

FURTHER PUBLIC COMMENT — SUBMISSION NO. 6

DR AS 3633:2026 Residential and public pools — Water quality

Cyanuric acid: additional bacterial and viral evidence and the validation of prescribed chlorine residuals

Project MC-000342-01
Technical Committee CS-061
Supplementary to previous public comments

1. Decision requested

Identify the independent evidence validating the chlorine residuals in Table 3.1.2(B) across the permitted cyanuric-acid (CYA) range, and amend the normative requirements where that evidence does not support the specified operating conditions.

Central question: What organism-specific outcomes, contact times and test conditions demonstrate that the prescribed chlorine/CYA operating range delivers the disinfection performance intended by the Standard?

2. What this submission adds

Enviroswim's September CYA technical addendum already addressed the draft's chemistry, Cryptosporidium research and the distinction between residual concentration and efficacy. Those objections and requested amendments remain on the record. This sixth submission adds bacterial-disinfection guidance and viral-inactivation research to that case; it does not present the previously cited Cryptosporidium studies as new evidence.

NSW Health's 2013 advisory document states that 50 mg/L CYA may extend the time for a 4-log reduction of *Pseudomonas aeruginosa* from one minute to approximately five minutes. It consequently recommends a higher chlorine residual in stabilised outdoor pools. This is a bacterial example requiring consideration alongside the earlier protozoan evidence. [2]

Yamashita et al. (1988) tested ten enteroviruses and two adenoviruses at 0.5 mg/L free available chlorine, pH 7.0 and 25°C. Adding 30 mg/L CYA prolonged the time for 99.9% inactivation by approximately 4.8–28.8 times, depending on the virus. The paper also reported slower poliovirus inactivation with 1.5 mg/L chlorine and 30 mg/L CYA than with 0.5 mg/L chlorine without CYA. These results support assessment by organism and chemical conditions. [3]

Research on *Naegleria gruberi* cysts provides additional mechanistic support: it identified hypochlorous acid as the predominant cysticidal species and found no measurable cysticidal contribution from chlorinated cyanurates under the tested conditions. This is supporting chemistry, not a claim about pathogenic *Naegleria fowleri* or every pool condition. [4]

3. The specific gap requiring an answer

Table 3.1.2(B) permits CYA in stabilised outdoor pools. Appendix D acknowledges that much of the DPD-measured chlorine is cyanurate-bound and that at 30–50 mg/L CYA the hypochlorous-acid concentration is of the order of 1% of measured free chlorine. Appendix D also recognises the importance of concentration and contact time. [1]

These acknowledgements do not, by themselves, invalidate the prescribed residuals. They do require an identifiable evidentiary connection between those residuals, CYA concentration and the intended microbial outcomes.

Enviroswim recognises both sides of the chemistry: CYA reduces sunlight-driven chlorine loss, while reducing immediately available disinfecting activity. NSW Health recommends higher chlorine residuals to compensate and states that stabilisation can produce a net chlorine saving. The question is whether the draft's compensation is adequately validated throughout its permitted operating range. [5]

A DPD result is an operational concentration measurement, not a direct pathogen-inactivation measurement. The approximately 1% HOCl statement must not be interpreted as an automatic 99% loss of overall efficacy: equilibrium replenishment and organism-specific kinetics matter. Likewise, the earlier *Cryptosporidium* hyperchlorination studies concern incident-response conditions and do not alone establish failure of every routine chlorine condition. [1, 6–7]

4. Four questions for technical disposition

Q1 — Evidence supporting the operating range. Which independent studies validate the free-chlorine values in Table 3.1.2(B) throughout the permitted CYA range? Identify the organisms, log-reduction endpoints and contact times, including the basis for any interpolation or extrapolation.

Q2 — Reconciliation with the additional evidence. How were the NSW Health bacterial example and Yamashita viral results evaluated? What evidence demonstrates that the draft's prescribed conditions adequately compensate for the reported CYA effects, with any limitations stated?

Q3 — Representative operating conditions. What evidence or validated modelling supports application under the specified pH and temperature range, sunlight, chlorine demand, bather loading and pool hydraulics? Distinguish controlled laboratory findings from evidence supporting field application.

Q4 — Equivalent performance and incident response. What common efficacy endpoints apply to conventional and alternative treatment pathways, and where does the draft provide CYA-specific contamination-response controls or an explicit reference to an applicable protocol?

For Q1–Q3, the evidence record should state CYA and chlorine concentrations, chlorine measurement method, pH, temperature, organism, endpoint, contact time, water matrix and demand, and the limits of application. A higher residual is a control measure; its adequacy for the claimed outcome remains the issue.

5. Amendments requested

- A. Clause 3.1.1 — Separate efficacy from concentration. Define the intended microbiological performance by organism-specific inactivation endpoints and contact times. Retain residual concentrations as operating controls supported by evidence, rather than treating a concentration alone as the definition of efficacy.
- B. Clause 3.1.2 / Table 3.1.2(B) — Validate the chlorine/CYA operating range. Identify the evidence supporting the prescribed combination of chlorine, CYA, pH and temperature. Where validation supports only part of the range, narrow or qualify the provisions, or require additional validated controls before permitting the unsupported conditions.
- C. Appendix D and associated normative provisions — Make CYA-specific response controls enforceable. Include, or explicitly incorporate by reference, an applicable contamination-response protocol covering CYA reduction where required, chlorine/contact-time targets, closure,

verification and reopening. Distinguish routine operating controls from *Cryptosporidium* incident response.

- D. Alternative-treatment provisions, including Appendix I — Apply equivalent claim-specific proof. Require each treatment pathway to demonstrate the outcomes claimed under its declared operating conditions. Methods may appropriately differ by technology, but acceptance criteria should protect the same public-health outcomes. Established use should be supported by an identifiable evidence base.

6. Proposed normative principle

Where cyanuric acid or a stabilised chlorine compound is used, the specified free-chlorine and cyanuric-acid operating range shall be supported by independently evaluated evidence demonstrating the required organism-specific disinfection performance under the stated operating conditions. The evidence shall identify the applicable pH, temperature, contact time and relevant water-quality and hydraulic conditions, together with limitations. A measured free-chlorine residual alone shall not establish equivalent microbiological efficacy.

This proposed wording is a performance principle for Committee drafting; organism-specific endpoints and acceptance criteria must be specified consistently with the Standard's scope.

7. Registration and reasoned disposition

Register this document as Submission No. 6, link it to Enviroswim's earlier public comments and September CYA addendum, and circulate it to CS-061 for consideration before finalisation. It supplements and does not replace the earlier record.

Provide a separate disposition for Q1–Q4 and amendments A–D, stating whether each is accepted, modified or rejected, with the evidence and technical reasons relied upon. An unsupported "no change" would not resolve the identified evidentiary question. Where assessment identifies a material unsupported requirement, revise it before publication and provide appropriate review of materially changed provisions.

Enviroswim is maintaining a public record of its submissions to allow independent examination of the evidence and its disposition. This submission asks for validation of the prescribed conditions, not acceptance of Enviroswim's position on commercial grounds.

References

- [1] Standards Australia. DR AS 3633:2026, Residential and public pools — Water quality. Project MC-000342-01. Clauses 3.1.1–3.1.2, Table 3.1.2(B), Appendix D and Appendix I. Public commenting draft, 2026.
- [2] Health Protection NSW. Public Swimming Pool and Spa Pool Advisory Document. April 2013. Section 4.4.1(vi), printed page 23 (PDF page 25).
<https://www.health.nsw.gov.au/environment/Publications/swimming-pool-and-spa-advisory-doc.pdf>
- [3] Yamashita T, Sakae K, Ishihara Y, Isomura S, Inoue H. Virucidal effect of chlorinated water containing cyanuric acid. *Epidemiology and Infection*. 1988;101(3):631–639.
<https://doi.org/10.1017/S0950268800029502>
- [4] Inactivation of *Naegleria gruberi* cysts by chlorinated cyanurates. *Applied and Environmental Microbiology*. 1983;46(5):1157–1162. <https://doi.org/10.1128/AEM.46.5.1157-1162.1983>
- [5] NSW Health. Stabiliser (cyanurate) use in outdoor swimming pools. Updated 21 April 2017.
<https://www.health.nsw.gov.au/environment/factsheets/Pages/stabiliser-cyanurate.aspx>
- [6] Shields JM, Arrowood MJ, Hill VR, Beach MJ. The effect of cyanuric acid on the disinfection rate of *Cryptosporidium parvum* in 20-ppm free chlorine. *Journal of Water and Health*. 2009;7(1):109–114.
<https://doi.org/10.2166/wh.2009.008>
- [7] Murphy JL et al. Effect of cyanuric acid on the inactivation of *Cryptosporidium parvum* under hyperchlorination conditions. *Environmental Science & Technology*. 2015;49(12):7348–7355.
<https://doi.org/10.1021/acs.est.5b00962>

Concise portal comment

Supplementary public comment — Submission No. 6. This document extends Enviroswim’s September CYA addendum with bacterial-disinfection guidance and viral-inactivation research. NSW Health reports increased *Pseudomonas* inactivation time with CYA; Yamashita et al. report delayed viral inactivation under specified test conditions. Enviroswim requests identification of the independent evidence validating Table 3.1.2(B) throughout the permitted chlorine/CYA operating range, reconciliation of that evidence with the additional findings, and amendments separating microbial efficacy from residual concentration, validating operating limits, providing CYA-specific incident-response controls and applying equivalent claim-specific performance criteria. Please address Q1–Q4 and amendments A–D individually, with technical reasons and supporting evidence. This submission supplements and does not replace earlier public comments.