

Critical Control Points for Drinking Water Management Systems

At the heart of the *Australian Drinking Water Guidelines* Framework are critical control points (CCPs). A CCP is an activity, procedure or process that is critical to control a water quality hazard. CCPs must be monitored regularly, ideally continuously, to ensure the effectiveness of barriers. Properly operated CCPs help ensure safe drinking water.

The most important CCPs are filtration (where present), disinfection and maintaining reservoir integrity. Water utilities may establish other CCPs, including fluoridation and selective abstraction of raw water.

Setting CCPs

A water utility's drinking water management system should define each CCP including the appropriate target and critical limit. Values need to be set for each CCP:

- A target value, which represents good control of the process.
- An adjustment limit can be set, which indicates the point at which adjustment needs to be made to restore control and to avoid the critical limit being exceeded.
- A critical limit at which, if exceeded, control of the process is lost and water quality is not guaranteed.

A water utility must consult with the local Public Health Unit and the Department of Industry Water before changing a CCP, particularly the critical limit. Proposed plant upgrade or modification may require assessment and approval by Department of Industry (DoI) Water. Values from the *Australian Drinking Water Guidelines* that have been used to set critical limits are shown in the table and agreed between NSW Health and DoI Water.

Table – Key CCPs and critical limits from the *Australian Drinking Water Guidelines*

Hazard	Control	Monitoring characteristic, location	Critical limit
Chlorine sensitive pathogens	Chlorination	Chlorine concentration after contact time (e.g. at outlet of clear water tank)	Minimum free chlorine concentration for C.t (concentration and contact time) of 15 mg.min/L
<i>Naegleria fowleri</i> (1)	Chlorination	Chlorine concentration after contact time (e.g. at outlet of clear water tank)	Minimum free chlorine concentration for C.t (concentration and contact time) of 30 mg.min/L
Chlorine sensitive pathogens	Chlorination	Turbidity at point of chlorination	Turbidity less than 1 NTU (2)
Chlorine resistant pathogens (3)	Filtration	Turbidity at individual filter outlet	Maximum turbidity 0.5 NTU (4)
Pathogens from vermin	Integrity of reservoirs	Regular inspection of reservoirs	Evidence of contamination

Notes: 1. Water that seasonally exceeds 30°C or continually exceeds 25°C can support growth of *Naegleria fowleri*.

2. A higher critical limit for turbidity may be acceptable where source water is protected from pathogens, such as deep groundwater (not under the influence of surface water), or where the effectiveness of chlorination at a higher turbidity value can be validated in the specific context.

3. Appropriate monitoring and critical limits must be established where UV is used as a control for chlorine resistant pathogens.

4. This critical limit is required where there is an identified risk from *Cryptosporidium* and *Giardia* and filtration alone is the control. The target for individual filter turbidity is <0.2 NTU, measured at each filter outlet. Continuous on-line monitoring of individual filters is recommended.

Maintaining CCPs

Standard operating procedures (SOPs) for maintaining CCPs must be easily accessible to operational staff and displayed at the CCP location or control room. SOPs provide guidance on maintaining operation in the target range, responding to adjustment limit and critical limit exceptions, and dealing with changes in raw water quality. Water utilities must respond promptly to adverse signals including operational monitoring results, alarms and weather warnings.

A CCP exception occurs when monitoring shows operation beyond the critical limits. This indicates that the safety of the water may be compromised.

Water utilities must immediately notify their local Public Health Unit of any incident affecting drinking water safety, including CCP exceptions, reservoir contamination and test results indicating possible contamination.

Improving water quality

Some drinking water supplies are currently unable to meet the CCP values in the *Australian Drinking Water Guidelines*. The performance of some water supplies could be improved through optimisation of processes and operational controls. Department of Industry Water and NSW Health can assist with assessing risks and control options, optimising treatment processes, and establishing appropriate targets, adjustment limits and critical limits.

To control health risks, implementation of drinking water management systems should include:

- Optimisation of existing water treatment processes to achieve the lowest possible turbidity.
- Standard operating procedures to give practical guidance on operation of treatment processes (including CCP monitoring, maintenance and calibration, and response to significant deterioration in raw water quality).
- Maintaining integrity and adequate chlorine residuals throughout distribution systems. For systems with free chlorine, **0.2 mg/L** should be the minimum residual. For chloraminated systems, **0.6 mg/L** total chlorine should be the minimum. Free chlorine should not drop below **0.5 mg/L** in systems where *Naegleria fowleri* is a risk.
- An action list to address risks that have been identified. Examples may include catchment management activities and installation of on-line monitoring of raw water turbidity.

Critical limits and target criteria from the *Australian Drinking Water Guidelines* should be used to specify performance of new water supply systems and for major upgrades of existing plants.

For more information

- Managing pathogen risks in drinking water: Response protocol for water utilities and public health units www.health.nsw.gov.au/environment/water/Pages/nswhrp-microbiological.aspx
- Drinking water management systems <https://www.health.nsw.gov.au/environment/water/Pages/water-utilities.aspx>
- *Naegleria fowleri* - information for utilities <https://www.health.nsw.gov.au/environment/water/Pages/Naegleria-utilities.aspx>
- Department of Industry Water <https://www.industry.nsw.gov.au/water/water-utilities>