



**North East Water**  
Engineering Guidelines for  
Subdivisions and  
Development Standards  
Part 7 Guidelines for Testing  
September 2009

# Contents

1.	Introduction	1
2.	Roads	1
3.	Wastewater Reticulation	2
3.1	General ( <i>refer WSA 22.1</i> )	2
3.2	Compaction Testing ( <i>refer WSA 22.1</i> )	2
3.3	Test of Gravitation Sewers	2
3.4	Air Pressure and Vacuum Testing of Gravity Sewers ( <i>refer WSA 22.4</i> )	2
3.5	Hydrostatic Testing	3
3.6	Testing of Concrete Maintenance Holes ( <i>refer WSA 22.4.4</i> )	3
3.7	Visual Inspection and Measurement for Infiltration ( <i>refer WSA 22.5</i> )	4
3.8	CCTV Inspection ( <i>refer WSA 22.7</i> )	4
3.9	Testing of Sewer Rising Main	5
3.10	Auditing Prior to Backfilling	6
4.	Water Reticulation	7
4.1	General ( <i>refer WSA 9.1</i> )	7
4.2	Acceptance Testing ( <i>refer WSA 19</i> )	7

## Table Index

Table 1	Simplified approach to leakage rates	6
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## Part 7- Guidelines for Testing

### 1. Introduction

This section of the Engineering Guidelines for Subdivisions and Developments outlines the Corporation's recommended practice for testing water and sewer reticulation. It is in no way a comprehensive "Testing Manual" and it is intended to be read in conjunction with relevant Standards that includes:

- » Australian Standards;
- » RTA NSW Standards;
- » Vic Roads Standards;
- » WSAA Standards for Water and Sewer; and
- » State Government Authority Standards.

The other sections of the Engineering Guidelines for Subdivisions and Developments are as follows:

- Part 1 - General Requirements
- Part 2 - Guidelines for Design of Roads (not used)
- Part 3 - Guidelines for Design of Drainage (not used)
- Part 4 - Guidelines for Design of Water Reticulation
- Part 5 - Guidelines for Design of Sewerage Reticulation
- Part 6 - Guidelines for Landscaping, and Measures for Erosion, Sedimentation and Pollution Control (not used)
- Part 7- Guidelines for Testing.**

The developer is required to pay for all tests.

Forty-eight (48) hours notice is required.

### 2. Roads

Not used. Refer to the Road Authority Standards.

## 3. Wastewater Reticulation

### 3.1 General *(refer WSA 22.1)*

This section relates to sewerage reticulation acceptance testing. The testing of sewerage reticulation shall generally be in accordance with the latest version of the Water Services Association of Australia (WSAA). However this part of the Corporation's "Engineering Guidelines" takes precedence over the WSAA Standards. The "Sewerage Code of Australia (WSA02) Part 3 Construction; Second Edition Version 2.3" has been cross-referenced.

All sewers and maintenance holes shall be subject to testing after construction (NATA accreditation is not mandatory). The tests shall be carried out before release of the "Works".

Should sewers or maintenance holes fail any test, defects shall be detected and repaired and the test repeated. The process of testing, detection and repair of defects and retesting shall continue until a satisfactory test is obtained.

All lines are to be clear and free from soil, slurry, liquids and other foreign substances at the notification of completion.

### 3.2 Compaction Testing *(refer WSA 22.1)*

All trenches are to be Flood Compacted or as determined by the Corporation. In the absence of flood compaction mechanical compaction shall be undertaken. Where mechanical compaction is undertaken then compaction of the sewer trenches shall be to 95% maximum dry density as per the modified compaction test or as approved by the Corporation in writing on a case by case basis. Note separately the Corporations requirement for 24 months maintenance period to rectify trench subsidence.

### 3.3 Test of Gravitation Sewers

The testing of gravitation sewers shall be in accordance with the relevant requirements and method of testing specified in Sections 3.4 or 3.5.

Before the test is performed, all pipelaying on the section shall be completed and backfill compacted to the level of the centre of the pipe barrel, and the Developer shall have requested the Corporation to audit the pipeline for line and grade.

The test may be carried out after risers and/or sidelines are constructed however the Corporation will be reliant on the final test conducted immediately prior to acceptance into maintenance.

Any fault detected is to be rectified and a satisfactory test obtained before the remainder of backfill is placed.

### 3.4 Air Pressure and Vacuum Testing of Gravity Sewers *(refer WSA 22.4)*

#### 3.4.1 Equipment

All necessary equipment is to be supplied by the Developer and kept in a condition acceptable to the Water Agency or Accredited Certifier.

Pressure gauges are to be tested daily by static water column. At least one spare gauge per test rig is to be kept on the job at all times.

Compressed air is to be supplied by a compressor capable of supplying at least  $1\text{m}^3/\text{minute}$  at 35 kPa. The air is to be fed through a pressure-reducing valve capable of reducing pressure from that supply to  $28\text{ kPa} \pm 4\text{ kPa}$ . The air is then to pass through an airtight line fitted with a 150 mm Bourdon type pressure gauge reading from 0 to 50 kPa, a pressure relief valve that may be set to blow off at  $28\text{ kPa} \pm 4\text{ kPa}$  and a gate valve to the pipeline to be tested.

### **3.4.2 Low Pressure Air Testing** (refer WSA 22.4.2.2)

The method of setting up and carrying out the test shall be in accordance with the requirements of WSA low-pressure air testing section WSA 22.4.2.2.

Pressure drop times, which are less than these, may indicate leakage or excessive air permeability through unsaturated pipe walls with some materials. Vitrified clay pipes, in particular, suffer from excessive air permeability under dry summer conditions. When this occurs, pipes must be thoroughly saturated with water before testing or a hydrostatic test applied.

In any case, where the allowable pressure drop time cannot be attained and there are no visible leaks, a hydrostatic test is to be applied at the request of the Water Agency.

## **3.5 Hydrostatic Testing**

Where the Corporation permits hydrostatic testing; the hydrostatic test shall be carried in accordance with the specific requirements of the Corporation.

### **3.6 Testing of Concrete Maintenance Holes** (refer WSA 22.4.4)

The Corporation may request the leakage testing of MH's at its discretion.

Where a test is required the test shall be carried out with the maintenance hole cover surround fitted with rendering of the channels and benches completed.

As an alternative to vacuum testing referred to in WSA 22.4.4 subject to the approval of the Water Agency water testing will be undertaken by plugging all pipe openings in the walls and by filling the maintenance hole with water to the lowest point on the top of the maintenance hole cover surround. The plugs shall be positioned in the pipes as near as practicable to the internal face of the maintenance hole.

After allowing 30 minutes for absorption, if not otherwise determined by the Water Agency, the maintenance hole shall be refilled and the loss of water during the following thirty minutes measured. The test on the maintenance hole will be considered satisfactory provided the water lost is less than 3 mm depth in the top section of the maintenance hole for each 1 metre depth of the maintenance hole. The depth of maintenance hole is to be taken from the bottom of the maintenance hole cover recess in the cover surround to the invert of the outlet from the maintenance hole. The plug of the outlet shall be fitted with a suitable release for emptying the maintenance hole on satisfactory completion of the test.

### **3.7 Visual Inspection and Measurement for Infiltration** *(refer WSA 22.5)*

Whenever the pipeline is subjected to a significant head of groundwater (i.e. 1500 mm or more above the obvert of the sewer main) provided that groundwater is at least 150 mm above any sideline it shall be visually inspected for infiltration.

The Developer shall propose full details of the method by which the infiltration is to be measured and rectified.

The Developer at his own expense shall determine the head of groundwater by a method acceptable to the Water Agency or Accredited Certifier.

### **3.8 CCTV Inspection** *(refer WSA 22.7)*

CCTV Inspection as required by the Corporation.

Apply the following requirements for CCTV Inspection

- » All sewer mains to be flushed prior to any CCTV inspections.
- » Camera to be self levelling.
- » Always camera upstream in a logical sequence as shown on the design plans.
- » Show start of survey from centre of access chambers (Chainage 0)
- » Show end of survey from centre of upstream access chamber or termination shaft (chainage)
- » Show grade of main (if available on camera equipment)
- » Pictures to be in clear focus with adequate lighting
- » CCTV pictures to be provided on DVD or USB drive able to be opened on Windows Media Player
- » Provide inspection report for each main surveyed.

Inspection report to include the following

- » Name of Subdivision or Project.
- » Client.
- » Date.
- » Description of main surveyed.
- » Chainage from down stream access chamber.
- » Chainage of any junctions with position eg. 3 o'clock, 9 o'clock
- » Chainage of any debris or water in the main.
- » Depth of water in the main as a percentage of the main covered.
- » Chainage of end of main.

### 3.9 Testing of Sewer Rising Main

Rising mains shall be pressure tested in accordance with this subclause in order to detect excessive leakage and defects in the pipeline including joints, thrust and anchor blocks, if any.

Pipelines shall be tested in sections approved by the Water Agency or Accredited Certifier as soon as practicable after each section has been laid, jointed and backfilled, provided that: -

- » If so specified or if the Developer so desires, some or all of the pipe joints shall be left uncovered until the whole of the section has been successfully pressure tested to the satisfaction of the Water Agency or Accredited Certifier; and
- » The pressure testing shall not be commenced earlier than seven days after the last concrete thrust or anchor block in the section has been cast.

For the purpose of this subclause, a section shall be defined as a length of pipeline, which can be effectively isolated for testing, eg. by means of main stop valves.

Unless otherwise approved by the Water Agency or Accredited Certifier, pressure testing shall not be carried out during wet weather.

During pressure testing, all field joints, which have not been backfilled, shall be clean, dry and accessible for auditing. During the pressure testing of a pipeline each stop valve shall sustain at least once, the full test pressure on one side of the valve in closed position with no pressure on the other side for at least 15 minutes.

Before testing a pipeline section, it shall be cleaned to the satisfaction of the Water Agency or Accredited Certifier and filled slowly with water, taking care that all air is expelled. Purging of air from rising mains shall be promoted by opening air valves. In order to achieve conditions as stable as possible for testing by allowing for absorption, movement of the pipeline and escape of entrapped air, the section shall be kept full of water for a period of not less than 24 hours prior to the commencement of the pressure testing.

The hydrostatic test pressure which shall be applied to each section of the pipeline shall be such that at each point of the section, the test head shall be equal to or greater than the design head specified or shown on the Drawings, but shall not exceed same by more than 20%.

The specified test pressure shall be maintained as long as required by the Water Agency or Accredited Certifier, while he examines the whole of the section, and in any case not less than 8 hours. For the purpose of determining the actual leakage losses, the quantity of water added in order to maintain the pressure during the period of testing shall be carefully measured and recorded.

The pressure testing of a section shall be considered to be satisfactory if:

- a. There is no failure of any thrust block, anchor block, pipe, fitting, valve, joint or any other pipeline component:
- b. There is no visible leakage; and
- c. The measured leakage rate does not exceed the permissible leakage rate as determined by the following formula:

$$Q_1 = \frac{(0.000532 + C) D.L (H^{1/2})}{1_p}$$

Where:

- Q<sub>1</sub> = permissible leakage rate (litres per hour)
- C = a co-efficient as specified hereunder for the particular pipe material and type of joint
- D = nominal diameter of pipe (mm)
- L = length of section tested (km)
- H = average test head (m)
- l<sub>p</sub> = average pipe length (m)

If the measured leakage rate does not exceed that rate calculated by the simplified formula for the type of pipe tabulated hereunder, the determination of the permissible leakage rate on the basis of the formula specified in (c) above will not be necessary. The following simplified formulae are based on the co-efficient “C” and average pipe lengths contained in that tabulation.

**Table 1** Simplified approach to leakage rates

Pipe Type	Simplified Formulae	Co-Efficient “C”	Nominal Pipe Length (M)
C.I. & D.I.	$Q_1 = 0.0105 DL (H)^{1/2}$	0.0548	5.5
uPVC	$Q_1 = 0.01 DL (H)^{1/2}$	0.0568	6.0

Any failure, defect, visible leakage and/or excessive leakage rate, which is detected during the pressure testing of the pipeline or during the Maintenance Period shall be made good by the Developer at his expense.

### 3.10 Auditing Prior to Backfilling

At the discretion of the corporation all sewerage lines shall be audited and approved by the Water Agency or Accredited Certifier after laying and jointing and prior to the placing of any backfilling.

## 4. Water Reticulation

### 4.1 General *(refer WSA 9.1)*

This section relates to water reticulation acceptance testing. The testing of water reticulation shall generally be in accordance with the latest version of the Water Services Association of Australia (WSAA). However this part of the Corporation's "Engineering Guidelines" takes precedence over the WSAA Standards. The "Water Supply Code of Australia (WSA03) Part 3 Construction; Second Edition Version 2.3" has been cross-referenced.

All water reticulation shall be subject to testing after construction (NATA accreditation is not mandatory). The tests shall be carried out before release of the "The Works".

Should the water reticulation fail any test, defects shall be detected and repaired and the test repeated. The process of testing, detection and repair of defects and retesting shall continue until a satisfactory test is obtained.

### 4.2 Acceptance Testing *(refer WSA 19)*

#### 4.2.1 Compaction Testing *(refer WSA 19.3)*

#### 4.2.2 Pressure Testing *(refer WSA 19.4)*

All pipelines including services shall be pressure tested to detect and repair leakage and defects in the pipeline including joints, thrust and anchor blocks, if any. The method of setting up and carrying out the test shall be in accordance with the requirements of WSA pressure testing section 19.4.

Pipelines shall be tested in sections approved by the Water Agency or Accredited Certifier as soon as practicable after each section has been laid, jointed and backfilled, provided that:

- » If so specified or if the Developer so desires, some or all of the pipe joints shall be left uncovered until the whole of the section has been successfully pressure tested to the satisfaction of the Water Agency or Accredited Certifier; and
- » The pressure testing shall not be commenced earlier than seven days after last concrete thrust or anchor block in the section has been cast.

For the purpose of this clause, a section shall be defined as a length of pipeline, which can be effectively isolated for testing, eg. by means of main stop valves.

Unless otherwise approved by the Water Agency or Accredited Certifier, pressure testing shall not be carried out during wet weather.

During pressure testing all field joints, which have not been backfilled, shall be clean, dry and accessible for auditing.

During pressure testing of a pipeline each stop valve shall sustain at least once the full test pressure on one side of the valve with no pressure on the other side for at least 15 minutes.

Before testing a pipeline section, it shall be cleaned to the satisfaction of the Water Agency or Accredited Certifier and filled slowly with water, taking care that all air is expelled. Purging of air from reticulation shall be prompted by opening hydrants.

In order to achieve conditions as stable as possible for testing by allowing for absorption, movement of the pipeline and escape of entrapped air, the section shall be kept full of water for a period of not less than 24 hours prior to the commencement of the pressure testing.

The minimum hydrostatic test pressure, which shall be applied to each section of the pipeline, shall be 1.2 Mpa or as otherwise approved by the Corporation.

Pressure testing shall not exceed the pressure class of the pipe.

The nominal test pressure is 1.5 times the pressure in the main.

Should the various works not be sufficiently completed to enable the supply to be thus provided when the pipeline is ready for testing, the time for testing shall be postponed until such is the case. Alternatively, the Developer may adopt other measures for supplying the water, but shall have no right to claim for any expenses that may be incurred thereby.

All expenses in connection with testing shall be borne by the Developer. The Developer shall have no claim for compensation or damages in respect of any postponement of the testing.

#### **4.2.3 Disinfection**

At the discretion of the Corporation all new or replacement water mains equal or greater than 100 mm diameter must be disinfected prior to being brought into service.

This work is only to be carried out by appropriately authorised personnel to the Corporation's requirements.



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