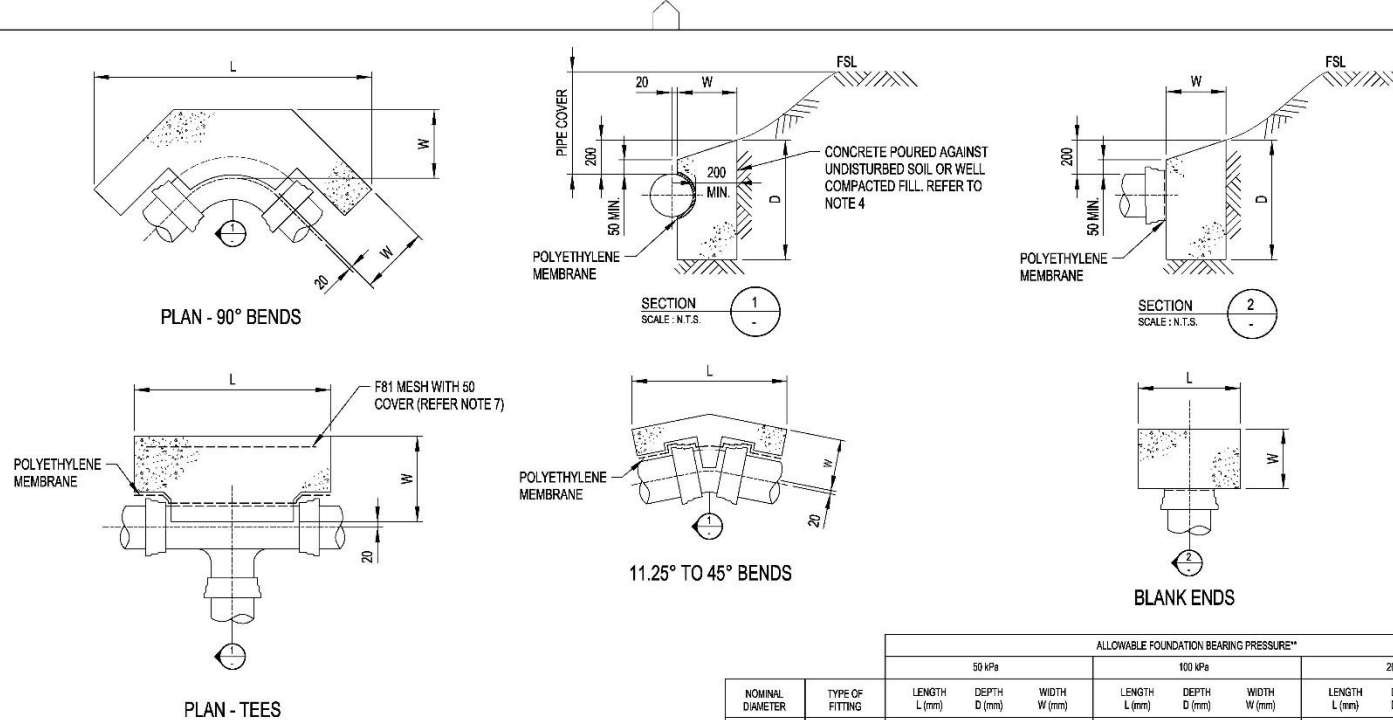
**Name** Contact no. (Team Leader Networks)

Yours faithfully

**Name**  
**GENERAL MANAGER OPERATIONS AND PLANNING**

Attached: Plan of works area





# CONSTRUCTION ISSUE

**GENERAL NOTES:**

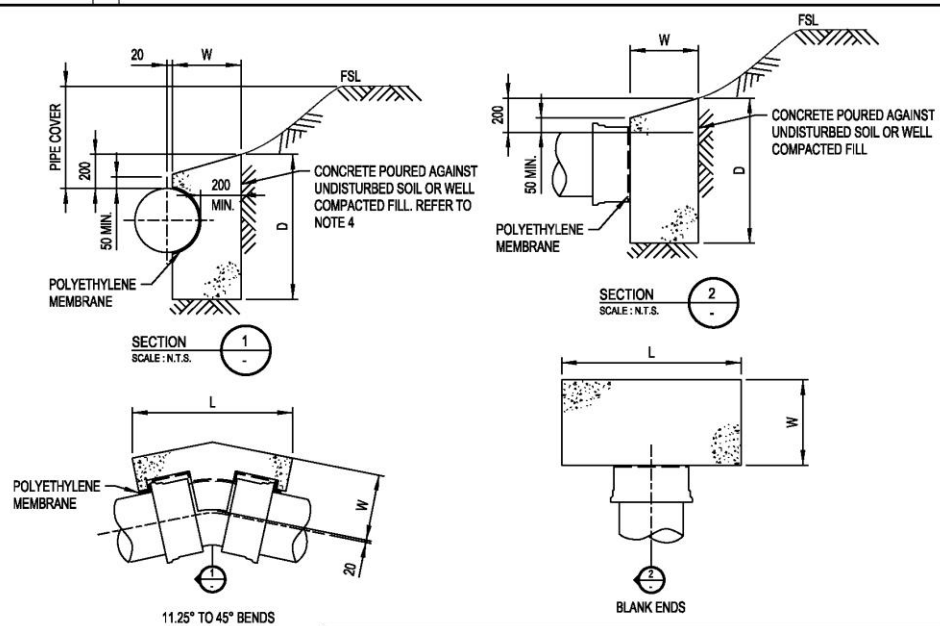
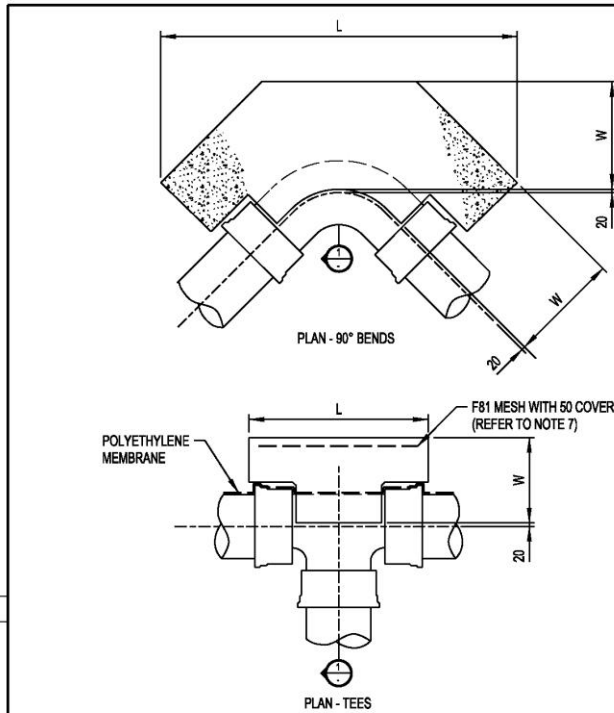
1. MINIMUM PIPE COVER TO BE 600mm.
2. ALL PIPE WORK AND FITTINGS TO BE IN ACCORDANCE WITH AS1477 AND AS4041.
3. MAXIMUM PIPE TEST PRESSURE TO BE 1200 kPa (120m).
4. WHERE TRENCH REQUIRES BACKFILL, FILL MATERIAL TO BE WELL GRADED CLEAN GRANULAR FILL COMPACTED TO 95% MDD IN LAYERS NOT EXCEEDING 300mm.
5. WHERE INSITU MATERIAL CONSISTS OF VERY SOFT/SOFT/FIRM CLAY, LOOSE CLEAN SAND OR UNCOMPACTED FILL, SPECIALIST GEOTECHNICAL ADVICE IS TO BE SORT.
6. WRAP POLYETHYLENE MEMBRANE AROUND PIPE AND FITTING FOR PROTECTION.
7. THRUST BLOCKS GREATER THAN 2000mm IN LENGTH TO HAVE SL81 MESH PLACED WITH 50mm COVER TO THE OUTMOST FACE OF THE BLOCK.
8. THRUST BLOCK CONCRETE CHARACTERISTIC COMPRESSIVE STRENGTH TO BE MINIMUM 25 MPa.
9. PIPE LINE JOINTS NOT BE COMPLETELY ENCASED IN CONCRETE. 180 DEGREE MAXIMUM ENCASEMENT AS SHOWN.

		ALLOWABLE FOUNDATION BEARING PRESSURE**								
		50 kPa			100 kPa			200 kPa		
NOMINAL DIAMETER	TYPE OF FITTING	LENGTH L (mm)	DEPTH D (mm)	WIDTH W (mm)	LENGTH L (mm)	DEPTH D (mm)	WIDTH W (mm)	LENGTH L (mm)	DEPTH D (mm)	WIDTH W (mm)
200	11.25°	350	650	300	300	650	300	300	650	300
	22.5°	650	650	300	350	650	300	300	650	300
	45°	1250	650	400	650	650	300	350	650	300
	90°	2350	650	600	1200	650	450	600	650	350
	END OR TEE*	1650	650	500	850	650	350	450	650	300

		ALLOWABLE FOUNDATION BEARING PRESSURE**								
		50 kPa			100 kPa			200 kPa		
NOMINAL DIAMETER	TYPE OF FITTING	LENGTH L (mm)	DEPTH D (mm)	WIDTH W (mm)	LENGTH L (mm)	DEPTH D (mm)	WIDTH W (mm)	LENGTH L (mm)	DEPTH D (mm)	WIDTH W (mm)
250	11.25°	450	700	300	300	700	300	300	700	300
	22.5°	900	700	350	450	700	300	300	700	300
	45°	1800	700	500	900	700	400	450	700	300
	90°	3150	700	750	1800	700	550	600	700	400
	END OR TEE*	2250	700	550	1150	700	450	600	700	350

NOTE:  
\* THRUST BLOCK DIMENSIONS TO BE SIZED FOR BRANCH PIPE DIAMETER.  
\*\* ALLOWABLE INSITU MATERIAL FOUNDATION PRESSURES TO BE DETERMINED IN ACCORDANCE WITH WSA GUIDELINES. REFER TO WSA-100.  
† 180° HATCHED THRUST BLOCK DIMENSIONS ARE NOT RECOMMENDED. SPECIALIST GEOTECHNICAL ADVICE SHOULD BE SORT TO INCREASE FOUNDATION BEARING RESISTANCE.

DES CKD DATE 31/01/2012	RECOMMENDED 31/01/2012 WOOD AND GRIEVE ENGINEERS	BUSSELTON WATER PO BOX 57 BUSSELTON WA 6280 PHONE: (08) 97810 500	WATER RETICULATION STANDARD DRAWINGS CONCRETE THRUST SUPPORTS - DN200-250 BEND, TEES & BLANK ENDS - PVC & DI PIPELINES		ORIGINAL SHEET SIZE A3	
DRN M B	REC APPROVED 31/01/2012 BUSSELTON WATER		FILE F1/A9	JOB No -	PLAN BW-84-2	CAD A



**PRELIMINARY**

- GENERAL NOTES:**
1. MINIMUM PIPE COVER TO BE 600mm.
  2. ALL PIPE WORK AND FITTINGS TO BE IN ACCORDANCE WITH AS1477 AND AS4041.
  3. MAXIMUM PIPE TEST PRESSURE TO BE 1200 kPa (120m).
  4. WHERE TRENCH REQUIRES BACKFILL, FILL MATERIAL TO BE WELL GRADED CLEAN GRANULAR FILL COMPACTED TO 95% MDD IN LAYERS NOT EXCEEDING 300mm.
  5. WHERE INSITU MATERIAL CONSISTS OF VERY SOFT/SOFT/FIRM CLAY, LOOSE CLEAN SAND OR UNCOMPACTED FILL, SPECIALIST GEOTECHNICAL ADVICE IS TO BE SORT.
  6. WRAP POLYETHYLENE MEMBRANE AROUND PIPE AND FITTING FOR PROTECTION.
  7. THRUST BLOCKS GREATER THAN 2000mm IN LENGTH TO HAVE SL81 MESH PLACED WITH 50mm COVER TO THE OUTMOST FACE OF THE BLOCK.
  8. THRUST BLOCK CONCRETE CHARACTERISTIC COMPRESSIVE STRENGTH TO BE MINIMUM 25 MPa.
  9. PIPE LINE JOINTS NOT BE COMPLETELY ENCASED IN CONCRETE. 180 DEGREE MAXIMUM ENCASEMENT AS SHOWN.

		ALLOWABLE FOUNDATION BEARING PRESSURE**								
		50 kPa			100 kPa			200 kPa		
NOMINAL DIAMETER	TYPE OF FITTING	LENGTH L (mm)	DEPTH D (mm)	WIDTH W (mm)	LENGTH L (mm)	DEPTH D (mm)	WIDTH W (mm)	LENGTH L (mm)	DEPTH D (mm)	WIDTH W (mm)
300	11.25°	600	750	350	300	750	350	300	750	350
	22.5°	1200	750	400	600	750	350	300	750	350
	45°	2350	750	600	1200	750	450	800	750	350
	90°	4800	750	950	2150	750	700	1100	750	500
	END OR TEE*	3000	750	750	1550	750	550	800	750	400

		ALLOWABLE FOUNDATION BEARING PRESSURE**								
		50 kPa			100 kPa			200 kPa		
NOMINAL DIAMETER	TYPE OF FITTING	LENGTH L (mm)	DEPTH D (mm)	WIDTH W (mm)	LENGTH L (mm)	DEPTH D (mm)	WIDTH W (mm)	LENGTH L (mm)	DEPTH D (mm)	WIDTH W (mm)
375	11.25°	850	850	400	450	850	400	300	850	400
	22.5°	1650	850	550	850	850	400	450	850	400
	45°	3200	850	850	1600	850	600	800	850	450
	90°	6600	850	1150	3200	850	850	1500	850	650
	END OR TEE*	4200	850	1050	2100	850	700	1050	850	500

NOTE:  
\* THRUST BLOCK DIMENSIONS TO BE SIZED FOR BRANCH PIPE DIAMETER.  
\*\* ALLOWABLE INSITU MATERIAL FOUNDATION PRESSURES TO BE DETERMINED IN ACCORDANCE WITH WSA GUIDELINES. REFER TO WAT-200.  
\*\*\* WAT-488 THRUST BLOCK DIMENSIONS ARE NOT RECOMMENDED. SPECIALIST GEOTECHNICAL ADVICE SHOULD BE SORT TO INCREASE FOUNDATION BEARING RESISTANCE.

DES CKD	RECOMMENDED	<p><b>BUSSELTON WATER</b> PO BOX 57 BUSSELTON WA 6280</p> <p>PHONE: (08) 97810 500</p>	<p><b>WATER RETICULATION STANDARD DRAWINGS</b> CONCRETE THRUST SUPPORTS - DN300-375 BEND, TEES &amp; BLANK ENDS - PVC &amp; DI PIPELINES</p>			ORIGINAL SHEET SIZE
DATE	REC		FILE	JOB No	PLAN	A3
DRN M B	APPROVED		-	-	BW - 84 - 3	
	APP				CAD ISSUE	MF

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## **Attachment 3 – DFES Standard Hydrant Installation**



**DEPARTMENT OF FIRE AND EMERGENCY SERVICES**

**STANDARD**

**FOR**

**HYDRANT INSTALLATION**

March 2013

## **Introduction**

Fire hydrants are integral to effective fire and emergency management. The Department of Fire and Emergency Service (DFES) is committed to monitoring contemporary emergency water service delivery measures and reviewing the suitability of these standard hydrant conditions as required. DFES has identified the following design standard requirements for hydrants connected to all water utility water mains.

DFES Hydrant Standard conditions have been developed from the Water Corporation Design Standard 63 for water service infrastructure. DFESA is working with the Aqwest and Busselton Water providers to include the following standard hydrant conditions in their infrastructure design requirements.

## **Specifications**

### **Hydrants**

Hydrants shall be WA pattern 100mm screw-down type with integral 'yoke' SPS 292 with built-in isolation valve and installed only on DN100mm or larger pipes. Hydrants shall be located;

- so that the maximum distance between a hydrant and the rear of a building envelope, (or in the absence of a building envelope the rear of the lot) shall be 120 m and the hydrants shall be no more than 200 m (+ / - 10m) apart;
- a maximum of 100 m (+ / - 10 m) spacing in industrial and commercial areas; hydrants in these areas should conform to Building Classification 2 – 9c as per the Building Code of Australia;
- hydrant spacing in rural residential areas where minimum site areas per dwelling is 10,000 m<sup>2</sup> (1ha), a maximum 400 m (+ / - 10 m) hydrant spacing be applied. If area is further subdivided to land parcels less than 1ha, then the residential standard (200m (+ / - 10 m) ) is to be applied;
- ideally hydrants will be located in proximity to a boundary to allow it to be readily located
- Hydrants shall be located centrally only when driveways create a problem;

- where appropriate at the truncation of road junctions or intersections so that they can serve more than one street and be readily located;
- on both sides of major roads at staggered intervals, where there are mains on both sides of the road;
- at major intersections on dual multi-lane roads, where two hydrants are to be sited on diagonally opposite corners;
- at least 20m from traffic calming devices, i.e. median slow points or chokers, chicanes, mini traffic circles, and intersection 'pop-outs to ensure traffic is not impeded;
- in locations where, seasonal inundation is not anticipated e.g. swales and drains;
- no vegetation (e.g. trees or shrubs) should be planted within 1.5m of a hydrant or so as to obstruct access from the road;
- at least 10m from "high voltage main electrical distribution equipment". Note. high voltage is defined in AS 3000 as greater than 1000V ac.

### **Miscellaneous**

- all hydrants to be installed in an approved hydrant box that enables adequate access to ship a DFES standpipe(s),
- hydrant box lids, to be opened with standard DFES tool bar carried on DFES appliances for this purpose,
- all hydrant lids to comply with requirements of *Occupational Safety and Health Act 1984* and Western Australian Standards – manual task code of practice 2010.
- hydrants will be identified with markings as described in DFES *Directive 3.3 – Operational Support SAP 3.3.A Hydrants*
- at all new installation of hydrants a flexible steel marker post shall be installed no more than 45 cm to rear or front of hydrant; this may be removed with approval of local fire station.

## Attachment 4 – Standard Water Service Drawing

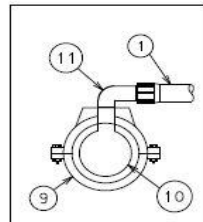
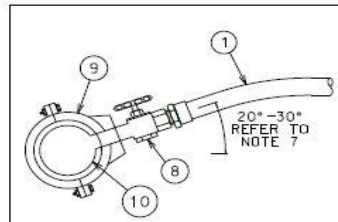
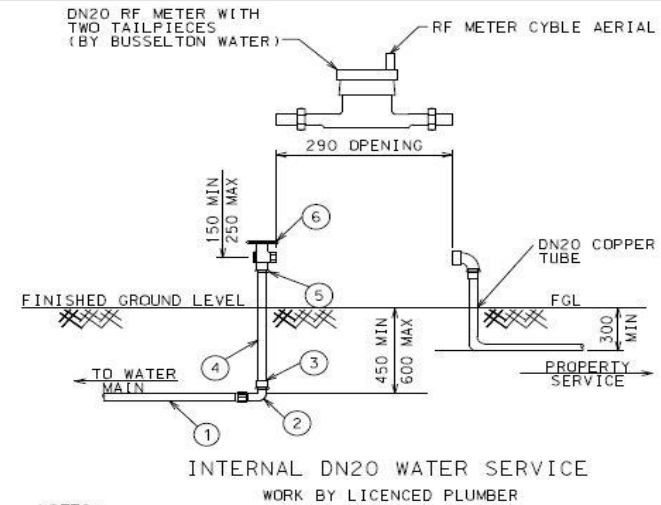
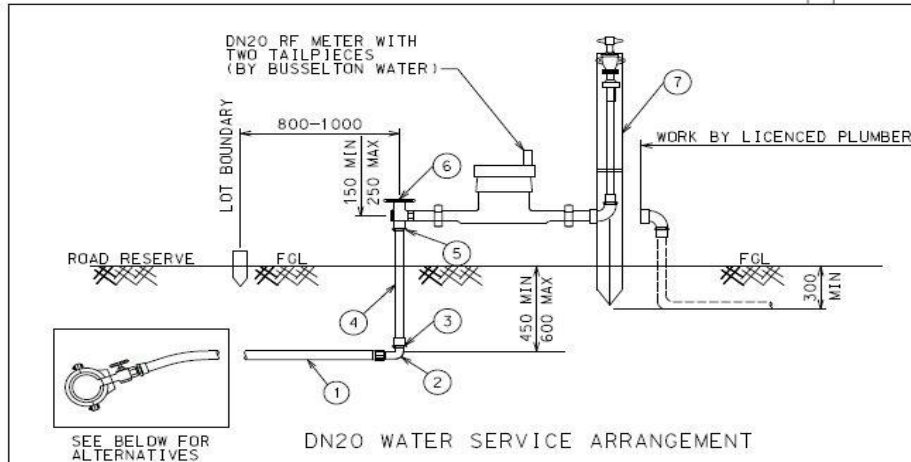


TABLE OF MATERIALS	
ITEM	PIPE/FITTING
1	DN25 POLYETHYLENE PIPE
2	DN20 M/F 90° BRASS ELBOW
3	DN20 TUBE ADAPTER (COPPER)
4	DN20 SERVICE RISER TUBE (COPPER)
5	DN20 TUBE ADAPTER (COPPER)
6	DN20 METER BALL VALVE (COPPER)
7	DN20 STANDPIPE ASSEMBLY (VARIOUS)
8	DN25 INLINE METAL BALL VALVE
9	TAPPING BAND TAPPED DN20
10	RETICULATION WATERMAIN
11	DN20xDN25 90° ELBOW

**NOTES:**

1. EACH TAPPING BAND SHALL BE POSITIONED AT LEAST 300mm CLEAR OF ANY WATERMAIN JOINT OR FITTING
2. THE PROPERTY SERVICE METER ASSEMBLY SHALL BE INSTALLED PARALLEL TO THE ROAD RESERVE BOUNDARY IN ACCORDANCE WITH ACCEPTED LOCAL PRACTICE
3. BUSSELTON WATER WILL INSTALL EACH SERVICE METER AND TAILPIECE ASSEMBLY AND THE TEMPORARY BUILDERS UPSTAND. A LICENCED PLUMBER SHALL REMOVE THE STANDPIPE ASSEMBLY AND INSTALL THE INTERNAL PROPERTY SERVICE
4. INTERNAL SUBMETER AND TAILPIECE ASSEMBLY SHALL BE INSTALLED BY BUSSELTON WATER. A LICENCED PLUMBER SHALL INSTALL PIPEWORK FROM LOT BOUNDARY MASTER SERVICE TO BALL VALVE AND FROM METER OPENING TO INTERNAL PROPERTY SERVICE
5. PE PIPE SHALL BE PE100, RATED PN12.5 TO AS/NZS 4130 DN20 COPPER TUBE SHALL BE TYPE A TO AS1432
6. SUB-METERS IN CAST IRON OR PVC COVERS MUST HAVE A MINIMUM CLEARANCE OF 75mm FROM RF METER CYBLE AERIAL. CAST IRON OR METAL LID COVERS MUST HAVE TWO 3/4" DIAMETER HOLES DRILLED AT OPPOSITE ENDS TO ALLOW TRANSMISSION OF READING SIGNAL
7. INSTALL PE SERVICE PIPE AT ANGLE TO ACHIEVE MINIMUM 150mm CLEARANCE FROM OTHER UTILITIES.

DES CKD	NOT TO SCALE	RECOMMENDED	<b>BUSSELTON WATER</b> PD BOX 57 BUSSELTON WA 6280 PHONE: (08) 97810 500	BUSSELTON WATER STANDARD DRAWINGS DN20 WATER SERVICE (DN25 PE PIPE) INTERNAL SUB-METER LAYOUT			ORIGINAL SHEET SIZE <b>A3</b>
DATE		REC		FILE	JOB No	PLAN	
DRN BD 08/10		APPROVED		F1/A9	SERVICE	BW-62-1	



## Attachment 6 – Non-Conformance Report

1. Non-Conformance Report					
NCR #		Event Date			
Status		Verification			
Raised by		Closed by			
Title		Title			
Raised On		Closed on			
2. Issue Description (150mm Main)					
3. Actions Taken to Fix					
3. Corrective Verification – Objective Evidence of Actions Taken					
4. Correction Acceptance					
Developer		Representative		Signature	
BusseLton Water		Representative		Signature	
5. Root Cause Analysis – <b>Contractor to complete</b>					
6. Corrective Actions to Avoid Future Occurrences – <b>Contractor to complete</b>					