



Disinfection of storage tanks and water services

This technical note has been published to provide information and list mandatory procedures for the disinfection of drinking water storage tanks and water supply pipes as set out in AS/NZS 3500.1:2021. This note should be read in conjunction with the Plumbing Code of Australia and the Plumbers Licensing and Plumbing Standards Regulations 2000.

Disinfection of tanks and water services

Adhering to the deemed-to-satisfy disinfection procedures in AS/NZS 3500.1:2021, appendices G and H using the correct doses of chemicals when commissioning drinking water storage tanks and water services is vital. Alternatively, licensed plumbing contractors may submit an application for a performance solution in accordance with the provisions of the Plumbing Code of Australia (PCA). This enables suitable alternative effective methods of disinfection to be used.

These provisions not only reduce the risk of contamination of water services but also protect pipe and fitting materials from premature failure due to water chemistry/quality issues. In commercial or major project work such as hospitals or nursing homes, it may be preferable to contract out the disinfection process to water quality experts who specialise in this area. This is particularly important in these buildings where occupants may have immune systems that are compromised. Insufficient doses may result in growth of unwanted bacteria (low chlorine levels), overdosing can result in damage to pipes and fittings.

Documented water management plan

It is recommended that a fully documented water management quality, testing and flushing plan be implemented when disinfection procedure is undertaken. The document will demonstrate that the licensed plumbing contractor has taken all steps to ensure the water service is fit for service. Additionally it will provide security for the building owner that the commissioning process has been done correctly and reduced the risk of future corrosion of the water service pipework and fittings.

Cleaning of storage tanks

The tank shall be drained and all debris and sludge removed. The surfaces of walls, floor and operating facilities shall be thoroughly cleaned using a high-pressure water jet, sweeping, scrubbing or other similar effective means. All water, dirt, and other material accumulated in this cleaning process shall be flushed or otherwise removed from the tank.



Disinfection of storage tanks

All water storage tanks for drinking water shall be cleaned and disinfected prior to initial use and whenever the tank is taken out of service for inspection, repairs, painting or other activity that may cause contamination of water.

After cleaning, the tank shall be disinfected by one of the following means:

- (a) Filling the tank to overflow level with drinking water to which enough chlorine is added to provide a free chlorine residual, in the whole tank, of not less than 10 milligrams per litre, at the end of the retention time.

The retention time shall be not less than 6 hours, when the water entering the tank has been chlorinated uniformly by gas-fed equipment or chemical pump, or not less than 24 hours, when the storage tank has been filled with water that has been mixed with approximately 400 milliliters of sodium hypochlorite or approximately 70 grams of calcium hypochlorite within the storage facility. The tank shall be drained after disinfection and flushed out with drinking water prior to being put back into service. The recommended quantities of these disinfection agents are given in the top row of the table in AS/NZS 3500.1:2021, appendix G shown below.

Chlorine dose (mg/L)	12.5% Sodium hypochlorite (mL)	70% Calcium hypochlorite (g)
50	400	70

- (b) The application of 200 milligrams per litre available chlorine directly to all surfaces of the storage tank. The disinfection solution shall remain in contact with the surface for at least 30 minutes. The tank surfaces shall then be hosed down and flushed with drinking water prior to being put back into service. The recommended amounts of chlorine, including agents required per 1,000 litres should be, chlorine dose 200 milligrams per litre, 12.5% sodium hypochlorite solution 1,600 milliliters and 70% calcium hypochlorite 280 grams as listed in the bottom row of the table in AS/NZS 3500.1:2021, appendix G shown below.

Chlorine dose (mg/L)	12.5% Sodium hypochlorite (mL)	70% Calcium hypochlorite (g)
200	1600	280

Notes:

1. The amount of chlorine to be added to obtain 10 milligrams per litre residual after the retention period will depend on the amount of organic material present and the chemical composition of the water. As a guide, an initial chlorine dose of 50 milligrams per litre is recommended.
2. Amounts of common chlorine, including agents required per 1000 litres should be as per the second table above.
3. Authorities may require chlorinated water to be neutralized before discharging to the environment and the separate collection and disposal of sludge and silts.
4. ANSI/AWWA C652 contains details of disinfection methods that may be used together with an appendix on neutralization of chlorinated water.
5. Choice of the method of disinfection used should include consideration of the size of the tank to be disinfected, the availability of materials and disinfection equipment, training of personnel, safety of operation and disposal of chlorinated water.

Disinfection of water services from storage tanks

After flushing, water services from storage tanks shall be disinfected at the same time as the storage tank by drawing chlorinated water from the storage tank into the service. After a retention period of 6 hours, a free chlorine residual of not less than 10 milligrams per litre shall remain throughout the services.

Flushing and disinfection of water services other than those from storage tanks

Water services used to supply drinking water shall be protected against contamination during storage, construction and repairs. On completion, or following any repairs, water services less than DN 80 shall be flushed and chlorinated with water from the water services provider's main before being placed in service.

Flushing shall be carried out at each discharge point to remove any dirty water or debris from the service. The flushing velocity in any section of the service shall be not less than 0.75 metres per second. A flushing point of a larger diameter than the water service may be necessary to obtain a velocity of 0.75 metres per second.

Water services of DN 80 or larger shall be disinfected as for a storage tank or disinfected in accordance with ANSI/AWWA C651.

Flushing after disinfection

After the applicable retention period, heavily chlorinated water shall not be allowed to remain in prolonged contact with service piping and fittings. In order to prevent damage to lining or corrosion to the pipes and fittings, the heavily chlorinated water shall be flushed from the service until chlorine measurements show that the concentration in the water leaving the service is no higher than that generally prevailing in the water services provider's distribution system.

Water management plan

On larger projects, consideration should be given to implementing a fully documented water quality management, testing and flushing plan. This will not only protect the piping system against premature corrosion but will ensure the health and safety of owner/occupiers avoiding high levels of chemicals such as chlorine or unwanted bacteria in their drinking water.

Example of a water management plan that may include the following:

- ▶ A detailed scope and an overview of the disinfection process.
- ▶ A list of equipment to be used to measure disinfection agents.
- ▶ A record of dates and times of the disinfection procedure.
- ▶ The total volume of water in the piping system required to be disinfected.
- ▶ The total volume of high chlorinated water required to be used in the disinfection process.
- ▶ Documented workings of the mixing calculation, including measurement of residual disinfectant already in the water. For example chlorine levels in the mains water supply.
- ▶ A correct measurement sample taken of the final disinfecting water.
- ▶ A plan of the piping system showing the disinfection pathways to all existing piping.
- ▶ A test procedure measurement at each outlet (this does not need to be exact providing the total value of disinfection water is measured and recorded).
- ▶ A detailed flushing plan (which is normally the reverse of the disinfection plan).
- ▶ A record of the time each outlet was tested for both disinfection and flushing.
- ▶ A plan for dealing with any ring mains that may need special consideration.

Protection of materials used in water services

It is the licensed plumbing contractor's responsibility to assess water quality from water mains that in some locations may have negative effects on private water services. AS/NZS 3500.1:2021, appendix B lists many factors that should be taken into account, including the nature and temperature of the water to ensure materials and products used are fit for their intended purpose. In such areas where incoming water quality may be an issue the use of chemical injection (phosphates), treatment devices or water filtration should be considered.

During major projects leaving stagnant water in water services can affect the interior surfaces of pipes, particularly when water chemistry or quality is not within acceptable limits.

Notes

The technical note series is issued by the Plumbers Licensing Board to assist the plumbing industry to comply with the Plumbers Licensing and Plumbing Standards Regulations 2000 (the Regulations) applicable to plumbing work in Western Australia.

Each technical note is to be read in conjunction with Part 6 of the Regulations that currently adopt the Plumbing Code of Australia (PCA) and the deemed to satisfy provisions of AS/NZS 3500:2021, parts 0, 1, 2 and 4 but modified in certain matters to suit the State's building approach and other local conditions.

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