Part 7: Water Supply

CONTENTS

Part 7: Water Supply

Part 7: Water Supply

Part 7: Water Supply

TABLES

FIGURES

EQUATIONS

Part 7: Water Supply

7.1 INTRODUCTION

This Part includes:

- The assessment of required infrastructure
- Technical design requirements
- Material requirements

This Part is not intended to be a detailed design guide or to replace the need for water engineering expertise in some areas of the design process. The standards included in this Part are one way of achieving the desired outcomes and performance criteria of the network components described below.

7.1.1 Description of the Water Supply System

The Waimakariri District water supply system is essentially a collection of discrete urban and rural schemes.

At present there are seventeen active water supply schemes in the Waimakariri District. These range from the small rural communities at West Eyreton and Garrymere to the large urban schemes of Kaiapoi and Rangiora.

The water schemes can be divided into three types, each affecting the amount and nature of water supply available to consumers.

- Urban schemes are set up in urban areas, and provide a full-flow water supply. There are six such urban schemes active in the District.
- Restricted schemes are generally used in rural areas. Supply is limited by a restrictor unit and each connection is required to have a tank (and usually a pump if an elevated tank site is not available) to supply the property. There are six restricted schemes in the District.
- Semi-restricted schemes are designed to provide an on-demand water supply, but at a limited flowrate, and at present are only in place in Garrymere and Ohoka, and a small number of properties on Poyntzs Road. Each connection on these schemes is restricted to a peak flow of 13 L/min, or about 19 m^3/d.

Table 7.1 List of WDC schemes

Scheme	Zone	Type	Typical Connection Size for Restricted Schemes
Cust	Urban	On-demand	NA
Kaiapoi	Urban	On-demand	NA
Oxford Urban	Urban	On-demand	NA
Rangiora	Urban	On-demand	NA
Waikuku Beach	Urban	On-demand	NA
Woodend-Pegasus	Urban	On-demand	NA
Mandeville-Fernside	Rural	Restricted	2 m^3/d
Oxford 1	Rural	Restricted	Various
Oxford 2	Rural	Restricted	Various
Poyntzs Road	Rural	Restricted	13 L/min
Summerhill	Rural	Restricted	2 m^3/d
West Eyreton	Rural	Restricted	4 m^3/d
Garrymere	Rural	Semi-restricted	13 L/min
Ohoka	Rural	Semi-restricted	13 L/min

Part 7: Water Supply

All of the schemes have some form of monitoring attached.

Please note the following points:

- All on-demand and semi-restricted schemes have some properties with restricted connections;
- No new semi-restricted connections or schemes will be approved. All new connections attached to these schemes will be fully restricted.

7.1.2 Ashley Rural Water Supply System

Although this scheme is reticulated within the Waimakariri District boundaries, it is owned, administered and maintained by the Hurunui District Council (HDC), and all enquiries regarding the scheme should be directed to HDC.

7.1.3 Effects of Development on the Water Supply Network

Groundwater and surface water resources are restricted by water quantity and quality. Any new development or extension to an existing scheme can have an effect on the available water supply. Consult with the Council before drawing up concept plans for additional water use.

System extensions, upgrading headworks and any other specific works required to provide water for a new development will be assessed and funded in accordance with the Council's *Water Supply Extension Policy* and *Development Contributions Policy*.

Part 7: Water Supply

7.2 CONSENT AND COMPLIANCE ISSUES

The consent and compliance information set out in Part 2: *General Requirements* applies to all works within the Waimakariri District, with the addition of the clauses below.

7.2.1 Legislation

The following Acts and amendments are the principal statutes governing water supply:

- Local Government Act (2002) (LGA)
- Health (Drinking Water) Amendment Act (2007)
- Resource Management Act (1991) (RMA)

7.2.2 Approval Process

New water supply systems require approval from the Council and consent(s) from Environment Canterbury. Extensions to existing water supply systems require approval from the Council only.

For new water supplies, specific approval is required from the Council before it will agree to take ownership of the asset. In making this decision, the Council will consider the following as a minimum:

- Compliance with this document;
- Reliability of supply, including redundancy, back-ups and fail-safe devices;
- Economic sustainability, including the type and size of scheme, and rates affordability;
- Water quality and compliance with the Drinking Water Standards;
- Implications of Resource Consent conditions for Council in the long-term;
- Proposed level of service and consistency with other schemes.

Where the developer proposes to drill a new well (bore) to provide a secure potable water supply then the developer shall:

- Obtain all required resource consents for the abstraction of water from Environment Canterbury;
- Submit to the Council for approval a copy of all such Resource Consents. Note that the developer is advised to consult with Council over proposed consent conditions prior to finalising of any consent.

The Council may agree to the establishment of a private water supply. In doing so, it will consider the following as a minimum:

- Ownership and management arrangements;
- Ability to comply with the relevant legislation, in particular the Health (Drinking Water) Amendment Act 2007;
- Feasibility of proposed source, location, headworks and treatment;
- Reliability of supply, including redundancy, back-ups and fail-safe devices;
- Economic sustainability, including the type and size of scheme, and rates affordability;
- Water quality and compliance with the NZ Drinking Water Standards;
- Proposed level of service.

7.2.3 District Council Requirements

The Council *Water Supplies Bylaw* defines the Council's requirements and protection for supply systems.

Part 7: Water Supply

All works on the water supply system shall adhere to the requirements of the Waimakariri District Council Hygiene Code of Practice for Work on Public Water Supplies. This is available on Council's website.

All works shall comply with the Council's Backflow Prevention Policy.

7.2.4 Source of Supply

Where a subdivision creates a new dwelling lot then the developer shall enable a safe and secure potable supply by provision of one of the following:

- An individual, safe and potable water supply to each dwelling lot (safe, in this context, includes a bore head that meets the MoH requirements for a 'secure' borehead and may include a bore that is sourced from a confined aquifer and/or a treatment system);
- A Council owned, operated and maintained community water supply, (refer to clauses 7.5.2 and 7.5.3). In this event the proposed supply shall be subject to Council approval prior to being vested in the Council;
- An existing Private water supply scheme operated and maintained by the community. This type of scheme will be shared and shall be protected by adequate agreements (refer to clause 7.5.4).

Refer to QP-C816-AA (attached as Appendix A) to assist in identifying the appropriate supply methodology.

Where a development is proposed in the Residential or Business Zone then the development shall connect to that supply and pay the associated Development Contribution/s per new connection/lot/unit.

7.2.5 Consent Application – Information Required

In addition to the information required to support the concept drawings and/or Resource Consent plans in CoP Part 2: *General Requirements*, the following data shall also be provided:

- General layout and alignment of reticulation showing locations of pipes, valves, hydrants and service connections;
- Connection points to the existing reticulation;
- Nominal diameters of principal mains;
- Redundancy and networking within the system;
- Confirmation that the connection to the Council scheme complies with the Council's water supply extension policy. This requires a separate application to the Council's Utilities Department.

For new water supplies the following information is required in addition to the above:

- Details of the source, headworks and treatment, including water quality, quantity, capacity, sustainability, reliability and risks;
- Assessment of ongoing operation and maintenance requirements including cost.

Part 7: Water Supply

7.3 QUALITY ASSURANCE REQUIREMENTS AND RECORDS

Provide quality assurance records that comply with the requirements in CoP Part 3: *Quality Assurance*, during design and throughout construction.

7.3.1 The Designer

The designer of all water supply systems that are to be taken over by Waimakariri District Council must be suitably experienced. The qualifications and experience of the designer may be requested by the Council for approval prior to commencement of the design.

The design reviewer must have at least equivalent experience to the designer.

7.3.2 System Review

When the pipe selection and layout have been completed, perform a system review, to ensure that the design complies with both the parameters specified by the Council and detailed in the CoP. The documentation of this review must include a full hydraulic system analysis. Compliance records must cover at least the following requirements:

- Minimum residual pressure can be maintained at all property connections;
- Maximum operating pressure will not be exceeded anywhere in the system;
- Pipe class is suitable for the pipeline application (including operating temperature, surge and fatigue);
- Pipe and fittings materials are suitable for the particular application and environment;
- Pipe and fittings materials are approved by the Council;
- Minimal likelihood of water quality problems or water stagnation;
- Valve spacing and positioning allows isolation of required areas and extension to future stage(s) or areas without shutdowns of existing consumers;
- Mains layout and alignment meets the Council's requirements;
- Fire fighting requirements are met;
- Control valves, where required, are positioned to provide the required control of system;
- Watermains are extended to the subdivision boundary where subsequent development may occur;
- Connections, to existing or future subdivisions, form a cohesive network and provide security of supply;
- Capacity provided for future adjacent development;
- System shall be easy and logical to access, maintain and operate.

Part 7: Water Supply

7.3.3 Engineering Design Approval

Provide the following information to support the engineering drawings and Design Report, as a minimum:

- Detailed offsets, alignments and grades of designed pipelines;
- Detailed plans of the proposed supply headworks, pumping and treatment system, storage and reticulation layout, as applicable'
- All assumptions used as a basis for calculations, including pipe friction factors;
- Design checklists or process records;
- Design flow rates;
- System review documentation as detailed in clause 7.3.2;
- Trenchless technology details, where appropriate;
- Calculations carried out for the surge analysis of pressure pipes, where appropriate;
- Summaries of hydraulic modelling including design parameters and assumptions;
- All options considered and the reason for choosing the submitted design.

7.3.4 Construction Records

Provide the information detailed in CoP Part 3: *Quality Assurance* and the CCC *Construction Standard Specifications* (CSS), including where applicable:

- All performance test results;
- Material specification compliance test results;
- Compaction test results;
- Subgrade test results;
- Site photographs;
- Pressure test results;
- Disinfection records.

The developer must provide the Council with a certificate for each pipeline tested, including the date, time and pressure of the test. The details of the pipes, including manufacturer, diameter, type, class, date of manufacture, serial number, jointing and contractor who laid the pipe, must be included on the certificate.

7.3.5 Hygiene Records

Provide documentation of procedure used to manage the hygiene of water supply installations as detailed in the Waimakariri District Council Hygiene Code of Practice for Work on Public Water Supplies, to demonstrate that the hygiene of the work undertaken has been adequately managed. This shall include, where applicable:

- Audits of work practices;
- Reporting of Gastrointestinal Illnesses;
- Qualifications of Water Supply Installers;
- Pipeline sterilisation results.

Part 7: Water Supply

7.3.6 Post-Construction Records

Provide the information detailed in CoP Part 3: *Quality Assurance*, Part 12: *As-Builts*, and the CCC *CSS*, including:

- Design report;
- Completion certificates;
- Certificate of compliance with the NZ Drinking Water Standards 2005 (Revised 2008);
- Producer statements – design, construction, construction review;
- Commissioning report, including all test results;
- Water quality test results;
- Operations & maintenance manuals, where applicable;
- Schedule of Costs;
- As-built plans and records.

7.3.7 Operations and Maintenance Manual

Provide an Operations and Maintenance Manual to the approval of the Council, for any water quantity and/or quality control facilities. The manual must include:

- A description of the facility and its purpose;
- Design criteria;
- A description of major features;
- Normal operational procedures and constraints (e.g. resource consent conditions);
- Emergency operational procedures (where relevant);
- A copy of any resource consents relating to the facility;
- A maintenance schedule for all items requiring periodic maintenance including landscaping;
- A schedule of suppliers and contact details for key components;
- A copy of Manufacturers' operating & maintenance instructions for key items;
- A copy of the as-built drawings and commissioning report for the facility.

The manual shall be contained in clearly marked A4 ring binders, divided into sections with clearly marked dividers. Drawings and other bulky information may be appended in separate folders. One copy shall be provided to the Council for review. Once the manual has been approved by Council, a final copy shall be provided to site and two printed and bound copies, plus electronic copies in Word (*.doc) and PDF (*.pdf) format, shall be provided to Council. CoP Part 10 section 10.6 – *Establishment & Maintenance* expands on these requirements.

7.3.8 Acceptance Criteria

All pipelines, pumping stations, and other integral components must be tested, certified and inspected as appropriate before acceptance by the Council. Perform testing in accordance with CoP Part 3: *Quality Assurance*. For pumping stations and other structures, the developer shall submit a specific methodology for testing and commissioning, which shall not be deviated from unless approved by the Council.

Part 7: Water Supply

7.4 GENERAL DESIGN PRINCIPLES

7.4.1 Design Considerations

Consider the:

- Hydraulic capacity of the system;
- Ability of the water system to maintain acceptable water quality, including consideration of materials and their disinfection demand, and prevention of back flow and stagnation;
- Structural strength of water system components to resist applied loads;
- Pipeline's ability to withstand both internal and external forces, taking into account any temperature variations;
- Requirements of the Fire Service Code of Practice;
- Health & Safety requirements;
- Environmental requirements;
- Impact of the works on the environment and community;
- "Fit-for-purpose" service life of the system;
- Best way to minimise the "whole-of-life" cost;
- Resistance of each component to internal and external corrosion or degradation;
- Installation requirements expressed in CCC *CSS: Part 4*;
- Capacity and ability to service future extensions and development;
- Networking, redundancy and security of supply;
- Ease of maintenance and operation.

In urban areas, also consider the Council's minimum levels of service, detailed in section 7.5 and in the Council's *Water Supply Activity Management Plan*. Design all parts of the water supply system that are in contact with drinking water using components and materials that comply with AS/NZS 4020:2002. Select the pipe material to ensure a minimal impact on water quality within the system.

7.4.2 Future System Expansion

Design water mains with sufficient capacity to cater for all existing and predicted development within the area to be served. Make allowance for areas of subdivided or un-subdivided land capable of future development, as specified by the Council in section 7.5.

7.4.3 Contaminated Sites

Avoid contaminated sites wherever possible. If a contaminated site cannot be avoided, provide details about the following issues with the engineering drawings:

- Compliance with statutory requirements;
- Options for decontaminating the area;
- Selection of wrapped ductile iron watermains, wrapped galvanised rider mains and jointing techniques to maintain the water quality (in accordance with the pipe selection chart in QP-C816-AB, attached as Appendix B);
- Safety of construction and maintenance personnel;
- Any special pipeline maintenance considerations.

Part 7: Water Supply

7.4.4 Reducing Waste

When designing the development, consider ways in which waste can be reduced:

- Plan to reduce waste during demolition e.g. minimise earthworks, reuse excavated material elsewhere;
- Design to reduce waste during construction, e.g. prescribe waste reduction as a condition of contract;
- Select materials and products that reduce waste by selecting materials with minimum installation wastage rates;
- Use materials with a high recycled content e.g. recycled concrete subbase.

See the Resource Efficiency in the Building and Related Industries (REBRI) website for guidelines on incorporating waste reduction in your project www.rebri.org.nz/.

7.4.5 Alternative Technology

The Council will consider alternative technologies on a case-by-case basis. Examples of such technologies are desalination plants and wastewater recycling.

Part 7: Water Supply

7.5 DESIGN PARAMETERS

In developments where adequate system pressure and coverage from hydrants already exists, the Council will advise the point of supply and the minimum pipe size for the supply pipe. The developer is responsible for the full cost of the supply pipe from the point of supply to the individual connection points.

When the developer is providing water reticulation for vesting in the Council, the Council will provide the following parameters, after receipt of the application plan:

- Point of supply;
- Mains size at the point of supply;
- Supply type (e.g. on-demand or restricted);
- Additional development to be allowed for in the design;
- Static pressure at point of supply;
- Residual pressure at point of supply during peak system demand in the network;
- Residual fire pressure during fire demand at point of supply;
- Fire risk classification at point of supply;
- The minimum residual pressure at house site at peak system demand;
- Networking requirements;
- Other requirements (e.g. minimum mains size).

The on-demand, restricted and semi-restricted water supply areas are listed in Section 7.1.1

Where a development is proposed in the areas noted above and adjacent to the reticulation then the development shall be connected to that supply and pay the associated development contributions, provided the development meets the criteria in the Water Supply Extension Policy. Connection will be subject to specific Council approval.

7.5.1 Supply Type

The following can be used to guide decisions on connection types for new connections or new developments. Ultimately the connection type able to be provided shall be at the discretion of Council.

On-demand connections can be provided in the following circumstances:

- Main scheme type is on-demand, adequate pressure and capacity can be provided by the scheme, the zoning is either Residential 1, Residential 2, Residential 3, Business 1 or Business 2, and the land parcel being serviced is less than 4,000 m^2.

Restricted connections shall be provided where the above criteria for an on-demand connection cannot be met, but where there is adequate pressure and capacity available for a restricted connection.

7.5.2 Design Life

All water supply distribution systems are expected to last for an asset life of at least 100 years with appropriate maintenance, and must be designed accordingly to minimise life cycle costs for the whole period. Assets designed to minimise capital cost at the expense of overall lifecycle cost will not be accepted.

The developer is advised that certain locations within the District have water and ground conditions that may be detrimental to the durability of some reticulation materials and fittings. Upon receipt of the developer's application, the Council may set specific location requirements for such materials and fittings, based on experience and historical performance.

Part 7: Water Supply

7.5.3 Design for Water Supply Schemes – On-Demand

Develop residential and business zones to comply with the definitions in the *District Plan*. Provide the design flow rates, for developments other than standard living zones (e.g. multi-unit developments or older persons' housing), with the engineering drawings.

The developer shall use the following table for design purposes:

Table 7.2 Flow Information

Type of Development	Peak Hourly Flow
Residential	0.10 L/s/dwelling
Business and Commercial	1.00 L/s/ha

For business and commercial developments, actual figures should be used where available. Specific design will be required for wet industries and high-density developments.

The developer shall design the water supply system to satisfy the following criteria:

- Fire flow plus 50% of the peak hourly flow with a minimum residual pressure of 100 kPa at hydrants and for Residential Zone allotment lateral connections;
- Peak hourly domestic flow with a minimum residual pressure of 300 kPa and minimum flow of 20 L/min at the point of supply;
- Peak hourly domestic flow with a minimum residual pressure of 250 kPa and minimum flow of 15 L/min at the house site;
- Minimum domestic flow case with a maximum static pressure of 850 kPa at the lowest elevation in the supply area;
- Appropriate working, emergency and fire-fighting storage (refer to Table 7.8).

Note that the minimum **combined** flow from any two hydrants shall be 25 L/s, and the maximum flow assumed from any single hydrant shall be 30 L/s;

The developer shall, for multi-lot developments that will connect to the Council's supply, obtain approval from the Council in regard to the design, layout and operation of the proposed system.

These requirements may be varied by the Council to suit specific usage or geographic conditions. Reasons for significant changes to the average figures will be outlined in the design parameters for the development, when applicable.

7.5.4 Design for Water Supply Schemes – Restricted

Restricted rural water supplies include the installation of a Council owned and maintained restrictor at each point of supply that restricts flow to each customer.

The developer shall provide:

- A minimum of 2.0 cubic metres per day (1.4 litres per minute) to each dwelling lot. This may be increased for certain schemes (see Table 7.1);
- An approved restrictor at the roadside boundary of each lot that limits the flow at the point of supply to that set for the scheme, and evenly distributes the flow over a 24 hour period;
- On-site potable water storage on each dwelling lot equivalent to either 24 hours supply or the minimum permitted volume (4.0 m³ for rural properties, 20 m^3 for rural-residential properties), whichever is greater;
- Storage tanks that are fit and adequate for the intended use, have an appropriate fire-hose connection, and that comply with appropriate New Zealand standards;
- Air-gap separation backflow prevention at the storage tank inlet in accordance with G12/AS1 of the Building Code;
- No connection upstream of the point of supply (restrictor unit).

Part 7: Water Supply

7.5.5 Design for Water Supply Schemes – Private

A private water supply is one that is not owned by the Council. The establishment of a private scheme still requires approval by the Council. Any water supplier is required to comply with the relevant legislation, in particular the Health (Drinking Water) Amendment Act (2007).

The Council may approve the construction of a shared rural water supply that the developer intends to be private, provided the supply meets the requirements of this document.

For private supplies clause 7.5.3 applies, with the following exceptions:

- The scheme shall be jointly owned by the landowners connected to the supply.
- A legal agreement shall be registered on the certificate of title for the equitable sharing of the ownership and the actual costs of operating and maintaining the water supply scheme.
- Clause 7.8.5 – *Site & Access*, regarding ownership of headworks' land & facilities and accessways, will not apply.
- The ownership of the headworks' land & facilities and accessways shall be held in joint ownership and included in the legal agreement required above.
- The results of bacteriological and annual chemical tests shall be forwarded to the Waimakariri District Council, at least annually or when requested. All sampling and testing shall be in accordance with clause 7.3.5. Copies of the results will be held on the Council's property file.
- There is no requirement for the installation of a SCADA system.

Note that it is appropriate for developers to keep themselves advised of proposed legislative changes with regard to private shared water supplies.

7.5.6 Fire Service Requirements

The water supply reticulation must comply with SNZ PAS 4509:2008 *New Zealand Fire Service – Firefighting Water Supplies Code of Practice*. In particular, the reticulation must meet the requirements for fire fighting flows, residual fire pressure and the spacing of hydrants, together with any additional requirements, including storage where applicable.

The reticulation must be designed to provide fire-fighting capacity within and adjacent to all urban areas, whether or not these areas are gazetted fire districts.

7.5.7 Fire-Prevention Services

Many industrial and commercial sites require the installation of additional fire-protection means where the fire risk exceeds the service level provided by the reticulation network. These fire-protection works must be designed to meet the requirements of the *New Zealand Building Code*.

Note that the available pressure and flow from the reticulated network is likely to reduce in the future, due to demand growth and pressure management. This may result in future compliance problems for the property owner/user unless a suitably conservative design approach is taken.

Part 7: Water Supply

7.6 PIPELINE DESIGN

Any development shall not cause adverse effects to existing consumers (e.g. cause pressure and/or flow to drop below the target level of service).

7.6.1 Maximum Design Pressure (Head)

Calculate the maximum design pressure for the mains as follows:

Equation 7.1 Maximum design pressure

$$H_{max} = H_s + S$$

where H_s = Static pressure (m)

S = Surge allowance (m)

Use the calculated maximum design pressure when:

- Selecting pipe materials and classes;
- Selecting pipe fitting types and ratings;
- Designing thrust and anchor blocks;
- Specifying the test pressure.

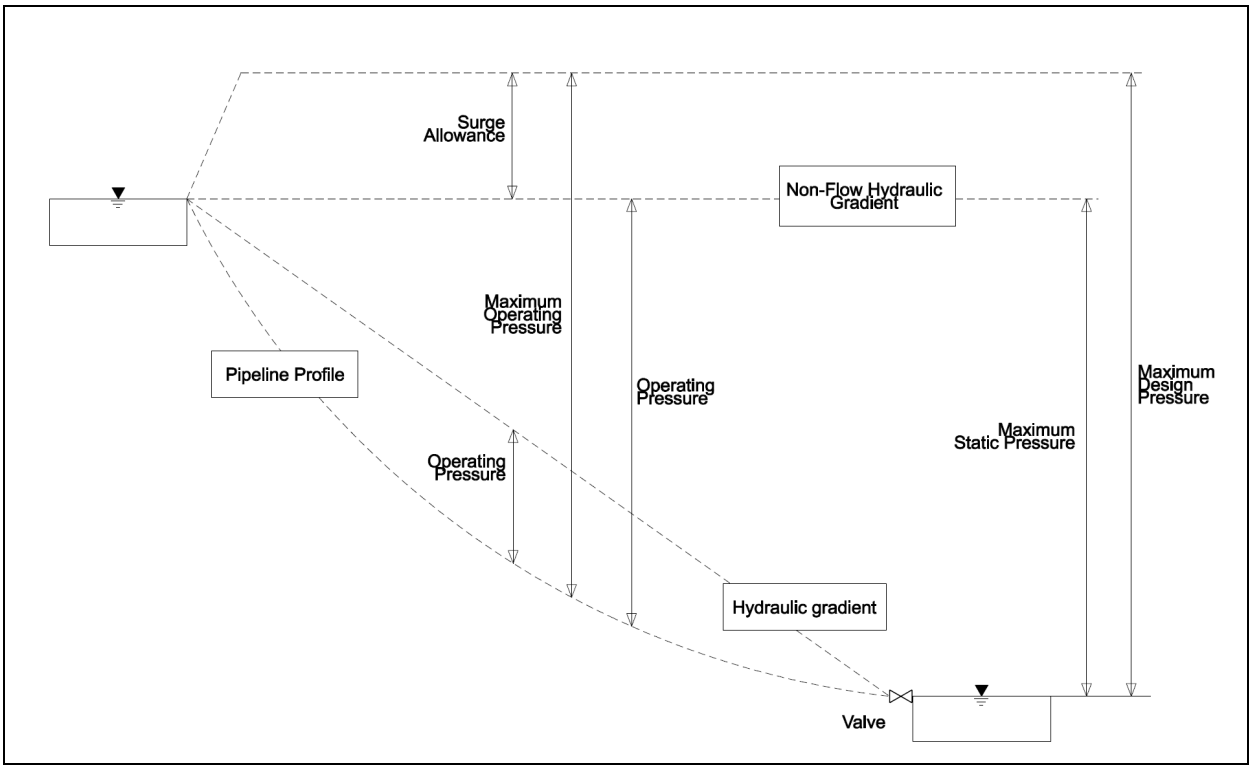

Figure 7.1 Conceptual Hydraulic Operation of a Gravity Main (CCC IDS Part 7 Fig. 1)

Where the main supplies directly to the reticulation system, the proposed maximum design pressure must comply with the maximum operating pressure normally supplied in that zone. Alternatively, if supply is required to a small area adjacent to the trunk main, the supply pressure may be reduced using a pressure reducing valve before its transition to a reticulation main.

Part 7: Water Supply

The developer shall note that most reticulation within the urban schemes operates between 300 kPa and 500 kPa working pressure and refer to NZS 4404:2004 Table 2 for design purposes. See also SD 600-412.

7.6.2 Pipeline Material Selection

Select watermain materials in accordance with the pipe selection chart in Appendix B, and with the WDC Materials Specification. Interpretation of this flow chart shall be at the discretion of the Council.

Each material has specific design and installation issues, as identified in the manufacturers' design manuals, specifications and other literature. Consider these issues, as listed below, when specifying materials.

- Polyvinyl Chloride: PVC-U, PVC-O
  - Test pressures not to exceed 1.25 times the rated pressure of the lowest rated component but to be at least 1.25 times the maximum operating pressure;
  - UV degradation after more than 2 years' storage or installation in outdoor conditions;
  - Depth of scratching, gouging and impact damage limited to 10% of the wall thickness;
  - Careful handling, bedding and installation required;
  - Possible permeation by some contaminants (e.g. hydrocarbons).
- Polyethylene: PE80B, PE100
  - Sophisticated equipment and highly skilled workers required where welded joints are required;
  - Depth of scratching, gouging and impact damage limited to 10% of the wall thickness;
  - UV degradation (Blue pipe is not suitable for outdoor installation);
  - Bedding support required to prevent excessive deformation;
  - Pulling forces for PE during trenchless installation are not to exceed the manufacturer's recommendations;
  - Vulnerable to permeation by some contaminants (e.g. hydrocarbons).
- Ductile Iron
  - Internal lining and external coatings must be undamaged or fully restored after repairs or fabrication work;
  - Polyethylene bag wrap corrosion protection system must be properly applied;
  - Potential for water quality effects where very low velocities are likely for extended periods of time;
  - Potential problems with stray electric currents and bimetallic corrosion.
- Concrete-lined Steel
  - Internal lining and external coatings must be fully restored after repairs or fabrication work and during jointing;
  - Potential for water quality effects where very low velocities are likely for extended periods of time

Rider mains must be of polyethylene pipe of resin type PE100 or PE80B, with a minimum pressure rating of PN12.5. Contaminated sites will require careful material selection. Refer to clause 7.4.3 – *Contaminated Sites*.

7.6.3 Standard Pipe Sizes

All pipe diameters referred to in this section are nominal internal diameters unless otherwise noted.

Part 7: Water Supply

Acceptable standard main sizes are 100, 150, 200, 300, 375, 450 and 600 mm nominal diameter. Other sizes may be considered where there is a particular long-term benefit to Council.

7.6.4 Minimum Pressure Rating

The minimum nominal pressure rating for pipelines is 1200 kPa (PN12). Check the Council's minimum requirements, using the flow chart in Appendix B, before specifying the required pressure rating.

The minimum nominal pressure rating for valves, fittings and hydrants is 1600 kPa (PN16).

7.6.5 Losses

When determining the residual pressure at each site, take into account the minimum residual pressure to be available at the point of supply, as specified in the design parameters for the development, and, for residential developments, also consider any friction losses through the supply pipe at peak flow rate.

Assume all private service pipes are not more than 20 mm internal diameter, unless a statement specifying the service pipe internal diameter is registered on the Property File relating to that allotment.

For all developments, design losses through meter(s) and the rider main must be such that the design flow rate downstream of any point allows for theses losses and complies with clauses 7.5.1 or 7.5.3 as appropriate.

Assume service connections to individual allotments to be 15 mm nominal internal diameter, unless consent has been given for a larger service connection size. Determine mains losses using flow rates in accordance with clauses 7.5.1 or 7.5.3 as appropriate.

7.6.6 Pipe Hydraulic Losses

Take differences in elevation across the subdivision or development into account.

Calculate pipe friction losses using the Darcy-Weisbach/Colebrook-White formulae, and the friction factors given in Table 7.3. Manufacturers' published friction factors/charts shall not to be used as they do not account for pipe aging and are usually over-optimistic.

Table 7.3 Friction factors (NZS 4404, Table 6.1)

Pipe material	k_S (mm)
PVC-U, PVC-O, PE	0.15
Ductile Iron	0.6

Most water supplies in the Waimakariri District must be pumped, so hydraulic gradients shall be less than 0.01 m/m (other than for fire fighting purposes). The Council may approve exceptions to this rule in isolated cases where the pressure is independent of pumping rates.

7.6.7 Surge and Fatigue Re-rating of Plastic Pipes

Plastic pipes are susceptible to damage from cyclic loads. Although plastic pipes may be permitted in zones affected by pressure variations (e.g. pump zones, in locations downstream of pressure reducing valves, and in high surge areas), it is essential that the pipe class be checked for long-term performance under surge & fatigue loadings in accordance with the criteria set out in QP-C841 *Design for Surge & Fatigue* (attached as Appendix D).

Part 7: Water Supply

7.6.8 Sloping Terrain

Give special consideration to the design and installation of pipelines in any land prone to slips or instability, or with a gradient steeper than 1:10.

7.6.9 Joints

Joints between fittings and pipes shall be made using the following methods (where appropriate):

- Socket & spigot (except for PE pipes) only where the socket is designed specifically for the spigot outside dimension);
- Gibault (except for PE pipes) where the gibault is either of the multi-fit type or specifically designed for the outside diameters of the items to be joined. Gibaults may not be used where the step difference exceeds 10 mm;
- Flange-socket or flange-gibault adaptors (except for PE pipes);
- Butt-fusion welding (PE pipes DN160 and larger only) by a specialist contractor only;
- Mechanical couplers (full restraint type – PE pipes only);
- Welding (concrete lined steel only);
- Threaded connections to BSP (small fittings <DN50 and connections only).

Electrofusion and solvent-cement joints are not permitted without specific approval by Council.

When specifying the connection details, consider the:

- Pipe materials, especially capacity for galvanic and other corrosion;
- Relative depth of mains;
- Standard fittings;
- Pipe restraint and anchorage;
- Limitations on shutting down major mains to enable connections;
- Existing cathodic protection systems.

Design anchorage for valves unless they are fully restrained by the pipe and fittings used.

Where the branch connection at the trunk main will have less than 1.5 m cover, obtain the correct cover on the proposed reticulation main by utilising joint deflection of the reticulation pipes downstream of the valve that is attached to the branch connection.

Design connections, from the end of an existing main, to address any differing requirements for the pipes being connected, particularly restraint, spigot/socket joint limitations and corrosion protection. Use standard fittings and pipework to connect to non-metallic mains. Confirm all sluice valves near the connection are restrained.

Any alterations or connections to the existing reticulation system shall be done at the developer's expense.

7.6.10 Flanges

All valves and fittings shall be flanged to either AS2129 Table D/E or AS4087 Class 16, using raised-face flanges. It is the developer's responsibility to ensure that all mating flanges are compatible. Note that this also applies to items such as flow meters, check valves and pressure-reducing valves, and that alternative flange standards (such as ANSI or DIN) will not be accepted. If higher pressure ratings are required, these will be subject to specific Council approval.

Part 7: Water Supply

7.6.11 Backfill and Bedding

Design bedding and backfill for the specific installation location. The materials used must be capable of achieving the backfill compaction requirements set out in CCC *CSS: Part 1*. Specify bedding for pipes to comply with CCC *CSS: Part 3* clause 8.5 and 8.6. Earth loads on deep pipelines can significantly increase when pipes are not laid in narrow trenches.

7.6.12 Specific Structural Design

Design pipelines being installed at depths greater than detailed in CCC *CSS: Part 4* to resist structural failure. The design must comply with AS/NZS 2566.1 including Supplement 1. Show details of the final design requirements on the engineering drawings.

Any ground that has a bearing capacity less than 50 kPa is unsatisfactory for watermain construction. In such cases, engage a geotechnical specialist to investigate the site and to design and supervise the construction of an appropriate support or foundation remediation system for the watermain.

Wherever it is necessary to fill an area before laying a watermain across it, or to build an embankment in which to lay the watermain, seek advice from a geotechnical specialist to ensure that the weight of the fill will not cause failure or leakage of the pipe joints after the main is laid.

Part 7: Water Supply

7.7 NETWORK LAYOUT DESIGN

Lay watermains in public roadways unless there is no practicable alternative. Public watermains across private property, other than right-of-ways, shall generally not be accepted. Remove any existing reticulation between new lots.

The developer shall include approved metallic detection tape in all pipe trench-lines that are:

- Not laid in accordance with SD 600-245A/B/C *Location of Underground Services*;
- At road crossings and intersections.

Metallic detection tape shall be continued to the nearest accessible point (e.g. valves and hydrants) and the end left such that it may be reached from the surface cover box.

The developer shall submit to the Council for approval any proposed reticulation not laid in accordance with SD 600-245A/B/C.

7.7.1 Mains Layout

Consider the following factors when deciding on the general layout of the mains:

- The need for mains to be replaced due to their physical condition and/or inadequate capacity or whether new mains are required to provide additional capacity;
- Providing easy access to the main for repairs and maintenance;
- Whether system security, disinfectant residual maintenance and mains cleaning meet operational requirements;
- The location of valves for shut off areas and zone boundaries;
- Topographical and environmental considerations;
- Avoidance of dead ends;
- Providing dual or alternate feeds to minimise customer disruptions.

Generally, the connection of reticulation to trunk mains is not permitted, as these mains may be shut down for servicing over extended periods, disrupting supply to reticulation where alternate feeds have not been provided.

7.7.2 Duplicate Mains

Provide duplicate mains to provide redundancy as per Table 7.4 below. Duplicate mains shall be of the same nominal diameter and separated such that a single event is unlikely to affect both (e.g. on separate sides of a road).

Table 7.4 Duplicate mains

Situation	Duplicate main
Parallel to large distribution/trunk mains that are not available for service connections	Required
Industrial/commercial areas	May be required
Arterial and dual carriageway streets	May be required

7.7.3 Ridermains (Sub-main)

Ridermain (sub-main) reticulation is required in all urban areas. Ridermain reticulation typically includes service connections and excludes fire hydrants.

Part 7: Water Supply

The developer shall provide ridermain reticulation that:

- Supplies service laterals to allotments on each side of each road;
- Is generally laid out in accordance with SD 600-245A/B/C;
- Is generally laid under berm and not under footpaths;
- Is generally laid behind the kerb or road shoulder;
- Excludes fire hydrants;
- Allows for the rider main to continue completely around the head of any cul-de-sacs.

For developments within Residential Zones, ridermains shall generally be 50 mm internal diameter (DN63) PN12.5 PE80B. Where there is insufficient room for installation of long lengths of PE pipe, DN50PN12 PVC-U pipe will be accepted. The maximum number of connections on a ridermain shall be in accordance with Table 7.5:

Table 7.5 Maximum Service Connections of Ridermain

Pressure	Type of Supply	
	One-End Supply	Two-End Supply
Low: P ≤ 400 kPa	5	15
Medium: 400 kPa < P ≤ 600 kPa	10	25
High: P > 600 kPa	15	30

Ridermains shall be extended around intersections and laid such that corner properties can be serviced from either street (refer Figure 7.2). Install rider mains approximately 600 mm from boundaries, to serve all allotments.

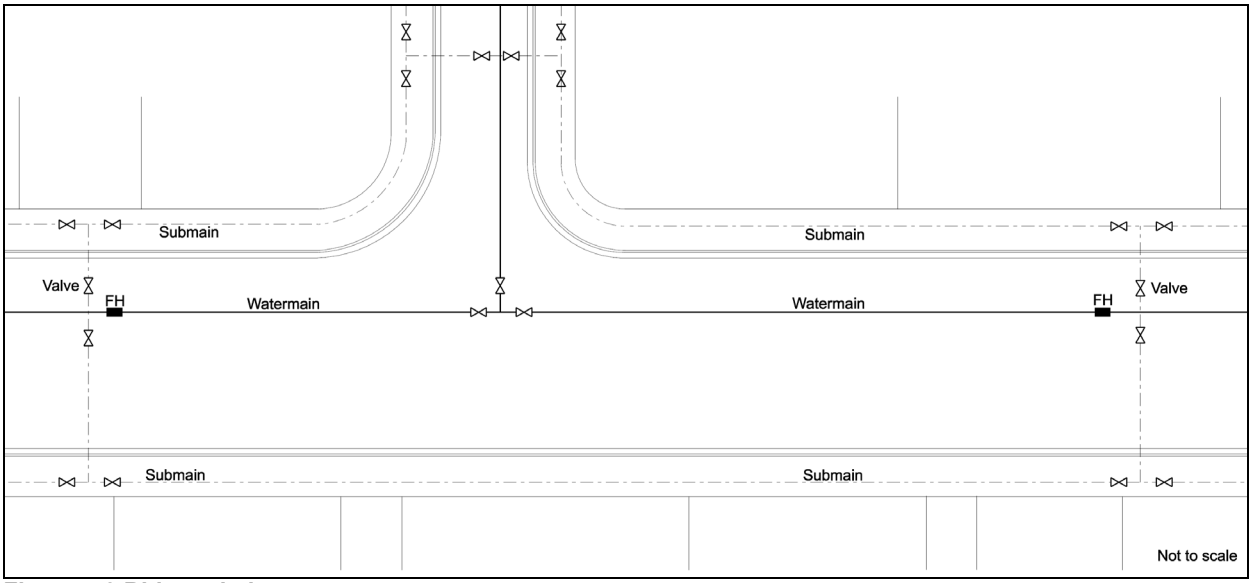

Figure 7.2 Ridermain layout

Ridermains must be served from crossovers, usually located at fire hydrants. The method of connection shall be a tapping saddle off the main. All crossovers must be DN63 PN12.5 PE80B, regardless of the pipe size.

Locate 50 mm sluice valves next to the ridermain on the crossover. Wherever a crossover serves both directions and more than ten properties each way, locate valves on the rider main on either side of the crossover.

Part 7: Water Supply

Ridermains and valve layout shall allow for flushing through the nearest hydrant. Where this is not possible an approved flushing point shall be provided. The preferred ridermain layout on straight roads is to lay connections between the rider and the water main adjacent to every second hydrant.

Council requires that water supply reticulation in private property remains with the owner/s of the allotments and that the point/s of supply are located at the roadside boundary by either separate connections, or otherwise multi-valve manifold connections. Refer also SD 600-412.

7.7.4 Valves

Reticulation shall include valves to enable each section of the main to be isolated. Only the Council, as the utility service provider, is authorised to close water supply reticulation valves.

Sluice valves are required next to the branch of any tee junction. Other valves must also be provided to ensure that turning off a maximum of five valves can isolate the network in any area. The maximum five-valve shut off must not isolate more than 50 properties.

Locate sluice valves at street intersections and also along the line of the main as required. Consider the following when deciding on the location of sluice valves:

- The operational needs of the system so that continuity of supply is maximised;
- Operation and maintenance requirements;
- The safety of maintenance personnel.

Keep the number of valves to a minimum, without compromising the ability to easily identify and isolate a section of the network.

Attach sluice valves to flanged fittings at junctions rather than plain-ended fittings.

The force required to open or shut a manually operated valve, using a standard valve key, with pressure on one side of the valve only, must not exceed 15 kg on the extremity of the key. Specify geared operation, motorised valves or a valve bypass arrangement, to reduce pressure across the valve, if the allowable force cannot be met.

Valves shall be located in accordance with Table 7.6 below.

Table 7.6 Reticulation Valve Locations

Type of Main	Valve Location
Trunk, Booster and Principal mains 100 mm and larger in diameter.	Shut-off valves shall be provided at each junction and generally not more than 500 m apart. Larger spacings shall be permitted for the delivery mains, with the approval of the Council. Subject to having a suitable discharge location, sluice valves may be required at the system's lowest elevation.
Rider mains not in road carriageway.	Shut-off valves shall be provided at each junction and generally to provide shut off isolation for not more than 10 lots.
Service connections	Toby valves shall be provided on each service connection, and generally located 300 mm off the property boundary.

7.7.5 Scour Valves

Scour valves are required to be installed at the following locations:

- On mains of 300 mm diameter and larger;
- On mains of less than 300 mm diameter where there are no fire hydrants;
- At the lowest point between isolating valves, and shall discharge to an approved outfall, (refer to CoP Part 5: *Stormwater* for outfall requirements);
- At the end of all dead-end mains where there are no fire hydrants.

Part 7: Water Supply

Scour valves shall be resilient-seat and clockwise-opening, with non-rising spindles. They shall be one nominal size smaller than the pipe; for example, the valve shall be 100 mm diameter when installed on a 150 mm pipe. Note that this applies to 50 mm mains and larger. The valves shall discharge to an approved outlet or accessible concrete chamber.

7.7.6 Air Valves

Air can accumulate at high points when it is drawn into the system at reservoirs and pumps. Mains should be laid evenly to grade between peaks to ensure all possible locations of potential air pockets are known. Investigate the need for air valves at all high points, particularly those more than 2.0 m higher than the lower end of the section of watermain, or if the main has a steep downward slope on the downstream side. When used for vacuum relief, size air valves to prevent a negative pressure greater than -50 kPa developing.

Air may also come out of solution in the water due to a reduction in pressure, such as when water in a main is pumped uphill or at pressure reducing valves. Air valves may be required to allow continuous air removal at these locations.

The number and location of air valves required is governed by the configuration of the distribution network, in terms of both the change in elevation and the slope of the watermains. Install air valves in a secure enclosure with an isolating valve to permit servicing or replacement without needing to shut down the main.

Air valves are not normally required on reticulation mains in residential areas, as the service connections usually eliminate air during operation. Where the need is primarily for admission and exhaust of air during dewatering and filling operations, a high-point hydrant usually adequately serves reticulation networks.

On hillsides, locate a fire hydrant adjacent to and downhill from any sluice valve where the main descends from that location to release air.

DN300 and DN375 reticulation mains, with only a few service connections, may require dual-acting air valves, to automatically remove accumulated air that may otherwise cause operational problems in the water system.

7.7.7 Fire Hydrants

The developer shall provide fire hydrants to principal mains for the purposes of fire-fighting, air release, charging and system maintenance.

Hydrants shall be located within 1.5 m of the end of a capped reticulation pipeline.

In addition to hydrants required for maintenance purposes, they shall be located to comply with NZS 4404: 2004 *Code of Practice for Urban Land Subdivision* and the following:

- 135 m maximum spacing in Residential Zone
- 90 m maximum spacing in Business Zone
- 20 m maximum distance from the end of a no-exit street – measured from the road boundary.
- Site and reticulation specific air release requirements.

7.7.8 Additional Hydrants and Scour Valves for Maintenance Activities

Hydrants, additional to those required by the *Fire Service Code of Practice*, may be needed to facilitate maintenance activities, such as flushing the watermains. Ensure that there are approved and adequate drainage facilities to cope with the contents of the watermain from dewatering and flushing operations. These shall be marked as specified in section 7.7.7.

Part 7: Water Supply

Where automatic dual-acting air valves are not installed at high points on the watermains, install a hydrant to release air during charging, to allow air to enter the main when dewatering and for manual release of any build up of air as required.

Provide hydrants at low points on mains to drain the pipeline when scours are not installed. As a general rule, place a hydrant or scour at the lowest point of elevation where the volume of water unable to be drained exceeds 15 m^3. This normally applies to mains DN200 or greater.

7.7.9 Pressure Reducing Valves and Check Valves

Pressure reducing valves (PRVs) are preferred over break pressure tanks, and must be sized for minimum and maximum demand. PRV installations shall include the following:

- A concrete chamber located in a berm or other non-carriageway area;
- Positive drainage from the chamber;
- Secure covers either protected from traffic loads or rated for them;
- Isolation valves on the main PRV to enable servicing;
- Adequate restraint of pipes and valves to cope with the forces generated under all conditions;
- Flexible joints such that pipework in the chamber can be readily disassembled;
- A bypass PRV or small diameter pipe to provide service during maintenance
- A pressure relief valve where the maximum downstream pressure in the event of PRV failure exceeds 1,000 kPa. This shall discharge to a kerb or other visible location that will not cause a flooding nuisance;
- A flow meter to register flow into the zone;
- 100 mm diameter pressure gauges with isolating cocks mounted on the chamber wall to register the upstream and downstream pressures
- Manual overrides on the valve pilot gear to permit the valve to be forced fully open or fully closed.

The PRV must be designed to provide peak flows (including fire flows) as well as minimum night flows. Where minimum flows are likely to result in excessive seat wear, a bypass PRV must be provided to meet normal daily flows.

Check valves shall also be installed in a chamber with isolating valves. Check valves 100mm and larger shall have either a bypass arrangement or a manual open feature so that flow can be reversed if required. Check valves shall be of the resilient flap type and able to be serviced from a removable top cover.

7.7.10 Thrust Blocks on Mains

Install thrust blocks for all fittings and valves, to withstand the maximum operating pressure and test pressure.

Where required, thrust blocks shall be constructed so as to be clear of pipe joints and fittings.

Cast in-situ concrete thrust blocks shall be provided at all points where an unbalanced thrust occurs. Anchors and thrust blocks shall be appropriately designed and installed clear of connections and fittings. Concrete shall:

- Be a minimum of 20 MPa at 28 days.
- Surround not more than 180 degrees or 50% of the reticulation.
- Be insulated from the reticulation using an appropriate membrane.

Part 7: Water Supply

The precast thrust block detailed in SD 600-405 may be used if all of the following criteria are met:

- It must have a minimum surface area of 0.18 m^2 in contact with an undisturbed trench wall;
- The fitting or valve is up to and including 150 mm diameter;
- The maximum operating pressure is up to and including 700 kPa;
- The trench ground conditions can sustain a safe bearing capacity greater than 150 kPa, as established by testing.

Design and detail thrust blocks individually for any of the following situations:

- The fitting or valve is over 150 mm diameter;
- The maximum operating pressure is greater than 700 kPa;
- The ground bearing capacity is less than 150 kPa.

Also detail anchorage for in-line valves on pipelines that are not capable of resisting end loads.

7.7.11 Restrained Joint Watermains

Restrained joint watermain systems can be used in place of thrust and anchor blocks to prevent the separation of elastomeric seal-jointed pipelines.

Restrained joint systems include welded steel joints, flanged pipes and fittings and commercial mechanical restrained joint systems. Specify details of commercial restrained joint systems on the engineering drawings, including the:

- Length of restrained pipeline and adjacent fittings required to ensure the transfer of thrust forces to the ground strata;
- Requirement for placing suitably worded marking tape in the trench over the pipeline to define the limits of the restrained joint system;
- Requirement for details of the commercial restrained jointing systems to be shown on the as-built drawings, including the location of restrained portions of pipelines.

7.7.12 Provision for Disinfection

The fittings and reticulation layout must provide for disinfection of new mains to be achieved as per Section 6 of the Waimakariri District Council Hygiene Code of Practice for Work on Public Water Supplies.

7.7.13 Backflow

Design and equip drinking water supply systems to prevent backflow and/or back-siphoning. This shall be in accordance with Council's Backflow Prevention Policy.

Locate air valves and scours to avoid water entering the system during operation.

7.7.14 Service Connections – On-Demand

For design purposes, assume a 15 mm connection and meter manifold unless Council consent has been granted for other sizes.

Individual connections shall not be installed until applied for by the consumer.

The developer shall provide:

- Service connections;
    - To the boundary of each dwelling allotment at the time of subdivision development;
    - For any lot that is accessed by a right of way, extended 1.0 metre minimum into the main body of the lot, excluding leg-in access.

Part 7: Water Supply

- Backflow prevention at the point of supply complete with at least a low-hazard, non-testable device, and a higher specification device where the Council specifically requires this;
- A flow meter where specifically required by the Council. The flow meter will be required to meet the standards specified by the Council.

Where the development includes traffic or pedestrian islands that will be landscaped, then the developer shall provide a 100 mm duct from the nearest main to the islands that shall terminate clear of other underground services and vehicle crossings.

Refer to SD 600-412 and NZS 4404:1981 *Code of Practice for Urban Land Subdivision*.

7.7.15 Service Connections – Restricted

In rural areas where long rights-of-way exist, the Council will consider the installation of a public main within the right-of-way with individual connections where all the following criteria are met:

- The length of the main is greater than 500 m;
- There are four or more connections on the main;
- The water main will be vested in the Council;
- A 3 m wide easement-in-gross in favour of the Council is provided over the main, stipulating that no locked gates shall be constructed along the pipe main.

7.7.16 Clearances to Other Services or Obstructions

The designer shall be familiar with the required clearances from existing and proposed overhead and underground utilities. All underground and surface obstructions, or utility assets that may be hazardous, shall be identified on the engineering drawings.

Table 7.7 Water Main Clearances

Service Type 1	Service Type 2	Clearance (mm)	
		Crossing	Parallel
Water mains DN ≤ 200	Water Mains > DN 375	500	600
	Water Mains ≤ DN 375	150	300
	Stormwater mains	150	300
	Wastewater pipes	500	1000
	Kerbs	150 (where possible)	150
Water mains DN ≤ 200	Water Mains > DN 375	500	600
	Water Mains ≤ DN 375	150	600
	Stormwater mains	150	600
	Wastewater pipes	500	1000
	Kerbs	150 (where possible)	600

Note that a vertical (crossing) clearance shall always be applied to wastewater mains, in addition to the horizontal clearance required where the pipes are parallel. The water main shall always be located above the wastewater pipe.

Refer to CoP Part 9 clause 9.5.4 – *Typical Services Layout and Clearances* for clearances for utility services.

When using a trenchless technology installation method, apply the clearances required for watermains laid in an open trench. Refer to NZS 4404:2004 for more information.

Services must cross as close as possible to 90° (right angles).

Part 7: Water Supply

7.7.17 Reticulation in Legal Road

Evaluate and incorporate the following design considerations when locating reticulation in legal roads:

- Situate the water main 1.5 m off the road crown, as shown in SD 600-245C;
- Consider the balance between initial capital cost versus ongoing operational and maintenance costs, for factors such as access and soil type;
- Special cover requirements when renewing or laying new pipes in streets with a high crown and dish channels (refer to clause 7.10.6 – *Cover Over Pipes*);
- Allow for known future utility services and road widening.

The preferred position of surface boxes is in line with either side of property entranceways, to avoid interference with parked vehicles. Surface boxes must be located clear of feature paving such as cobblestones, and within roundabouts where possible.

7.7.18 Water Mains in Easements

Water mains may be located within a registered easement-in-gross only with the specific approval of the Council. Easements must extend a minimum of 1.5 m each side of the centreline of the water main (i.e. 3 m wide easement). The easement registration must provide the Council with rights of occupation, conveyance and access and ensure suitable conditions for water main replacement, upgrade, operation and maintenance. All WDC easements shall be easements-in-gross.

Typical situations where the Council may approve mains in easements include those where there is a need for a link main to provide continuity of supply or where fire protection is required for multiple properties within a private right-of-way.

An easement over private property for a water main is not the preferred option and is generally only used as a temporary solution to landlocked developments, pending the future provision of a permanent supply within a legal road. Easements may be located over private property, public reserves, crown reserves, other government-owned land, private roads or access ways in both conventional and community title subdivisions.

7.7.19 Termination Points and Hydrants at the End of Mains

Avoid dead end mains in order to prevent poor water quality. Where a dead end main of 50 mm diameter is unavoidable, a flushing valve shall be installed at the termination point. Refer to SD 600-404. Consider alternative configurations such as a continuous network, link mains and use of rider mains to service properties off the end of mains.

A hydrant must be placed within 1.5 m of the end of all permanent and temporary sections of dead end mains greater than or equal to DN100. Apart from the fire fighting function, this also allows the section of dead end main to be flushed regularly to ensure acceptable ongoing water quality. This is particularly important in new subdivisions, where only a small number of properties may be connected initially.

7.7.20 Temporary Ends of Watermains

Lay watermains to within 1.0 m of a subdivision boundary, where it is intended that the road will extend into other land at some future time.

In new development areas, construct mains to terminate approximately 2.0 m beyond finished road works, with a hydrant within 1.5 m of the temporary end, as detailed in clause 7.7.19. The hydrant must be suitably anchored, to ensure that future works do not cause disruption to finished installations.

Part 7: Water Supply

7.7.21 Temporary Works

The Council may, at its discretion, approve a delay in providing the total infrastructure requirements for large developments that will be developed over a period of several years. Such approval is conditional on the provision of a temporary infrastructure of sufficient capacity for the immediate development and may require a bond to ensure construction of the remaining infrastructure when necessary.

7.7.22 Reticulation on Private Property

Supply pipes in private property and mutually owned rights-of-way are considered to be privately owned and must be protected by easements in favour of the dominant tenants. The developer shall state the intended water supply proposal for the development on the subdivision consent application.

For multiple-unit developments, individual water connections shall be provided at the boundary. For large, Body Corporate establishments, the Council may approve a single metered connection. In rural areas where long rights-of-way exist, the Council will consider the installation of a public main with individual connections (refer to section 7.7.15).

7.7.23 Multiple Meters at the Boundary

Locate all the meters at the legal road boundary as shown in Figure 7.3. This layout can be used for fee simple, cross lease or unit title developments.

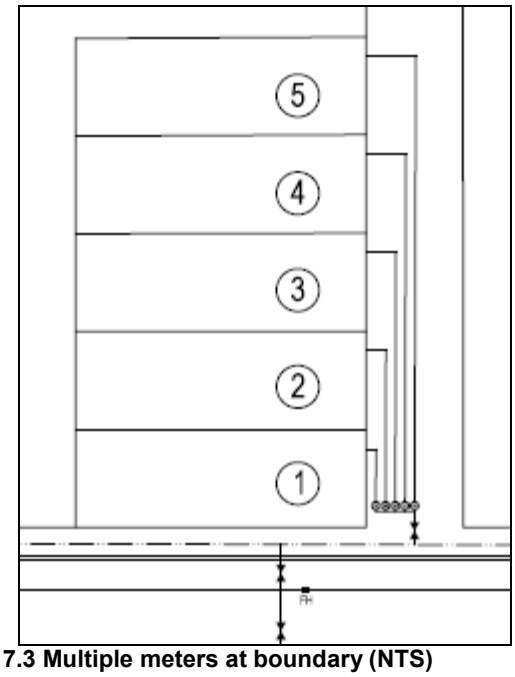

Figure 7.3 Multiple meters at boundary (NTS)

7.7.24 Single Connection to Body Corporate

Where a development requires the creation of a Body Corporate (e.g. a Unit Title subdivision) a single meter can supply all the dwelling units as shown in Figure 7.4.

This layout requires only one Council meter, however the developer must install additional sub-meters within the private land. These sub-meters will be private and will not be maintained by the Council.

Part 7: Water Supply

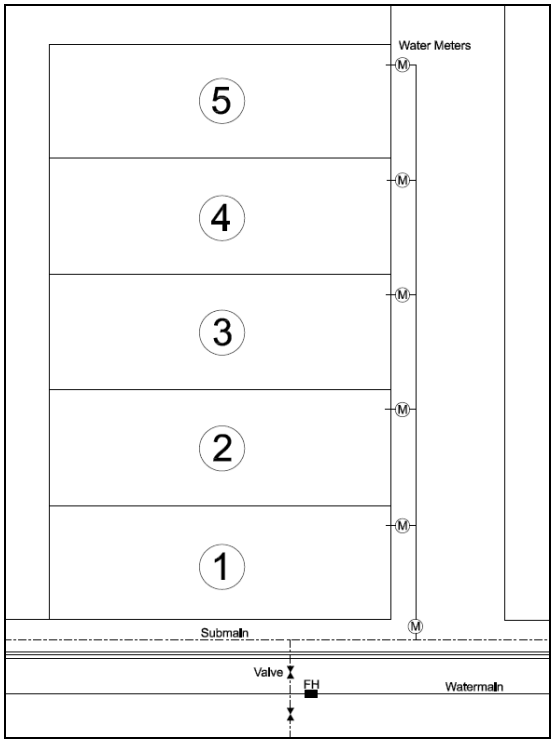

Figure 7.4 Single connection at Body Corporate boundary (NTS)

Any water supply charges will be invoiced by the Council against the Body Corporate. The rules of the Body Corporate shall nominate the Unit to which the water charges are applied. The rules shall also allow for the equitable distribution of these charges between all Units on the basis of volumetric use, if the Council implements water charges by this method.

The Body Corporate documents shall be supplied to the Council for approval as part of the application for the Section 224c certificate, including the identity of the nominated Unit.

Part 7: Water Supply

7.8 HEADWORKS & PUMPING STATION DESIGN

Any requirement for headworks (i.e. any combination of a pumping station, treatment plant, supply well and storage reservoirs) will become apparent during the preliminary reticulation design. The Council will take into account the long-term cost-effectiveness (i.e. total life-cycle costs) of the facility before accepting any infrastructure to be vested in the Council. Design and construct any such infrastructure to accord with the *Water Supply Wells, Pumping Station and Reservoir Design Specification*. Design pumping stations that supply residential zones to provide the flow requirements set in section 7.5 unless otherwise specified.

Obtain requirements for pumping stations from the Council prior to design.

7.8.1 Water Supply Wells

Wells shall have sufficient year round capacity to supply the maximum daily flow for the scheme, with a maximum of 20 hours' pumping per day. Water pumped from the well to the storage tanks shall be by an adequate and durable submersible pump.

The following information shall be submitted to the Council for approval:

- The well log/strata data;
- Depth of the well;
- Water levels (static and operating);
- Materials' classification;
- Water bearing strata type and depth;
- Well screen type, dimensions and position(s);
- The results of a step draw down test up to the maximum yield of the well, which shall then be continued for a minimum of 48 hours, and the recovery time taken to the initial static water level;
- Defined well plume or catchment area;
- Independent or comparative comment on well capacity, future performance, and the likely extent of the abstraction plume.

A resource consent shall be obtained to extract water from a supply well. The resource consent application shall consider and address any effects on other parties.

All water supplies with 400 or more connected properties shall have two supply wells, each capable of meeting the peak daily demand.

All water supplies shall be installed complete with a magflow meter on the outlet and a water level sensor capable of sensing the full range from static water level to maximum drawdown. The magflow meter and level sensor shall be connected to the Council's DATRAN system.

7.8.2 Water Treatment

Where new treatment facilities are required, these shall be designed, constructed and tested to demonstrate compliance with the MoH *Drinking Water Standards* 2005 (Revised 2008), or any subsequent revisions. The approval process will depend on a number of factors including:

- The quality of source water;
- The size of scheme;
- The complexity of treatment process; and
- Whether the scheme shall be vested in the Council.

Contact the Council to discuss the approval process when details of the source and treatment are known.

Part 7: Water Supply

7.8.3 Pumping Station Buildings

Where the developer requests that the pumping station be vested in the Council then the pumping station building shall:

- Be constructed from durable products, such as concrete block or masonry construction on a reinforced concrete slab floor, with Coloursteel roofing;
- Consist of two separate compartments, one to house pumps, pressure system and electrical controls and the other for treatment equipment and chemical storage. The compartments shall be isolated from one another by sealed wall(s) or door(s) and separately vented;
- Provide a chemical treatment storage and equipment compartment that shall be fully insulated on all walls, floor and ceiling;
- Have a containment foundation with the floor graded to a discharge point with an outlet to a holding tank with a minimum storage of the volume of liquid chemical contained plus 25%, or 1000 litres, whichever is the greater;
- Have thermostatically controlled ventilation;
- Have a building consent and Code Compliance certificate;
- Include 15 mm faucets capable of withstanding flame sterilisation for both raw and treated water and identified by appropriate signage;
- Include a stainless steel hand-basin complete with associated fittings and drainage to the public sewer (where available) or to the holding tank in the pumping compartment;
- Include an external sign showing the name of the station and any hazards;
- Include Council approved three-phase wiring and plug installation to enable reticulated power supply isolation and connection of portable emergency power generation equipment;
- Be keyed to Council's standard water supply key for all locks (including padlocks).

7.8.4 Pumping Station Pumps

Where the supply is not gravity fed, the developer shall provide a minimum of two reticulation mains pressure pumps for each pumping station.

Each pump shall have sufficient capacity to provide the required peak instantaneous flow for the total area reticulated while maintaining the design residual mains pressure (duty and stand-by).

All pumps shall be:

- Models approved by the Waimakariri District Council prior to installation;
- Fitted with flanged pipe fittings;
- Wired with IP66 plug connections;
- Installed with sufficient valving to allow simple isolation from the reticulation system;
- Fitted with an automatic start (upon reticulated power supply failure) emergency backup diesel generator where the pumps supply on-demand reticulation.

Where pumps are providing flow directly into the reticulation, they shall be controlled with PDL variable speed drives (VSD).

Part 7: Water Supply

7.8.5 Site & Access

Where the developer requests that the pumping station be vested in the Council then the pumping station site shall include:

- Site and accessways are vested in the Council;
- A sealed all-weather accessway to each wellhead, pump house building and headworks storage site;
- Chain-link fencing around all headworks components, with a minimum height of 2 m, barbed wire top, complete with a 4.2 m wide lockable gate;

7.8.6 Electrical Control Panel

Where the developer requests the Council to adopt a water supply pumping station then the electrical control panel shall be installed in the pump house and shall include the following components:

- Separate steel cabinets powder coated complete with relevant New Zealand Standard approved boards for power meters and fuses;
- Hour meter for each pump (including the well submersible pump/s);
- Start counter for each pump;
- Ammeter for each pump;
- Duty selector switch;
- A manual/off/auto switch for each pump;
- Automatic start of standby pump(s);
- Phase failure relay in control circuit with a delay reset;
- Motor overload protection, thermistor on surface pumps and electronic on submersible pumps;
- Low well cut-out on well pump;
- Time delay between pump starts to meet manufacturers requirements;
- Alarms and panel indication for low well, low storage, high storage, no flow and pump fault.
- Pressure gauges;
- Engraved labels;
- Numbered wiring;
- Full "As Built" drawings and documentation;
- Floatless level controls for level controls and alarms;
- Well and storage level measument equipment connected to SCADA;
- Flow measurement equipment on bores and reticulation pumps with connection to SCADA for instantaneous and totalised flows;
- SCADA RTU unit complete with transmitting equipment;
- Connection and changeover switch for standby generator (where permanent generator is not required);
- Manuals for all components with comprehensive operating instructions.

7.8.7 Reservoir Design

Reservoirs are required to provide:

- Working storage (calculated from a volume balance across the peak demand period);
- Fire fighting storage (calculated from SNZ PAS 4509:2003);
- Emergency storage (sufficient to maintain supply for a period of time as specified in Table 7.8).

Part 7: Water Supply

Table 7.8 Storage Capacity Requirements

Source of Supply	Emergency Storage Required (Time at ADF)
Single surface-water or non-artesian groundwater source	24 hours
Multiple surface-water or non-artesian groundwater sources	12 hours
Single or multiple artesian groundwater sources	6 hours

The size of the reservoir shall be given by the working volume, plus the emergency or fire fighting storage (whichever is larger), plus the unused volume (for example, volume between the base of reservoir and the outlet).

7.8.8 Headworks Supply Storage for On-Demand and Semi-Restricted Supplies

All on-demand and semi-restricted supplies shall have storage provided at each headworks.

Generally, the developer shall provide a volume equivalent to the working storage plus the greater of either the fire fighting storage **or** the emergency storage. However, where multiple artesian sources or multiple sources with backup power supply are provided, a risk assessment may be carried out to demonstrate that a reduced emergency storage volume is appropriate. The methodology and the outcome shall require the specific approval of the Council.

Each tank shall have a sealed and locked secure inspection cover.

Pipework & fittings shall be installed that:

- Allows all tanks to be individually isolated for maintenance;
- Ensures balanced flow through all tanks;
- Provides protection from freezing;
- Provides stock protection.

A level sensor must be installed in all reservoirs and be connected to the Council's SCADA system.

7.8.9 Headworks Supply Storage for Restricted Supplies

All restricted supplies' headworks shall incorporate a minimum of two storage tanks with a minimum capacity of 30 m^3 each. These tanks should be the same size where possible.

Each tank shall have a sealed and locked secure inspection cover.

Pipework & fittings shall be installed that:

- Allows all tanks to be individually isolated for maintenance;
- Ensures balanced flow through all tanks;
- Provides protection from freezing;
- Provides stock protection.

A level sensor must be installed in all separate reservoirs and be connected to the Council's SCADA system.

Part 7: Water Supply

7.9 MATERIALS

The Council is currently in the process of developing an approved materials specification. The following brief outline is provided as guidance, specific details are available from the Council on request.

All products must be fit for their respective purpose and comply in all respects with the Council's current specification for the supply of that material and the standards referenced. The manufacturer's requirements shall be complied with during construction.

Where a material or product is proposed that is not approved in the district, the Council may require assurance that demonstrates the durability of that material prior to approval. Where there is no current standard, the manufacturer will be required to supply copies of their Quality Assurance procedures and producer statements to support their performance and composition claims for the products concerned.

7.9.1 Material Selection

All materials must comply with their respective current NZS or AS/NZS standards.

The following pipe materials currently available in New Zealand are acceptable for distribution mains:

- PVC-U and PVC-O;
- Polyethylene - PE 100 and PE 80B;
- Ductile iron;
- Concrete-lined steel.

PVC-M pipe will not be accepted.

These pipes, with nominal internal diameters of 100, 150, 200 and 300 mm, are readily available and are the sizes commonly used in the Waimakariri District.

All PVC pipes used in the Waimakariri public supplies must have a minimum pressure rating (PN) of not less than 12 bar or PN12 (1200 kPa).

7.9.2 Bedding and Backfill

Bedding material shall be suitable for the pipeline material in question and shall comply with CCC CSS: Part 3 clauses 8.5 and 8.6.

7.9.3 Reticulation Fittings

Nylon coated ductile iron fittings complying with AS/NZS 2280 shall be generally used. Where socketed fittings are used, these shall be specifically designed for Series 1 or Series 2 pipe as appropriate (i.e. fittings that use adaptor rings are not permitted). Fabricated fittings shall not be used without specific Council approval.

7.9.4 Sluice Valves

Sluice valves used for scour or isolation purposes shall be resilient-seat and clockwise-opening, with non-rising spindles. They shall be of nylon coated ductile iron construction suitable for buried service and comply with AS/NZS 2638. Sluice valves shall have dual shaft seals and be of the removable bonnet type (i.e. unitary construction valves are not permitted).

Part 7: Water Supply

7.9.5 Hydrants

Hydrants shall be clockwise closing, screw down, medium pattern with a screwed outlet and comply with NZS/BS 750: 1984 Specification for Underground Fire Hydrants and Surface Box Frames and Covers. The stem gland shall have PTFE packing or "0" ring seals and the sealing cup washer shall be made of Polyurethane.

7.9.6 Small Diameter Valves & Fittings

Small diameter (i.e. threaded) valves and fittings (including service manifolds) shall be constructed of either dezincification–resistant brass, bronze or stainless steel. Buried valves shall be of the metal gate type, with conventional (anti-clockwise) opening and installed such that the operating wheel can be operated from the surface by hand.

Ball valves shall not be installed where there is potential for freezing. Water sample taps shall be of metallic construction and mounted securely with the operating handle removed in a position that allows convenient sterilising of the tap (by flame or by disinfectant solution).

Female threaded connections on polymer fittings must have a stainless steel reinforcing ring or similar to prevent splitting.

7.9.7 Air Valves

Air valves shall be dual-acting air valves, incorporating a kinetic air valve (large orifice) and a dynamic air valve (small orifice) in a single unit. The nominal size of the large orifice of air valves must be DN50, for installation on mains less than or equal to DN300.

7.9.8 Service Connections – On-Demand

Service connection fittings shall be in accordance with the material specification, but generally shall include:

- DN20 OD (15 mm internal diameter) blue PE80B pipe;
- Manifold in accordance with Standard Drawing 600-414A.
- A marker groove cut into the adjacent kerb & channel, painted blue.

7.9.9 Service Connections – Restricted

Service connections shall be in accordance with all relevant approved New Zealand Standards, but generally shall include:

- DN25 (20 mm internal diameter) blue PE80B pipe;
- Manifold in accordance with Standard Drawing 600-414B.
- The installation of an appropriately sized restrictors (typically 2,000 L/d);
- A white plastic marker post attached to the boundary or fence, adjacent to the connection.

7.9.10 Surface Boxes and Markers

All valves shall be provided with an approved surface box in accordance with 7.9.10 and a vertical section of 150 mm minimum diameter PVC-U pipe from the valve bonnet to 50 mm below the finished surface. The pipe shall be installed so as not to transfer surface load to the reticulation main (refer also SD 600-406).

Table 7.9 Surface Box Requirements

Situation	Surface Box
Line valve, scour valve, air valve or hydrant	Cast iron or ductile iron valve box, marked "FH", "AV" or "V" as appropriate and capable of carrying Class 1 vehicle load.

Part 7: Water Supply

Rider mains in berm or footpath	UV-resistant, high-impact, high-density polyethylene (Draper Enterprises Type D), complete with blue lid marked “V”.
Service connections – On-Demand	Refer to Standard Drawing 600-414A.
Service connections – Restricted	Refer to Standard Drawing 600-414B.

Surface boxes shall finish flush with the final ground surface. Valve boxes shall be painted blue. Hydrant boxes shall be painted yellow.

Hydrant posts or plates shall be installed as required by PAS SNZ 4509.

Permanent marker posts or plates shall be installed for all valves larger than DN100. The marker shall identify the size of the valve, and the distance to the valve (to 0.1 m accuracy).

White and yellow paint shall accord with the requirements of TNZ *Manual of Road Markings* Part 2. Blue paint type will be subject to specific Council approval.

Part 7: Water Supply

7.10 INSTALLATION

7.10.1 Authorised Installers

Water Reticulation Workers shall adhere to the requirements of Section 3 of the Waimakariri District Council Hygiene Code of Practice for Work on Public Water Supplies. This sets out minimum qualification requirements for workers installing, repairing or testing new water mains either for Council or to be vested in Council.

Construction of the water supply system must not start until acceptance in writing has been given by the Council.

Wherever works are installed within existing legal roads, a Carriageway Access Request (CAR) must be obtained for that work. The work must comply with requirements as set out in the Council standard specification QP-C843 for this type of work.

No work may start until the CAR has been approved in writing by the Council.

7.10.2 Handling

Both the developer and the contractor are responsible for ensuring the appropriate handling, storage, transportation and installation of pipes and fittings to avoid damage and to preserve their dimensions and physical properties. The total exposed storage period from the date of manufacture to the date of installation for all PVC and Blue PE pipe must not exceed 12 months. Store fittings under cover at all times.

Refer also to Section 4.2 of the Waimakariri District Council Hygiene Code of Practice for Work on Public Water Supplies for requirements for managing hygiene of water supply pipes during storage.

7.10.3 Proposed Method of Installation

There are a number of methods of installing underground services. These include open trenching, directional drilling, pipe bursting or slip lining. Factors that may influence the selection of installation method include ground conditions, disruption to traffic, need to work around trees, topographical and environmental aspects, site safety and the availability of ducts or redundant services, e.g. old gas mains or their offsets.

Wherever the intention is to lay a number of utilities with a rider main in a common trench, pay particular attention to obtaining the required minimum cover and clearances for each utility in the trench cross-section. Mains must always be laid in a separate trench. The required clearance between services is presented in CoP Part 9, Table 9.2 *Utility Clearances*.

7.10.4 Bedding and Backfill

Reticulation pipework shall include pipe trench bedding using a selected granular material in accordance with the manufacturer's recommendations.

Under no circumstances is the trench base or excavated material to be used as pipe bedding.

The developer shall ensure that the manufacturers' recommendations for pipe storage, handling, protection, and laying techniques are complied with.

The developer shall prevent the entry of clay, bedding, stormwater runoff and other foreign material into the pipeline during construction. End caps shall be used wherever practicable during the construction phase.

All fittings and anchors shall be left exposed for inspection by the Council during the course of the acceptance test.

Part 7: Water Supply

7.10.5 Trenchless Technology

Trenchless technology may be adopted for alignments passing through:

- Environmentally sensitive areas;
- Built-up or congested areas;
- Arterial and strategic roads;
- Areas not suitable for trenching (e.g. railway and main road crossings);
- Difficult hill crossings;
- Private land;
- Under sealed roads or accessways.

Open trenching through all roads shall be avoided where possible. Excavation by methods such as directional-boring, thrust-boring, micro-tunnelling, and pipe-jacking may be used in order to lessen the impact of the works on pavements and trees.

Submit the following, with the engineering drawings:

- How the required clearances from other services and obstructions will be achieved;
- The location of access pits and exit points;
- The depth at which the pipeline is to be laid and the tolerance on this, to ensure minimum cover is maintained;
- How pipe support and ground compaction will be addressed.

The Council may also request process details.

Where the developer proposes trenchless installation in road, railway or drainage reserve then this shall be submitted to the Council for approval. Note that additional approvals may also be required from the New Zealand Transport Agency and/or Ontrack for works in state highways and rail reserves, respectively. Carrier pipes may also be required in such situations.

7.10.6 Cover Over Pipes

The minimum cover to all mains from finished ground level shall be:

- 600 mm in berm, footpath or behind carriageway or kerb & channel;
- 750 mm under carriageways or areas where the Council proposes carriageways
- 1000 mm in all areas for strategic water mains such as delivery mains.

Where the minimum required cover is not available, specific design is required.

Special design considerations apply to the installation of pipes in streets with high crown and/or dish channels. These roads are likely to get reconstructed in future years, which usually results in a lower crown, hence pipes must be installed at greater depths so that the 750 mm cover is maintained after road reconstruction. To estimate future road levels, take spot levels along the property boundaries, which will most likely be the future crown level. Deduct 125 mm from that level to get the future kerb level. Install water mains with 750 mm cover over those future levels.

7.10.7 Working around Structures

Watermains that are located close to structures, such as foundations for brick walls and buildings, must be clear of the “zone of influence” of the structure’s foundations, to ensure that the stability of the structure is maintained and that excessive loads are not imposed on the watermain. Refer to the table below for guidance on minimum clearances from structures.

Part 7: Water Supply

Table 7.10 Minimum clearance from structures

Nominal Pipe Diameter (mm)	Clearance to Wall or Building (mm)
<100	300
100-150	1000
200-300	1500
375	2000

Watermains that are constructed from metallic materials must not be located within 30 m, measured horizontally, of overhead electricity transmission towers having a voltage 66 kV or higher, especially if cathodic protection will be provided. Galvanic anodes for cathodic protection should be located away from the transmission lines or approximately midway between the transmission towers.

Deviate pipelines around obstructions by deflection at the pipe joints and with bends. If plastic pipes are used, the pipes may be cold bent, with minimum radii not less than 50 nominal diameters (PE pipes) or 300 diameters (PVC-U pipes), or as recommended by the manufacturer, whichever is the greater. The deflection angle permitted at a flexible joint must comply with the manufacturer's recommendation. Provide a detailed design, showing the route of the watermain around the obstructions.

7.10.8 Crossings

Wherever watermains cross under roads, railway lines, waterways, drainage reserves or underground services, make the crossing, as far as practicable, at right angles to the centreline of the road, railway lines, etc. Design and locate the main to minimise maintenance and crossing restoration work. Make all crossings of natural waterways below the invert level of the waterway.

Refer to section 7.10.6 regarding the minimum cover required over the pipe. Wherever pipelines are located under major infrastructure assets, carriageways, intersections or waterways, determine whether the pipeline may require mechanical protection or increased cover, or if different pipeline materials are needed for the crossing.

7.10.9 Above-ground Watermains

Include the design of pipeline supports and loading protection with the design of above ground watermains. Address any exposure conditions such as corrosion protection, potential for vandalism, UV protection and temperature re-rating.

7.10.10 Works within Road Reserve

For any works within a road reserve, the developer shall obtain a road opening permit from the Council. Refer also to WDC *Standard Specification – Road Openings* (QP-C843, attached to CoP Part 8: *Roading* as Appendix B).

For any temporary works within a road reserve, the developer shall meet the Council's requirements for temporary traffic management, which may include the submission of a traffic management plan to the Council for approval and prior to commencing work.

7.10.11 Valve Installation

All buried valves shall be installed with cast iron surface boxes such that the top of the spindle or handle is within 750 mm of the surface. Spindle extensions shall be provided where required.

Standard Drawing 600-406-C shall be referred to.

Part 7: Water Supply

7.10.12 Hydrant Installation

Hydrants shall be:

- Mounted on Council approved hydrant tees, with risers if necessary, such that the top of the valve spindle is between 100 and 250 mm from the finished surface level;
- Identified with an H (75 mm high) cut into the top surface of the kerb (typically using a grinding wheel) and a 300 mm length of kerb painted yellow at that point.
- Marked in accordance with NZS 4501:1972, and include an approved blue coloured Raised Reflectorised Pavement Marker (RRPM) cemented to the carriageway surface by an approved adhesive. The RRPM shall be located adjacent to the centre of the base of the triangle.
- Provided with a surface box of a type approved by the Council. The box lid shall be painted using a yellow paint to be approved by the Council.
- Yellow circular clearance marking (in accordance with MOTSAM Section 4.07.03), shall be provided around fire hydrants that may be obstructed by park vehicles (as set out in SNZ 4509:2008 Appendix L3.1(c)).

Hydrants shall be raised on approved precast concrete sections from the level of the hydrant base flange and installed not to transfer loads to the reticulation. Construction shall accord with the requirements of NZS/BS 750: 1984 *Specification for Underground Fire Hydrants and Surface Box Frames and Covers* (refer also CoP Part 8 Roading 8.11.9 – *Road Markings*).

Standard Drawing 600-406-C shall be referred to.

Part 7: Water Supply

7.11 TESTING & COMMISSIONING

7.11.1 Testing and Inspection

Mains shall be pressure tested, and sterilised prior to connection to the existing system. The developer shall obtain prior approval from the Council for the location of waste disinfection water.

Pressure Testing

After bedding and haunching, but prior to final backfilling, the developer shall make available for inspection:

- Each section of reticulation main.
- All fittings, anchors and thrust blocks.
- The reticulation for testing in the presence of the Council's representative. The pressure test may be undertaken simultaneously with the visual inspection.

Testing shall:

- Include visual inspection by the Council.
- Use water to the test pressure requirements approved by the Council.
- Successfully withstand a pressure test performed using the appropriate method set out in section CoP Part 3 section 3.8 – *Pipe Testing – Pressure.*

The developer shall supply all necessary test equipment and apparatus.

Sterilisation

Sterilisation of new water mains shall be carried out in accordance with Section 6 of the Waimakariri District Council Hygiene Code of Practice for Work on Public Water Supplies.

7.11.2 Connecting into Existing System

Prior to connecting into the Council water supply system, the applicant shall complete an 'Application for Approval to Connect to Council Water Infrastructure' (QS-U550-AC).

As part of this application, the application shall set out:

- Evidence that chlorination and pressure testing have been witnessed and acceptable results obtained.
- Methodology for connecting into the existing pipework.
- Qualifications of staff to be undertaking the cut-in.
- Details of affected customers to be notified.
- List of key parts to be used.
- Plan for flushing and commissioning the pipework following the cut-in.

A Council Water Unit staff member shall be present to oversee the connection, or they shall be engaged to undertake the connection.

Part 7: Water Supply

7.12 AS-BUILT INFORMATION

Present as-built information which complies with CoP Part 12: *As-Builts* and this Part.

Part 7: Water Supply

7.13 ASSOCIATED DOCUMENTS

Appendix A Water Supply System Selection Flowchart (QP-C816-AA)

Appendix B Pipe Materials Selection (Water Supply – Pressure) (QP-C816-AB)

Appendix C Water Quality Testing (QP-C816-AC)

Appendix D Designing for Surge and Fatigue (QP-C841)