

Procedure for Capping, Swabbing, Flushing and Testing for New Water Mains

1. Overview

At a glance

What

This procedure covers the requirements for the capping, swabbing, flushing and testing of new water mains prior to disinfection/commissioning. Three options detailing controls in the main laying process are described in this procedure.

The materials to be used in the process for the disinfection of fittings and swabbing as well as suppliers are outlined in this procedure. The steps and requirements for each of the processes are stated along with descriptions.

This procedure is applicable for all water main laying methodologies including pipe bursting, slip lining, horizontal directional drilling (HDD) and conventional water main laying covering both potable and recycled water mains. The process also ensures that auditable documentation and records are available confirming that the quality assurance steps of capping, swabbing, flushing and testing prior to disinfection are undertaken.

Scope

Who

This procedure will guide an authorised person/contractor/constructor or business in meeting the requirements to prepare a water main for disinfection using one of three options. Options include a combination of capping, swabbing, flushing and testing.

Objective

Why

To ensure that all new Sydney Water water mains are introduced into service with the objective of protecting public health by providing safe drinking water to Sydney Water's customers who are to be serviced by the new main.

The options detailed in this procedure for capping, swabbing, flushing and testing of water mains prior to disinfection ensures that the main is clean and clear of foreign material which will drastically reduce the time required to disinfect and commission new mains.

2. Procedure in detail

Sydney Water requires all new water mains to be laid in accordance with one of the three options detailed below in preparation for disinfection. The Water Supply Code of Australia Sydney Water Edition 2014 (particularly sections 15.1.1 to 15.1.4 and section 18) must also be referred to in conjunction with these options. Refer to Appendix 1 for a process flow chart.

All contractors are to develop and implement a new Safe Work Method Statement (SWMS) to cover the risks identified in this procedure. All contractors must develop Inspection and Test Plans (ITPs) that cover the risks and requirements detailed in this document.

2.1 Controls used for pipelaying in preparation for disinfection

2.1.1 Option 1 - Capping/sealing of pipes and fittings



Figure 1 Pipes capped overnight in trench



Figure 2 Fittings capped overnight in trench

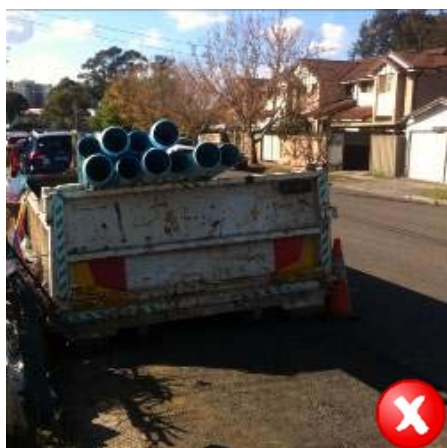


Figure 3 Pipes stored without protective caps



Figure 4 Pipes and fittings stored with protective caps

The following actions are mandatory:-

1. All pipes up to **200mm** in diameter shall be capped/sealed either from the manufacturer's /suppliers premises or within 2 working days of the pipes being received on site. (For pipes greater than DN200mm capping/sealing is optional)
2. During and after pipelaying operations in order to prevent contamination, the contractor shall supply and use caps or equivalent to seal **all** open ends of pipes, fittings and valves.
3. At the end of each day pipes and fittings in excavations are to be sealed to prevent water or contaminants entering the pipe. When recommencing works any water is to be removed from the trench prior to the removal of caps/plug or seal.
4. Sealing is to remain in place during boring to prevent any contamination.
5. Each pipe is to be visually inspected for contaminants prior to laying. Wipe and remove any material prior to installation.
6. Without **exception** all main taps, fittings and connecting of pipes shall be sprayed with 1% sodium hypochlorite (sodium hypo) (Cliklorite Sanitiser).
7. Clear coupons from hole saws after each drill, **speed bores are not to be used.**
8. In preparation for flushing and disinfection each end of laid pipe is required to have flushing bends installed. Larger mains to be tapered down to accommodate flushing bends (currently available up to 150mm) or temporary tees installed at the ends of the main.
9. Flush main for a minimum 15 minutes or until clear. If water is not clear within 30 minutes check feedwater. If feedwater is not clear contact Sydney Water staff. If feedwater is clear the main must be swabbed as many times as necessary until the water exiting the new main is clear.
10. A turbidity and odour test will then be required to be undertaken by a third party (a list of Sydney Water certified Field Testers is available).

If acceptance criteria are met the main is then ready for disinfection.

It is the responsibility of the constructor to ensure that the mains are laid in accordance with this procedure. If any of the acceptance criteria fails (turbidity, odour, disinfection process, failure of controls, etc) and is related to contamination in the main laying process, then the main MUST be swabbed and re-tested

2.1.2 Option 2 - Capping/sealing of pipes & fittings and swabbing

Follow steps 1 to 8 in 2.1.1. Following construction the water main is to be swabbed (refer to Figure 5) in one continuous length using water pressure to propel the swab along the length of the water main to an exit point.

The following actions are mandatory:-

1. A control for the swab discharge is to be developed by the contractor. Not using a swab catcher could present a risk and all OHS controls shall be in place before use.
2. Keep swabs clean and stored in plastic bags until immediately prior to insertion. Swabs shall only be used once for long length runs and then disposed of appropriately.
3. Ensure swab catcher is kept clean and stored appropriately.
4. Two standpipes should be kept clean and stored separately and used only for swabbing and flushing purposes.
5. Hydrant box should be clean and free of water and debris before attaching standpipe.
6. Spray standpipe ends, clean and spray springs using 1% sodium hypo (Cliklorite Sanitiser) prior to installation of standpipe for swabbing.

7. When attaching swab catcher to hydrant tee, spray hydrant tee and catcher with 1% sodium hypo (Cliklorite Sanitiser) immediately prior to installation.
8. Swabbing sponges should be immersed in a stainless steel bucket filled with 500mL 1% sodium hypo (Cliklorite Sanitiser) immediately prior to the swabbing operation.
9. Insert swabs using a clean plunger.
10. Operate the controlling hydrant to propel the swab along the main at a velocity of between 0.5 and 1.0 m/s.
11. Control discharge water away from the trench into a surface drain following the approved environmental site management plan.
12. Upon removal of the swabs flush main for a minimum 15 minutes or until clear. If water is not clear within 30 minutes check feedwater. If feedwater is not clear contact Sydney Water staff. If feedwater is clear the swabbing must be repeated as many times as necessary until the water exiting the new main is clear.
13. Record the number of swabs (using ITP) as they leave the main to ensure that none are left in the main. In the event of a swab failing to emerge from the main, the swab shall be located and removed together with any obstruction.
14. A clarity and odour test will then be required to be undertaken by Sydney Water certified Field Testers. There will be no change to the current Delivery Management controlled process when swabbing is undertaken in relation to the clarity testing.
15. Close the controlling hydrant.
16. Flushing bends will remain in place for disinfection of the new main.

If acceptance criteria are met the main is then ready for disinfection.

It is the responsibility of the constructor to ensure that the mains are laid in accordance with this procedure. If any of the acceptance criteria fails (clarity, odour, disinfection process, failure of controls, etc) and is related to contamination in the main laying process, then the main MUST be re-swabbed and a turbidity test must be undertaken.

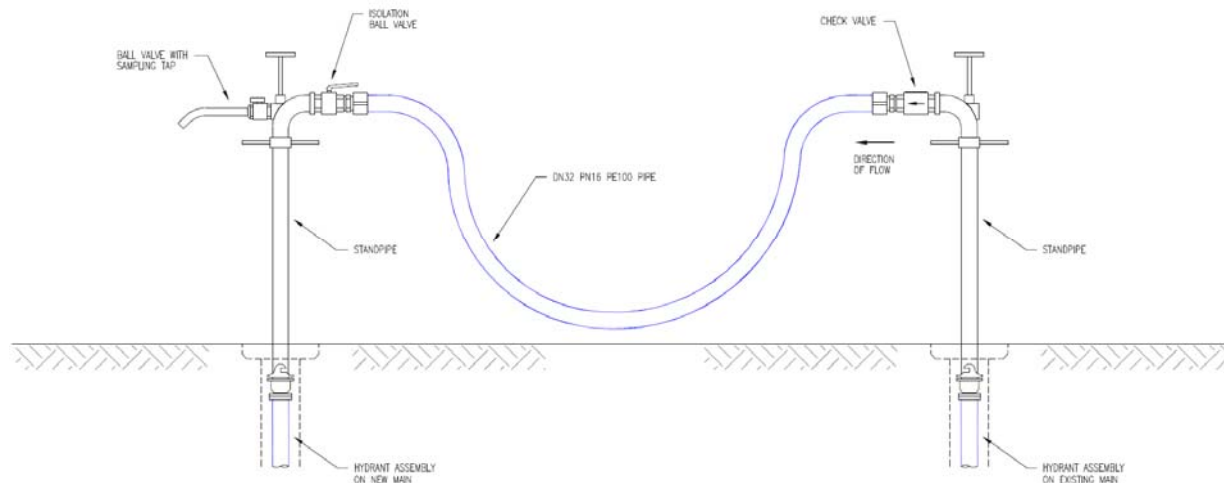


Figure 5 Swab equipment assembly



Figure 6 Discharged water & swab controlled



Figure 7 Discharged water & swab uncontrolled



Figure 8 Discharged water directed away from trench

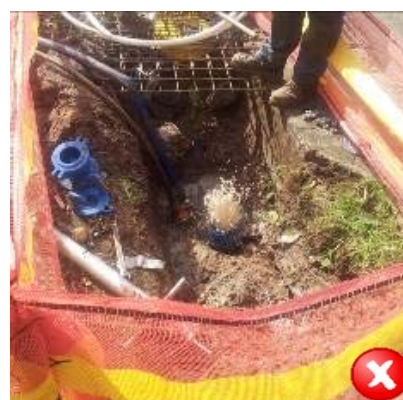


Figure 9 Discharged water into Trench

2.1.3 Option 3 - Capping/sealing of pipes & fittings and swabbing for short single length runs (up to 18 meters in length)

Follow steps 1 to 5 in 2.1.1.

The following actions are mandatory:-

1. Short single length pipe runs may be swabbed with a sponge and Cliklorite solution prior to laying (above ground) provided contamination is controlled during construction (refer to steps 1 to 7 in 2.1.1). All tees and fittings also require treatment with Cliklorite solution before installation (a safe method work statement required).
2. Swabbing sponges should be immersed in a stainless steel bucket filled with 500mL 1% sodium hypo (Cliklorite Sanitiser) immediately prior to the swabbing operation.
3. Testing of the main (odour & clarity/turbidity and hydrostatic pressure test) by Sydney Water certified Field Testers may be undertaken at the same time other new mains are connected to short single length runs. If acceptance criteria are met the main is ready for disinfection.
4. If no other new mains are connected to the short single length run then the main can be scheduled for disinfection unless approved otherwise by Sydney Water (provided that there are no control breaches).

It is the responsibility of the constructor to ensure that the mains are laid in accordance with this procedure. If any of the acceptance criteria fails (clarity, odour, disinfection

process, failure of controls, etc) and is related to contamination in the main laying process, then the main **MUST** be re-swabbed and a turbidity test must be undertaken.

2.2 Testing

2.2.1 Sampling

After flushing a sample must be collected for a turbidity or odour testing (option dependant). The hydrant box must be clean and free of water and debris before attaching the standpipe to minimise the risk of sample contamination. Figures 10 and 11 show a typical standpipe sampling tap arrangement. The sample is to be collected in a clean clear glass jar (or vial if undertaking a turbidity test).



Figure 10 Standpipe with sampling tap



Figure 11 Collect sample in clean glass jar or turbidity vial

2.2.2 Turbidity / Clarity Testing

Clarity or turbidity can be defined as the cloudiness caused by fine suspended matter like clay or silt in the water. Elevated turbidity can be detected by customers (affects aesthetic quality) and can cause the disinfection process to fail (can affect public health by shielding or protecting bacteria).

Two different methods for assessing the turbidity/clarity of the water are outlined below. The required method as stated in Section 2.1 (options) must be used.

Method 1 Turbidity Testing

Turbidity testing is a quantitative test and is conducted using a turbidity meter which provides a turbidity result.

After flushing, a turbidity test can be carried out (in place of clarity testing) by a trained sampling person with the results recorded in the contractor's ITP. This is to be done for all pipe sizes.



Figure 12 HACH turbidity meter

Procedure for HACH turbidity meter

- Ensure meter is calibrated in accordance with manufacturers standards
- Collect water sample in vial provided with test kit
- Ensure outside of vial is clean and free of any moisture by wiping the outside with a lint free tissue.
- Wipe a thin film of oil solution provided in the kit over the outside of the vial.
- Insert vial into meter and press read.
- The turbidity level of the water will be displayed on the meters screen and record result.

Please follow manufacturer's instructions for other types of meters.

When turbidity testing is undertaken disinfection cannot be requested until turbidity is less than or equal to 2 NTU.

The following problems could lead to wrong turbidity results:

- Dirty glass vial (clean vial)
- Scratches on the outside of the vial (replace vial)
- Moisture on the outside of the vial (wipe with lint free cloth/tissue)
- Fluctuating turbidity levels on same sample could indicate that the batteries may need to be replaced (replace batteries)
- Air bubbles in the sample can be read as turbidity (check sample for air bubbles and if present gently tap/shake vial to eliminate air bubbles)

Method 2 Clarity Testing

Clarity testing is a simple test that can be used to estimate turbidity. Clarity testing is qualitative and is based on estimating how clear the water is using sight.

After flushing, a clarity test will be carried out by a trained sampling person with the results recorded in the contactor's ITP. This is to be done for all pipe sizes.

Collect a sample in a clean clear glass jar and hold up against a white background.



Figure 13 Check sample for clarity against a white background

Descriptions that can be used for clarity include; clear, cloudy/milky, black/brown, yellow/orange, blue/green and other (provide description).

Disinfection cannot be requested until clarity has been recorded as clear.

2.2.3 Odour Testing

Odour is an aesthetic characteristic that could be detected by customers. This is a simple test that can be undertaken in the field before water is disinfected and sent to customers.

Collect a sample in a clear, clean glass jar and place close to nose. Wave hand over jar towards nose (refer to Figure 14) and record odour rating. Rating is based on a scale of 1 to 5 and appears in Table 1. If odour is not acceptable (rating of 4 or 5) describe odour.



Figure 14 Check for odour

Table 1 Odour rating scale

Score	Description
1	This water has excellent odour and I would readily use it.
2	This water has an acceptable odour and I would accept it if supplied.
3	This water has some odour and I would accept it if supplied.
4	This water has a bad odour and I would not accept it if supplied.
5	This water is undrinkable, totally offensive.

Recover hydrant after testing.

Disinfection cannot be requested until an odour test score of between 1 and 3 is achieved.

2.3 Disinfection

Disinfection of new mains where required will be carried out by Sydney Water, who will determine the type of disinfectant (either ozone or chlorine) to be used based on size and length. This will be identified as part of design review in conjunction with the Flow Isolation Flow Management (FIFM) impact assessment.

Requests for disinfection will be submitted to Sydney Water via SWConnect.

2.3.1 Ozonation

For projects identified to be disinfected by ozone, disinfection requests will be submitted in conjunction with water main connection requests, a minimum of ten working days prior to the proposed connection date.

Sydney Water will provide disinfection results and confirm the connection date a minimum of five working days prior the connection.

2.3.2 Chlorination

For projects identified to be disinfected by chlorine, disinfection requests will be submitted a minimum of four weeks to the proposed connection date.

Sydney Water will provide disinfection results within five working days of chlorination. If this result fails to meet procedures, an additional five working days will be required for flush and resample. If the resample also fails to meet guidelines, rechlorination will be required.

For these projects, water main connection requests cannot be submitted until a bacteriological water quality sample pass is achieved.

2.3.3 High risk situations

Where suspected contamination has occurred leading to an unacceptable high risk situation (for example; entry of vermin, presence of faecal matter, etc.) bacteriological and potentially other types of sampling (depending on the type of contamination) must be collected after the main has been disinfected. Water main connection requests cannot be submitted until these water quality samples meet the acceptance criteria.

2.4 Materials

Swabs

Swabs are available from Joyce Foam Products
5-9 Bridges Road (**Head Office**)
Moorebank NSW 2170 Australia
Telephone: 1800 021 304
Facsimile: 1800 807 168



Table 2 Dimensions of swabs and discharge units

Maximum Internal Pipe Diameter (mm)	Swab Diameter (mm)	Swab Length (mm)	Maximum Length of Swab Discharge Control Unit (mm)
100	130-150	200-250	Not Required
150	200-225	300-350	Not Required
200	250-300	350-400	Not Required
225	300-340	400-450	1500
250	350-375	425-500	1600
300	400-450	450-600	1600
400	500-600	500-800	1800
450	550-675	600-900	2000
600	750-900	900-1200	2600
850	1000-1275	1100-1700	3000

Cliklorite

Cliklorite Sanitizer is available from Aussie Soap Direct

Unit 2, 16-18 Barry Road
Chipping Norton NSW 2170

Phone: 02 9755 2125 Fax: 02 9755 2126

sales@aussiesoapdirect.com
admin@aussiesoapdirect.com



Figure 17 Cliklorite solution

Ensure all safety precautions are followed including:

- Obtain Safety Data Sheet (previously MSDS) for Cliklorite.
- Read and understand the safe handling, use and First Aid precautions.
- Have available the recommended PPE (eye, hand, skin & breathing protection where required.)
- Include recommended clean up materials if applicable and disposal of waste or containers.

3. Definitions

Term	Definition
Pipe bursting	Pipe bursting is a trenchless method of replacing buried pipelines without the need for a traditional construction trench. Pipe bursting fractures a pipe from the inside and forces the fragments outwards while a new pipe is drawn in to replace the old.
Slip lining	Slip lining involves the insertion of a new pipe by pulling or inverting a new liner into an existing pipe.
Horizontal Directional Drilling (HDD)	A steerable trenchless method of installing underground pipes by using a surface-launched drilling rig with minimal impact on the surrounding area.
Swabbing	Mechanical method of cleaning mains using a foam swab
Sodium hypo	Sodium hypochlorite (liquid chlorine)
Cliklorite	Sanitiser solution made up of 1% sodium hypochlorite solution
ITP	Inspection & Test Plan
Turbidity	Cloudiness in water caused by fine suspended matter
FIFM	Flow Isolation &/or Flow Management
MSDS	Material Safety Data Sheet
PPE	Personal Protective Equipment

4. Context

4.1 References

Document type	Title
Policies and procedures	Water Supply Code of Australia (WSA Code 03-2011-3.1) – Sydney Water Edition 2014
Policies and procedures	Material Safety Data Sheet (MSDS) – Cliklorite (Issued 28/02/13)

5. Document control

5.1 Review

Stage	Date
Original procedure	Initial issue 22/05/15
This review	Initial issue 22/05/15
Next review	22/05/2018

5.2 Change history

Version	Key changes
1	New document replacing previous guide

6. Appendix 1

Controls used for pipe laying in preparation for disinfection

