



CS7 – Water

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CS7 Water

7.1 Scope

This section sets out the requirements for the construction or upgrade and maintenance of the district water supply. It covers the specifications for constructing, testing and maintaining the water supply and related ancillary items such as Pumpstations & Treatment plants.

Road works shall be maintained throughout the maintenance period. Maintenance shall include but not be limited to sound engineering practices.

Evidence of a regular maintenance contract, including contact details shall be submitted for Council approval prior to the consideration by Council of the release of either the s224 certificate or certificate of practical completion.

7.2 Definitions

Definitions are set out in Section 1 of the Development Code: Design, unless otherwise described.

7.3 Related Documents

The following Drawings and other documents form part of this contract Document as listed:

Design Standard CS7:	Water
Drawings Number.....	and Name
Construction Standard CS7:	Water

7.4 Materials

Materials shall be as listed in the appropriate section of the Development Code: Construction, or as defined in this document.

Materials shall be as specified within this document, unless otherwise specifically agreed with Council.



7.5 General

Where the word “Contractor” is used below, it shall apply to all work undertaken by either the Consent Holder’s Contractor or Council’s appointed contractor (i.e. where works are undertaken by Council). The following construction specifications apply to the water supply system. Ref: National Code of Practice for Utilities Access to Road and Rail Corridors.

7.6 Existing Utility Services

Before commencing any excavation, all service utility providers shall be contacted and any approvals necessary for excavating in the vicinity of their services shall be obtained. Any conditions stipulated by the utility provider in regard to working in the vicinity of their service shall be followed.

RON’s from ‘In3 Roads’ and Approvals from ‘The New Zealand Transport Agency’ must be obtained prior to working on Local Roads or State Highways and. Requirements of the HPT are to be followed at all times and where necessary an Archaeological Authority to be applied for and approved prior to commencing works on site.

7.7 Construction

7.7.1 Alignment

The alignment of the watermains shall be set out with reference to permanent land transfer pegs or temporary boundary marks placed by the licensed cadastral surveyor responsible for the final land transfer pegging. The alignments shall reflect the design in the approved engineering drawings for the development.

Laying by reference to the kerbline should only be carried out where the surveyor has confirmed that it is the correct designed distance from the land transfer peg positions.

The location of water mains within the road reserves shall be shown as on the drawings.

7.7.2 Depth of Watermains

Both principal mains and rider mains shall have the minimum covers as per DS7 – Water Supply Design, except in circumstances where specific design has been approved and requiring special protection. Greater depth shall only be provided if required and / or approved by the Authorised Officer. The sections of mains adjacent to a carriageway crossing shall be gradually deepened, to allow the required cover under the carriageway without necessitating vertical bends.



Water Mains under State Highways shall be constructed to the required depths as per the requirements and specifications from New Zealand Transport Agency (NZTA).

Service connection pipes shall have the minimum covers as per DS7 – Water Supply Design. Similar provision shall be made to give the necessary cover over valve spindles, i.e. 350mm cover.

7.7.3 Excavation

Excavations in roading reserves shall conform to Council's Road opening procedures. Watermains shall be thrust (or directionally drilled) under existing roads, permanent surfaces and vehicle entrances. Where it is not possible using trenchless technology to thrust or drill under existing carriageways and roads open excavations shall only be carried out with the approval from Council prior to any excavations commencing. This must be carried out in a safe manner with the minimum disruption to traffic and/or pedestrians. Refer Drawings

7.7.4 Pipe Bedding

Water main pipes shall be bedded on suitable fine, non-cohesive, granular material, either insitu natural or imported that complies with the design and the manufacturer's specification. All water mains under carriageways shall have sand or fine granular bedding and surround (except when the water main has been thrust or drilled).

All Pipe bedding shall be in accordance with the manufacturer's specification and a design approved by Council.

There shall be no sharp stones or large clay lumps in the bedding or surround. Bedding material immediately around the pipe or fittings shall not contain particulate matter greater than 12mm.

Each pipe shall be laid so that the barrel of the pipe is supported for at least 90% of its circumference along its entire length. The bottom of the trench shall be cut out to sufficient size to permit jointing of the pipes and all pipes shall be supported upon their barrels only. Refer Drawings.

7.7.5 Pipe Laying

Pipes shall be accurately laid to the alignments, levels and gradients shown on the drawings and in accordance with manufacturer's specifications. During pipe laying, the inside of the pipes shall be at all times kept free from dirt and debris and shall at the end of the construction be thoroughly cleaned and fittings shall be inspected for faults or damage and any faulty pipes or fittings shall be marked and rejected.



All watermain pipes that are labeled shall be laid with product labelling uppermost in the trench. Night caps (or dust caps) shall be fitted to the end pipes in the construction zone at the end of each working day to avoid contamination of the inside of the pipe outside of the working hours.

When necessary, pipes shall be cut, or ends turned by approved means or turning machine in accordance with the manufacturer's recommendations. Exposed steel or buried steel pipe and fittings shall be protected from corrosion.

7.7.6 Jointing

All jointing shall be installed in accordance with the manufacturer's specification. Care shall be taken to ensure that the rubber rings are not twisted and are located evenly around the joint. The spigot end shall be pushed firmly into the socket such that the gap between the two pipes is within the manufacturer's specified tolerance and such that the witness mark is just visible. All seal rings shall be thoroughly cleaned of any dirt and grit, particularly on the sealing faces, before lubricant application and assembly.

Where polyethylene butt or electro fusion joints are made all work must be carried out in accordance with the manufacturer's specifications, and by a registered PE welder having been assessed competent to the requirements of POLYTEC Electro fusion or Butt Welding accreditation Program v3.0.

All Joints will be marked with the welder's PIN number and date of the weld. A minimum of two sample welds must be destructively tested, by a qualified testing facility for bending and tensile strength. One sample will be taken from the pipeline in the construction zone. The results must be submitted as part of the QA documentation

7.7.7 Tolerances

All works shall be constructed within the tolerances set out in this clause.

Horizontal: + 100mm

Vertical: -0mm, +100mm (tolerances as per DS7 – Water Supply Design.)

Where the above tolerances are unable to be met then specific approval from Council is required prior to construction.

7.7.8 Fittings

Pipe fittings such as tees, hydrant tees, crosses, tapers, hydrant risers, blank caps, plugs, bends of various degrees, shall be of ductile iron. All ductile iron fittings shall have anti corrosive epoxy /



polymer coatings. Spigot and socket PVC bends (long radius) may be used. (Galvanised iron or steel fittings are not acceptable).

All steel joints and fittings incorporating threads or galvanised bolts, nuts and washers shall be wrapped in Denso Putty and Denso inner and outer Tape, or with heat shrink protective sleeve. As an alternative, 316 grade stainless steel bolts may be approved by the Authorising Officer. All fittings and valves shall have anti-corrosion protective epoxy/polymer coatings.

7.7.9 Hydrants

Hydrants shall be screw-down type to NZS/BS 750 clockwise closing. The use of ball hydrants is not permitted.

All hydrants are to be nylon coated to AS/NZS 4158.

Drain holes for frost protection are not permitted. If the hydrant is drilled for this purpose, the hole shall be plugged.

Hydrant tees shall be flanged if laid next to other flanged fittings. Otherwise flexible joints are permitted (gibault or supertite).

Hydrant risers shall be used, or the watermain laid deeper, where necessary, in order to ensure that the top of the spindle is between 100mm and 250mm below finished surface level.

Where approved by Council, hydrants to be installed on trunk mains shall be fitted with an isolating valve. The tee will be positioned facing horizontal. All fittings shall be flanged. A comping anchor block shall be constructed at the Tee.

7.7.10 Hydrant Boxes

The manufacture and installation of hydrant boxes shall be as shown on Drawings.

Hydrant boxes and risers should be fitted with lifting cleats to assist installation.

Surface boxes set in bitumen or concrete surfaces (carriageway or actual footpaths) shall be surrounded by such edging and with the immediately adjacent concrete set within a rectangular boxed-out construction joint if required. Refer drawings.



7.7.11 Location, Marking of Fire Hydrants

The marking and position of markings of fire hydrants shall be to New Zealand Firefighting Water Supplier Code of Practice SNZ PAS 4509:2003 and subsequent amendments, subject to the following clarification:

- i. The lid and concrete surround is to be painted yellow (to TNZ M7).
- ii. A triangle is required with its base next to the road centerline.
- iii. Blue cats eye double sided reflective marker to be on centerline of road perpendicular to the hydrant.
- iv. In any street with special paving (e.g. cobblestones) it is not desirable to paint a yellow triangle on the paving. In these cases the blue cats-eyes and the marker post are required and a 500mm length of the kerb is to be painted yellow.
- v. In kerbed residential streets the kerb is to be painted on both the face and top for a length of 500mm and a marker post is not required.
- vi. In un-kerbed streets and rural areas H4 treated timber or concrete indicator posts, if required, shall be of an approved type, set vertically in the ground within 300mm of the lot boundary and immediately opposite the hydrant which it indicates. Each post shall be firmly set to a depth below ground level of at least one third of its overall height and shall bear the inscribed letter "H". Hydrant indicator posts shall be painted yellow and in accordance with NZS 4404 and this Code.
- vii. Where a hydrant is in the carriageway, a painted yellow triangle and blue cats eye marker are also required.

7.8 Valves

7.8.1 Sluice Valves

Only resilient seated, anticlockwise closing sluice valves shall be used on watermains greater than 50mm diameter, to AS 2638.2

Sluice valves shall be installed to ensure the spindle is always vertically positioned and there is no impedance or debris preventing the operation or maintenance of the valve.



All sluice valves 100mm dia and larger shall be flanged and anchored to a concrete anchor block with galvanized steel angles. Refer to the Drawings.

Sluice valves must be kept open during pressure tests.

7.8.2 Gate Valves

The gate valves on 50mm diameter rider mains shall be resilient seated. Gate valves shall be clockwise closing to AS 2638:2.

An extension spindle shall be incorporated as necessary to ensure the top of the spindle is 350 mm below the Finished Surface Level.

7.8.3 Valve Boxes

Valve boxes shall be constructed in accordance with the drawings or to such other established local practice as may be permitted or required by the Authorising Officer.

Each valve shall be installed with the concrete valve surrounds, riser pipe, steel edge and the cast iron valve box set flush with the surface. These must be installed centrally over the valve spindle to ensure there is no impedence to restrict the operation and maintenance of the valve. Valves shall have the same internal diameter as the main on which they are installed.

7.8.4 Valve Indicator Posts and Markings

The position of all valves on principal mains and rider mains shall be indicated by means of a concrete indicator posts as described above (hydrants) except that the posts shall bear the inscribed letter "V". Valve indicator posts shall be painted white and in accordance with NZS 4404 Appendix A drawing WS-006. Paint shall be to TNZ M7 1998.

7.8.5 Service Connection Box

Service connection boxes, manifolds and backflow preventers require specific approval of the Authorising Officer and shall be installed at the time of subdivision. Each connection shall have a Water Connection Application Form completed and approved by Council prior to issue of 224 Certificate.



7.9 Reinstatement

7.9.1 Backfilling

In public areas, backfilling shall keep pace with the laying of pipes so that not more than 20m of pipeline shall be left exposed in an open trench where this could represent a danger to the public. Care shall be taken during backfilling to prevent displacement of the laid pipes.

Except as specified below, material excavated from the trench shall be used for backfilling trenches.

In paved areas where in material excavated from the trench is unsatisfactory for backfilling purposes, imported granular material shall be used to the satisfaction of the Authorised Officer and in accordance with manufacturer's specifications and the design.

Under roads the trench shall be backfilled in accordance with DS4 – Transportation.

Backfill material immediately around the pipe or fittings shall not contain particulate matter greater than 12mm.

7.9.2 Compaction

Trenches under paved areas shall be backfilled and compacted in layers commensurate with the compaction equipment to a density of at least 95% of the maximum dry density. Field compaction shall be tested using the New Zealand standard compaction test or a nuclear densometer or a dynamic cone penetrometer. Testing by alternative methods may be approved, but shall be subject to the approval of the Engineer.

Under roads the trench shall be compacted and tested in accordance with DS4 – Transportation.

The Contractor shall undertake sufficient tests to demonstrate that the specified compaction standards have been achieved throughout.

Compaction testing of fill material shall be in accordance with NZS 4402 - Methods of Testing Soils for Civil Engineering Purposes.

Trenches outside road reserves and not under paved areas shall be backfilled in layers not exceeding 300 mm thick and well compacted with mechanical compaction equipment.



7.9.3 Repair of Damage

The Contractor shall be responsible for and notify all damage caused to existing services and shall complete all reinstatement to the same or better condition that existed at the commencement of the work.

7.9.4 Final Reinstatement

The Contractor shall complete the reinstate trenches within 7 days or as soon as practicable after the backfilling has been completed.

All surfaces shall be reinstated at least to their original condition or as otherwise specified. The finished reinstatement shall have a neat appearance with clean long straight lines parallel to the kerb or footpath.

Permanent reinstatement materials shall be similar in type, quality, texture, skid resistance and strength to the surrounding materials.

The surface level of the reinstated trench shall match the surrounding surface level.

Reinstatement of roads and pavements shall be in accordance with DS7 – Transportation...

Drains, fences and other structures shall be put back in their original place to their original condition or better. In the case of damage, repairs shall be effected using similar materials.

7.10 Cleaning, Testing, Disinfecting and Acceptance

7.10.1 General

All watermains and connections shall be properly cleaned, tested and disinfected before connection to an existing watermain in accordance with Council's 'Hygiene Code of Practice (HCoP) For Water Supply Systems' (appended) and the specifications in this document.

The HCoP stipulates specific documentation to be completed as part of the procedure.

Note: For the purpose of supplying water to pig, clean, disinfect, test and liven the water main, prior to a section 224 being issued or vesting in Council, a temporary 20mm metered water connection fitted with a double check valve may be applied for from Council. On completion of the works the connection will be permanently disconnected following the commissioning and connection of the new mains to Council's water supply network.



7.10.2 Cleaning

All detritus is to be removed from the pipe by flushing (and in some cases 'pigging') and then flushing again.

The main shall be flushed through its entire length and extremities using suitable hydrants and scours, until the water runs clean and clear.

The contractor's independent Quality Manager will issue a certificate, which will record: the date, the location, the length of pipeline flushed and disinfected.

Testing and records shall be provided prior to the issue of a 224 Certificate or practical completion.

7.10.3 Disinfection

After backfilling, pigging and flushing and successful testing, and before being put into service, all pipes, valves, house connections and other fittings shall be disinfected in accordance with Council's HCoP.

The disinfection procedure and results must be recorded and verified by the Consent Holders Representative. These results will form part of the QA documentation for the new mains and be submitted to Council.

7.10.4 Testing

For Watermain Pressure Testing Procedure refer to NZS 4404, Appendix B.

- i. The system pressure acceptance test will be undertaken after completion of construction of the system including all water connections. The acceptance test will be undertaken prior the connection of the new main by a contractor approved by Council to any existing Council reticulation system.
- ii. Before undertaking the acceptance test the system being tested will have been filled with water and held at local mains pressure for at least 24 hours. The system shall then be pre-tested by the Contractor in the presence of the Consent Holder's representative to confirm that the system meets the required acceptance test prior to contacting Council for observation of the final acceptance test.
- iii. Each section of the reticulation system shall be tested by the developer in the presence of the Consent Holder's Representative and a representative from Council. The test shall be conducted by the Consent Holder's representative and the Contractor with all test equipment supplied by the same.



iv. The reticulation system being tested shall meet the following (which ever is the greater) minimum pressure:

- 1400 kPa measured at the lowest point of the reticulation system under test,
- Or
- 1.25 times the working pressure for PVC-O pipes.
- 1.25 times the working pressure for MDPE pipes.
- 1.50 times the working pressure for all other pipe materials.

Note: the test method must be appropriate to the pipe material. Recommended test procedures for flexible plastic pipelines from AS / NZS 2566 Part 2 Appendix M are:

- Long pipelines in PVC-O and PVC-M, DI, and steel from DN 100 – DN 575 – Method M4
- Long pipelines in PE from DN 125 and larger – Method M5
- Long pipelines in PE not exceeding DN 315 – Method M7
- Short length pipelines (less than 200m length), or small diameter PE or PVC pipelines from 50mm nominal Bore (DN 63) or smaller, – Method M8

Note: In particular, methods designed for long, large bore PE pipelines, based on detection of viscoelastic response SHOULD NOT be used for short length or small diameter PE pipes, or for PVC, as the response is effectively un-detectable.

During the period of the test leakage from the system under test **shall not exceed one litre/ten mm pipe diameter/km length of pipeline/hr.**

Council may require a more rigorous test of reticulation system constructed from PE pipe materials. The test required is specified in Appendix B of NZS4404 sB2.

7.10.5 Watermains to be Kept Charged

After any watermain has been laid and tested and disinfected, it shall be kept continually charged with water, and under pressure. The pressure shall be maintained while electrical and other underground services are being laid in the vicinity of the main and until the main is commissioned.

7.11 Connections to Existing Water Reticulation

The physical work of connecting to the existing reticulation shall only be done by a contractor who is authorised by Council under contract to undertake such work. This can be undertaken only once the new reticulation has successfully passed all necessary acceptance tests. The operating of the valves and hydrants to effect a shutdown of the water supply to an area where new mains are to be



connected in to the reticulation system can only be done by Councils Water Maintenance Contractor.

Where such connections are required the consent holder shall terminate the new main approximately 1m from the existing main at the appropriate level.

7.12 Connection Process

Any connection or work to Council's water system requires an advanced notice to Council by the contractor. This notice will be by completion and submission of Form UM13 in the Water Section of this document.

- i. The contractor is to provide a shutdown plan to the Authorising Officer for approval. The plan shall be submitted a minimum of seven working days prior to the shutdown in order to allow Council to publicly advertise the shutdown if necessary. The contractor shall deliver letters to all properties that could be affected advising of the shutdown. These letters shall be delivered at least 72 hours before the time for the shutdown.
- ii. Shutdowns affecting schools or industrial / commercial premises may be required to be carried out after 5.00pm or on Saturdays or Sundays, at the discretion of the Authorising Officer.
- iii. The shutdown plan shall include a map showing the location of the works, identifying all valves and hydrants to be used, the extent of affected customers, date, time and duration of the shutdown. The contractor shall have actively located and tested the action of all valves and hydrants that are required for the shutdown prior to submitting the map.
- iv. When the shutdown is likely to exceed 1 hour duration, a copy of the shutdown plan and map shall be provided to the New Zealand Fire Service and the shutdown shall be confirmed to them by telephone shortly before the actual event.

7.13 Marking Trunk Supply Pipelines

Where principal or trunk watermains are laid "across country" or outside urban districts or not parallel to boundary lines, the location of the watermain is to be marked by H4 treated timber or concrete valve/Hydrant posts, painted white, without the H or V mark.

Watermains laid 'across country' or outside urban districts shall have a warning tape with wire trace placed above the pipe in the trench to help identify the location of the pipeline. Wire traces to be electrically continuous between valves/hydrants and anchored to those fittings.



Where watermains are thrust or drilled the warning tape shall be replaced with a 2.5mm multi strand copper insulated cable which shall be wrapped around the pipe at a 2.0m pitch (i.e. 1 revolution every 2.0m) and taped to the pipe with electrical insulating tape at 2.0m intervals. The wire shall be electrically continuous and shall be looped up to the surface and down to the pipe at each sluice valve and hydrant, within the valve and hydrant risers/boxes.



Appendix 1: Hygiene Code of Practice for Water Supply Systems

Western Bay of Plenty District Council



HYGIENE CODE OF PRACTICE FOR WATER SUPPLY SYSTEMS

December 2008

**Revision History**

This document has been prepared by reviewing, amalgamating and updating the previously prepared Tauranga City Council Water Supply Hygiene Code Of Practice (November 2005) and the Western Bay of Plenty of Plenty District Council Water Supply Systems Cleaning Code of Practise (April 2006) and the Code of Practise for Disinfection (March 2006). The review team comprised Peter Bahrs, Graeme Mills and David Karrol (Tauranga City Council) and Paul van den Berg, Nigel Hesford, Nicola Chisnall and Graeme Brown (Duffill Watts Consulting / Western Bay of Plenty of Plenty District Council).

Revision N°	Prepared By	Description	Date
A	Peter Bahrs	Draft	25 th November 2008

This Code of Practise to be reviewed at least annually by the following people or as amended:

Revision N°	Reviewed By	Description of Updates	Date of Review
0	Peter Bahrs		
0	Paul van den Berg	Minor methodology.	18 th December 2008
0	Ulrich Glasner		



A7.1 Objectives of the Hygiene Code of Practice

The importance to the community of a consistently safe water supply cannot be overstated. Therefore it is vital that all personnel working with water supplies take the strictest possible precautions to avoid any contamination which might endanger public health.

This Hygiene Code of Practice (HCoP) has been developed as a mandatory document outlining work practices required to prevent the contamination of the Council's public water supplies. All personnel operating, maintaining or extending the water supply are expected to be fully aware of the Code's contents and shall comply with the requirements of the Code at all times. The Code applies equally to Council employees, contractors' employees and all other personnel working on the Council's water supply system.

The objectives of the Hygiene Code of Practice (HCoP) are to:

- Comply with the Health Act 1956 and in particular to the Health (drinking water) amendment Act 2007, together with the Public Health Risk Management Plans required under this legislation.
- Ensure that the water supplied to customers, meets the Councils' Public Health objectives for their customers.
- Align the sanitary and hygiene requirements under the Building Act to those in the Health Act and its amendments.
- Meet the current New Zealand Drinking Water Standard or as amended
- Comply with the Resource Management Act, 1991
- Minimise demerit points under the Ministry of Health, Water Supply Grading System, and
- Afford a high level of security against water contamination due to commissioning of / or maintenance on the water supply systems whether this is new or existing infrastructure.

The purpose of HCoP is to eliminate sources of contamination, which can lead to negative public health impacts which can occur during the construction, commissioning, operation or repair of water infrastructure, or during the storage and handling of pipes, fittings, pumps etc. prior to installation.

A7.2 General Information/Requirements

A7.2.1 Coverage



This document outlines the recommended practice for hygiene procedures and disinfection of the water supply systems. Where possible existing standards or reference material have been used to provide a consistent approach to hygiene and disinfection practices.

The key situations covered are:

- New Mains & associated valves & fittings
- Repairs of exiting mains & associated valves and fittings
- Newly installed reservoirs or tanks
- Existing Reservoirs or tanks

A7.2.2 Competency

Council has adopted the requirements as outlined in the Public Health Grading of Community Drinking-Water Supplies 2003 Explanatory Notes and Grading Forms, Appendix C as a basis of competency. This requires that the qualification held by the operational staff directly responsible for the day-to-day operation of the water distribution system must hold a National Certificate in Water Reticulation (Service Person) (Level 3) with strands in water and wastewater.

The controlling officer or the person performing the practice must be fully aware of all legislative requirements which governs this code of practice.

The controlling officer or the person performing the practice must be qualified and competent to perform the task to be undertaken, to understand the risks associated with the task and to ensure public health of the water supply system is maintained.

A7.2.3 Testing

All chemical and bacteriological testing required under this code shall be done by a Ministry of Health approved testing laboratory chosen by the Contractor. The contractor shall organise (including appropriate advance notice) and pay for the testing, and forward copies of results to the Council or the Councils' representative as soon as practical after the tests are completed. This is required prior to Council considering approval to continue with any further activity unless otherwise agreed.

A7.2.4 Cleanliness and Hygiene Practice Vehicles, Tools and Equipment

The following practices are required to mitigate the potential for tools and equipment to introduce sources of contamination when water distribution systems are being constructed or have been opened for repairs:

A methodology of cleanliness is to be established for all equipment, machinery, pipes and fittings prior to use on all works, and requires that all materials and equipment used in direct contact with



the water supply system must be clean and disinfected. All equipment is to be cleaned of dirt and debris and disinfected (using 100 mg/L chlorine solution) before use.

Vehicles, tools and maintenance workers equipment and clothing for water supply and sewage operations shall be segregated as far as practicable¹. A high standard of cleanliness is required for vehicles interiors (including the backs of seats, trucks etc). The contractor to show through their quality assurance and health and safety plans that they have mitigated all potential risks.

All vehicles are to have hand cleaning agents (soap; preferably antiseptic) available for staff.

Sufficient supplies of cleaning detergents, disinfectant solutions, anti bacterial lubricants, etc. to undertake the task, must be available and used to ensure contamination of the water supply system is prevented.

A7.2.5 Hygiene Practice for Personnel

The following steps shall be taken to minimise the potential for personnel being the source of contamination when water distribution systems are being constructed or have been opened for repairs:

- i. Wherever practical personnel should be dedicated to working on the water supply system, and not alternate between water and wastewater supply. A clear hygiene control methodology must be approved and followed under circumstances where this movement is undertaken.
- ii. The importance of all personnel maintaining a high standard of personal hygiene cannot be overstressed.
- iii. **Medical Certification:** All personnel that undertake maintenance or construction work² that involves, or potentially involves direct contact with water in the system must obtain a Doctor's medical clearance certifying that they are not carriers of potentially water borne diseases³ under the following conditions:
 - prior to employment on the water system
 - on an annual basis thereafter or
 - following overseas travel to countries with endemic water borne disease.

¹ Vehicles used for carrying or handling sewage or sludge or have been used to transport contaminated equipment shall only enter a water treatment site with the specific authorisation of water treatment staff.

² Examples of this type of work include repairs to treatment plant equipment, repairs to distribution system controls and equipment, opening / entering water storage reservoirs, water mains repairs, making connections to the water supply system.

³ Current MoH recommendations require faecal specimens to be tested for the presence of Shigella, Salmonella, Campylobacter, hepatitis A, Giardia, Cryptosporidium



iv. **Medical Health:** If personnel have suffered diarrhoea or any notifiable disease or gastrointestinal illness, with or without vomiting, they shall not undertake works that involves or potentially involves direct contact with water supplies until a further medical clearance certificate has been obtained stating that they are clear of the disease. Any further tests as prescribed by the Doctor to determine evidence of infection shall be carried out. Workers are to report gastrointestinal illness and are not to work with water systems components until they can provide a medical certificate stating that they are clear of the disease. All staff should be encouraged to report medical issues without prejudice to their employment situation.

v. **Site Facilities**

Satisfactory toilet arrangements must be made for all personnel working on water supply activities and hands must be washed thoroughly after using any toilet facilities. It is imperative that a lack of toilet arrangements does not lead to contamination of water supplies. Where permanent or temporary toilet facilities are provided on site, these must be maintained in a clean and hygienic condition and arrangements made for regular and safe disposal of toilet wastes. For work on sites where there are no toilet facilities, alternative hygienic arrangements must be agreed locally, and all personnel concerned formally told of the arrangement. In all situations involving water supply work, adequate hand washing facilities, using soap and water or a suitable anti-septic hand cream, must be provided.

vi. **Other Considerations:**

Other points of hygiene consideration include:

- a. An approved methodology must be provided and followed when potable water is used for filling, testing and disinfecting a new water system including service connections.
- b. Bactericidal lubricant is to be used for all rings and gaskets coming into contact with the water in the system.
- c. Manufacturers guidelines of their installation and operation of pipes and fittings must be followed.
- d. In addition the "precautionary working practices" as outlined in Appendix B must be adhered to.

A7.3 Method of Cleaning and Disinfection

All bacteriological testing, where required under this code of practice, shall be done by a Ministry of Health recognised testing laboratory chosen by the Contractor. The contractor shall organise (including appropriate advance notice) and pay for the testing, and forward copies of results to the council or the Councils' representative as soon as practical after the tests are completed. This is required before approval will be given to commission and bring the system online for water supply.



A7.3.1 New main

i. General Conditions

Before being put into service, each section of new watermain, including all fittings and service connection pipes, shall be disinfected to protect the health and safety of the water consumers. New watermains will not be accepted to be put into service until all of the requirements below have been successfully completed, and copies of the successful tests and associated documentation have been received and approved by the council or the council's representative. The principle adopted is to achieve water main disinfection in a practical manner while minimising the impact on the environment. The key outcome is to ensure the main and associated fittings are free of organisms that could impact on public health.

ii. Installation Practice

All manufacturers' installation requirements for pipes and the associated fittings must be met.

iii. Mains Cleaning

The cleaning of the main prior to disinfection is as important as the disinfection process itself. The main shall first be thoroughly flushed in sections through hydrant or wash out points with sufficient volume and velocity (minimum velocity of 1.5 m/s) of water to remove all foreign matter. The flow of water shall be from one direction at any time, and depending on the position of the flushing point (s), flushing may be required alternatively from opposite directions to ensure thorough flushing of the main has been achieved (consideration must be given to water volume displaced, velocity, removal of debris, clarity etc.).

The water used for flushing must be potable and must be applied by either:

- connecting to a live water main, with approved backflow device. Or
- a water tanker filled with potable water. (The water tanker must be approved and compliant to the current New Zealand Drinking Water Standard).

Air scouring or swabbing the main may be used in preference to flushing where the pipe diameter makes developing sufficient velocity difficult. Where the minimum velocity can not be achieved a cleaning methodology to be submitted for approval by the council or the council's representative.

iv. Levels of Disinfection

The disinfection of new mains will follow successful leak and pressure testing of the mains and shall be undertaken in accordance with the principles of NZS 4404: 2004 with the following requirements:

After mains cleaning, the main shall be slowly filled with potable water and sufficient disinfectant to achieve a uniform concentration of free available chlorine with a minimum Free



Available Chlorine (FAC) concentration of 15 mg/l the main. This is to be confirmed by FAC testing.

The disinfectant to be used will be sodium hypochlorite solution with sufficient active Chlorine to achieve disinfection levels indicated below. A concentrated sodium hypochlorite solution contains 10%-15% of Chlorine. When polyethylene pipe is being disinfected the concentrated chlorine solution must not come into contact with the pipe as concentrations greater than 12% can chemically attack and degrade polyethylene. Note: the concentration of sodium hypochlorite solution deteriorates on storage.

The desired level of chlorine concentration, to ensure a minimum of 15 mg/l FAC once introduced into the pipe, is produced by thoroughly mixing sufficient sodium hypochlorite (NaOCl) with potable water in a clean disinfected tanker. The initial solution is recommended to be greater than the minimum level of FAC to ensure final FAC on filling is at the required level. Note: some pipe linings may exert additional chlorine demand and in these instances a higher chlorine dose must be applied to ensure the required disinfection levels are achieved. The material safety data sheets (MSDS) and manufacturer's guidelines for handling sodium hypochlorite must be adhered to at all times.

A suitable solution of chlorinated water shall be introduced at the lowest point of the section of the main to be disinfected and filled in such a way to ensure no air is trapped in the system. While in contact with chlorinated water, all valves, hydrants and other fittings on the pipe section shall be operated at least once to allow the chlorinated water to pass through them and under valves seats etc. to ensure all parts of the main to be disinfected, are reached. The main shall then be left full of this chlorinated water for a minimum of 12 hours.

After a minimum of 12 hours the residual chlorine concentration must not be less than 5 mg/L FAC. This to be confirmed by testing for FAC. If this requirement is not achieved, the chlorination procedures shall be repeated. When this disinfection requirement is achieved, the higher chlorinated water in the main and service connection pipes shall then be flushed out and de-chlorinated to a maximum FAC of 0.5 mg/l before discharging (a discharge resource consent may be required for this discharge). The flushing shall continue until the chlorine concentration inside the water main is between 0.5 and 1.0mg/L FAC (test required).

Following a successful chlorination procedure above and prior to connecting to the reticulation system, the main shall be tested for the presence of E. coli. If water quality tests do not show compliance with water quality requirements the flushing and disinfection process will need to be repeated until test results demonstrate compliance.

v. Connection Procedure / Hook Up

It is important to note the restrictions faced when undertaking disinfecting and testing procedures. Once a pipe has had a successful bacteriological test and the connection is



approved by Council, it must either be connected to the mains system, or re-flushed, within seven days. If only flushing is carried out, the pipe must then be connected in a further seven days failing which it must be re-disinfected, re-sampled and then the time period for connection restarts. For this reason it is essential that persons undertaking this work adhere to the Council shutdown procedures and liaise with Council to plan the connection processes (including shutdown methodology approval, public notification etc.), otherwise the connection may not be available before the period expires.

Once the new water system has met the requirements of Council including Code of Practice requirements then "approval to connect" to the live reticulation system will be given by Council or the Council Representative.

- The hook up must be undertaken by a Council Approved Contractor (CAC) as required by the Councils Licensed Contractor system.
- This hook up process is considered as a medium risk situation and therefore the CAC will adopt the appropriate disinfection procedure for the risk.

vi. Compliance

The Principle/Contractor shall provide the documentation as shown in Appendix A 1&2 below. Council reserves the right to be present during compliance testing. Written notification is required at least 2 working days prior to testing.

The producer statement must be signed by the Principle /Client or the Contractor's representative.

A7.3.2 Existing mains

i. General Conditions

This covers work on existing mains while they are in service: this includes the repair and maintenance arising during normal operation and installation, replacement and removal of fittings during connection of new mains and disconnection of redundant mains. Only CAC's are allowed to undertake this type of work. The contractor shall follow the hygiene and disinfection procedures outlined below:

To prevent ingress of contamination at the point of work, draining watermains through hydrants shall be done where all of the section of pipe being drained is fully intact, i.e. where the pipe has no cut or broken areas. A "Contractors" type standpipe is to be used for de-pressurising water mains. Where no hydrant is fitted, an appropriate scour point will be used.

Watermains that have been cut or broken shall only be drained through the cut or broken area (e.g. where a piece of pipe has been removed to install a branch tee). During these operations



the level of the contamination in the trench must be drained and kept well below (at least 500 mm) the cut area of the pipe.

The disinfection of repaired mains depends on the risk criteria as outlined below:

ii. Low Risk Situations

Low risk situations are where the pressure in the pipe is maintained while carrying out work which involves cutting or tapping into the live main (e.g. installing service connection, or a branch connection using live tapping techniques)

The procedure shall be:

- Spray all surfaces of fittings and the exterior of the water main with 1% m/v Chlorine (10,000mg/l) solution. The CAC shall have an approved methodology in place to prepare the required Chlorine solution.

iii. Medium Risk

Medium risk situation are where the pressure in the pipe is removed by controlled draining of the pipe into the trench excavation under the point where the pipe is cut, but no external liquid or solid material makes any contact at all with the pipe's interior, i.e. little possibility of contamination (e.g. cutting in a branch tee, or repair where the trench is thoroughly dewatered)

The procedure shall be:

- Spray all surfaces of fittings, and the interior of both open ends of the water main with 1% m/v Chlorine (10,000mg/l) solution.
- After completion of the work, flush the watermain out through hydrants on either end of the break. The principles of flushing must be consistent with those outlined in the section on mains cleaning above (3.1.3).

iv. High Risk

High-risk situations are where any external liquid or solid material has made contact with the cut or broken area of the pipe or has entered the pipe fittings, i.e. contamination has occurred.

The procedure shall include:

Where ever possible positive pressure shall be maintained to prevent further contamination. This will not be possible for pipe breaks on larger pipe sizes so extreme care shall be exercised in these circumstances.

- Immediately inform the Engineer when the situation arises
- Isolate the watermain to prevent further travel of the contaminated water.
- If practical, also isolate all affected service connections
- If the excavation is badly contaminated, apply liberal amounts of HTH powder or 1% m/v Chlorine (10,000 mg/l) solution using the spray bottle to spray around the affected areas to reduce the risk of contamination.



- Drain the watermain through the cut section while keeping the trench water level well below the level of the cut pipe.
- While maintaining this water level in the trench, flush as much of the contaminated material as possible from the watermain through the cut area by opening valves at either end of the reticulation system.
- After completion of work, follow the disinfection procedure; by shock dosing the main using a water tanker filled with predetermine chlorine strength.
- In cases of emergency when the system must be returned to service as soon as possible, a FAC of 325 mg/l with a contact time of at least 15 minutes may be used with prior approval from Council. The affected section can be flushed and returned to service provided the FAC is not less than 300 mg/l at the end of the 15 minute period. Ensure all chlorination, disposal of super chlorinated water and flushing procedures are followed.
- For all high risk situations a bacteriological water sample shall be taken by an individual that has received appropriate training in water sampling procedures, and samples to be sent to an accredited laboratory, (note samples to be packaged and cooled as specified by the laboratory). Although the laboratory bacteriological results will not be available until after the water main has been livened the sampling is intended to provide a record of the effectiveness of the disinfection procedures. In the event of a positive result appropriate actions in accordance with incident plans will be implemented.

Note: In the event of any possible contamination from a sewer or similar high risk source prior approval of the cleaning, disinfection and reinstatement methodology must be obtained from Council before the water main can be repaired and returned to service.

A7.3.3 Reservoirs and Tanks

i. General Conditions

Before being put into service, each reservoir or tank, including all fittings, shall be disinfected to protect the health and safety of the water consumers. New, refurbished or cleaned reservoirs or will not be accepted to be put into service until the requirements of an agreed cleaning and disinfection methodology has successfully been met and copies of the successful tests and associated documentation have been received and approved by the Council or Council's representative.

All safety protocols including working at height and confined space entry works will be carried under OSH requirements and Councils health and safety policies.

ii. In situ Inspections / Cleaning with Divers and Suction Lines:

There are instances where a reservoir or tank is inspected and/ or cleaned while still in operation using divers. Prior to any in situ cleaning or inspection an access, cleaning, hygiene and disinfection methodology specific to each reservoir / tank, must be produced by the CAC and approved by the Council or Council's representative. All requirements of an agreed



methodology must be demonstrated and documented. All relevant documentation must be provided following completion of the work to the Council or Council's representative.

iii. Principles Required by Methodology:

Divers / persons entering the reservoir to meet health requirements (see items 2.1 of TCC's Water Supply Hygiene code of practice) associated with working in a potable water reservoir / tank.

The methodology of cleaning and disinfection of diving suit and footwear must be provided and approved by Council prior to any work being undertaken. To avoid contamination of water in reservoir, all diving, cleaning, inspection equipment and clothing used by the diver(s) should be disinfected immediately prior to use within the water storage and reservoir. A chlorine foot bath is to be used at the reservoir site for use prior to any tank entry.

Council will arrange bacteriological testing of the water in the facility following any diving, inspections, cleaning, etc. This would be required either for audit purposes or where the risk is high this will be needed prior to placing the reservoir back in service.

iv. Inspections / Cleaning / Maintenance Requiring the Draining of the Potable Water Reservoir or Tank

The CAC to provide a methodology to drain and clean the reservoir and this must be approved by the Council prior to work commencing. This methodology needs to ensure that the draining does not negatively impact on the water supply quality and any discharges to the environment meet compliance criteria (including but not restricted to the RMA, EBOP discharge limitations, Freshwater Plans, EBOP Water & Land Use Plans). If clean water is to be disposed to a water course, particular attention is to be given to the potential of the discharge to cause downstream erosion or alteration to the natural water course.

Methodology to ensure, as a minimum, that the following interventions are included once any sediment has been removed:

- a. Removal of materials that are not part of the structural or operating facilities of the tank (i.e. all scaffolding, planks, tools, rags, etc)
- b. The method of cleaning the surfaces of the walls, floor, and operating facilities (this could include thorough cleaning using a high-pressure water jet, sweeping, scrubbing, or alternative effective means).
- c. The removal of all water, dirt, and foreign material accumulated in this cleaning operation and how this will be discharged or removed from the storage facility.

Similarly the methodology should as a minimum deal with the following once the cleaning operation is complete;



Checking all potential contamination access points for functionality and condition (i.e. vent screen, overflow screen, and any other screened openings)

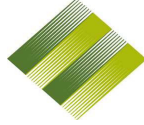
Methods to be taken to prevent the introduction of dirt or other foreign material once cleaning has been completed.

v. Disinfection of Reservoir or Tank

This to be undertaken as per an agreed approved methodology. For routine inspections, the objective of the disinfection procedure is to achieve full disinfection of the reservoir floor, while at the same time minimising the inconvenience associated with disposing of a large volume of highly chlorinated water. Council will arrange bacteriological testing of the water once all activities are completed and once disinfection has been undertaken. A negative E. coli result is required prior to placing the reservoir back in service. A failed bacteriological test may require the reservoir to be emptied and re-disinfected.



APPENDIX A1 – Producer Statement



**Western Bay of Plenty
District Council**

Western Bay of Plenty District Council

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UTILITIES AND SERVICES

Items	Descriptions
Resource Consent / Contract No.	
Location of Work Street Address:	
Town / Area	
Total length & size of Pipe / volume of Reservoir disinfected	
Type of Pipe / Reservoir	
Chlorine dose applied (FAC mg/l)	
Chlorine FAC mg/l (after Contact time)	
Date time start / finish & Contact Period (hrs)	
Chlorine Residual in main / reservoir after final flush (FAC mg/l)	
Chlorine Residual after dechlorination (mg/l) discharged water	
Date of De-chlorination / discharge	
Bacteriological results	Attached Results (Must be original from IANZ Laboratory)
Principle /Client name:	
Address:	
Contact person:	
Contact phone:	
Contractor/ Company Name	
Address:	
Engineer (CPE) involved:	
Council Representative involved	
Contact phone:	
Comments:	
Name:.....	
Signature:..... Date.....	
Principle/Contractor Representative	



APPENDIX A2 – Producer Statement



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UTILITIES AND SERVICES

Items	Descriptions
Resource Consent / Contract No.	
Location of Work Street Address:	
Town / Area	
Total length & size of Pipe / volume of Reservoir disinfected	
Type of Pipe / Reservoir	
Chlorine dose applied (FAC mg/l)	
Chlorine FAC mg/l (after Contact time)	
Date time start / finish & Contact Period (hrs)	
Chlorine Residual in main / reservoir after final flush (FAC mg/l)	
Chlorine Residual after dechlorination (mg/l) discharged water	
Date of De-chlorination / discharge	
Bacteriological results	Attached Results (Must be original from IANZ Laboratory)
Principle /Client name:	
Address:	
Contact person:	
Contact phone:	
Contractor/ Company Name	
Address:	
Engineer (CPE) involved:	
Council Representative involved	
Contact phone:	
Comments:	
Name:.....	
Signature:..... Date.....	
Principle/Contractor Representative	



APPENDIX B – Precautionary Working Practices

The following is taken from the World Health Organisation (2004) Safe Piped Water: Managing Microbial Water Quality in Piped Distribution Systems Chapter 5 “Precautions during construction and repairs” and was previously abstracted from two sets of guidelines viz. Water UK, 1998 and AWWA, 1999.

- When working with pipes and fittings on site, ensure that they are protected from contamination by storing off the ground, capping the ends of pipes and liners, and keeping fittings in wrappings until the time of use.
- Ensure that the open ends of pipes in trenches are plugged and watertight when not being worked on or when there is a risk of the trench flooding.
- Excavate trenches to below the pipe level to provide a sump, and keep as dry as possible to prevent water entering a pipe or fitting.
- Ensure that sealing materials and lubricants are clean and certified as suitable for contact with potable water supplies.
- Protect unattended trenches and engineering sites from vandals and animals.
- If a part of the distribution system has been taken out of service for an extended period, treat it as a potentially contaminated new installation. Apply the flushing, disinfection and microbiological sampling procedures that are normally applied to new installations.
- If a part of the distribution system is to be abandoned, ensure that all boundaries with the live system are effectively closed with especially secure and marked valves, or are capped. Create boundaries to minimize dead legs on the live system and ensure that the location of the abandoned system is recorded for future reference.
- When planning new installations and renovation works, make sure that the plans include valves, injection and washout points to facilitate effective cleaning and disinfection of the pipework.

References:

1. Tauranga City Council Water Supply Hygiene Code of Practice 2005
2. Western Bay of Plenty District Council Water Reticulation Disinfection Code of Practice 2006
3. Western Bay of Plenty District Council Water Supply System Cleaning Code of Practice 2006
4. Tauranga City Council Code of Practice for Development 2006
5. Ministry of Health, Guidelines for Drinking-Water Quality Management for New Zealand.
6. Ministry of Health, Drinking-Water Standards for New Zealand
7. Health (Drinking Water) Amendment Act 2007
8. NZS 4404:2004 Land Development and Subdivision Engineering Appendix C Water Supply Disinfection Specification.
9. 2004 World Health Organization. Safe Piped Water: Managing Microbial Water Quality in Piped Distribution Systems. Edited by Richard Ainsworth. ISBN: 1 84339 039 6. Published by IWA Publishing, London, UK.
10. Chapter 4 Maintenance and survey of distribution systems, Dammika Vitanage, Francis Pamminger and Tony Vourtsanis



11. Chapter 5 Precautions during construction and repairs Richard Ainsworth and David Holt
12. Ministry of Health, Public Health Risk Management Plan Guide: Distribution System Operation Ref D2.3 Appendix 1 &2 June 2001
13. Ministry of Health, Amendments to the Public Health Grading Criteria 2003