



PROPOSAL FOR CHANGE
NATIONAL CONSTRUCTION CODE SERIES

SUBJECT	Water Lead Testing and Lead Free Plumbing
BCA Volume One:	H102.2(d)
BCA Volume Two:	3.5.1.2; 3.5.1.3; 3.5.2.2
Guide to Volume One:	N/A
PCA Volume Three:	Tas B104.4; Tas B101.7; BP1.2

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Proposer's Organisation: The Lead Education and Abatement Design (LEAD) Group Inc (environmental, occupational and public health promotion charity)

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The Proposal

1. What is the proposal?

The LEAD Group proposes that clauses in the NCC allowing lead products in contact with water, be changed to permit only lead-free products in contact with water, and that prior to use, water is analysed for lead, and the results added to a National Register of Tap Water Lead Results. The Register will be set up prior to the publication of NCC 2019, and have at least 20,000 lead results (the "Pilot Study") in it before NCC 2019 compliance is required by States and Territories. Results in the Register will be online and searchable by Water Authority of mains water supply, suburb/postcode where samples were collected, water softness, pH, plumbing product brand names and model numbers, the flushing period/s, and first flush and flushed water sample lead results. If follow-up testing is required, the follow-up test results are linked to the first round of test results.

Data in the Register will be analysed quarterly by ABCB, and a summary of trends web-published with recommendations as to how to lower the lead results. All results exceeding the Australian Drinking Water Guideline (ADWG) lead limit will require follow-up to ensure that the source of the excess lead in the water is identified and lead abatement action is taken, until re-testing demonstrates compliance with the ADWG lead limit.

In order to determine the period of flushing required before a representative sample of the water supply is running through the tap after the first flush (of water that has been stagnant in the tap for at least 9 hours), a Flushing Period Calculator would need to be developed by ABCB. The Calculator would estimate the period based on measurement/estimate of the pipe distance between the tap and the water supply (tank or mains, etc). If the first flush sample and the flushed sample lead results are both less than one-tenth of the ADWG lead limit, then the building's plumbing is "Certified lead not-detected". If they are both between the limit of detection and the ADWG lead limit, the plumbing is "Certified compliant with ADWG lead limit". If the first flush result exceeds ADWG lead limit but the flushed sample result complies, this pinpoints the end-of-line tap fitting as the lead source. (Current advice given by



The LEAD Group is to then replace any brass tap with a stainless steel tap and repeat the testing.)

But if the flushed sample lead result exceeds the ADWG lead limit, the Calculator is again used to determine the second round flushing period distance from the tap to the next most likely source of lead eg brass valves, brass joints, brass water pump. The sample/s on this second round of testing is/are collected (after non-use of the system for at least 9 hours) after the water is flushed for the period/s calculated to measure the lead leached during the stagnancy period **in** that/each in-line fitting/pump.

Once water is compliant with the ADWG lead limit, the successful lead abatement method (including brand names of replacement products) is linked to the previous rounds of data for this plumbing system in the Register. Successes are reported quarterly among Case Histories and the summary of data trends.

Proposed changes to clauses in NCC 2016 and additional clauses required:

NCC BCA Part One Clause H102.2(d) would change FROM:

- (d) The provision of a reticulated water supply from—
 - (i) a regulated entity; or
 - (ii) a private water supply with on-site treatment, which meets the Australian Drinking Water Guidelines, satisfies **Tas H102 P2(b)**.

TO:

- (d) The provision of a reticulated water supply from—
 - (i) a regulated entity; where water from the tap meets the Australian Drinking Water Guidelines, or
 - (ii) a private water supply with on-site treatment, which meets the Australian Drinking Water Guidelines, satisfies **Tas H102 P2(b)**.
- (e) Laboratory lead analysis results for first flush water after non-use of the tap for 9 hours, and for flushed water (flushed for a period determined by the Flushing Period Calculator) must comply with the Australian Drinking Water Guideline lead limit, and be registered in the National Register of Tap Water Lead Results along with the suburb/postcode where samples were collected, brand names of all newly installed plumbing components and the source of the reticulated water supply:
 - (i) the name of the regulated entity and the softness and pH of the water supplied, or
 - (ii) the source, softness and pH of the private water supply and details of any on-site treatment prior to use of the water.

NCC BCA PART TWO Clause 3.5.1.2(e) would change FROM:

- (e) Lead *flashings* must not be used on any roof that is part of a potable water catchment area.

TO:

- (e) Lead *flashings* must not be used on any roof.

In **Table 3.5.1.2 ACCEPTABILITY OF CONTACT BETWEEN DIFFERENT ROOFING MATERIALS CHANGE** each **Yes** in the **Lead columns** and row **TO: No**.

NCC BCA PART TWO Clause 3.5.1.3(g)(vi) CHANGE from:



(vi) Lead *flashings* must not be used with prepainted steel or zinc/aluminium steel or on any roof if the roof is part of a potable (drinking) water catchment area.

TO:

(vi) Lead *flashings* must not be used with prepainted steel or zinc/aluminium steel or on any roof if the roof is part of a water catchment area or on a newly constructed roof. If existing lead flashings are on a roof that is part of a water catchment area, or prior to adding a water tank to a building, existing lead flashings must be replaced with non-lead flashings in accordance with Table 3.5.1.2.

NCC BCA PART TWO Clause 3.5.1.3(h)(iv) CHANGE from:

(iv) Lead *flashings* must not be used with prepainted steel or zinc/aluminium steel or on any roof if the roof is part of a potable water catchment area.

TO:

(iv) Lead *flashings* must not be used with prepainted steel or zinc/aluminium steel or on any roof if the roof is part of a water catchment area. If existing lead flashings are on a roof that is part of a water catchment area, or prior to adding a water tank to a building, existing lead flashings must be replaced with non-lead flashings in accordance with Table 3.5.1.2.

NCC BCA PART TWO Clause **3.5.2.2, CHANGE from:**

Gutters, downpipes and *flashings* must—

(d) not contain any lead if used on a roof forming part of a potable water catchment area.

TO:

(d) not contain any lead. On existing buildings, lead gutters, downpipes and flashing must be replaced with non-lead gutters, downpipes and flashing if used on a roof forming part of a water catchment area.

NCC BCA PART TWO Clause **3.5.2.2, ADD** the following additional clause:

(e) After a water tank has been installed, laboratory lead analysis results for first flush water after non-use of the tap for 9 hours, and for flushed water (flushed for a period determined by the Flushing Period Calculator) must comply with the Australian Drinking Water Guideline lead limit, and be registered in the National Register of Tap Water Lead Results along with the suburb/postcode where samples were collected, brand names of all newly installed plumbing components (including model number of any pump) and the source of the reticulated water supply:

(i) the name of the regulated entity and the softness and pH of the water supplied, or

(ii) the source (eg rain, dam), softness and pH of the private water supply and details of any on-site treatment prior to use of the water.

NCC PCA PART THREE Clause **Tas B101.4, CHANGE from:**

(a) Materials and *products* in contact with water to be used in a *drinking water* supply must comply with AS/NZS 4020.

TO [note the term “drinking water supply” has been cut to “water supply”]:

(a) Materials and *products* in contact with water to be used in a *water* supply must comply with AS/NZS 4020.



NCC PCA PART THREE Clause **Tas B101.4, CHANGE** from:

(d) **Solders**

Solders used in the manufacture of tanks must be certified under the *WaterMark Certification Scheme* to AS/NZS 4020. Soft solder must comply with AS 1834.1 and for roof *drainage* components used for the conveyance of *drinking water*, be lead free.

TO [note the term “drinking water supply” has been cut to “water supply”]:

(d) **Solders**

Solders used in the manufacture of tanks must be certified under the *WaterMark Certification Scheme* to AS/NZS 4020. Soft solder must comply with AS 1834.1 and for roof *drainage* components used for the conveyance of *water*, be lead free.

NCC PCA PART THREE Clause **Tas B101.7, CHANGE** from:

Explanatory information:

Rainwater for drinking purposes should not be collected from recently painted roofs (until after the first few rainfalls), timber roofs preserved with chemicals, roofs coated with lead flashings, lead-based paints or tar-based coatings, or parts of roofs near flues from solid fuel heaters.

TO [Note the term “drinking purposes” has been changed to “any purpose”]:

Explanatory information:

Rainwater for any purpose should not be collected from recently painted roofs (until after the first few rainfalls), timber roofs preserved with chemicals, roofs coated with lead flashings, lead-based paints or tar-based coatings, or parts of roofs near flues from solid fuel heaters.

NCC PCA PART THREE Clause **BP1.2, ADD:**

(g) Laboratory lead analysis results for first flush water after non-use of the tap for 9 hours, and for flushed water (flushed for a period determined by the Flushing Period Calculator) must comply with the Australian Drinking Water Guideline lead limit, and be registered in the National Register of Tap Water Lead Results along with the suburb/postcode where samples were collected, brand names of all newly installed plumbing components (including model number of any mixer tap) and the source of the reticulated water supply:

(i) the name of the regulated entity and the softness and pH of the water supplied, or

(ii) the source, softness and pH of the private water supply (including model number of any pump) and details of any on-site treatment prior to use of the water.

The Current Problem

2. What problem is the proposal designed to solve?

Australians have such faith in the National Construction Codes that there is a widespread belief that drinking water is lead-safe for drinking and garden and irrigation water is lead-safe for vegetables, crops and food animals and that building run-off is lead-safe for our waterways, sediments and water-grown produce. Yet the few studies of water lead levels and blood lead levels that have been published, would indicate otherwise. This proposal is designed to eliminate the use of lead flashing and lead solder in new construction/renovation projects, and to create a DataBank – the National Register of Tap Water Lead Results – to help manage the reduction of lead levels in tap water.



3. What evidence exists to show there is a problem?

Please see evidence regarding the problem of lead flashing and roofing products in the Proposal for Change (PFC) form *Change proposal to permit & promote only lead-free flashing* submitted on 31st August 2017 by Grant Brown, DEKS (<http://lead.org.au/BCA-Change-proposal-to-permit-&-promote-only-lead-free-flashing.pdf>).

Regarding the general problem of lead in plumbed water, according to John Power, in *Lead in drinking water: up to 720,000 homes affected - despite the acknowledged health hazards of lead in drinking water, Australian homes and workplaces continue to be blighted by this scourge, mostly via lead leached from brass tapware and related fittings* (Plumbing Connection Magazine, Winter 2017 (online March 2017), <http://search.informit.com.au/documentSummary;dn=753049977160088;res=IELENG>):

“While there is clear evidence dating back many decades of a massive problem, the precise extent of the hazard is unknown, as (incredibly) there are no systematised water testing processes at the customer side of street mains to produce comprehensive data on the subject.

“...Last year [2016] two significant events shone a spotlight on unsafe lead levels in potable water: the first was a Macquarie University study¹ which, for the first time, tested lead levels in water consumed in a broad cross-section of homes in New South Wales. Tests involved the sampling of first-draw water in the morning, when water had been in contact with fittings overnight. The study involved the sampling of potable water drawn from the kitchen taps of 212 homes across the entire State, and detected lead in 56% of samples; some 8% of the total test samples exceeded recommended lead thresholds of 0.01mg/L of water, as stipulated in the Federal Government-approved advisory document [Australian Drinking Water Guidelines](#)². A straightforward extrapolation of the findings at a national scale, based on Australia’s nine million dwellings, equates to approximately 720,000 households with unsafe levels of lead in their drinking water.

“...The case studies (Phase 2) show that the likely source of drinking water lead contamination is the components within the internal property plumbing,’ the study report states. NB: there is no suggestion that elevated lead levels in water can be blamed on civic water supply lines, which are monitored routinely for purity and safety. The problem, it is worth repeating, lies with plumbing systems within homes, with the worst culprits in the Macquarie study being taps less than one year old. [Harvey et al, 2016,

<http://www.sciencedirect.com/science/article/pii/S0013935116303280> and Harvey 2016 *Drinking water lead contamination flows on*, <http://lead.org.au/lanv17n1/lanv17n1-10.html>]

“The second event was the announcement that the newly constructed Perth Children’s Hospital could not open due to the detection of unsafe lead levels in the building’s drinking water. At the time of going to print the hospital remains closed, and the source of the contamination has not been identified.” [end of Power, 2017 quotes.]



According to the *Report on Perth Children's Hospital Potable Water - Chief Health Officer Review*, (July 2017, <http://ww2.health.wa.gov.au/Reports-and-publications/CHO-review-into-lead-at-PCH>):

"The results of the data analysis and scientific experiments pointed to the same conclusions:

1. the source of the lead in the water is from brass fittings that have undergone a process of dezincification;
2. many of these brass fittings are located within approximately 1200 Thermostatic Mixing Valve (TMV) Assembly Boxes, located within a metre or two of drinking water outlets; and
3. phosphate treatment has been partially but not sufficiently effective in reducing lead levels."

...[elevated water lead levels] can arise from two mechanisms:

- soluble lead leaching into water as a result of a concentration gradient between a dezincified brass fitting and water; and
- particulate or solid lead which can be elemental or complexed with other products, and released spontaneously from a damaged surface or after physical scouring by fast flowing water.

"The main potential causes of dezincification include the nature of the brass itself, water stagnation and inconsistent flushing, and hyperchlorination."

The Objective

4. How will the proposal solve the problem?

If this proposal had been incorporated into NCC 2013, the costly Perth Children's Hospital debacle would have been prevented (and the Hospital would be operational) and people in the estimated 720,000 homes with water lead levels exceeding the ADWG, and the possible 56% of Australian homes with detectable lead in their water (based on Harvey et al 2016) would not have been exposed to lead in their drinking water. The sooner there is a system in place to identify and make known the problem plumbing products, soft-water or low pH water areas and water treatments, the sooner blood lead levels will fall and the sooner less lead will contaminate the food chain and the environment.

5. What alternatives to the proposal (regulatory and non-regulatory) have been considered and why are they not recommended?

The status quo (business as usual) has been considered and is not recommended because:

Lead flashing / roofing products and lead solder clearly add lead to water so by not permitting them in any new buildings/plumbing systems, the future stormwater and



wastewater will contain less lead. If lead flashing on roofs with a water tank were replaced with non-lead flashing, the rate of addition of lead to water will be further decreased.

Appendix H in Watermark Certification involves flushing the product being tested for half an hour before water is left in contact with the product, but in the real world, half an hour of flushing is wasteful of water and time so unlikely to occur. Products in contact with water should be required to comply with the ADWG lead limit when a first flush sample of water is taken, without any prior flushing. The test water used in Appendix H is of average softness and pH and is not chlorinated or treated in any other way so the lead leaching results cannot reflect real world lead results in the water from these products. Also, if each product in a plumbing system complies individually (during Watermark Certification), with the ADWG lead limit, it does not mean that when placed in a plumbing system, the ADWG limit will be achieved. Only first flush and flush sample lead results after installation can assess whether the system complies.

The Impacts

6. Who will be affected by the proposal?

Everyone who is unwittingly drinking leaded water or using it for their home-grown produce, pets, farm animals, crops, etc will be better off under this proposal. The US EPA, in *Reducing lead in drinking water: a Benefit Analysis* (1986) listed the following benefits of reducing lead in drinking water:

- Children's health benefits: reduced medical costs, reduced cost of cognitive damage
- Adult health benefits: reduced hypertension savings, savings from fewer heart attacks, savings from fewer strokes, savings from fewer deaths
- Materials benefits: benefits of reduced corrosion damage.

If laboratory lead testing of the water as soon as a plumbing system is installed were a requirement, and plumbing product details were searchable in the Register, plumbing products which add lead to water would soon stop selling so well and companies making or importing products which don't add lead to the water will be more successful.

7. In what way and to what extent will they be affected by the proposal?

Reduced lead exposure from plumbed water will lower blood lead levels and in people, lower blood lead levels are associated with higher IQ, less violent and criminal behaviour, and longer, healthier lives.

The US EPA (1986) estimated the ratio of Total annual monetized benefits to the Estimated annual costs of reducing lead in drinking water to be **4:1**.



Consultation

8. Who has been consulted and what are their views?

Grant Brown, DEKS (mentioned above) was consulted and hopes the ABCB will take his submission on lead free flashing, and this one seriously.

Emeritus Professor Brian Gulson, Head, The LEAD Group's Technical Advisory Board has been consulted and views this proposal as a practical solution to a problem he first identified in the 1990s. He also recommends that those concerned about safe water have a look at the [Drinking Water and Children's Health Report](#), in which the US EWG reviewed drinking water reports from nearly 50,000 water companies or utilities nationwide, collected between 2010 and 2015, and compared test results to science-based health guidelines (WWW.EWG.ORG/TAPWATER database is searchable by US zipcode, city, and water utility).

Professor Gulson notes that while the ADWG lead limit is 10ppb (parts per billion), the US EWG Report states:

"...there is no amount of lead exposure scientists consider safe.

"Recent Environmental Protection Agency modeling suggests that lead concentrations in excess of 3.8 ppb could boost some children's lead exposure above acceptable levels. Meanwhile, the Food and Drug Administration limits lead in bottled water to 5 ppb, and California has set a public health goal of 0.2 ppb lead in tap water to protect children's' brains and prevent the loss of IQ points."

A Sydney-based Plumber who was consulted, added:

"I agree with the views and changes the LEAD Group has put forward here. I however wouldn't call myself a specialist in this area, but do hold the view after 25 plus years in the industry, that improvements that can be made, should be made. Especially in the area of Health and Safety. Lead has been used in plumbing for many years from a usability standpoint, but is far from a healthy choice. If other products like stainless steel can become a substitute, they should be offered. Better lightweight flashings are now available also as lead replacements. Better testing in this area will give greater insight into how we can continue these improvements. I see the changes being discussed as positive and necessary to Australia to continue our high standards in this area."

Peter Byrne MD Evo Building Products was consulted and wrote: "Evo has been involved in the promotion of lead free products in Australia since 2002 and been educating builders and lead resellers of issues concerning lead safety and lead toxicity. The proposed change would make an enormous impact on the levels of awareness for both consumers and builders in this field promoting a safer living environment for all stakeholders. Evo Building products fully endorses the changes proposed."



Endorsement

From: John Power, freelance journalist and former editor of 'Plumbing Connection' magazine, Australia's peak professional publication servicing the plumbing sector in Australasia.

I wholeheartedly endorse the activities of The LEAD Group, and in particular the efforts of President Elizabeth O'Brien, whose work over several decades has highlighted the immense problems of lead contamination in Australia. The LEAD Group's advocacy was instrumental in the removal of lead from petrol-based products, and one might argue that lead contamination in drinking water is an even larger health hazard.

Over the past year I have written articles on the subject of lead contamination in drinking water, as referenced above, and noted with amazement how little material progress has been made in tackling this problem despite clear and incontestable health warnings. The time has come to acknowledge that genuine practical reform is needed urgently, and that peak national bodies, operating under NCC terms of reference, must be responsible for nationwide safety checks and balances. At the crux of the matter are two main observations: there are no 'safe levels' of lead contamination in plumbing products; and the supply of safe products falls under the umbrella of Non-Conforming Building Products (NCBPs).

Not only should conformance standards be upgraded and toughened to reflect a 'zero tolerance' towards lead contamination in tapware and related fittings, but such a policy should also be supported by a national product register and centralised enforcement policy.

It is worth noting that State-based legislations (notably Queensland) are already addressing NCBPs within their own jurisdictions (<http://statements.qld.gov.au/Statement/2017/8/24/palaszczuk-government-leads-the-way-with-new-building-product-safety-laws>), so a tough NCC stance on lead contamination should be a high priority NOW in advance of an avalanche of State-based actions.

The idea of a national register of safe and conforming products should be applauded. Such a register is currently under examination by the Building Ministers Forum, which has appointed an SOG 'to explore the practicality and benefits of third-party certification for building product conformity'. We can only hope that the Forum embraces the idea of a national register, which is the only means of ensuring the quality and safety of products used throughout Australia's building industry. Such a register must be underpinned by the most rigorous, up-to-date NCC standards, including the abovementioned modifications proposed by The LEAD Group, in accordance with the latest medical and scientific views on the matter. A healthier Australia depends on it.

John Power

1 September 2017